

# Test & Measurement 2016 Product Catalog



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### Chroma Group

| CHROMA GROUP     |  |                        |                     |
|------------------|--|------------------------|---------------------|
| CHROMA ATE INC.  |  |                        |                     |
| Neworld H.K.     | Chroma Investment                      | MAS Automation/Taiwan  | ADIVIC Technology   |
| Chroma/Beijing   | Chroma/USA                             | MAS Automation/Nanjing | EVT Technology      |
| Chroma/Shanghai  | Chroma/Netherlands                     | MAS Automation/Xiamen  | Testar Electronics  |
| Chroma/Suzhou    | Chroma/Japan                           |                        | Chroma New Material |
| Chroma/Chongqing | Quantel/SE Asia<br>(Company of Chroma) |                        | DynaScan Technology |
| Chroma/Xiamen    |  |                        | ADLINK Technology   |
| Chroma/Shenzhen  |  |                        |                     |
| Chroma/Dongguan  |  |                        |                     |

### **Global Operation Sites**





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Ede, Netherlands

Irvine, CA



Foothill Ranch, CA





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c-Si Solar Cell Tester

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#### Video Pattern Generator

- Comply with DisplayPort 1.2a standard - 4K x 2K 60/50Hz
  - Pixel rate support up to 600MHz

  - Auto / Manual training mode - 1.62 / 2.7 / 5.4Gbps per lane
  - -1/2/4 Link
  - 0 / 3.5 / 6 / 9.5 dB pre-emphasis
  - 400 / 600 / 800 / 1200mV Swing level
  - MST( Multi Stream Transport )
  - DPCD Analyze

#### HDMI support up to 300MHz

- 4K x 2K 24/30Hz
- 1080p 120Hz
- 3D format with 1080p 60Hz (Frame packing / Side-by-Side Full)

#### **Video Pattern Generator**

- Modular design
- HDMI 2.0 Signal module (option)
- Comply with HDMI 2.0 standard
- 4K x 2K 60/50Hz
- Pixel rate support up to 600MHz (6Gbps TMDS rate)
- RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0 - HDCP 1.4 / 2.2
- CEA-861-F timing
- 24 / 30 / 36 color depth
- ARC (Audio Return Channel)
- sYCC601 / Adobe RGB / Adobe YCC601 / xvYCC / ITU-R BT.2020

#### Model 2235

- 2 HDMI ports + 2 DisplayPort output
- Analog support up to 300MHz
- Support HDCP function
- S-Video/CVBS/SCART/RGB/Component/ D-terminal NTSC/PAL/SECAM standard
- Digital DVI Frequency 330MHz
- EDID Read/Write/Compare/Analyze
- Support Pattern Scrolling Function
- ESD Protection Circuit
- Front Panel USB Port & Control Interface
- Graphic Operating & Editing Interface

#### See Page 4-11

#### **Model 2403**

- DisplayPort Signal module (option)
  - Comply with DisplayPort 1.2a standard - 4K x 2K 60/50Hz

  - Pixel rate support up to 600MHz
  - 1.62 / 2.7 / 5.4Gbps per lane
  - 1 / 2 / 4 Link
  - 2 Channel (L-PCM)
- EDID Read / Write / Compare / Analyze
- Scrolling function
- Built in China high-definition / 3D / 4K test pattern

Model 27014

- User Define Key(32 Key max)
- One-touch function keys

#### See Page 4-21

#### **FPD** Tester

Modular interface design for various panel test application

- Highly accurate programmable power
  - VDD 2 ~ 20V / 10A max, 36W max (24W max available on September)
  - VBL 2 ~ 25V / 20A max, 100W Max (100W max available on September)
  - Real-time voltage / current measurement
  - Programmable power protection function
- Cross coordinate defect positioning function
- eDP 1.4 Signal module (Option)
  - Support up to UHD (5K x 3K@60Hz)
  - -6/8/10 bit color depth
  - 1.62 / 2.16 / 2.43 / 2.7 / 3.24 / 4.32 / 5.4Gbps per lane

  - 0 / 3.5 / 6 / 9.5 dB pre-emphasis
  - 200 / 250 / 300 / 350 / 400 / 450 / 600 / 800 / 1000mV Swing level
  - PSR1 test function



#### **LED Chip Level Tester**

- High test speed: complete whole test within 25ms (selected test items)
- Super statble of temperature variation
- Support high voltage and high power LED test requirement
- Support multi-die test (option)
- Support ESD test (option)



### 3-1

- Model 58173-TC

- See Page 5-11

- -1/2/4/8 Link



#### **TO-CAN Package Inspection System**

**Model 7925** 



#### It can inspect lens scratch, crack, particle and metal cap defect of TO-CAN package

- Auto focus function can overcome height variation from tray or package
- Defect criteria editor for versatile pass/fail criteria setting
- Higher reliability and repeatability than visual inspection
- Throughput is higher than UPH 3600
- Reduce time of operator loading/unloading because of auto-cassette function
- Provide customized inspection report and defect images for defect analysis

#### 过 www.chromaate.co

# **New Products**

#### **Solar Cell Inspection Test/Sorting System**

#### Model 3760



- Good for 6 inches mono/multi-crystalline silicon cells
- Inline structure un-loader together with firing furnace including cells position pre-capture CCD and Bernoulli Arm picking up cells to conveyor speedy
- Flexible design of buffer loader to support engineer/operator during production maintenance period no matter frontend or backend side
- High throughput and low breakage rate< 0.1%.</p>

- High integration capability with customized optical inspector and IV tester
- Customized efficiency, Color classes and sorting Bins
- High cell positioning repeatability to ensure consistent result
- Extendable sorting bins module to fulfill customer request
- MES systems for instant production result analysis
- Lane by lane controller for engineer maintenance easy

#### 🗐 See Page 8-3



#### Automatic Optical Solar Wafer/Cell Inspection Modules Model 7200 Series

- Adjustable criteria for different process application or model
- Flexible algorithms programming editor for mono-crystalline and multi-crystalline silicon solar cells
- Multiple interface to communicate with manufacturing equipment or information system
- Various defects inspection capability from multilayer LED lighting design
- Flexible design that can be easily integrated to your in-line printing system and sorting system

#### See Page 8-5



#### Wafer Inspection System

#### Model 7940

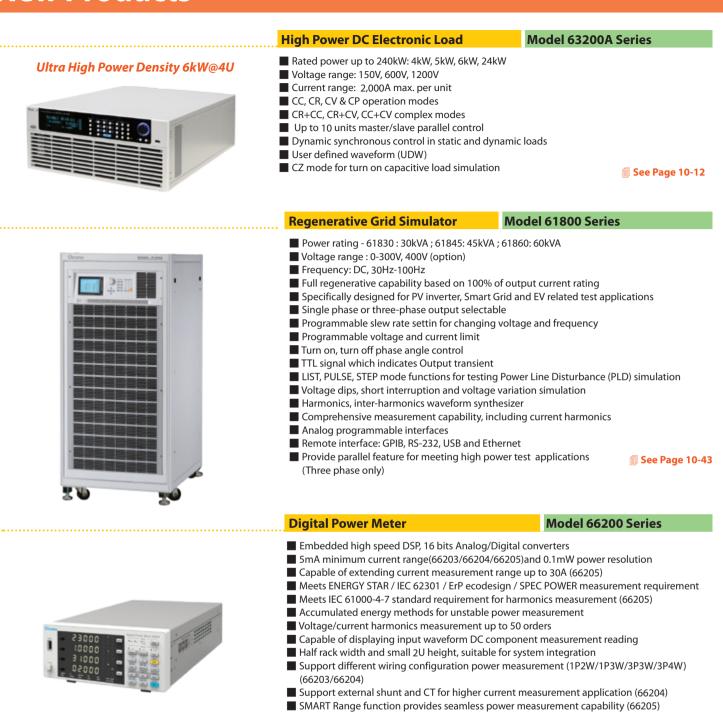
- Inspect 6" LED wafer in 2.5 minutes with high speed architecture
- Maximum 8 inch wafer handling capability (10 inch inspection area)
- Unique detection algorithm can be replaced or added for different customer or model
- No precise wafer loading is needed because of auto alignment function
- Edge finding to test various wafer shapes
- Defect criteria editor for versatile pass/fail criteria setting
- Chip optical character defect detection rate > 98%
- Combine AOI and upstream machine data and upload a final mapping file for downstream machine
- Customized inspection report for defect analysis
- Suitable for LED, laser diodes, photo diodes, and other wafer chip

#### See Page 9-7

#### **LED Load Simulator**

#### **LED Load Simulator**

- Model 63110A/63113A/63115A
- Unique LED mode for LED power driver test
- Programmable LED dynamic resistance (R<sub>d</sub>)
- Programmable internal resistance (Rr) for simulating LED ripple current
- Fast response for PWM dimming test
- Up to eight channels in one mainframe
- 16-bit precision voltage and current measurement with dual-range
- Full Protection: OC, OP, OT protection and OV alarm



Support GPIB, USB, RS232, Ethernet (LXI) interface (66205)

#### See Page 10-47

Model 62150H-S Series

#### Solar Array Simulator

#### Solar Array Simulator

- Voltage range : 0 ~150V / 600V / 1000V / 1500V
- 3U/15kW high power density module with easy master/slave parallel operation up to 1.5MW
- Fast transient response solar array simulation
- Simulation of multiple solar cell material's I-V characteristic (fill factor)
- Simulation of dynamic irradiation intensity and temperature level from clear day to cloud cover conditions
- Shadowed I-V curve output simulation (4096 points)
- Low leakage current (< 3mA)
- Build-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004, CGC/GF035, NB/T 32004
- Auto I-V program: 100 I-V curves & Dwell time 1-15,000s

🗊 See Page 10-59



#### EVSE ATS

- Customized system for EV Supply Equipment (EVSE) testing
- Meets SAE-J1772, CNS15511, GB/T18487, GB/T27930, GB/T20234 standards
- Simulates various AC grid situation and EV charging mode
- Integrated connecting panel
- Exclusive test items

#### See Page 10-65



#### **Battery Pack ATS**

Model 8700

**Model 8000** 

- Specifically designed for battery production line, or battery development testing
   The application range of this system includes battery modules for electric vehicles,
- motor vehicles, and power storage systems
- Increases QA efficiency by up to 80%
- Inspection of BMS functions, connector withstand voltage, consistency, and performance of battery module
- Charge/discharge power range : 5kW~500kW Charge/discharge voltage range : 0V~1200V Charge/discharge current range : 0A~2600A
- Standard test items include insulation resistance, electrical tests, software/communication, and battery performance testing
- Able to create test fixture to connect the customized battery module with the automated switch control
- The control system is an easy to use open software platform that supports shop floor control integration with Manufacturing Execution System (MES)

See Page 11-13

#### Regenerative Charge & Discharge Test System Model 17011

- Lithium-ion secondary batteries, Electrical Double Layer Capacitors (EDLC) and Lithium-ion Capacitors test
- High precision output and measurement up to 0.02%
- Independent operation and test
- Channel parallel output function maximum 1200A
- High Sampling Rate up to 10ms
- Build-in battery DCIR test function

Discharging energy recycle function

- Build-in EDLC/LIC capacitance (F) and DCR test functions to provide prompt and accurate test results
- Real-time outer loop resistance monitoring, contact check and polarity check safety function
- 🗊 See Page 11-3

Model 17020/17030





#### **Regenerative Battery Pack Test System**

- Regenerative battery energy discharge
- Energy saving, environment protection, and low heat output
- Channels paralleled for higher currents
- Charge / discharge mode (Constant current, Constant voltage, Constant power)
- Driving cycle simulation (Power/Current)
- High precision measurement accuracy
- Fast current conversion
- Smooth current without over shoot
- Testing data analysis function
- Data recovery protection (after power failure)
- Independent protection of multi-channel (Model 17020)
- Total harmonic distortion: less than 5% of rated power (Model 17020)
- Customized rating power/voltage/current
  - Voltage range : 0~200V ; Current range : 0~1200A ; Power range : 600W~50kW (Model 17020)
- Voltage range : 10~1200V ; Current range : 0~1000A ; Power range : 90~500kW (Model 17030)
- System Integration (Model 17030)
  - Chamber Control
  - Multi-channels voltage/temperature measurement (Max 256CH) - BMS Communication
- See Page 11-5

Model 11050 Series

Model 19301A

**Model 1870D Series** 



#### **HF LCR Meter**

- Test Parameter: L/C/R/Z/Y/DCR/Q/D/ θ
- Test Frequency : 1kHz ~ 10MHz (11050), 60Hz ~ 5MHz (11050-5M)
- Test Level: 10mV ~ 5V
- Basic Accuracy: 0.1%
- 7ms fast speed measurement
- 3 kinds of output impedance modes
- Test signal monitoring function
- Compare & bin-sorting function
- Open/short zeroing & load correction function
- Detached measurement & display unit design
- Standard Handler, RS-232C, USB storage & external bias current control interface
- Optional GPIB or LAN interface

See Page 12-3



### Impulsing Winding Tester

■ 10V~1000V impulse voltage test, with 0.25V test resolution

- High impulse test sampling rate (200MHz),10bits
- <35mS high speed mode (P1.0)</p>
- Inductance contact check function
- Inductance differential voltage compensation function
- Apply to High/low inductance test (0.1uH~100uH)
- Breakdown voltage analysis function
- Low voltage range to increase the sensibility of waveform analysis (32V/64V/128V/256V/ 512V/1024V)
- USB port for storing waveform & screen capture
- Graphical color display
- Standard LAN, USB and RS232 interfaces

See Page 13-14



#### Inductor Test & Packing Machine

- Test and packing speeds from 200ppm to 1,800ppm
- Provides 4 test stations based on test requirements for users to select desired test items
- Complete list of test items: Polarity, Layer Short Circuit, IR, DCR, Ls & Rs (Q value), Bias current
- Patented high-speed polarity reversing design ensures that products on the conveyor all have the same polarity
- Each test station has an independent NG (No Good) product collection box for later quality analysis
- Circular load plate design eliminates dropped inductors
- Equipment is fast, stable and safe
- Exclusive data collection software designed for test and packing machines for monitoring product quality in real time

#### See Page 12-25

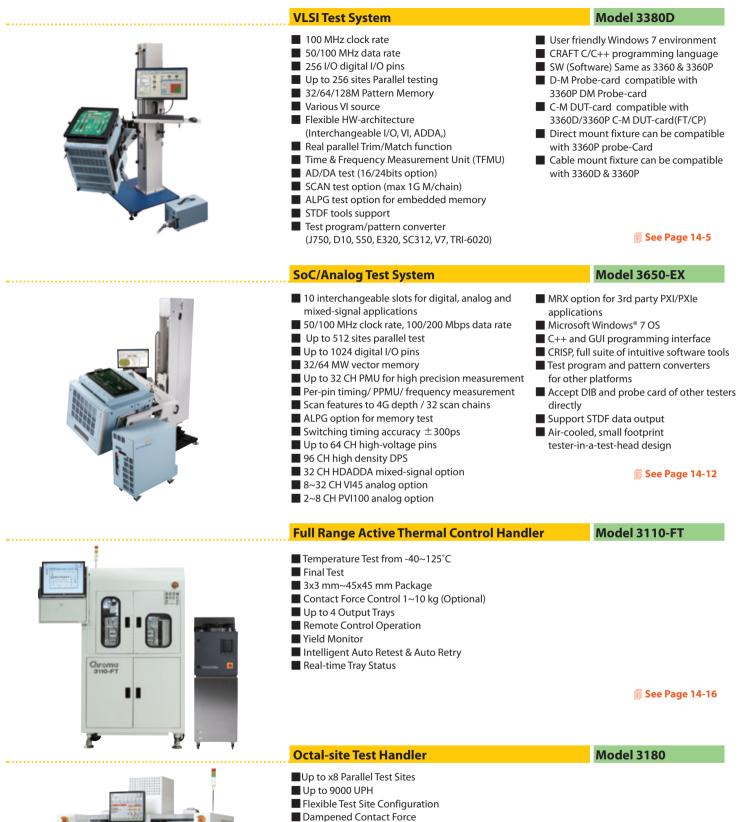


#### **Inductor Layer Short ATS**

- Test speeds from 200ppm to1,500ppm
- Provides from 2 to 5 test stations for ATS selections based on testing requirements
- Equipped with inductance measurement contact check and voltage difference compensation functions
- Patented testing probe with "Four wire system" design to test voltage's authenticity and stability
- Tested NG inductors are collected to a separate box by failed item for bad process model and cause analysis
- Circular load plate design to eliminate dropped inductors
- Exclusive data collection software designed for layer short automatic test system for monitoring product quality in real time

#### See Page 12-26

#### Model 1871



- Contact Force Auto Learning
- 3x3 mm ~ 50x50 mm Packages
- Up to 6 Output Tray Locations
- Temperature Test from Ambient ~ 150 °C
- Intelligent Auto Retest & Auto Retry
- Yield Monitor

#### See Page 14-18



Smart Conveyor

See Page 18-1

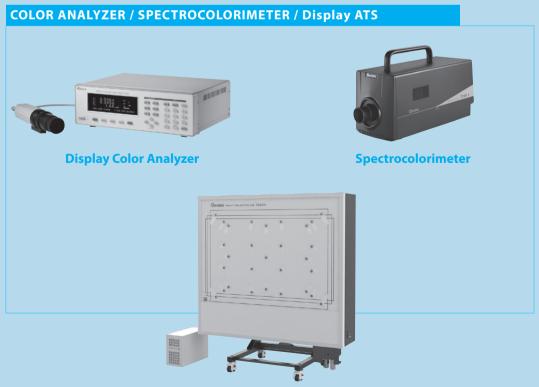


## Video & Color Test Solution

| Selection Guides              | 4-1  |
|-------------------------------|------|
| Video Pattern Generator (VPG) | 4-3  |
| HDMI Distributor              | 4-22 |
| MHL Module                    | 4-23 |
| SDI Module                    | 4-24 |
| Pattern Analyzer              | 4-25 |
| Display Color Analyzer        | 4-26 |
| Spectrocolorimeter            | 4-28 |
| Front Projector ATS           | 4-30 |

#### **VIDEO PATTERN GENERATOR** 0 ----. 10 **HDMI** MHL SDI Pattern Distributor Module Module Analyzer -

**Video Pattern Generator** 



**Front Projector ATS** 

### **Selection Guides**

| Video Pattern Ge | nerator Selection | Guide-1 |            |            |             |                    |                                      |      |
|------------------|-------------------|---------|------------|------------|-------------|--------------------|--------------------------------------|------|
| ТҮРЕ             | Model             | Analan  |            |            | Digital     |                    |                                      | PAGE |
| TTPE             | woder             | Analog  | DVI (TMDS) | HDMI       | DisplayPort | Standard           | Interface                            | PAGE |
|                  | 22293-B           | 250MHz  | 330MHz     | * 165MHz   |             | HDMI 1.3           | HDMI x 3                             | 4-3  |
|                  | 22294-A           | 300MHz  | 330MHz     | ** 300MHz  |             | HDMI 1.4           | HDMI x 4                             | 4-5  |
| Programmable     | 2233-B            | 250MHz  | 330MHz     | * 165MHz   | 270MHz      | HDMI 1.3<br>DP 1.1 | HDMI x 3<br>DP x 2                   | 4-7  |
| J                | 2234              | 250MHz  | 330MHz     | * 165MHz   | 270MHz      | HDMI 1.3<br>DP 1.1 | HDMI x 3<br>DP x 2                   | 4-9  |
|                  | 2235              | 300MHz  | 330MHz     | ** 300MHz  | 600MHz      | HDMI 1.4<br>DP 1.2 | HDMI x 2<br>DP x 2                   | 4-11 |
|                  | 23293-B           | 250MHz  | 330MHz     | * 165MHz   |             | HDMI 1.3           | HDMI x 3                             | 4-13 |
| Non-             | 23294             | 250MHz  | 330MHz     | * 165MHz   |             | HDMI 1.4           | HDMI x 3                             | 4-15 |
| Programmable     | 2333-B            | 250MHz  | 330MHz     | * 165MHz   | 270MHz      | HDMI 1.3<br>DP 1.1 | HDMI x 3<br>DP x 2                   | 4-17 |
|                  | 2401              | 165MHz  |            |            |             |                    |                                      | 4-19 |
| Economy          | 2402              | 165MHz  | 165MHz     | 165MHz     |             | HDMI 1.3           | HDMI x 1                             | 4-19 |
| ,                | 2403              |         |            | *** 600MHz | 600MHz      | HDMI 2.0<br>DP 1.2 | HDMI x 4 (Option)<br>DP x 2 (Option) | 4-21 |

\* TMDS Rate 225MHz

\*\* TMDS Rate 300MHz

\*\*\* TMDS Rate 600MHz

| Video Pattern Generator Selection Guide-2 |         |      |      |      |     |       |      |        |     |      |  |  |
|---|---------|------|------|------|-----|-------|------|--------|-----|------|--|--|
| ТҮРЕ                                      | Model   | D    | тv   |      | TV  |       |      | OTHERS |     |      |  |  |
| TTPE                                      | Model   | SDTV | HDTV | NTSC | PAL | SECAM | HDCP | AUDIO  | I/O | PAGE |  |  |
|   | 22293-B | V    | V    | V    | V   | V     | V    | V      | USB | 4-3  |  |  |
|   | 22294-A | V    | V    | V    | V   | V     | V    | V      | USB | 4-5  |  |  |
| Programmable                              | 2233-В  | V    | V    | V    | V   | V     | V    | V      | USB | 4-7  |  |  |
|   | 2234    | V    | V    | V    | V   | V     | V    | V      | USB | 4-9  |  |  |
|   | 2235    | V    | V    | V    | V   | V     | V    | V      | USB | 4-11 |  |  |
|   | 23293-B | V    | V    | V    | V   | V     | V    | V      | USB | 4-13 |  |  |
| Non-<br>Programmable                      | 23294   | V    | V    | V    | V   | V     | V    | V      | USB | 4-15 |  |  |
|   | 2333-B  | V    | V    | V    | V   | V     | V    | V      | USB | 4-17 |  |  |
|   | 2401    | V    | V    | V    | V   | V     |      | V      | USB | 4-19 |  |  |
| Economy                                   | 2402    |      |      |      |     |       | V    | V      | USB | 4-19 |  |  |
| ·   | 2403    |      |      |      |     |       | V    | V      | USB | 4-21 |  |  |

| Signal Module Selection Gu | ıide                 |         |              |                 |      |  |  |  |  |
|----------------------------|----------------------|---------|--------------|-----------------|------|--|--|--|--|
| Signal Madula              | Output Signal        |         |              |                 |      |  |  |  |  |
| Signal Module              | HDMI 1.3 Distributor | MHL 2.0 | 3G/HD/SD SDI | Main board PCBA | PAGE |  |  |  |  |
| A222907                    | V                    |         |              |                 | 4-22 |  |  |  |  |
| A222908                    |                      | V       |              |                 | 4-23 |  |  |  |  |
| A222915                    |                      |         | V            |                 | 4-24 |  |  |  |  |
| A222917                    |                      |         |              | V               | 4-25 |  |  |  |  |

### Model 22293-B



Analog 250 MHz DVI (TMDS) 330 MHz HDMI V1.3C 165 MHz (TMDS Rate 225 MHz) Multi-port (HDMIx3)

#### **KEY FEATURES**

- Multi-port independent output test application
- HDMI port output x 3
- SCART port x 2 (output x1 / input x1)
- Analog pixel rate 250MHz
- Digital (DVI) pixel rate 330MHz
- DVI Dual HDCP test application support
- HDCP supports Auto / Manual Mode
- HDMI V1.3C (with 24/30/36 bit deep color / xvYCC / CEC / Lip Sync)
- HDMI V1.3C maximum 687 billion color depth
- DVI and HDMI with HDCP output
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y color difference output
- S-Video / CVBS / SCART / RGB / Color Component / D-terminal
- NTSC / PAL / SECAM signal
- EDID read / write / compare
- Optical / Coaxial audio input (S/PDIF)
- Easy and variable pattern edit
- Scrolling Pattern support
- HDMI / DVI plug & play function
- Gamma correction
- ESD protection circuit
- USB Host / Device



The 22293-B Programmable Video Pattern Generator provides a total solution for multimedia tests that are applied in the industries of high frequency digital and analog displays such as LCM Monitor / LCD TV / PDP / Projector of today and in

the future.

Large scale and high definition have become the trend as the development of video industry goes. The 22293-B designed with brand new architecture uses high performance CPU to carry the high speed/high density FPGA as Graphics Rendering Engine. It provides highly efficient system control as well as supports the up-to-date high resolution multimedia digital/video interface, HDMI V1.3, for the following features:

Higher bandwidth and Color Deep : It supports 24, 30, 36 bit (RGB or YCbCr) and new color standard xvYCC to implement real natural color and high resolution image screen with larger color range.

CEC (Consumer Electronics Control) Function : It allows users to activate the HD device that equipped with multiple CEC functions via a remote controller. The 22293-B is able to set the CEC test parameters automatically or manually and support TX (transmission) / RX (reception) / MONITOR (monitoring) & FEATURE (user property) test modes. The built-in CEC test patterns give users easier and faster test judgment.

Lip Sync: Since the technology of digital signal process improves continuously, to have a high definition video presentation, there may have potential factors to cause delay when processing the video. HDMI 1.3 allows CE devices to compensate the time difference automatically that can synchronize both video and audio to enhance viewer's feeling.

The 22293-B is able to provide Analog/Digital/TV signals concurrently:

For the analog signal RGB output, the pixel rate is up to 250MHz that meets the RS-343A standard, and it supports Y,Pb,Pr / Y,Cb,Cr / Y,R-Y,B-Y. The digital signal output is TMDS with pixel rate up to 330MHz and the test screen resolution supports beyond UXGA. Furthermore, to cope with higher frequency signal test, the 22293-B supports DVI Dual HDCP test for dual channel DVI test application.

As to the specification of TV output, the image and chrominance signals of the 22293-B meet the NTSC, PAL and SECAM standards. The output signals include CVBS compound signals, BNC and Y/ C (Luminance/ Chrominance) separated signals as well as S-Video/SCART output connectors. Tests for special TV functions such as Closed Caption, V-chip and Teletext are also supported. In the meantime to fulfill the test application for multi-port output, the 22293-B has built-in 3 HDMI and 2 SCART ports to reduce a great deal of test time, so as to finish the tests in the fastest way possible.

As to operation, the 22293-B has equipped with a 3.5 inches multicolor display with graphic operation interface. Users can edit various timing parameters and patterns through the icons on the panel directly or using the VPG MASTER control software via the USB interface to do remote control manually or automatically. The comprehensive, rapid and easy to understand user interface can improve the test efficiency effectively. Following the rising market of new generation display the competition and demand for product quality are getting more and more sever. Under the consideration of quality and cost, the 22293-B Video Pattern Generator has built in the most complete multi-media test interfaces that can meet the requirements for various video tests in the industry. It is the best solution for the users in the field of RD, production and inspection.

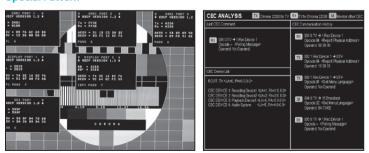


Model 22293-B Rear View

#### **ORDERING INFORMATION**

22293-B: Video Pattern Generator Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/TV/HDTV A240001: Remote Controller

#### **Special Pattern**



Multi-HDCP Pattern

### Model 22293-B

| SPECIFICATIONS   |   |  |  |   |  |   |                         |                   |
|--|---|--|--|---|--|---|-------------------------|-------------------|
| ANALOG OUTPUT  |   | <b>TV OUTPUT</b>   |  |   |  |   |                         |                   |
| Display Size   | 4096 x 2048   | Output Mode  |  | NTSC  | PA   | L   | SECAM                   |                   |
| Pixel Rate Range   | 0.5~250MHz  |  |  | 443 M,J BD0   | GHI M 6  | 0 N N                                     | c 4.41/                 |                   |
| Video Level  | R,G,B (75 ohms) 0~1.0V programmable   | Subcarrier Fr  | equency  | 4.43 3.58 4.4   | 43 3.57 4.4  | 43 4.43 3.                                | 58 4.25                 | MHz               |
| Sync on Green/Level  | 0~0.5V On/Off programmable  | Subcarrier St  | ability  |   |  | Hz  |                         |                   |
| White Level  | 0~1.2V programmable   |  |  | Composite (BN   | C, RCA), S-Vid   | eo  |                         |                   |
| Black Level  | 7.5 IRE / 0 IRE selectable  |  |  | Burst On/Off (N   | TSC, PAL)  |   |                         |                   |
| HORIZONTAL TIMING  | ·   | Video Outpu  | +  | Contrast progra   | ammable  |   |                         |                   |
| Total Pixels   | 32~8192 pixels / 1 pixels resolution  | video Outpu  |  | Brightness prog   | grammable  |   |                         |                   |
| VERTICAL TIMING  |   |  |  | Saturation prog   | grammable  |   |                         |                   |
| Total Pixels   | 4~4096 lines (non-interlace) / 1 line programmable<br>4~2048 lines (interlace) / 1 line programmable  | Closed Caption   |  |   |  |   |                         |                   |
| COMPOSITE SYNC   |   | Support (NTS   |  | C1, C2, C3, C4 /  | Т1, Т2, Т3, Т4   |   |                         |                   |
|  | H+V, H EXOR V, Equalization & Serration Pulse   | `  |  | MPAA Rating : (   | G, PG, PG-13,  | R, NC-17, X                               |                         |                   |
| SEPARATE SYNC  |   |  |  | FCC Rating : TV   |  |   | 14, TV-MA               |                   |
|  | BNC : Hs,Vs,Xs ; D-SUB : Hs(Xs), Vs   | V-CHIP (NTSO   |  | Canada English  |  |   |                         |                   |
| VIDEO FORMAT   |   |  | Canada French  |   |  |   |                         |                   |
|  | R, G, B / RS-343A   |  |  | G, 8ans+, 13ans   | 5  | Bans+                                     |                         |                   |
|  | Y, R-Y, B-Y   | Teletext (PAL  | .)   | Teletext System   | B Level 1, 1.  | 5   |                         |                   |
| Video Output   | Y, Cb, Cr / ITU 601   | SDTV FORM  | ΔΤ   |   |  |   |                         |                   |
|  | Y, Pb, Pr / ITU 709, RP177, SMPTE 240M  |  |  | ssive Mode  | Interla  | ice Mode                                  |                         |                   |
|  | DDC II B (D-SUB)  | Timing   | Fram   | e Rate (Hz)   | Frame  | Rate (Hz)                                 | Stand                   | lard              |
| DVI (TMDS) OUTPUT  |   |  | 59.94P   | 60/1.001  |  |   | SMPTE                   | 293               |
| Pixel Rate Range   | 25< 1 link ≤ 165MHz / 165< 2 link ≤ 330MHz  | 720 x 483  |  |   | 59.941   | 59.94/2                                   | ITU 6                   | 501               |
| EDID   | Read / Write / Compare / Edit   |  |  |   | 59.941   | J9.94/2                                   | SMPTE                   | 170M              |
| HDCP   | HDCP V.1.0 (with Dual Mode)   | 720 x 576  | 50P  | 50  |  |   | ITU 1                   | 382               |
| Compliant  | DVI 1.0 specification   | 720 × 570  |  |   | 501  | 25  | ITU 6                   | 501               |
| Video Signal Type  | RGB   | HDTV FORM  | IAT  |   |  |   |                         |                   |
| Sampling Mode  | 4:4:4   | Timing   | Progressiv   | ve Mode Frame   | Interlace  | Mode Frame                                | Stand                   | lard              |
| Sumpling Wood  | 76767   | Timing   | Ra   | ate (Hz)  | Rat  | e (Hz)                                    | Stand                   | laru              |
| HDMI VIDEO OUTPUT  |   |  | 60P  | 60  | 601  | 30  | SMPTE                   |                   |
| Version  | HDMI 1.3C   |  | 59.94P   | 60/1.001  | 59.94l   | 30/1.001                                  | SMPTE                   |                   |
| Divel Date Dange   | (with 24,30,36bit deep color/xvYCC/CEC/Lip Sync)<br>25 ~ 165 MHz (TMDS CLK: 225MHz)   |  | 50P  | 50  | 501  | 25  | SMPTE                   |                   |
| Pixel Rate Range<br>Support HDMI Timing  | 77 Timing (CEA-861D)  | 1920 x 1080  | 30P  | 30  |  |   | SMPTE                   |                   |
|  | 4   | 1920 x 1000  | 29.97P   | 30/1.001  |  |   | SMPTE                   |                   |
| Pixel Repetition   | RGB or YCbCr  |  | 25P  | 25  | _  |   | SMPTE                   |                   |
| Video Signal Type<br>Sampling Mode   |   |  | 24P  | 24  |  |   | SMPTE                   |                   |
| 1 3  | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2  |  | 23.98P   | 24/1.001  |  |   | SMPTE                   |                   |
| Bits per Component   | 8 / 10 / 12 @RGB & YCbCr  |  |  |   | 601  | 30  | SMPTE                   |                   |
|  | RGB/ITLL B BT 601/ITLL B BT 700/vvVCC   | 1920 x 1035  |  |   | 50.041   | 30/1.001                                  | SMPTE                   | 240               |
| Color Space  | RGB/ITU-R BT.601/ITU-R BT.709/xvYCC   | 1920 x 1035  |  |   | 59.94l   | 30/1.001                                  | _                       |                   |
| Color Space  | (IEC61966-2-4)/sYCC 601/Adobe RGB/  |  | 60P  | 60  | 59.941   | 30/1.001                                  | SMPTE                   | 296               |
|  | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601   | 1920 x 1035  | 60P<br>59.94P  | 60<br>60/1.001  | 59.941   | 50/1.001                                  | _                       | 296               |
| HDCP   | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2   |  |  |   | 59.941   | 30/1.001                                  | SMPTE                   | 296<br>296        |
| HDCP<br>EDID   | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit  | 1280 x 720   | 59.94P<br>50P  | 60/1.001<br>50  |  | 30/1.001                                  | SMPTE<br>SMPTE          | 296<br>296        |
| HDCP<br>EDID<br>HDMI AUDIO OUTPUT  | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit  | 1280 x 720   | 59.94P<br>50P  | 60/1.001<br>50  |  |   | SMPTE<br>SMPTE          | 296<br>296        |
| HDCP<br>EDID   | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz   | 1280 x 720<br>DATA STOR/<br>Default  | 59.94P<br>50P  | 60/1.001<br>50<br>2000 timings  | 5 + 2000 patte   | erns                                      | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br>HDMI AUDIO OUTPUT<br>Sample Rate<br>Number of Channel  | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)   | 1280 x 720<br>DATA STORA<br>Default<br>Internal Men  | 59.94P<br>50P<br>AGE DEVIC                                 | 60/1.001<br>50<br>2000 timings<br>3000 timings  | 5 + 2000 patte<br>5 + 3000 patte   | erns                                      | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br>HDMI AUDIO OUTPUT<br>Sample Rate<br>Number of Channel<br>Bits per Sample   | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit  | 1280 x 720<br>DATA STORA<br>Default<br>Internal Men<br>External Mer  | 59.94P<br>50P<br>AGE DEVIC                                 | 60/1.001<br>50<br>2000 timings  | 5 + 2000 patte<br>5 + 3000 patte   | erns                                      | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br>HDMI AUDIO OUTPUT<br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform   | (IEC61966-2-4)/sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave   | 1280 x 720<br>DATA STORA<br>Default<br>Internal Men<br>External Mer<br>OTHERS  | 59.94P<br>50P<br>AGE DEVIC                                 | 60/1.001<br>50<br>2000 timings<br>3000 timings<br>USB Host int  | s + 2000 patte<br>s + 3000 patte<br>erface   | erns<br>erns + 1000 p                     | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br><b>HDMI AUDIO OUTPUT</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude   | (IEC61966-2-4)/SYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS   | 1280 x 720<br><b>DATA STOR/</b><br>Default<br>Internal Men<br>External Men<br><b>OTHERS</b><br>AC Input                            | 59.94P<br>50P<br>AGE DEVIC                                 | 60/1.001<br>50<br>2000 timing:<br>3000 timing:<br>USB Host int<br>1Ø 100~240  | s + 2000  patte<br>s + 3000  patte<br>erface<br>$V \pm 10\% \text{ V}_{LN,4}$  | erns<br>erns + 1000 p<br>47~63Hz          | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br><b>HDMI AUDIO OUTPUT</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range  | (IEC61966-2-4)/SYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz  | 1280 x 720<br><b>DATA STOR/</b><br>Default<br>Internal Men<br>External Men<br><b>OTHERS</b><br>AC Input<br>Operation/St            | 59.94P<br>50P<br>AGE DEVIC                                 | 60/1.001<br>50<br>2000 timings<br>3000 timings<br>USB Host int<br>1Ø 100~240'<br>0. +5~+40 deg                            | s + 2000  patte<br>s + 3000  patte<br>erface<br>$V \pm 10\% \text{ V}_{LN,4}$  | erns<br>erns + 1000 p<br>47~63Hz          | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution  | (IEC61966-2-4)/SYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step                                 | 1280 x 720<br><b>DATA STOR</b><br>Default<br>Internal Men<br>External Men<br><b>OTHERS</b><br>AC Input<br>Operation/St<br>Humidity | 59.94P<br>50P<br>AGE DEVICI<br>nory<br>nory<br>corage Temp | 60/1.001<br>50<br>2000 timings<br>3000 timings<br>USB Host int<br>USB Host int<br>1Ø 100~240'<br>0. +5~+40 deg<br>20~90 % | s + 2000  patte<br>s + 3000  patte<br>erface<br>$V \pm 10\% \text{ V}_{LN,4}$  | erns<br>erns + 1000 p<br>47~63Hz          | SMPTE<br>SMPTE<br>SMPTE | 296<br>296        |
| HDCP<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input | (IEC61966-2-4)/SYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial (S/PDIF) | 1280 x 720<br><b>DATA STOR/</b><br>Default<br>Internal Men<br>External Men<br><b>OTHERS</b><br>AC Input<br>Operation/St            | 59.94P<br>50P<br>AGE DEVICI<br>nory<br>nory<br>corage Temp | 60/1.001<br>50<br>2000 timings<br>3000 timings<br>USB Host int<br>1Ø 100~240'<br>0. +5~+40 deg<br>20~90 %                 | s + 2000  pattern<br>s + 3000  pattern<br>s + | erns<br>erns + 1000 j<br>17~63Hz<br>deg.C | SMPTE<br>SMPTE<br>SMPTE | 296<br>296<br>296 |
| HDCP<br>EDID<br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution  | (IEC61966-2-4)/SYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32, 44.1, 48, 88.2, 96, 176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step                                 | 1280 x 720<br><b>DATA STOR</b><br>Default<br>Internal Men<br>External Men<br><b>OTHERS</b><br>AC Input<br>Operation/St<br>Humidity | 59.94P<br>50P<br>AGE DEVICI<br>nory<br>nory<br>corage Temp | 60/1.001<br>50<br>2000 timings<br>3000 timings<br>USB Host int<br>1Ø 100~240'<br>0. +5~+40 deg<br>20~90 %                 | 3 + 2000  patters<br>3 + 3000  patters<br>3 + 3000  patters<br>$4 \pm 10\% V_{LN, 2}$<br>$C / -20 \sim +60 \text{ gm}$<br>3.46  sm   | erns<br>erns + 1000 j<br>17~63Hz<br>deg.C | SMPTE<br>SMPTE<br>SMPTE | 296<br>296<br>296 |

PXI Test & Measurement

/ideo & Color

Flat Panel LED/ Display Lighting

 Optical
 PhotovoltaicTest
 Automated
 Power
 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Devices
 & Automation
 Optical Inspection
 Electronics
 Automation
 Component
 Safety
 IC

### Model 22294-A



| Analog     | 300 MHz  |
|------------|----------|
| DVI (TMDS) | 330 MHz  |
| HDMI V1.4a | 300 MHz  |
| (TMDS Rate | 300 MHz) |
| Multi-port | HDMIx4   |
| 3D Output  |          |

#### **KEY FEATURES**

- Fully Comparable with HDMI 1.4 Standard
  - 3D Format Output
  - Audio Return Channel
  - Ethernet Channel
  - 4Kx2K / 1080P 120Hz
- sYCC601 / Adobe RGB / Adobe sYCC601 - CEC / Deep Color / Lip-Sync / xvYCC
- Multi ports output test application
- HDMI port output x 4 - SCART port x 2 (output x1/input x1)
- 330MHz digital (DVI) frequency
- Support Dual HDCP in DVI test application
- HDCP supports Auto / Manual Mode
- Ethernet Browser on Screen
- HDCP ON / OFF IN DVI & HDMI Interface
- S-Video / CVBS / SCART / RGB /
- Y.Pb.Pr / Y.Cb.Cr / Y,R-Y,B-Y / D-terminal
- NTSC / PAL / SECAM signals
- EDID Read/ Write/Compare/Analysis
- Optical / coaxial audio input (SPDIF)
- Support pattern dynamic scrolling
- Built-in China high definition standard HD patterns
- HDMI/DVI Hot-Plug function
- Support Gamma calibration
- ESD protection circuit
- Front USB & control interface
- PIP & OSD function

Chroma 22294-A Programmable Video Pattern Generator is a multi-functional test device with high speed signal transmission features. It has high resolution test quality and multiple outputs support that can meet the test requirements for the multimedia display industries such as LCD Monitor / LCD TV / PDP / Projector of today and in the future.



Chroma 22294-A supports the up-to-date high resolution multimedia digital/video interface, HDMI V1.4, with the features described below.

The VPG has 3D signal standard format output, Audio Return function that is able to test the external audio source and the Ethernet function that is able to do two-way data transmission. In addition, higher bandwidth and Color Deep are equipped to support 24, 30, 36 bit (RGB or YCbCr) and the new generation color standard xvYCC, sYCC601, Adobe RGB as well as Adobe YCC601 for the implementation of 4Kx2K real natural colors and high resolution image screens with larger color range.

#### **CEC(Consumer Electronics Control) Function:**

Chroma 22294-A is able to set the CEC test parameters automatically or manually and support TX (transmission) / RX (reception) / MONITOR (monitoring) & FEATURE (user property) test modes.

Lip Sync : Since the technology of digital signal process improves progressively, potential factors may exist to cause delay when processing the video for a high definition presentation. The HDMI 1.3 allows CE devices to compensate the time difference automatically by synchronizing both of the video and audio to enhance viewer's experiance.

This video pattern generator is able to provide analog/digital/TV control signals concurrently: For the analog signal RGB output, the pixel rate is up to 300MHz that meets the RS-343A signal standard, and it supports Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y.

The digital signal output is TMDS with pixel rate up to 330MHz and the test screen resolution supports beyond WQUXGA. Furthermore, to cope with the higher frequency signal tests, Chroma 22294-A also supports DVI Dual HDCP test for dual channel DVI test application.

As to the specification of TV output, the image and chrominance signals of Chroma 22294-A meet the NTSC, PAL and SECAM standards. The output signals include CVBS compound signals, BNC and Y/ C (Luminance/Chrominance) separated signals as well as S-Video/SCART output connectors. Tests for special TV functions such as Closed Caption, V-chip and Teletext are also supported.

For the application of multiple tests, Chroma 22294-A supports a variety of audio/video and pattern file formats for play with the resolution up to 1080p. Meanwhile, to fulfill the test application for multi-ports output, multi-port HDMI have been built in to reduce a great deal of test time and finish the tests in the fastest way possible.

For operation, Chroma 22294-A has adopted full color graphic interface and built in super capacity memory for storage with the diversified special test patterns like xvYCC, HDCP&E-EDID, 8/10/12bit deep color, CEC, Lipsync and Chinese high definition test patterns embedded for use. Tests can be performed easily and rapidly to save the time and control the cost. Besides using the panel or remote controller for editing, users can edit various timing parameters and test patterns via the VPG Master application. Its easy operating interface and complete test functions are applicable for all video and related industries in R&D, production test and quality assurance.

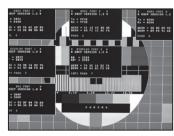
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Model 22294-A Rear View

#### **ORDERING INFORMATION**

22294-A : Video Pattern Generator Analog 300MHz/DVI 330MHz/HDMI 300MHz (TMDS Rate 300MHz)/TV/HDTV A240001: Remote Controller

#### **Special Pattern**



Multi-HDCP Pattern



CEC Analysis





HEC & ARC Test Pattern

3D Operation Interface

All specifications are subject to change without notice.

4096 x 2160

0.5~300MHz

SPECIFICATIONS **ANALOG OUTPUT** 

Pixel Rate Range

Display Size

### Model 22294-A

443 M,J BDGHI

NTSC

'ideo & Flat Panel Display Optical Devices Photovoltaic Test Automated & Automation Optical Inspection

SECAM

4.41/

PAL

Μ

60

Ν

Nc

Power Battery Test & Passive Electrical Electronics Automation Component Safety

Semiconductor/ IC

PXI Test & Measurement

General Manufacturing Turnkey Test & Purpose Execution System Automation

| Pixel Rate Range                             | 0.5~300MHz   | Subcarrier Fr  |                           | 443   M,J  BDG                                  | iHI   M   6                      | 0   N   Nc      | 4.41/ MH    |  |  |  |  |
|--|--|--|---------------------------|---|----------------------------------|-----------------|-------------|--|--|--|--|
| Video Level                                  | R,G,B (75 ohms) 0~1.0V programmable  |  | Subcarrier Frequency 4.43 |   |                                  | 43 4.43 3.58    | 3 4.25      |  |  |  |  |
| Sync on Green/Level                          | 0~0.5V On/Off programmable   | Closed Capti   |                           | C1, C2, C3, C4 /                                |                                  |                 |             |  |  |  |  |
| White Level                                  | 0~1.2V programmable  |  |                           | MPAA Rating : G                                 |                                  |                 |             |  |  |  |  |
| Black Level                                  | 7.5 IRE / 0 IRE selectable   |  |                           | FCC Rating : TV-                                |                                  |                 |             |  |  |  |  |
| HORIZONTAL TIMING                            |  | V-CHIP (NTSO   | C) (                      | Canada English Rating : C, C8+, G, PG, 14+, 18+ |                                  |                 |             |  |  |  |  |
| Total Pixels                                 | 32~8192 pixels / 1 pixels resolution   |  | (                         | Canada French Rating :                          |                                  |                 |             |  |  |  |  |
| VERTICAL TIMING                              |  |  | (                         | G, 8ans+, 13ans                                 | 5, 8ans+, 13ans+, 16ans+, 18ans+ |                 |             |  |  |  |  |
|  | 4~4096 lines (non-interlace)   | Teletext (PAL  | )  -                      | Teletext System                                 | B Level 1 , 1.                   | 5               |             |  |  |  |  |
| Total Pixels                                 | 4~2048 lines (interlace) / 1 line programmable                                   |  | SDTV / HDTV FORMAT        |   |                                  |                 |             |  |  |  |  |
| COMPOSITE SYNC                               |  |  | Progressive               |   | Interlace                        | Mode Frame      |             |  |  |  |  |
|  | H+V, H EXOR V, Equalization & Serration Pulse                                    | Timing   |                           | ate (Hz)  |                                  | e (Hz)          | Standard    |  |  |  |  |
| SEPARATE SYNC                                |  |  | 59.94P                    | 60/1.001  |                                  |                 | SMPTE 293   |  |  |  |  |
|  | BNC : Hs,Vs,Xs ; D-SUB : Hs(Xs), Vs  | 720 x 483  |                           |   | 50.04                            | 50.04/2         | ITU 601     |  |  |  |  |
| VIDEO FORMAT                                 |  |  |                           |   | 59.941                           | 59.94/2         | SMPTE 170N  |  |  |  |  |
|  | R, G, B / RS-343A  | 720 11 576   | 50P                       | 50  |                                  |                 | ITU 1382    |  |  |  |  |
|  | Y, R-Y, B-Y  | 720 x 576  |                           |   | 501                              | 25              | ITU 601     |  |  |  |  |
| Video Output                                 | Y, Cb, Cr / ITU 601  |  | 60P                       | 60  | 601                              | 30              | SMPTE 274   |  |  |  |  |
|  | Y, Pb, Pr / ITU 709, RP177, SMPTE 240M   |  | 59.94P                    | 60/1.001  | 59.941                           | 30/1.001        | SMPTE 274   |  |  |  |  |
|  | DDC II B (D-SUB)   |  | 50P                       | 50  | 501                              | 25              | SMPTE 274   |  |  |  |  |
|  |  |  | 30P                       | 30  |                                  |                 | SMPTE 274   |  |  |  |  |
| DVI (TMDS) OUTPUT                            |  | 1920 x 1080  | 29.97P                    | 30/1.001  | -                                |                 | SMPTE 274   |  |  |  |  |
| Pixel Rate Range                             | $25 < 1 \text{ link} \le 165 \text{MHz}/165 < 2 \text{ link} \le 330 \text{MHz}$ |  | 25P                       | 25  | -                                |                 | SMPTE 274   |  |  |  |  |
| EDID   | Read / Write / Compare / Edit / Analysis   |  | 24P                       | 24  | -                                |                 | SMPTE 274   |  |  |  |  |
| HDCP   | HDCP V.1.0 (with Dual Mode)  |  | 23.98P                    | 24/1.001  | -                                |                 | SMPTE 274   |  |  |  |  |
| Compliant                                    | DVI 1.0 specification  |  | 23.501                    | 2 1/ 1.001                                      | 601                              | 30              | SMPTE 240   |  |  |  |  |
| Video Signal Type                            | RGB  | 1920 x 1035  |                           |   | 59.941                           | 30/1.001        | SMPTE 240   |  |  |  |  |
| Sampling Mode                                | 4:4:4  | -  | 60P                       | 60  | 55.541                           | 30/1.001        | SMPTE 240   |  |  |  |  |
| Sampling wode                                | <del></del> -  | 1280 x 720   | 59.94P                    | 60/1.001  | -                                |                 | SMPTE 296   |  |  |  |  |
| HDMI VIDEO OUTPUT                            | •  | 1200 x 720   | 59.94F                    | 50  | -                                |                 |             |  |  |  |  |
| Version                                      | HDMIV1.4b  |  | 50F                       |   |                                  |                 | SMPTE 296   |  |  |  |  |
|  | (3D Format / ARC / HEC / CEC / Lip Sync)   | 3D VIDEO FO  | ORMAT OUT                 |   |                                  |                 |             |  |  |  |  |
| Pixel Rate Range                             | 25~300MHz  | _  |                           | Frame packi                                     |                                  |                 |             |  |  |  |  |
| Support HDMI Timing                          | 85 Timing (CEA-861E)   |  |                           | Field alterna                                   |                                  |                 |             |  |  |  |  |
| Pixel Repetition                             | 4  | 2D Scanning  | Mada                      | Line alternat                                   |                                  |                 |             |  |  |  |  |
| Video Signal Type                            | RGB or YCbCr   | 3D Scanning  | Mode                      | Side-by-Side                                    | (Full)                           |                 |             |  |  |  |  |
| Sampling Mode                                | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2   |  |                           |   | araphics + a                     | raphics-depth   |             |  |  |  |  |
| Bits per Component                           | 8 / 10 / 12 @RGB & YCbCr   |  |                           | Top & Bottor                                    |                                  | upines depen    |             |  |  |  |  |
|  | RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC  |  |                           | Side-by-Side                                    |                                  |                 |             |  |  |  |  |
| Color Space                                  | (IEC61966-2-4) / sYcc601 / Adobe RGB /   |  |                           |   |                                  |                 |             |  |  |  |  |
|  | Adobe sYcc601  | DATA STOR  | AGE DEVICE                |   |                                  |                 |             |  |  |  |  |
| HDCP   | HDCP V1.2  | Default  |                           | 2000 timings                                    |                                  |                 |             |  |  |  |  |
| EDID   | Read / Write / Compare / Edit / Analysis   | Internal Men   |                           | 3000 timings                                    |                                  | erns + 1000 pr  | ograms      |  |  |  |  |
| HDMI AUDIO OUTPU                             |  | External Mer   | nory                      | USB Host inte                                   | erface                           |                 |             |  |  |  |  |
| Sample Rate                                  | 32, 44.1, 48, 88.2, 96, 176.4, 192KHz  | OTHERS   |                           |   |                                  |                 |             |  |  |  |  |
| Number of Channel                            | 8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)   | AC Input   |                           | 1Ø 100~240V                                     | $' \pm 10\% V_{LN_{,}}$          | 17~63Hz         |             |  |  |  |  |
| Bits per Sample                              | 16 / 24 bit  | Operation/St   | orage Temp                | o. +5~+40 deg.                                  | C/-20~+60 d                      | deg.C           |             |  |  |  |  |
| Waveform                                     | Sine wave  | Humidity   |                           | 20~90 %   |                                  |                 |             |  |  |  |  |
| Amplitude                                    | -90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS   | DIMENSION  | & WEIGHT                  |   |                                  |                 |             |  |  |  |  |
| Frequency Range                              | 10Hz to 20KHz  | 22204 4  |                           | 88 x 350 x 350                                  | 0 mm / 3.46 x                    | x 13.78 x 13.78 | inch (HxWxD |  |  |  |  |
| riequency nunge                              |  | 22294-A 88 x 350 x 350 mm / 3.46 x 13.78 x 13.78<br>5.6 kg / 12.33 lbs |                           |   |                                  |                 |             |  |  |  |  |
|  | 1Hz / Step   |  |                           | 3.0 Kg / 12.55                                  | 103                              |                 |             |  |  |  |  |
| Frequency Resolution<br>External Audio Input | Dptical and Coaxial (S/PDIF)   |  |                           | J.0 Kg / 12.55                                  | 103                              |                 |             |  |  |  |  |

**ΤV OUTPUT** 

Output Mode

### Model 2233-B



Analog250 MHzDVI (TMDS)330 MHzHDMI V1.3C165 MHz(TMDS Rate 225 MHz)JisplayPort V1.1aDisplayPort V1.1a270 MHzMulti-port (HDMIx3, DPx2)

#### **KEY FEATURES**

- Multi-port independent output test application
  - HDMI port output x 3
  - DisplayPort port output x 2
- SCRAT port (output x 1 / input x 1)
- DisplayPort V1.1a pixel rate 270MHz
- DisplayPort with HDCP V1.3 support
- Support Automatically & Manually setting for DisplayPort function
  - 2 Link rate (1.62/2.7Gbps) selectable
  - 1, 2, 4 Video lane selectable
  - 0/3.5/6/9.5dB pre-emphasis selectable
  - 400/600/800/1200mV Swing level selectable
- HDMI V1.3C (with 24,30,36bit deep color / xvYCC / CEC / Lip Sync function)
- DVI pixel rate 330MHz
- Support DVI Dual HDCP test application
- DVI & HDMI & DisplayPort with HDCP output
- Y \ Pb \ Pr / Y \ Cb \ Cr / Y \ R-Y \ B-Y output
- S-Video / CVBS / SCART / RGB / Color
- Component / D-terminal output
- NTSC / PAL / SECAM TV signal
- EDID Read / Write / Compare
- Easy and variable pattern edit
- HDMI/DVI Plug & Play function
- Power saving mode support
- USB Host / Device

Chroma 2233-B Programmable Video Pattern Generator is a multi-function measurement equipment. Combining Analog / DVI / HDMI / DisplayPort / SDTV / HDTV signals with high resolution test quality and multiple output support, it is capable of providing a complete test solution to customers.

For the digital signal of TMDS output, the pixel rate is up to 330MHz with resolution supporting above UXGA. Moreover, for the higher frequency test application, Chroma 2233-B supports DVI Dual HDCP for 2 Link DVI transmission.

As large scale and high definition have become the trend for video industry, Chroma 2233-B supports the up-to-date high resolution multimedia digital video transmission interface, HDMI V1.3 is able to provide higher speed bandwidth and color depth. It supports 24,30,36 bits (RGB or YCbCr) and new color standard xvYCC, sYCC 601, Adobe RGB, and Adobe YCC 601 (CEA-861E) to get real natural color and high resolution image.

DisplayPort is the state-of-the-art video output interface defined by Video Electronics Standards Association (VESA). It is an open and extendable



interface standard for industrial applications. The objective of this standard is to lower down the platform design cost and provides an interoperable digital communication interface for PC and components. Same as HDMI, the high definition digital audio and video frequency can be received via a digital video transmission cable. Its maximum transmission bandwidth is up to 10.8Gb/s. The sufficient bandwidth is able to fulfill the requirements for large display with higher resolution in the future.

The 2233-B is equipped with DisplayPort standard format with the following key features:

The connection of DisplyPort is composed of main channel, AUX CH and Hot Plug Detect (HPD) 3 types of signals. The main channel is formed by 4 lanes (1, 2, 4Lane) and each lane can support 2.7Gbps or 1.62Gbps transmission rate. Up to 10.8Gbps can be transmitted by 4 lanes.

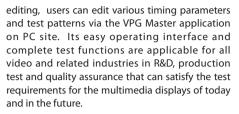
DPCD (DisplayPort Configuration Data) is the main function of DisplayPort that acts as a communication bridge between source and sink. The 2233-B is able to adjust the parameters such as Lane, Main link rate, etc. automatically or manually after connection. As the signal attenuation may occur during long distance transmission for DisplayPort, the Pre-emphasis and Swing voltage can also be adjusted.

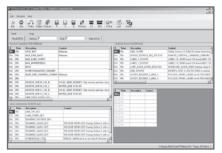
In addition the 2233-B supports SSC (Spread Spectrum Clock, the technology to eliminate EMI) test that can significantly reduce the EMI problems occurred among displays and components, and simplify the product design.

In the meantime to fulfill the test application for multi-port output, the 2233-B has built-in 3 HDMI, 2 DisplayPort and 2 SCART ports to reduce a great deal of test time, so as to finish the tests in the fastest way.

For operation, the 2233-B has adopted full color graphic interface and built in super capacity memory for storage. Besides using the panel for

#### **Multi-output with HDCP Test**





#### DPCD Screen



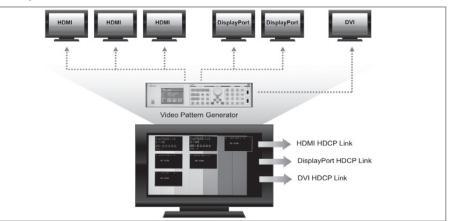
**DisplayPort Timing Screen** 



Model 2233-B Rear View

#### ORDERING INFORMATION

2233-B : Video Pattern Generator Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/DisplayPort 270MHz A240001: Remote Controller



All specifications are subject to change without notice.

### Model 2233-B

| SPECIFICATIONS  |   |   |   |  |  |  |  |                 |   |   |  |  |
|---|---|---|---|--|--|--|--|-----------------|---|---|--|--|
| ANALOG OUTPUT   |   | HDCP Suppo  | rt  | HDCP V   | 1.3  |  |  |                 |   |   |  |  |
| Display Size  | 4096 x 2048   | Main Link Da  |   | 2.7Gbps  | 2.7Gbps or 1.62Gbps per lane                                       |  |  |                 |   |   |  |  |
| Pixel Rate Range  | 0.5~250MHz  | Lane Count  |   | <u> </u>   | 1/2/4 Lanes  |  |  |                 |   |   |  |  |
| Video Level   | R,G,B (75 ohms) 0~1.0V programmable   | Pre-emphasis  | 5   |  | 0dB/3.5dB/6dB/9.5dB selectable                                     |  |  |                 |   |   |  |  |
| Sync on Green / Level   | 0~0.5V On/Off programmable  | Swing level   |   |  | 400mV/600mV/800mV/1200mV selectable                                |  |  |                 |   |   |  |  |
| White Level   | 0~1.2V programmable   |   |   |  | nel (L-PCI   |  |  |                 |   |   |  |  |
| Black Level   | 7.5 IRE / 0 IRE selectable  | Audio   |   |  | 8 Channel (AC3/DTS)-External                                       |  |  |                 |   |   |  |  |
| HORIZONTAL TIMING   |   | Bit Per Sampl   | e   | 24bit  |  | ,  |  |                 |   |   |  |  |
| Total Pixels  | 32~8192 pixels / 1 pixels resolution  | Sample Rate   |   | 32, 44.1,  | , 48, 88.2   | , 96, 176  | 5.4, 192KH   | Ιz              |   |   |  |  |
| VERTICAL TIMING   |   |   |   |  |  |  |  |                 |   |   |  |  |
|   | 4~4096 lines (non-interlace)  | <b>TV OUTPUT</b>  |   |  |  |  |  |                 |   |   |  |  |
| Total Pixels  | 4~2048 lines (interlace) / 1 line programmable  | Output Mode   |   | NTSC   |  | PA   |  |                 | SECAM   |   |  |  |
| COMPOSITE SYNC  | H+V, H EXOR V, Equalization & Serration Pulse   | Subcarrier Fre  | allency   | 443 M,J  |  |  | 50 N   | Nc              | 4.41/4.25   | MHz   |  |  |
|   | BNC: Hs, Vs, Xs   |   |   | 4.43 3.58  | 4.43   | 3.57 4.  |  | 3.58            |   |   |  |  |
| SEPARATE SYNC   | D-SUB: Hs (Xs), Vs  | Subcarrier St   |   |  |  | ±5   | 0  |                 |   | Hz  |  |  |
| VIDEO FORMAT  |   |   |   | Composite  |  |  |  |                 |   |   |  |  |
|   | R,G,B/RS-343A   |   |   | Burst On/O   |  |  |  |                 |   |   |  |  |
|   | Y, R-Y, B-Y   | Video Outpu   | F  -  | Contrast pr  | 5  |  |  |                 |   |   |  |  |
| Video Output  | Y, Cb, Cr / ITU 601   |   | Brig  |  |  | mable  |  |                 |   |   |  |  |
| naeo output   | Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M   |   |   | Saturation   | -  |  |  |                 |   |   |  |  |
|   | DDC II B (D-SUB)  |   | Hue progra  | mmable   |  |  |  |                 |   |   |  |  |
|   |   |   | Closed Caption C1   |  |  | 2, T3, T4  |  |                 |   |   |  |  |
| DVI (TMDS) OUTPUT   |   | Support (NTS  | SC)   |  |  |  |  |                 |   |   |  |  |
| Pixel Rate Range  | 25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz  |   |   | MPAA Ratin   |  |  |  |                 |   |   |  |  |
| E-EDID  | Read / Write / Compare / Edit   |   |   | FCC Rating   |  |  | <u> </u>   |                 | <u>.</u>  |   |  |  |
| HDCP Support  | HDCP V1.0 (with Dual Mode)  | V-CHIP (NTSC  | -   | Canada Eng   |  |  | :8+, G, PG   | , 14+,          | 18+   |   |  |  |
| Compliant   | DVI 1.0 specification   |   |   | Canada Fre   |  | 0  |  |                 |   |   |  |  |
| Video Signal Type   | RGB   |   |   | G, 8 ans+, 1   |  |  |  |                 |   |   |  |  |
| Sampling Mode   | 4:4:4   | Teletext (PAL)  | ) [   | Teletext Sys   | stem B Le  | evel 1 , 1   | .5   |                 |   |   |  |  |
| 1 3   |   | HDTV FORM   | AT  |  |  |  |  |                 |   |   |  |  |
| HDMI VIDEO OUTPUT   |   |   |   | ve Mode Fra  | ame  | Interlace  | Mode Fr  | ame             |   |   |  |  |
| Version   | HDMI V1.3C(with 24,30,36 bit deep color/xvYCC/<br>CEC/Lip Sync)   | Timing  | R   | ate (Hz)   | Rate (H  |  | ate (Hz)   | e (Hz)          |   | ard   |  |  |
| Pixel Rate Range  | 25 ~ 165 MHz ( TMDS CLK : 225MHz)   |   | 60P   | 60   |  | 601  |  | 30              | SMPTE   |   |  |  |
| Support HDMI Timing   | 77 Timing(CEA-861D)   |   | 59.94P  | 60/1.0   | 01   | 59.941   |  | 1.001           | SMPTE   |   |  |  |
| Pixel Repetition  | 4   |   | 50P   | 50   |  | 501  | 2  | 25              | SMPTE   |   |  |  |
| Video Signal Type   | RGB or YCbCr  | 1920 x 1080   | 30P   | 30   |  |  |  |                 | SMPTI   |   |  |  |
| Sampling Mode   |   |   | 29.97P  |  | 01   |  |  |                 | SMPTE   | 274   |  |  |
|   | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2  |   |   | 30/1.0   | -  |  |  |                 |   |   |  |  |
| Bits per Component  | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 / 12 @RGB & YCbCr  |   | 25P   | 25   |  |  |  |                 | SMPTE   | 274   |  |  |
| Bits per Component  |   |   | 25P<br>24P  |  |  |  |  |                 | SMPTE<br>SMPTE  | 274<br>274                                    |  |  |
| Bits per Component<br>Color Space   | 8 / 10 / 12 @RGB & YCbCr  |   | 25P   | 25   |  |  |  |                 | SMPTE<br>SMPTE<br>SMPTE                                     | 274<br>274<br>274                             |  |  |
| · · ·   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-  | 1920 x 1035   | 25P<br>24P  | 25<br>24   |  | 601  | 3  | 30              | SMPTE<br>SMPTE  | 274<br>274<br>274                             |  |  |
| · ·   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/   | 1920 x 1035   | 25P<br>24P  | 25<br>24   |  | 60I<br>59.94I  |  | 30<br>1.001     | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE                   | 274<br>274<br>274<br>240<br>240               |  |  |
| Color Space   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601  | 1920 x 1035   | 25P<br>24P  | 25<br>24   |  |  |  |                 | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE                            | 274<br>274<br>274<br>240<br>240               |  |  |
| Color Space<br>HDCP Support   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit   | 1920 x 1035   | 25P<br>24P<br>23.98P                                      | 25<br>24<br>24/1.0   | 01   |  |  |                 | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE                   | 274<br>274<br>274<br>240<br>240<br>296        |  |  |
| Color Space<br>HDCP Support<br>EDID   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit   |   | 25P<br>24P<br>23.98P<br>60P                               | 25<br>24<br>24/1.0<br>60   | 01   |  |  |                 | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br>HDMI AUDIO OUTPU   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit   | 1280 x 720  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50   | 01   |  |  |                 | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz  | 1280 x 720<br>DATA STOR   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b>   | 01   | 59.941   | 30/*   |                 | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel  | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)  | 1280 x 720<br>DATA STOR/<br>Default   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin   | 101<br>101<br>101  | 59.941<br>2000 pat   | 30/ <sup>*</sup>                                   | 1.001           | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br>HDMI AUDIO OUTPU<br>Sample Rate<br>Number of Channel<br>Bits per Sample  | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit   | 1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | <ul> <li>25</li> <li>24</li> <li>24/1.0</li> <li>60</li> <li>60/1.0</li> <li>50</li> <li>50</li> <li>2000 tin</li> <li>3000 tin</li> </ul> | 101<br>101<br>101<br>101<br>101<br>101<br>101<br>101<br>101<br>101 | 59.941<br>2000 pat<br>3000 pat   | 30/*   | 1.001           | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS  | 1280 x 720<br>Default<br>Internal Mem<br>External Mem   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | <ul> <li>25</li> <li>24</li> <li>24/1.0</li> <li>60</li> <li>60/1.0</li> <li>50</li> <li>50</li> <li>2000 tin</li> <li>3000 tin</li> </ul> | 101<br>101<br>101  | 59.941<br>2000 pat<br>3000 pat   | 30/ <sup>*</sup>                                   | 1.001           | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz   | 1280 x 720<br>Default<br>Internal Mem<br>External Mem<br>OTHERS   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos  | 01<br>01<br>01<br>nings + 2<br>nings + 3<br>st interfa             | 59.94l<br>2000 pat<br>3000 pat<br>ce                                   | terns terns + 1                                    | 1.001<br>000 pr | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU'</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution  | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step  | 1280 x 720<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos<br><b>1</b> Ø 100~                                 | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>3000 pat<br>ce<br>10% VLN                        | 30/<br>terns<br>terns + 1<br>, 47~63H              | 1.001<br>000 pr | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br>HDMI AUDIO OUTPU'<br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF )  | 1280 x 720<br><b>DATA STOR</b><br>Default<br>Internal Mem<br>External Mem<br><b>OTHERS</b><br>AC Input<br>Operation/St  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>3000 tin<br>USB Hos<br><b>I</b> Ø 100~<br>0. +5~+40        | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>3000 pat<br>ce<br>10% VLN                        | 30/<br>terns<br>terns + 1<br>, 47~63H              | 1.001<br>000 pr | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step  | 1280 x 720<br><b>DATA STOR</b><br>Default<br>Internal Mem<br>External Mem<br><b>OTHERS</b><br>AC Input<br>Operation/St<br>Humidity                            | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos<br><b>1</b> Ø 100~                                 | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>3000 pat<br>ce<br>10% VLN                        | 30/<br>terns<br>terns + 1<br>, 47~63H              | 1.001<br>000 pr | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br>HDMI AUDIO OUTPU'<br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF )<br>Tone / Sweep / Mute / Repeat / Play Time  | 1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION                            | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>3000 tin<br>USB Hos<br><b>I</b> Ø 100~<br>0. +5~+40        | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>3000 pat<br>ce<br>10% VLN                        | 30/<br>terns<br>terns + 1<br>, 47~63H              | 1.001<br>000 pr | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Range<br>Frequency Resolution<br>External Audio Input<br>Special Control Mode  | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF )<br>Tone / Sweep / Mute / Repeat / Play Time  | 1280 x 720<br><b>DATA STOR</b><br>Default<br>Internal Mem<br>External Mem<br><b>OTHERS</b><br>AC Input<br>Operation/St<br>Humidity                            | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos<br>10/100-<br>0. +5~+40<br>20~90 9                 | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>8000 pat<br>ce<br>10% V⊾<br>-20~+60              | 30/<br>terns<br>terns + 1<br>, 47~63H              | 000 pr          | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Range<br>Frequency Resolution<br>External Audio Input<br>Special Control Mode<br><b>DISPALY PORT OUTPU</b>                       | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF )<br>Tone / Sweep / Mute / Repeat / Play Time<br><b>JT</b>                                   | 1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION                            | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos<br>10/100-<br>0. +5~+40<br>20~90 9<br>88 x 350     | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>8000 pat<br>ce<br>10% V⊾<br>-20~+60<br>nm / 3.40 | 30/*<br>:terns<br>tterns + 1:<br>47~63H<br>0 deg.C | 000 pr          | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Range<br>Frequency Resolution<br>External Audio Input<br>Special Control Mode<br><b>DISPALY PORT OUTPU</b><br>Pixel Rate Range   | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>T</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF )<br>Tone / Sweep / Mute / Repeat / Play Time<br><b>JT</b><br>25~270MHz                      | 1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION<br>2233-B (H x V           | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos<br>10/100-<br>0. +5~+40<br>20~90 9                 | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>8000 pat<br>ce<br>10% V⊾<br>-20~+60<br>nm / 3.40 | 30/*<br>:terns<br>tterns + 1:<br>47~63H<br>0 deg.C | 000 pr          | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |
| Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input<br>Special Control Mode<br><b>DISPALY PORT OUTPU</b><br>Pixel Rate Range<br>Video Signal Type | 8 / 10 / 12 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF )<br>Tone / Sweep / Mute / Repeat / Play Time<br><b>JT</b><br>25~270MHz<br>RGB/YCbCr | 1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION<br>2233-B (H x V<br>WEIGHT | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.0<br>60<br>60/1.0<br>50<br><b>E</b><br>2000 tin<br>3000 tin<br>USB Hos<br>10/100-<br>0. +5~+40<br>20~90 9<br>88 x 350     | 001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001<br>001 | 59.941<br>2000 pat<br>8000 pat<br>ce<br>10% V⊾<br>-20~+60<br>nm / 3.40 | 30/*<br>:terns<br>tterns + 1:<br>47~63H<br>0 deg.C | 000 pr          | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |

Video & Color

### Model 2234



Analog 250 MHz DVI (TMDS) 330 MHz HDMI V1.3C 165 MHz (TMDS Rate 225 MHz) DisplayPort V1.1a 270 MHz Multi-port (HDMIx3, DPx2) Multimedia Audio/Video

#### **KEY FEATURES**

- Support multimedia audio / video play formats
- Support up to 1080p high definition resolution
- Multi ports independent output test
  - application
  - HDMI port output x 3
  - DisplayPort output x 2
- SCART port x 2 (output x 1 / input x 1)
- DisplayPort V1.1a pixel rate 270MHz
- DisplayPort supports HDCP V1.3
- Support automatically & manually setting for DisplayPort function
  - 2 Link rate (1.62 / 2.7Gbps) selectable
  - 1, 2, 4 Video lane selectable
  - 0 / 3.5 / 6 / 9.5dB pre-emphasis selectable
  - 400 / 600 / 800 / 1200mV swing level selectable
- Support HDMI V1.3C (with 24, 30, 36bit color depth / xvYCC / CEC / Lip Sync)
- Support dual HDCP in DVI test application
- HDCP supports auto / manual mode
- HDMI and DisplayPort multiplexer function or switching for independent output
- HDCP ON/OFF in DVI, HDMI & DisplayPort interface
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
- S-Video / CVBS / SCART / RGB /
- Color Component / D-terminal
- NTSC / PAL / SECAM signals
- EDID read / write / compare
- Optical / coaxial audio input (SPDIF)
- Scrolling pattern support
- Built-in China HD standard test patterns
- HDMI / DVI hot plug function

In order to perform motion pictures on the displays nowadays, the 2234 Video Pattern Generator has integrated the Multi-Media playback technology to provide versatile motion pictures for display quality evaluation test. It has high resolution test quality and multiple outputs support that can meet the requirements for multimedia video tests such as LCD Monitor / LCD TV / PDP / Projector of today and in the future.

This Video Pattern Generator provides both analog and digital signals, also supports multiple ports for independent output test and multimedia audio/video formats for play application. For the digital signal, the pixel rate of TMDS output is up to 330MHz and the test screen resolution is able to support beyond WQUXGA. Moreover, to cope with the higher frequency signal test for DVI Dual HDCP tests, it also supports dual link DVI test application.



Chroma 2234 has built in the up to date high resolution multimedia digital video transmission interface, HDMI V1.3, to provide high speed bandwidth and color depth. It supports 24, 30, 36 bits (RGB or YCbCr) and new color standard xvYCC along with sYCC, Adobe RGB, and Adobe YCC(CEA-861E) to implement the real natural colors and high resolution images.

DisplayPort is the state-of-the-art video output interface defined by VESA. The signal transmission is mainly composed of main channel, AUX CH and hot plug (HPD) 3 types of signals. The main channel is formed by 4 lanes (1, 2, 4 Lane) and each lane can support 2.7Gbps or 1.62Gbps transmission rate. Up to 10.8Gbps can be transmitted by 4 lanes. Chroma 2234 supports the DisplayPort standard formats with the following key features:

DPCD (DisplayPort Configuration Data) is the main function of DisplayPort that acted as a communication bridge between source and sink. Chroma 2234 is able to adjust the parameters such as Lane, Main link rate and etc. automatically or manually after connection. As the signal attenuation may occur during long distance transmission for DisplayPort, the Pre-emphasis and Swing voltage can also be adjusted.

In addition Chroma 2234 supports SSC (Spread Spectrum Clock, the technology to eliminate EMI) test that can significantly reduce the EMI problems occurred among displays and components, and simplify the product design.

For the application of multiple tests, Chroma 2234 supports a variety of audio/video and pattern file formats for play with the resolution up to 1080p. Meanwhile, to fulfill the test application for multi ports output, 3 HDMI and 2 DisplayPorts of which the output settings can be executed separately have been built in to reduce a great deal of test time and finish the tests in the fastest way possible. For operation, Chroma 2234 has adopted full color graphic interface and built in memory for storage with the diversified special test patterns like xvYCC, HDCP&E-EDID, 8/10/12bit deep color, CEC, Lipsync and China high definition test patterns embedded for use. Tests can be performed easily and rapidly to save the time and control the cost.

A remote controller (optional) can be used to replace the direct panel editing for flexible practice in a large test area. It is suitable for mass application in the production line. In addition, various timing parameters and test patterns can be edited via the VPG Master application on PC site. The easy operating interface and complete test functions of Chroma 2234 are applicable for all video and related industries in R&D, production test and quality assurance.

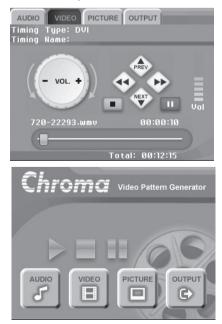


Model 2234 Rear View

#### **ORDERING INFORMATION**

2234 : Video Pattern Generator Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/DisplayPort 270MHz A240001 : Remote Controller

#### **Multimedia Operation interface**



### Model 2234

| SPECIFICATIONS                         |  |   |       |  |            |         |          |          |         |           |       |  |
|--|--|---|-------|--|------------|---------|----------|----------|---------|-----------|-------|--|
| ANALOG OUTPUT                          |  | HDCP Support                                |       | HDCP \   | /1.3       |         |          |          |         |           |       |  |
| Display Size                           | 4096 x 2160  | Main Link Data Rate                         |       | 2.7Gbp   | s or 1.62  | 2Gbps   | per la   | ne       |         |           |       |  |
| Pixel Rate Range                       | 0.5~250MHz   | Lane Count                                  |       | 1/2/4 L  |            |         |          |          |         |           |       |  |
| Video Level                            | R,G,B (75 ohms) 0~1.0V programmable  | Pre-emphasis                                |       | 0dB/3.5  | 5dB/6dB    | /9.5dE  | 3 selec  | table    |         |           |       |  |
| Sync on Green / Level                  | 0~0.5V On/Off programmable   | Swing level                                 |       | 400mV  | /600mV     | /800m   | V/120    | 0mV s    | electa  | able      |       |  |
| White Level                            | 0~1.2V programmable  |   |       | 2 Channel (L-PCM)-Internal                                     |            |         |          |          |         |           |       |  |
| Black Level                            | 7.5 IRE / 0 IRE selectable   | Audio                                       |       | 8 Channel (AC3/DTS)-External                                   |            |         |          |          |         |           |       |  |
| HORIZONTAL TIMING                      |  | Bit Per Sample                              |       | 24bit  |            |         |          |          |         |           |       |  |
| Total Pixels                           | 32~8192 pixels / 1 pixels resolution   | Sample Rate                                 |       | 32, 44.1   | , 48, 88.  | 2, 96,  | 176.4,   | 192KF    | Ιz      |           |       |  |
| VERTICAL TIMING                        |  |   |       |  |            |         |          |          |         |           |       |  |
|  | 4~4096 lines (non-interlace)   | TV OUTPUT                                   |       |  | 1          |         |          |          |         |           |       |  |
| Total Pixels                           | 4~2048 lines (interlace) / 1 line programmable                                   | Output Mode                                 | _     | NTSC   |            |         | PAL      |          |         | SECAM     |       |  |
| COMPOSITE SYNC                         | H+V, H EXOR V, Equalization & Serration Pulse                                    | Subcarrier Frequency                        | , 44  |  | BDGHI      |         | 60       | N        | Nc      | 4.41/4.25 | 5 MHz |  |
|  | BNC: Hs, Vs, Xs  | . ,   | 4.4   | 3 3.58   | 4.43       |         |          | 4.43     | 3.58    |           |       |  |
| SEPARATE SYNC                          | D-SUB: Hs (Xs), Vs   | Subcarrier Stability                        |       |  |            |         | ±50      |          |         |           | Hz    |  |
| VIDEO FORMAT                           |  |   |       |  | e (BNC), 9 |         |          |          |         |           |       |  |
|  | R,G,B/RS-343A  |   |       |  | off (NTSC  |         |          |          |         |           |       |  |
|  | Y, R-Y, B-Y  | Video Output                                |       | ·  | rogramr    |         |          |          |         |           |       |  |
| Video Output                           | Y, Cb, Cr / ITU 601  |   |       |  | program    |         |          |          |         |           |       |  |
|  | Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M  |   |       |  | program    |         | le       |          |         |           |       |  |
|  | DDC II B (D-SUB)   |   | Hu    | e progra   | ammabl     | e       |          |          |         |           |       |  |
|  |  | Closed Caption                              | C1,   | C2, C3,  | C4/T1,     | T2, T3, | T4       |          |         |           |       |  |
| <b>DVI (TMDS) OUTPUT</b>               |  | Support (NTSC)                              |       |  |            |         |          |          |         |           |       |  |
| Pixel Rate Range                       | $25 < 1 \text{ link} \le 165 \text{MHz}/165 < 2 \text{ link} \le 330 \text{MHz}$ |   |       |  | ng : G, P  | ,       |          |          |         |           |       |  |
| E-EDID                                 | Read / Write / Compare / Edit  |   |       | FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA            |            |         |          |          |         |           |       |  |
| HDCP Support                           | HDCP V1.0 (with Dual Mode)   |   |       | Canada English Rating : C, C8+, G, PG, 14+, 18+                |            |         |          |          |         |           |       |  |
| Compliant                              | DVI 1.0 specification  |   |       | Canada French Rating :<br>5, 8 ans+, 13 ans+, 16 ans+, 18 ans+ |            |         |          |          |         |           |       |  |
| Video Signal Type                      | RGB  |   |       |  |            |         |          | ans+     |         |           |       |  |
| Sampling Mode                          | 4:4:4  | Teletext (PAL)                              | lei   | etext Sy   | stem B l   | Level   | , 1.5    |          |         |           |       |  |
| HDMI VIDEO OUTPUT                      | r  | MULTIMEDIA PLAY                             |       |  |            |         |          |          |         |           |       |  |
|  | HDMI V1.3C(with 24,30,36 bit deep color/xvYCC/                                   | Video Format                                | MPE   | G-1(.mp  | g, .dat) ; | MPEC    | 6-2(.vo  | b)       |         |           |       |  |
| Version                                | CEC/Lip Sync)  | MPEG-4(.avi, .mp4) ; Support Up to 40Mbps(1 |       |  |            |         |          |          |         |           |       |  |
| Pixel Rate Range                       | 25 ~ 165 MHz ( TMDS CLK : 225MHz)  | Audio Format                                |       | MPEG-1 Layer-3(.mp3) ; LPCM(.wav) ; AAC(.aac)                  |            |         |          |          |         |           |       |  |
| Support HDMI Timing                    | 77 Timing(CEA-861D)  | Picture Format                              |       |  | o) ; JPEG  | (.jpg)  |          |          |         |           |       |  |
| Pixel Repetition                       | 4  | Interface                                   | USB   |  |            |         |          |          |         |           |       |  |
| Video Signal Type                      | RGB or YCbCr   | File system                                 |       |  | -3, Exter  |         |          |          |         |           |       |  |
| Sampling Mode                          | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2   | Storage method                              | Inter | nal: 160   | 6B Flash   | Memo    | ory, Ext | ternal:  | Medi    | a USB Por | t     |  |
| Bits per Component                     | 8 / 10 / 12 @RGB & YCbCr   | DATA STORAGE DEV                            | UCE   |  |            |         |          |          |         |           |       |  |
|  | RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-                                   | Default                                     | VICE  | 2000 +i  | mings +    | 2000    | pattor   | nc       |         |           |       |  |
| Color Space                            | 2-4) /sYCC 601/Adobe RGB/  |   |       |  |            |         | •        |          | 000     |           |       |  |
|  | Adobe YCC 601  | Internal Memory                             |       |  | -          |         | patter   | 115 + 11 | 000 p   | rograms   |       |  |
| HDCP Support                           | HDCP V.1.2   | External Memory                             |       |  | ost interf | ace     |          |          |         |           |       |  |
| EDID                                   | Read / Write / Compare / Edit  | OTHERS                                      |       | 10 100   | ~2401/-    | + 100/  | V 4-     | WE 2LL   | 7       |           |       |  |
| HDMI AUDIO OUTPU                       | Т  | AC Input<br>Operation/Storage Te            |       |  | ~240V :    |         | ,        |          | 2       |           |       |  |
| Sample Rate                            | 32,44.1,48,88.2, 96,176.4, 192KHz  |   | mp.   |  | 0 deg.C /  | / -20~  | +00 de   | eg.c     |         |           |       |  |
| Number of Channel                      | 8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)   | Humidity                                    |       | 20~90  | 70         |         |          |          |         |           |       |  |
| Bits per Sample                        | 16 / 24 bit  |   |       | 00   | 0.4.250    |         | 2 4 6    | 12 70    | . 1 2 7 | 0 in alt  |       |  |
| Waveform                               | Sine wave  | 2234 (H x W x D)                            |       | oo x 35  | 0 x 350 ı  | mm / :  | 5.46 X   | 13./8)   | x 13./  | oinch     |       |  |
| Amplitude                              | -90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS   | WEIGHT                                      |       | E C L  | 12.22.1    |         |          |          |         |           |       |  |
| Frequency Range                        | 10Hz to 20KHz  | 2234  |       | 5.6 kg /   | 12.33 lk   | DS      |          |          |         |           |       |  |
| Frequency Resolution                   | 10Hz / Step  |   |       |  |            |         |          |          |         |           |       |  |
| External Audio Input                   | Optical and Coaxial ( S/PDIF )   |   |       |  |            |         |          |          |         |           |       |  |
| Special Control Mode                   | Tone / Sweep / Mute / Repeat / Play Time   |   |       |  |            |         |          |          |         |           |       |  |
|  |  |   |       |  |            |         |          |          |         |           |       |  |
| DISPALY PORT OUTPU                     | ЛТ   |   |       |  |            |         |          |          |         |           |       |  |
| DISPALY PORT OUTPL<br>Pixel Rate Range | 25~270MHz  |   |       |  |            |         |          |          |         |           |       |  |
| Pixel Rate Range                       |  |   |       |  |            |         |          |          |         |           |       |  |
| Pixel Rate Range<br>Video Signal Type  | 25~270MHz  |   |       |  |            |         |          |          |         |           |       |  |
| Pixel Rate Range                       | 25~270MHz<br>RGB/YCbCr   |   |       |  |            |         |          |          |         |           |       |  |

Video & Color

Flat Panel LED/ Display Lighting

 Optical
 PhotovoltaicTest
 Automated
 Power
 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Devices
 & Automation
 Optical Inspection
 Electronics
 Automation
 Component
 Safety
 IC

### Model 2235



#### **KEY FEATURES**

- Comply with DisplayPort 1.2a standard - 4K x 2K 60/50Hz
  - Pixel rate support up to 600MHz
  - Auto / Manual training mode
  - 1.62 / 2.7 / 5.4Gbps per lane
  - 1 / 2 / 4 Link
  - -0/3.5/6/9.5 dB pre-emphasis
  - 400 / 600 / 800 / 1200mV Swing level
  - MST( Multi Stream Transport )
  - DPCD Analyze
- HDMI support up to 300MHz
  - 4K x 2K 24/30Hz
  - 1080p 120Hz
  - 3D format with 1080p 60Hz
  - (Frame packing / Side-by-Side Full)
- 2 HDMI ports + 2 DisplayPort output
- Analog support up to 300MHz
- Support HDCP function
- S-Video/CVBS/SCART/RGB/Component/ D-terminal NTSC/PAL/SECAM standard
- Dual link DVI support up to 330MHz
- EDID Read/Write/Compare/Analyze
- Support Pattern Scrolling Function
- ESD Protection Circuit
- Front Panel USB Port & Control Interface
- Graphic Operating & Editing Interface

Chroma 2235 is a programmable video pattern generator that equipped with various standard analog/digital signal output functions. The built-in high speed graphic engine is able to provide standard test signals and patterns for display devices with various resolutions to meet the requirements of multimedia display industries today and in the future for R&D and test applications.

The Video Pattern Generator supports the up-to-date high resolution multimedia digital audio and video transmission interface HDMI and DisplayPort specification with the following features:

#### Support 4Kx2K ultra high resolution

For digital interface, the DisplayPort supports 600MHz, the HDMI supports 300MHz and DVI supports up to 330MHz (Dual link). For analog interface, the signal supports up to 300MHz. The high bandwidth signal output capability supports the testing for the newest generation of 4K ultra high resolution displays.



#### DP 1.2 standard format signal output

Supports DisplayPort 1.2 standard HBR2(High Bit Rate 2, 5.4Gbps) bandwidth transmission up to 4K x 2K 60Hz resolution. Supports MST( Multi Stream Transport ) function, with one DisplayPort output testing 4 Full HD(1080P) monitors at once. The 3D function is fully supported with abundant 3D test patterns, and provided for the user to download customized 3D patterns (splitting left/ right images in Bitmap file format).

#### **Fully support HDMI defined functions**

The 2235 is equipped with HEAC (Ethernet / Audio Return Channel) / Lipsync / HDCP / CEC / EDID functions and supports 24 / 30 / 36 bit color depth (RGB or YCbCr) and newest generation of color standard xvYCC / sYCC601/ Adobe RGB / Adobe YCC601.

#### Multi-signal port for simultaneous output

The 2235 has 2 HDMI / DisplayPort output ports that can provide multi-signal output simultaneously to meet the test applications for multi-port displays nowadays.

The RGB (BNC / D-Sub) and component (YPbPr / D-Terminal) signals provided by 2235 are able to output all kinds of standard signal formats to test the displays with traditional analog interface. The digital DVI output signal supports dual channels HDCP which is most applicable for high resolution display testing.

For TV signals, the 2235 is able to output the signals that comply with NTSC, PAL and SECAM specifications, also to support CVBS and Y/C

separation signal formats for BNC / S-Video / SCART output ports. Special TV function tests such as Closed Caption, V-chip and Teletext are also supported.

Chroma 2235 has full color graphic interface and super large capacity of storage memory with lots of special test patterns built-in such as xvYCC, HDCP, E-EDID Deep color, CEC, Lipsync and high-definition test images defined by China to give the user an easy way to judge the test result and save the time for production improvement as well as to achieve cost effective control. In addition to the panel editing of standalone device, remote control can be applied also the application software VPG Master can be utilized to edit various test programs and parameters. Its easy-to-use interface and complete test functions are most suitable for the applications of R&D, production tests and guality assurance in all video and associate industries.



Model 2235 Rear View

#### **ORDERING INFORMATION**

2235 : Video Pattern Generator Analog 300MHz/DVI 330MHz/HDMI 300MHz (TMDS Rate 300MHz)/DisplayPort 600MHz A240001 : Remote Controller



#### Soft Panel

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DPCD Screen



DisplayPort Timing Screen

### Model 2235

#### SPECIFICATIONS

| Analog Output               |  | Sampling N         | lode          | RGR 4·4                               | ·4 / YC                      | ℃r 4•      | 4:4 or 4:2:2            |                    |                  |      |
|-----------------------------|--|--------------------|---------------|---------------------------------------|------------------------------|------------|-------------------------|--------------------|------------------|------|
| Display Size                | 4096 x 2160  | Color Dept         |               |                                       | 6/8/10/12 bits per component |            |                         |                    |                  |      |
| Pixel Rate Range            | 0.5~300MHz   | HDCP               |               | HDCP V                                |                              | 5 per e    | omponent                |                    |                  |      |
| Video Level                 | R,G,B (75 ohms) 0~1.0V programmable  | Audio              |               |                                       |                              | tornal (   |                         |                    |                  |      |
| Sync on Green/Level         | 0~0.5V On/Off programmable   | Bit Per Sam        | nlo           | 2 Channel internal (L-PCM)<br>24bit   |                              |            |                         |                    |                  |      |
| White Level                 | 0~1.2V programmable  | Sample Rat         | •             | 32, 44.1, 48, 88.2, 96, 176.4, 192KHz |                              |            |                         |                    |                  |      |
| Black Level                 | 7.5 IRE / 0 IRE selectable   | Frequency          |               | 10Hz to                               |                              |            | , 170.4, 19.            |                    |                  |      |
| Horizontal Timing           | 7.5 IRE / 0 IRE selectable   | MST *              | naliye        |                                       |                              |            | 50) x 4 max             |                    |                  |      |
| Total Pixel                 | 32~8192 pixels / 1 pixels resolution   | 10131              |               |                                       | 920 X I                      | 1060-0     | 00) X 4 111dX           | •                  |                  |      |
|                             | 32~8192 pixels / 1 pixels resolution   | <b>TV Output</b>   |               |                                       |                              |            |                         |                    |                  |      |
| Vertical Timing             | 4~4096 lines (non-interlace) / 1 line programmable   | Output Mo          |               | NTSC                                  | -                            |            | PAL                     |                    | SECAM            |      |
| Total Line                  | 4~4096 lines (non-interface) / 1 line programmable<br>4~2048 lines (interlace) / 1 line programmable |                    |               | 443 N                                 | N,J BI                       |            | M 60                    | N N                | c 4.41/          | MHz  |
| Composite Sync              |  | Subcarrier I       | requency      | 4.43 3                                | .58 4                        | 4.43       |                         | 4.43 3.5           | 8 4.25           |      |
|                             | Hs+Vs, Hs EXORVs, Equalization & Serration Pulse   |                    |               |                                       |                              |            | ±50                     |                    |                  | Hz   |
| Separate Sync               |  |                    |               | Compo                                 | site (B                      | BNC), S-   | Video                   |                    |                  |      |
|                             | BNC : Hs,Vs,Xs ; D-SUB : Hs(Xs), Vs  | · · ·              |               | Burst O                               |                              | . ,        |                         |                    |                  |      |
| DVI (TMDS) Output           |  |                    |               | Contras                               | t /Brig                      | ghtnes     | s/Saturatio             | n/Hue pro          | grammab          | le   |
| Pixel Rate Range            | 25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz   | Closed Cap         |               | C1, C2, 0                             | C3 C4                        | 1/T1 T     | 2 T3 T4                 |                    |                  |      |
| EDID                        | Read / Write / Compare / Edit / Analysis   | Support (N         | TSC)          |                                       |                              |            |                         |                    |                  |      |
| HDCP                        | Support HDCP V.1.0 (with Dual Mode)  | V-CHIP (NTS        | SC)           | MPAA/F                                | CC/Ca                        | anada      | English /Ca             | anada Frer         | ch Rating        | )    |
| Compliant                   | DVI 1.0  | Teletext (PA       | L)            | Teletext                              | t Syste                      | em B Le    | evel 1 , 1.5            |                    |                  |      |
| Video Signal Type           | RGB  |                    |               |                                       |                              |            |                         |                    |                  |      |
| 3 71                        |  | SDTV / HD1         | V Format      |                                       |                              |            | Into                    | laca Mada          |                  |      |
| Sampling Mode               | 4:4:4  | Timing             | Progi         | ressive M                             | lode F                       | rame       |                         | lace Mode<br>Frame | Stan             | dard |
| HDMI Video Output           |  | Timing             |               | Rate (Hz)                             |                              |            |                         | ate(Hz)            | Stan             | uaru |
| Version                     | HDMI 1.4b (3D / ARC / HEC / CEC / Lip Sync)  |                    | 60P           | 60                                    |                              | 601        |                         |                    | 274              |      |
| Pixel Rate Range            | 25 ~ 300 MHz (TMDS rate 300 MHz)   |                    | 59.94P        |                                       | 0/1.00                       | 01         | 59.941                  | 30/1.00            |                  |      |
| Support HDMI Timing         | 85 Timing(CEA-861E)  |                    | 50P           | 5                                     | 0                            |            | 501                     | 25                 | SMPTE            | 274  |
| Pixel Repetition            | 4  | 1920X1080          | 30P           |                                       | 0                            |            |                         |                    | SMPTE            |      |
| Video Signal Type           | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2   | 1920/11000         | 29.97P        |                                       | 0/1.00                       | 01         |                         |                    | SMPTE            |      |
| Color depth                 | 24 / 30 / 36 bits per pixel  |                    | 25P<br>24P    |                                       | 5                            |            |                         |                    | SMPTE<br>SMPTE   |      |
| Color Space                 | RGB / ITU-R BT.601 / ITU-R BT.709 / xvYcc / sYcc601 /<br>Adobe RGB / Adobe sYcc601                   |                    | 24P<br>23.98P |                                       | 4/1.00                       | 01         |                         |                    | SMPTE            | 274  |
| HDCP                        | HDCP V.1.2   | 1920X1035          |               |                                       |                              |            | 601                     | 30                 | SMPTE            |      |
| EDID                        | Read / Write / Compare / Edit / Analysis   |                    | 60P           | 6                                     | 0                            |            | 59.941                  | 30/1.00            | 1 SMPTE<br>SMPTE |      |
| HDMI Audio Output           |  | 1280X720           | 59.94P        |                                       | 0/1.00                       | 01         | _                       |                    | SMPTE            |      |
| Sample Rate                 | 32, 44.1, 48, 88.2, 96,176.4, 192KHz   | 1200/(720          | 50P           |                                       | 0                            |            | _                       |                    | SMPTE            |      |
| Number of Channel           | 8 Channel (FL/FR/LR/RR/FC/LFE/RLC/RRC)   |                    |               |                                       |                              |            |                         |                    |                  |      |
| Bits per Sample             | 16 / 24 bit  | Data Stora         | ge Device     |                                       |                              |            |                         |                    |                  |      |
| Waveform                    | Sine wave  | Default            |               | 2000 t                                | iming                        | js + 200   | 00 patterns             | 5                  |                  |      |
| Amplitude                   | -90.3 to 0.0 dBFS / -138.4 to 0.0 dBFs   | Internal Me        | mory          | 3000 t                                | iming                        | js + 300   | 00 patterns             | s + 1000 pi        | ograms           |      |
| Frequency Range             | 10Hz to 20KHz  | External Me        | emory         | USB H                                 | ost int                      | terface    |                         |                    |                  |      |
| <b>Frequency Resolution</b> | 1Hz / Step   | Others             |               |                                       |                              |            |                         |                    |                  |      |
| External Audio Input        | Optical and Coaxial ( S/PDIF )   | AC Input           |               | 1Ø 10                                 | 0~240                        | $V \pm 10$ | 0% V <sub>LN,</sub> 47∼ | 63Hz               |                  |      |
| Special Control Mode        | Tone / Sweep / Mute / Repeat / Play Time   | Operation<br>Temp. | n/Storag      | e +5~+4                               | 10 deg                       | g.C / -2(  | 0∼+60 deg               | .C                 |                  |      |
| DISPLAYPORT Output          | t  | Humidity           |               | 20~90                                 | %                            |            |                         |                    |                  |      |
| Version                     | DISPLAYPORT 1.2a (3D)  | Dimension          | & Weight      |                                       |                              |            |                         |                    |                  |      |
| Pixel Rate Range            | 25~600 MHz (4K x 2K 60Hz)  |                    |               | 1                                     | 0x350                        | ) mm /     | 3.46x13.78              | x13 78 inc         | h                |      |
| Main Link Data Rate         | 1.62 / 2.7 / 5.4 Gbps per lane   | 2235 (HxW)         | kD)           | 5.6 kg                                |                              |            | 5. TOX 1 5.70           |                    |                  |      |
| Lane Count                  | 1/2/4 Lanes  |                    |               | 9                                     |                              |            |                         |                    |                  |      |
| Pre-emphasis                | 0dB/3.5dB/6dB/9.5dB selectable   |                    |               |                                       |                              |            |                         |                    |                  |      |
|                             |  |                    |               |                                       |                              |            |                         |                    |                  |      |
| Swing Level                 | 400mV/600mV/800mV/1200mV selectable  |                    |               |                                       |                              |            |                         |                    |                  |      |

General Manufacturing TurnkeyTest & Purpose Execution System Automation

### Model 23293-B



Analog 250 MHz DVI (TMDS) 330 MHz HDMI V1.3C 165 MHz (TMDS Rate 225 MHz)

#### **KEY FEATURES**

- Multi-port output tests
  - 3 HDMI output ports
  - 2 SCART ports (output x1/ input x1)
- Analog Pixel rate 250MHz
- DVI Pixel rate 330MHz (dual channel)
- DVI Dual HDCP test application support
- HDMI V1.3C
- True 30 bits color depth output
- Support xvYCC & sYCC, Adobe RGB, Adobe YCC color space
- Support CEC Function
- Built-in Lip Sync test pattern
- Digital audio output
- 3 HDMI outputs to provide individual HDCP Enable/Disable
- DVI & HDMI with HDCP output
- Support HDCP V1.0 (DVI) / V1.2 (HDMI)
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
   S-Video / CVBS / SCART / RGB / color
- component / D-terminal
- NTSC / PAL / SECAM TV signals
- Support Closed Caption / V-Chip / Teletext
- EDID read / write / compare
- Built-in low low-distortion audio output (2ch/8ch)
- Easy-to-use audio hot key
- Optical/Coaxial audio input (S/PDIF)
- Easy-to-use pattern editor
- Scrolling Pattern support
- HDMI / DVI plug & play function
- USB (Host & Device)
- User Key (up to 32 continuous actions can be combined)

Chroma 23293-B Video Pattern Generator is a high value-added test device that is designed by brand new architecture with high speed transmission features to provide high performance system control. It also supports the up-to-date high resolution multimedia digital/audio transmission interface, HDMI V1.3.

Chroma 23293-B has Analog/Digital/ TV signals. For the analog signal of RGB output, the pixel rate is up to 250MHz, while the digital signal of TMDS output, the pixel rate is up to 330MHz. Also, it supports the DVI dual channel HDCP test to satisfy the requirements for higher bandwidth application.



In TV output specification, the image and chromaticity signals comply with the NTSC, PAL and SECAM standards. Furthermore, the tests for special TV functions such as Closed Caption, V-chip and Teletext are supported.

The HDMI output video signals are RGB & YCbCr with the sampling modes of 4:4:4 & 4:2:2. The audio output contains the built-in low distortion sine wave. Chroma 23293-B supports the brand new HDMI V1.3 features:

Higher speed bandwidth and color depth: It supports 24,30 bits (RGB or YCbCr) and the new generation color standards xvYCC, sYCC 601, Adobe RGB and Adobe YCC 601 to attain truly natural color and high resolution image screen.

CEC (Consumer Electronics Control): The CEC parameter settings (VPG Master) support multiple test modes that is able to facilitate users for easier and faster tests with the patterns built-in specially for CEC tests.

Lip Sync: Since the technology of digital signals process improves continuously to have a high definition video presentation, there may have potential factors to cause delay when processing the video. HDMI 1.3 allows CE devices to compensate the time difference automatically that can synchronize both video and audio to enhance viewer's feeling.

To fulfill the application of multi-port output test, Chroma 23293-B has built-in 3 HDMI and 2 SCART ports that can finish testing the displays with multi-port in the fastest speed and reduce the test time in a great deal.

Various test patterns and timing parameters are built-in Chroma 23293-B for operation. Shortcuts are provided for Timing/Pattern/ Program/Audio to simplify the settings. The test program edited by the user on PC can be downloaded to Chroma 23293-B directly for storage and recall next time.

Moreover, for the function keys used frequently, a special User Key is designed to combine these functions. Up to 32 keys can be memorized for continuous actions and executed by a single key. Besides the panel operation, remote control can be enabled with a remote controller for users to operate the device more easily.



Model 23293-B Rear View

#### **ORDERING INFORMATION**

23293-B: Video Pattern Generator Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/TV/HDTV A240001: Remote Controller

### Model 23293-B

| SPECIFICATIONS   |   |   |   |   |  |   |                |   |   |  |  |  |
|--|---|---|---|---|--|---|----------------|---|---|--|--|--|
| ANALOG OUTPUT  |   | <b>TV OUTPUT</b>  |   |   |  |   |                |   |   |  |  |  |
| Display Size   | 4096 x 2160   | Output Mode   | 2   | NTSC  | F  | PAL   |                | SECAM   |   |  |  |  |
| Pixel Rate Range   | 0.5~250MHz  | · · ·   |   | 443 M,J BE  |  | 60 N  | Nc             |   |   |  |  |  |
| Video Level  | R,G,B (75 ohms) 0~1.0V programmable   | Subcarrier Fr   |   |   |  | 4.43 4.43   |                | 4.41/4.25   | MHz   |  |  |  |
| Sync on Green / Level  | 0~0.5V On/Off programmable  | Subcarrier Stability  |   |   |  | 50  |                |   | Hz  |  |  |  |
| White Level  | 0~1.2V programmable   |   |   | Composite (R  | omposite (RCA), S-Video  |   |                |   |   |  |  |  |
|  |   |   |   | Burst On/Off (NTSC, PAL)  |  |   |                |   |   |  |  |  |
| Black Level 7.5 IRE / 0 IRE selectable   |   |   |   |   |  |   |                |   |   |  |  |  |
|  | ORIZONTAL TIMING  |   | Video Output  |   | Contrast programmable Printpass programmable   |   |                |   |   |  |  |  |
|  | Total Pixels   32~8192 pixels / 1 pixels resolution   |   |   |   | Brightness programmable  |   |                |   |   |  |  |  |
| VERTICAL TIMING  | /ERTICAL TIMING   |   |   |   | Saturation programmable  |   |                |   |   |  |  |  |
| Total Pixels   | 4~4096 lines (non-interlace)  | Closed Caption  |   | Hue programmable  |  |   |                |   |   |  |  |  |
|  | ~2048 lines (interlace) / 1 line programmable Closed Caption  |   |   | C1, C2, C3, C4/T1, T2, T3, T4   |  |   |                |   |   |  |  |  |
| COMPOSITE SYNC   | H+V, H EXOR V, Equalization & Serration Pulse   | Support (NTSC)  |   |   |  |   |                |   |   |  |  |  |
| SEPARATE SYNC  | D-SUB: Hs (Xs), Vs  |   |   | MPAA Rating : G, PG, PG-13, R, NC-17, X   |  |   |                |   |   |  |  |  |
| VIDEO FORMAT   |   |   |   | FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA   |  |   |                |   |   |  |  |  |
|  | R, G, B / RS-343A / RS-170 / VESA (VSIS)  | V-CHIP (NTSC  | E   | Canada English Rating : C, C8+, G, PG, 14+, 18+   |  |   |                |   |   |  |  |  |
|  | Y, R-Y, B-Y   |   |   | Canada French Rating :  |  |   |                |   |   |  |  |  |
| Video Output   | Y, Cb, Cr / ITU 601   |   |   | G, 8 ans+, 13 a   |  |   |                |   |   |  |  |  |
|  | Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M   | Teletext (PAL   | )   | Teletext System B Level 1 , 1.5   |  |   |                |   |   |  |  |  |
|  | DDC II B (D-SUB)  | AUDIO (ANA  |   | PIIT  |  |   |                |   |   |  |  |  |
|  |   | Number of C   |   |   | 8/1)   |   |                |   |   |  |  |  |
| DVI (TMDS) OUTPUT  |   | Sample Rate   |   | 2 Channel (R / L)   |  |   |                |   |   |  |  |  |
| Pixel Rate Range   | $25 < 1 \text{ link} \le 165 \text{MHz}/165 < 2 \text{ link} \le 330 \text{MHz}$  | · · · · · · · · · · · · · · · · · · ·   |   | 32, 44.1 , 48 , 88.2 , 96 , 176.4 , 192KHz  |  |   |                |   |   |  |  |  |
| E-EDID   | Read / Write / Compare / Edit   | Level Resolution  |   | 10mV / Step   |  |   |                |   |   |  |  |  |
| HDCP Support   | HDCP V1.0 (with Dual Mode)  | Level Range   |   | 0V to 2V (at 600 Ohms Load)   |  |   |                |   |   |  |  |  |
| Compliant  | DVI 1.0 specification   | Frequency Range   |   | 10Hz to 20KHz / 10Hz Step   |  |   |                |   |   |  |  |  |
| Video Signal Type  | RGB   | Special Control Mode  |   | Tone / Sweep / Mute / Repeat / Play Time  |  |   |                |   |   |  |  |  |
| Sampling Mode  | 4:4:4   | HDTV FORM   | лт  |   |  |   |                |   |   |  |  |  |
|  |   | IIDTV FORM  |   | /e Mode Fram  | o Intoria  | ce Mode Fra   | me             |   |   |  |  |  |
| HDMI VIDEO OUTPUT  | HDMI V1.3C(with 24,30,36 bit deep color/xvYCC/<br>CEC/Lip Sync)   |   |   | Rate (Hz) Rate (Hz)   |  |   |                | Standa  | ard   |  |  |  |
| Version  |   |   | 60P   | 60  | 601  | 30  | n              | SMPTE   | 274   |  |  |  |
| VEISION  |   |   | 59.94P  | 60/1.001  |  |   |                | SMPTE   |   |  |  |  |
| Pixel Rate Range   | 25 ~ 165 MHz (TMDS CLK : 225MHz)  |   | 59.94F  | 50  | 59.94  | 25  |                | SMPTE   |   |  |  |  |
| Support HDMI Timing  | 77 Timing(CEA-861D)   |   |   |   | 501  | 23  | 2              |   |   |  |  |  |
|  |   | 1920 x 1080   | 30P   | 30  | _  |   |                | SMPTE   |   |  |  |  |
| Pixel Repetition   | 4   | 1920 x 1080   |   |   |  |   |                | SMPTE   | 2/4   |  |  |  |
| · ·  | 4<br>RGB or YCbCr   | 1920 x 1080   | 29.97P  | 30/1.001  | _  |   |                |   |   |  |  |  |
| Video Signal Type  | RGB or YCbCr  | 1920 x 1080   | 25P   | 25  |  |   |                | SMPTE   | 274   |  |  |  |
| Video Signal Type<br>Sampling Mode   | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2  | 1920 x 1080   |   |   |  |   |                |   | 274   |  |  |  |
| Video Signal Type  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr   | 1920 x 1080   | 25P   | 25  |  |   |                | SMPTE   | 274<br>274                                    |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component   | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-   |   | 25P<br>24P  | 25<br>24  |  | 30  | 0              | SMPTE<br>SMPTE  | 274<br>274<br>274                             |  |  |  |
| Video Signal Type<br>Sampling Mode   | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/  | 1920 x 1080   | 25P<br>24P  | 25<br>24  |  |   |                | SMPTE<br>SMPTE<br>SMPTE                                     | 274<br>274<br>274<br>274<br>240               |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601   |   | 25P<br>24P  | 25<br>24  | 601  |   |                | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE                            | 274<br>274<br>274<br>274<br>240<br>240        |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2   |   | 25P<br>24P<br>23.98P                                      | 25<br>24<br>24/1.001  |  |   |                | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE                   | 274<br>274<br>274<br>240<br>240<br>296        |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit  | 1920 x 1035   | 25P<br>24P<br>23.98P<br>60P                               | 25<br>24<br>24/1.001<br>60  |  |   |                | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br>HDMI AUDIO OUTPU  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit  | 1920 x 1035<br>1280 x 720   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50  |  |   |                | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br>32,44.1,48,88.2, 96,176.4, 192KHz   | 1920 x 1035<br>1280 x 720<br>DATA STOR/   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E   |  | l 30/1.   |                | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel   | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)   | 1920 x 1035<br>1280 x 720<br><b>DATA STOR/</b><br>Default   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E   |  | l 30/1.   |                | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE          | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit  | 1920 x 1035<br>1280 x 720<br>DATA STOR/   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P              | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir   |  | atterns   | .001           | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave   | 1920 x 1035<br>1280 x 720<br><b>DATA STOR/</b><br>Default   | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir   | 601<br>59.94<br>gs + 2000 p<br>ngs + 3000 p  | atterns   | .001           | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br>32,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit  | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br><b>E</b><br>2000 timir<br>3000 timir  | 601<br>59.94<br>gs + 2000 p<br>ngs + 3000 p  | atterns   | .001           | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave   | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i   | 601<br>59.94<br>gs + 2000 p<br>ngs + 3000 p  | atterns + 10  | .001<br>00 prc | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude   | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS   | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i<br>10/100~24                            | 601<br>59.94<br>ngs + 2000 p<br>ngs + 3000 p<br>nterface<br>40V ± 10% V  | I 30/1.<br>atterns<br>atterns + 10                  | .001<br>00 prc | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range  | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz  | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Men<br>External Men<br>OTHERS<br>AC Input<br>Operation/St  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i<br>1Ø 100~24<br>0. +5~+40 de            | 601<br>59.94<br>ngs + 2000 p<br>ngs + 3000 p<br>nterface   | I 30/1.<br>atterns<br>atterns + 10                  | .001<br>00 prc | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution                          | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF ) | 1920 x 1035<br>1280 x 720<br>Default<br>Internal Men<br>External Men<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity  | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i<br>10/100~24                            | 601<br>59.94<br>ngs + 2000 p<br>ngs + 3000 p<br>nterface<br>40V ± 10% V  | I 30/1.<br>atterns<br>atterns + 10                  | .001<br>00 prc | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU'</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step                                   | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION                 | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i<br>1Ø 100~24<br>0. +5~+40 de<br>20~90 % | 601<br>59.94<br>gs + 2000 p<br>ngs + 3000 p<br>nterface<br>40V ± 10% V<br>eg.C / -20~+   | atterns<br>atterns + 10<br>/LN, 47~63Hz<br>60 deg.C | 001<br>00 prc  | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU'</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF ) | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Men<br>External Men<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION<br>23293-B (H x | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i<br>1Ø 100~24<br>0. +5~+40 de<br>20~90 % | 601<br>59.94<br>ngs + 2000 p<br>ngs + 3000 p<br>nterface<br>40V ± 10% V  | atterns<br>atterns + 10<br>/LN, 47~63Hz<br>60 deg.C | 001<br>00 prc  | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |
| Video Signal Type<br>Sampling Mode<br>Bits per Component<br>Color Space<br>HDCP Support<br>EDID<br><b>HDMI AUDIO OUTPU'</b><br>Sample Rate<br>Number of Channel<br>Bits per Sample<br>Waveform<br>Amplitude<br>Frequency Range<br>Frequency Resolution<br>External Audio Input | RGB or YCbCr<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2<br>8 / 10 @RGB & YCbCr<br>RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-<br>2-4) /sYCC 601/Adobe RGB/<br>Adobe YCC 601<br>HDCP V.1.2<br>Read / Write / Compare / Edit<br><b>1</b><br><b>3</b> 2,44.1,48,88.2, 96,176.4, 192KHz<br>8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)<br>16 / 24 bit<br>Sine wave<br>-90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS<br>10Hz to 20KHz<br>10Hz / Step<br>Optical and Coaxial ( S/PDIF ) | 1920 x 1035<br>1280 x 720<br>DATA STOR/<br>Default<br>Internal Mem<br>External Mem<br>OTHERS<br>AC Input<br>Operation/St<br>Humidity<br>DIMENSION                 | 25P<br>24P<br>23.98P<br>60P<br>59.94P<br>50P<br>AGE DEVIC | 25<br>24<br>24/1.001<br>60<br>60/1.001<br>50<br>E<br>2000 timir<br>3000 timir<br>USB Host i<br>1Ø 100~24<br>0. +5~+40 de<br>20~90 % | 601<br>59.94<br>105<br>105<br>100 p<br>105 + 2000 p<br>105 + 3000 p<br>105 + 3000 p<br>105 + 3000 p<br>105 + 3000 p<br>105 + 2000 p<br>105 + 2 | atterns<br>atterns + 10<br>/LN, 47~63Hz<br>60 deg.C | 001<br>00 prc  | SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE<br>SMPTE | 274<br>274<br>274<br>240<br>240<br>296<br>296 |  |  |  |

### Model 23294



Analog 250 MHz DVI (TMDS) 330 MHz HDMI V1.4a 165 MHz (TMDS Rate 225 MHz) 3D Output

#### **KEY FEATURES**

- Multiport independent output test
  - application
  - 3 HDMI port output
- 2 SCART port (Input/Output x1/Outputx1)
   Analog frequency 250MHz
- Digital (DVI) frequency 330MHz (dual channel)
- DVI Dual HDCP test application support
- HDMI 1.4 standard
- 3D standard format output
- ARC audio return function
- HEC network test function
- Color vector sYCC601 / Adobe RGB / Adobe YCC601
- CEC / Deep Color / Lip-Sync / xvYCC
- 4Kx2K graphic display capability
- CEC analysis & multi-directional monitor
- Real 30bit deep color output
- DVI & HDMI with HDCP output
- Support HDCP V1.0 (DVI) / V1.2(HDMI)
- Y, Pb, Pr / Y, Cb, Cr / Y,R-Y, B-Y Output
- S-Video / CVBS / SCART / RGB /
- color component / D terminal
- NTSC / PAL / SECAM TV signals
- Support Close Caption / V-Chip / Teletext
- EDID read / write / compare
- HDMI supports fiber/coaxial audio input (S/PDIF)
- ARC supports fiber/coaxial audio output (S/PDIF)
- Built-in low distortion audio output (2ch / 8ch)
- Easy to use audio shortcuts
- Support graphic dynamic movement (Scrolling) function
- Built in China high definition standard test patterns / 3D test images
- HDMI / DVI plug and play function
- ESD protective circuit
- Front USB control interface
- User Key (maximum 32 combinations of serial actions)

Chroma 23294 Video Pattern Generator provides various international standard signals with built-in 3 HDMI and 2 SCART ports that can satisfy the output tests for multiple ports to shorten the test time and improve productivity.

Chroma 23294 adopts a brand new structure design with a high performance CPU to carry high speed / high density FPGA as the graphic engine. It has highly efficient system control and supports the up-to-date high definition multimedia digital video interface HDMI V1.4 standard to supply the following features:



3D signal standard format output: It is a fast operating interface designed specially for 3D only that can adjust and switch to various 3D output easily.

The ARC (Audio Return Channel) function is able to test the external audio source and the Ethernet (HDMI Ethernet Channel) function is able to provide dual data transmission test, higher speed bandwidth & Color Deep. It supports 24, 30 byte (RGB or YCbCr) and the color standards of new generation such as xvYCC, sYCC601, Adobe RGB and Adobe YCC601 to realize the true natural color and high definition image with broader color range.

CEC (Consumer Electronics Control) Function: The CEC test parameters can be set via the proprietary software VPG MASTER which also supports the test modes of TX (send)/RX (receive)/MONITOR (monitor) & FEATURE (user's).

Chroma 23294 has analog/digital/TV control signals as well.

For the analog RGB output, its pixel frequency is up to 250MHz that complies with the RS-343A signal standard and support Y,Pb,Pr / Y,Cb,Cr / Y, R-Y& B-Y. As to the digital signal, it is TMDS pixel frequency up to 330MHz with dual channel DVI output that can support DVI Dual HDCP tests to satisfy the application for testing higher bandwidth display.

In TV output specification, the image and chromaticity signals of 23294 comply with NTSC, PAL and SECAM regulations. The output signals include CVBS composite signals, Y/C (Luminance/Chrominance) image/chromaticity separate signals and S-Video/SCART output connector. It can also support special TV test functions such as Closed Caption, V-chip and Teletext.

To supply multiple test applications, Chroma is able to play the picture file format up to 4Kx2K resolution. Moreover, 3 HDMI and 2 SCART ports are built in to satisfy the test for multiport independent output and reduce the test time substantially.

Chroma 23294 has many special test patterns such as xvYCC, HDCP&E-EDID, 8/10 bit deep color, CEC, Lipsync and China high definition patterns for easy test assessment to save the time and increase productivity efficiently. In addition, the equipped application VPG Master with easy-to-use interface and complete test functions that is capable of editing various kinds of test procedures and parameters makes Chroma 23294 suitable for the R&D, production test and quality assurance of all video and related industries.



Model 23294 Rear View

#### **ORDERING INFORMATION**

23294 : Video Pattern Generator Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/TV/HDTV A240001: Remote Controller

### Model 23294

| SPECIFICATIONS        |   |                              |   |  |   |                                      |          |             |           |       |  |  |
|-----------------------|---|------------------------------|---|--|---|--------------------------------------|----------|-------------|-----------|-------|--|--|
| ANALOG OUTPUT         |   | <b>TV OUTPUT</b>             |   |  |   |                                      |          |             |           |       |  |  |
| Display Size          | 4096 x 2160   | Output Mode                  | e                                       | NTSC   |   |                                      | PAL      |             | SECAM     |       |  |  |
| Pixel Rate Range      | 0.5~250MHz  | Subcarrier Fr                | oquoncy                                 | 443 M,J  | BDGH  |                                      | 60       | N Nc        | 4.41/4.25 | мц-   |  |  |
| Video Level           | R,G,B (75 ohms) 0~1.0V programmable   | Subcarrier Fr                | equency                                 | 4.43 3.58  | 4.43  | 3.57                                 | 4.43     | 4.43 3.58   | 4.41/4.25 |       |  |  |
| Sync on Green / Level | 0~0.5V On/Off programmable  | Subcarrier Stability         |   |  |   | <u>+</u>                             | 50       |             |           | Hz    |  |  |
| White Level           | 0~1.2V programmable   |                              |   | Composite (RCA), S-Video   |   |                                      |          |             |           |       |  |  |
| Black Level           | 1 0   |                              | Video Output                            |  |   | Burst On/Off (NTSC, PAL)             |          |             |           |       |  |  |
| HORIZONTAL TIMING     |   |                              |   |  |   | Contrast programmable                |          |             |           |       |  |  |
| Total Pixels          | 32~8192 pixels / 1 pixels resolution  | Video Output                 |   | Brightness programmable  |   |                                      |          |             |           |       |  |  |
| VERTICAL TIMING       | · · · · ·   |                              | Saturation programmable                 |  |   |                                      |          |             |           |       |  |  |
| Total Pixels          | 4~4096 lines (non-interlace)  |                              | Hue programmable                        |  |   |                                      |          |             |           |       |  |  |
| COMPOSITE SYNC        | 4~2048 lines (interlace) / 1 line programmable<br>H+V, H EXOR V, Equalization & Serration Pulse | Closed Capti<br>Support (NTS | C1, C2, C3, C4/T1, T2, T3, T4           |  |   |                                      |          |             |           |       |  |  |
| SEPARATE SYNC         | D-SUB: Hs (Xs), Vs  |                              |   | MPAA Rating : G, PG, PG-13, R, NC-17, X                            |   |                                      |          |             |           |       |  |  |
| VIDEO FORMAT          |   |                              |   | FCC Rating : TV-Y, TV-Y7, TV-G, TV-PG, TV-14, TV-MA                |   |                                      |          |             |           |       |  |  |
| VIDEOTORMAT           | R, G, B / RS-343A / RS-170 / VESA (VSIS)  | V-CHIP (NTSC)                |   | Canada English Rating : C, C8+, G, PG, 14+, 18+                    |   |                                      |          |             |           |       |  |  |
|                       | Y, R-Y, B-Y   |                              |   | Canada Fre   | -   |                                      | , .      | ,           |           |       |  |  |
| Video Output          | Y, Cb, Cr / ITU 601   |                              | -                                       |  |   | G, 8 ans+, 13 ans+, 16 ans+, 18 ans+ |          |             |           |       |  |  |
| video Output          | Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M   | Teletext (PAL                | .)                                      | Teletext Sy  |   |                                      |          |             |           |       |  |  |
|                       | DDC II B (D-SUB)  | -                            | ,                                       | ,  |   |                                      | ,        |             |           |       |  |  |
|                       |   | HDTV FORM                    | IAT                                     |  |   |                                      |          |             |           |       |  |  |
| DVI (TMDS) OUTPUT     |   | Timing                       | Progress                                | ive Mode Fr  | ame   | Interla                              | ace Mo   | de Frame    | Stand     | hard  |  |  |
| Pixel Rate Range      | 25 < 1 link ≤ 165MHz/165 < 2 link ≤ 330MHz  |                              | F                                       | Rate (Hz)  |   | Rate (Hz)                            |          | Stanuaru    |           |       |  |  |
| E-EDID                | Read / Write / Compare / Edit   |                              | 60P                                     | 60   | )   | 601                                  |          | 30          | SMPTE     | E 274 |  |  |
| HDCP Support          | HDCP V1.0 (with Dual Mode)  | -                            | 59.94P                                  | 60/1.  | 001   | 59.94                                | 1I       | 30/1.001    | SMPTE     | E 274 |  |  |
| Compliant             | DVI 1.0 specification   | -                            | 50P                                     | 50   | )   | 50l                                  |          | 25          | SMPTE     | E 274 |  |  |
| Video Signal Type     | RGB   | <br>1920 x 1080              | 30P                                     | 30   | )   |                                      |          |             | SMPTE     | E 274 |  |  |
| Sampling Mode         | 4:4:4   | 1920 X 1060                  | 080 29.97P                              | 30/1.  | 001   |                                      |          |             | SMPTE     | E 274 |  |  |
| Sumpling mode         |   |                              | 25P                                     | 25   | 5   |                                      |          |             | SMPTE     | E 274 |  |  |
| HDMI VIDEO OUTPUT     |   |                              | 24P                                     | 24   | L I   |                                      |          |             | SMPTE     | E 274 |  |  |
| Version               | HDMI V1.4a  |                              | 23.98P                                  | 24/1.  | 001   |                                      |          |             | SMPTE     | E 274 |  |  |
| VEISION               | (3D Format / ARC / HEC / CEC / Lip Sync)  | 1000 1005                    |   |  |   | 601                                  |          | 30          | SMPTE     | E 240 |  |  |
| Pixel Rate Range      | 25 ~ 165 MHz (TMDS rate 225MHz)   | 1920 x 1035                  |   |  |   | 59.94                                | 11       | 30/1.001    | SMPTE     | E 240 |  |  |
| Support HDMI Timing   | 85 Timing(CEA-861E)   |                              | 60P                                     | 60   | )   |                                      |          |             | SMPTE     | E 296 |  |  |
| Pixel Repetition      | 4   | 1280 x 720                   | 59.94P                                  | 60/1.  | 001   |                                      |          |             | SMPTE     | E 296 |  |  |
| Video Signal Type     | RGB or YCbCr  |                              | 50P                                     | 50   | )   |                                      |          |             | SMPTE     | E 296 |  |  |
| Sampling Mode         | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2  |                              |   |  |   |                                      |          |             |           |       |  |  |
| Bits per Component    | 8 / 10 / 12 @RGB & YCbCr  | <b>3D VIDEO FO</b>           | ORMAT OL                                |  |   |                                      |          |             |           |       |  |  |
|                       | RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC   |                              |   | Frame packing<br>Field alternative                                 |   |                                      |          |             |           |       |  |  |
| Color Space           | (IEC61966-2-4) / sYcc601 / Adobe RGB /  |                              |   |  |   | -                                    |          |             |           |       |  |  |
|                       | Adobe sYcc601   | 3D Scanning                  | Line alternative<br>Side-by-Side (Full) |  |   |                                      |          |             |           |       |  |  |
| HDCP Support          | HDCP V.1.2  | _ 50 Scanning Mode           |   | L + dep  |   | un)                                  |          |             |           |       |  |  |
| EDID                  | Read / Write / Compare / Edit   |                              |   |  |   | aphics +                             | - graph  | nics-depth  |           |       |  |  |
| HDMI AUDIO OUTPU      |   |                              |   | Top & E  |   |                                      | 3 1 1    |             |           |       |  |  |
| Sample Rate           | 32,44.1,48,88.2, 96,176.4, 192KHz   |                              |   | Side-by  | /-Side (H   | Half)                                |          |             |           |       |  |  |
| Number of Channel     | 8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)  | DATA STOR                    |   | CE .   |   |                                      |          |             |           |       |  |  |
| Bits per Sample       | 16 / 24 bit   | Default                      |   |  | minac   | 2000 -                               | attorn   | c           |           |       |  |  |
| Waveform              | Sine wave   | Internal Mem                 | 2011/                                   | 2000 timings + 2000 patterns                                       |   |                                      |          |             |           |       |  |  |
| Amplitude             | -90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS  |                              |   | 3000 timings + 3000 patterns + 1000 programs<br>USB Host interface |   |                                      |          |             |           |       |  |  |
| Frequency Range       | 10Hz to 20KHz   | External Memory              |   | OSR HC   | stinter   | lace                                 |          |             |           |       |  |  |
| Frequency Resolution  | 10Hz / Step   | OTHERS                       |   |  |   |                                      |          |             |           |       |  |  |
| External Audio Input  | Optical and Coaxial (S/PDIF)  | AC Input                     |   | 1Ø 100~240V ± 10% V <sub>LN</sub> 47~63Hz                          |   |                                      |          |             |           |       |  |  |
| Special Control Mode  | Tone / Sweep / Mute / Repeat / Play Time  | Operation/Storage Tem        |   | ·  |   | / -20~+                              | -60 deg  | g.C         |           |       |  |  |
| Special Control Mode  | _ ione / sweep / Mule / Repeat / Play Inne  | Humidity                     |   | 20~90  | %   |                                      |          |             |           |       |  |  |
|                       |   | DIMENSION                    |   |  |   |                                      |          |             |           |       |  |  |
|                       |   | DIMENSION                    | ·                                       |  | 23293-B (H x W x D) 88 x 350 x 350 mm / 3.46 x 13.78 x 13.78 inch |                                      |          |             |           |       |  |  |
|                       |   |                              |   | 88 x 35  | 0 x 350   | mm / 3.                              | .46 x 13 | 3.78 x 13.7 | 8 inch    |       |  |  |
|                       |   |                              |   | 88 x 35  | 0 x 350   | mm / 3.                              | .46 x 13 | 3.78 x 13.7 | 8 inch    |       |  |  |

/ideo & Color

Flat Panel LED/ Display Lighting

### Model 2333-B



Analog250 MHzDVI (TMDS)330 MHzHDMI V1.3C165 MHz(TMDS Rate 225 MHz)DisplayPort V1.1a270 MHz

#### **KEY FEATURES**

- Multi-port output tests
  - 3 HDMI output ports
  - 2 DisplayPort output ports
- 2 SCART ports (output x1/ input x1)
- DisplayPort V1.1a pixel rate 270MHz
  - 2 Link Rate (1.62/2.7Gbps)
  - 1,2,4 Video Lane
- HDMI V1.3C
  - True 30 bits color depth output
  - Support xvYCC & sYCC, Adobe RGB,
  - Adobe YCC color space
  - Support CEC Function
  - Built-in Lip Sync test pattern
  - Digital audio output
  - 3 HDMI outputs to provide individual HDCP Enable/Disable
- DVI pixel rate 330MHz (dual channel)
- DVI Dual HDCP test application support
- DVI, HDMI & DisplayPort with HDCP output
   Support HDCP V1.0 (DVI) / V1.2 (HDMI) / V1.3 (DisplayPort)
- Y, Pb, Pr / Y, Cb, Cr / Y, R-Y, B-Y output
- S-Video / CVBS / SCART / RGB / color component / D-terminal output
- NTSC/PAL/SECAM TV signal
- Support Closed caption / V-Chip / Teletext
- Built-in low low-distortion audio output (2ch/8ch)
- Easy-to-use audio hot key
- EDID read/write/compare
- USB (Host & Device)
- User key (up to 32 continuous actions can be combined)

Chroma 2333-B is a high value-added test equipment that can meet the diversified demands for multi-media displays. It has high resolution test quality and multiple output types that can support comprehensive tests for large-scale application in the field of R&D, quality assurance and mass production.

Chroma 2333-B combines Analog / DVI / HDMI / DisplayPort / SDTV / HDTV signals that can satisfy the needs for testing various signals from multimedia displays.

For digital signal: The TMDS output with pixel rate 25~330MHz that supports the dual channel HDCP test is able to fit in the high bandwidth test requirements under 120Hz screen refresh rate.



For HDMI output: The 2333-B provides higher speed bandwidth and color depth. It supports 24,30 bits (RGB or YCbCr) and the new generation color standards xvYCC, sYCC, Adobe RGB and Adobe YCC to attain truly natural color and high resolution image screen. It also supports complete CEC and Lip Sync tests.

DisplayPort is the new video output interface promoted by Video Electronics Standards Ass ociation; VESA. It is an open and extendable interface standard for display devices. Its maximum transmission bandwidth is up to 10.8Gb/s. With the official certification of VESA, Chroma 2333-B is able to provide the consistency and integrity signals in highest standard.

DisplayPort is composed of main channel, auxiliary channel and hot swap (HPD) 3 types of signals. The main channel is made by 4

lanes (1, 2, 4 Lane) and each lane supports 2.7Gbps or 1.62Gbps transmission rate. The parameters can be adjusted automatically via DPCD connection and complete the test procedure in sequential.

For TV output, the image and chromaticity signals are complying with the NTSC, PAL and SECAM standards. Also, the tests for special TV functions such Closed Caption, V-chip and Teletext are supported.

To fulfill the application of multi-port output test, Chroma 2333-B has built-in 3 HDMI, 2 DisplayPort and 2 SCART ports that can finish testing the displays with multi-port in the fastest speed and reduce the test time in a great deal.

Various test patterns and timing parameters are built-in Chroma 2333-B for operation. Shortcuts are provide for Timing/Pattern/Program/Audio to simplify the settings. The test program edited by the user on PC can be downloaded to Chroma 2333-B directly for storage and recall next time.

Moreover, for the function keys used frequently a special User Key is designed to combine these functions. Up to 32 keys can be memorized for continuous actions and executed by a single key. Besides the panel operation, remote control can be enabled with a remote controller for users to operate the device more easily.



Model 2333-B Rear View

#### **ORDERING INFORMATION**

2333-B : Video Pattern Generator Analog 250MHz/DVI 330MHz/HDMI 165MHz (TMDS Rate 225MHz)/DisplayPort 270MHz A240001: Remote Controller

4-17

# Model 2333-B

| SPECIFICATIONS        | SPECIFICATIONS   |   |   |                                  |          |                     |          |              |           |      |
|-----------------------|--|---|---|----------------------------------|----------|---------------------|----------|--------------|-----------|------|
| ANALOG OUTPUT         |  | DISPLAYPORT OUTPU                       | Л   |                                  |          |                     |          |              |           |      |
| Display Size          | 4096 x 2160  | Version                                 | Display   | Port 1.1a                        |          |                     |          |              |           |      |
| Pixel Rate Range      | 0.5~250MHz   | Pixel Rate Range                        | 25~270  | MHz                              |          |                     |          |              |           |      |
| Video Level           | R,G,B (75 ohms) 0~1.0V programmable  | Video Signal Type                       | RGB/YC  | RGB/YCbCr                        |          |                     |          |              |           |      |
| Sync on Green / Level | 0~0.5V On/Off programmable   | Sampling Mode                           | RGB 4:4   | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 |          |                     |          |              |           |      |
| White Level           | 0~1.2V programmable  | Color Depth                             |   |                                  |          |                     |          |              |           |      |
| Black Level           | 7.5 IRE / 0 IRE selectable   | Transmission                            | 6/8/10 bits per component   |                                  |          |                     |          |              |           |      |
| HORIZONTAL TIMING     | i  | HDCP                                    | HDCP V1.3   |                                  |          |                     |          |              |           |      |
| Total Pixels          | 32~8192 pixels / 1 pixels resolution   | DPCD Read / Write                       |   |                                  |          |                     |          |              |           |      |
| VERTICAL TIMING       |  | Main Link Data Rate                     | ta Rate 2.7Gbps or 1.62Gbps per lane  |                                  |          |                     |          |              |           |      |
| Total Pixels          | 4~4096 lines (non-interlace)   | Lane Count                              | 1/2/4 Lanes   |                                  |          |                     |          |              |           |      |
|                       | 4~2048 lines (interlace) / 1 line programmable                                   | Audio                                   | 2 Chanr   | nel (L-PCM                       | l)-Intei | rnal                |          |              |           |      |
| COMPOSITE SYNC        | H+V, H EXOR V, Equalization & Serration Pulse                                    | Bit Per Sample                          | 24bit   |                                  |          |                     |          |              |           |      |
| SEPARATE SYNC         | D-SUB: Hs (Xs), Vs   | Sample Rate                             | 32, 44.1  | , 48, 88.2,                      | 96, 17   | 6.4, 19             | 92KHz    | <u>.</u>     |           |      |
| VIDEO FORMAT          |  | TV OUTPUT                               |   |                                  |          |                     |          |              |           |      |
|                       | R, G, B / RS-343A / RS-170 / VESA (VSIS)   | Output Mode                             | NTSC  | 1                                |          | PAL                 |          |              | SECAM     |      |
|                       | Y, R-Y, B-Y  | · · · · · · · · · · · · · · · · · · ·   | 443 M,J   | BDGHI                            |          | 60                  | N        | Nc           |           |      |
| Video Output          | Y, Cb, Cr / ITU 601  | Subcarrier Frequency                    | 4.43 3.58   |                                  | 3.57     |                     |          | 3.58         | 4.41/4.25 | MHz  |
|                       | Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M  | Subcarrier Stability                    |   |                                  |          | ± 50                |          | 0.00         |           | Hz   |
|                       | DDC II B (D-SUB)   | Subcurrer Stability                     | S-Video, F  | RCA                              |          |                     |          |              |           | 1.12 |
|                       |  |   | Burst On/Off (NTSC, PAL)<br>Contrast programmable<br>Brightness programmable<br>Saturation programmable |                                  |          |                     |          |              |           |      |
| DVI (TMDS) OUTPUT     |  |   |   |                                  |          |                     |          |              |           |      |
| Pixel Rate Range      | $25 < 1 \text{ link} \le 165 \text{MHz}/165 < 2 \text{ link} \le 330 \text{MHz}$ | Video Output                            |   |                                  |          |                     |          |              |           |      |
| E-EDID                | Read / Write / Compare / Edit  |   |   |                                  |          |                     |          |              |           |      |
| HDCP Support          | HDCP V1.0 (with Dual Mode)   |   | Hue programmable  |                                  |          |                     |          |              |           |      |
| Compliant             | DVI 1.0 specification  | Closed Caption                          |   |                                  |          |                     |          |              |           |      |
| Video Signal Type     | RGB  | Support (NTSC)                          |   |                                  |          |                     |          |              |           |      |
| Sampling Mode         | 4:4:4  |   | MPAA Rat  | ina : G. PC                      | G. PG-1  | 13. R. I            | NC-17    | . X          |           |      |
| HDMI VIDEO OUTPUT     | ſ  |   | FCC Ratin   |                                  |          |                     |          |              | 4. TV-MA  |      |
|                       | HDMI V1.3C(with 24,30 bit deep color/xvYCC/CEC/                                  | V-CHIP (NTSC)                           | Canada E  |                                  |          |                     |          |              |           |      |
| Version               | Lip Sync)  |   | Canada F  |                                  |          | , ,                 |          | ,,           |           |      |
| Pixel Rate Range      | 25 ~ 165 MHz (TMDS CLK : 225MHz)   |   | G, 8 ans+   |                                  | 5        | s+, 18              | ans+     |              |           |      |
| Support HDMI Timing   | 77 Timing(CEA-861D)  | Teletext (PAL)                          | Teletext S  | ystem B L                        | evel 1   | , 1.5               |          |              |           |      |
| Pixel Repetition      | 4  | · · · · · · · · · · · · · · · · · · ·   |   |                                  |          |                     |          |              |           |      |
| Video Signal Type     | RGB or YCbCr   | AUDIO (ANALOG) OUT<br>Number of Channel |   | nel (R / L)                      |          |                     |          |              |           |      |
| Sampling Mode         | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2   |   |   | - ( - )                          | 06       | 176 4               | 1021/    | 11-          |           |      |
| Bits per Component    | 8 / 10 @RGB & YCbCr  | Sample Rate                             |   | , 48 , 88.2                      | ,90,     | 176.4               | , 192K   | ΠZ           |           |      |
|                       | RGB/ITU-R BT.601/ITU-R BT.709/xvYCC (IEC61966-                                   | Level Resolution                        | 10mV/   |                                  | No 1     | I)                  |          |              |           |      |
| Color Space           | 2-4) /sYCC 601/Adobe RGB/  | Level Range                             | _   | / (at 600 C                      |          | ,                   |          |              |           |      |
|                       | Adobe YCC 601  | Frequency Range                         |   | 20KHz / 1                        |          |                     | - / DI   | . <b>T</b> ' |           |      |
| HDCP Support          | HDCP V.1.2   | Special Control Mode                    | Ione / S  | weep / M                         | ute / R  | repear              | t / Play | / IIme       |           |      |
| EDID                  | Read / Write / Compare / Edit  | DATA STORAGE DEVIC                      | CE  |                                  |          |                     |          |              |           |      |
| HDMI AUDIO OUTPU      | Т  | Default                                 | 2000 t  | imings + :                       | 2000 p   | oatter              | ns       |              |           |      |
| Sample Rate           | 32,44.1,48,88.2, 96,176.4, 192KHz  | Internal Memory                         | 3000 t  | imings + :                       | 3000 p   | oatter              | ns + 1   | 000 p        | rograms   |      |
| Number of Channel     | 8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)   | External Memory                         | USB H   | ost interfa                      | ace      |                     |          |              |           |      |
| Bits per Sample       | 16 / 24 bit  | OTHERS                                  |   |                                  |          |                     |          |              |           |      |
| Waveform              | Sine wave  | AC Input                                | 1Ø 10   | 0~240V ±                         | 10%      | V <sub>LN,</sub> 47 | ~63H     | z            |           |      |
| Amplitude             | -90.3 to 0.0 dBFS / -138.4 to 0.0 dBFS   | Operation/Storage Tem                   | ip. +5~+4   | 10 deg.C /                       | -20~+    | ⊦60 de              | eg.C     |              |           |      |
| Frequency Range       | 10Hz to 20KHz  | Humidity                                | 20~90   | %                                |          |                     |          |              |           |      |
| Frequency Resolution  | 10Hz / Step  | DIMENSION                               |   |                                  |          |                     |          |              |           |      |
| External Audio Input  | Optical and Coaxial ( S/PDIF )   | 2333-B (H x W x D)                      | 88 x 3  | 50 x 350 n                       | nm / 3   | .46 x <sup>-</sup>  | 13.78    | x 13.7       | 8 inch    |      |
| Special Control Mode  | Tone / Sweep / Mute / Repeat / Play Time   | WEIGHT                                  |   |                                  |          |                     |          |              |           |      |
|                       |  | 2333-B                                  | 4.5 kg  | / 9.9 lbs                        |          |                     |          |              |           |      |
|                       |  |   |   |                                  |          |                     |          |              |           |      |

# Model 2401/2402



| Analog     | 165MHz  |        |
|------------|---------|--------|
| DVI(TMDS)  | 165MHz  | (2402) |
| HDMI V1.3b | 165MHz  | (2402) |
| (TMDS Rate | 225MHz) |        |

#### **KEY FEATURES**

- Analog pixel rate 165MHz
- Analog output with DDC
- 2K x 2K Graphic size
- NTSC / PAL / SECAM signal (Model 2401)
- Closed Caption function (NTSC) (Model 2401)
- V-Chip function (NTSC) (Model 2401)
- Teletext function (PAL) (Model 2401)
- S-Video / CVBS / SCART / RGB Color
- Component / D-Terminal (Model 2401) Bi-level SDTV format (Model 2401)
- Tri-level HDTV Format (Model 2401)
- DVI pixel rate 165MHz (Model 2402)
- HDMI V1.3b (with xvYCC) (Model 2402)
- DVI & HDMI with HDCP output (Model 2402)
- Y, Pb, Pr/Y, Cb, Cr/Y, R-Y, B-Y output (Model 2401)
- PC remote control
- User Define Key
- Built-in variety of video timings & patterns
- Scrolling Pattern
- USB interface
- High Capacity Memory
- ESD protection circuit
- Economy

Along with the rapid development of LCD TV industry, all manufacturers are facing the competition of producing high value added and low cost products; and seeking for a total test solution to meet their needs has become the first priority.

Chroma 2401/2402 Video Pattern Generator with the features described below is specially designed to fit in the requirements and application of production line for LCD-TV manufacturers.

(1). Lightweight Design : The size of Chroma 2401/2402 VPG is close to A4 that is portable and handy for various kinds of spaces or locations.

(2). Exclusive Signals : The mapped international standard signal sources are provided for diverse Video signals requirements such as the requisite TV and monitor that are applied in the configuration of production line planning and test workstation.



(3). Convenient & Rapid Function : The test programs created in advance increase the production efficiency; in addition for the frequently used function keys, users can edit the User KEY to work with compound functions in specific test to save the test time.

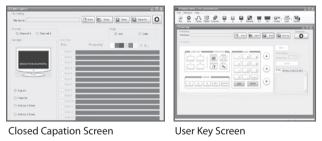
(4). USB Interface : The convenient USB interface can use USB Disk on PC to edit test programs, patterns and even to upload or download the upgrade programs to 2401/2402 to reduce engineer's workload in setup and management.

(5). Large Capacity : It has built in large capacity of storage memory that allows users to swap and save for different UUT without backup or download.(1000 TIMINGS and PATTERNS, 500 PROGRAMS)

(6). Abundant Test Patterns : It includes standard static, dynamic and pattern screens to check the characteristics response, white balance and residual of UUT. Also it can use PC to create the test patterns required.

(7). Extended Control : The default extended function on the front/rear panel is able to add remote control device or output control device for on-line link automatically.

#### Software - Model 2401



#### Software - Model 2402



E-EDID Screen





Model 2402 Rear View

#### **ORDERING INFORMATION**

2401: Video Pattern Generator Analog 165MHz/TV/HDTV 2402: Video Pattern Generator Analog 165MHz/DVI 250MHz/HDMI 165MHz (TMDS Rate 225MHz) A240001: Remote Controller

# Model 2401/2402

| SPECIFICATIONS        |  |                                |                |                  |             |                            |             |                   |            |       |
|-----------------------|--|--------------------------------|----------------|------------------|-------------|----------------------------|-------------|-------------------|------------|-------|
| ANALOG OUTPUT         |  | TV OUTPUT                      | (Model 2       | 401 only)        |             |                            |             |                   |            |       |
| Display Size          | 2048 x 2048                                    | Output Mode                    |                | NTSC             |             | PAL                        |             |                   | SECAM      |       |
| Pixel Rate Range      | 0.5~165MHz                                     | Culture and the Fue            |                | 443 M,J          | BDGHI       | M 60                       | NI          | Nc                | 4 41 /4 25 | N411- |
| Video Level           | R,G,B (75 ohms) 0~1.0V programmable            | Subcarrier Fre                 | equency        | 4.43 3.58        | 4.43        | 3.57 4.43                  | 4.43 3      | 3.58 <sup> </sup> | 4.41/4.25  | MHZ   |
| Sync on Green / Level | 0~0.5V On/Off programmable                     | Subcarrier Sta                 | ability        |                  | ±50 Hz      |                            |             |                   |            | Hz    |
| White Level           | 0~1.2V programmable                            | Composite (RCA), S-Video       |                |                  |             |                            |             |                   |            |       |
| Black Level           | 7.5 IRE / 0 IRE selectable                     | Burst On/Off (NTSC, PAL)       |                |                  |             |                            |             |                   |            |       |
| HORIZONTAL TIMING     |  |                                |                | Contrast p       | rogram      | mable                      |             |                   |            |       |
| Total Pixels          | 64~8192 pixels / 2 pixels resolution           | Video Output                   |                | Brightness       | program     | mmable                     |             |                   |            |       |
| VERTICAL TIMING       |  |                                |                | Saturation       | program     | nmable                     |             |                   |            |       |
|                       | 4~4096 lines (non-interlace) /                 |                                |                | Hue progr        | ammabl      | e                          |             |                   |            |       |
| Total Pixels          | 1 line programmable                            | Closed Caption                 |                | C1, C2, C3,      | C4/T1       |                            |             |                   |            |       |
|                       | 4~2048 lines (interlace) / 1 line programmable | Support (NTSC)                 |                | $C_1, C_2, C_3,$ | C4/11,      | 12, 13, 14                 |             |                   |            |       |
| COMPOSITE SYNC        | H+V, H EXOR V, Equalization & Serration Pulse  |                                |                | MPAA Rati        | ng : G, P   | G, PG-13, R                | , NC-17, X  | (                 |            |       |
| SEPARATE SYNC         | Hs(Xs), Vs                                     |                                |                | FCC Rating       | g : TV-Y, T | V-Y7, TV-G                 | TV-PG, T    | V-14,             | TV-MA      |       |
| VIDEO FORMAT          |  | V-CHIP (NTSC                   | )              | Canada En        | iglish Ra   | ting : C, C8-              | +, G, PG, 1 | 14+, 1            | 8+         |       |
|                       | R, G, B / RS-343A                              |                                |                | Canada Fre       | ench Rat    | ting :                     |             |                   |            |       |
|                       | Y, R-Y, B-Y                                    |                                |                |                  |             | , 16 ans+, 1               |             |                   |            |       |
| Video Output          | Y, Cb, Cr / ITU 601                            | Teletext (PAL)                 |                | Teletext Sy      | stem B      | Level 1 , 1.5              |             |                   |            |       |
|                       | Y, Pb, Pr / ITU 709, RP 177, SMPTE 240M        | SDTV / HDTV                    | FORMAT         | (Model 24        | 01 only     | r)                         |             |                   |            |       |
|                       | DDC II B                                       |                                |                | sive Mode F      |             | Interlace I                | Node Fran   | me                | <u> </u>   |       |
|                       |  | Timing                         |                | Rate (Hz)        |             |                            | e (Hz)      |                   | Standa     | ard   |
| HDMI VIDEO OUTPUT     |  |                                | 59.94          |                  | .001        |                            |             |                   | SMPTE      | 293   |
| Version               | HDMI V1.3b (with xvYCC)                        | 720 x 483                      |                |                  |             | 59.941                     | 59.94       | 12                | ITU 60     | 01    |
| Pixel Rate Range      | 25 ~ 165 MHz (TMDS CLK : 225MHz)               |                                |                |                  |             | 59.941                     | 59.94       | 12                | SMPTE 1    | 70M   |
| Support HDMI Timing   | 77 Timing(CEA-861D)                            | 720 x 576                      | 50P            | 5                | 0           |                            |             |                   | ITU 13     | 82    |
| Pixel Repetition      | 4  | 720 × 570                      |                |                  |             | 501                        | 25          |                   | ITU 60     | 01    |
| Video Signal Type     | RGB or YCbCr                                   |                                | 60P            | 6                | 0           | 601                        | 30          |                   | SMPTE      | 274   |
| Sampling Mode         | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2               |                                | 59.94          | P 60/1           | .001        | 59.94I                     | 30/1.0      | 01                | SMPTE      | 274   |
| Bits per Component    | 8 bits (1024 color)                            |                                | 50P            | 5                | 0           | 501                        | 25          |                   | SMPTE      | 274   |
| Color Space           | RGB / ITU-R BT.601 / ITU-R BT.709 / xvYCC      | 1920 x 1080                    | 30P            | 3                | 0           |                            |             |                   | SMPTE      | 274   |
| HDCP Support          | HDCP V.1.2                                     | 1920 x 1080                    | 29.97          | P 30/1           | .001        |                            |             |                   | SMPTE      | 274   |
| EDID                  | Read / Write / Compare / Edit                  |                                | 25P            | 2                | 5           |                            |             |                   | SMPTE      | 274   |
| HDMI AUDIO OUTPU      | Г  |                                | 24P            | 2                | 4           |                            |             |                   | SMPTE      | 274   |
| Sample Rate           | 32,44.1,48,88.2, 96,176.4, 192KHz              |                                | 23.98          | P 24/1           | .001        |                            |             |                   | SMPTE      | 274   |
| Number of Channel     | 8 Channel (FL/FR/RL/RR/FC/LFE/RLC/RRC)         | 1920 x 1035                    |                |                  |             | 601                        | 30          |                   | SMPTE      | 240   |
| Bits per Sample       | 16   | 1920 X 1055                    |                |                  |             | 59.94l                     | 30/1.0      | 01                | SMPTE      | 240   |
| Waveform              | Sine wave                                      |                                | 60P            | 6                | 0           |                            |             |                   | SMPTE      | 296   |
| Amplitude             | -90.3 to 0.0 dBFS                              | 1280 x 720                     | 59.94          | P 60/1           | .001        |                            |             |                   | SMPTE      | 296   |
| Frequency Range       | 10Hz to 20KHz                                  |                                | 50P            | 5                | 0           |                            |             |                   | SMPTE      | 296   |
| Frequency Resolution  | 10Hz / Step                                    |                                |                | DUT              |             |                            |             |                   |            |       |
| External Audio Input  | Optical and Coaxial ( S/PDIF )                 |                                |                |                  |             |                            |             |                   |            |       |
| Special Control Mode  | Tone / Sweep / Mute / Repeat / Play Time       | Frequency Ra                   | nge            | 50Hz~20          |             |                            |             |                   |            |       |
|                       |  | Waveform                       |                | Sine way         |             |                            |             |                   |            |       |
| DVI (TMDS) OUTPUT     | 1 · · · · · · · · · · · · · · · · · · ·        | Number of Ch                   | nannel         | 2 Channe         |             |                            |             |                   |            |       |
| Pixel Rate Range      | 25< 1 link ≤ 165MHz (256 color)                | Level Range                    | -1.0.4         |                  |             | Ohms Load                  |             |                   |            |       |
| E-EDID                | Read / Write / Compare / Edit                  | Special Contr                  | ol Mode        | Ione / Sv        | veep / N    | lute / Repe                | at / Play T | ime               |            |       |
| HDCP Support          | HDCP V1.0                                      | DATA STORA                     | <b>GE DEVI</b> | CE               |             |                            |             |                   |            |       |
| Compliant             | DVI 1.0 specification                          | Default                        |                | 1                | mings +     | 1000 patte                 | rns         |                   |            |       |
| Video Signal Type     | RGB  | Internal Mem                   | ory            |                  | -           | 1000 patte                 |             | ) proc            | grams      |       |
| Sampling Mode         | 4:4:4  | External Mem                   | ,              |                  | ost interf  | •                          | 2.50        | 1                 | ,          |       |
|                       |  | OTHERS                         | ,              | 1000.10          |             |                            |             |                   |            |       |
|                       |  | AC Input                       |                | 1Ø 100           | ~240V -     | ±10% Vln 4                 | 7~63Hz      |                   |            |       |
|                       |  | Operation/Sto                  | orage Tem      |                  |             | / -20~+60 c                |             |                   |            |       |
|                       |  | Humidity                       | .uge ien       | 20~90            | <u> </u>    | , 20 1000                  | 9           |                   |            |       |
|                       |  | DIMENSION                      |                | 20190            | ,0          |                            |             |                   |            |       |
|                       |  | 2401 (H x W x                  | (ח             | 88 v 21          | 0 x 2/0     | mm / 3.46 x                | 126 × 0     | 45 in             | ch         |       |
|                       |  | 2401 (H x W x<br>2402 (H x W x |                |                  |             | mm / 3.46 x<br>mm / 3.46 x |             |                   |            |       |
|                       |  | WEIGHT                         | 0              | 00 X 32          | 0 ^ 240     |                            | 12.0 X 9.4  | -1.) [1](         |            |       |
|                       |  | 2401                           |                | 3240             | 7.05 lbs    |                            |             |                   |            |       |
|                       |  |                                |                |                  |             |                            |             |                   |            |       |
|                       |  | 2402                           |                | 3.1 Kg /         | 6.83 lbs    | >                          |             |                   |            |       |

Video & Color

Flat Panel LED/ Display Lighting

PXITest & General Manufacturing Turnkey Test & Measurement Purpose Execution System Automation

# Model 2403



#### **KEY FEATURES**

- Modular design
- HDMI 2.0 Signal module (Option)
   Comply with HDMI 2.0 standard
  - 4K x 2K 60/50Hz - Pixel rate support up to 600MHz
  - (6Gbps TMDS rate) - RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0
  - HDCP 1.4 / 2.2
  - CEA-861-F timing
  - 24 / 30 / 36 color depth
  - ARC (Audio Return Channel)
  - sYCC601 / Adobe RGB / Adobe
  - YCC601 / xvYCC / ITU-R BT.2020
- DisplayPort Signal module (Option)
   Comply with DisplayPort 1.2a standard
   4K x 2K 60/50Hz
  - Pixel rate support up to 600MHz
  - 1.62 / 2.7 / 5.4Gbps per lane
  - 1 / 2 / 4 Link
  - 2 Channel (L-PCM)
- EDID Read / Write / Compare / Analyze
- Scrolling function
- Built in China high-definition / 3D /
- 4K test pattern
- User Define Key(32 Key max)
- One-touch function keys
- Front panel USB and control interface
- Graphical software user interface
- ESD protection circuit

Chroma 2403 programmable video pattern generator is the perfect instrument for digital video signal interface testing. It provides users with a high performance-low cost test solution. The built-in high speed graphic engine is able to provide standard test signals and patterns for display devices with various resolutions to meet the requirements of multimedia display industries today and in the future for R&D and test applications.

The Video Pattern Generator supports the up-todate high resolution multimedia digital audio and video transmission interface HDMI and DisplayPort specification with the following features:

#### Supports 4K x 2K 60Hz

2403 is built-in with a high speed graphic engine. The output signal can reach up to 600MHz. It supports UHD(Ultra High Definition) 4K x 2K@60Hz ultra high resolution displays testing.

#### **Modulized Signal Interface Design**

The modulized design output interface has 2 signal module terminals for users to choose from based on their testing needs. The modules support multi-signal terminal synchronized output capability which meet the multi-input terminals displays testing.

#### HDMI 2.0 Testing Function (HDMI module)

Supports HDMI 2.0 standard 6Gbps TMDS signal output (TMDS rate) and HDCP1.4 / 2.2 Supports 24 / 30 / 36 bits color depth (RGB / YCbCr) and HDMI 2.0 standard YCbCr 4:2:0 sampling format output and at the same time provides high resolution color standard ITU-R BT2020 and HDCP 2.2 / ARC (Audio Return Channel) / CEC / EDID testing functions.

#### 

#### DisplayPort 1.2a Testing Function (DP module)

Supports DisplayPort 1.2 standard HBR2(High Bit Rate 2, 5.4Gbps) bandwidth transmission up to 4K x 2K 60Hz . Also supports audio transmission and 3D/EDID testing functions.

#### **Hot Key Function**

Default or user-defined testing program can help to increase manufacturing efficiency. Chroma 2403 is built-in with abundant timing and pattern, including standard static, motion and scrolling pattern. It supports the testing of the displays' performance.The modulized signal interface design can be flexibly choose from based on testing application. The VPG Master supports programmable timing, pattern and program. Its user-friendly interface is suitable for R&D, production and QA verification.



#### ORDERING INFORMATION

2403: Video Pattern Generator A240001 : Remote Controller A240301 : HDMI signal module A240302 : DisplayPort signal module

| 2403 Main Frame         |  |  |  |
|-------------------------|--|--|--|
| Display Size            | 4096 x 2160  |  |  |
| Horizontal Timing       |  |  |  |
| Total pixel             | 32~8192 pixels / 1 pixels resolution               |  |  |
| Vertical Timing         |  |  |  |
| Total line              | 4~4096 lines (non-interlace) / 1 line programmable |  |  |
| lotal line              | 4~2048 lines (interlace) / 1 line programmable     |  |  |
|                         |  |  |  |
| Data storage device     |  |  |  |
| Default                 | 1000 timings + 1000 patterns                       |  |  |
| Delault                 | (Depend on signal module)                          |  |  |
| Internal Memory         | 1000 timings + 1000 patterns + 500 programs        |  |  |
| External Memory         | USB Host interface                                 |  |  |
| Other                   |  |  |  |
| AC Input                | 100-240V , 50~60Hz , 1A Maximum                    |  |  |
| Operation/Storage Temp. | +5~+40 deg.C / -20~+60 deg.C                       |  |  |
| Humidity                | 20~90 %  |  |  |

320x240mm / 3.46x12.6x9.45inch

3.1kg / 6.83 lbs



2403 (HxWxD)

Weight

#### A240301 : HDMI signal module

| HDMI Signal Module A240301  |   |
|---|---|
| Version   | HDMI 2.0 x 4ch (3D / ARC / CEC)   |
| Pixel Rate Range  | 25 ~ 600 MHz (TMDS rate 600 MHz)  |
| Support HDMI Timing   | 125 Timing (CEA-861F)   |
| Sampling Mode   | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0   |
| Color depth   | 24 / 30 / 36 bits per pixel   |
| Color Space   | RGB / ITU-R BT.601 / ITU-R BT.709 / xvYcc / sYcc601 / Adobe RGB /   |
| Color space   | Adobe sYcc601 / ITU-R BT.2020   |
| EDID  | Read / Write / Compare / Edit / Analysis  |
| HDCP  | HDCP 2.2 / 1.4 (Automatic selection)  |
| Audio   | 8 Channel (16 / 24 bit)   |
| upport HDMI Timing<br>ampling Mode<br>Color depth<br>Color Space<br>DID<br>HDCP | 125 Timing (CEA-861F)<br>RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2 or 4:2:0<br>24 / 30 / 36 bits per pixel<br>RGB / ITU-R BT.601 / ITU-R BT.709 / xvYcc / sYcc601 / Adobe RGB /<br>Adobe sYcc601 / ITU-R BT.2020<br>Read / Write / Compare / Edit / Analysis<br>HDCP 2.2 / 1.4 (Automatic selection) |

#### A240302 : DisplayPort signal module

| DisplayPort Signal Module A240302 |                                    |  |  |  |  |
|-----------------------------------|------------------------------------|--|--|--|--|
| Version                           | DISPLAYPORT 1.2a x 2ch             |  |  |  |  |
| Pixel Rate Range                  | 25 ~ 600 MHz                       |  |  |  |  |
| Main Link Data Rate               | 1.62 / 2.7 / 5.4Gbps per lane      |  |  |  |  |
| Lane Count                        | 1 / 2 / 4 Lanes                    |  |  |  |  |
| Sampling Mode                     | RGB 4:4:4 / YCbCr 4:4:4 or 4:2:2   |  |  |  |  |
| Color depth                       | 6 / 8 / 10 / 12 bits per component |  |  |  |  |
| HDCP                              | HDCP 1.3                           |  |  |  |  |
| Audio                             | 2 Channel (16 / 24 bit)            |  |  |  |  |

# **HDMI** Distributor



#### **KEY FEATURES**

- One HDMI Source to connect up to 4 displays
- Support Full-HD 1080P resolution
- Compliant with HDMI V1.3
- Compliant HDCP V1.2
- HDCP Key sets allows each output independently
- Control by Smart I/O interface
- DDCIIB Plug & Play Function
- Distributor / Multiplexer Mode selection
- ESD protection
- Low cost

Chroma A222907 HDMI Distributor has HDMI signal output interface that can work with the Video Pattern Generator of Chroma to perform extended tests for HDMI signals.

This distributor has 1-In/4-Out HDMI ports that comply with the HDMI 1.3 standards to support the tests for the newest HDMI 1.3 functions.

In addition, Chroma A222907 is equipped with Distributor and Multiplexer modes that each output port can set the HDCP/EDID to be enabled or disabled concurrently or separately to facilitate the user's tests greatly.

Supporting most of CEC features which are used to communicate with HDMI network. Chroma A222907 can also output 4 CEC commands simultaneously to reduce user's test time. Depends on the showing response message from A222907 on the screen, users can verify the CEC function immediately.

In order to comply with the multi-port input design of digital FPD industry, this distributor adopts external connection with handy compact size to ease the use in variety of production lines and R&D labs.

Chroma A222907 has dynamic message function which can display HDCP key data and EDID content of TV and help users to check the data correctness.

This distributor is applicable for the Signal Generators with Smart I/O manufactured by Chroma to extend and expand the HDMI signals for various applications such as the long distance transmission of serial production line or parallel usage in demonstration room and etc. In the meantime, its special output design can be used to protect the back-end of a signal generator.

#### HDMI Distributor Application 1 for single unit

One A222907 has 4 outputs to test all of the HDMI ports (maximum 4) on the display directly.

### HDMI Distributor Application 2 for single unit

One A222907 can output signals to 4 displays to test the EDID & HDCP functions and interpret the data separately or concurrently.

### HDMI Distributor Application 3 for multiple units

Multiple A222907 can be connected in series to test even more displays for the seriesparallel application of multiple devices.

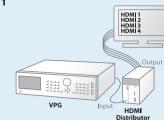
### HDMI Distributor Application 4 for CEC feature

One A222907 can output features to 4 different displays to test CEC function of TV independently.

### HDMI DISTRIBUTOR APPLICATIONS

Model A222907

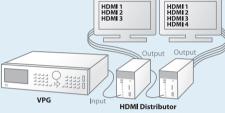
#### Application 1



#### **Application 2**



#### Application 3



#### SPECIFICATIONS

| Signal FormatTMDS signal LinkVideo SignalPixel Rate25 to 165 MHz (TMDS CLK : 225MHz )Audio SignalSampling Frequency32 to 192 KHzAudio SignalSampling Frequency32 to 192 KHzBumber of Channels8 ChannelESD / Surge protect (IEC 6100-4-2 Level 4 Regulation)Contact 8KV / Air 15 KVHDMI / HDCPVersion 1.3aHDMI VersionVersion 1.2DDCDDC28 compliantE-EDIDVersion 1.3ConcectorVersion 1.3Formectorin 22xx / 23xx SeriesInput Signal Sourcefequipped with Smart I/O portfrom Chroma VPG Seriesin 22xx / 23xx SeriesHDMI 19 Pin x5samst I/OSmart I/O3 ln 3 Out x1CECOne touch playSupport FeatureSystem standbySupport FeatureOsD DisplaySupport FeatureControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtterVersionUser InterfaceSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureQorageStorage-20~-60 deg.CHumidity-20~-60 deg.CHumiditySat 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>7.50 y 1.65lbs   | Output                       |                                 |                                  |  |  |  |  |
|--|------------------------------|---------------------------------|----------------------------------|--|--|--|--|
| Video Signal         Pixel Rate         25 to 165 MHz (TMDS CLK : 225MHz)           Video Signal         Color Space         RGB, ITU-601, ITU-709, xvYcc           Audio Signal         Sampling Frequency         32 to 192 KHz           Number of Channels         8 Channel           ESD / Surge protect (IEC 61000-4-2 Level 4 Regulation)         Contact 8KV / Air 15 KV           HDMI / HDCP         Version 1.3a           HDCP Version         Version 1.3a           DDC         DDC2B compliant           E-EDID         Version 1.3           Connector         Equipped with Smart I/O port           Input Signal Source         Equipped with Smart I/O port           from Chroma VPG Series         In 20 to x/ 23xx Series           HDMI 19 Pin x5         Smart I/O           Smart I/O         3 In 3 Out x1           CEC         One touch play           System standby         OSD Display           Set OSD Name         Give power status           Audio control         Audio control           Tempet Mode         Control by VPG or Manual           Monau Mode         Output ON / OFF, or selection           Other         User Interface         Smart I/O           DC Input         Operation         45~40 deg.C <tr< td=""><td>•</td><td></td><td>TMDS signal Link</td></tr<>   | •                            |                                 | TMDS signal Link                 |  |  |  |  |
| Video Signal         Color Space         RGB, ITU-601, ITU-709, xvYcc           Audio Signal         Sampling Frequency         32 to 192 KHz           Audio Signal         Sampling Frequency         32 to 192 KHz           ESD / Surge protect (IEC 61000-4-2 Level 4 Regulation)         Contact 8KV / Air 15 KV           HDMI / HDCP         Version 1.3a           HDCP Version         Version 1.2           DDC         DDC28 compliant           E-EDID         Version 3           Connector         Input Signal Source           Input Signal Source         Equipped with Smart I/O port           from Chroma VPG Series         Equipped with Smart I/O port           from Chroma VPG Series         In 22xx / 23xx Series           HDMI         HDM 19 Pin x5           Smart I/O         3 In 3 Out x1           CEC         One touch play           System standby         OSD Display           Support Feature         System standby           Support Feature         Control by VPG or Manual           Maual Mode         Output ON / OFF, or selection           Manual Mode         Output ON / OFF, or selection           OLtrue Interface         Smart I/O           DC Input         9V/2A (With Chroma adapter only)           Verst   |                              | Pixel Rate                      |                                  |  |  |  |  |
| Audio SignalSampling Frequency<br>Number of Channels32 to 192 KHzESD / Surge protect (IEC 61000-4-2 Level 4 Regulation)Contact 8KV / Air 15 KVHDMI / HDCPVersion 1.3aHDMI / VersionVersion 1.3aHDMI / VersionVersion 1.2DDCDDC2B compliantE-EDIDVersion1.3ConnectorInput Signal SourceEquipped with Smart I/O portfrom Chroma VPG SeriesEquipped with Smart I/O portin 22xx / 23xx Seriesin 22xx / 23xx SeriesHDMIHDMI 19 Pin x5Smart I/O3 ln 3 Out x1CECOne touch play<br>System standbySupport FeatureOne touch play<br>System standbySupport FeatureControl ModeKer Sign 2000 Manual<br>Output Nov PG or ManualManual ModeOutput Nov PG or ManualManual ModeOperationOtherSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureOperationMattict20% Odg.CHumidity20% Odg.CDIMENSION & WEIGHT88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | Video Signal                 | Color Space                     |                                  |  |  |  |  |
| Audio Signal         Number of Channels         8 Channel           ESD / Surge protect (IEC 61000-4-2 Level 4 Regulation)         Contact 8KV / Air 15 KV           HDMI / HDCP         Version 1.3a           HDMI Version         Version 1.2           HDM Version         Version 1.2           DDC         DDC28 compliant           E-EDID         Version1.3           Connector           Input Signal Source         Equipped with Smart I/O port           from Chroma VPG Series         In 22xx / 23xx Series           HDMI 19 Pin x5         Smart I/O           Signal Source           from Chroma VPG Series         In 3 Out x1           Cec           Smart I/O         In 3 Out x1           Cec           Support Feature         One touch play           System standby         OSD Display           Support Feature         Control by VPG or Manual           Manual Mode         Control by VPG or Manual           Manual Mode         Output ON / OFF, or selection           Other         User Interface         Smart I/O           DC Input         9V/2A (With Chroma adapter only)           Temperature         Operation         +5~+40 deg.C   |                              |                                 |                                  |  |  |  |  |
| HDMI / HDCP         HDMI Version       Version 1.3a         HDCP Version       Version 1.2         DDC       DDC28 compliant         E-EDID       Version 1.3         Connector         Input Signal Source       Equipped with Smart I/O port         from Chroma VPG Series       in 22xx / 23xx Series         HDMI       HDMI 19 Pin x5         Smart I/O       3 In 3 Out x1         CEC       One touch play         System standby       System standby         Support Feature       OsD Display         Set OSD Name       Give power status         Audio control       Manual Mode         Output ON / OFF, or selection       Other         User Interface       Smart I/O         DC Input       9V/2A (With Chroma adapter only)         Temperature       Operation         Storage       -20~+60 deg.C         Humidity       Z0~90%         DIMENSION & WEIGHT       88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch         A222907 (H x W x D)       88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch  | Audio Signal                 |                                 | 8 Channel                        |  |  |  |  |
| HDMI / HDCP         HDMI Version       Version 1.3a         HDCP Version       Version 1.2         DDC       DDC28 compliant         E-EDID       Version 1.3         Connector         Input Signal Source       Equipped with Smart I/O port         from Chroma VPG Series       in 22xx / 23xx Series         HDMI       HDMI 19 Pin x5         Smart I/O       3 In 3 Out x1         CEC       One touch play         System standby       System standby         Support Feature       OsD Display         Set OSD Name       Give power status         Audio control       Manual Mode         Output ON / OFF, or selection       Other         User Interface       Smart I/O         DC Input       9V/2A (With Chroma adapter only)         Temperature       Operation         Storage       -20~+60 deg.C         Humidity       Z0~90%         DIMENSION & WEIGHT       88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch         A222907 (H x W x D)       88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch  | ESD / Surge protect ( IE     | C 61000-4-2 Level 4 Regulation) | Contact 8KV / Air 15 KV          |  |  |  |  |
| HDCP Version 1.2<br>DDC Version 1.2<br>DDC2 Compliant<br>E-EDID Version 1.3<br>Connector<br>Input Signal Source from Chroma VPG Series Equipped with Smart I/O port<br>from Chroma VPG Series Equipped with Smart I/O port<br>in 22xx / 23xx Series<br>HDMI 9 Pin x5<br>Smart I/O 3 In 3 Out x1<br>CEC One touch play<br>System standby<br>ODE Display<br>Support Feature Give power status<br>Audio control<br>Front Control Mode<br>Front Control Mode<br>Front Control Mode<br>Manual Mode Output ON / OFF, or selection<br>Other<br>User Interface Smart I/O<br>DC Input 9V/2A (With Chroma adapter only)<br>CI power status<br>Aution Control Singe 20~90%<br>DIMENSION & WEIGHT<br>A222907 (H x W x D) Singe Singe 20~90%<br>Sa x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | 51                           |                                 |                                  |  |  |  |  |
| DDCDDC2B compliantE-EDIDVersion1.3ConnectorInput Signal Source<br>from Chroma VPG SeriesEquipped with Smart I/O port<br>in 22xx / 23xx SeriesHDMIHDMI 19 Pin x5Smart I/O3 In 3 Out x1CECOne touch play<br>System standby<br>OSD DisplaySupport FeatureFont Control ModeFont Control ModeFont Control ModeSupport FeatureSupport Set Colspan=Support Set   | HDMI Version                 |                                 | Version 1.3a                     |  |  |  |  |
| Defense of the second | HDCP Version                 |                                 | Version 1.2                      |  |  |  |  |
| Connector       Equipped with Smart I/O port         Input Signal Source       in 22xx / 23xx Series         HDMI       HDMI 19 Pin x5         Smart I/O       3 ln 3 Out x1         CEC       One touch play         Support Feature       One touch play         Bett OSD Name       OsD Display         Give power status       Audio control         Manual Mode       Output ON / OFF, or selection         Other       User Interface       Smart I/O         DC Input       9V/2A (With Chroma adapter only)  | DDC                          |                                 | DDC2B compliant                  |  |  |  |  |
| Input Signal Source<br>from Chroma VPG SeriesEquipped with Smart I/O port<br>in 22xx / 23xx SeriesHDMIHDMI 19 Pin x5Smart I/O3 In 3 Out x1CECOne touch play<br>System standbyOSD DisplaySupport FeatureOne touch play<br>System standbyOSD DisplaySupport FeatureOSD Display<br>Set OSD Name<br>Give power status<br>Audio controlPout Control ModeOutput ON / OFF, or selectionOutput ON / OFF, or selectionManual ModeOutput ON / OFF, or selectionOutput ON / OPER colspan="2">Operation + 5~+40 deg.CItemperatureOperation + 5~+40 deg.CItemperatureOSN ManuelON # 00~90% <tr <td="">DIMENSION &amp; WEIG</tr>  | E-EDID                       |                                 | Version1.3                       |  |  |  |  |
|  |                              |                                 |                                  |  |  |  |  |
| from Chroma VPG Seriesin 22xx / 23xx SeriesHDMIHDMI 19 Pin x5Smart I/O3 ln 3 Out x1CECOne touch play<br>System standby<br>OSD DisplaySupport FeatureOne touch play<br>System standby<br>OSD DisplayFront Control ModeGive power status<br>Audio controlFront Control ModeRemote ModeControl by VPG or Manual<br>Output ON / OFF, or selectionOne tureVer InterfaceSmart I/O<br>Output ON / OFF, or selectionOtherUser InterfaceSmart I/O<br>OUtput ON / OFF, or selectionDC Input9V/2A (With Chroma adapter only)<br>+ 5~+40 deg.CTemperatureOperation<br>Storage-20~+60 deg.CHumidity20~90%DIMENSION & WEIGHT88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs   | Connector                    |                                 |                                  |  |  |  |  |
| HDMIHDMI 19 Pin x5Smart I/O3 In 3 Out x1CECOne touch playSupport FeatureOne touch playSupport FeatureSystem standbySupport FeatureOSD DisplaySet OSD NameGive power statusAudio controlAudio controlFront Control ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceSmart I/ODC InputOperation+   | Input Signal Source          |                                 | Equipped with Smart I/O port     |  |  |  |  |
| Smart I/O3 In 3 Out x1CECOne touch playSupport FeatureOne touch playSupport FeatureOne touch playSupport FeatureSystem standbySet OSD NameGive power statusGive power statusAudio controlFront Control ModeRemote ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceUser InterfaceSmart I/ODC InputSystem standbyTemperatureOperationStorage-20~460 deg.CHumidity20~90%DIMENSION & WEIGHT88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs   | from Chroma VPG Serie        | es                              | in 22xx / 23xx Series            |  |  |  |  |
| CEC G G G G G G G G G G G G G G G G G G  | HDMI                         |                                 | HDMI 19 Pin x5                   |  |  |  |  |
| Support FeatureOne touch play<br>System standby<br>OSD Display<br>Set OSD Name<br>Give power status<br>Audio controlFront Control ModeFront Control ModeControl by VPG or ManualManual ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceSmart I/ODeparationOperation+5~+40 deg.CTemperatureOperation<br>StorageOMENSION & WEIGHT20~90%DIMENSION & WEIGHTA222907 (H x W x D)88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | Smart I/O                    |                                 | 3 ln 3 Out x1                    |  |  |  |  |
| Support Feature       System standby         OSD Display         Set OSD Name         Give power status         Audio control         Front Control Mode         Remote Mode         Manual Mode         Ontrol by VPG or Manual         Manual Mode         Output ON / OFF, or selection         Other         User Interface         DC Input         Pemperature         Operation         Storage         -20~+60 deg.C         Humidity         DIMENSION & WEIGHT         A222907 (H x W x D)   | CEC                          |                                 |                                  |  |  |  |  |
| Support Feature       OSD Display         Set OSD Name       Give power status         Audio control       Audio control         Front Control Mode         Control by VPG or Manual         Manual Mode       Control by VPG or Manual         Manual Mode       Output ON / OFF, or selection         Other         User Interface       Smart I/O         DC Input       9V/2A (With Chroma adapter only)         Temperature       Operation       +5~+40 deg.C         Humidity       20~90%         DIMENSION & WEIGHT         A222907 (H x W x D)       88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch 750g / 1.65lbs   |                              |                                 | One touch play                   |  |  |  |  |
| Support FeatureSet OSD Name<br>Give power status<br>Audio controlFront Control ModeFront Control ModeControl by VPG or ManualManual ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceSmart I/ODC InputTemperatureOperation $+5 \sim +40$ deg.CStorage $-20 \sim +60$ deg.CHumidity $20 \sim 90\%$ DIMENSION & WEIGHTA222907 (H x W x D) $88 \times 45 \times 200$ mm / $3.46 \times 1.77 \times 7.87$ inch<br>$750g$ / $1.65$ lbs  |                              |                                 | System standby                   |  |  |  |  |
| Set OSD NameGive power status<br>Audio controlFront Control ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherOutput ON / OFF, or selectionUser InterfaceSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureOperationStorage-20~+40 deg.CHumidity20~90%DIMENSION & WEIGHTA222907 (H x W x D)88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs   | Support Fosturo              |                                 | OSD Display                      |  |  |  |  |
| Audio controlAudio controlAudio controlManual ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureOperation+5~+40 deg.CStorage-20~+60 deg.CHumidity20~90%DIMENSION & WEIGHTA222907 (H x W x D) $88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch 750g / 1.65lbs$  | Support reature              |                                 | Set OSD Name                     |  |  |  |  |
| Front Control ModeRemote ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceUser InterfaceSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureOperationStorage-20~+60 deg.CHumidity20~90%DIMENSION & WEIGHTA222907 (H x W x D)Remote Mode88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  |                              |                                 | Give power status                |  |  |  |  |
| Remote ModeControl by VPG or ManualManual ModeOutput ON / OFF, or selectionOtherUser InterfaceSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureOperation $+5\sim+40$ deg.CHumidity $20\sim+60$ deg.CHumidity $20\sim90\%$ DIMENSION & WEIGHTA222907 (H x W x D) $88 \times 45 \times 200$ mm / $3.46 \times 1.77 \times 7.87$ inch<br>$750g$ / $1.65$ lbs   |                              |                                 | Audio control                    |  |  |  |  |
| Manual ModeControl of MarketManual ModeOutput ON / OFF, or selectionOtherUser InterfaceUser InterfaceSmart I/ODC Input9V/2A (With Chroma adapter only)TemperatureOperation $from degled+5~+40 degledHumidity20~+60 degledDIMENSION & WEIGHT20~90%A222907 (H x W x D)88 \times 45 \times 200 \text{ mm } / 3.46 \times 1.77 \times 7.87 \text{ inch } 750g / 1.65lbs$   | Front Control Mode           |                                 |                                  |  |  |  |  |
| Other         Smart I/O           User Interface         Smart I/O           DC Input         9V/2A (With Chroma adapter only)           Temperature         Operation         +5~+40 deg.C           Storage         -20~+60 deg.C           Humidity         20~90%           DIMENSION & WEIGHT         88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | Remote Mode                  |                                 |                                  |  |  |  |  |
| User Interface         Smart I/O           User Interface         9V/2A (With Chroma adapter only)           DC Input         9V/2A (With Chroma adapter only)           Temperature         Operation           Storage         -20~+60 deg.C           Humidity         20~90%           DIMENSION & WEIGHT         88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch 750g / 1.65lbs  | Manual Mode                  |                                 | Output ON / OFF, or selection    |  |  |  |  |
| DC Input         9V/2A (With Chroma adapter only)           Temperature         Operation         +5~+40 deg.C           Storage         -20~+60 deg.C           Humidity         20~90%           DIMENSION & WEIGHT           A222907 (H x W x D)         88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs   | Other                        |                                 |                                  |  |  |  |  |
| Operation         +5~+40 deg.C           Storage         -20~+60 deg.C           Humidity         20~90%           DIMENSION & WEIGHT           A222907 (H x W x D)         \$8 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | User Interface               |                                 |                                  |  |  |  |  |
| Temperature         Storage         -20~+60 deg.C           Humidity         20~90%           DIMENSION & WEIGHT         88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | DC Input                     |                                 | 9V/2A (With Chroma adapter only) |  |  |  |  |
| Storage         -20~+60 deg.C           Humidity         20~90%           DIMENSION & WEIGHT         88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch 750g / 1.65lbs   | Tomporaturo                  | Operation                       | +5~+40 deg.C                     |  |  |  |  |
| DIMENSION & WEIGHT           A222907 (H x W x D)         88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | Temperature                  | Storage                         | -20~+60 deg.C                    |  |  |  |  |
| A222907 (H x W x D)<br>88 x 45 x 200 mm / 3.46 x 1.77 x 7.87 inch<br>750g / 1.65lbs  | Humidity                     |                                 | 20~90%                           |  |  |  |  |
| A222907 (H x W x D) 750g / 1.65lbs   | <b>DIMENSION &amp; WEIGH</b> | IT                              |                                  |  |  |  |  |
| 750g / 1.65lbs   | A222907 (H x W x D)          |                                 |                                  |  |  |  |  |
|  |                              |                                 | 5                                |  |  |  |  |

urnkey Test &

### **MHL Module**

# Model A222908



#### **KEY FEATURES**

- Compliant with MHL 2.0 standard
- MHL pixel rate support up to 150MHz
  - 1080p 60Hz
  - 3D format
- Cbus (RCP) test function
- Vbus test function
- Active load 500/900mA
- Voltage & current measurement
- EDID / HDCP linking test
- Test result on screen display
- 8 channel audio
- 2 MHL ports output
- 2 HDMI ports output
- ESD protection
- High cost-performance value
- Compliant with chroma 22/23/24 series

Chroma A222908 MHL module is a test equipment that supports the Mobile High-definition Link (MHL<sup>™</sup>) signal, which is able to work with the Chroma Video Pattern Generator for extending MHL signal output, in order to provide the solutions for display industry.

The A222908 supports the specification of MHL v2.0 which can expand 1 set of HDMI signal to 2 sets of MHL signal and HDMI signal. Its main features are as the following.

#### **Standard MHL Signal Output**

It provides two sets of standard MHL signal output that supports up to 1080P 60Hz (PackedPixel mode) and 8-channel audio signal transmission.

#### **3D standard Format Signal Output**

Supporting MHL defined 3D format (Frame packing / Top-and-Bottom / Left-Right) that works with the 3D Video Pattern Generator of Chroma to output 3D test pattern for 3D display application.

### Multiple Signal Port Output function concurrently

The A222908 is equipped with signal output function of 2 sets of MHL and 2 sets of HDMI simultaneously that comply with multiple input port display test application nowadays.

#### **HDCP/EDID Test Function**

Working with the Video Pattern Generator of Chroma that can display HDCP and EDID test results on the test pattern for getting quick testing function.

#### **Cbus Test Function**

MHL specification provides Remote Control Protocol (RCP) to support RCP display for users control smart phone via the remote controller to select the film to be viewed and perform control functions of play, fast forward or rewind. Chroma A222908 works with the Video Pattern Generator of Chroma to provide RCP detection function and fast judge remote control function of MHL display.

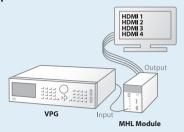
#### **Vbus Measurement Function**

Working with the Video Pattern Generator of Chroma that can provide MHL Vbus voltage measurement function. Fast judge Vbus function by reading the measured voltage and current value on the test pattern.

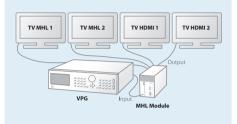
In the aspect of operation, the A222908 provides users simple and rapid setting management, easy operation interface and complete test function via Chroma control editing software (VPGMaster, need work with the Video Pattern Generator of Chroma). It is applicable for research and development, production test and quality verification application of all MHL related video industry.

#### MHL MODULE APPLICATIONS

#### Application 1



#### **Application 2**



| EC |  |  |  |
|----|--|--|--|
|    |  |  |  |
|    |  |  |  |

| MHL Video Output               |   |
|--------------------------------|---|
| Version                        | MHL v2.0  |
| Pixel rate                     | 25 ~ 150MHz                                     |
| Color space                    | RGB / YCbCr                                     |
| HDMI Video Output              |   |
| Version                        | HDMI v1.4                                       |
| Pixel rate                     | 25 ~ 165MHz                                     |
| Color space                    | RGB / YCbCr                                     |
| MHL / HDMI Audio Output        |   |
| Sample Rate                    | 32, 44.1, 48, 88.2, 96, 176.4, 192KHz           |
| Number of Channel              | 8 Channel                                       |
| MHL Function                   |   |
| Vbus test                      | Voltage / Current                               |
| Message Display                | Cbus (RCP) / Device Capability / HDCP / EDID    |
| Connector                      |   |
| MHL                            | Micro USB 5 pin x 2                             |
| HDMI                           | HDMI TYPE A 19 Pin x3 ( Input x 1 / Output x 2) |
| SMART I/O                      | Smart I/O x 1                                   |
| Others                         |   |
| DC Input                       | 12V / 2.5A (With Chroma adapter only)           |
| Temperature(Operation/Storage) | +5~+40 deg.C / -20~+60 deg.C                    |
| Humidity                       | 20 ~ 90%  |
| Dimension & Weight             |   |
| A222908 (HxWxD)                | 88x45x200mm / 3.46x1.77x7.87 inch               |
|                                | 750g / 1.65lbs                                  |

# **SDI Module**

# Model A222915



#### **KEY FEATURES**

- Convert HDMI signal to SDI signal output
- Support 48K Audio output
- SDI Output x 2
- SYNC Output x 1
- Comply with SDI Standard (SMPTE) - SD-SDI : SMPTE-259M
  - HD-SDI : SMPTE-274M / 296M
  - 3G-SDI : SMPTE-425M (Level A/B)
- SD/HD/3G format auto identification
- Control by Smart I/O interface
- ESD protection
- Low cost

SPECIFICATIONS

Chroma A2229015 SDI Module is specially designed to meet the test demands of diversified low cost SDI signals for today's display industry. It has extended specifications and functions when integrated with the main VPG test device that creates the SDI signal products for applications in broad domain.

#### Œ

It is an HMDI to SDI Adapter that can be controlled by Smart I/O. With the combination of Chroma VPG with A222915, the external module can be connected to Chroma VPG easily for various SDI tests.

Chroma A222915 has equipped with the latest 3G-SDI standard resolution which is the mainstream specification of all 1080P transmission. It can double the HDTV transmission rate in the advanced video environment, also enhance the overall broadcasting quality in the transmission network.

The industries of Chroma A222915 applied extensively include the distributed amplifier, video router and the serial connection interface of switch, camera and other devices. The SDI can use a 75 $\Omega$  coaxial cable to transmit the uncompressed digital video signal within long distance range in a TV studio or a place with related equipment to achieve the high quality HD playback.

For peripheral industry, the display related customer can involve the SDI test requests directly to the application of LED TV wall, projector, outdoor large-scale display and broadcasting hardware. In the meantime, its simple design is applicable for all SDI multimedia tests in practical use including R&D, manufacturing test and quality assurance, especially the mass production for rapid verification and assessment.

Moreover, Chroma A222915 uses HDMI as the signal input source and 2 sets of SDI can output at the same time. SD-SDI/ HD-SDI/3G-SDI supports 2CH / 8CH - 48khz Audio output that can work with VPG to test various standard static and dynamic images.

To cope with the design of multi-port inputs for the FPD in this digital age, the SDI module is developed to connect externally and in compact size to be used flexibly in any site of production line and laboratories.

| STECHTCKHORS                                  |                      |   |   |                      |  |  |  |
|---|----------------------|---|---|----------------------|--|--|--|
| PIXEL RANGE                                   |                      |   |   |                      |  |  |  |
| Input : HDMI Signal                           |                      | HDMI Ver1.0 ~ 1.3 (2.25Gbp                    | HDMI Ver1.0 ~ 1.3 (2.25Gbps)                            |                      |  |  |  |
| Output : SDI Signal                           |                      | SD/HD/3G SDI SMPTE 259M                       | SD/HD/3G SDI SMPTE 259M/274M/296M/425M (Up to 2.97Gbps) |                      |  |  |  |
| Connector                                     |                      |   |   |                      |  |  |  |
| Input Signal Source fro                       | om Chroma VPG Series | Equipped with Smart I/O pe                    | Equipped with Smart I/O port in 22xx / 23xx Series      |                      |  |  |  |
| HDMI  |                      | Input : HDMI 19 Pin x1                        |   |                      |  |  |  |
| SDI   |                      | Output : BNC x2                               |   |                      |  |  |  |
| SYNC  |                      | Output : BNC x1                               |   |                      |  |  |  |
| ESD / Surge protect<br>(IEC 61000-4-2 Level 4 | Regulation)          | Contact 8KV / Air 15 KV                       |   |                      |  |  |  |
| TIMING LIST                                   |                      |   |   |                      |  |  |  |
| Output format                                 | Bit rate             | Standard                                      | Video format  |                      |  |  |  |
| SD-SDI  | 270Mbps              | SMPTE-259M                                    | NTSC  | 720x480/59.94i       |  |  |  |
| וענ-ענ  | 270Mbps              | SIVIPTE-239101                                | PAL   | 720x576/50i          |  |  |  |
|   |                      | SMPTE-274M                                    | 1920x1080p  | 30/29.97/25/24/23.98 |  |  |  |
| HD-SDI  | 1.485Gbps            |   | 1920x1080i  | 60/59.94/50          |  |  |  |
|   |                      | SMPTE-296M                                    | 720p  | 60/59.94/50          |  |  |  |
|   |                      |   | 1920x1080p  | 60/59.94/50          |  |  |  |
| 3G-SDI  | 2.97Gbps             | SMPTE-425M (Level A)                          | 1920x1080i  | 60/59.94/50          |  |  |  |
| 20-201  | 2.97 Gbps            |   | 1920x1080psf  | 30/29.97/25/24/23.98 |  |  |  |
|   |                      | SMPTE-425M (Level B)                          | 1920x1080p  | 60/59.94/50          |  |  |  |
| Other   |                      |   |   |                      |  |  |  |
| User Interface                                |                      | Smart I/O                                     |   |                      |  |  |  |
| DC Input                                      |                      | 9V/2A (With Chroma adapt                      | er only)  |                      |  |  |  |
| Temperature                                   | Operation            | +5~+40 deg.C                                  | +5~+40 deg.C  |                      |  |  |  |
| Temperature                                   | Storage              | -20~+60 deg.C                                 | -20~+60 deg.C   |                      |  |  |  |
| Humidity                                      |                      | 20~90%  |   |                      |  |  |  |
| <b>DIMENSION &amp; WEIGH</b>                  | IT                   |   |   |                      |  |  |  |
| A222915 (H x W x D)                           |                      | 88 x 45 x 200 mm / 3.46 x 1<br>750g / 1.65lbs | .77 x 7.87 inch   |                      |  |  |  |

Electronics

Battery Test &

Component Safety

Semiconductor/

PXI Test & Measurement

General Manufacturing T Purpose Execution System

Jrnkey Test &

# Pattern Analyzer



#### **KEY FEATURES**

- TV / Monitor PCBA test system
- VESA / JEIDA data mapping
- LVDS 2 channel input / output
- LVDS 6 / 8 / 10 bits
- LVDS pixel rate
- 1 Link up to 135MHz
- 2 Link up to 270MHz
- 4 Link up to 540MHz (A222917 x 2)
- Timing / pattern / audio compare
- LVDS Vdd measurement
- DC voltage measurement
- PWM frequency / duty cycle measurement
- Bidirectional digital control
- Speaker / headphone audio input
- Optical / Coaxial audio input (SPDIF)
- EDID / HDCP test (with VPG)
- IR transceiver control (Option)
- ESD protection
- Modular design
- High Cost-performance value

Chroma A222917 is a multi-functional PCBA main board signal test device for display. It has ultra high speed LVDS (Low-voltage differential signaling) as image signal analysis core to provide high efficiency and stability test quality. It can form a PCBA automatic test system when integrated with the newest generation of Chroma 22XX Series Video Pattern Generator (\*1) that can meet the requirements for testing the PCBA main boards automatically in present and future multimedia display industries.

The A222917 Pattern Analyzer supports various audio and video automatic testing functions for PCBA production line. The features include:

High speed LVDS video pattern standard format signal analysis interface that supports VESA and JEIDA standard with 6 / 8 / 10 color depth testing selection. The LVDS signal frequency supports up to 270MHz in Dual link mode and is able to output simultaneously during analysis so that the user can connect the panel to do screen inspection.

#### LVDS timing analysis

Timing analysis can be done via various detail parameters including pixel rate, horizontal and vertical timing, which can be used easily to judge if the LVDS transmission channel is correct.

#### Image comparison

It replaces the traditional artificial screen inspection with high speed image comparison core to do a series of comparison on each frame. The user can set the frame numbers and maximum 32 comparing blocks in each frame for comparison. It can also mark the error coordinates and inspection values for follow-up fixing latter.

#### Audio signal test

It has digital/analog audio signal amplitude and frequency test capability for the production line to test the audio signal interface function rapidly.

#### Digital control interface

It has 16 channels of bidirectional digital control interface and is able to set 3.3V or 5V interface voltage for automatic testing control or warning.

#### Voltage measurement module

Equipped with LVDS Vdd voltage and 8 DC voltage measurement modules, A222917 is able to measure the voltage for PCBA test points.

To achieve automated test application for PCBA production line, the A222917 Pattern Analyzer replaces the traditional screen inspection with automatic signal inspection device by programming the complex PCBA test procedures via software. Only one button is required for the actual production line inspection to complete related tests automatically. It saves the test time greatly and improve the test accuracy.

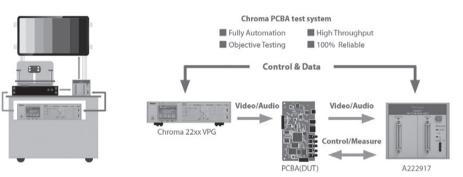
The A222917 has graphical test program editing software that gives the user an easy and fast way to manage and edit the test programs with the actual test items performed in production line. The easy-to-use operating interface and complete test functions are most applicable for all video and related industries when doing research and development, production test and quality assurance.

(\*1) Support Model 22293-B/22294-A/2233-B/ 2234/2235

#### **ORDERING INFORMATION**

A222917 : Pattern Analyzer





#### SPECIFICATIONS

| LVDS In/Out                     |   |
|---------------------------------|---|
| Signal format                   | VESA / JEIDA  |
| Color depth                     | 6 / 8 / 10 bits   |
| Link mode                       | 1 link up to 135 MHz / 2 link up to 270MHz                        |
| Audio input                     |   |
| Channel                         | 2 Ch(LINE/COAX/OPTICAL) / 3 Ch(SPEAKER)                           |
| Amplitude                       | 0 ~ 4 Vp-p(LINE) / 0 ~ 40 Vp-p(SPEAKER)                           |
| Frequency                       | 20 Hz ~20 KHz   |
| Digital I/O                     |   |
| Voltage range                   | 3.3V / 5V Selectable (Bidirectional )                             |
| DC voltage measurement          |   |
| Voltage range                   | 0 ~ 20V   |
| Connector                       |   |
| LVDS                            | MDR 50 pin x 2  |
| S/PDIF Input                    | Optical x1 / Coaxial x 1  |
| Line in                         | Headphone Jack x 1  |
| Speaker in                      | 8 pin 2.5mm header x 1  |
| Other                           |   |
| DC Input                        | 9V/2A (With Chroma adapter only)                                  |
| Temperature (Operation/Storage) | +5~+40 deg.C / -20~+60 deg.C                                      |
| Humidity                        | 20 ~ 90%  |
| Dimension & Weight              |   |
| A222917                         | 88X100X200 mm / 3.46X3.94X7.87 inch (H x W x D)<br>1 kg / 2.2 lbs |

# Model A222917

# **Display Color Analyzer**

# Model 7123



#### **KEY FEATURES**

- Luminance and chromaticity measurement of Color Display
- 0.005 cd/m<sup>2</sup> low luminance measurement (A712301)
- Wide range of luminance display: 0.0001 to 25,000 cd/m<sup>2</sup> (A712301) 0.01 to 200,000 cd/m<sup>2</sup> (A712302) 0.01 to 6000 cd/m<sup>2</sup> (A712200)
- High accuracy measurement
- Maximum 9 display modes: xyY, T $\triangle$ uvY, u'v'Y, RGB, XYZ, FMA(A712200), FLVL(A712200), Contrast, Program
- Support Contrast, JEITA and VESA for flicker measurements (A712200)
- Able to control Video Pattern Generator and UUT (Unit Under Test)
- Built-in contrast measurement function to calculate the contrast ratio directly
- Equipped with programmable test items that can complete the planned tests with one single button
- Support USB flash disk that can copy the test procedures to other station for use
- Judgment function embedded to judge the test result automatically with one single button
- Calibration period setting and reminding function
- Memory for storing 100 channels of standard color data and calibration data
- Built-in flat display calibration data LCD-D65 & LED-D65\* to be applied for chromaticity measurement instantly
- Optional display white balance alignment system can be used to integrate all optical test stations to one single station
- \* It uses the typical fluorescent excited white light LED display

Chroma 7123 Display Color Analyzer adopts the design of contact and non-contact type measurements based on the probe selected to measure the luminance and chromaticity of display panels. Developed with the most advanced digital signal processor and the technology of optoelectronic transfer as well as precision optical parts and circuit design, the 7123 Display Color Analyzer is capable of performing high speed, accurate and stable color tests.

The configuration of Chroma 7123 complies with the color matching function sensor of CIE 1931 and CIE1976 UCS that can measure the luminance and chromaticity of display panel accurately. Users can switch to various types of chromaticity coordinates freely including xyY, T∆uvY, u' v' Y, RGB, XYZ, FMA (A712200), FLVL (A712200), Contrast and Program 9 modes in total. The A712301 that is designed to test the LCD characteristics with LED backlight is able to meet the low luminance test requirements of 0.005cd/ m<sup>2</sup>. In addition, the A712302, designed for small size display in particular can solve the problem of color analyzer measurement area larger than the



display area with its 5mm measurement area.

To satisfy the needs for automation, the 7123 is equipped with the function to control the video pattern generator and the UUT without using a personal computer to cut down the acquisition and management cost. The 7123 also has the functions of contrast measurement, result judgment and programmable test items that can fulfill the auto test requirements to enhance the production efficiency.

The Optical Measurement Software incorporated by Chroma 7123 is able to do chromaticity, luminance, Flicker (A712200) and Gamma measurements on PC, and then show the measured data on CIE 1931 and CIE1976 UCS chromaticity coordinate chart directly. Besides the function of drawing Gamma curve, the measured data can also be stored on PC and exported to EXCEL® for process. The example programs enclosed in optical measurement software allow users to develop the test programs that suit their needs.

Chroma 7123 Display Color Analyzer has 100 channels of built-in memory for storing the value of standard colors and calibrated data. In addition, Chroma 7123 also provides many friendly user interfaces for operation such as the way test data shows, the position set for push buttons, the positioning projector, USB and RS-232 interfaces for data transmission, calibration period setting as well as reminding function and etc. to satisfy the requirements for actual measures. Using the USB flash disk, the test procedures can be copied to other stations for use and reduce the time for repeated editing considerably.

As the technology and products of flat displays have become the

mainstream in the market today, every manufacturer is seeking

for high value-added and low cost measurement solutions to raise

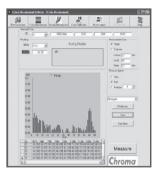
its competitiveness; Chroma 7123 Display Color Analyzer is the



**Color Measurement** 



Gamma Measurement



**Flicker Measurement** 

- Color Measurement -Gamma Measurement -Color Calibration

excellent tool to assist in achieving that purpose.

-Multiple Control **API Development Library** 

System Requirements

Example Program:

Operating System: Windows® XP/7

Software Development Kit (SDK)

Windows<sup>®</sup> & EXCEL<sup>®</sup> are the registered trademarks of Microsoft in United States and other countries.

#### System Diagram Standard Lens cap for A712301/A712200 (Standard accessory) A240100 Video Pattern Generator (Option) USB Flash Disk A712301 (Option) (Option) RS-232 Ultra-low luminance measuring probe 103 (83 103 (83 103 (83 Standard Hood for A712301/A712200 A712200 (Option) 7123 Main unit Flicker measuring probe (Standard accessory) RS-232 / LISB AC Power Cord Small Lens cap for A712302 (Option) (Standard Accessory) A712302 Small size high luminance measuring probe (Standard accessory) Optical Measurement Software/SDK (Standard Accessory

All specifications are subject to change without notice.

PC (Option)

4-26

Optical

Electronics

Test &

Passive

Electrical

Semiconductor/

PXI Test &

Purpose

Manufacturing

Component

# **Display Color Analyzer**

# Model 7123

| SPECIFICATIO<br>Model              |                      |   | 7123  |  |
|------------------------------------|----------------------|---|---|--|
| Probe Model                        |                      | A712301 (Ultra-Low luminance<br>measuring probe)  | A712302 (Small size high Luminance<br>measuring probe)  | A712200 (Flicker measuring probe)  |
| Measurement A                      | Area                 | Ø27 mm / Ø1.06 inch   | Ø5 mm / Ø0.20 inch  | Ø27 mm / Ø1.06 inch  |
| Measurement [                      | Distance             | 30±10mm   | 0~10mm  | 30±10mm  |
| Acceptance An                      | gle                  | ± 2.5°  | ± 5°  | ± 2.5°   |
| Display Range                      | Luminance            | 0.0001 to 25,000 cd/m <sup>2</sup>  | 0.01 to 200,000 cd/m <sup>2</sup>   | 0.01 to 6,000 cd/m <sup>2</sup>  |
| Jisplay Range                      | Chromaticity         |   | 4 or 3 digits display   | · · · · · · · · · · · · · · · · · · ·  |
| uminance uni                       | ź                    | cd/r  | n <sup>2</sup> or fL, selectable via button on the front  | panel  |
| Display Mode                       | Digital              | xyY ; T∆uvY; u' v' Y ; RGB ;  |   | xyY; TΔuvY; u'v'Y; RGB; XYZ; FMA; FLVL<br>Contrast; Program  |
|                                    | Analog               | Δχ Δγ ΔΥ; ΔR ΔG ΔΒ; Δ   | R G/R B/R; R/G ΔG B/G   | $\Delta x \Delta y \Delta Y; \Delta R \Delta G \Delta B; \Delta R G/R B/R; R/G \Delta G B/G; FN$   |
|                                    | Meas. Range          | 0.0050 to 6,000cd/m <sup>2</sup> (0.001 to 1751fL)  | 0.30 to 6,000 cd/m <sup>2</sup> (0.09 to 1751 fL)   | 0.10 to 6,000 cd/m <sup>2</sup> (0.03 to 1751 fL)  |
| uminance                           | Accuracy             | 0.0050 to 0.0199 cd/m <sup>2</sup> :± 0.0005cd/m <sup>2</sup><br>0.020 to 0.099 cd/m <sup>2</sup> :± 4% ± 2 digits<br>0.100 to 6,000 cd/m <sup>2</sup> :± 2% ±1 digit   | 0.30 to 6,000 cd/m <sup>2</sup> :±2%±1 digit  | 0.10 to 6,000 cd/m <sup>2</sup> : ±2%±1 digit  |
| Repeatability                      |                      | 0.0050 to 0.0199 cd/m <sup>2</sup> : $\pm$ 0.0003cd/m <sup>2</sup><br>0.020 to 0.099 cd/m <sup>2</sup> : 1% + 2 digits(2 $\sigma$ )<br>0.100 to 0.999 cd/m <sup>2</sup> : 0.2% + 1 digit(2 $\sigma$ )<br>1.00 to 6,000 cd/m <sup>2</sup> : 0.1% + 1 digit (2 $\sigma$ ) | 0.30 to 2.99cd/m <sup>2</sup> : 0.2% +1 digit(2 $\sigma$ )<br>3.00 to 6,000 cd/m <sup>2</sup> :0.1%+1 digit(2 $\sigma$ )  | 0.10 to 0.99 cd/m <sup>2</sup> : 0.2% + 1 digit (2 $\sigma$<br>1.00 to 6,000 cd/m <sup>2</sup> : 0.1% + 1 digit (2 $\sigma$  |
| Chromaticity<br>Repeatability      |                      | 0.100 to 2.99 cd/m <sup>2</sup> : $\pm$ 0.008<br>3.00 to 4.99 cd/m <sup>2</sup> : $\pm$ 0.005<br>5.00 to 9.99 cd/m <sup>2</sup> : $\pm$ 0.003<br>10.00 to 6,000 cd/m <sup>2</sup> : $\pm$ 0.002   | 0.30 to 14.99 cd/m <sup>2</sup> : $\pm$ 0.008<br>15.00 to 119.9 cd/m <sup>2</sup> : $\pm$ 0.005<br>120.0 to 6,000 cd/m <sup>2</sup> : $\pm$ 0.003   | $\begin{array}{c} 0.1 \text{ to } 2.99 \text{ cd/m}^2 \colon \pm \ 0.008 \\ 3.00 \text{ to } 4.99 \text{ cd/m}^2 \colon \pm \ 0.005 \\ 5.00 \text{ to } 9.99 \text{ cd/m}^2 \colon \pm \ 0.003 \\ 10.00 \text{ to } 6,000 \text{ cd/m}^2 \colon \pm \ 0.002 \end{array}$ |
|                                    |                      | 0.100 to 0.199 cd/m <sup>2</sup> : 0.015(2 $\sigma$ )<br>0.200 to 0.499 cd/m <sup>2</sup> : 0.008(2 $\sigma$ )<br>0.500 to 1.99 cd/m <sup>2</sup> : 0.003(2 $\sigma$ )<br>2.00 to 6,000 cd/m <sup>2</sup> : 0.001(2 $\sigma$ )  | 0.30 to 0.59 cd/m <sup>2</sup> : 0.015 (2 $\sigma$ )<br>0.60 to 1.49 cd/m <sup>2</sup> : 0.008 (2 $\sigma$ )<br>1.50 to 7.99 cd/m <sup>2</sup> : 0.003 (2 $\sigma$ )<br>8.00 to 6,000 cd/m <sup>2</sup> : 0.001 (2 $\sigma$ ) | 0.10 to 0.19 cd/m <sup>2</sup> : 0.015 (2 $\sigma$ )<br>0.20 to 0.49 cd/m <sup>2</sup> : 0.008 (2 $\sigma$ )<br>0.50 to 1.99 cd/m <sup>2</sup> : 0.003 (2 $\sigma$ )<br>2.00 to 6,000 cd/m <sup>2</sup> : 0.001 (2 $\sigma$ )  |
|                                    | Range                |   |   | 5 cd/m <sup>2</sup> or higher  |
|                                    | Display Range        |   |   | 0.0 to 100%  |
| Flicker<br>Contrast<br>Method(FMA) | Accuracy             |   |   | ± 1% (Flicker frequency:<br>30 Hz AC/DC10 % sine wave)<br>± 2% (Flicker frequency:<br>60 Hz AC/DC 10 % sine wave)  |
| Repeatability                      |                      |   |   | 1% (2 σ) (Flicker frequency:<br>20 to 65 Hz AC/DC 10 % sine wave)  |
|                                    | Range                |   |   | 5 cd/m <sup>2</sup> or higher  |
| licker - JEITA/                    | <b>Display Range</b> |   |   | 6-240Hz  |
| /ESA Method<br>FLVL)               |                      |   |   | $\pm$ 0.5dB (Flicker frequency:<br>30 Hz AC/DC10 % sine wave)  |
| ,                                  | Repeatability        |   |   | 0.3dB (2 $\sigma$ ) (Flicker frequency:<br>30 Hz AC/DC 10 % sine wave)   |
| Measurement<br>Speed               |                      | Y:0.0050 to 0.0199 cd/m <sup>2</sup> : 1 time/sec<br>(Low luminance Mode)<br>Y:0.020 to 1.99 cd/m <sup>2</sup> : 4 times/sec.<br>(Auto mode) ;<br>2.00 cd/m <sup>2</sup> and above: 15 times/sec.   | 0.3 to 7.99 cd/m <sup>2</sup> :1 time/sec.<br>8.00 cd/m <sup>2</sup> and above:15 times/sec.  | 0.1 to 3.99 cd/m <sup>2</sup> : 5 times/sec. ;<br>4.00 cd/m <sup>2</sup> and above: 15 times/sec.  |
|                                    | FMA                  |   |   | 6 times/sec. (UNIV) ; 20 times/sec.(NTSC<br>16 times/sec. (PAL)  |
|                                    | FLVL                 |   |   | 0.5 time/sec.  |
| Dimension                          |                      | Ø 46 x 234.9(D) mm /  | Ø 46 x 221.9(D) mm /  | Ø 46 x 234.9(D) mm /   |
|                                    |                      | Ø 1.81 x 9.25(D) inch   | Ø 1.81 x 8.74 (D) inch  | Ø 1.81 x 9.25(D) inch  |
| Weight                             |                      | 0.5 kg / 1.1 lbs  | 0.5 kg / 1.1 lbs  | 0.5 kg / 1.1 lbs   |
| Cord Length                        |                      |   | 2.5m / 98.43 inch   |  |
| Optical System                     |                      |   | LED positioning function  |  |
| <u>Nain unit</u>                   |                      |   |   |  |
| Aemory Chanr                       | nel                  |   | 100 Channels  |  |
| ync Mode                           |                      |   | NTSC, PAL, EXT, UNIV, INT   |  |
| Object Under N                     | Neasurement          |   | 10~240 Hz   |  |
| nterface                           |                      | USB(2.0),   | USB flash disk port, RS-232C (Baud rate ma  |  |
| nput Voltage F                     |                      |   | $10010$ 10~240V $\pm 10$ % VLN, 47~63Hz, 50VA   |  |
| Dperating Tem<br>lumidity Rang     | e                    | 10°C to 30°C (50°F t  | o 86°F); less than 75% relative humidity (w   | ith no condensation)   |
| Storage Tempe<br>Humidity Rang     | е                    | 0°C to 40°C (32°F to  | 104°F); less than 75% relative humidity (w  | ith no condensation)   |
| Dimension (H x                     | (W x D)              |   | 115x320x260 mm / 4.5x12.6x10.2 inch   |  |
| Veight                             |                      |   | 2.7 Kg / 5.95lbs  |  |
| Other Function                     | IS                   | comparison, video pattern ge  | nory channel ID storage, variable analog di<br>enerator and UUT control, programmable t<br>I setting and reminding function, USB flasl  | test item, test result judgment,   |

Note \*1: Standard illuminant A is used for test according to Chroma's test condition. **Note \*2:** Only the USB flash disks certified by Chroma are supported. **\*Reference standards:** IEC 61747-6, EIAJ ED-2522, ASTM E455-03, VESA Standard

#### **ORDERING INFORMATION**

7123 : Display Color Analyzer Main Unit

A712200: Flicker measuring probe (with 2.5m signal cable)

A712301: Ultra-Low luminance measuring probe (with 2.5m signal cable)

A712302: Small size high luminance measuring probe (with 2.5m signal cable)

A712102: Tripod (including a level gauge)

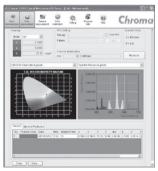
# Spectrocolorimeter

# Model 71611

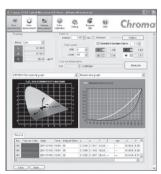


#### **KEY FEATURES**

- Use of spectrophotometric technique
- Suitable for laboratories and production lines
   Display luminance, chromaticity and spectral measurement
- 0.01 cd/m<sup>2</sup> low luminance measurement
- Wide range of luminance display: 0.01 to 2000 cd/m<sup>2</sup>
- Highly accurate measurement
   Up to 9 display modes:
- xyY, T  $\triangle$  uvY, u' v' Y, XYZ,  $\lambda$  d/Pe, Spectral, Contrast, Program and User Define
- Wide view color LCD to facilitate the reading and operation
- Able to control the Video Pattern Generator and DUT
- Built-in contrast measurement for contrast ratio calculation
- Embedded with programmable test items to test the planned items with one key
- Support USB interface for data control and process
- Equipped with judgment function for production line to use easily
- Built-in calibration period setting and reminding function
- Able to connect external device for synchronized trigger function



Color Measurement



Gamma Measurement



Chroma 71611 Spectrocolorimeter is specially designed to meet the requirements of laboratory and production line by implementing the contact and non-contact measurement to test the luminance and color presentation of display panels. Developed with the most advanced digital signal processor and photoelectric conversion technology, Chroma 71611 is able to measure the color with high speed, accuracy and stability when integrated with precision optics and circuit design.

The spectrophotometric technique applied to 71611 can measure the display panel spectral precisely and calculate the luminance and chromaticity correctly. It is applicable for the displays in different technologies and solves the problem of measurement errors caused by the DUT (Device Under Test) spectral difference to save the time and cost from frequent calibrations. The user is able to change various display modes including xyY,  $T \Delta uvY$ , u' v' Y, XYZ,  $\lambda d/Pe$ , Spectral, Contrast, Program and User Define. For the LCD with LED backlight, the 71611 has designed in particular to meet the 0.01cd/m<sup>2</sup> low luminance requirement.

The 71611 is able to control the Video Pattern Generator and DUT directly for automation without using a PC to save the cost of PC purchase and management. Moreover, there are functions of contrast measurement, result judgment and programmable test items to fulfill the needs of automated test and increase the production efficiency.

The optical measurement software 71611 uses is able to measure the chromaticity, luminance, spectral and Gamma on a PC, and show the data on the chromaticity coordinate of CIE 1931 and CIE1976 directly with Gamma curve drawing. It can also save the measured data to PC or import to EXCEL® for process. The program example of optical measurement software allows the user to develop a suitable test program fits the need rapidly.

The 71611 has 9 memories built in to store the standard spectral calibration data. In addition the 71611 has many user-friendly designs to comply with the user's requirements, such as the color display, the way test data displays, the button's position, the light positioning device, the USB and RS-232 data transmission interface, as well as the setting and reminding functions of calibration period. The supported USB flash disk drive can copy the test programs to other devices for use to save the time for repeat editing.

As the technology and products of flat panel display have become the mainstream of market, every manufacturer is in search of the solution for high value-added and low cost automated measurement. Chroma 71611 Spectrocolorimeter is the excellent tool to assist the FPD industry in improving the efficiency and the competitiveness.

| C 00    | M Ø2       | T 00    | 20 | 10.05.24         |
|---------|------------|---------|----|------------------|
| х       | 0.3        | 769     |    |                  |
| y       | 0.3        | 645     |    |                  |
| Y       | 4 7        | .79     | Сd | / m <sup>2</sup> |
|         |            |         |    |                  |
|         |            |         |    |                  |
| SNGL    | SLOW       | AUTO    | -  | ₽ AUTO           |
| Chromat | icity Meas | urement |    |                  |



Spectrum Measurement

| C 00     | M Ø1                       | T 00  | 2010.05.24                                |
|----------|----------------------------|-------|---|
| x:       | 0.3798                     |       | NG  |
| y:<br>Y: | Ø.3596<br>46.79            | cd/m² | <inspection></inspection>                 |
|          | 00 ±50<br>00 ±50<br>.00 ±1 | PAT   | ING NO:14<br>TERN NO:41<br>YY TIME:1000ms |
|          |                            |       |   |
| SNGL     | SLOW                       | AUTO  | <b>∢</b> ) ♀ AUTO                         |



| C Ø9 | M Ø1 | T 00 | 201        | 0.05.25                 |
|------|------|------|------------|-------------------------|
| BR   | 2    | 79.7 | cd/        | ' <b>m</b> <sup>2</sup> |
| DK   |      | 0.49 | cd/        | <b>m</b> <sup>2</sup>   |
| CR   |      | 74.3 |            |                         |
|      |      |      |            |                         |
|      |      |      |            |                         |
| SNGL | SLOW | MANU | <b>4</b> ) | Ý ON                    |

Contrast Measurement



71611 Rear Panel

4-28

Optical

All specifications are subject to change without notice.

# Spectrocolorimeter

# Model 71611

**Calibration Application** 



Dispaly Color Analyzer

| SPECIFICATIONS        |                        |   |  |  |  |  |
|-----------------------|------------------------|---|--|--|--|--|
| Model                 |                        | 71611   |  |  |  |  |
| Wavelength            |                        | 400~700 nm  |  |  |  |  |
| Wavelength Resolution | on                     | 0.3nm/pixel   |  |  |  |  |
| Wavelength Interval   |                        | 1nm   |  |  |  |  |
| Spectral Accuracy     |                        | $\pm$ 0.3nm(average wavelength:546.1nm Hg lamp)   |  |  |  |  |
| Acceptance Angle      |                        | ±2.5°   |  |  |  |  |
| Measuring Distance    |                        | 30±10mm   |  |  |  |  |
| Measuring Area        |                        | φ27mm   |  |  |  |  |
| Luminance Unit        |                        | cd/m <sup>2</sup> or fL   |  |  |  |  |
| Display Mode          |                        | xyY $\land$ T $\triangle$ uvY $\land$ u' v' Y $\land$ XYZ $\land$ $\lambda$ d/Pe $\land$ Spectral $\land$ Contrast $\land$ Program $\land$ User Define  |  |  |  |  |
|                       | Range                  | 0.01 to 2,000 cd/m <sup>2</sup> (0.003 to 583.8 fL)   |  |  |  |  |
|                       |                        | 0.01 to 0.99 cd/m <sup>2</sup> : $\pm$ 0.02 cd/m <sup>2</sup> $\pm$ 1digit  |  |  |  |  |
| Luminance *1          | Accuracy               | 1.00 to 2,000 cd/m <sup>2</sup> : ±2 % ±1digit  |  |  |  |  |
| Luminance             |                        | 0.01 to 0.99 cd/m <sup>2</sup> : 0.01 cd/m <sup>2</sup> + 1digit (2 $\sigma$ )  |  |  |  |  |
|                       | Repeatability Accuracy | 1.00 to 7.99 cd/m <sup>2</sup> : 0.5 % + 1digit(2 $\sigma$ )  |  |  |  |  |
|                       |                        | 8.00 to 2,000 cd/m <sup>2</sup> : 0.1 % + 1digit (2 $\sigma$ )  |  |  |  |  |
|                       |                        | 0.50 to 0.99 cd/m <sup>2</sup> : ±0.007   |  |  |  |  |
|                       | Accuracy               | 1.00 to 9.99 cd/m <sup>2</sup> : ±0.004   |  |  |  |  |
|                       |                        | 10.00 to 2,000 cd/m <sup>2</sup> : ±0.003   |  |  |  |  |
| Chromaticity *1       |                        | 0.50 to 0.99 cd/m <sup>2</sup> ÷ 0.003 (2 σ )   |  |  |  |  |
| chromaticity          |                        | 1.00 to 1.99 cd/m <sup>2</sup> ÷ 0.002 (2 σ )   |  |  |  |  |
|                       | Repeatability Accuracy | 2.00 to 3.99 cd/m <sup>2</sup> : 0.001 (2 σ )   |  |  |  |  |
|                       |                        | 4.00 to 7.99 cd/m <sup>2</sup> : 0.0005 (2 $\sigma$ )   |  |  |  |  |
|                       |                        | 8.00 to 2,000 cd/m <sup>2</sup> : 0.0004 (2 $\sigma$ )  |  |  |  |  |
| Measurement Speed     |                        | Fast: 2~10 sec./per test , Slow: 4~15 sec./per test   |  |  |  |  |
| Optical System        |                        | LED positioning function  |  |  |  |  |
| Data Display          |                        | Color display   |  |  |  |  |
| Memory                |                        | 9 channels  |  |  |  |  |
| Sync Mode             |                        | EXT, INT  |  |  |  |  |
| Sync Frequency        |                        | 10~200 Hz   |  |  |  |  |
| Data Comm. Interface  | e                      | USB(2.0), USB flash disk drive communication port, RS232C (Baud rate max. 115200)   |  |  |  |  |
| Input Voltage Range   |                        | 1Ø 110~240V ±10% VLN, 47~63Hz, 1A ; DC 24V 16.7A  |  |  |  |  |
| Operating Temperatu   | ire / Humidity Range   | $5^{\circ}$ C to $30^{\circ}$ C ( $50^{\circ}$ F to $86^{\circ}$ F) ; less than 80% relative humidity (non-condensing)  |  |  |  |  |
| Storage Temperature   | Range                  | 0°C to 40°C (32°F to 104°F); less than 80% relative humidity (non-condensing)   |  |  |  |  |
| Dimension (H x W x D  | ))                     | 218 x 138 x 364 mm / 8.59 x 5.44 x 14.33 inch   |  |  |  |  |
| Weight                |                        | 5.08 kg / 11.17 lbs   |  |  |  |  |
| Other Function        |                        | Customized light source calibration, memory channel ID storage, display pause, remote control, contrast<br>measurement, video pattern generator and DUT control, programmable test items, test result judgment,<br>calibration period setting and reminding, USB flash disk drive supported <sup>*2</sup> |  |  |  |  |
|                       |                        |   |  |  |  |  |

Note\*1: The standard illuminant A light source is used for test which set measure mode on AUTO and measure speed on slow.

Note\*2: Only the Chroma certified USB flash disk drive is supported.

\* Reference standards: IEC 61747-6, EIAJ ED-2522, ASTM E455-03, VESA Standard

**ORDERING INFORMATION** 

71611: Spectrocolorimeter

# Front Projector ATS

# Model 7600A



#### **KEY FEATURES**

- 0.001 Lux ultra low illumination display range
- Comply with ANSI-1997, JBMIA, IEC & SJ/T projector testing standards
- 29 sets chroma meter & Illuminance meter measuring at the same time, high test throughput
- Integrated with Video Pattern Generator and one click to complete all measurements
- Accurate chroma meter with tuned color filters (closely approximates CIE 1931 color matching functions), and cosine correctors
- User-defined calibration function facilitates the system maintenance
- Testing criteria storage for various models requirements
- "Pre-Test" function to edit testing items setting for non-ANSI standard tests
- Automatic white balance adjustment
- Auto maximum brightness selection and DC-index compliance with chromaticity specification
- Complete test items: ANSI Lumens, Light Uniformity, Color Uniformity, Contrast Ratio and Correlated Color Temperature
- High accuracy measurement:
  - Y:  $\pm 2\% \pm 1$  digit x, y:  $\pm 0.002$
- Precise repeatability measurement:
   Y: ±0.5%±1 digit
  - x, y: ±0.0005
- NIST traceable calibration
- Data output saved automatically for statistical analysis and able to upload to MES
- User authority control for system management
- Support Windows 7 (32 bit)

Chroma 7600A is an automatic test system developed in compliance with with ANSI /NAPM IT 7.228-1997 which is defined by American National Standard Institute, JBMIA-ISO21118 (2005.8) which is defined by Japan Business Machine & Information Industry Association, IEC61947-1 (2002) which is defined by International Electrotechnical Commission and SJ/T 11340-2006 (2007.1.1) which is defined by Ministry of Industry and Information Technology of the People's Republic of China to test the front projectors. The chroma meter used in the system is designed with advanced microprocessor and precision optical components along with filters closely approximate to CIE 1931 Color Matching

Function and Cosine Correction. It can offer accurate and high-speed illuminant and chromatic measurements performance and quality judgments for LCD, DLP and LCOS projectors.

The software of Chroma 7600A is a Window<sup>™</sup> based control program with comprehensive graphic user interface that can enhance testing efficiency of the projector manufacturers and lower down the test and labor cost. With the integration of video pattern generator of Chroma, the user can complete all the ANSI-1997 testing items, acceptance criteria and file saving with just one click.

To accommodate the diversified needs users may have, Chroma 7600A provides various test results including ANSI Lumens, Light Uniformity, Color Uniformity, Contrast Ratio and Correlated Color Temperature for one's choice. In addition, a flexible formula editing wizard is offered for the user to edit the desired calculation formula. The "Pre-Test" function in the software allows the user viewing the measured values in real time to integrate into the convergence, grayscale tests and VR adjustments etc. before performing ANSI tests. And with the user-defined calibration function Chroma 7600A provides, it is very convenient for the system maintenance which can reduce the calibration cost in the future effectively.

When the performance of luminancechrominance has become the key factor for the value of front projector, the chromaticity measurements must comply with more standards and test benchmarks. As the demand of compact, high brightness and resolution display devices is increasing quickly now, the front projector will play a leading role in the near future. Every front projector make is looking for the most cost-effective test solution to keep up with this trend. Such a versatile and easy-to-use instrument like Chroma 7600A must satisfy your intent to win competitive advantages.

| SPECIFICATIONS                      |   |   |                          |  |  |  |  |  |
|-------------------------------------|---|---|--------------------------|--|--|--|--|--|
| Model                               |   | 7600A   |                          |  |  |  |  |  |
|                                     | 13 chroma meters (13 points) or 13 chroma meters plus   |   |                          |  |  |  |  |  |
| Photo Sensor                        | 16 Illuminance meters (29 points)   |   |                          |  |  |  |  |  |
| FIIOLO SEIISOI                      | closely approximates CIE 1931 Color Matching Function,  |   |                          |  |  |  |  |  |
|                                     |   | and cosine correctors   |                          |  |  |  |  |  |
| Illuminance Range                   | 0.05 to 30,000 Lux  |   |                          |  |  |  |  |  |
| Display Range                       |   | 0.001 to 30,000 Lux   |                          |  |  |  |  |  |
| OS                                  |   | Windows® 7  |                          |  |  |  |  |  |
| Software                            | readings : Y, x, y/CCT/ Y, u  | ndard : Illuminance & Chro<br>u', v'/ ∆ u'v'/ANSI Lumens/U<br>16 points) readings : Y/Con | Iniformity/Max/Min/ Avg. |  |  |  |  |  |
| Software<br>User Interface          | User-defined testing parameters, calculating formula,<br>white balance adjustment, auto maximum brightness selection and<br>DC-index compliance with chromaticity specification |   |                          |  |  |  |  |  |
|                                     | Data storage  |   |                          |  |  |  |  |  |
| Measuring Area                      | 100 in. 60 in.  |   | 25 in.                   |  |  |  |  |  |
|                                     | (13 points & 29 points)   | (13 points & 29 points)   | (13 points) *1           |  |  |  |  |  |
| Body Modular                        | Fixed : 4:3, 16:9,16:10   | Fixed : 4:3, 16:9,16:10   | Fixed : 4:3, 16:9,16:10  |  |  |  |  |  |
|                                     | 3 in 1 : 4:3/16:9/16:10   | 3 in 1:4:3/16:9/16:10   | 3 in 1:4:3/16:9/16:10    |  |  |  |  |  |
| Chroma Meter<br>Measuring Area      |   | Ø22mm   |                          |  |  |  |  |  |
| Repeatability (2 $\sigma$ ) $^{*2}$ | Y: =  | $\pm$ 0.5% $\pm$ 1 digit ; x, y : $\pm$ 0.  | 0005                     |  |  |  |  |  |
| Accuracy *2                         | Y: ±2%±1 digit ; x, y : ±0.002  |   |                          |  |  |  |  |  |
| Data Communication                  |   | USB   |                          |  |  |  |  |  |
| Power                               | 1Ø 110  | 0~240V ±10% V <sub>LN</sub> , 47~63H  | z, 50VA                  |  |  |  |  |  |
| Power Consumption                   |   | 55VA max. (110V AC 60Hz)  | )                        |  |  |  |  |  |
| Operating                           | 1   | 5°C to 40°C (41°F to 104°F  | );                       |  |  |  |  |  |
| Temp./Humidity Range                | < 75  | 5% R.H. (without condensa   | tion)                    |  |  |  |  |  |
| Storage Temp./<br>Humidity Range    | 0°C to 50°C (32°F   | to 122°F) ; < 75% R.H. (with  | nout condensation)       |  |  |  |  |  |
| Certification                       |   | CE  |                          |  |  |  |  |  |

Note \*1:25 in. supports 13 chroma meters only

Note \*2 : Measurement condition is under 500 Lux illuminant A

#### **ORDERING INFORMATION**

7600A : Front Projector ATS
Project Board : 100 inch, 60 inch ,25 inch ; project ratio : Fixed - 4:3 / 16:9 / 16:10, 3 in 1 - 4:3/16:9/16:10
Body Modular : Fixed - 4:3,16:9,16:10 ; 3 in 1 - 4:3/16:9/16:10
71507 : Chroma meter (13 points)
71508 : Illuminance meter (16 points)
A760020 : RS232 to UART bridge
A766006 : USB to I<sup>2</sup>C bridge
LCD Display
Chroma Series Video Pattern Generators

Nanufacturing

| OLED Lifetime Test System                    | 5-1  |
|--|------|
| OLED Display Shorting Bar Pattern Generator  | 5-2  |
| LTPS Display Shorting Bar Pattern Generator  | 5-3  |
| LCD Shorting Bar Pattern Generator           | 5-4  |
| LCM Pattern Generator Card                   | 5-6  |
| LCM Tester                                   | 5-8  |
| FPD Tester                                   | 5-11 |
| LCM ATS                                      | 5-13 |
| DC Power Supply for LCM Burn-in Applications | 5-20 |
|  |      |



**OLED Lifetime Test System** 



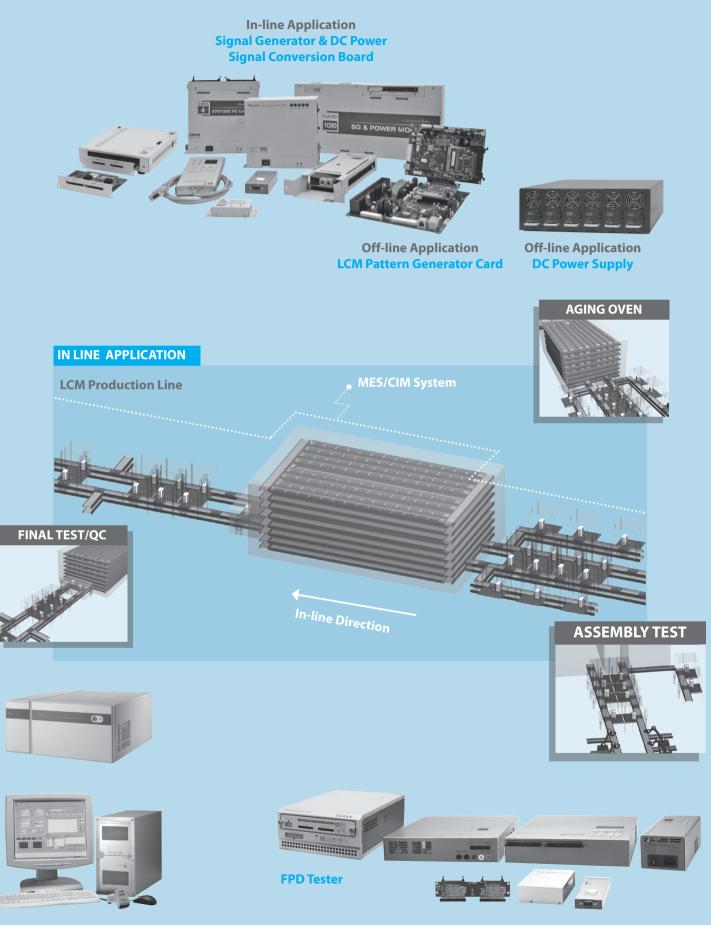
OLED Display Shorting Bar Pattern Generator



LTPS Display Shorting Bar Pattern Generator



LCD Shorting Bar Pattern Generator



**LCM ATS Family** 

**LCM Tester Family** 

# OLED Lifetime Test System



#### **KEY FEATURES**

- Individual PMU for each UUT
- Precision sourcing of current/voltage per UUT - Precision measurement unit per UUT
- Single UUT failure is self contained, will not interrupt or corrupt other UUT testing
- Test Function
  - Electrical Characteristics
  - Brightness
  - Programmable driving waveform (Bipolar current/voltage)
- Automatic testing and data logging - Standard Test System
- PXI Chassis with Controller
- Modular OLED test cards
- (one for every two OLED panels)
- Maximum 34 UUTs/system Optional Components
- TEC heater
- Spectrometer unit for in depth optical characterization
- Turnkey test solution
- Flexible test fixtures
- (Accept different OLED panel sizes) - Half rack with sliding drawers
- (4 fixtures per drawer)

The 58131 Lifetime Test System is designed specifically for the OLED industry. Model 58131 provides twoquadrant constant current (CC) and constant voltage (CV) stimulus to each OLED panel and acquires electrical and optical characteristics automatically. Two independent and isolated precision source-and-measure units (PMU) are incorporated in one modular card, which is capable of testing two OLED panels. Additional instrument cards are added to expand test capacity.

58131 comes with a simple to use windowing graphical interface. Configuration of stimulus voltage, current, duty cycle, calibration, and test intervals can be changed easily. Adjustable measurement frequency at different time intervals allows rapid sampling at initial stages and lengthened measurement period later on. Report generation, including graphical data presentation is available to facilitate data analysis. 58131 software is comprehensive enough for R&D in depth characterization, yet simple enough for production on-going reliability test operation.

58131 OLED Lifetime Test System offers good test capacity in a very small footprint, isolated PMU for each panel, and comprehensive software with a friendly user interface. Without a doubt, it is the best OLED test solution in the market.



#### Hardware

- 18-slot PXI Chassis
- ADLINK PXI-3920 above, 1GHz Embedded
- 52951 Two-Quadrant Source-Measure Card
- Optional 19" Rack of 20U
- Optional 19" LCD monitor, mouse & keyboard

#### Software

The test system provides a WindowsTM interface for easy configuration of all electrical & optical tests. Each test comprises:

- Multiple stimulus configuration
- Real time test data presentation in tabular and graphical forms
- Up to 34 UUTs
- Brightness calibration
- Automatic test termination when brightness test limit is reached



#### **Customized Test Fixture**

- 19" Rack Mount configuration
- Up to 34 test fixtures in drawers
- Flexible fixture design allows for different OLED panel sizes



#### Calibration

Independent calibration data for each channel

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|  | ng<br>Soft stander<br>gyffinder Professioner Hiller<br>2        | Todag Mich. Jander<br>Synthet + #W<br>I mad Have @W P10801-401110-3.             | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft stander<br>gyffinder Professioner Hiller<br>2        | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft stander<br>gyffinder Professioner Hiller<br>2        | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft stander<br>gyffinder Professioner Hiller<br>2        | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft stander<br>gyffinder Professioner Hiller<br>2        | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft kinnen<br>Application (Professional Profession)<br>2 | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft kinnen<br>Application (Professional Profession)<br>2 | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft kinnen<br>Application (Professional Profession)<br>2 | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |
|  | ng<br>Soft kinnen<br>Application (Professional Profession)<br>2 | Todag Matha Jandar<br>Synthe L + 4000<br>I mad failer @ 10 Price - 01-400/110-3. | Numir in<br>@`E4.4.<br>44 |               |

#### Graphical Data Presentation

| 017<br>A<br>05 | - •<br>B  | C C   |   |   |  |  | Δ-  |
|----------------|---|---|---|---|--|--|---|
| 06             |   |   |   |   |  |  |   |
|                |   |   | D   | E   | F  | G  | T   |
|                | 13.56192326   | 9.981699962   | 1845.967514   | 100   |  |  |   |
| ls             | 13.1150004  | 9.879114332   | 1864.367784   | 100.9967819   |  |  |   |
| 25             | 13.0204297  | 9.911854427   | 1876.232051   | 101.6394946   |  |  |   |
| 36             | 12,90450432   | 10.0188054  | 1887.243796   | 102.2360243   |  |  |   |
| 44             | 12.82518695   | 9.953325213   | 1888.593622   | 102.3091473   |  |  |   |
| 56             | 12.80688294   | 9.966421251   | 1895.129636   | 102.6632165   |  |  |   |
| 66             | 12,75197092   | 9.966421251   | 1899.818498   | 102.9172227   |  |  |   |
| 78             | 12.6934829  | 9.983882635   | 1900.173715   | 102.9364656   |  |  |   |
| 84             | 12.67722956   | 9.896575716   | 1898.965975   | 102.8710398   |  |  |   |
| 96             | 12,64672288   | 9.955507886   | 1903.796034   | 103.1327431   |  |  |   |
| 10s            | 12.63757087   | 9.940229175   | 1905.430935   | 103.2212604   |  |  |   |
| lls            | 12.6253682  | 9.983882635   | 1914.808679   | 103.7292728   |  |  |   |
| 12s            | 12.61926687   | 9.964238578   | 1913.174678   | 103.6407555   |  |  |   |
| 136            | 12.61316553   | 9.916219773   | 1915.519114   | 103.7677586   |  |  |   |
| 14s            | 12.54300017   | 10.04718015   | 1916.797897   | 103.837033  |  |  |   |
| 15s            | 12,53384816   | 9.964238578   | 1918.502942   | 103.9293989   |  |  |   |
| 16s            | 12.53843417   | 10:00134402   | 1915.092853   | 103.7446671   |  |  | 1   |
|                | 4s<br>5s<br>6s<br>9s<br>10s<br>11s<br>12s<br>13s<br>14s<br>15s<br>16s | 4 12.82518695<br>5 12.8068234<br>6 12.7597092<br>7 12.6924829<br>8 12.6722356<br>9 12.6467288<br>10 12.64575982<br>12 12 26455682<br>12 12 12 26455682<br>14 12.6453658<br>14 12.6453658<br>14 12.54584816<br>15 12.5584816<br>15 12.5584816<br>12 12.5584816<br>12 12 12 12 12 12 12 12 12 12 12 12 12 1 | 4         12.8353466         9.93832513           5         12.805466         9.966421251           6         12.73197020         9.066421251           78         12.6014025         9.066421251           8         12.6772366         9.80623755           9.01         12.6572286         9.806257766           10         12.6557086         9.006882635           11         12.655966         9.006882635           13         12.6559667         9.0019775           14         12.655967         9.0019775           15         12.5358646         9.00428578           16         12.5558446         9.00428578           15         12.53584456         9.00428578           16         12.5558447         10.00144074           16         12.5558447         10.00248057           16         12.5584477         10.00248057 | 44         L22511807         495132211         888.9592.2           55         L22605807         99642121         1951.206           66         L225119702         996421231         1951.206           70         L2261207         996421231         1951.206           70         L2261207         996421231         1951.206           70         L2264202         \$96820351         000.10715           70         L2264202         \$96820351         000.10815           70         L22647202         \$96800351         000.10816           70         L22647202         \$96800351         000.10816           70         L22647202         \$96800351         000.10806           70         L22647202         \$96800351         000.10806           70         L22647202         \$96800351         000.10806           70         L25517407         \$9551777         95551777           70         L25517407         \$9551777         \$95579875           75         L2384416         \$96242877         \$95579875           76         L2384416         \$96242877         \$95579875 | 4         L.2.2.11004         9.9313221         985.9520         9.9313221           5         L.2.2.80246         9.941321         9.9514231         9.9514231           6         L.2.2.91705         9.9442121         19.951424         9.951231           6         L.2.1.2.91705         9.9442121         19.951424         9.951231           6         L.2.5.21726         9.9442131         19.751424         9.931214           6         L.2.642726         9.9527151         9.0249244         19.112413         19.112413           6         L.2.6427264         9.9527151         9.0249244         19.112413         19.112413           10         L.2.6427264         9.9527151         9.0249244         19.112413         19.312413           10         L.2.6427264         9.8427157         9.512714         9.512714         9.512714         9.512714         19.51271444         19.5127144 </td <td>4.         L.20210005         9.0533212         988.75920         98.75920           5.         L.2080005         9.0543212         98.75920         98.75920         98.75920           5.         L.201005         9.0542121         98.75120         98.75120         98.75120           5.         L.201005         9.0542121         98.75140         98.75120         98.75120           5.         L.201005         9.05420151         96.45120         98.75140         198.75140         198.75140           5.         L.201005         9.05420151         96.45120         98.75140         198.75140         198.75140           5.         L.201005         9.05420151         96.451201         96.451201         96.451201           5.         L.2010105         96.45201151         96.451201         96.451201         96.451201           5.         L.2010105         96.4512015         96.451201         96.451201         96.451201           10.         L.2010105         96.4512015         96.451201         96.451201         96.451201           10.         L.20101005         96.451201         96.451201         96.451201         96.451201           10.         L.201440055         96.4511701         96.512010000</td> <td>4         L.2.2.11004         \$9333231         \$985.9502         \$9339231           5         L.2.2.8.2024         \$9842121         \$9534231         \$9534231           5         L.2.5.90705         \$9842121         \$9534231         \$9534231           5         L.2.5.90705         \$9842121         \$9534231         \$9534231           6         L.2.5.90705         \$9842131         \$9534231         \$9534231           6         L.2.6.90726         \$9535910         \$9334291         \$9331291           6         L.2.6.90726         \$93329941         \$9331291         \$9331291           10         L.2.6.90726         \$9432991         \$9331291         \$9331291           10         L.2.6.90726         \$9432991         \$9331291         \$9331291           10         L.2.6.90726         \$94329917         \$9331291         \$9331291           10         L.2.6.9067         \$94329917         \$9331291         \$933799           10         L.2.6.9067         \$9437997         \$933799         \$933799           10         L.2.6.9067         \$9437997         \$933799         \$933799           10         L.2.6.9067         \$9437997         \$9337999         \$933799</td> | 4.         L.20210005         9.0533212         988.75920         98.75920           5.         L.2080005         9.0543212         98.75920         98.75920         98.75920           5.         L.201005         9.0542121         98.75120         98.75120         98.75120           5.         L.201005         9.0542121         98.75140         98.75120         98.75120           5.         L.201005         9.05420151         96.45120         98.75140         198.75140         198.75140           5.         L.201005         9.05420151         96.45120         98.75140         198.75140         198.75140           5.         L.201005         9.05420151         96.451201         96.451201         96.451201           5.         L.2010105         96.45201151         96.451201         96.451201         96.451201           5.         L.2010105         96.4512015         96.451201         96.451201         96.451201           10.         L.2010105         96.4512015         96.451201         96.451201         96.451201           10.         L.20101005         96.451201         96.451201         96.451201         96.451201           10.         L.201440055         96.4511701         96.512010000 | 4         L.2.2.11004         \$9333231         \$985.9502         \$9339231           5         L.2.2.8.2024         \$9842121         \$9534231         \$9534231           5         L.2.5.90705         \$9842121         \$9534231         \$9534231           5         L.2.5.90705         \$9842121         \$9534231         \$9534231           6         L.2.5.90705         \$9842131         \$9534231         \$9534231           6         L.2.6.90726         \$9535910         \$9334291         \$9331291           6         L.2.6.90726         \$93329941         \$9331291         \$9331291           10         L.2.6.90726         \$9432991         \$9331291         \$9331291           10         L.2.6.90726         \$9432991         \$9331291         \$9331291           10         L.2.6.90726         \$94329917         \$9331291         \$9331291           10         L.2.6.9067         \$94329917         \$9331291         \$933799           10         L.2.6.9067         \$9437997         \$933799         \$933799           10         L.2.6.9067         \$9437997         \$933799         \$933799           10         L.2.6.9067         \$9437997         \$9337999         \$933799 |

Tabular Data Presentation

# Model 58131

| SPECIFICATIONS              | 5                                    |
|-----------------------------|--------------------------------------|
| HARDWARE                    |                                      |
| Model                       | 58131                                |
| Facilities                  |                                      |
| Power source                | 110/220VAC(50/60Hz)                  |
| voltage                     | 110/22007(C(30/00112)                |
| Electric power              | Maximum 1,000Watt                    |
| consumption                 |                                      |
| Storage                     | 0~75°C                               |
| temperature                 |                                      |
| Operation<br>environmental  | 0 ~ 35°C                             |
| temperature                 | 0~550                                |
| Operation                   |                                      |
| humidity                    | 35 ~ 90% RH (No condensation)        |
| Atmosphere                  | No corrosive gas environment         |
| Grounding                   | Grounding with 3-pin-plug            |
| Size of System              | W 600 x D1000 x H 1140 (mm)          |
| Weight                      | Approximately 150kg                  |
| Constant Curren             |                                      |
| Current Range               | 0~10mA(0.64W)                        |
| Step Current                | 5uA                                  |
| Accuracy                    | $\pm$ (0.5% Programmed Value + 30uA) |
| Current                     |                                      |
| Resolution                  | 12Bit                                |
| Maximum                     |                                      |
| Voltage                     | 18V                                  |
| <b>Constant Voltag</b>      | e Mode                               |
| Voltage Range               | ±18V                                 |
| Step Voltage                | 10mV                                 |
| Accuracy                    | $\pm$ (0.5% Programmed Value + 30mV) |
| Voltage                     | 120:4                                |
| Resolution                  | 12Bit                                |
| Switching Mode              | <u>}</u>                             |
| Output                      | CC/CV switching waveform             |
| Cycle time                  | 60HZ~120HZ(16.66msec~8.33msec)       |
| Duty Cycle                  | 1/256~256/256                        |
| <b>Current Measure</b>      | ement                                |
| Range                       | 0~10mA                               |
| Accuracy                    | +/-(0.5% Programmed Value + 40uA)    |
| Resolution                  | 12Bit                                |
| Voltage Measur              | ement                                |
| Range                       | +/-18V                               |
| Accuracy                    | +/-(0.5% Programmed Value + 40mV)    |
| Resolution                  | 12Bit                                |
| <b>Brightness</b> Meas      | surements                            |
|                             |                                      |
| Detector Type               | Si Photodiode                        |
| Detector Type<br>Wavelength |                                      |
|                             | Si Photodiode<br>320~1100nm          |
| Wavelength                  | 320~1100nm                           |
| Wavelength<br>range         |                                      |

#### SOFTWARE

#### **Operating Systems supported**

#### Microsoft Windows XP or 7

#### **Test Application**

- The application supports the following measurements: 1.Brightness
- 2. Constant Voltage mode Voltage and Current 3. Constant Current mode Voltage and Current

The application support the following features:

- Program restart can reload last configuration and status Multiple stimulus configuration
- (CC, CV, CC/-CV switching, CC/OFF switching, CV/OFF switching) • Stimulus parameter setting (Frequency, Duty, Voltage, Current) • Up to 34 UUTs, each UUT may pause and restart testing
- Automatic test termination when brightness test limit is reached Real time graphical presentation of current, voltage,
- relative brightness and test time
- Independent calibration data for each channel

#### **ORDERING INFORMATION**

Model 58131 : PXI OLED Lifetime Test System

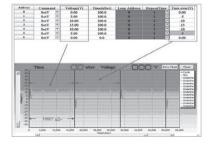
# OLED Display Shorting Bar Pattern Generator Model 58166

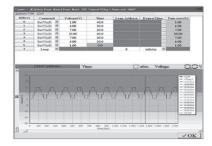


#### **KEY FEATURES**

Provide the test signal for different sizes of OLED display

- Powerful PC-based platform
- Flexible waveform editor
- Auto FTP download
- Engineer analysis function
- Lock function during testing
- 0-255 steps waveform output
- Auto discharge





58166 is a Shorting Bar Pattern Generator especially designed for OLED Cell inspection. The unique PC-Based architecture can upgrade the inspection Flow settings automatically from Server through FTP network without doing it on the client side respectively that increases the production efficiency significantly. The built-in RS-232 and USB interfaces can work with any AOI and Gamma optical measurement systems. 58166 can solve the problems that traditional equipments had in complex upgrade procedures, unfriendly user interface, difficult system integration and etc.

58166 works with 0.1  $\mu$  S high-resolution time unit to edit the output waveforms of Source and Gate. The strong driving capacity and High Slew Rate design along with the step waveform output for maximum 255 steps can output the inspected waveform accurately that also eliminate panel from any block effect. In addition, the unique engineer analysis mode can provide engineers the best test environment for waveform analysis.

Utilizing the flexible adjustment function to change the parameters of voltage and time in real time can acquire the most applicable test conditions for the production line during mass production. Auto discharge function is especially designed to prevent the residual charge and potential ESD from damaging the panel. 58166 helps improving production yield rate, optimizing inspection process and also reduces measurement cost.

58166 is the most compatible Shorting Bar Pattern Generator for OLED testing in the market today.

| SPECIFICATIONS             |                        |                      |               |  |  |  |
|----------------------------|------------------------|----------------------|---------------|--|--|--|
| Specifications of Inspect  | ion Signal             |                      |               |  |  |  |
| Type of signal             | Signal name            | Number of signal     | Voltage range |  |  |  |
| Data signal                | Data1~Data24           | 12*2                 | +40V ~ -40V   |  |  |  |
| Power signal               | VDD(V1)                | 1*1                  | 0~+40V        |  |  |  |
|                            | VSS(V2)                | 1*1                  | - 40 ~ 0 V    |  |  |  |
| Data signal (Vsign & WS)   | generator (Total 24CH) |                      |               |  |  |  |
| Vsign (Data 1~12)          | Output                 | + 40V ~ - 40V / 0.1A |               |  |  |  |
|                            | Voltage accuracy       | ±2% ±0.1V            |               |  |  |  |
|                            | Time base              | 0.1 µs               |               |  |  |  |
|                            | Quantity of Ch         | 12                   |               |  |  |  |
|                            | Load Regulation        | 2%                   |               |  |  |  |
| WS (Data 13~24)            | Output                 | + 40V ~ - 40V / 0.1A |               |  |  |  |
|                            | Voltage accuracy       | ±2% ±0.1V            |               |  |  |  |
|                            | Time base              | 0.1 µs               |               |  |  |  |
|                            | Quantity of Ch         | 12                   |               |  |  |  |
|                            | Load Regulation        | 2%                   |               |  |  |  |
| Power signal generator (To | otal 20CH+2CH)         |                      |               |  |  |  |
|                            | DC Output              | + 40V ~ 0V / 30A     |               |  |  |  |
| VDD(V1)                    | Voltage accuracy       | $\pm 1\% \pm 0.1V$   |               |  |  |  |
|                            | Load Regulation        | 5%                   |               |  |  |  |
|                            | DC Output              | 0V ~ - 40V / 50A     |               |  |  |  |
| VSS (V2)                   | Voltage accuracy       | ±1% ±0.1V            |               |  |  |  |
|                            | Load Regulation        | 5%                   |               |  |  |  |
| General Specification      |                        |                      |               |  |  |  |
| AC Power source voltage    | 220V/50Hz 1 \$\$500VA  |                      |               |  |  |  |
| Storage temperature        | 0~75°C                 |                      |               |  |  |  |
| Operation temperature      | 5 ~ 35°C               |                      |               |  |  |  |
| Operation humidity         | 35 ~ 90% RH (No conder | isation)             |               |  |  |  |
| Dimension (H x W x D)      | 1827 x 600 x 900 mm    |                      |               |  |  |  |
| Weight                     | Approximately 350kg    |                      |               |  |  |  |

Note\*1: VDD(V1) and VSS(V2) are DC, waveform editor is not applicable

#### **ORDERING INFORMATION**

Model 58166 : OLED Display Shorting Bar Pattern Generator

Electronics

Component Passive

PXI Test &

Manufacturing Execution System

# LTPS Display Shorting Bar Pattern Generator Model 58167



#### **KEY FEATURES**

- High Slew Rate of max. 2500V/µs
- Provide the test signal for E-paper and LTPS panels
- Powerful PC-based platform
- Auto FTP download
- Engineer analysis function
- Lock function during testing
- 512 steps waveform output
- Auto discharge
- 36 channels output

In the evolution of panel design, larger display and higher resolution will be the main-stream of future technology for panel manufacturers. LTPS TFT process is one of many technologies that could fulfill the abovementioned requirements. It had become a more and more important milestone for panel manufacturers who want to maintain their competitiveness.

58167 is a Shorting Bar Pattern Generator especially designed for OLED Cell inspection. The unique PC-Based architecture can upgrade the inspection Flow settings automatically from Server through FTP network without doing it on the client side respectively that increases the production efficiency significantly. The built-in RS-232 and USB interfaces can work with any AOI and Gamma optical measurement systems. 58167 can solve the problems that traditional equipments had in complex upgrade procedures, unfriendly user interface, difficult system integration and etc.

58167 is the most compatible Shorting Bar Pattern Generator for LTPS technology testing in the market today.

| SPECIFICATIONS         |                               |
|------------------------|-------------------------------|
| Model                  | 58167                         |
| Power source voltage   | 110/220VAC(50/60Hz)           |
| Storage temperature    | 0 ~ 75°C                      |
| Operation humidity     | 5 ~ 35°C                      |
| temperature            | 5~35 C                        |
| Operation humidity     | 35 ~ 90% RH (No condensation) |
| Dimension of Main unit | 130 x 442x 505 mm             |
| (HxWxD)                | 150 x 442x 505 11111          |
| Weight                 | Approximately 14 kg           |
| Data1~Data12           |                               |
| Output                 | + 20V ~ - 20V / 400mA         |
| Voltage Accuracy       | ±2% ±0.1V                     |
| Time base              | 0.1 µs                        |
| Number of output       | 12                            |
| Line Regulation        | 2%(full load, 1.8m cable)     |
| Data13~Data36          |                               |
| Output                 | + 40V ~ - 40V / 120mA         |
| Voltage Accuracy       | $\pm$ 2% $\pm$ 0.1V           |
| Time base              | 0.1 μs                        |
| Number of output       | 24                            |
| Line Regulation        | 2% (full load, 1.8m cable)    |

#### **ORDERING INFORMATION**

58167 : LTPS Shorting Bar Pattern Generator

# LCD Shorting Bar Pattern Generator

### Model 58162 Series



#### **KEY FEATURES**

- Strong Driving Capacity
- 0-255 step waves output
- Auto discharge
- 12 Source Output
- 8 Gate Output
- (expandable up to 16 channels) 4 COM Output
- Powerful PC-based platform
- Auto FTP download
- Friendly Flow editing
   Easy to integrate with AOI & Optical measure system
- Real-time voltage & time parameter adjustment
- Engineer Analysis Function

58162 is a high capability Shorting Bar Pattern Generator especially designed for LCD Cell inspection. The exclusive PC-Based architecture can download the inspection Flow settings automatically from Server through FTP network for update without doing it on the client respectively that increases the production efficiency significantly. The built-in RS-232 and USB interfaces can integrate with any AOI and Gamma optical measurement systems. 58162 can solve the problems of complex upgrade for traditional equipment, unfriendly user interface, difficult system integration and etc.

58162 works with 0.5  $\mu$  S high-resolution time unit to edit the output waveforms of Source and Gate. The strong driving capacity and High Slew Rate design along with the step waves output for maximum 512 steps can output the inspected waveform accurately to eliminate panel from any block. In addition the unique engineer analysis mode can provide engineers the best test environment for waveform analysis. Utilizing the flexible adjustment function to change the parameters of voltage and time in real time can acquire the most applicable test conditions for the production line during mass production. Auto discharge function is especially designed to prevent the residual charge and ESD from damaging the panel. 58162 not only increases the panel defect inspection ability, reduce the inspection process but also improve the production yield rate and lower down the measurement cost.

58162 is expandable with Gate extension board up to 24 channels that can satisfy the a-Si/LTPS multiple panel design in the future. It is the most compatible Shorting Bar Pattern Generator in the market today.

| SPECIFICATIONS<br>Model                    | 581                              | 62   | 5816       | 52-A          | 5816         | 2-AE          | 581       | 62-E     | 5816       | 2-EE |
|--|----------------------------------|--|------------|---------------|--------------|---------------|-----------|----------|------------|------|
| Power source<br>voltage                    | 551                              | 110/220VAC(50/60Hz)  |            |               |              |               |           |          | 5010       |      |
| Electric power<br>consumption              |                                  | Main unit : Maximum 500Watt  |            |               |              |               |           |          |            |      |
| Insulation<br>resistance                   | Min. 1                           | Min. 10M $\Omega$ at DC500V Mega (Between AC power source terminal and housing case) |            |               |              |               |           |          |            |      |
| Dielectric strength                        | 1 n                              | ninute o   | f AC 1000  | V (Betwe      | en AC po     | wer sour      | ce termin | al and h | ousing cas | se)  |
| Storage<br>temperature                     |                                  |  |            | . (Detire     | 0~7          |               |           |          | o using cu |      |
| Working<br>environmental<br>temperature    |                                  |  |            |               | 5~3          | 35°C          |           |          |            |      |
| Working humidity                           |                                  |  |            | 35 - 90       | 0% RH (No    | conder        | isation)  |          |            |      |
| Atmosphere                                 |                                  |  |            | No co         | orrosive ga  | is enviro     | nment     |          |            |      |
| Grounding                                  |                                  |  |            | Gro           | unding wi    | th 3-Pin      | -Plug     |          |            |      |
| Dimension of<br>Main unit(HxWxD)           |                                  |  |            | 1             | 30 x 442 >   | : 504 (mi     | m)        |          |            |      |
| Weight                                     |                                  |  |            | ŀ             | Approxim     | ately 14k     | g         |          |            |      |
| Type of signal                             |                                  |  |            |               |              |               |           |          | Number     |      |
| Type of signal                             | of signal                        |  |            |               |              |               |           |          | of signal  |      |
| Source (Data)                              | 6*2                              | -20 ~<br>+20V  | 6          | -20 ~<br>+20V | 6            | -20 ~<br>+20V |           |          |            |      |
| Common                                     | 1*2<br>1*2                       | -20 ~<br>+20V  | 1          | -20 ~<br>+20V | 1            | -20 ~<br>+20V | 12        | -40 ~    | 12*2       | -40  |
| Gate                                       | 4*2                              | -40 ~  | 4          | -40 ~         | 4            | -40 ~<br>+40V |           | +40V     | 12"2       | +40  |
| Gale                                       | 4"2                              | +40V   | 4          | +40V          | 12           | -40 ~<br>+40V |           |          |            |      |
| Specifications of li                       | nspectior                        | n Signal   |            |               |              |               |           |          |            |      |
| General                                    |                                  |  |            |               |              |               |           |          |            |      |
| Time base                                  |                                  |  |            |               | 0.5          | μs            |           |          |            |      |
| Frame period                               |                                  |  |            | 8             | ,000us ~1    | ,000,000      | us        |          |            |      |
| Source and<br>Common total<br>output power |                                  |  | 75 V       | Vatt          |              |               |           |          |            |      |
| Gate total output<br>power                 |                                  |  |            |               | 75 V         | Vatt          | 1         |          | 1          |      |
| Source signal gene                         | erator                           |  |            |               |              |               |           |          |            |      |
| Output                                     |                                  | -  | 20~+20     | / / 400m      | A            |               | -         | -        | -          | -    |
| Voltage accuracy                           |                                  |  | ±2%        | ±0.1V         |              |               |           |          |            |      |
| Number of output                           | 1                                | 2  |            |               | 6            |               | -         | _        |            |      |
| Load Regulation                            |                                  | 1.5  | %(full loa | d, 2m ca      | ble)         |               | -         | _        | -          | -    |
| Gate signal genera                         | ator                             |  |            | -             |              |               |           |          |            |      |
| Output                                     |                                  |  |            | -             | 40V ~ +40    | V/ 500m       | ۱A        |          |            |      |
| Voltage accuracy                           |                                  |  |            |               |              | .2V           |           |          |            |      |
| Number of output                           | 6                                | 3  | 4          | ŀ             | 1            | 6             | 1         | 2        | 2          | 4    |
| Load Regulation                            |                                  |  |            |               | 6 (full load |               |           |          |            |      |
| DC Voltage genera                          | tor                              |  |            |               |              |               |           |          |            |      |
| Output                                     |                                  | -:   | 20V ~ +20  | V / 400m      | ηA           |               | -         | -        | -          | -    |
| Voltage accuracy                           | -20V ~ +20V / 400mA<br>±2% ±0.1V |  |            |               |              |               |           | -        |            |      |
| Number of output                           | 4 2                              |  |            |               |              |               |           | -        |            |      |
| Load Regulation                            |                                  |  | %(full loa |               |              |               | -         | -        | -          | -    |
| Industrial Comput                          | er                               | 1.5  |            | , <u>_</u> cu | ,            |               |           |          |            |      |
| Operating System                           |                                  |  |            | \٨/i          | ndows XF     | Embed         | ded       |          |            |      |
| CPU  |                                  |  |            |               | 1.6 (        |               | acu       |          |            |      |
| Hard Disk                                  |                                  |  |            |               | 80 G         |               |           |          |            |      |
|  |                                  |  |            |               | 00 G         | byte          |           |          |            |      |
| RAM  |                                  |  |            |               | 1 Gk         | ovto          |           |          |            |      |

Patent Name : Multi-Channel Signal Generator for Optical Display Device with Protective Circuit Patent No. : 96208025

#### **ORDERING INFORMATION**

58162 : LCD Shorting Bar Pattern Generator 12S-8G-4C 58162-A : LCD Shorting Bar Pattern Generator 6S-4G-2C 58162-AE : LCD Shorting Bar Pattern Generator 6S-16G-2C 58162-E : LCD Shorting Bar Pattern Generator 12G 58162-EE : LCD Shorting Bar Pattern Generator 24G A581600 : Conversion board box



Conversion board box

/ Test &

# LCD Shorting Bar Pattern Generator

# Model 58168



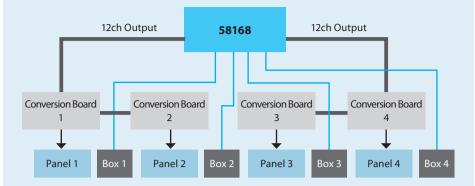
#### **KEY FEATURES**

- 24CH Output(12CH or 24CH, optional)
- 0~1024 step waves output
- Prober integration with RS-232
- Loading Recipes via SD Card
- 4 Colonization by 4 OP BOX
- Low cost

58168 is a high C/P ratio Shorting Bar Pattern Generator especially designed for small size LCD cell inspection. The exclusive modularized architecture provides the unique implement of inspections by "1 instrument, 4 Colonization", which provide 4 users 4 OP boxs to operate the only one 58168 instrument simultaneously but each one of them feel like that they own a whole instrument without interferenced by others. 58168 is truly suitable in low cost application display field.

58168 works with 0.5  $\mu$  s high-resolution time unit to edit the output waveforms of Data channels. All channels of each model are edited in PC's software and saved to SD card, which is capable of more than 500 models . Fast duplication of SD which is easy in PC provide the engineer with efficiency with the lack of network. In addition no PC is required while 58168 operates ensures low power consumption.

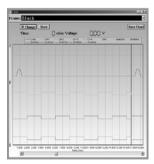
#### 4 Colonization by 4 OP BOX

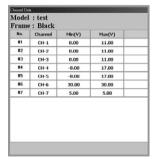


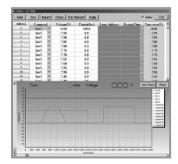
| SPECIFICATIONS                    |  |                            |               |
|-----------------------------------|--|----------------------------|---------------|
| Model                             | 58168                                      |                            |               |
| Power source voltage              |  | 110/220VAC(50/60Hz)        |               |
| Electric power consumption        | М  | ain unit: Maximum 200Wa    | att           |
| Storage temperature               |  | 0 ~ 75°C                   |               |
| Operation humidity<br>temperature | 5 ~ 35°C                                   |                            |               |
| Operation humidity                | 35   | ~ 90% RH (No condensati    | on)           |
| Dimension of Main unit<br>(HxWxD) |  | 190 x 320 x 370 mm         |               |
| Weight                            | Approximately 9.5kg                        |                            |               |
| Type of signal                    | Signal name                                | Number of signal           | Voltage range |
| Data                              | Data1, Data2, Data3<br>Data4, Data5, Data6 | 6*4                        | -40V~+40V     |
| Specifications of Inspection      | pection Signal                             |                            |               |
| General                           |  |                            |               |
| Time base                         | 0.5 μs                                     |                            |               |
| Frame period                      | 8000us ~100000us                           |                            |               |
| Total data output power           | 75 Watt                                    |                            |               |
| Source signal generator           |  |                            |               |
| Item                              | Content                                    |                            |               |
| Output                            | -40V ~ +40V / 120mA                        |                            |               |
| Voltage accuracy                  |  | ±2% ±0.1V                  |               |
| Time base                         |  | 0.5 us                     |               |
| Number of output                  |  | 24                         |               |
| Load Regulation                   |  | 2% (full load, 1.8m cable) |               |

| Path | C:\Documents | and Setting    | Model test - |
|------|--------------|----------------|--------------|
| No.  | Frome Name   | Cycle Time(s/S | ec) Note     |
| #1   | Black        | 16667          |              |
| 82   | Gray         | 16567          |              |
| 10   |              | 16667          |              |
|      | 6            | 16567          |              |
| \$5  | 8            | 16667          |              |
|      |              |                |              |

**Channel Editing Screen** 







Waveform of all channels Screen Channel Information Screen

**Channel Editing Screen** 

#### **ORDERING INFORMATION**

58168: LCD Shorting Bar Pattern Generator with 4 Colonization A581600 : Conversion board box



Conversion board box

# LCM Pattern Generator Card

# Model 27010 Series



#### **KEY FEATURES**

- LVDS / MIPI(Optional) / eDP(Optional) output
- Display size up to UHD 4096x2160@60Hz max
- Data Clock: Single 1 Lin 150MHz / 2 Link
- 300MHz/ 4Link 600MHz / 8Link 1.2GHz max
- Data Bits: 6/8/10bit programmable max
- Vdd output 2V~24V/3A programmable max
- Vbl output 2V~36V/6A programmable max
   Vbl/Vdim Dimming adjustable 0~8V max
- Voi/ voim Dimming adjustable 0-
- Power OCP protection
- Up / down load function
- Timing / Pattern Auto / Manual Run
- Low cost
- Customer design for user define

\* All specifications of 27010 series are customer design, please contact Chroma sales representative for detailed information.

To comply with the current digital standard signal, LCD and digital display for test application, the Pattern Generator Card is a low cost and high value-added product that can provide LCD manufactures for In-line or Batch oven of aging test.

This 27010 series LCM Pattern Generator Card can be output with LVDS signal. For the multimedia applications, the 27010 series can be support MIPI/eDP(optional). By supporting the display screen up to 4096x2160@60Hz, it is capable of performing LCD pixel inspection during production, OLB test, burn-in test, combination test, final test and life test widely.

The PG Card uses Programmable Logic Device which is the pattern generator for LCD MODULE test. It supports VGA~ UHD, 1 Link / 2 Link / 4 Link /8 Link and 30 sets Timings, 64 sets Patterns and 30 sets Programs max for testing.

The signal transmission using the method of replacement output to panel depends on the interface the LCD Module installed for the signal (LVDS, MIPI, eDP) used. As to power rating, its VDD support 2V~24V, 3A max output power is applicable to signal and LCD Module. Furthermore the required pattern, Color and other test functions can be set manually via the system control.

The PG card is equipped with a unique windowbased editing software. Its convenient operating environment allows users to set timings, create patterns, and edit programs as well as control the power on/off timings of the PG Card via PC. The created files can be uploaded or downloaded from data buffer to PG Card easily

#### 

for modification. This useful and practical design enables the software and testing parameter of PG Card be updated efficiently and optimizes its functions. Under this series could be customer design by user define.

#### Signal Conversion Board A270144

- Extension of the 2701007 PG Card for eDP/MIPI tests
- Signal Conversion Board modular design
- Compatible eDP V1.3 Standard
  - Resolution: 2560 x 1600 @ 60 Hz max
  - Lane rate : 1.62 / 2.7 Gbps selectable
  - Lane count : 1 / 2 / 4 Lane selectable
  - Color depth : 8 / 10 bits
- Compatible MIPI DSI V1.02.00 spec
  - Lane rate : 1 Gbps selectable
  - Lane count : 1 / 2 / 3 / 4 / 4+4 Lane selectable
  - Pixel format : RGB-565 / RGB-666 / RGB-888
- Output resolution up to
  - eDP up to 2560x1600 @ 60Hz (Max)
  - MIPI up to 2560x1600@60Hz Max (4+4 Lane)
- Able to provide 2 sets of eDP / MIPI
- standard signal source simultaneously
- Easy-to-use graphical interface
   Production line process control and data editing



The Chroma A270144 Signal Conversion Board is a device designed to convert signals to various types of video signals for output that can meet the testing demands of multimedia display industries for the products like Notebook, PAD and Mobile Phone.

The Signal Conversion Board supports the latest eDP and MIPI standard and featured as follows:

Display Port is a digital video interface standard promoted by Video Electronics

#### 27010 Series Pattern Generator Cards

Standards Association (VESA). It is one of the new generation specifications in video display interface technology that can transmit image and voice data when connected to PC with display (screen) or PC with home theatre system or DVD player and Notebook, etc. to replace the traditional LVDS interfaces.

The latest specification, eDP (embedded Display Port), developed by VESA for mobile devices is also becoming the major internal interface specification of portable PCs such as notebook and tablet PC.

MIPI (Mobile Industry Processor Interface) designed for handheld electronic products have the following main standards.

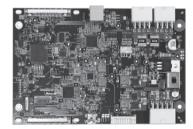
DCS (Display command set) specifies the control command set ; DSI (Display Serial Interface) specifies the transmission interface between CPU and display module (ex. MIPI signal source output) All of the above can easily by Chroma software.

#### eDP Bist module A270148

- Compatible eDP V1.3 Standard
  - Version: Support DPCD V1.1
  - DP AUX Channel : 1MHz
- BIST mode : DPCD Read / Write control
- Vdd output 3V~12V/3A programmable max

Vbl output 10V~24V/6A programmable max
 Able to provide 2 sets of eDP BIST signal

- source simultaneously
- Easy-to-use graphical interface
   Production line process control and data editing



A270148 eDP Bist module can provides the DPCD control signal and power for panel into BIST mode, integrate with Chroma Aging system can provide a complete eDP panel aging test solution.



PXI Test &

# LCM Pattern Generator Card

# Model 27010 Series

| 規格表                       |   |  |  |  |
|---------------------------|---|--|--|--|
| Model                     | 2701007   | 2701007 10 bit   | 2701009 *  | 2701020  |
| LVDS Interface            |   |  |  |  |
| Resolution                | up to 1920 x1080/60Hz                                       | up to 2560 x1600/60Hz                                  | up to 4096x2160/120Hz  | up to 2560 x1600/60Hz                                |
| 1 Link                    | 90MHz   | 135MHz   | 150MHz   | 135MHz   |
| 2 Link                    | 180MHz (90MHz x 2)  | 270MHz (135MHz x 2)                                    | 300MHz (150MHz x 2)  | 270MHz (135MHz x 2)                                  |
| Pixel Rate 4 Link         | -   | -  | 600 MHz (150MHz x 4)   | 330MHz   |
| 8 Link                    | -   | -  | 1.2 GHz (150MHz x 8)   |  |
| Color Depth               | 6/8 bits  | 6/8/10 bits  | 6/8/10 bits  | 6/8/10 bits<br>(10bit for gray scale)                |
| Output Mode               | 2 Channel x 2   | 2 Channel x 2  | 8 channel x 1 / 4 channel x 2 /<br>2 channel x 4 / 1 channel x 4 | 2 Channel x 2<br>4 Channel x 1                       |
| I/O                       | Box Head 34pin  | Box Head 40pin   | JAE 51 pin   | Box Head 50pin                                       |
| Power Requirement         |   |  |  |  |
| Input (Vdd)               | 15V/3A  | 15V/3A   | 16V/8A   | 16V/10A  |
| Output (DC)               | Vdd : 3.3,5,12V/2.5A<br>Vbl : 12,24V/6A max<br>Vif : 3.3,5V | Vdd : 3.3~12V/3A<br>Vbl : 12~24V/6A<br>Vif : 3.3/5V/1A | Vdd : 2 ~24 V/6A<br>Vbl : 2~36V/12A                              | Vdd : 3.3~13V/4A max<br>Vbl : 10~25V/26A<br>Vif : 5V |
| Communication Interface   | RS-485  | RS-485   | Ethernet   | RS-485   |
| Vdim                      | 0~7V/0.1 step   | 0~7V/0.1 step  | 0 ~ 8V/0.1 step  | 0~7V/0.1 step  |
| Inverter Voltage          | On : 5V ; Off : 0V  | On : 5V ; Off : 0V                                     | On : 3.3V ; Off : 0V   | On : 5V ; Off : 0V                                   |
| Power Sequence Resolut    | tion  |  | · · · · · ·  |  |
| Turn-on (Vdd/Signal/Vbl)  | 1ms   | 1ms  | 1ms  | 1ms  |
| Turn-off (Vdd/Signal/Vbl) | 1ms   | 1ms  | 1ms  | 1ms  |
| Operation                 |   |  |  |  |
| Pattern Control           | 64 sets auto/manual<br>(30 sets by editing)                 | 64 sets auto/manual<br>(30 sets by editing)            | 200 sets by editing  | 64 sets auto/manual<br>(30 sets by editing)          |
| Timing Control            | 30 sets by editing  | 30 sets by editing                                     | 200 sets by editing  | 30 sets by editing                                   |
| Program Control           | 30 sets by editing  | 30 sets by editing                                     | 100 sets by editing  | 30 sets by editing                                   |
| Environment               |   |  |  |  |
| Operation Temperature     | 0~60°C  | 0~60°C   | 0~60°C   | 0~60°C   |
| Storage Temperature       | -20~80°C  | -20~80°C   | -20~80°C   | -20~80°C   |
| Humidity                  | 0~80%   | 0~80%  | 0~80%  | 0~80%  |
| Dimension                 |   |  |  |  |
| HxWxD                     | 180x140x30 mm   | 180x140x30 mm  | 216x66x228 mm  | 210x230x60mm   |
| Weight                    | 845g  | 845g   | 2000g  | 1870g  |
|                           |   |  |  |  |

| Model                 | A270144                     |  |
|-----------------------|-----------------------------|--|
| Main Board            |                             |  |
|                       | LVDS 2 Link                 |  |
| Input Video           | 25 ~ 135 MHz / 1 Link       |  |
|                       | 50 ~ 270 MHz / 2 Link       |  |
| Vdd(Vcc)              | By pass from PG Card        |  |
| Input Power           | DC +16V                     |  |
| Communication         | RS-485                      |  |
| eDP Signal Module     |                             |  |
| Compliant             | eDP V1.3                    |  |
| Resolution            | 2560 x 1600 @ 60 Hz max     |  |
| Lane rate             | 1.62 / 2.7 Gbps             |  |
| Lane Count            | 1 / 2 / 4 Lane              |  |
| Color depth           | 8 /10 bits                  |  |
| Function              | HPD / EDID                  |  |
| MIPI Signal Module *  |                             |  |
| Compliant             | MIPI DSI V1.02.00           |  |
| Resolution            | 2560 x 1600 @ 60 Hz max     |  |
| Lane rate             | 1 Gbps                      |  |
| Lane Count            | 1/2/3/4/4+4 Lane            |  |
| Pixel format          | RGB-565 / RGB-666 / RGB-888 |  |
| Environment           |                             |  |
| Operation Temperature | 20 ~ 60°C                   |  |
| Storage Temperature   | -20 ~ 70°C                  |  |
| Humidity              | 70%                         |  |
| Dimension (H x W x D) | 16x153x82 mm                |  |
| Weight                | 85g                         |  |

| Model                 | A270148 *                 |
|-----------------------|---------------------------|
| Main Board            |                           |
| Input Power           | LDC + 16V                 |
| Vdd(Vcc)              | RS-485                    |
| eDP Signal Module     |                           |
| Compliant             | eDP V1.3                  |
| DP AUX Channel        | 1 MHz                     |
| BIST Mode             | DPCD Read / Write control |
| Lane Count            | 1 / 2 / 4 Lane            |
| Color depth           | 8 /10 bits                |
| Function              | HPD / EDID                |
| Environment           |                           |
| Operation Temperature | 20 ~ 60°C                 |
| Storage Temperature   | 0 ~ 70°C                  |
| Humidity              | 70%                       |
| Dimension (H x W x D) | 17x163x105 mm             |
| Weight                | 300g                      |

\* Call for availability

#### ORDERING INFORMATION

2701007 : Pattern Generator Card, 2CH Signal 90MHz/Dual 180Hz 2701007 10 bit : Pattern Generator Card, 2CH Signal 135MHz/Dual 270MHz 2701009 : Pattern Generator Card 8 CH 2701020 : Pattern Generator Card, 4CH 330MHz/10bit A2701005 : Remote Keypad A270105 : Remote Keypad A270114 : Hub A270121 : External Control Box A270144 : Signal Conversion Board A270148 : eDP Bist Module

### **LCM** Tester

# Model 27011



#### **KEY FEATURES**

LVDS / TTL (Optional) / TMDS (Optional) output

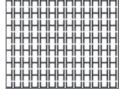
- Pixel rate up to 162 MHz (LVDS x 2 Link)
   Display size up to UXGA (1600 x 1200)
- Isplay size up to UXGA (1600 x 1200
   16 timings selecting and editing
- 64 patterns library (32 sets by editing)
- 16 programs (total 3553 sequence)
- 12V / 5V output for backlight
- 12V / 5V / 3.3V output for Vdd
- Power on sequence for signal / Vdd
- Timing / Pattern editing via PC
- Up / down load function

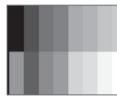
Timing / Pattern Auto / Manual Run
 Low cost

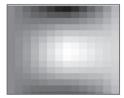












### CE ELVDS Power

To meet the high accuracy and low price requirements for LCM test device, Chroma 27011 that integrates the signal and power source provide a complete test solution for LCD Module. Its LVDS / TTL signal source fully complies with the digital signal standard, meanwhile with the 12V/5V/3.3V DC source output it is able to supply power to VDD/Backlight for LCM test without obtaining external power source. Equipped with the interface of single key to switch the timing/pattern/program rapidly for test in auto or manual mode, the 27011 is able to provide a direct and convenient test environment for LCM by its complete hardware configuration and easy operation.

To fulfill the standard test signal requirements of various panels, this device supports LVDS signal with optional TTL signal available for use. It has 16 timings, 64 patterns, auto image rotation display system and multiple test functions settings. In addition an editor software is available for editing timing / pattern / program at PC site to create a product specific test program. The design of signal and power source integration for 27011 allows it to be utilized extensively in R&D/Quality Assurance/ Quality Inspection/After Sales Services/Sales fields for LCM related tests.

The Programmable Logic Device is used in 27011 as the image generator to test the LCD Module. It supports VGA, SVGA, XGA, SXGA, UXGA and

1 Link / 2 Link digital signal output, also it has quartz oscillator built in to supply stable test signals as the standard signal source to the Device Under Test. This test device provides LVDS signal primarily, however, users can purchase the optional TTL signal conversion board for use to cope with the LCM features.

Besides the power source input of AC 90~250V, it has the 12V / 5V / 3.3V DC power switch required by the LCM Vdd in the market and the 12V / 5V power for Backlight Inverter. Moreover, it has Signal/Vdd power on sequence to fit in the LCM Turn On test sequence.

As regards operation, 27011 can switch the Timing / Pattern and Program by the Mode key on the front panel directly to show the status on a 7-segament display. Users can select the required Timing and switch it to Pattern mode by pressing the Mode key, or switch it to program; and then conduct the test automatically or manually. It can execute tests easily and quickly with the convenient operation method and multiple function keys.

#### ORDERING INFORMATION

27011 : LCM Tester A270100 : Data Bank A270111 : LVDS to TTL Signal Adapter A270112 : TTL to TMDS Signal Adapter

| SPECIFICATIONS               |   |                    |                |  |
|------------------------------|---|--------------------|----------------|--|
| Model                        |   | 27011              |                |  |
| Output                       | LVDS  |                    |                |  |
| Option                       | TTL (A270   | 111) / TMDS (A27   | 0112)          |  |
| Pixel Range                  | Pixel Range   |                    |                |  |
| Pixel Rate                   | 1 Link  | 2 L                | ink            |  |
| 25.175MHz                    | VGA (25.175MHz)   |                    | -              |  |
| 40MHz                        | SVGA (40MHz)  |                    | -              |  |
| 32.5MHz                      | XGA (65MHz)   | XGA (6             | 5MHz)          |  |
| 54MHz                        | -   | SXGA (1            | 08MHz)         |  |
| 81MHz                        | -   | UXGA (1            | 62MHz)         |  |
| Signal Interface             |   |                    |                |  |
| Signal                       | LVDS (6 or 8 bit)   |                    |                |  |
| Connector                    | Box Header 26 Pin Right Angle   |                    |                |  |
| Power Requirement            |   |                    |                |  |
| Input (AC)                   | 1Ø 110~240V ±10% V <sub>LH,</sub> 47~63Hz                             |                    |                |  |
| Output (DC)                  | 5V/2.5A max. and 12V/4A max. (for Backlight)<br>12V/5V/3.3V (for Vdd) |                    |                |  |
| Power Sequence<br>Resolution | Main Board PWR Vdd Signal   |                    | Signal         |  |
| Turn-on                      | 1ms   | 1ms                | 1ms            |  |
| Turn-off                     | -   | 1ms                | 1ms            |  |
| Operation                    |   |                    |                |  |
| Pattern Control              | 64 sets auto / manual (32 sets by editing)                            |                    |                |  |
| Timing Control               | 16 sets auto / manual   |                    |                |  |
| Program Control              | 16 programs (Total 3553 sequence max.)                                |                    |                |  |
| Environment                  |   |                    |                |  |
| <b>Operation Temperature</b> | 0 ~ 60°C  |                    |                |  |
| Storage Temperature          | -20 ~ +80°C   |                    |                |  |
| Humidity                     |   | 0 ~ 80 %           |                |  |
| Dimension (H x W x D)        | 84.4 x 103.5 x 232  | 2.2 mm / 3.32 x 4. | 07 x 9.14 inch |  |
| Weight                       | 1.4 kg / 3.08 lbs   |                    |                |  |





A270100

PXI Test &

Photovoltaic Test & Automation

Automated

Electronics

Test &

Passive

# LCM Tester

# Model 27012



#### **KEY FEATURES**

- Support LCD TV Module Testing
- LVDS signals output
- TTL (Optional) signals output
- Pixel rate up to 162 MHz (LVDSX2 Link)
- Display size up to 1920X1080 @ 60Hz
- 16 timings for selection
- 64 patterns library
- 16 programs (total 3553 sequence)
- 24V / 12V / 5V output for Vbl
- 12V / 5V / 3.3V output for Vdd
- Power on sequence for signal / Vdd
- Timing / Pattern editing & download
- Timing / Pattern Auto / Manual Run
- Low cost





### CE ELVDS Power

To meet the high accuracy and low price requirements for LCM TV test device, Chroma 27012 that integrates the signal and power source provide a complete test solution for LCD Module. Its LVDS / TTL(Option) signal source fully complies with the digital signal standard, meanwhile with the 24V/12V/5V/3.3V DC source output it is able to supply power to VDD/ Backlight for LCM test without obtaining external power source. Equipped with the interface of single key to switch the Timing/Pattern/Program rapidly for test in auto or manual mode, the 27012 is able to provide a direct and convenient test environment for LCM TV by its complete hardware configuration and easy operation.

To fulfill the standard test signal requirements of various panels, this device supports LVDS signal with optional TTL signal available for use. It has 16 timings, 64 patterns, auto image rotation display system and multiple test functions settings. In addition an editor software is available for editing Timing/Pattern/Program at PC site to create a product specific test program. The design of signal and power source integration for 27012 allows it to be utilized extensively in R&D/Quality Assurance/ Quality Inspection/After Sales Services/Sales fields for LCM related tests.

The Programmable Logic Device is used in 27012 as the image generator to test the LCD TV Module. It supports VGA~UXGA and 1 Link/2 Link digital

signal output, also it has quartz oscillator built in to supply stable test signals as the standard signal source to the Device Under Test. This test device provides LVDS signal primarily, however, users can purchase the optional TTL signal conversion board for use to cope with the LCM TV features.

Besides the power source input of AC 100V~240V, it has the 12V/5V/3.3V DC power switch required by the LCM Vdd in the market and the 24V/12V/5V power for Backlight Inverter. Moreover, it has Signal/Vdd power on sequence to fit in the LCM TV Turn On test sequence.

As regards operation, 27012 can switch the Timing/Pattern and Program by the Mode key on the front panel directly to show the status on a 7-segament display. Users can select the required Timing and switch it to Pattern mode by pressing the Mode key, or switch it to program for test program editing; and then conduct the test automatically or manually. It can execute tests easily and quickly with the convenient operation method and multiple function keys.

#### ORDERING INFORMATION

27012 : LCM Tester A270100 : Data Bank A270103 : Editor Software A270111 : LVDS to TTL Signal Adapter

| SPECIFICATIONS        |  |                     |                  |
|-----------------------|--|---------------------|------------------|
| Model                 |  | 27012               |                  |
| Output                | LVDS   |                     |                  |
| Option                | TTL (A270111) / TM                                 | DS (A270112) / Dat  | a Bank (A270100) |
| Pixel Range           |  |                     |                  |
| Pixel Rate            | 1 Link up to 81 MHz                                | 2 Link up t         | o 162 MHz        |
| 25.175MHz             | VGA (25.175MHz)                                    |                     | -                |
| 40MHz                 | SVGA (40MHz)                                       |                     | -                |
| 32.5MHz               | XGA (65MHz)  | XGA (6              | 55MHz)           |
| 54MHz                 | -  | SXGA (1             | 08MHz)           |
| 81MHz                 | -  | UXGA (1             | I62MHz)          |
| Signal Interface      |  |                     |                  |
| Signal                | LVDS (6 or 8 bit)                                  |                     |                  |
| Connector             | Box Header 34 Pin (Compatible with 27011)          |                     |                  |
| Power Requirement     |  |                     |                  |
| Input (AC)            | 1Ø 110~240V ±10% VLH, 47~63Hz                      |                     |                  |
| Output (DC)           | 5V / 1.5A ; 12V / 7A ; 24V / 6.5A max. (for Vbl) ; |                     |                  |
| • • •                 | 12V / 5V / 3.3V / 3.5A (for Vdd)                   |                     |                  |
| Power Sequence        | Vdd  | Signal              | Vbl              |
| Resolution            | -  |                     |                  |
| Turn-on               | 1ms  | 1ms                 | 1ms              |
| Turn-off              | 1ms  | 1ms                 | 1ms              |
| Operation             |  | (                   | 11.1 3           |
| Pattern Control       | 64 sets auto / manual (32 sets by editing)         |                     |                  |
| Timing Control        | 16 sets auto / manual                              |                     |                  |
| Program Control       | 16 programs (Total 3553 sequence max.)             |                     |                  |
| Environment           |  |                     |                  |
| Operation Temperature |  | 0~40°C              |                  |
| Storage Temperature   |  | -20 ~ +70°C         |                  |
| Humidity              |  | 0~70%               |                  |
| Dimension (H x W x D) | 69.6 x 310.5 x 2                                   | 73 mm / 2.74 x 12.2 | 2 x 10.75 inch   |
| Weight                | 3.3 kg / 7.27 lbs                                  |                     |                  |



A270111



A270100

# LCM Tester





#### KEY FEATURES

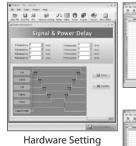
- LVDS Signals support
  - 1 / 2 / 4 Channel output
  - Color depth 6 / 8 / 10bits
  - 2 output port
  - Pixel rate up to 330MHz (1 Link 135MHz / 2 Link 270MHz / 4 Link 330MHz)
- The Resolution up to 2560x1600
- 30 sets Timing / Power / Program selection
- 64 sets Pattern
- Vdd output 3.3~13V / 3.5A programmable
- Vbl by pass outside DC source
- DC Power protection OCP
- EDID Read / Write / Compare
- 10 sets EDID data store
- Auto / Manual Pattern switch
- Auto Pattern switch delay time setting
- Power on sequence for signal / Vdd / Vbl (External)
- RGB Signal reverse Hot Key
- Control by RS-232

Chroma 27013 is a portable tester that supports high resolution and large scale LCM with the signals, power supply and test patterns required for LCD Module test.

Users can edit various timing parameters and patterns on PC via software applications. Auto execution or one-key manual control on the device can switch the Timing / Pattern / Program mode rapidly. The easy and convenient operation along with compound key usage made the 27013 LCM Tester most applicable for R&D/ Quality Assurance/ Quality Verification/ Services/ Sales areas for LCM related tests.

27013 LCM Tester contains the following features: (1) Comply with Full HD 120Hz Test: The 27013 LCM Tester supports LVDS signal with pixel rate

#### **PG Master Software**





Timing Setting

### € ELVDS Power Full HD 120Hz

330MHz (1 Link 135MHz/2 Link 270MHz/4 Link 330MHz ) that can test the screen resolution up to 2560x1600 pixels to meet the test requirements for standard test signal of various panels today and Full HD 120Hz (Double frame rate.)

#### (2) Providing, Measuring & Determining

**Output Power:** The system provides 3.3~13V / 3.5A VDD output power for users to set auto test by LCM's electrical features. Each output channel is able to simulate the timing relationship of power on/off and over voltage protection function. Protection occurs when the power parameter exceeds the predefined range.

(3) Complete Test Patterns: The large capacity of memory provides 30 Timings/64 Patterns with many built-in standard test patterns. The 27013 not only can generate the patterns of 10Bit grayscale, pure color, stripes, text and cross.

(4) Separate RGB Signal Control: The panel of 27013 LCM Tester has several rapid one-key operation modes which include: R, G, B & Inversion signal separation and resume – it can separate or resume one of the RGB signals in the display screen; while the Inversion reverses the pattern display on the screen.

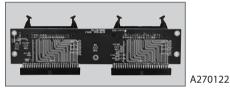
Timing / Pattern / Program / Power mode – users can create the test program specially for UUT by the PC software application and conduct one-key operation from the panel directly. The VDD rapid key is able to switch the built-in 3 fixed voltage settings 3.3V/5V/12V directly to meet the power output conditions for most LCM tests rapidly.

(5) RS-232 Interface for Data Upload/ Download: 27013 LCM Tester with PG MASTER software can edit the test programs and upload/ download edited data through the RS-232 interface data control box. Users can update test programs on different testers via the data control box directly without controlling by PC to save the time effectively.

Chroma 27013 carried complete test functions with highly accurate signals and power source. It adopts 20x4 LCD screen in compact size with friendly user interface, and its small-scale design can be used flexibly on various tests to satisfy the work unit that needs to move often. The powerful function and fast test speed make it the best tool for production test.

### ORDERING INFORMATION 27013 : LCM Tester

A270122 : Conversion Board 50pin to 34pin



| SPECIFICATIONS            |  |                              |                   |
|---------------------------|--|------------------------------|-------------------|
| Model                     | 27013                                    |                              |                   |
| Output                    | LVDS                                     |                              |                   |
| Option                    |  | DataBank                     |                   |
| LVDS interface            |  |                              |                   |
| Resolution                | Up to 256                                | 50x1600 / 60Hz , 1920X108    | 30 / 120Hz        |
| Pixel Rate                | 1 link up to 135MH                       | lz / 2 link up to 270MHz / 4 | link up to 330MHz |
| Color Deep                | 6/8/10bits                               | Programmable (10bit for      | gray scale)       |
| Output mode               | 2  | 2 Channel x2 / 4 Channel x   | 1                 |
| Connector                 |  | Box Header 50Pin             |                   |
| Power Requirement         |  |                              |                   |
| Input (AC)                | 1Ø <sup>-</sup>                          | 110~240V ±10% VLH 47~6       | i3Hz              |
|                           | Vdd : 3.3V~13V, 3.5A programmable        |                              |                   |
| Output (DC)               | Vb                                       | ol : Internal 12V / 24V 4A M | ах                |
|                           | Extenal 25V / 26A Max                    |                              |                   |
| Vdim                      |  | 0V~7V Step 0.1V              |                   |
| Inverter Voltage          | On: 5V , Off: 0V                         |                              |                   |
| Power Sequence Resolution |  |                              |                   |
| -                         | Vdd                                      | Signal                       | Vbl               |
| Turn-on                   | 1ms                                      | 1ms                          | 1ms               |
| Turen-off                 | 1ms                                      | 1ms                          | 1ms               |
| Operation                 |  |                              |                   |
| Pattern Control           | 64 sets auto/manual (30 sets by editing) |                              |                   |
| Timing Control            | 30 sets by editing                       |                              |                   |
| Program Control           | 30 sets by editing                       |                              |                   |
| EDID Application          |  |                              |                   |
| EDID 1                    | Read / Write / Compare                   |                              |                   |
| EDID 2                    | Read / Write / Compare                   |                              |                   |
| EEDID                     | Read / Write / Compare                   |                              |                   |
| EDID store                | 10 sets EDID Data store                  |                              |                   |
| Environment               |  |                              |                   |
| Operation Temperature     |  | 0~40°C                       |                   |
| Storage Temperature       |  | -20~70°C                     |                   |
| Humidity                  |  | 0~80%                        |                   |
| Dimension (H x W x D)     | 69 x 309.3                               | x 271.5 mm / 2.74 x 12.18 :  | x 10.69 inch      |
| Weight                    |  | 2.9 kg / 6.39 lbs            |                   |

**Power Setting** 

Pattern Setting

PXI Test &

Manufacturing Execution System

### **FPD** Tester

# Model 27014



#### **KEY FEATURES**

- Modular interface design for various panel test application
  - One LVDS module (option) + One MIPI
- / eDP / V-by-One signal module (option)
   Highly accurate programmable power
   VDD 2 ~ 20V / 10A max, 36W max
- (24W max available on September) - VBL 2 ~ 25V / 20A max, 100W Max
- (100W max available on September)
- Real-time voltage / current measurement
- Programmable power protection function
- On / off timing programmable
- Editable timing, pattern and power source for test program combination
- User friendly edit software available
   Cross coordinate defect positioning function
- Bitmap file display function
- Scrolling pattern display function
- eDP 1.4 Signal module (Option)
  - Support up to UHD (5K x 3K@60Hz)
  - 6 / 8 / 10 bit color depth
  - 1.62 / 2.16 / 2.43 / 2.7 / 3.24 / 4.32 /
  - 5.4Gbps per lane
  - 1 / 2 / 4 / 8 Link
  - 0 / 3.5 / 6 / 9.5 dB pre-emphasis
  - 200 / 250 / 300 / 350 / 400 / 450 / 600 /
  - 800 / 1000mV Swing level
  - PSR1 test function





Chroma 27014 FPD Tester is a complete test solution that meets the requirements for LCM tests and production line and control by friendly remote keypad integrate the video generator, multi-channel precision power supply and process control unit for LCM signals, patterns and electricity tests.

Users can use software to edit the test program according to the LCM task features to create a comprehensive and effortless test mode for production improvement.

Chroma 27014 FPD Tester has the following test functions:

Test Program Editing: It sets the parameters of Turn On / Turn Off, Timing, Pattern and O.C.P. / O.V.P. / U.C.P. / U.V.P. following the LCM specification to offer a complete and accurate test.

Screen Quality Test: It has built in standard patterns for use, or users can create the required geometric patterns by assembling the Icons randomly or input the natural picture with BMP extension. With the pattern preview function, it is very convenient to edit it.

Timing Setting and Pattern Editing: Besides the default VESA timings and patterns available for use, users can define their own test timings and patterns for application.

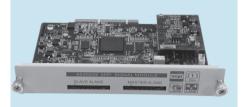
#### **ORDERING INFORMATION**

- \* 27014 : FPD Tester
- \* eDP+MIPI Signal Module
- \* MIPI Signal Module
- \* V-by-One Signal Module
- \* eDP 1.4 Signal Module
- \* LVDS Output Module

\* Call for availability



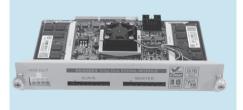
eDP+MIPI Signal Module



**MIPI Signal Module** 



eDP Signal Module



V-by-One Signal Module



eDP 1.4 Signal Module



Remote Control Box

# **FPD** Tester

# Model 27014

#### SPECIFICATIONS

| Model                      | 27014  |
|----------------------------|--|
| Main Frame                 |  |
| Configuration              | Embedded MCU with FPGA graphic engine        |
| Circuit in the offense     | Slot front: Option for eDP / MIPI / V-by-One |
| Signal interface           | Slot upper: Option for LVDS 4 ch             |
| I <sup>2</sup> C x 1       | Floating / 0V / 3.3V / 5 V programmable      |
| (VBL output connector)     | Floating / 0v / 3.3v / 5 v programmable      |
| Inverter On/Off Control    | 0V / 3.3V / 5V programmable                  |
| (VBL output connector)     | 0v / 5.5v / 5v programmable                  |
| Analog Vdim control        | 0.8V(20mA) 0.1V(top programmable)            |
| (VBL output connector)     | 0~8 V (20mA), 0.1Vstep programmable          |
| Digital Vdim control (PWM) | 3.3V / 5V                                    |
| (VBL output connector)     | Frequency 100~15K Hz / 1 Hz step             |
| (VBL Output connector)     | Duty cycle 0~100% +/-1%                      |

| Data Store            |   |
|-----------------------|---|
| Timing                | 50  |
| Pattern               | Logic: 300 BMP: 8G Memory (999 BMP files max) |
| Program               | 50  |
| Power                 | 50  |
| Communication I/O     |   |
| Remote / PC           | D-Sub 15                                      |
| Application Functions |   |
| Cursor                | Display x, y coordinates and RGB values       |
| Motion Pattern        | Moving direction and speed programmable       |
|                       |   |

| VDD Output                  |  |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
|-----------------------------|--|--------------|--------------------|------------|-----------------------------|----------------------|--|-------------|------------------------|----------|------------------------|-------------------------|--|
| Voltage range               | 2 ~ 20V / 10A max, 36W max   |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Resolution                  | 0.1 V/ step  |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Accuracy                    | 1% F.S.  |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Voltage ripple<br>and noise | Under 100mV@20MHz  |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Rising time                 | 1ms <tr 30ms<="" <="" td=""></tr> <tr><td>Falling time</td><td>&lt; 30ms @ full load</td></tr> <tr><td>Protection</td><td>OCP / OVP / UCP / UVP / OPP</td></tr> <tr><td>Measurement<br/>range</td><td>OVP / UVP: 0~ 22V<br/>OCP / UCP: 0~ 11A<br/>OPP: 40W<br/>Protection delay range: 0~1000 ms programmable</td></tr> <tr><td>Measurement</td><td>Voltage: <math>\pm</math> 1% F.S.</td></tr> <tr><td>accuracy</td><td>Current: <math>\pm</math> 2% F.S.</td></tr> <tr><td>Maximum<br/>remote sense</td><td>Maximum remote sense line drop compensation is 1V<br/>(If the voltage is compensated to maximum voltage,<br/>the voltage is no longer compensated)</td></tr> | Falling time | < 30ms @ full load | Protection | OCP / OVP / UCP / UVP / OPP | Measurement<br>range | OVP / UVP: 0~ 22V<br>OCP / UCP: 0~ 11A<br>OPP: 40W<br>Protection delay range: 0~1000 ms programmable | Measurement | Voltage: $\pm$ 1% F.S. | accuracy | Current: $\pm$ 2% F.S. | Maximum<br>remote sense | Maximum remote sense line drop compensation is 1V<br>(If the voltage is compensated to maximum voltage,<br>the voltage is no longer compensated) |
|                             |  |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Falling time                | < 30ms @ full load   |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Protection                  | OCP / OVP / UCP / UVP / OPP  |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Measurement<br>range        | OVP / UVP: 0~ 22V<br>OCP / UCP: 0~ 11A<br>OPP: 40W<br>Protection delay range: 0~1000 ms programmable   |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Measurement                 | Voltage: $\pm$ 1% F.S.   |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| accuracy                    | Current: $\pm$ 2% F.S.   |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |
| Maximum<br>remote sense     | Maximum remote sense line drop compensation is 1V<br>(If the voltage is compensated to maximum voltage,<br>the voltage is no longer compensated)   |              |                    |            |                             |                      |  |             |                        |          |                        |                         |  |

| VBL Output               |   |              |                  |            |                             |                   |   |                      |  |                      |  |
|--------------------------|---|--------------|------------------|------------|-----------------------------|-------------------|---|----------------------|--|----------------------|--|
| Voltage range            | 2 ~ 25V / 20A max, 100W Max   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Resolution               | 0.1 V/ step   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Accuracy                 | 1% F.S.   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Voltage ripple and noise | Under 100mV@20MHz   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Rising time              | 1ms <tr 30ms<="" <="" td=""></tr> <tr><td>Falling time</td><td>&lt; 50ms@full load</td></tr> <tr><td>Protection</td><td>OCP / OVP / UCP / UVP / OPP</td></tr> <tr><td>Measurement range</td><td>OVP / UVP: 0~ 27V<br/>OCP / UCP: 0~ 22A<br/>OPP: 100W<br/>Protection delay range: 0~1000 ms programmable</td></tr> <tr><td>Measurement accuracy</td><td>Voltage: <math>\pm</math> 1% F.S.<br/>Current: <math>\pm</math> 2% F.S.</td></tr> <tr><td>Maximum remote sense</td><td>Maximum remote sense line drop compensation is 1V<br/>(If the voltage is compensated to maximum voltage,<br/>the voltage is no longer compensated)</td></tr> | Falling time | < 50ms@full load | Protection | OCP / OVP / UCP / UVP / OPP | Measurement range | OVP / UVP: 0~ 27V<br>OCP / UCP: 0~ 22A<br>OPP: 100W<br>Protection delay range: 0~1000 ms programmable | Measurement accuracy | Voltage: $\pm$ 1% F.S.<br>Current: $\pm$ 2% F.S. | Maximum remote sense | Maximum remote sense line drop compensation is 1V<br>(If the voltage is compensated to maximum voltage,<br>the voltage is no longer compensated) |
|                          |   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Falling time             | < 50ms@full load  |              |                  |            |                             |                   |   |                      |  |                      |  |
| Protection               | OCP / OVP / UCP / UVP / OPP   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Measurement range        | OVP / UVP: 0~ 27V<br>OCP / UCP: 0~ 22A<br>OPP: 100W<br>Protection delay range: 0~1000 ms programmable   |              |                  |            |                             |                   |   |                      |  |                      |  |
| Measurement accuracy     | Voltage: $\pm$ 1% F.S.<br>Current: $\pm$ 2% F.S.  |              |                  |            |                             |                   |   |                      |  |                      |  |
| Maximum remote sense     | Maximum remote sense line drop compensation is 1V<br>(If the voltage is compensated to maximum voltage,<br>the voltage is no longer compensated)  |              |                  |            |                             |                   |   |                      |  |                      |  |

| MIPI + eDP Signal Me   | odule   |
|--|---|
| MIPI   |   |
| Compliant  | MIPI DSI v1.02.00 spec  |
| Resolution   | 1920 x 1200@60Hz max  |
| Lane count   | 1/2/3/4 Lane  |
| Pixel format   | RGB-565 / RGB-666 / RGB-888   |
| eDP  |   |
| Compliant  | eDP v1.3 spec   |
| Resolution   | 2560 x 1600@60Hz max  |
|  |   |
| Lane count   | 1/2/4Lane   |
| Color Depth  | 6 / 8 / 10 bits   |
| Lane rate  | 1.62 / 2.7 Gbps   |
| MIPI Signal Module   |   |
| Compliant  | MIPI DSI v1.02.00 spec  |
| compliant  | 1920 x 1200@60Hz max(4 lane)  |
| Resolution   | 2560 x 1600@60Hz max(8 lane)  |
| Lono count   | 1/2/3/4/8 Lane  |
| Lane count   |   |
| Pixel format   | RGB-565 / RGB-666 / RGB-888   |
| eDP Signal Module  |   |
| Compliant  | eDP v1.3 spec   |
| •  | 2560 x 1600@60Hz max (4 lane)   |
| Resolution   | 3840 x 2160@60Hz max (8 lane)   |
| Lane count   | 1/2/4/8 Lane  |
| Color Depth  | 6 / 8 / 10 bits   |
| •  |   |
| Lane rate  | 1.62 / 2.7 Gbps   |
| V-by-One Signal mo   | dula  |
| Resolution   |   |
|  | 5120 x 2880@60Hz max  |
| Lane count   | 16 / 8 / 4 lane   |
| Color Depth  | 8 / 10 bits   |
| Data mapping   | Non / 2 / 4 / 8 division  |
| eDP 1.4 Signal Modu  | le  |
| Compliant  | eDP v1.4 spec   |
|  | 4096 x 2160 @ 60Hz max (4 lane)   |
| Resolution   | 5120 x 2880 @ 60Hz max (8 lane)   |
| Lane count   | 1/2/4 Lane  |
| Color Depth  | 6/8/10 bits   |
|  |   |
| Lane rate  | 1.62Gbps / 2.16Gbps / 2.43Gbps / 2.7Gbps /  |
|  | 3.24Gbps / 4.32Gbps / 5.4Gbps Lane  |
| Pre- Emphasis  | 0 / 3.5 / 6 / 9.5 dB selectable   |
| Swing Level  | 200mV / 250mV / 300mV / 350mV / 400mV /   |
|  | 450mV / 600mV / 800mV / 1000mV selectable   |
| LVDS Output Module   | 8   |
| Resolution   | 4096 x2160 @ 60Hz max   |
| LVDS mode  | VESA / JEIDA  |
| Color Depth  | 6/8/10 bits   |
| color Depth  |   |
|  | 4 Channel   |
| Link mode  | 1 Link : 10-150 MHz   |
|  | 215-14-20-200 MU  |
|  | 2 Link : 20- 300 MHz  |
|  | 2 Link : 20- 300 MHz<br>4 Link : 40- 600 MHz  |
| Others   |   |
| Others<br>AC Input   |   |
| AC Input   | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz  |
| AC Input<br>Operating  | 4 Link : 40- 600 MHz  |
| AC Input<br>Operating<br>temperature   | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz  |
| AC Input<br>Operating<br>temperature<br>Storage  | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz  |
| AC Input<br>Operating<br>temperature<br>Storage<br>temperature                           | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% VLN, 47~63 Hz<br>10 ~ 40 °C<br>0 ~ 80 °C                          |
| AC Input<br>Operating<br>temperature<br>Storage<br>temperature<br>Humidity               | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz<br>10 ~ 40 °C                          |
| AC Input<br>Operating<br>temperature<br>Storage<br>temperature<br>Humidity<br>Dimensions | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz<br>10 ~ 40 °C<br>0 ~ 80 °C             |
| AC Input<br>Operating<br>temperature<br>Storage<br>temperature<br>Humidity               | 4 Link : 40- 600 MHz<br>1Ø 100~240Vac ± 10% V <sub>LN</sub> , 47~63 Hz<br>10 ~ 40 °C<br>0 ~ 80 °C<br>20 ~ 90% |

Video & Color

Flat Panel

LED/ Lighting

# Model 29133/29135



#### **KEY FEATURES**

For full HD measurement

- True Color computer base LCM Testing
- LVDS/TTL(OPT)/TMDS signals support
- (29130 LVDS 8 bit only) Display Up to WUXGA @ 60Hz
- Precise programmable DC sourceExtension Power control (option)
- Power protection OVP/OCP/UVP/UCP
- Voltage/Current measurement
- GO/NOGO fast measurement
- GO/NOGO last measurement
- Easy for Timing/Pattern/Program editing
   Unlimited Timing/Pattern/Program storage
- EDID read/write/compare
- LCM failure code editing & record
- Cross Mark for cell checking
- JPG/BMP/AVI/MPEG file support
- Keypad operation
- Special I/O
- Network management function (option)
   Production line process control and data
- collection

The Chroma 29133/29135 LCM Automatic Test System (ATS) which is structured in computer based system with powerful on-line network function and easy-to-use interface is designed to fulfill the key requirements of LCM tests and the production line management theory from factory. By integrating the video generator, multi-channel precision power supply and process control unit, the LCM ATS is capable of providing complete test solutions for LCM signals, patterns and electricity.

The test programs performed by LCM ATS tasks can be edited by the embedded test editor. The mouse and remote keypads used by the test program editor give the production line a most complete and convenient test mode to expedite the productivity. The test functions Chroma 29133/29135 LCM ATS have are:

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(1) Test Program Editor: It contains the parameters settings of power Turn On/ Turn Off, scanning timing, pattern, over and under voltage/ current protection (OCP/OVP/UCP/UVP), and real-time voltage Ramp Up/Ramp Down based on the LCM electricity specifications for accurate and comprehensive tests.

(2) Screen Quality Test: Besides the built-in standard patterns, users can define the geometry patterns that composed of various ICONs; moreover, the natural picture file with BMP/JPG filename extension can be imported. In addition the animation function is available for the LCD Response time test. All patterns can be scaled automatically according to the LCM resolution to facilitate the pattern editing preview function.

#### (3 Timing Setting and Pattern Editing: It

provides VESA timings and patterns; furthermore, the user-defined test timings and patterns can be created as per request. The LVDS / TMDS / TTL (OPTION) signals required by LCM are offered as well.

#### (4 Output voltage, current measurement and

judgment: The system has 3 programmable DC power outputs 15V/4A, 16V/1A to provide the power source required by LCM control chip, driver chip and backlight module through the RS-232 interface.

(5 Test Methods: Mouse and keypad are used to control the cross mark for cell checking and log during test, also the LCM defect types can be built by the test patterns that minimize the test time intensely. Thus the test can be done rapidly no matter it is applied in R&D or production line.

#### (6) Network Management Control(Option):

The system administrator is able to perform the test program maintenance and management, hardware configuration, data upload/download, computing and EDID read/write/compare network on-line function via the network interface for production status control at the first time as well as analysis of production, efficiency and yield rate.

The Chroma 29133/29135 LCM ATS utilizes the computer based system to integrate the signal source /power source for LCM patterns and electricity specification tests, also equips with easy-to-use system program for Timing/Pattern/ Power/Program editing, mouse or keypad for LCM defect log, system self test for electricity judgment and rapid selection for defect types greatly reduce the test time in production line.

#### LCM Master II Software



#### **Main Test Screen**

- Model and Test Program Mapping Setting
   System layout and on-line status for factory
- production line Visualization management in factory to show
- real time information
- Real time production line fail rate display, warning appears when the failure rate is too high
- VDD/VBL voltage/current setting, real time reading for 2D display, and high speed auto voltage/current maximum/minimum judgment and warning
- Display all of the information required including, model, test date and time, detected date, production area, fail status, and etc.

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|         | Pattern - 14 |                          |                  |   |                |
|         |              | <u> </u>                 |                  |   |                |

#### Pattern Edit Screen

- More than 23 types of ICON for patterns creation
- Various ICON composition for logic computing
- Support BMP / JPG file format
- Various resolution auto scaling
- Support animation
- Real time preview function



#### **Timing Edit Screen**

- H / V Display, Sync, Back-Porch, Front-Porch, setting
- $\blacksquare$  H/V Sync Polarity  $\pm$  setting
- LVDS / TMDS / TTL output setting
- Pixel rate setting
- 1 / 2 Clock Mode, 6 / 8 / 10 bit link setting
- Bit Rotate setting

| Model 29133/29135 |
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#### Power Edit Screen

- 3 channel DC source setting
- OVP / OCP / UVP / UCP setting
- Vdd / Signal / Vbl On / Off sequence
- setting
- Vdd / Vbl / Idd / Ibl spec judgment
   Power Sweep setting
- rower sweep setting



Test Program Edit Screen

Provide TIMING / PATTERN / POWER for LCM test programs creation

Provide Loop function

Provide Pre-test function

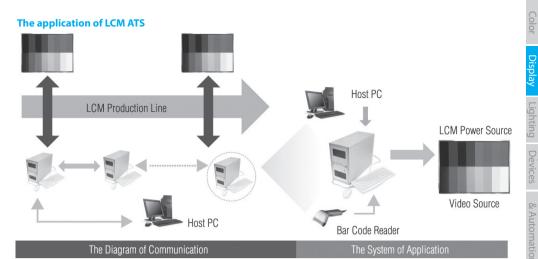
#### **ORDERING INFORMATION**

29133 : LCM Automatic Test System 29135 : LCM Automatic Test System A270111 : LVDS to TTL Signal Adapter A270143 : Signal Conversion Board A712306 : Flicker Measuring Probe (for LCM ATS)

Network management function of software



A270111



SPECIFICATIONS Model 29133 29135 **LVDS** Interface 640x480; 800x600; 1024x768; 1152x864; 1280x768; 1280x960; 1280x1024; Resolution 1400x1050; 1600x900; 1600x1024;1600x1200; 1920x1080; 1920x1200; 1280x800; 1366x768;1280x854 **Pixel Rate** 1 link 135/2 link 162MHz 1 link 135/2 link 270MHz Signal 6 / 8 / 10 bit (10 bit for Gray Scale) H,V Sync Polarity + or -Video signal output can turn ON OFF by software **DVI Interface** 640x480; 800x600; 1024x768; 1152x864; 1280x768; 1280x960; 1280x1024; 1400x1050; 1600x900; 1600x1024;1600x1200; 1920x1080; 1920x1200; 1280x800; Resolution 1366x768;1280x854 Pixel Rate Up to 162MHz Interlace Interlace or Non-Interlace H,V Sync Polarity + or -Video signal output can turn ON OFF by software **Internal Power Source** Channel Channel 1 **Channel 2** Channel 3 **Output Voltage** 2~15V 3~16V 3~25V Output Current 0~4A 0~1A 0~3A **Programmable Resolution Output Voltage** 5mV 5mV 12.5mV **Current Protect** 1mA 1mA 1mA **Meter Ratings** Read back Voltage 0~20V 0~20V 0~30V Read back Current 0~5A 0~2A 0~4A **Meter Resolution** 2mV 2mV Read back Voltage 4mV Read back Current 0.3mA 0.2mA 0.4mA **On / Off Sequence Resolution** Turn-On/Off 1ms 1ms 1ms **V-dim function PWM** function Freq: 100~500Hz / 1Hz step; Vdim Duty: 0%~100%; Level: 5V / 3.3V programmable Analog function 0~8V / 0.1V step Others AC Input Voltage 1Ø 110~240V ± 10% VIH **AC Input Frequency** 47~63 Hz **Operation Temperature** 10~30°C Max. 70% **Operation Humidity** 

# Manufacturing Turnkey Test & Execution System Automation

Optical

Electronics

Test &

Passive

Component

PXI Test & Measurement

Automated

All specifications are subject to change without notice.

# Model 2916



#### **KEY FEATURES**

- LCM signal and power source test systems
- LVDS 4 channel output
- LVDS pixel rate Signal : 135MHz
   Dual 270MHz
   4 Link 540MHz
- The resolution up to 1920x1080/240Hz
- LVDS data Even/Odd switch support
- MPEG/AVI/GIF Playback
- Easy transfer pattern file to BMP file
- Output voltage and current measurement
- Output 8 channel DC Power
- Power protection OVP/OCP/UVP/UCP
- EDID read/write/Compare
- External control interface I<sup>2</sup>C/SMBUS/PWM individually
- Network function base on fast Ethernet (option)
- GO/NOGO fast measurement
- Operator authority control
- High efficient GUI for easy operation
- Production line process control and data collection

Chroma 2916 is a high performance, highly stable LCM Automatic Test System with modular design that can work with different signals and power modules flexibly to compose the test conditions required. It integrates the signals and power source with powerful network function and friendly interface that make it suitable for the production tests of various sizes LCMs including the standard signal source required, pattern inspection and voltage/current measurements. Chroma 2916 is an integrated LCM ATS equipment that is most applicable for production test, quality inspection or automatic system integration.

This equipment mainly supports LVDS signals with optional TMDS signal converters available for purchase to meet the standard test signals requirement for various panels and digital displays of today.



2916 LCM ATS has the following test functions: LVDS Signal Output

It supports Signal, Dual, Quad Link output test with pixel rate up to 600MHz. The test screen resolution supports up to 1920x1080 @240Hz (refresh rate) that complies with the test specification of Full HD high multiple frequency transmission technology nowadays.

#### **Editing Timing, Pattern & Test Sequence**

Chroma 2916 supports standard JEIDA/VESA Timing Format. Users can select the timing parameters directly or build them as need.

Through the combination of Icon, the geometry patterns required for diversified tests can be built, also the natural patterns with the extension of BMP/JPG can be inputted. In the meantime it supports MPEG/AVI/GIF play format for animation and provides LCD Response time test. All patterns can be scaled based on the LCM resolution and previewed by pattern editor.

Besides the LVDS signals required for LCM test, the LCM electricity specification can be followed to provide parameter settings of Turn On/Turn Off, Scan Timing, Pattern, supply voltage/current high/low limit protection (OCP/OVP/UCP/UVP) and voltage Ramp Up/Ramp Down for the most complete and accurate LCM test.

#### **Multiple High-Precision DC Power Supply**

This system has many modulized external power supplies that are applicable for various kinds of panel sizes. It supports 8 sets of direct power output to provide the power required by LCM control chip, driver chip and backlight module via USB standard interface. Each output contains the actual readings of voltage and current. Its unique design can move the measurement point to load to prevent the transmission voltage drop also ensure the measurement accuracy reaches mV level for complete analysis of LCM working status. Meanwhile each output channel is able to simulate the timing relationship of power on/ off, the Ramp-up/down waveform output and over voltage/current protection function. When the status exceeds the setting, in addition to the protection, LED and beeps are activated to remind users to fix it.

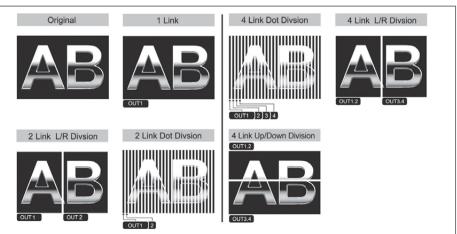
#### **Environment & Network Control (Optional)**

For production test, Chroma 2916 allows the administrator to preset the operator's access permission and unify the system management mode to reduce the human operation error. The user friendly graphic interface is very easy to use. Mouse and keypad can be utilized to control the cross coordinate defect positioning check and log during test. Moreover, the information including the LCM defect types and levels as well as all kinds of test report analysis are able to build and generate via the interface. Thus tests can be done in the fastest way to cut down the test time significantly no matter it is applied to R&D or production line.

To fulfill complete test application and management on the production line, network interface is used to maintain and manage the test programs, configure the hardware, upload/ download data, compile statistics and write in EDID so that the system administrator can control the production status effectively from remote distance for productivity, efficiency as well as yield rate review. The system also has other external control interfaces such as I<sup>2</sup>C/SMBUS/PWM to extend the functions and enhance the system flexibility.

2916 LCM ATS is structured based on PC under the OS of Windows XP to give users an easy and familiar operating environment. With powerful software support and user-friendly operation interface to edit Timing/Pattern/Power/Program, the system is able to judge the electrical specification automatically and select the defect type rapidly to save the test time. In addition the test result can be exported to network easily for data gathering and analysis via network management function to provide an excellent solution for production management.

#### 4 Link Data Mapping



All specifications are subject to change without notice.

# Model 2916

| Model                     | 2916 (CE)   | Power Source                  | ırce                     |                       |                  |
|---------------------------|---|-------------------------------|--------------------------|-----------------------|------------------|
| LVDS Interface            |   | Channel                       | DC1                      | DC2                   | DC3 <sup>,</sup> |
|                           | 640x480; 800x600; 1024x768; 1152x864; 1280x768;12 | Output Voltage                | 2-25V                    | 5-25V                 | 0-               |
| Resolution                | 80x960;1280x1024;1400x1050; 1600x900; 1600x1024;  | Output Current                | 0-4A                     | 0-26.5A               | 0-               |
| Resolution                | 1600x1200; 1920x1080; 1920x1200; 1280x800;        | Programmable Resolution       |                          |                       |                  |
|                           | 1366x768; 1280x854; 2560x1600                     | Output Voltage                | 20mV                     | 20mV                  |                  |
|                           | 1 Link up to 135 MHz                              | Current Protect               | 5mA                      | 20mA                  |                  |
| Pixel Rate                | 2 Link up to 270 MHz (135 MHz x 2)                | Meter Ratings                 |                          |                       |                  |
|                           | 4 Link up to 540 MHz (135 MHz x 4)                | Read back Voltage             | 0-30                     | 0-30V                 |                  |
| Signal                    | 6/8/10 Bit and support bit rotate                 | Read back Current             | 0-5A                     | 0-30A                 |                  |
|                           | (10 Bit for Gray Scale)                           | Meter Resolution              |                          | 1                     |                  |
| H,V Sync Polarity         | + or -  | Voltage                       | 20mV                     | 20mV                  |                  |
| Connector                 | 10 Bit Four Link by MDR36 x 2                     | Current                       | 5mA                      | 20mA                  |                  |
| Video signal output can t | urn ON OFF by software                            | On / Off Sequence Resolution  |                          |                       |                  |
| General Specifications    |   | Turn-On/Off                   | 1ms                      | 1ms                   | 1r               |
| AC Input Voltage          | 1Ø 110~240V ± 10% VIH                             | I <sup>2</sup> C BUS Function |                          |                       |                  |
| AC Input Frequency        | 47~63Hz   | SDA                           | 3.3 / 5V / device select |                       | ect              |
| Operation Temperature     | 10~40°C   | SCL                           | 50~100KHz                |                       |                  |
| Operation Humidity        | Max. 70%  | DIM Function                  |                          |                       |                  |
| Dimension & Weight        |   | Analog                        | Analo                    | g function 0~8 / 0.   | 1V step          |
| 2916 Main System          |   | V-PWM Function                |                          |                       |                  |
| Dimension (HxWxD)         | 156.4x320x430 mm / 6.16x12.6x16.9 inch            | Vpwm                          | 3                        | .3 / 5V / FV Selectal | ole              |
| Weight                    | 8 kg / 17.62 lbs                                  | Fout                          | 100~15KHz                |                       |                  |
| A291600 Signal Module     |   | Dout                          | 0~100% 1% Step           |                       |                  |
| Dimension (HxWxD)         | 50x320x230 mm / 1.96x12.59x9.06 inch              | SMBUS Function                |                          |                       |                  |
| Weight                    | 1.7 kg / 3.8 lbs                                  | SDA                           | 3                        | .3 / 5V / device sele | ect              |
| A291512 Power module      |   | SCL                           |                          | 10~100KHz             |                  |
| Dimension (HxWxD)         | 206.4x100x430 mm / 8.12x3.937x16.92 inch          | ·                             |                          |                       |                  |
| Weight                    | 4.6 kg / 10.1 lbs                                 |                               |                          |                       |                  |
| 2916LCM ATS (2916+A2      |   |                               |                          |                       |                  |
| Dimension (HxWxD)         | 206.4x420x430 mm / 8.13x16.54x16.93 inch          |                               |                          |                       |                  |
| Weight                    | 14.3 kg / 31.5 lbs                                |                               |                          |                       |                  |

#### **ORDERING INFORMATION**

2916 : LCM Automatic Test System A270143 : Signal Conversion Board A291600 : Signal Module LVDS 135/270/540 MHz A291512 : Power Module 780W A712306 : Flicker Measuring Probe (for LCM ATS) Network Management Function of Software



A291600



A291512



A712306

| Color                     | Video &           |
|---------------------------|-------------------|
| Display                   | Flat Panel        |
| Lighting                  | LED/              |
| Devices                   | Optical           |
| & Automation              | Photovoltaic Test |
| <b>Optical Inspection</b> | Automated         |
| Electronics               | Power             |
| Automation                | Battery Test &    |
| Component                 | Passive           |
| Safety                    | Electrical        |

Semiconductor/ IC

PXI Test & Measurement

General Manufacturing TurnkeyTest & Purpose Execution System Automation

DC3~DC8 0-5V 0-1A

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# Model 2917



#### **KEY FEATURES**

- LCM signal and power source test systems
- Easy for Timing / Pattern / Program editing
- Suitable for Full HD measurement
- The Resolution up to
- 1920x1080@240Hz, 3840x2160@60Hz
- LVDS 8 channel output
- MPEG/AVI Playback
- High accurate programmable DC source
- Output voltage and current measurement Power protection OVP/OCP/UVP/UCP
- EDID read/write
- Cross coordinate defect positioning function Network management function (OPT)
- In-line process control and data collection
- Operator authority control
- GO/NOGO fast measurement
- High efficient GUI for easy operation

The technology development of liquid display has been moving toward the features of large scale, high quality, high contrast and fast dynamic response recently that made the Full HD (1920X1080) high resolution specification become a new mainstream in the market. In order to meet the test requirements of today's industries, Chroma 2917 LCM ATS is structured in modulized with integrated signals and power source. The powerful on-line network function and easy-to-use interface are equipped to fulfill the test requirements such as all kinds of standard signal sources, test patterns and voltage/current measurements for various sizes of LCM.

This ATS provides LVDS signals and users can set the settings through mouse and Remote Keypad in accordance with the LCM features to give the production line a most complete and convenient test mode to expedite the productivity. The test functions Chroma 2917 LCM ATS have are:

#### **Modulized Design**

To cope with the test requirements of various sizes panels, the design concept of modulization is applied to fit in the specifications of different signals and power modules for application.

#### **Test Program Editor**

It contains the parameters settings of power Turn On/ Turn Off, scanning timing, pattern, over and under voltage/current protection (OCP/OVP/UCP/ UVP), and real-time voltage Ramp Up/Ramp Down based on the LCM electricity specifications for accurate and comprehensive tests.

#### **Screen Quality Test**

Besides the built-in standard patterns, users can define the geometry patterns that composed of various ICONs; moreover, the natural picture file with BMP/JPG filename extension can be imported. In addition the animation function is available for the LCD Response time test. All

1 240Hz Full HD RS-232 USB Power

patterns can be scaled automatically according to the LCM resolution to facilitate the pattern editing preview function.

#### **Timing Setting and Pattern Editing**

The ATS allows users to define the test timings and patterns for application as need and provides LVDS signals for comprehensive LCM tests by setting the signal/power supply activation time. Other signals like TMDS / TTL / ANALOG (option) can also be applied for testing.

#### Output voltage, current measurement and judgment

This system has multiple modulized external power supplies that can be used for different sizes of panels / LED backlight constant current sources (option) and to provide the power source required by LCM control chip, driver chip and backlight module through the USB interface. Also Provide the optional of multi-channel metering system for readback applications.

#### **Test Methods**

Mouse and keypad are used to control the cross mark for cell checking and log during test, also the LCM defect types can be built by the test patterns that minimize the test time intensely. Thus the test can be done rapidly no matter it is applied in R&D or production line.

#### **Network Management Control**

The system administrator is able to perform the test program maintenance and management, hardware configuration, data upload/download, computing and EDID read/write network on-line function via the network interface for production status control at the first time as well as analysis of production, efficiency and yield rate.

Chroma 2917 LCM ATS integrates the signal source/power source for LCM patterns and electricity specification tests. The user-friendly interface along with simple system programs can be used to edit the Timing / Pattern / Power / Program while the mouse or keypad can be used to log the LCM defects. Moreover, the PC based platform can fully utilize the network function for data collection and analysis that makes it most applicable for production line management.



Chroma 2917 LCM ATS is structured in modulized with integrated signals and power source. The powerful on-line network function and easy-to-use interface are equipped to fulfill the test requirements such as all kinds of standard signal sources, test patterns and voltage/current measurements for various sizes of LCM.

#### **Main Unit**

- Support 2 port LAN
- Integrated all test signals with LVDS
- Provide LVDS Signal Output
- Support 2 / 4 / 8 ch Data Output



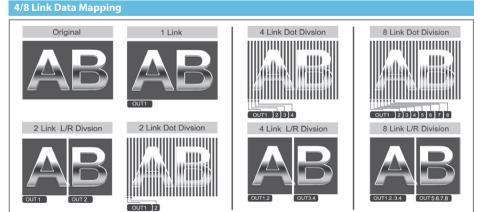
#### **Power Module Series A291710**

- 4~8 channel Power Source (Depend on Model)
- OCP/UCP/OVP/UVP Protection
- SM Bus, I<sup>2</sup>C external data read and write functions



#### Signal Conversion Board A270143(option)

- Extension of the 29135 LCM ATS for eDP/MIPI tests
- Signal Conversion Board modular design
- Compatible eDP V1.3 Standard - Auto / Manual Training
  - Lane rate selectable: 1.62 / 2.7 Gbps
  - Lane count selectable: 1 / 2 / 4 Lane
  - Color depth: 8 /10 bits
- Compatible MIPI DSI V1.02.00 spec
- Auto / Manual Training
- Lane rate selectable: 1 Gbps
- Lane count selectable: 1 / 2 / 3 / 4 Lane
- Output resolution up to - eDP up to 2560x1600 @ 60Hz (Max)
  - MIPI up to 1920x1080 @ 60Hz (Max)
- Able to provide 2 sets of eDP / MIPI standard signal source simultaneously
- Test images support BMP format output



All specifications are subject to change without notice.

- Easy-to-use graphical interface
- Production line process control and data editing



#### LVDS to eDP Signal Conversion Module A270147 (option)

The Chroma A270147 is a signal conversion module that converts the LVDS to eDP signal, the eDP output support up to 5.4Gbps/lane and comply with eDP1.4 standard, extension of the 2917 LCM ATS for eDP testing.

Signal Conversion Board modular design

- LVDS input: 8 links up to 1.2Gbps
- Compatible eDP V1.4 Standard
  - Resolution: 4096 x 2160@60Hz max
  - Lane rate : 1.62Gbps / 2.16Gbps / 2.43Gbps/
     2.7Gbps / 3.24Gbps / 4.32Gbps / 5.4Gbps Lane selectable
  - Lane count : 1 / 2 / 4 Lane selectable
  - Color depth : 6/8/10 bits
  - Function : HPD / EDID
- Able to provide 2 sets of eDP standard signal source simultaneously



#### Flicker Measuring Probe A712306 (option)

The Chroma A712306 Flicker Measuring Probe for LCM ATS is specifically designed for adjusting the flicker on LCM automatically following the FMA(Flicker Modulation Amplitude) standards defined by VESA (Video Electronics Standards Association) and JEITA(Japan Electronics Information Technology Industries Association) for flicker measurement. It can work with the Chroma 291X Series LMC automatic test system to complete auto flicker adjustment.

- Able to integrate with LCM ATS for LCM auto flicker adjustment
- Capable of integrating Chroma 29XX Series LCM Auto Test System
- Support FMA and FLVL flicker measurement mode
- Have a patented adjustment algorithm, making adjustment speed faster
- Capable of editing adjustment script when using with LCM Master

#### V by one SG & Power Module A040105 (option)

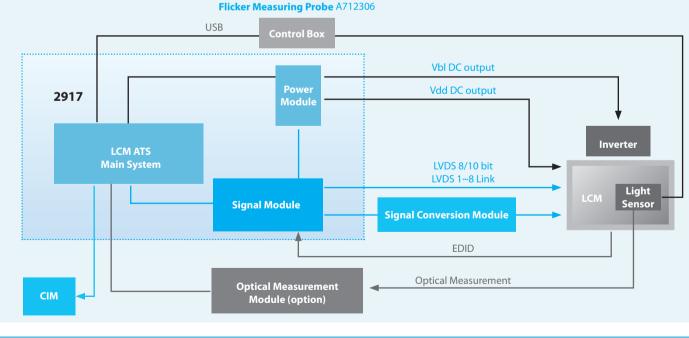
Model 2917

The Chroma A040105 is a signal conversion module that converts the LVDS to V by One signal with additional sets of IO signals for panel control. V-By One signal is defined as the next generation of LCM video signal transmission interface to provide high bandwidth and long distance signal transmission.

- Extension of the 2917 LCM ATS for V by one testing
- Signal/power source integrated design
- Support 3840 x 2160 resolution
- Support 8 channel LVDS input and outputting 16 Lanes V by one
- Support 16 Lanes Channel Data mapping function (follow up V by One V1.3)



#### 2917 System Application Block Diagram



#### **ORDERING INFORMATION**

2917 : LCM Automatic Test System A040105 : V by one SG & Power module A270143 : Signal conversion board A270147 : eDP signal conversion module A270148 : eDP bist module A291710 : Power module 650W A712306 : Flicker measuring probe (for LCM ATS) 7123 : Display color analyzer main unit Network Management Function of Software

All specifications are subject to change without notice.

5-18

PXI Test &

# Model 2917

| Model                         |  | 2917                                     |                 |  |
|-------------------------------|--|--|-----------------|--|
| LVDS Interface                |  |  |                 |  |
| Resolution                    | 640x480; 800x600; 1024x768; 1152x864; 1280x768<br>1280x960; 1280x1024;1400x1050; 1600x900;<br>1600x1024; 1600x1200; 1920x1080; 1920x1200;<br>1280x800; 1366x768; 1280x854; 2560x1600;<br>3840x2160 |  |                 |  |
| Pixel Rate                    | 1 Link up to 135 MHz<br>2 Link up to 270 MHz (135 MHz x 2)<br>4 Link up to 540 MHz (135 MHz x 4)<br>8 Link up to 1.08GHz (135 MHz x 8)   |  |                 |  |
| Signal                        |  | Bit and support b<br>10 Bit for Gray Sca |                 |  |
| Data Swap                     |  | + or -                                   |                 |  |
| H,V Sync Polarity             |  | + or -                                   |                 |  |
| Compared Superifications      | •  |  |                 |  |
| General Specifications        | 10   |  | ( <b>M</b>      |  |
| AC Input Voltage              | 10   | 110~240V ± 109                           | 0 VLH           |  |
| AC Input Frequency            |  | 47~63Hz                                  |                 |  |
| Operation Temperature         |  | 10~40°C                                  |                 |  |
| Operation Humidity            |  | Max. 70%                                 |                 |  |
| Dimension & Weight            |  |  |                 |  |
| 2917 Main System              |  |  |                 |  |
| Dimension (HxWxD)             | 20.64 x 32 x 43 mm / 8.12 x 12.6 x 16.92 inch  |  |                 |  |
| Weight                        | 12.6 kg / 27lbs lbs  |  |                 |  |
| A291710 DC Power Source       | 2  |  |                 |  |
| Dimension (HxWxD)             | 206.4 x 100 x 430 / 8.12 x 3.94 x 16.92 inch   |  |                 |  |
| Weight                        | 4.6 kg/10.1 lbs  |  |                 |  |
| 2917 LCM ATS (2917 Main       | System and A291710 DC Power Source)  |  |                 |  |
| Dimension (HxWxD)             | 206.4 x 420 x 430 mm / 8.12 x 16.54 x 16.92 inch   |  |                 |  |
| Weight                        | 17.2 kg / 37.1 lbs   |  |                 |  |
| Power Source                  | •<br>·   |  |                 |  |
| Channel                       | DC1  | DCa                                      |                 |  |
|                               | DC1<br>2-20V   | DC2<br>5-50V                             | DC3~DC4<br>0-5V |  |
| Output Voltage                |  |  |                 |  |
| Output Current                | 10A  | 22A                                      | 0-1A            |  |
| Power Consumption             | 132W   | 500W                                     | 15W             |  |
| Programmable Resolution       |  |  | 1               |  |
| Output Voltage                | 20mV   | 20mV                                     | -               |  |
| Current Protect               | 20mA   | 20mA                                     | -               |  |
| Meter Ratings                 | 1  | 1  | 1               |  |
| Read back Voltage             | 0-22V  | 0-55V                                    | -               |  |
| Read back Current             | 0-11A  | 0-24.2A                                  | -               |  |
| Meter Resolution              |  |  |                 |  |
| Voltage                       | 100mV  | 100mV                                    | -               |  |
| Current                       | 100mA  | 100mA                                    | -               |  |
| On / Off Sequence Resolut     | ion  |  |                 |  |
| Turn-On/Off                   | 1ms  | 1ms                                      | 1ms             |  |
| I <sup>2</sup> C BUS Function |  |  |                 |  |
| SDA                           | 3.   | 3 / 5V / device sel                      | ect             |  |
| SCL                           | 50~100KHz  |  |                 |  |
| DIM Function                  |  |  |                 |  |
| Analog                        | Analoo   | g function 0~12/0                        | .1V step        |  |
| V-PWM Function                |  | ,  |                 |  |
| Vpwm                          | 2  | 3 / 5V / FV Selecta                      | ble             |  |
| Fout                          | J.   | 100~15KHz                                | 2.0             |  |
| Dout                          |  |  | <u>,</u>        |  |
| Dout                          | 0~100% 1% Step   |  |                 |  |
| SMRUS Euroction               |  |  |                 |  |
| SMBUS Function<br>SDA         | 2  | 3 / 5V / device sel                      | oct             |  |

| Model                      |               | A270143  |
|----------------------------|---------------|--|
| Main Board                 |               |  |
| Input Video                |               | LVDS 2 Link  |
|                            |               | 25 ~ 135 MHz / 1 Link ; 50 ~ 270 MHz / 2 Link  |
| Vdd(Vcc)                   |               | By pass from Tester  |
| Input Power                |               | DC +12V  |
| Communicatio               |               | USB  |
| eDP Signal Mo<br>Compliant | aule          | eDP V1.3   |
| Resolution                 |               | 2560 x 1600 @ 60 Hz max  |
| Lane rate                  |               | 1.62 / 2.7 Gbps  |
| Lane Count                 |               | 1/2/4 Lane   |
| Color depth                |               | 8/10 bits  |
| Function                   |               | HPD / EDID   |
| MIPI Signal Mo             | odule         |  |
| Compliant                  |               | MIPI DSI V1.02.00  |
| Resolution                 |               | 1920 x 1200 @ 60 Hz max  |
| Lane rate                  |               | 1 Gbps   |
| Lane Count                 |               | 1/2/3/4/4+4 Lane   |
| Pixel format               |               | RGB-565 / RGB-666 / RGB-888  |
| Environment                |               |  |
| Operation Tem              |               | 20 ~ 40°C  |
| Storage Tempe              | rature        | -20 ~ 70°C   |
| Humidity                   |               | 70%  |
| Dimension (H x             | W X D)        | 43 x 190 x 164 mm  |
| Weight                     |               | 1 Kg / 2.2 lbs   |
| Model                      |               | A270147  |
| Main Board                 |               |  |
|                            |               | LVDS 2 / 4 / 8 Link, 15 ~ 150 MHz / 1 Link,  |
| Input Video                |               | 30 ~ 300 MHz / 2 Link, 60 ~ 600 MHz / 4 Link,  |
|                            |               | 20MHz ~ 1.2GHz / 8 Link  |
| Vdd(Vcc)                   |               | By pass from Tester  |
| Input Power                |               | DC +12V  |
| Communicatio               |               | LAN  |
| eDP Signal Mo              | odule         |  |
| Compliant                  |               | eDP V1.4   |
| Resolution                 |               | 4096 x 2160@60Hz max   |
| Lane rate                  |               | 1.62Gbps / 2.16Gbps / 2.43Gbps / 2.7Gbps /   |
| Lana Caunt                 |               | 3.24Gbps / 4.32Gbps / 5.4Gbps Lane<br>1 / 2 / 4 Lane                                   |
| Lane Count<br>Color depth  |               | 6 / 8 / 10 bits  |
| Function                   |               | HPD / EDID   |
| Environment                |               | TIFD / EDID  |
| Operation Tem              | nerature      | 5~ 40°C  |
| Storage Tempe              |               | -20 ~ 60°C   |
| Humidity                   | iucuic        | 70%  |
| Dimension (H x             | W x D)        | 34 x 147 x 211 mm  |
| Weight                     |               | 1 Kg / 2.2 lbs   |
|                            |               |  |
| Model                      | 1.000         | A712306  |
| Measurement A              |               | Ø10mm  |
| Measurement [              |               | 0 mm (contact measurement)   |
| Measurement F              |               | 10 lux ~1000lux<br>FMA , FLVL  |
| measurement                | Display Range | 0.0 to 100%  |
|                            | Display hange | $\pm 2\%$ (Flicker frequency :   |
| Flicker                    |               | 30 Hz AC/DC 10 % sine wave)  |
| -Contrast                  | Accuracy      | $\pm 3\%$ (Flicker frequency :   |
| Measurement                |               |  |
| method (FMA)               |               | 60 Hz AC/DC 10 % sine wave)  |
|                            | Repeatability | 1% (2 $\sigma$ ) (Flicker frequency :  |
| Elicker                    |               | 20 to 65 Hz AC/DC 10 % sine wave)  |
| Flicker                    | Accuracy      | $\pm$ 1dB (Flicker frequency :   |
| -JEITA                     |               | 30 Hz AC/DC 10 % sine wave)  |
| Measurement                | Repeatability | 0.5dB (Flicker frequency :   |
| method                     | . ,           | 30 Hz AC/DC 10 % sine wave)  |
| Measurement                | FMA           | 0.5 sec / time   |
| time                       | JEITA         | 2 sec / time   |
| Communicatio               |               | USB  |
| Supported Soft             | ware          | LCM Master   |
| Input Voltage              |               | DC 5V, 500 mA  |
| inpationage                |               | 0°C to 40°C (32° F to 104° F);   |
|                            |               |  |
| Operating Tem              | p./Humidity   | less than 90% relative humidity  |
|                            | p./Humidity   | (non-condensing)   |
| Operating Tem              |               | (non-condensing)<br>0°C to 40°C (32° F to 104° F);                                     |
|                            |               | (non-condensing)<br>0°C to 40°C (32° F to 104° F) ;<br>less then 90% relative humidity |
| Operating Tem              |               | (non-condensing)<br>0°C to 40°C (32° F to 104° F);                                     |

All specifications are subject to change without notice.



#### **KEY FEATURES**

- Three models: 67322 5V/100A 67346 12V/90A
  - 67366 24V/50A
- N+1 Redundancy Power System Ideal for Burn-in Applications
- High Power Density (464mW / cm<sup>3</sup>)
- Hot-swappable
- Cost-effective
- Remote Sense, 1V Line Loss Compensation
- Remote ON/OFF Signal
- Remote RS-485 Interface Control
- Graphic Softpanel Control and Monitor (option)

Chroma's new 67300 Series of modular DC power supplies offer many unique features for Burn-in applications. The features include a N+1 redundancy power system, high power density, hot-swappable for maintenance, remote ON/OFF input signal as well as the ability to create a custom burn-in chamber system.

The 67300 Series contain 3 different modules ranging from 600W to 1500W, up to 100A and 30V. The 67300 mainframe allows encasing up to six modules for parallel or stand-alone operation that made it easy to expand up to thirty units of mainframe for high power applications via RS-485 control.

The Modular DC Power Supplies of 67300 Series are cost effective with high power density (464mW/cm<sup>3</sup>). They are most suitable for burn-in applications such as the typical LCD panel, D2D converter, power inverter, notebook, battery charger, and etc.

Modern power factor correction circuitry is incorporated in 67300 Series to increase the input power factor above 0.98 to meet the IEC regulation. It not only reduces the input current requirement but also raises the efficiency over 80%. In addition, an optional graphic Softpanel connected via RS-485 is offered to control and monitor the power system which is a user friendly tool applicable for factory automation.

#### RS-485

#### **ORDERING INFORMATION**

67300 : Six Position 67300 Mainframe with 1 output BUS bar, 220V 1Ø 67300 : Six Position 67300 Mainframe with 2 output BUS bar, 220V 1Ø 67300 : Six Position 67300 Mainframe with 3 output BUS bar, 220V 1Ø 67300 : Six Position 67300 Mainframe with 6 output BUS bar, 220V 1Ø A673002 : Six Position 67300 Mainframe with 2 output BUS bar, 220V/380V 3Ø A673003 : Six Position 67300 Mainframe with 3 output BUS bar, 220V/380V 3Ø A673004 : Six Position 67300 Mainframe with 6 output BUS bar, 220V/380V 3Ø A673005 : Three Position 67300 Mainframe with 2 output BUS bar, 220V/380V 3Ø A673005 : Three Position 67300 Mainframe with 2 output BUS bar, 220V/380V 3Ø A673005 : Three Position 67300 Mainframe with 2 output BUS bar, 220V/380V 3Ø A67306 : DC Power Supply Module 5V/100A/600W 67346 : DC Power Supply Module 12V/90A/1484W

67366 : DC Power Supply Module 30V/50A/1500W



#### Module

| SPECIFICATIONS                                |   |                             |                  |
|---|---|-----------------------------|------------------|
| Model   | 67322   | 67346                       | 67366            |
| Electrical Specifications                     |   |                             |                  |
| Output Ratings                                |   |                             |                  |
| Output Voltage Range                          | 2.5 ~ 6V  | 2 ~ 16V                     | 2 ~ 30V          |
| Default Voltage Setting                       | 5V  | 15V                         | 24V              |
| Output Current                                | 100A  | 90A                         | 50A              |
| Output Power                                  | 600W  | 1440W                       | 1500W            |
| Line Regulation                               |   | 0.10%                       |                  |
| Load Regulation                               |   | 5%                          |                  |
| Meter Accuracy                                |   | 1% F.S.                     |                  |
| Noise (0-20MHz) : V (P-P)                     | 100mV   | 100 mV                      | 100 mV           |
| Output Ripple (rms) : V                       | 30 mV   | 30 mV                       | 30 mV            |
| Efficiency                                    |   | > 80% @ Full Load           |                  |
| Transient response time -Time                 |   | < 5 ms                      |                  |
| Time for the output voltage to recover within |   |                             | er within 1%     |
| 25% step change-Leve                          | of its r  | ated for a load changed     | of 25%           |
| Protection Function                           |   |                             |                  |
| OVP   | Automatically shuts down when over setting voltage plus |                             |                  |
| OVF   | 0.2V (67322) / plus 0.5V( 67346 / 67366)                |                             |                  |
| OCP   | 0A - Full Scale setting current limit, CC mode          |                             |                  |
| OTP   | Automatically shuts down                                |                             |                  |
| I/O Signal                                    |   |                             |                  |
| Remote ON/OFF                                 | (   | Closed is enable, vice vers | a                |
| Remote Interface                              |   |                             |                  |
| RS-485  | Standard (Adjust  | table via DIP switch of ea  | ch power supply) |
| General Specifications                        |   |                             |                  |
| Remote Sensing                                |   | 1V line loss compensation   | n                |
| Parallel Operation                            | Current Sharing ( $\pm$ 5%)                             |                             |                  |
| Operating Temperature                         |   | -5°C to 50°C                |                  |
| Humidity Range                                | 0 ~ 90% RH. Non-condensing                              |                             |                  |
| AC Input Voltage                              | 220~230V ±10% V <sub>LN</sub> 47~63Hz                   |                             |                  |
| Input Power Factor                            | > 0.98@ full load                                       |                             |                  |
| Weight  | 3.7 kg / 8.15 lbs                                       |                             |                  |
| Dimension (H x W x D)                         | 132.5 x 67.5 x 376 mm / 5.22 x 2.66 x 14.8 inch         |                             |                  |
| Front Panel Overview                          |   |                             |                  |
| Control Function                              | V&I disp  | olay change buttom, mai     | n switch         |
| Indications LED                               | Norma   | al, Warming, V, I, 7-segme  | nt LED           |

| ESD Test System                                     | 6-1  |
|---|------|
| LED Electrical Test Module                          | 6-2  |
| LED Chip Level Tester                               | 6-3  |
| LED Mapping Probe Tester                            | 6-4  |
| Packaged LED Test Sorter & Tapper                   | 6-5  |
| LED Burn-in Tester                                  | 6-7  |
| LED Light Bar Test System                           | 6-8  |
| LED Light Bar Electrical Test System                | 6-9  |
| LED Luminaires Test System (For Laboratory)         | 6-10 |
| LED Luminaires In-line Test System (For Production) | 6-11 |
|   |      |





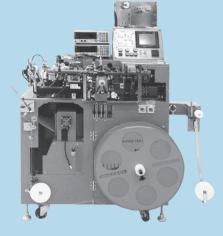


**ESD Test System** 

LED Electrical Test Module

**LED Chip Level Tester** 





LED Mapping Probe Tester

Packaged LED Test Sorter & Tapper





LED Burn-in Tester

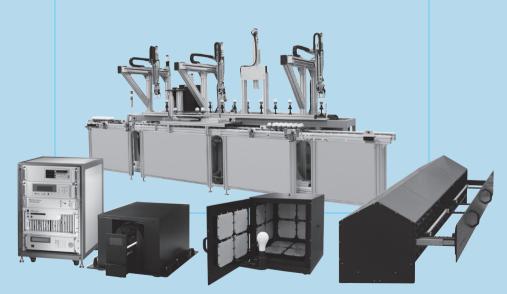
LED Light Bar Electrical Test System



LED Light Bar Test System



LED Lighting Test System (For Laboratory)



LED Luminaires In-line Test System (For Production)

# **ESD** Test System

# Model 58154 Series



### **KEY FEATURES**

- Two models ESD pulse generation : human body model and machine model
- Programmable auto test : pulse delay, cycle and polarity are programmable
- Resolution (58154) : 5V per-step for machine model, 20V per-step for human body model
- Resolution (58154-B) : 10V per-step for machine model, 30V per-step for human body model
- Resolution (58154-C) : 10V per-step for machine model, 30V per-step for human body model
- Diversity control interface : PCI DIO card
- Up to 8000V (58154-C)

# Œ

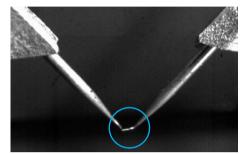
Chroma 58154 series ESD (Electrostatic Discharge) Test Systems are PCI controlled module to simulate electrostatic discharge pulse during electronic device testing. The 58154 series offer both ANSI/ESDA/JEDEC JS-001-2014-Human Body Model and ANSI/ESD STM 5.2-2012-Machine Model. The user friendly software offers programmable and flexible features, such as sampling test on a wafer, ESD model, ESD pulse polarity, ESD pulse interval in a sequence, and automatic testing function.

The 58154 series includes a control module and a pulse output external box. High voltage power supply unit (PSU) and pulse shaping circuits provide the ESD standards compliant pulse waveform.

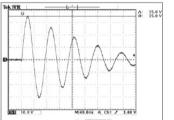
The 58154 series offer a flexible and total ESD test solution to customers. Furthermore, the ESD pulse is generally applied to the device under test before measuring device electric parameters and the 58154 series can be perfectly integrated with Chroma 58212-C to provide a total solution in production line.

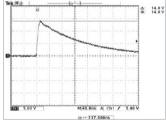
### ORDERING INFORMATION

**58154 :** ESD Test System (4kV/400V) **58154-B :** ESD Test System (6kV/800V) **58154-C :** ESD Test System (8kV/800V)



ESD Test on LED chip





Machine Model waveform

Human Body Model waveform

| SPECIFICATIONS          |   |   |   |  |  |
|-------------------------|---|---|---|--|--|
| Model                   | 58154                                   | 58154-C                                   |   |  |  |
| Parameter               |   | Value                                     |   |  |  |
| ESD Mode                |   | Machine Model / Human body model          |   |  |  |
| Pulse Voltage           | Machine model: 50V to 400V $\pm$ 5V     | Machine model: 100V to 800V $\pm$ 10V     | Machine model: 100V to 800V $\pm$ 10V   |  |  |
| Fuise voitage           | Human body model: 250V to 4KV $\pm$ 20V | Human body model: 250V to 6KV $\pm$ 30V   | Human body model: 250V to 8KV $\pm$ 30V |  |  |
| ESD Specification *1 *2 | Machine model reference on ST           | M5.2-2012 ; Human body model reference or | ANSI/ESDA/JEDEC JS-001-2014             |  |  |
| Pulse Interval          |   | 20 ms *3 to 1 s (User definable)          |   |  |  |
| Pulse Repetition        |   | Single or multiple                        |   |  |  |
| Pulse Polarity          |   | Positive or negative (software control)   |   |  |  |
| AC Input                | 100 to 240V, 47 to 63 Hz                |   |   |  |  |
| Dimensions              | 434.6mm(W) x 97.7r                      | nm(H) x 306.8mm(D)                        | 434.6mm(W) x 97.7mm(H) x 450mm(D)       |  |  |
| Weight                  | 12 kg                                   |   |   |  |  |

Pattern No. : I311648, I398655, ZL 2009 2 0148342.2

Pattern Name : Discharge and remote feedback integrated testing system

**Note\*1**: The test condition is under Chroma's probe tips

**Note\*2**: The accuracy of Chroma 58154 may vary in customer's setup conditions. To fix this problem, ESD tester needs to be tuned the value of the impedance to minimized waveform distortion, or customers provide their setup information in advance and Chroma tunes ESD testers before shipment to fit customer's test method.

Note\*3 : The test condition is for Model 58154 and the operation is at fix pulse mode.

# **LED Electrical Test Module**

# Model 58221-200-2



### **KEY FEATURES**

- Focuses on LED test application
- Cover High Voltage (HV) and High Power (HP) LED test requirement
- Build-in hardware sequencer
- Build-in program memory and data memory
- Support LED SCR characteristic detect function

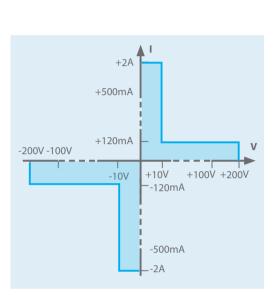
### **TEST ITEMS**

- Forward voltage (Vf)
- Reverse breakdown voltage (Vrb) Leakage (Ir)
- LIV
- I-V characterization

Chroma 58221-200-2 is a module specially designed to test the electrical features of LED in full range. It has all functions required for testing the LED electrical features. The 58221-200-2 supplies high accuracy current source up to  $\pm 200V/\pm 120$ mA for High voltage (HV) and up to  $\pm 10V/\pm 2$ A for High Power (HP). Besides the standalone operation the 58222-200-2 is featured in, the USB interface and other integrated design can also be applied for synchronous measurement.



### 58221-200-2: LED Electrical Test Module



| Model                       | 58221-200-2            |  |                                   |   |  |  |
|-----------------------------|------------------------|--|-----------------------------------|---|--|--|
| Current Source Accuracy     |                        |  |                                   |   |  |  |
| Range                       | Programming Resolution | Source Accuracy<br>$23^{\circ}C \pm 5^{\circ}C$<br>$\pm$ (Reading + Range) | Default Measurement<br>Resolution | Measurement Accuracy<br>$23^{\circ}C \pm 5^{\circ}C$<br>$\pm$ (Reading + Range) |  |  |
| ±20 μ A                     | 1nA                    | 0.05% + 0.04%  | 1nA                               | 0.05% + 0.04%   |  |  |
| ±500 μ A                    | 50nA                   | 0.05% + 0.04%  | 50nA                              | 0.05% + 0.04%   |  |  |
| ±20mA                       | 1 µ A                  | 0.05% + 0.04%  | 1 <i>µ</i> A                      | 0.05% + 0.04%   |  |  |
| ±500mA                      | 50 µ A                 | 0.08% + 0.04%  | 50 μ A                            | 0.08% + 0.04%   |  |  |
| ±2A                         | 100 <i>µ</i> A         | 0.05% + 0.1% (≥0.1A range)<br>0.1% + 0.3% (<0.1A range)                    | 100 µ A                           | 0.05% + 0.1% (≥0.1A range)<br>0.08% + 0.1% (<0.1A range)                        |  |  |
| Voltage Source Accuracy     |                        |  |                                   |   |  |  |
| Range                       | Programming Resolution | Source Accuracy<br>$23^{\circ}C \pm 5^{\circ}C$<br>$\pm$ (Reading + Range) | Default Measurement<br>Resolution | Measurement Accuracy<br>$23^{\circ}C \pm 5^{\circ}C$<br>$\pm$ (Reading + Range) |  |  |
| ±10V                        | 1mV                    | 0.03% + 0.02%  | 1mV                               | 0.03% + 0.02%   |  |  |
| ±100V                       | 10mV                   | 0.03% + 0.02%  | 10mV                              | 0.03% + 0.02%   |  |  |
| ±200V                       | 10mV                   | 0.03% + 0.02%  | 10mV                              | 0.03% + 0.02%   |  |  |
| General Specification       |                        | · · · · · · · · · · · · · · · · · · ·                                      |                                   | ·   |  |  |
| Interface                   |                        | USB/Star   | nd alone                          |   |  |  |
| Trigger                     |                        | Avail  | able                              |   |  |  |
| RAM (16 bits)               |                        | 16   | M                                 |   |  |  |
| Operatoin Environment       |                        | 0°C~5°C (32°F~122°F) ; Humidi  | ty : < 70% R.H. Non-condensin     | g   |  |  |
| Max. Power Consumption (VA) |                        | 120  | )VA                               |   |  |  |
| Dimensions (WxHxD)          |                        | 432x110  | «432 mm                           |   |  |  |
| Weight (kg)                 |                        | 1  | 0                                 |   |  |  |

Video & Color

Flat Panel Display

# LED Chip Level Tester

# Model 58173-TC



# The LED Test System Model 58173-TC focuses on LED wafer/chip characteristics analysis and provides optimized test performance. Its test items include a variety of voltage/current output measurement, optical power measurement, and spectrum analysis. On measurement, several electrical and optical characteristics analysis can be achieved at a time within 25 ms, and its electrical measurement supports high-voltage LED and high-brightness LED applications.

SPECIFICATIONS

**Electiral Test Items** 

Model

**Parameters** 

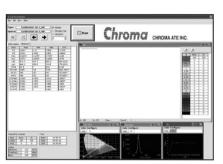
On system integration, the 58173-TC can easily integrate various Probers and Handlers for wafer probing and chip sorting. In addition, optional switch module allows test system to perform multi-channel and multi-chip measurements.

Forward Voltage(Vf), Reverse Leakage Current (Ir), Reverse

Luminous Intensity (mcd) Lumon (lm) Padiant neuvor (mu)

# **KEY FEATURES**

- High test speed: complete whole test within 25ms (selected test items)
- Super statble of temperature variationSupport high voltage and high power
- LED test requirement
- Support multi-die test (option)
- Support ESD test (option)



**Real-Time Production Information** 

| H 54.5   | er (fac s   | led.  |                |                         |                                       |                     |                             |                |            |   |  |               |  |                        |  |  |   |   |               |  |   |   |
|--|---|---|----------------|-------------------------|---------------------------------------|---------------------|-----------------------------|----------------|------------|---|--|---------------|--|------------------------|--|--|---|---|---------------|--|---|---|
| 8  |   | • • • •   |                | + nyt<br>o Sre<br>o Mar | fo the                                |                     | Run                         |                |            | Cł  | r  | on            | 10   | Z                      | CHF  | IOM  | nates                                       | Dermi d   | her! a        | 0912B                                  |   |   |
| idit Tesi  | Table   |   |                |                         |                                       | -                   | _                           | _              |            |   |  |               |  |                        |  |  |   |   |               |  |   |   |
| Atlas  | 30000   | 0.00  | fim            |                         |                                       |                     |                             |                |            |   |  |               |  |                        |  |  |   |   |               |  |   |   |
| 10   | . im  |   |                |                         | -                                     |                     |                             | -              | _          | Paratel   | *  |               | -  | _                      |  | <b>Appendix</b>                                |   |   | Arms          |  |   | _                                       |
| 되니-  | 12  | 20  | 84             | Safety Str.             |                                       | 1.0                 | Setti Back                  |                | -          | functional data   | 6.001  | - Secol       |  |                        |  |  |   |   |               |  |   |   |
| 0.8  |   | 23  | 11             | Calling Int             |                                       | -11-                | Link half                   |                | ÷.         | free locations  | 100  | in the second |  | -                      |  |  |   |   |               |  |   |   |
|  | 1.741.01  | 1. 1  | 10             | man in                  | - 10                                  | 1.0                 | 208200                      | a              | 11         | Datase Trajel   | 1.2  | Number        | 104  | 1.018                  |  | dist.  | 52  | - Set   | itva Cerl     | 1 24                                   |   | (ate                                    |
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| *<br>***   | 1<br>9601<br>8  | t<br>Han<br>B   |                | - 4 6 33                | - 4 8/88                              |                     |                             | ~ 7.2 00       | 80 X X =   | 1 1<br>04 04<br>04 04   | 10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>1                  | 4 4<br>7 7    | 14<br>14,00<br>14,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,00<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,0000<br>16,00000<br>16,000000<br>16,0000000000 |                        |  | 1402   | 10<br>1041<br>1042<br>11                    | 8<br>970<br>970<br>870<br>870   | n<br>w<br>M   | 2<br>10<br>10<br>33                    | 0<br>4)<br>11<br>20                     |   |
| re<br>Te<br>tan  | 1<br>9601<br>8  | 1   |                |                         | - 4 8 08                              |                     |                             | ~ 7.7 00       | - 10 X 3 - | 1 1<br>01 09<br>01 01<br>1 1  | are<br>are<br>B  | 11            | 14<br>14<br>14<br>16<br>16<br>16<br>16   |                        |  | 1402   | 38<br>1993<br>1942<br>19                    | 8<br>75<br>87<br>87<br>87<br>87<br>87<br>87<br>87<br>87<br>87<br>87<br>87<br>87<br>87   | n 2 2 50      | ************************************** | 8                                       | No. of                                  |
| tan<br>Tan<br>Tan<br>Treshol   | i<br>sen<br>B   |   | - 4 10         | 1<br>4<br>8<br>8        | - 80.00                               |                     |                             | - 2200 -       | mol. 3. =  |   | 10<br>10 4<br>10 4<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10 |               | 8  | 8                      | E III  | nes<br>Nes<br>B                                | 9<br>1993<br>1942<br>1942                   | 1000 m  | N 22 20 1     | 8                                      | 8                                       | a la                                    |
| tan<br>Te<br>tan<br>Trevelo  |   | 1 108   |                |                         | - 4 100                               | E S                 | in in                       | ~ 7 7 20 ~ 2 1 | BOX X =    |   | 10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>1                  | 9 9<br>1 4    | 2.00<br>2.00<br>2.00   | 1 1.42<br>(2)          | Net B  | NAC<br>NAC<br>B                                | 9<br>199<br>197<br>197<br>197<br>197<br>197 | 9<br>970<br>970<br>170<br>170   | N 22 23       | 8                                      | 8                                       | N IN IN                                 |
| tan<br>Tan<br>Tan<br>Treshol   | 1<br>9400<br>9400<br>8<br>8<br>4<br>9400<br>9400<br>9400<br>9400<br>940 | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 |                |                         | - 4 V (S)                             | 100                 | in in                       | 12             |            | 1 1<br>(B-1) (B+2)<br>(B-1) (B+2)<br>(B-1) (B+2)<br>(B-1) (B+2)<br>(B-1) (B+2)<br>(B-1) (B+2) | 14 0<br>14 0   |               | - 22   | 1 1.42<br>10<br>10,000 | 11 11 11 11 11 11 11 11 11 11 11 11 11         | nes<br>Nes<br>B                                | 4,49,5                                      | 9<br>970<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>970<br>80<br>970<br>80<br>970<br>970<br>80<br>970<br>80<br>970<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>80<br>970<br>970<br>970<br>80<br>970<br>970<br>80<br>970<br>970<br>80<br>970<br>970<br>970<br>970<br>970<br>970<br>970<br>970<br>970<br>97 | 100           |  | 1                                       | A R A R A R A R A R A R A R A R A R A R |
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Flexible Editable Test Parameters



Powerful Report File Editing

|                         |                      | Luminous Intensity (mcd), Lumen (Im), Radiant power (mw),      |  |  |  |  |
|-------------------------|----------------------|--|--|--|--|--|
| Optical Test Item       | IS                   | Dominant Wavelength (Wd), Peak Wavelength (Wp), FWHM,          |  |  |  |  |
|                         |                      | CIE Chromaticity, CCT, CRI                                     |  |  |  |  |
| <b>Electrical Paran</b> | neter Measurements   |  |  |  |  |  |
| Power Range             |                      | $\leq$ 20W, as the figure shows on next page                   |  |  |  |  |
|                         | Source Range         | $\pm 10V / \pm 100V / \pm 200V$                                |  |  |  |  |
| Valtaga                 | Source Accuracy      | 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. *1   |  |  |  |  |
| Voltage                 | Measurement Range    | ±10V/±100V/±200V   |  |  |  |  |
|                         | Measurement Accuracy | 0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. /0.03% + 0.02%F.S. *1    |  |  |  |  |
|                         | Source Range         | $\pm$ 20uA / $\pm$ 500uA / $\pm$ 20mA / $\pm$ 500mA / $\pm$ 2° |  |  |  |  |
|                         | Source Accuracy      | 0.08% + 0.06%F.S. / 0.08% + 0.05%F.S. / 0.08% + 0.05%F.S. /    |  |  |  |  |
| Current                 |                      | 0.3% + 0.1%F.S. / 0.3% + 0.3%F.S *1                            |  |  |  |  |
| Current                 | Measurement Range    | $\pm$ 20uA / $\pm$ 500uA / $\pm$ 20mA / $\pm$ 500mA / $\pm$ 2° |  |  |  |  |
|                         | Measurement Accuracy | 0.06% + 0.04%F.S. / 0.06% + 0.03%F.S. / 0.06% + 0.03%F.S. /    |  |  |  |  |
|                         | Measurement Accuracy | 0.25% + 0.1%F.S. / 0.25% + 0.3%F.S. *1                         |  |  |  |  |
| <b>Optical Measur</b>   | ements               |  |  |  |  |  |
| Spectrometer            | Wavelength Rang      | 350 ~ 780 nm   |  |  |  |  |
| Spectrometer            | Detector Pixels      | 2048 pixels  |  |  |  |  |
| Wp                      | Repeatability *2     | ±0.5 nm  |  |  |  |  |
| Wd                      | Repeatability *2     | ±0.2 nm  |  |  |  |  |
| (380~780nm)             |                      | 0.2 mm   |  |  |  |  |
| Radiant Flux            | Repeatability *2     | ±1%  |  |  |  |  |
| (mW)                    | , ,                  |  |  |  |  |  |
| Operation               | Temperature          | 20°~ 30°   |  |  |  |  |
| Environment             | Humidity             | 40% ~ 70%  |  |  |  |  |
| Facility Require        |                      | 1  |  |  |  |  |
| Power Requirem          | ent                  | 800 VA   |  |  |  |  |
| Dimensions (W >         | (D x H)              | Electrical Test Module : 486 mm x 462 mm x 110 mm              |  |  |  |  |
|                         |                      | Optical Test Module : 486 mm x 475 mm x 110 mm                 |  |  |  |  |
| Weight                  |                      | 15 kg  |  |  |  |  |
|                         |                      |  |  |  |  |  |

58173-TC

Breakdown Voltage (Vrb), SCR

Note \*1 : Test condition is under point of sensing

Note \*2 : The tested device is blue LED chip

# **ORDERING INFORMATION**

58173-TC : LED Chip Level Tester Optical Fiber : UV-VIS / 0.25m~2m / ψ100~600nm Optical Attenuation Module Solar Cell Photo Detector (optional) Integrating Sphere (2"~4") (optional) Industrial Personal Computer Four channels Switching Box

# LED Mapping Probe Tester

# Model 58212-C



### **KEY FEATURES**

- High Speed and Accuracy
- Lateral, Vertical, and Flip Chip
- Wide Power Test Range (up to 200V/2A)
- Up to 8 inch Wafers
- Chroma® Huge Photo Detector
- Unique Edge Sensor
- Patented Probe Head
- Robust Z-Axis Stage
- Wafer Mapping Algorithm
- **External Light Shielding Enclosure**
- Analysis Tools and Statistical Reports

# HARDWARES

- Automatic LED Wafer/Chip Prober
- Electrical Test Module
- Optical Test Module
- Optional ESD Test Module

### **TEST ITEMS**

- Electrical Parameters:
- Forward Voltage Measurement (Vf)
- Reverse Breakdown Voltage
- Measurement(Vrb)
- Reverse Leakage Current (Ir)
- SCR Detection
- Optical Parameters:
  - Optical Power (mw, Im, mcd)
  - Dominant Wavelength (Wd)
  - Peak Wavelength (Wp) - Full Width at Half Maximum (FWHM)
  - CIExy CCT CRI



The Chroma 58212-C features an automated LED wafer/chip probe tester, delivering fast and accurate LED measurements with test times less than 125ms \*1.

The system can be modified to support different LED structures including Lateral, Vertical, and Flip Chip designs. Integrated scanners provide autonomous wafer mapping to guarantee precision testing. The patented probe head prevents device scratches and ensures solid contact with every LED.

Chroma's unique design acquires and analyzes optical data such as the dominant wave length, peak wavelength, and CCT. Additionally, it provides essential electrical data such as forward voltage, leakage current, and reverse breakdown voltage, all in one test step.

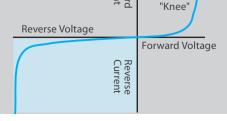
The 58212-C includes a user-friendly graphical interface and advanced logic algorithms to

significantly increase production efficiency. Comprehensive statistical reports and analysis tools allow for easy control and mass production management.

Note \*1 : Test condition: under 300um sample pitch, 5 electrical test parameters and 1 optical parameter. Due to differences in LED characteristics, the measurement results may vary.



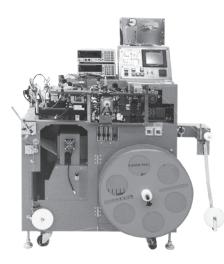
| SPECIFICATIO           | NS                              |  |  |  |  |  |
|------------------------|---------------------------------|--|--|--|--|--|
| Model                  |                                 | 58212-C  |  |  |  |  |
| Application            |                                 |  |  |  |  |  |
| Test Area              |                                 | $\psi$ 8 inch wafer  |  |  |  |  |
| Supported Dev          | vice                            | Chip on wafer : 2", 4", 6", 8"   |  |  |  |  |
| (Chuck is devic        | ce selected)                    | Chip on tape : 2", 4", 6"  |  |  |  |  |
| Chuck Type             |                                 | Lateral type, Vertical type, and Flip Chip type (Select one of them)                               |  |  |  |  |
| Die Size               |                                 | 7 ~ 120 mil  |  |  |  |  |
| Pad Size               |                                 | $\geq$ 70 $\mu$ m  |  |  |  |  |
| <b>Electrical Para</b> | ameter Measuremen               | ts   |  |  |  |  |
| Power Range            |                                 | ≦ 20W  |  |  |  |  |
|                        | Source Range                    | ±10V/±100V/±200V   |  |  |  |  |
| Voltage                | Source Accuracy                 | 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. *2                                       |  |  |  |  |
| voltage                | Measure Range                   | $\pm 10V / \pm 100V / \pm 200V$  |  |  |  |  |
|                        | Measure Accuracy                | 0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. *2                                       |  |  |  |  |
|                        | Source Range                    | $\pm$ 20uA / $\pm$ 500uA / $\pm$ 20mA / $\pm$ 500mA / $\pm$ 2A                                     |  |  |  |  |
|                        | Source Accuracy                 | 0.08% + 0.06%F.S. / 0.08% + 0.05%F.S. / 0.08% + 0.05%F.S. /  |  |  |  |  |
| Current                |                                 | 0.3% + 0.1%F.S. / 0.3% + 0.3%F.S *2  |  |  |  |  |
|                        | Measure Range                   | $\pm 20 \text{uA} / \pm 500 \text{uA} / \pm 20 \text{mA} / \pm 500 \text{mA} / \pm 2A$             |  |  |  |  |
|                        | Measure Accuracy                | 0.06% + 0.04%F.S. / 0.06% + 0.03%F.S. / 0.06% + 0.03%F.S. / 0.25% + 0.1%F.S. / 0.25% + 0.3%F.S. *1 |  |  |  |  |
| <b>Optical Measu</b>   | urements                        |  |  |  |  |  |
|                        | Wavelength Rang                 | 350 ~ 780 nm   |  |  |  |  |
| Spectrometer           | Wp Repeatability                | ±0.5 nm  |  |  |  |  |
| spectrometer           | Wd Repeatability<br>(380~780nm) | ±0.3 nm  |  |  |  |  |
| Optical Power          | Repeatability                   | ±1%  |  |  |  |  |
| Operation              | Temperature                     | 20° ~ 30°  |  |  |  |  |
| Environment            | Humidity                        | 40% ~ 70%  |  |  |  |  |
| <b>Facility Requi</b>  |                                 |  |  |  |  |  |
| Machine Dime           | nsion                           | 980 mmx1160mmx1500 mm (does not include monitor and signal)  |  |  |  |  |
| Power Require          | ment                            | Single phase, 220VAC $\pm$ 10%, 50/60Hz, 20A   |  |  |  |  |
| Input Air              |                                 | -0.2 Mpa / $\psi$ 6 mm   |  |  |  |  |
| Weight                 |                                 | 750 kg   |  |  |  |  |
| Note *1 : Test c       | ondition is under poir          | nt of sensing  |  |  |  |  |
|                        | ested device is blue LE         |  |  |  |  |  |
| <b>ORDERING IN</b>     | FORMATION                       | ent  |  |  |  |  |
| 58212-C: LED           | Mapping Probe Tester            | 주 죠. "Knee"  |  |  |  |  |



All specifications are subject to change without notice.

# Packaged LED Test Sorter & Tapper

# Model 58270/58280



Tapper 58280

### **KEY FEATURES**

- High testing/sorting speed : Up to 42k/48k LEDs per hour (58270)
- Fully configurable test stations
- Complete optical and electrical test functions including : CIE x,y, CCT, mW, Lumen, Vf, Ir etc.
- Auto polarity detection and orientation correction
- High accurate SMU and temperature controlled spectrometer provide highest measurement repeatability under any environment
- Super low stress bowl feeder provides highest yield
- Optional optical inspection secures no chipped chips or chips with stains go into pass bins
- Up to 256/36 (58270/58280) customer definable bins
- Packaged type supported : 1313 CSP, 1616 CSP, 0603, 0606, 0608, 1005, 1608, 1612, 1615, 2012, 3010, 3014, 3030, 3216, 3303, 3528, 4014, 5050, 5630, 7020, 7030, 8520 ; other types available upon request
- High speed tapping (58280)
- Versatile graphical user interface



With rise of Green Energy, LED, with its high

energy efficiency and reliability, has played

important role in energy saving. Despite LED

light, many modern electronics applications are

also increasingly using LED because of its energy

saving feature, such as backlight of LCD monitor, TV and mobile devices. This results continue

growth of demand in, not only volume but also

LED tester/sorter is equipment used to test and

sort (white) packaged LEDs then sort them into

different specs that are defined by customers.

However, with new type of LED packaging

technologies, primarily CSP (Chip Scale Packing),

they brings new challenges to the conventional

Unlike conventional white packaged LEDs which

package Blue LED chips into plastic mold with

metal lead frame and dispense phosphor to

give desired white color, CSP LED dispense the

phosphor directly on Flip-Chip type of LED wafer

therefore, no additional packaging process is

need. Plus, removing the plastic mold, it provides

wider light emitting angle which highly desirable

new innovations in packaged LED.

packaged LED Tester/Sorter design.

LED Packaged Lavel Tester 58174

for backlight application. However, the CSP LED and its unique structure make probing lot difficult then conventional packaged LED. Also, lacking of plastic mold and lead frame, it is structurally more fragile than conventional packaged LED.

Chroma 58270 Packaged LED Tester/ Sorter was designed to meet all of the challenges brought by conventional and new type of CSP LED. Bin numbers can be custom-designed up to 256 bins. Innovative probing mechanism provides highly repetitive probing quality; Specially designed low stress bowl feeder guarantees minimum chipped chips; Optional optical inspection secure no fail devices go to pass bins. to provide high speed, high accurate yet high yield of testing & sorting solution.

For some manufacturing process alignments, Packaged LED Tester/Sorter may require to combine with Tapper so the main bin can be tapped into reel directly. Chroma 58280 is designed to combine LED Tester, Sorter and Tapper into one integrated system with all features available in Chroma 58270 (except bin numbers).



Packaged LED Tester/ Sorter 58270



Flexible Editable Test Parameters

**Real-Time Production Information** 

Powerful Report File Editing

# Packaged LED Test Sorter & Tapper

# Model 58270/58280

| Model               | 58270  | 58280   |  |  |
|---------------------|--|---|--|--|
| Throughput (UPH)    | up to 48k (0603) *1                          | up to 48k (0603) *1   |  |  |
| LED Type            |  | 1608, 1612, 1615, 2012, 3010, 3014, 3030, 3216,<br>.8520 ; other types available upon request |  |  |
| Bin Number          | up to 256                                    | up to 37  |  |  |
| Optical Inspection  | optional                                     | optional  |  |  |
| LED Tester          | Chroma 58174 LED Tester                      | Chroma 58174 LED Tester   |  |  |
| LED Reel Type       | void   | carrier tape  |  |  |
| Dimension (HxWxD)   | 1,680mm x 850mm x 1,400mm                    | 1,800mm x 1,000mm x 1,500mm   |  |  |
| Weight              | approx. 450 kg                               | approx. 300 kg  |  |  |
| Input Power         | 220V; 5                                      | 50/60Hz   |  |  |
| Environment         | 18~28°C                                      | ; < 70%RH   |  |  |
| Utility Requirement | Air pressure: >4~ $\leq$ 5kg/cm <sup>2</sup> | Air pressure: >4~ $\leq$ 5kg/cm <sup>2</sup>  |  |  |
| ounty requirement   | Vacuum Input: 20~60 kpa                      | Vacuum Input: 20~60 kpa   |  |  |

Note \*1 : Actual UPH may vary based on distribution of the bins.

Note \*2 : The tested device is blue LED chip

| SPECIFICATIONS            |                             |  |  |  |
|---------------------------|-----------------------------|--|--|--|
| Model                     |                             | 58174  |  |  |
| Parameters                |                             |  |  |  |
| Electiral Test Items      |                             | Forward Voltage(Vf), Reverse Leakage Current (Ir),<br>Reverse Breakdown Voltage (Vrb), SCR   |  |  |
| Optical Test Items        |                             | Luminous Intensity (mcd), Lumen (lm), Radiant power (mw), Dominant Wavelength (Wd), Peak<br>Wavelength (Wp), FWHM,<br>CIE Chromaticity, CCT, CRI |  |  |
| Electrical Parameter      | Measurements                |  |  |  |
| Power Range               |                             | ≦ 20W  |  |  |
|                           | Source Range                | ±10V/±100V/±200V   |  |  |
| Voltage                   | Source Accuracy             | 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. / 0.05% + 0.03%F.S. *1   |  |  |
| voltage                   | Measurement Range           | $\pm 10V / \pm 100V / \pm 200V$  |  |  |
|                           | Measurement Accuracy        | 0.03% + 0.02%F.S. / 0.03% + 0.02%F.S. /0.03% + 0.02%F.S. *1  |  |  |
|                           | Source Range                | $\pm 20 \mu A / \pm 500 \mu A / \pm 20 m A / \pm 500 m A / \pm 2^{\circ}$  |  |  |
| Current                   | Source Accuracy             | 0.08% + 0.06%F.S. / 0.08% + 0.05%F.S. / 0.08% + 0.05%F.S. / 0.3% + 0.1%F.S. / 0.3% + 0.3%F.S *1  |  |  |
| Current                   | Measurement Range           | $\pm$ 20uA / $\pm$ 500uA / $\pm$ 20mA / $\pm$ 500mA / $\pm$ 2°   |  |  |
|                           | Measurement Accuracy        | 0.06% + 0.04%F.S. / 0.06% + 0.03%F.S. / 0.06% + 0.03%F.S. / 0.25% + 0.1%F.S. / 0.25% + 0.3%F.S. *1   |  |  |
| <b>Optical Measuremen</b> | ts                          |  |  |  |
| Cur a atua un ata u       | Wavelength Rang             | 350 ~ 780 nm   |  |  |
| Spectrometer              | Detector Pixels             | 2048 pixels  |  |  |
| CIExy                     | Repeatability               | ±0.0015  |  |  |
| Wp                        | Repeatability               | ±0.5 nm  |  |  |
| Wd (380~780nm)            | Repeatability               | ±0.2 nm  |  |  |
| Radiant Flux (mW)         | Repeatability               | ±1%  |  |  |
| Note *1: Test condition   | n is under point of sensing |  |  |  |

Note \*2: The tested device is cool white LED

Note \*3: The tested device is blue LED chip

**ORDERING INFORMATION** 

58270 : Packaged LED Test Tapper 58280 : Packaged LED Test Sorter 58174 : LED Packaged Lavel Tester

Turnkey Test & Automation

# LED Burn-in Tester

# Model 58266



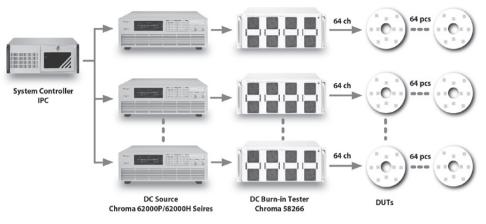
# **KEY FEATURES**

- Flexible channels output: 32/64/128 channels
- Each channel can offer up to 500mA /400V
- Each channel can parallel connection for high current requirement. Ex: 2-ch: 1A, 4-ch: 2A
- High accuracy of current output and voltage measurement

# SYSTEM ARCHITECTURE

- DUT: single LED, LED array, LED light bar or LED module
- Support channels: 64 ch
- Force Current: Max. 500mA per-channel
- Support parallel connection: Ex: 2-ch: 1A
- Voltage measurement: Max. 400V

Chroma 58266 is a LED Burn-in Tester that each channel can offer a constant current up to 500mA but also has 0~400V voltage measurement function. For product application, various programmable power supplies can be applied for multi-channel constant current output and voltage measurement. The user can integrate several power supplies based on the demands of channels and current for multi-channel test.



| CONFIGURATION             |                     |         |         |  |  |
|---------------------------|---------------------|---------|---------|--|--|
| Programmable              | LED Burn-in Tester  | Force   | Measure |  |  |
| DC Power Supply           | LED Burn-III lester | l range | V Range |  |  |
| Model 62012P-40-12        | Model 58266         | 500mA   | 30V     |  |  |
| 40V/120A/1200W            | WIDGel 56200        | 400mA   | 35V     |  |  |
| Model 62012P-100-50       | Model 58266         | 500mA   | 32V     |  |  |
| 100V/50A/1200W            | WIDGel 56200        | 170mA   | 95V     |  |  |
| Model 62024P-80-60        | Model 58266         | 500mA   | 70V     |  |  |
| 80V/60A/2400W             | WOULEI 56200        | 440mA   | 75V     |  |  |
| Model 62024P-100-50       | Model 58266         | 500mA   | 70V     |  |  |
| 100V/50A/2400W            | WIDUEI 56200        | 350mA   | 95V     |  |  |
| Model 62024P-600-8        | Model 58266         | 110mA   | 300V    |  |  |
| 600V/8A/2400W             | WIOUEI 38200        | 80mA    | 400V    |  |  |
| Model 62050P-100-100      | Model 58266         | 500mA   | 95V     |  |  |
| 100V/100A/5000W           | 100000 58200        | JUUITA  | 937     |  |  |
| Model 62050H-450          | Model 58266         | 500mA   | 400V    |  |  |
| 450V/34A/15KW (380V/3Φ4W) | 100001 30200        | JUDITA  | 4000    |  |  |

| SPECIFICATIONS                          |                            |     |                           |                |            |          |  |
|---|----------------------------|-----|---------------------------|----------------|------------|----------|--|
| Model                                   | 58266                      |     |                           |                |            |          |  |
| Voltage Accuracy (23°C ±                | ±5°C)                      |     |                           |                |            |          |  |
| Range                                   | 0~4V                       |     | 0~4                       | 40V            |            | 0~400V   |  |
| Default Measurement<br>Resolution       | 1mV                        |     | 10                        | mV             |            | 100mV    |  |
| Measure Accuracy $\pm$ (%rdg. + offset) | 0.2%+5mV                   |     | 0.2%+                     | -50mV          | 0.3%+500mV |          |  |
| Current Accuracy (23°C ±                | ±5°C)                      |     |                           |                |            |          |  |
| Range                                   | 10 µ A                     |     | 1mA                       | 100mA          | ١          | 500mA    |  |
| Programming<br>Resolution               | 5nA                        |     | 500nA 50 μ                |                | Ą          | 200 µ A  |  |
| Source Accuracy $\pm$ (%rdg. + offset)  | 0.1%+20nA                  | 0.1 | %+300nA                   | 0.1%+200 μ A   |            | 0.2%+1mA |  |
| Temperature                             |                            |     |                           | 8°C & 28~50°(  | -          | <u> </u> |  |
| Coefficient                             |                            |     | $\pm$ (0.5 $\times$ accur |                | ion)/ C    |          |  |
| Max. Voltage Difference                 | 10V @ 500mA<br>50V @ 100mA |     |                           |                |            |          |  |
| of all Channel                          |                            |     |                           | 50mA           |            |          |  |
| Operation Environment                   |                            |     |                           | re:10~50°C     |            |          |  |
| Operation Environment                   |                            |     | Humidity :                | 10~70%RH       |            |          |  |
| Storage Environment                     |                            |     | •                         | ure : -20~70°C | ;          |          |  |
| storage Environment                     |                            |     | Humidity :                | 5~95%RH        |            |          |  |

# **ORDERING INFORMATION**

58266: LED Burn-in Tester

# LED Light Bar Test System

# Model 58182



### **KEY FEATURES**

- Measure the top-view/side-view light bar uniformity composed of white light
- Equipped with image recognition function to capture the LED location accurately
- Excellent optical performance
- ESD damaged sorting function
- FPC/PCB light bar adaptability

Chroma 58182 LED Light Bar Test System is a fully automatic test system able to measure the top-view/side-view light bar uniformity composed of white light. With image recognition function, it can accurately capture the location of LED and identify the center of LED under the measurement. With automatic mechanical and optical measurement function, the 58182 can perform extremely accurate optical and electrical measurement.

The 58182 integrates image recognition function, automatic mechanical and optical measurement. It can not only improve the yield rate by sifting out the defect products, but also reduce the product verification time and development cost. In addition, the 58182 has a flexible measurement platform to adapt different type of top-view / side-view LED light bar measurement, and friendly user interface to reduce user's learning time. Consequently, the 58182 is the best choice for testing top-view/side-view light bar.



**CIE127 Partial Flux Measurement Module** 



CIE127 Condition B measurement Module

### **ORDERING INFORMATION**

58182 : Top-view LED Light Bar Test System

| SPECIFICATIONS           |                    |                                  |                                      |                 |  |  |  |
|--------------------------|--------------------|----------------------------------|--------------------------------------|-----------------|--|--|--|
| Model                    |                    |                                  | 58182                                |                 |  |  |  |
| Optical Module           |                    | CIE 127 conditio                 | n B optical tube or Partial flux mea | surement module |  |  |  |
|                          | Range              |                                  | 100~10000mcd                         |                 |  |  |  |
| Average Intenstive (mcd) | Accuracy           |                                  | ±5%                                  |                 |  |  |  |
|                          | Repeatability      |                                  | ±2%                                  |                 |  |  |  |
| CIE x, y                 | Accuracy           |                                  | ±0.004                               |                 |  |  |  |
| CIE X, Y                 | Repeatability      |                                  | ±0.002                               |                 |  |  |  |
|                          | Wavelength Range   |                                  | 380~780nm                            |                 |  |  |  |
| Spectrumeter             | Optical resolution |                                  | 2nm                                  |                 |  |  |  |
|                          | A/D                |                                  | 16 bits                              |                 |  |  |  |
| Light Bar length         |                    |                                  | 600mm                                |                 |  |  |  |
| Offer Channels           |                    |                                  | 20 X 12 Ch                           |                 |  |  |  |
|                          | Voltage            | 0~200V                           | 0~60V                                | 0~300V          |  |  |  |
| Power Supply             | Current            | 10uA~5mA                         | 1mA~2A                               | 40mA~2A         |  |  |  |
| Power Supply             | Voltage accuracy   | 0.3%+0.1%F.S                     | 0.01%+10mV                           | 0.05%+0.05%F.S  |  |  |  |
|                          | Current accuracy   | 0.3%+0.1%F.S                     | 0.01%+1mA                            | 0.03%+40mA      |  |  |  |
| Data output              | Format             | Excel (*.csv)                    |                                      |                 |  |  |  |
| Data output              | Output items       |                                  | mcd, CIEx, CIEy                      |                 |  |  |  |
| XY moving range          |                    | 600x250mm                        |                                      |                 |  |  |  |
| Dimension                |                    | 1300 (D) × 2360 (W) × 1815 (H)mm |                                      |                 |  |  |  |

LED/

notovoltaic Test

Automated

Test &

Inspection

urnkey Test &

# LED Light Bar Electrical Test System

# Model 58183



Integrating customer's extend power supply

Using general DUT adapter to offer test

Software support authority managerment

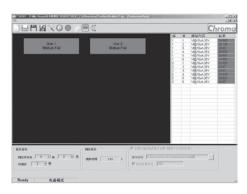
**KEY FEATURES** 

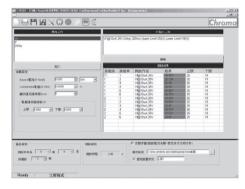
PC base design

Support multi- channels test

application widely

Chroma 58183 is a PC base test system for LED light bar electrical test. In hardware design, Chroma 58183 not only offers a accurately current (10uA~5mA) to test LED electrical features but also can integrate an extra high power supply for high current test. Otherwise, Chroma 58183 offers multi-channels test function. It is widely used in many application. In LED light bar manufactory, 58183 can test more 10 pieces Light bar at the one time. In LED backlight manufactory, 58183 can test 4 pieces LED backlight via a 4 channels control box. To sum up, 58183 is a very strong and powerful tool for LED light bar and LED backlight manufactories.





### ORDERING INFORMATION

# 58183 : LED Light Bar Electrical Test System

| SPECIFICATIONS                |                             |                               |
|-------------------------------|-----------------------------|-------------------------------|
| Model                         | 58                          | 183                           |
| Voltage                       |                             |                               |
| Output Range                  | 10V / 10                    | 0V / 200V                     |
| Source Accuracy *1            | 0.05% +                     | 0.03% F.S                     |
| Measure Accuracy *1           | 0.03% +                     | 0.02% F.S                     |
| Current                       |                             |                               |
| Output Range                  | 20uA/500uA/                 | 20mA/500mA                    |
| Source Accuracy *1            | 0.1% +                      | 0.1% F.S                      |
| Measure Accuracy *1           | 0.1% +                      | 0.1% F.S                      |
| Applicative Type              | Top/side-view               | / LED light bar               |
|                               | IPC : 451 x                 | 426.5 x 177                   |
| Dimensions                    | Relay Box : 2               | 76 x 430 x102                 |
|                               | Chroma 58221 : 432 x 4      | 32 x 110 (D x W x H mm)       |
|                               | Total                       | 27 Kg                         |
| Weights                       | (IPC 12Kg, Relay Box 5Kg, G | -<br>Chroma 58221-200-2 10Kg) |
| Relay Box (Not in live wire)  |                             |                               |
|                               | Ch1~24                      | Ch25~32                       |
| Switch voltage                | 200VDC                      | 300VDC                        |
| Carry current                 | 300mA                       | 600mA                         |
| Life expectancy of mechanical | 10^6                        | 10^6                          |
| Power IN                      |                             |                               |
| IPC, Chroma 58221-200-2       | 90-24                       | IOVAC                         |
| Relay Box                     | 110 / 220V,5                | 50~60Hz, 2A                   |
| Others                        |                             |                               |
| General purpose relay         | 32 Ch                       | annels                        |
|                               | Temperatu                   | re:10~40°C                    |
| Operation environment         | Humidity:                   | 10%~70%                       |

# LED Luminaires Test System

# Model 58158



# **For Laboratory**

### **KEY FEATURES**

- Simulate the real AC test condition and environment
- Integrate AC, DC, and optical features test to one platform
- Support DC test for AC LED
- Support dual-optical test module in one platform (Integrating sphere or average intensity) (optional)
- Support AC /DC LIV Analysis
- Offer standard light source for calibration

Chroma 58158 LED Lighting Test System, compliances the AC LED Device National Standard, has integrated Chroma's Power Electronics Test Equipment - Programmable AC Power Source and Digital Power Meter to offer users a real AC environment for measuring AC LED.

Furthermore, the 58158 also integrates Chroma DC Power Supplies with the flexible optical test platform which equips with integrating sphere, photo detector, and etc.. Users can measure optical and electrical parameters of AC/DC LED through a friendly softtware interface.



For Laboratory Test

| SPECIFICATIONS           | (50 cm Integrating Sphere | e)   |  |  |  |
|--------------------------|---------------------------|--|--|--|--|
| Model                    |                           | 58158  |  |  |  |
| Measurement Ite          | ems                       |  |  |  |  |
| Optical Measurem         | ient Items                | Lumens (lm), CIE(x,y)), CIE(u',v'), CCT, CRI                           |  |  |  |
| Electrical Measure       | ement Items               | Frequency, Real power P, power factor PF,<br>THD (Option), Vf (Option) |  |  |  |
| <b>Optical Measure</b>   | ment                      |  |  |  |  |
| Photo Detector           | Wavelength Range          | 380~780nm  |  |  |  |
| FIIOLO DELECLOI          | Lumens Range *1           | <5,000 lm (>5K lm optional)  |  |  |  |
| Spectrometer             | Detector Type             | 2048 Pixels Linear CCD array (optional)                                |  |  |  |
| spectrometer             | Optical Fiber Connector   | SMA 905  |  |  |  |
| Lumen accuracy           |                           | ±5%  |  |  |  |
| CIExy accuracy           |                           | ±0.004   |  |  |  |
| Lumen Repeatabi          | lity *2                   | ±0.5%  |  |  |  |
| CIExy Repeatabilit       | zy *2                     | ±0.005   |  |  |  |
| <b>Electrical AC Sou</b> | rce                       |  |  |  |  |
| Output Rating-AC         |                           | 500VA  |  |  |  |
|                          | Range/Phase               | 150V/300V/Auto   |  |  |  |
|                          | Accuracy                  | 0.2%+0.2%F.S.  |  |  |  |
| Voltage                  | Resolution                | 0.1V   |  |  |  |
|                          | Line Regulation           | 0.10%  |  |  |  |
|                          | Load Regulation           | 0.20%  |  |  |  |
| Max.Current /            | RMS                       | 4A/2A (150V/300V)  |  |  |  |
| Phase                    | peak                      | 24A/12A (150V/300V)  |  |  |  |
| Electrical AC Met        | er                        |  |  |  |  |
| Power                    | Range (W)                 | 1.5W~1KW (Model 66201) ; 1.5W~10KW (Model 66202)                       |  |  |  |
| Power                    | Power Factor Accuracy *3  | 0.006+(0.003/PF)KHz  |  |  |  |
| Harmonic                 | Range                     | 2~50 order   |  |  |  |
| DC Measuremen            | t (Optional)              |  |  |  |  |
|                          | Output Voltage            | 0~64V (> 64V optional)   |  |  |  |
|                          | Output Current            | 0~3A (> 3A Optional)   |  |  |  |
|                          | Ripple and Noise          | 1400 uVrms & 14 mVp-p / < 1mA  |  |  |  |
| DC Power Supply          | Line Regulation           | 0.01% +4mV / 0.01% + 300 μ A   |  |  |  |
|                          | Load Regulation           | $<$ 6mV / 0.01% + 300 $\mu$ A  |  |  |  |
|                          | Program Accuracy          | 0.02% + 10mV / 0.01%+1mA   |  |  |  |
|                          | Read back Accuracy        | 0.02% + 10mV / 0.01%+1mA   |  |  |  |
| Others                   |                           |  |  |  |  |
| Dimension (H x W         | x D)                      | 1081 x 532 x 700 mm  |  |  |  |
| Weight                   |                           | 100k g   |  |  |  |
| Power Consumpti          | on                        | 300 W  |  |  |  |
| Operating                |                           | 100~240V VAC 50/60HZ   |  |  |  |
| Software Suppor          | rt DC Source              |  |  |  |  |
|                          |                           | Chroma 11200 (800V), Keithley 24XX Series                              |  |  |  |
|                          |                           |  |  |  |  |

Notes \*1: 20 inch Integrating Sphere

Notes \*2 : The unit under test is 10W halogen lamp

**Notes \*3 :** The PF spec. applies only when the signals are higher then 50% of the selected voltage and current ranges

### **ORDERING INFORMATION**

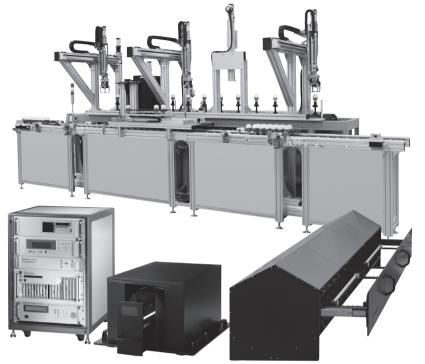
58158: LED Luminaires Test System (for laboratory Test)

| Integrating<br>sphere | 50cm                    | 1m                                | 2m  |  |
|-----------------------|-------------------------|-----------------------------------|---|--|
| Luminaire             | small lamp, bulb, MR-16 | middle lamp,<br>2 feet T8/T5 tube | large lamp,<br>4 feet T8/T5 tube,<br>street light |  |
| Application           | laboratory              | laboratory                        | laboratory  |  |

Note: Customization for 3m integrating sphere

urnkey Test &

# LED Luminaires In-line Test System



Test Instruments

Solar Cell Modules

# Model 58158-SC

The design concept of Chroma LED high speed measurement module is to combine several large size detectors and add up the luminous flux obtained by each detector to calculate the total flux of LED light. This design not only overcomes the shortcoming of previous inconvenient measurement for total flux by conventional integrating sphere, it also implements the inline test on production line. Chroma is able to provide the customer a fully automatic production line that covers both quality and productivity.

# **TEST ITEMS**

- Optical Power characteristics :
- Lm, lm/w, LED operating frequency (Flicker) Color characteristics :
- CIExy, Duv, CIEu'v', CCT, CRI Power characteristics :
- AC mode : Power factor (PF), Irms, Vrms, THD DC mode : Forward voltage

### **ORDERING INFORMATION**

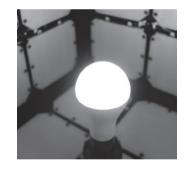
58158-SC: LED Luminaires In-line Test System \*

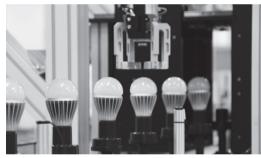
\*Call for customized availability

# **For Production**

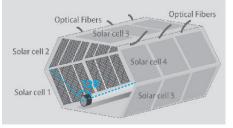
### **KEY FEATURES**

- Mass production application: LED lamp, LED bulb, LED bar, LED streetlight, and other luminaries
- Less error comparing to integrating sphere measurement
- High speed test and flicker measurement
- Provide standard light source for calibration which is international standard traceable
- Thermal control fixture adaptable (option)





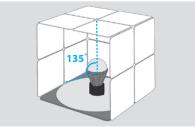




Solar Cell Module for JEL 801 LED Tube







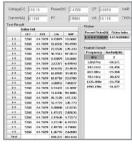
Solar Cell Module for Omnidirectional lamp

# LED Luminaires In-line Test System

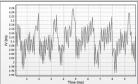
# Model 58158-SC

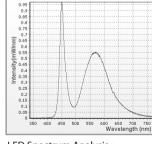
| Model                      |                          | 58158 -SC  |  |  |
|----------------------------|--------------------------|--|--|--|
| Measurement Items          |                          |  |  |  |
| Optical Measurement It     | ems                      | Lumens (lm), CIE(x,y)), CIE(u',v'), CCT, CRI                           |  |  |
| Electrical Measurement     | Items                    | Frequency, Real power P, power factor PF,<br>THD (Option), Vf (Option) |  |  |
| <b>Optical Measurement</b> |                          |  |  |  |
| Photo Detector             | Wavelength Range         | 380~780nm  |  |  |
|                            | Lumens Range             | <5,000 lm (>5K lm optional)  |  |  |
| Spectrometer               | Detector Type            | 2048 Pixels Linear CCD array   |  |  |
| Optical Fiber Connector    |                          | SMA 905  |  |  |
| Lumen measurement R        | epeatability             | ±0.5%  |  |  |
| CIExy Repeatability *1     |                          | ±0.0005  |  |  |
| CCT Repeatability          |                          | ±5K  |  |  |
| CRI Repeatability          |                          | ±1   |  |  |
| Electrical AC Source       |                          |  |  |  |
| Output Rating-AC           |                          | 500VA  |  |  |
| Voltage                    | Range/Phase              | 150V/300V/Auto   |  |  |
|                            | Accuracy                 | 0.2%+0.2%F.S.  |  |  |
|                            | Resolution               | 0.1V   |  |  |
|                            | Line Regulation          | 0.10%  |  |  |
|                            | Load Regulation          | 0.20%  |  |  |
| Max.Current / Phase        | RMS                      | 4A/2A (150V/300V)  |  |  |
| peak                       |                          | 24A/12A (150V/300V)  |  |  |
| Electrical AC Meter        |                          |  |  |  |
| Power                      | Range (W)                | 1.5W~1KW (Model 66201) ; 1.5W~10KW (Model 66202)                       |  |  |
| Power                      | Power Factor Accuracy *2 | 0.006+(0.003/PF)KHz  |  |  |
| Harmonic                   | Range                    | 2~50 order   |  |  |
| DC Measurement (Opt        | ional)                   |  |  |  |
| De measurement (opt        | Output Voltage           | 0~64V (> 64V optional)   |  |  |
|                            | Output Current           | 0~3A (> 3A Optional)   |  |  |
|                            | Ripple and Noise         | 1400 uVrms & 14 mVp-p / < 1mA  |  |  |
| DC Power Supply            | Line Regulation          | 0.01% +4mV / 0.01% + 300 μ A   |  |  |
|                            | Load Regulation          | < 6mV / 0.01% + 300 µ A  |  |  |
|                            | Program Accuracy         | 0.02% + 10mV / 0.01% + 1mA   |  |  |
|                            | Read back Accuracy       | 0.02% + 10mV / 0.01%+1mA   |  |  |
| Others                     |                          |  |  |  |
| Dimension (H x W x D)      |                          | 1081 x 532 x 700 mm  |  |  |
| Weight                     |                          | 100k g   |  |  |
| Power Consumption          |                          | 300 W  |  |  |
| Operating                  |                          | 100~240V VAC 50/60HZ   |  |  |
| Software Support DC        | Source                   |  |  |  |
|                            |                          | /), Chroma 11200 (800V), Keithley 24XX Series                          |  |  |

# **Analysis Tools**



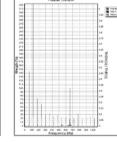
Power Analysis : Im, Im/W, PF, Power





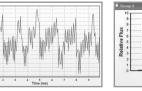
LED Spectrum Analysis : CCT, CRI, Duv

4.3 Group



THD Analysis

- 🗆 ×



Flicker Analysis

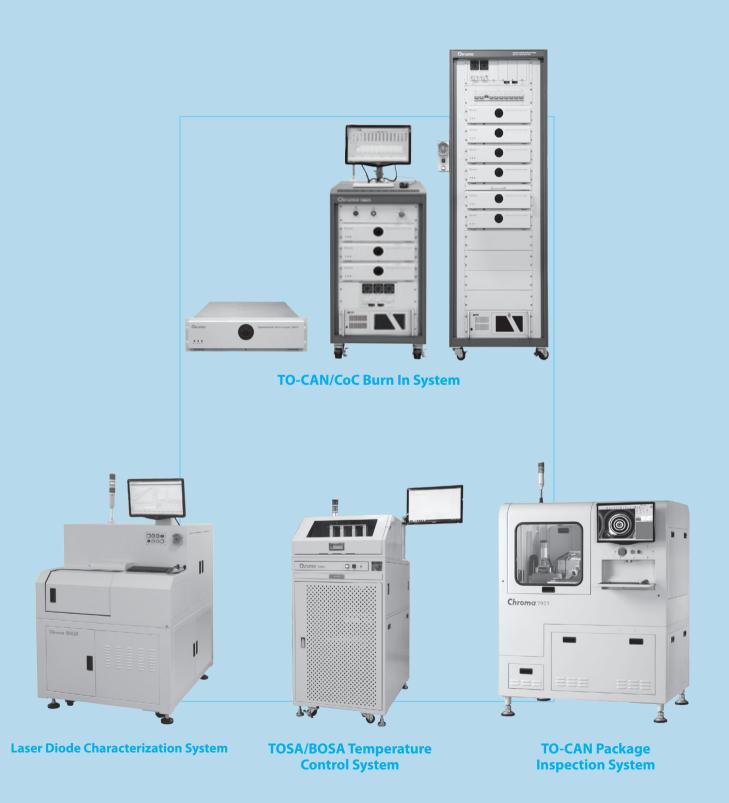
Flicker Analysis

Semiconductor/

PXI Test & Measurement

General Manufacturing Turnkey Test & Purpose Execution System Automation

| TO-CAN/CoC Burn In System            | 7-1 |
|--------------------------------------|-----|
| Laser Diode Characterization System  | 7-3 |
| TOSA/BOSA Temperature Control System | 7-5 |
| TO-CAN Package Inspection System     | 7-7 |
|                                      |     |



# **TO-CAN/CoC Burn In System**

# Model 58603 Series



Half height rack

### **KEY FEATURES**

- For Burn-In, Reliability and Life Testing
- Up to 128 laser diodes per module
- Up to 10 modules (1280 laser diodes) per systems
- ACC and APC control modes
- Individual channel driving and measurement
- Driving current 500 mA per channel and up
- Precise temperature control up to 120 °C
- Individual module operation
- Customization for device form factor upon request

### **Burn-in, Reliability & Life Test**

The Chroma 58603 is a high density, multifunction, and temperature controlled module for laser diode burn-in and lifetime tests. Each module has up to 128 discrete channels which can source current and measure voltage in various control modes as described below.

### **Auto Current Control Mode (ACC)**

In auto current control (ACC) mode, the control circuit will provide the preset current to each laser diode with high stability. No matter how the device resistance and temperature change, the current will be kept constant over the test period. The device voltage will be recorded as a quality reference parameter.

### Auto Power Control Mode (APC)

With feedback signal from the optional external Photo Diode PCB, the control circuit can adjust the laser diode current automatically to keep constant feedback signal strength, which means the optical output of the laser diode is maintained constant over the test period. The device voltage and current are recorded as quality parameters for reference.

### **Temperature Control**

A proprietary designed heat plat will control the laser diode case temperature with high accuracy, excellent stability, and good uniformity. Compared with oven or chamber types of laser diode burn-in systems, our solution is much more compact, easier to operate, better performance, and energy saving. Customers gain benefit for small footprint, versatile usage, and easy maintenance.

### **Individual Module Operation**

Modules are mounted in a 19" rack to form a system. Each module is a 3U height drawer to fit in the rack. Customers can set different modules in different temperatures, operated in different control modes, and with different start and stop times. This provides great flexibility in operation.

### **Protection and Individual Channel Shutdown**

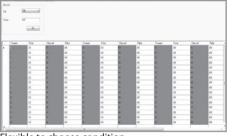
The control circuit is specially designed for protecting laser diodes. No rush current or voltage will occur to hurt the devices. High/Low limits of current and voltage can be set to perform shutdown protection. When abnormality happens, only the particular channel will be shutdown while others are running normally. Besides the protection functions implemented in the control circuit, isolation and ESD protection are also taken care in system design.

# Auto Data Recovery after Communication Interruption

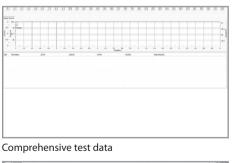
The burn-in data are stored in system PC and optional remote servers. If the communication between the module and PC is broken temporarily, the data will be buffered in the module up to 8 hours or even longer. After the communication is restored, the buffered data will be dumped to the PC/server without loss.

### **User Friendly Softpanel**

The soft panel provides an intuitive visual interface that one can check certain device at certain module with some simple mouse-clicks anytime during the tests. The burn-in raw data are stored in Microsoft Excel compatible format for further analyses. Optional barcode system can be cooperated for test management.

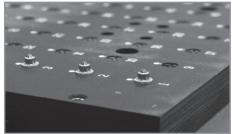


Flexible to choose condition

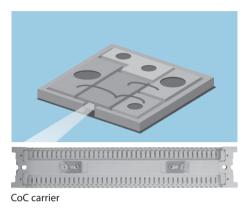


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| Owned_3           |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| Denet_1           |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| Devine_3          |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| A. Inner          |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| Donnel J          |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| Durnel_8          |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| Durnel_S          |              |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |
| *                 |              | -      | _        | _          |                 |         |           |           |          |        |              |         |             |                 | * |
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| 4.5m: [100_139    | -            |        |          |            |                 |         | 1         |           |          |        |              |         |             |                 |   |
|                   | -            |        |          |            |                 |         |           |           |          |        |              |         |             |                 |   |

GUI calibration interface



**TO-CAN** carrier





Optical module



# TO-CAN/CoC Burn In System

# Model 58603 Series

| SPECIFICATIONS                  |                               |  |  |  |  |
|---------------------------------|-------------------------------|--|--|--|--|
| Model                           |                               | 58603                                  |  |  |  |
| Module                          |                               |  |  |  |  |
| Channel Number                  |                               | up to 128                              |  |  |  |
| Laser Diode Type                |                               | TO-46, TO-56, CoC, CoS                 |  |  |  |
| Test Function                   |                               | ACC, APC (optional)                    |  |  |  |
| Burn-in Record Time             |                               | 1 min to 5000 hours                    |  |  |  |
| Communication Port              |                               | RS232                                  |  |  |  |
| Change Kit                      |                               | DUT carrier board                      |  |  |  |
| <b>Auto Current Control Mod</b> | e                             |  |  |  |  |
| Current Range                   |                               | 0~500 mA *1                            |  |  |  |
| Currnt Setting Resolution       |                               | 0.02 mA                                |  |  |  |
| Current Accuracy                |                               | 1%+1mA                                 |  |  |  |
| Compliant Voltage               |                               | 4 V                                    |  |  |  |
| Voltage Measurement Rang        | e                             | 4 V                                    |  |  |  |
| Voltage Measurement Reso        | ution                         | 200uV                                  |  |  |  |
| Voltage Measurement Accu        | racy                          | 1%+10mV                                |  |  |  |
| <b>Auto Power Control Mode</b>  | (Optional)                    |  |  |  |  |
| External PD type                |                               | Si or InGaAs *2                        |  |  |  |
| Wavelength Range                |                               | 390 to 1700 nm                         |  |  |  |
| PD Current Stability            |                               | 1%                                     |  |  |  |
| LD Current Range                |                               | 0~500 mA                               |  |  |  |
| LD Current Measurement Ad       | ccuracy                       | 1%+1mA                                 |  |  |  |
| LD Compliant Voltage            |                               | 4 V                                    |  |  |  |
| LD Voltage Measurement Ad       | ccuracy                       | 1% + 10mV                              |  |  |  |
| Temperature Control             |                               |  |  |  |  |
| Temperature Measuring Rar       | nge                           | 0~150 °C                               |  |  |  |
| Temperature Setting Range       |                               | 40~120 °C                              |  |  |  |
| Temperature Setting/Readir      | ng Resolution                 | 0.1 °C                                 |  |  |  |
| Temperature Stability           |                               | 0.2 °C                                 |  |  |  |
| Temperature Accuracy            |                               | 1 °C                                   |  |  |  |
| Temperature Uniformity          |                               | ±(1 °C + 1.2% ∆T)                      |  |  |  |
| System                          |                               |  |  |  |  |
| Configuration                   |                               | 23" rack, half or full height          |  |  |  |
| Number of Modules               |                               | up to 10 (For full height rack)        |  |  |  |
| DUTs per system                 |                               | up to 1280 (For full height rack)      |  |  |  |
| CommunicationPort               |                               | Ethernet to server                     |  |  |  |
| Dimensions                      | Half height rack , 3 modules  | 1600 x 600 x 900 mm                    |  |  |  |
| $(H \times W \times D)$         | Full height rack , 10 modules | 2000 x 600 x 900 mm                    |  |  |  |
| Weighte                         | Half height rack , 3 modules  | 230kg                                  |  |  |  |
| Weights                         | Full height rack , 10 modules | 500kg                                  |  |  |  |
| Daniel i                        | Half height rack , 3 modules  | AC 220V±10%, 50/60Hz, 11.4A, 2.5KW     |  |  |  |
| Power Requirements              | Full height rack , 10 modules | AC 220V±10%, 50/60Hz, 20A, 4.4KW       |  |  |  |
| Environment Temperature         |                               | 20~30°C                                |  |  |  |
| Humidity                        |                               | <80% RH, non-condensing                |  |  |  |
|                                 |                               | ······································ |  |  |  |

Note \*1 : Can be customized for other specifications

Note \*2 Wavelength dependent, customized PD types upon request Note \*3 : Thermal platform temperature without DUT loading,  $\Delta T = |$  ambient temperature - setting temperature |

**ORDERING INFORMATION** 

58603 : TO-CAN/CoC Burn In System

Video & Color

Flat Panel Display

Optical Devices

 PhotovoltaicTest
 Automated
 Power
 Battery Test &
 Passive
 Electrical

 & Automation
 Optical Inspection
 Electronics
 Automation
 Component
 Safety

Semiconductor/

PXI Test & Measurement

General Manufacturing T Purpose Execution System

Turnkey Test & Automation

# Laser Diode Characterization System

# Model 58620



### **KEY FEATURES**

- Full turnkey automated test for edge-emitting laser diodes
- High precision and large capacity carrier, interchangeable with other automated equipment
- Fully automated alignment for fiber-coupled tests
- Automated optical inspection to decrease mechanical positioning delays
- Highly accurate TEC temperature controller with stability up to ±0.01°C
- PXI-Based SMU and power meter for fast test times
- Full suite of software analysis tools for laser diode characterization (Ith, Rs, Vf, slope efficiency, λ p, and etc.)

Laser Diodes are becoming more ubiquitous. Current applications range from medical and defense, to being the critical backbone of the world's fiber optic communication networks. There are several highly precise processes involved in the production of Laser Diodes. These processes are all quite cost intensive ranging from wafer growth all the way to fibre alignment and package high speed testing.

The Chroma 58620 Laser Diode Characterization Station is a state-of-the-art full turnkey system designed specifically for Laser Diodes. Its features range from macro inspection of the facette or aperture active area to a full suite of electrooptical parametric tests. When Chroma's high capacity carrier is used, multiple devices can be rapidly repeatably indexed improving not only test times but the reliability of the tests themselves. The Chroma 58620 is equipped with a highly stable, large scale, temperature control platform to provide the ability to incorporate R&D style tests in a production environment. This enables the ability to study correlation between laser diode forward current and temperature.

### **Ultra-precise Carrier Design**

Chroma's high precision carriers can be adapted to suit multiple form factors such as Chip on Carrier, Submounts, or Laser-Bar's. The innovative bi-lateral design is symmetrical with components placed on both sides to allow for a larger volume of components. The carrier is multi-layered to allow for components to be easily placed in their respective pockets yet secured once the other layers are mounted. The thermal interface structure allows for efficient component thermal contact along with a high degree of temperature control during heating and cooling cycles. At the touch of a button, an operator can perform full-scale automated testing once a carrier has been inserted.



### **Customized & Sharing Carrier**

From developed technology in Semiconductor IC test technology, Chroma 58620 introduces batch processing through the sharing carrier and changing kit to the Laser Diode industry. The carrier protects the laser diode from being handled and damaged as it is processed as test lots through the burn-in and test process while providing the hooks for data tracking thus increasing both productivity and yields. This same carrier is designed to operate with the Chroma 58603 Optoelectronic SMU Module for seamless burn-in & test processing. Through a 58620 change kit, as the laser diode under test changes (by evolving design or new product), the systems can adapt to various form factors and features. This flexibility allows for one solution to potentially test TO-Can, Chip on Carrier, Laser-bar, etc.

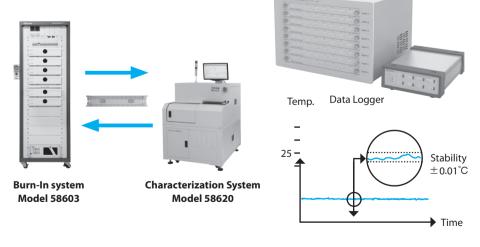
# **Auto-aligment Fiber with AOI Assistance**

One of the primary uses of high performance laser diodes are in the fields of optical data and telecommunications where the requirements for fiber coupling are guite stringent. If most DC parametric and optical characteristics are understood before a laser diode is inserted into the final product there is a greater cost savings and higher degree of in-field reliability. The Chroma 58620 is equipped with a fully automated alignment station to simulate a real-world fiber package coupling test to predict coupling efficiencies and spectral performance. Multiple optical heads and fibers may be used and coupled to an optical receiver such as an Optical Spectrum Analyzer (OSA) to analyze full spectral characteristics such as Side Mode Suppression Ration and Center Wavelength ( $\lambda$  p,  $\lambda$  c). Since every device is traceable with data, the Chroma 58620 affords the ability to correlate unpackaged optical performance with final package performance and helps in justifying a reduced final package test requirement.



### **High Precision Control Platform**

External and Internally induced thermal stresses on Laser Diodes strongly influence spectral and other electro-optical characteristics. Due to these issues, the Chroma 58620 includes a temperature control platform using a high precision Chroma 54130 - 300W TEC Controller and a Chroma 51101 Data Logger. These are highly regarded as world class instruments to ensure the uniformity of the carrier temperature and hence the devices under test. There are several thermal sensors placed along the carrier platform to ensure both a high degree of temperature uniformity and stability.





# Laser Diode Characterization System

# Model 58620

# Video & Flat Panel LED/ Optical Photo

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**Jrnkey Test &** 

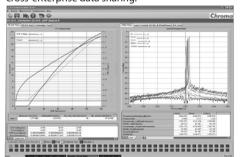
# **PXI Test Platform**

Chroma's PXI Turnkey Test Solutions product offers an open and flexible platform that can be rapidly integrated into production. High performance test instruments such as Chroma 52400-Series High Precision Source Measure Unit (SMU) along with the Chroma 52961 Optical Power Meter (with various wavelength detectors) can perform an ultra-fast current source and detection sweep with a high dynamic range (80dB) for testing various Laser Diode demonstrating a wide range of output power and irradiance characteristics.



# **Friendly and Flexible User Interface**

The Chroma 58620 is equipped with a completed Graphical User Interface (GUI) which includes recipe generation, test execution, and data management. There are checks and balances to ensure correct part placement in the carrier such as enabling the user to photograph every device and provide an ability to adjust before testing begins, saving time. Recipe generation enables the user to create test plans for an entire carrier down to the device level. Test execution provides the user with an in-depth window into the performance of every DUT from tabular opto-electronic parameters to graphical curves of spectral magnitude or any combination thereof. Depending on how test limits are managed, the Chroma 58620 can be a dumb data gathering tool with no pass/fail criteria or provide the user with an accurate picture of final test yield. Once tests are performed, Data Management is extremely flexible ranging from viewing on the tester itself to remote database and the file storage systems for cross-enterprise data sharing.



# Flexible User Interface

ORDERING INFORMATION

58620: Laser Diode Characterization System

| SPECIFICATIONS                                     |   |  |  |  |  |  |
|--|---|--|--|--|--|--|
| Model  | 58620   |  |  |  |  |  |
| Device Under Test                                  |   |  |  |  |  |  |
| Form Factor  | CoC, CoS  |  |  |  |  |  |
| Channels in Carrier                                | 80 Channels per cycle <sup>*1</sup>                                       |  |  |  |  |  |
| Current Ranges (Chroma Model 52401)                |   |  |  |  |  |  |
| Current Range (Source & Measurement)               | ± 200nA / 2μA / 20μA / 200μA /2mA /<br>20mA / 200mA                       |  |  |  |  |  |
| Current Resolution                                 | ±1.6pA/±16pA/±160pA/±1.6nA/±16nA/<br>±160nA/±1.6μA                        |  |  |  |  |  |
| Current Accuracy (Source & Measurement)            | I range ≥ $1mA : 0.1\% + 0.1\%$ FS ;<br>I range < $1mA : 0.05\%+0.2\%$ FS |  |  |  |  |  |
| Voltage Ranges                                     |   |  |  |  |  |  |
| Compliance Voltage Range                           | ± 0.5V/1V/2.5V/5V/10V/25V   |  |  |  |  |  |
| Compliance Voltage Accuracy                        | $\geq$ 1V: 0.05% + 0.01%FS ; <1V: 0.05% + 0.1%FS                          |  |  |  |  |  |
| Voltage Measurement                                | ± 3.8nV~ ± 25V  |  |  |  |  |  |
| Voltage Measurement Accuracy                       | 0.05% + 38nV @0.5V to 0.05% + 1.9mV @25V                                  |  |  |  |  |  |
| Test Parameters                                    |   |  |  |  |  |  |
| Electrical   | L-I-V Curves, Ith, Vf, Rs, Linearity (Kink)                               |  |  |  |  |  |
| Spectral   | Peak wavelength, SMSR, etc.   |  |  |  |  |  |
| Optical Spectrum Analyzer*(Optional)               |   |  |  |  |  |  |
| Wavelength Range                                   | 700 nm to 1700 nm   |  |  |  |  |  |
| Resolution Bandwidth                               | < 0.1 nm  |  |  |  |  |  |
| SMSR Measurement                                   | > 40 dB   |  |  |  |  |  |
| Wavelength Accuracy                                | ±0.03 nm  |  |  |  |  |  |
| Temperature Control                                |   |  |  |  |  |  |
| Temperature Range                                  | 25 °C ~85°C ; -5°C ~85°C (optional)                                       |  |  |  |  |  |
| Temperature Accuracy                               | 0.3 °C  |  |  |  |  |  |
| Temperature Uniformity                             | ±(0.5°C+1% ΔT) *3   |  |  |  |  |  |
| Mechanical Specification                           |   |  |  |  |  |  |
| Motion Stage Travel Distance                       | 400 mm  |  |  |  |  |  |
| Minima Fine Stage Resolution                       | 20 nm   |  |  |  |  |  |
| System Size (W x D x H)                            | 1000 mm x 1200 mm x 1350 mm   |  |  |  |  |  |
| System Weight                                      | 400 ± 20 Kg   |  |  |  |  |  |
| Power Input  | 220V single phase • 50/60 Hz  |  |  |  |  |  |
| Water flow Rate                                    | <3~5 lpm  |  |  |  |  |  |
| Operating Environment                              | Temperature : 20 $^{\circ}$ C ~25 $^{\circ}$ C ; Humidity : <70%          |  |  |  |  |  |
| Software   |   |  |  |  |  |  |
| Operating System Supported                         | Microsoft Windows <sup>®</sup> 2000, XP or 7                              |  |  |  |  |  |
| <b>Note *1 :</b> Capacity of carrier depends on th |   |  |  |  |  |  |

**Note \*2 :** Chroma 58620 is compatible with multiple Optical Spectrum Analyzers. Please inquire for further details.

**Note** \*3:  $\Delta T = I$  Ambient temperature - setting temperature I

# TOSA/BOSA Temperature Control System Model 58690/58691



### **KEY FEATURES**

- Wide temperature range (-40°C~ 85°C)
- Excellent temperature uniformity to make sure all DUTs are under the same temperature condition
- Within ±0.5°C temperature stability
- Fast heating and cooling to shorten testing time
- Temperature control up to 72 DUTs at the same time to increase testing output
- In mass production, TOSA/BOSA provides:
  - Electrical test connector
  - Optical fiber connector

\* Dependent on DUT form factor

TOSA (transmitter optical sub assembly) and BOSA (bi-directional optical sub assembly) are very important components for optical communication. Since the characteristics of TOSA and BOSA are sensitive to temperature(such as threshold current and wavelength), they need to go through temperature testing before shipment. The Chroma 58690/58691 are models with novel technology specially designed for TOSA and BOSA testing. Integrating with the outstanding temperature control technology, the 58690/58691 are temperature control systems devised specifically for TOSA and BOSA featured in fast heating, cooling and excellent temperature uniformity that can substantially increase the test throughput.

### **Excellent Temperature Uniformity**

Different from warming up the ambient air surrounding the DUT to get the temperature control effect, Chroma 58690/58691 use contact temperature platform design to make the carrier's temperature achieve perfect control and uniformity when working with a high precision TEC controller. The temperature platform presents excellent temperature uniformity as there are 4 temperature sensors evenly distributed on it with a temperature feedback controller in the center.

### **Fast Heating and Cooling**

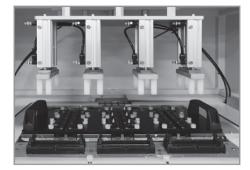
Currently TOSA/BOSA temperature control system is required to perform tri-state temperature tests during mass production. The 58690/58691 configured with Chroma high precision TEC controller. Excellent temperature control technique make tri-temperature cycle (including soaking time) within 25 minutes to significantly increase the mass production.

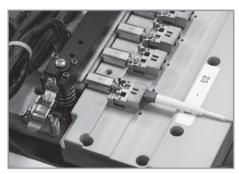
### **High Precision Customized Fixtures**

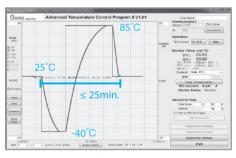
Chroma provides high precision fixtures for various TOSA/BOSA packing types to use. The fixtures comprise the temperature control platform required by DUT. Moreover, electrical and optical connection interfaces are conceived for testing the optical and electrical characteristics on DUT. The fixtures are easy for the user to place DUTs in the temperature control system and connect to the testing system on user site directly. Different channels of fixtures are also provided for different DUT packing types. The TO-56 packing type TOSA, for example, can support up to 72 channels increasing throughput of production lines.

### **User Friendly Interface**

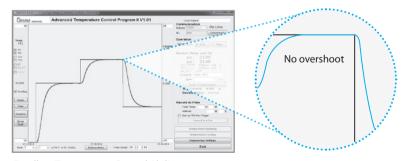
An user interface is provided to configure the 58690/58691 and TEC controller. It allows the user to set up and read temperature parameters, check TEC current and temperature vs. time curve, record data to documents, set temperature cycling and rising/falling speed, etc. The PID, current limit and other essential settings are set in engineering mode.





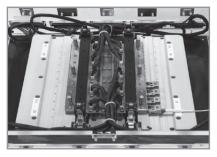


Fast Heating and Cooling

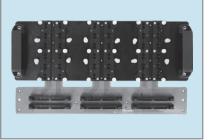


**Excellent Temperature Control Ability** 

# TOSA/BOSA Temperature Control System Model 58690/58691



TOSA/BOSA Temperature Control Fixture (58690)



TOSA/BOSA Temperature Control Fixture (58691)



**Optical Communication Devices Test Application** 

| SPECIFICATIONS                         |  |   |  |  |  |  |  |  |
|--|--|---|--|--|--|--|--|--|
| Model                                  | 58690  | 58691   |  |  |  |  |  |  |
| Device Under Thermal Control           |  |   |  |  |  |  |  |  |
| Form Factor                            | QFSP TOSA  | Cylindrical TOSA, BOSA                                    |  |  |  |  |  |  |
| Temperature Area                       | 440 x 350 (mm)   | 440 x 350 (mm)  |  |  |  |  |  |  |
| DUT Number <sup>*1</sup>               | 20 typically   | 72 typically  |  |  |  |  |  |  |
| Communication Port                     | Ethernet   | Ethernet  |  |  |  |  |  |  |
| Temperature Control                    |  |   |  |  |  |  |  |  |
| Temperature Setting Range              | -40 to 85°C  | -40 to 85°C   |  |  |  |  |  |  |
| Temperature Setting/Reading Resolution | 0.01°C   | 0.01°C  |  |  |  |  |  |  |
| Temperature Control Stability *2       | < ±0.5°C   | < ±0.5°C  |  |  |  |  |  |  |
| Temperature Uniformity                 | $<\pm(1+1\%\Delta T)^{*3}$                                   | $<\pm(1+1\%\Delta T)^{*3}$                                |  |  |  |  |  |  |
| Temperature Cycle <sup>*2</sup>        | $\leq$ 25 minutes typically                                  | $\leq$ 25 minutes typically                               |  |  |  |  |  |  |
| Mechanical Specifications              |  |   |  |  |  |  |  |  |
| Dimension (W x D x H)                  | 700mm x 900mm x 1511mm                                       | 700mm x 900mm x 1511mm                                    |  |  |  |  |  |  |
| System Weight                          | 220kg  | 220kg   |  |  |  |  |  |  |
| Facility                               |  |   |  |  |  |  |  |  |
| Power Requirement                      | 220 VAC, 50/60Hz, 2kW  | 220 VAC, 50/60Hz, 2kW                                     |  |  |  |  |  |  |
| Operation Temperature                  | 10 to 35°C   | 10 to 35°C  |  |  |  |  |  |  |
| Dry Air                                | Meets ISO 8573.1:2001 Class 2.1.2<br>Flow Rate $\geq$ 50 LPM | Meets ISO 8573.1:2001 Class 2.1.2 Flow Rate $\geq$ 50 LPM |  |  |  |  |  |  |

**Note \*1** : Dependent on DUT form factor (e.g. 64 channel for TOSA TO-CAN form factor) **Note \*2** : Under the condition that is without loading and stable thermal loading **Note \*3** :  $\Delta T = |$  ambient temperature – setting temperature |

58690: OSA/BOSA Temperature Control System 58691 : OSA/BOSA Temperature Control System /ideo &

Flat Panel Display

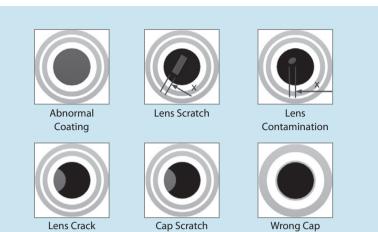
Turnkey Test & Automation

# **TO-CAN Package Inspection System**

# Model 7925



# **TO-CAN DEFECT ITEMS**



### **KEY FEATURES**

- It can inspect lens scratch, crack, particle and metal cap defect of TO-CAN package
- Auto focus function can overcome height variation from tray or package
- Defect criteria editor for versatile pass/fail criteria setting
- Higher reliability and repeatability than visual inspection
- Throughput is higher than UPH 3600
- Reduce time of operator loading/unloading because of auto-cassette function
- Provide customized inspection report and defect images for defect analysis

Chroma 7925 is an automatic inspection system for TO-CAN package. The appearance defects over 30  $\mu$  m like lens scratch, partial are clearly conspicuous by using advanced illumination technology. Because the height variation of tray and package exists, Chroma 7925 can calculate the focus distance and compensate to overcome the variation with auto focus function.

User can edit his own defect criteria for versatile pass/fail rule setting and pick by the defect code. The whole machine process is automatic during load, inspection, pick to unload. It greatly reduces the opportunity of operator error and abnormal process. Engineer can get a detail inspection raw data and defect images. It is more helpful to analysis the process problem and increase the yield for using the data got from Chroma 7925.



| SPECIFICATION  | SPECIFICATIONS  |  |  |  |  |  |
|----------------|---|--|--|--|--|--|
| Model          | 7925  |  |  |  |  |  |
| Target         | TO-CAN package  |  |  |  |  |  |
| Tray Size      | < 6" (width) X 6" (Length)  |  |  |  |  |  |
|                | Optical side inspector X1   |  |  |  |  |  |
| Station Layout | Auto cassette X 2   |  |  |  |  |  |
|                | Picker X1   |  |  |  |  |  |
| Throughput     | UPH 3600 (depends on the numbers of lighting)                     |  |  |  |  |  |
| Stages         | X, Y axis motorized stages  |  |  |  |  |  |
| Algorithm      | Provide enable/ disable function and external algorithm interface |  |  |  |  |  |
| Image Save     | All/ defect/ none image selectable                                |  |  |  |  |  |
| Monitor        | Real-time tray map  |  |  |  |  |  |
| Report         | *.txt, including chip position, defect type                       |  |  |  |  |  |
| Dimension      | 1500mm x 1200 mm x 1800mm   |  |  |  |  |  |

### **ORDERING INFORMATION**

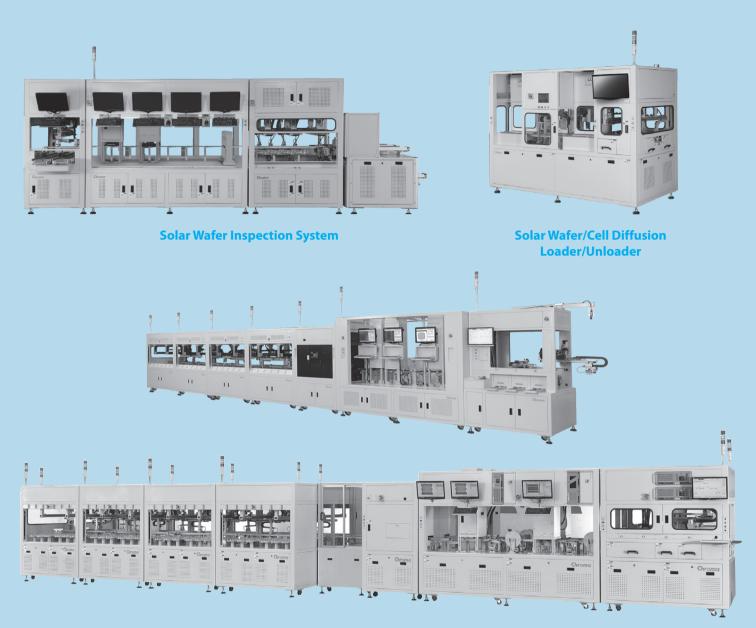
7925 : TO-CAN Package Inspection System

# **TO-CAN Package Inspection System**

# Model 7925

|     | Video &<br>Color                  |
|-----|-----------------------------------|
|     | Flat Panel<br>Display             |
|     | el LED/<br>/ Lighting             |
|     |                                   |
|     | Optical<br>Devices                |
|     | Photovoltaic Test<br>& Automation |
|     |                                   |
|     | Automated<br>Optical Inspection   |
|     | tion E                            |
|     | Power<br>Electronics              |
|     | S Aut                             |
|     | Battery Test &<br>Automation      |
|     | Passive<br>Component              |
|     |                                   |
|     | Electrical<br>Safety              |
|     | Semiconductor/<br>IC              |
|     |                                   |
|     | PXI Test &<br>Measurement         |
|     | Fest &<br>Irement                 |
|     | General<br>Purpose                |
|     |                                   |
|     | Manufacturing<br>Execution System |
|     | Turnkey Test &<br>Automation      |
| 7-8 | est &<br>tion                     |

| Solar Wafer Inspection System                        | 8-1 |
|--|-----|
| Solar Cell Inspection Test/Sorting System            | 8-2 |
| Solar Wafer/Cell Diffusion Loader/Unloader           | 8-4 |
| Automatic Optical Solar Wafer/Cell Inspection System | 8-5 |
| c-Si Solar Cell Tester                               | 8-9 |
|  |     |



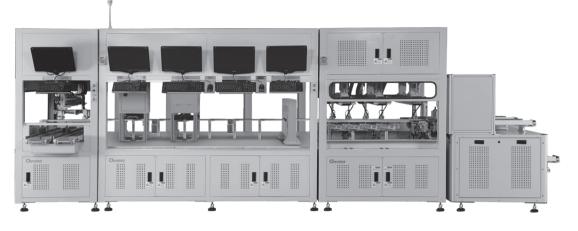
Solar Cell Inspection Test/Sorting System



Automatic Optical Solar Wafer/Cell Inspection System c-Si Solar Cell Tester

# Solar Wafer Inspection System

# Model 3710-HS



### **KEY FEATURES**

- Good for 5 inches and 6 inches wafer
- High throughput and low breakage rate ≤0.1%
- 2D geometry inspection
- Surface inspection
- Micro Crack inspection
- Saw Mark Inspection
- Resistively/ Thickness tester
- Lifetime tester
- Easy trouble shooting
- Loader : coin stack
- Unload : Coin stack / cassette

Integrated with 2D Geometry, Surface, Micro Crack, Saw mark inspection system and Resistivity & Thickness, Lifetime tester by customer defined, Chroma 3710-HS is a fully user configuration wafer sorter system with very low breakage rate and high through put.

Chroma 3710-HS solar wafer inspection system is ideal for PV incoming process. Plus wafer can be sorted by user defined algorithm fully automatically into coin stack or cassette. The unique auto coin stack/cassette exchange feature eliminates system down time when changing full coin stack/cassette to empty coin stack/cassette manually. For the breakage rate that is one of the key concern for PV wafer handling system. The 3710-HS uses state-of-the-art cell transportation technique to ensure minimum breakage rate.

# ORDERING INFORMATION

3710-HS: Solar Wafer Inspection System







Optical Inspection



Sorter



Unloading



# **KEY FEATURES**

- Good for 5 inches and 6 inches mono/ multi-crystalline silicon cells
- High throughput and low breakage rate ≦0.1%
- Loader can automatically pick up and place cell finished by firing
- Efficiency and Color classes and Sorting Bins can be defined by customers' request
- Integrated with Inspector and IV Tester by customers' request
- High cell positioning repeatability to ensure consistent test result
- Sorting Bins can be extended by module

Chroma 3730 Solar Cell Inspection Test/Sorting System is ideal for PV backend process. In loader it can automatically pick up and place PV cell finished by firing. Then it will inspect cell surface and backside defects and will automatically sort the cells into carrier by different efficiency and color classes defined by customers' request.

Breakage rate is one of the key concern for PV cell handling system. Chroma 3730 uses state-ofthe-art cell transportation technique to ensure minimum breakage rate. Based on customer's requirement of different processes, the carrier type and the amount of sorting bins also can be designed and adjusted.

# **ORDERING INFORMATION**

3730: Solar Cell Inspection Test/Sorting System



**Firing Unload** 



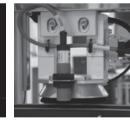
Loading



AOI



IV Testing



Sorting

urnkey Test &



### **KEY FEATURES**

- Good for 6 inches mono/multi-crystalline silicon cells
- Inline structure un-loader together with firing furnace including cells position pre-capture CCD and Bernoulli Arm picking up cells to conveyor speedy
- Flexible design of buffer loader to support engineer/operator during production maintenance period no matter frontend or backend side
- High throughput and low breakage rate< 0.1%.</li>
   High integration capability with customized
- optical inspector and IV tester
- Customized efficiency, Color classes and sorting Bins
- High cell positioning repeatability to ensure consistent result
- Extendable sorting bins module to fulfill customer request
- MES systems for instant production result analysis
- Lane by lane controller for engineer maintenance easy

Chroma 3760 Solar Cell Inspection Test/Sorting System is an ideal design and suitable for PV backend process. There will be a detection CCD and an Arm to proceed the cell pick and place from Firing furnace to conveyor. The cells will be transferred to Automatically Optical Inspector for cells quality inspection and IV Tester for efficiency measurement. Finally the cells will be put in the corresponding Soting Bins based on above testing results.

The breakage rate is one of the key concerns for PV cell handling system. Chroma 3760 uses state-of-the-art cell transportation technique to ensure the minimum breakage rate. Based on the customer's requirement of different process, the carrier type and the amount of sorting bins can be designed and adjusted.

# ORDERING INFORMATION

3760: Solar Cell Inspection Test/Sorting System



Loading



Flipping



AOI



IV Testing



Sorting

# Solar Wafer/Cell Diffusion Loader/Unloader Equipment Model 3775



### **KEY FEATURES**

- Low Breakage rate
- High Throughput
- Flex picker robot transfer
- Surface Inspection : Option
- Loader: Quartz Boat
- Unload : Coin stack / Cassette (option)

Furnace tube process is commonly used for wafer phosphorous diffusion . Chroma is not only providing short boat but also long boat for diffusion process loader/Unloder system to our customers. High speed flex picker robots are used on wafer transfer . Chroma provide the lower breakage, high throughout and low cost loader and unloader system in diffusion process and met our customer all of diffusion process function requirement.

# **ORDERING INFORMATION**

**3775 :** Solar Wafer/Cell Diffusion Loader/Unloader Equipment



Loading



Unloading

/ideo &

<sup>=</sup>lat Panel Display

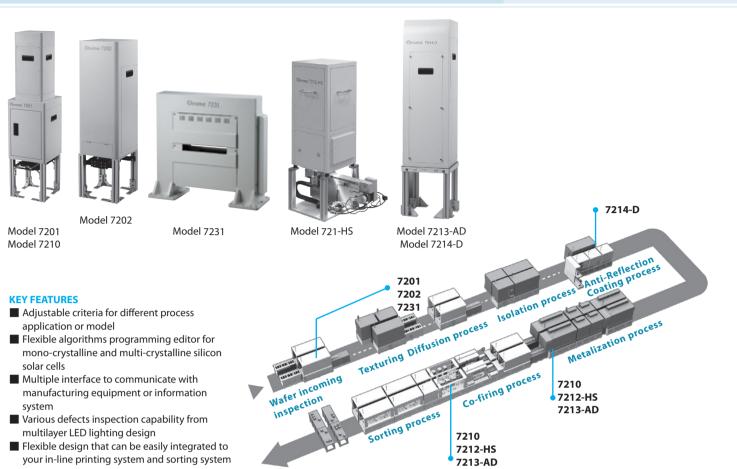
Test

Automated Optical Inspection

Electronics

Power

# Automatic Optical Solar Wafer/Cell Inspection System Model 7200 Series

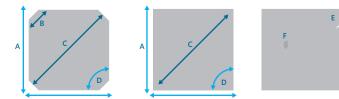


| Function Guide  | 7201         | 7202         | 7210         | 7212-HS      | 7231         | 7213-AD      | 7214-D       |
|---|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Sawmark   |              |              |              |              | $\checkmark$ |              |              |
| Geometry<br>(Length, angle, area, and etc)                  | $\checkmark$ |              |              |              |              |              |              |
| Surface stain (Particle, water mark, finger print, and etc) | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |              | $\checkmark$ | $\checkmark$ |
| Printing defect<br>(Fat, interruptions, nodes…etc)          |              |              | $\checkmark$ | $\checkmark$ |              | ~            |              |
| Color defect<br>(Coloring, variation, spot, and etc)        |              |              | $\checkmark$ | ~            |              |              | $\checkmark$ |

### Solar Wafer Geometry and Surface Inspector Model 7201

The Chroma 7201 was designed to measure wafer lengths, widths, diagonal, orthogonal and chamfer size and angle, it is also capable to detect surface stains. User friendly software and GUI enable versatile parameter settings and result, it also provides defect display and storage function for further analysis or potential MES/CIM integration.

- Capable to be integrated to any wafer sorters
- Flexible algorithms editor for mono-crystalline, multi-crystalline and quasi-crystalline wafers, and works for both 5" and 6"
- Multiple interface to communicate with different equipment or manufacturing execution system (MES)
- Ready for diamond-saw wafers inspection
- Self-monitor and calibration system



### Illustration on 7201 inspection items

A: Side length B: Chamfer length C: Diagonal D: Orthogonal

E: V-cut F: Stain





Among several factors for PV to achieve grid-parity, reliability of the PV modules plays an important role. Since it's known that some of the cell defects such as edge chips/ flakes, bumps of cell surface were proved to be source of infant mortality of the c-Si PV modules, therefore, to detect those defects is very important for c-Si cell

However, most of cell defects are inherited by wafers. Therefore, both cell and wafer defect inspections are crucial to final PV module quality

Due to the increasing BIPV and rooftop

application, even for those defects that does

not directly link to reliability issues such as

water mark, surface stain, have to detected and

considered as fail or secondary grade of cells for

Conventionally, those defects were visually

inspected by operators. But, the inconsistent

inspect result makes fully automatic optical

inspection (AOI) solution becomes unavoidable

Chroma 7200 series are specially designed for detecting wide variety of defects observed for c-Si cells & wafers for all sizes and crystallizations. Base on the process needs, eight inspectors are available for both incoming wafer and final cell

equipment for c-Si cell & wafer lines.

manufacturers.

and reliability.

c-Si cell buyers.

sorting requirements.

# Automatic Optical Solar Wafer/Cell Inspection System Model 7200 Series

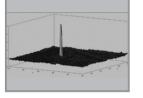
### **Solar Wafer Quality Inspector Model 7202**

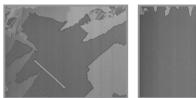
In the design of 7202, Chroma applied an unique optical design that ensures the result of grain-size calculation is highly repetitive. Since the classification of different grain-size could be quantified, the inspected wafers can be applied to the proper cell manufacturing lines to get highest possible cell efficiency.

Pinhole defect can also be detected by 7202. The pinhole defect is known to be cause of  $\mu$ -crack or severe local shunting that will lead to reliability issue to the PV module.

- Capable to be integrated to any wafer sorters
- Flexible algorithms editor for mono-crystalline, multi-crystalline and quasi-crystalline wafers, and works for both 5" and 6"
- Multiple interface to communicate with different equipment or manufacturing execution system(MES)
- Unique illumination design to ensure the repeatability of grain-size







an or all the set

Analysis on pinhole defect

### **Solar Wafer Sawmark Inspector** Model 7231

Sawmarks happened during the wafering process because of the impurities or vibration of the wires. It happens sometimes in near the edge and sometimes in the center. By following the British standard of EN 50513 2009, Chroma is able to provide the solution that also sense the sawmarks in the center.

- Capable to be integrated to any wafer sorters
- Flexible algorithms editor for mono-crystalline, multi-crystalline and quasi-crystalline wafers, and works for both 5" and 6"
- Multiple interface to communicate with different equipment or manufacturing execution system(MES)
- Follow the British standard of EN 50513 2009 to measure different wafer properties



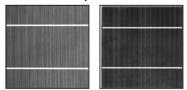
Chroma 7210 has built two functions which are color sorting and printing inspection in one structure. With the compact "2 in 1" design, it not only optimizes the floor space but also maximizes the performance. As the "metallization" technology goes further in PV industry, the finger width has become narrower. Experts believe that practical finger width through "screen printing" technology would be narrower than 40  $\mu$  m in the near future, and Chroma's 7210 is able to provide 33  $\mu$  m/pixel\* solution for Photovoltaic technology innovators.

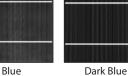
The Chroma c-Si cell coloring theory was designed to provide high repetitive color classification for c-Si PV cells. The CIE 1931 Lab color space and up to 60x60 grids for entire cell surface allow Chroma to provide numeric color severities down to 3600 blocks throughout the cell under test. Using the color information of each block and the customized algorithm, the user may determine the represented color for non-uniform color cells such as poly-crystalline cells or the cells have uneven anti-reflection coating thickness.

Note \*: When working with Chroma 3730 Series

# 7210 Color Examples

Light Blue

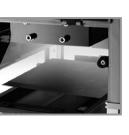






**Color Variance** 

All specifications are subject to change without notice.

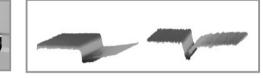


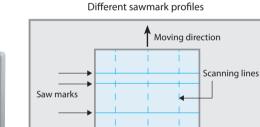


Chroma 7202

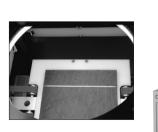


Examples on the grain-size inspection result on 7202





Sawmark inspection methodology







Electronics

Test &

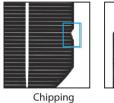
PXI Test &

# Automatic Optical Solar wafer/Cell Inspection System Model 7200 Series

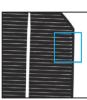
The defects caused by front-side (sunny side) printing process of c-Si PV cells may impact the performance, reliability or appearance. Therefore, a reliable and repetitive inspection of defects such as losing Ag paste on busbars, gridline interruptions, printing shift or rotation, water mark etc., has to be performed to ensure the quality before shipment. The Chroma 7210 solar cell quality classifier has equipped with a high resolution camera and superior software algorithm to recognize the unwanted defects on the front-side of c-Si PV cells.

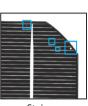
The 7210 can be used right after the front-side process to retire cells with major defects. This allows best use of the capacity for the processes like I-V testing and sorting which are known as the bottlenecks of c-Si cell line. It can be integrated into in-line or off-line sorter for final inspection prior to shipping. The 7210 can also detected cells' back side surface defects and color classification.

The 7210's backside inspection is applied on screen printing defect detection and color classification for Bifacial production. As to PERC production, the 7210 also provides defect detections for both screen printing and laser process.









Discolorationt

**Finger Width** 

Stains

# Solar Cell Front-side Printing and Surface Defect Inspector (High-Speed) Model 7212-HS

The Chroma 7212-HS is a line scan AOI inspector that can provide superior defect inspection for PV cells. As the fine grid printing process goes even faster than before, a reliable printing quality inspector is required to reduce the cost during PV cells metallization. The Chroma 7212-HS is able to provide 14µm/pixel resolution that can stop even the finest finger interruptions during the metallization process, and also feed back to the operator for instant response to improve the production yield rate.

The Chroma 7212-HS can also use 20µm/pixel resolution to make the final quality judgment on the PV cell sorting process. The optical design in Chroma 7212-HS is even better. It can provide superior inspections for defects like stains and finger prints, which have been hurdles in other PV AOI products.

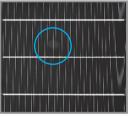
- Integrated with screen printing line and cell sorting lines from any manufacturers
- Flexible and intuitive SW user interface
- Resolution down to 14 µm/pixel
- Superior stain defects detection

### **Solar Cell Backside Printing and Surface Inspector** Model 7213-AD

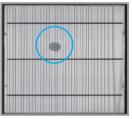
Defects causes by back-side printing process of c-Si PV cells will also cause performance, reliability impact. Among all the back-side printing defects, bumps caused by improper printing may cause high cell breakage rate during lamination of c-Si module process. Chroma 7213-AD c-Si cell back-side printing inspector uses unique lighting technique to detect common back-side printing defects plus most demanding bumps.

The 7213-AD can be used after back-side process to retire cells with major defects. It can also be integrated to in-line or off-line sorter for final inspection prior to shipping.





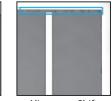
Stain shown before detection



Stain shown after detection







Alignment Shift

PERC Laser Line Variation

Bump

**Busbar Defect** 

Stain

# Automatic Optical Solar Wafer/Cell Inspection System Model 7200 Series

# Solar Cell Anti-Reflection Coating Inspector Model 7214-D

Chroma 7214-D is the inspector for Anti-reflection coating process. With 4M mono CCD and Chroma's experience RGB illumination design. we could assure that each defined defectives could be identified through our cusomized setup. Chroma 7214-D can be used right after anti-reflection coating process to ensure only cells with acceptable color uniformity go down to metallization process. And the fail cells may then be sent for re-work.

With our flexible and hierarchy software design, customer could set up the criteria to inspect their unique defect that is generated because of different PECVD machines.

7214-D Inspection Items :

- Color difference
- Stripe shape watermark
- Belt mark

Model

Speed

UPH\*2

Interface

Options Model

Camera

Speed

Lens

Resolution

Light Source

Application

Dimension Weight

Accessory

Interface

Model

Speed

Lens

Camera

Resolution

Light Source

Application

Dimension

Accessory

Interface

Weight

Description

**Detection limit** 

Inspection items

Wafer size

Stacking cells

SPECIFICATIONS

Brownish stains Particles

7201

Solar wafer geometry & surface inspector

80µm

NA \*3

7210

25M mono CCD

33µm/pixel \*1

NA

LED strobe lighting

Frontside defect and color inspection

320mm x 324mm x 1032mm

60 kg

7213-AD

4M mono CCD

90µm/pixel

NA

LED strobe lighting

Backside defect inspection

Low distortion lens

320mm x 324mm x 1032mm

60 kg External keyboard, mouse, PC, monitor

Ethernet, Option : IO, RS-232

- Acid mark
- Chipping



7202

Solar wafer quality inspector

5' or 6'wafers, for mono c-Si, multi c-Si and quasi mono c-Si

80µm

350mm/s

Length, Width, Diagonal, Chamfer length, Pinhole, Stain, Chipping, Grain-size, Sawmark, backside

3000~3600

TCP/IP ; Option: IO,RS-232

RAID, UPS, MES,

7212-HS/C8

8K linescan

20µm/pixel

350mm/s

Low distortion lens

External keyboard, mouse, PC, monitor

Ethernet, Option : IO, RS-232

7214-D

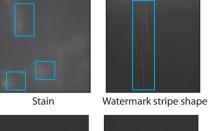
4M mono CCD

90µµm/pixel

NA

WRGB LED strobe lighting

Anti-reflection coating inspection





Particles

Acid mark

7231

Solar wafer sawmark inspector

5µm

350mm/s

7212-HS/M12

12K linescan

14µm/pixel

500mm/s

RGB LED strobe lighting

Frontside defect inspection

340mm x 380mm x 760mm

70 kg

Electronics

Automation

| Ŧ    |      |
|------|------|
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**ORDERING INFORMATION** 7201 : Solar wafer geometry and surface inspector

7202: Solar Wafer Quality Inspector

**Note \*1 :** When work with Chroma 3730 Note \*2: When work with Chroma 3710-HS

7231 : Solar Wafer Sawmark Inspector

7210: Solar Cell Quality Inspector

7212-HS: Solar Cell Front-side Printing and Surface Defect Inspector 7213-AD : Solar Cell Backside Printing and Surface Inspector 7214-D: Solar Cell Anti-reflection Coating Inspector

Note \*3: On-fly inspection on demand, maximum speed is 250mm/s

# c-Si Solar Cell Tester

# Model 58301



### **SYSTEM FEATURES**

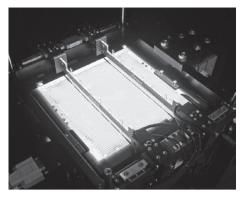
- Measurements: Eff, Pmpp, Impp, Vmpp, Isc, Voc, FF, Rshunt, Rs, Irev.
- Full four-quadrant source for both light forward/reverse & dark forward / reverse test
- Class AAA+ solar simulator
- Versatile system software and user editable test sequences
- Low stress probe
- Patterned probe-bar to ensure minimum probe shadow
- PV cell sorter integration (Chroma 3720)

I-V test is the most important test for PV cell/ module manufacturing because the measured power rating or efficiency of the cell or module directly affect the selling price of the product. Therefore, highly accurate and repeatable I-V test result is not only for quality issue but also for Business issue.

However, PV cell I-V testing represents several technical challenges; therefore, it's extremely hard to achieve stable and accurate test results even if class AAA type of solar simulator is used. Those challenges include:

- Spectral mismatch correction
- Minimize impact of non-uniformity
- Simultaneous measurement to avoid error caused by temporal instability of irradiance intensity
- Temperature correction or control to STC or desired temperature
- Low stress probing to avoid cell breakage
- Maximize probe-contact repeatability & minimize probing shadow

Chroma 58301 c-Si Solar Cell (Crystalline Silicon) Tester is ideal for both RD & in-line production (see Chroma 3720) application. Using Wacom<sup>®</sup> class AAA+ solar simulator, comprehensive irradiance/temperature correction technique and probing system, Chroma 58301 c-Si Solar Cell Tester achieves the highest test repeatability and measurement accuracy for most demanding customers.



ORDERING INFORMATION 58301: c-Si Solar Cell Tester

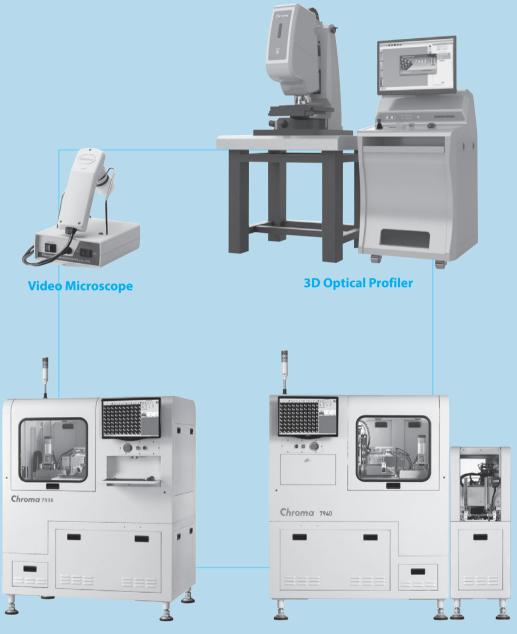
| Line regulation                             | 0.005% F.S.         |
|---|---------------------|
| Slew Rate                                   | 1.25A/µs            |
| Power                                       |                     |
| Power Rating                                | 400W                |
| Measurement Section                         |                     |
| Voltage                                     |                     |
| Voltage Measurement Range - Forward         | 1V                  |
| V <sub>FORWARD</sub> Measurement Resolution | 16 bits             |
| V <sub>FORWARD</sub> Measurement Accuracy   | 0.05% F.S.          |
| Measurement Points per I-V - Forward        | 40-200 programmable |
| Voltage Measurement Range - Reverse         | -15V                |
| V <sub>REVERSE</sub> Measurement Resolution | 16 bits             |
| V <sub>REVERSE</sub> Measurement Accuracy   | 0.05% F.S.          |
| Measurement Points per I-V - Reverse        | 40-100 programmable |
| Current                                     |                     |
| Current Measurement Range - Forward         | 10A/20A             |
| IFORWARD Measurement Resolution             | 16 bits             |
| IFORWARD Measurement Accuracy               | 0.1% F.S.           |
| Measurement Points per I-V - Forward        | 40-200 programmable |
| Current Measurement Range - Reverse         | -0.1A/-1A/-15A      |
| I <sub>REVERSE</sub> Measurement Resolution | 16 bits             |
| I <sub>REVERSE</sub> Measurement Accuracy   | 0.1% F.S.           |
| Measurement Points per I-V - Reverse        | 40-100 programmable |
| Irradiance (Forward Only)                   |                     |
| Input Range                                 | 200mV               |
| Irradiance Measurement Resolution           | 16 bits             |
| Irradiance Measurement Accuracy             | 500uV               |
| Measurement Points per I-V - Forward        | 40-200 programmable |
| Temperature Sensing Section                 |                     |
| Measurement Type                            | IR/Thermopile       |
| Temperature Range                           | 0~500°C             |
| Reproducibility                             | ± 0.5°C             |

| SPECIFICATIONS                          |  |  |  |  |
|---|--|--|--|--|
| Model                                   | 58301                                    |  |  |  |
| Solar Simulator Section                 |  |  |  |  |
| Lamp Type                               | Xenon Short Arc                          |  |  |  |
| Lamp Life                               | 1,200 hrs                                |  |  |  |
| Illumination Area                       | 163mm x163mm                             |  |  |  |
| Light Source                            | Steady State (w/Shutter Control)         |  |  |  |
| Air Mass                                | AM1.5G (IEC60904-3)                      |  |  |  |
| Irradiation Intensity                   | $100$ mW/cm2 $\pm$ 15% (1 Sun $\pm$ 15%) |  |  |  |
| Spectral Mismatch                       | $\pm$ 25% or Better                      |  |  |  |
| Positional Non-uniformity               | 2% or Better                             |  |  |  |
| Temporal Stability                      | 1% or Better                             |  |  |  |
| Light Collimation                       | <5°                                      |  |  |  |
| Power Section                           |  |  |  |  |
| Voltage                                 |  |  |  |  |
| Voltage Forward Range                   | 20V                                      |  |  |  |
| V <sub>FORWARD</sub> Program Resolution | 16 bits                                  |  |  |  |
| V <sub>FORWARD</sub> Ripple             | <3mVrms                                  |  |  |  |
| Voltage Reverse Range                   | -20V                                     |  |  |  |
| V <sub>REVERSE</sub> ProgramResolution  | 16 bits                                  |  |  |  |
| V <sub>REVERSE</sub> Ripple             | <3mVrms                                  |  |  |  |
| Transient Response Time                 | < 100µs                                  |  |  |  |
| Load regulation                         | 0.002% F.S.                              |  |  |  |
| Line regulation                         | 0.002% F.S.                              |  |  |  |
| Slew Rate                               | 1V/μs                                    |  |  |  |
| Current                                 |  |  |  |  |
| Current Forward Range                   | 20A                                      |  |  |  |
| IFORWARD Program Resolution             | 16 bits                                  |  |  |  |
| I <sub>FORWARD</sub> Ripple             | <0.03%                                   |  |  |  |
| Current Reverse Range                   | -20A                                     |  |  |  |
| IREVERSE Program Resolution             | 16 bits                                  |  |  |  |
| Transient Response Time                 | < 75µs                                   |  |  |  |
| Load regulation                         | 1mA                                      |  |  |  |

|  |    | /ideo &<br>Color                  |
|--|----|-----------------------------------|
|  |    | Flat Panel<br>Display             |
|  |    | Lighting                          |
|  |    | Optical<br>Devices                |
|  |    | Photovoltaic Test<br>& Automation |
|  |    |                                   |
|  |    | Automated<br>Optical Inspection   |
|  |    |                                   |
|  |    | Power<br>Electronics              |
|  |    |                                   |
|  |    | Battery Test &<br>Automation      |
|  |    | & Passive<br>Component            |
|  |    |                                   |
|  |    | Electrical<br>Safety              |
|  |    |                                   |
|  |    | Semiconductor/<br>IC              |
|  |    |                                   |
|  |    | PXI Test &<br>Measurement         |
|  |    | General<br>Purpose                |
|  |    | al Ma<br>se Exec                  |
|  |    | Manufacturing<br>Execution System |
|  |    | g Turnkey Test &<br>m Automation  |
| All specifications are subject to shapped without notice | 10 | rTest & ation                     |

| Video Microscope                     | 9-1                                     |
|--------------------------------------|---|
| 3D Optical Profiler                  | 9-3                                     |
| Double Sided Wafer Inspection System | 9-5                                     |
| Wafer Inspection System              | 9-7                                     |
|                                      | ••••••••••••••••••••••••••••••••••••••• |

| Selection Guide |   |  |       |  |  |
|-----------------|---|--|-------|--|--|
| Model           | Primary Function  | <b>Examples of Inspection Applications</b>   | Page  |  |  |
| 7200 Series     | Automatic Optical Solar Wafer/Cell Inspection Modules :<br>Solar Wafer Geometry and Surface Inspector (7201)<br>Solar Wafer Quality Inspector (7202)<br>Solar Wafer Sawmark Inspector (7231)<br>Solar Cell Quality Inspector (7210)<br>Solar Cell Front-side Printing and Surface Defect Inspector (7212-HS)<br>Solar Cell Backside Printing and Surface Inspector (7213-AD)<br>Solar Cell Anti-Reflection Coating Inspector (7214-D) | Solar wafers, solar cells  | 8-5   |  |  |
| 7310            | Video Microscope  | Capacitors, Resistors, PCB, connectors, fiber connectors, SMD, die chips, textiles, etc.   | 9-1   |  |  |
| 7503            | Sub-nano 3D Optical Profiler  | Display : Photo spacers, prism sheets of LCD<br>PCB : laser via, wire high, wide, pitch<br>MEMS : printer nozzles, hard disk read heads<br>Semiconductor : thin film transistors | 9-3   |  |  |
| 7925            | TO-CAN Package Inspection System  | TO-CAN package   | 7-7   |  |  |
| 7936            | Double Sided Wafer Inspection System  | Top side and back side of laser diodes, photo diodes, and LED chips  | 9-5   |  |  |
| 7940            | Wafer Inspection System   | Laser diodes, Photo diodes, and LED chips  | 9-7   |  |  |
| 7970            | CMOS Image Sensor Inspection System   | CMOS image sensors   | 14-28 |  |  |



Double Sided Wafer Inspection System

Wafer Inspection System

### Video Microscope

### Model 7310



#### **FUNCTIONS**

#### Handy Type Easy to Operate

It can be held by hand easily to view the object in clear image without adjusting the focus

#### Picture Freeze

You can freeze the frame and release it easily by touching the frame freeze button on the handle. Besides, you are also able to use remote cord to freeze the frame via the terminal on the rear panel.

#### Frame Split

If you need to compare two objects, you can choose one-two frame on the screen by switching the "Memory" to "2".

# Measurement for Multiple Masks The mask designed for multiple functions can be used with magnification lens to observe the object with non-contact contact and

the object with non-contact, contact and oblique for three-dimension effect.

#### Fully Field Use

It provides complete lens combination from magnification 5X to 1000X with maximum working distance up to 18cm. To work with appropriate accessories and measurement software, the Measurement Master can meet the different requirements for various industries.

#### Multiple Peripherals Support

The 7310 can connect diverse recording media, color displays, and PC environment (with appropriate interface card installed) via the video out terminal. You can select the desired peripheral.

### Œ

The 7310 video microscope is a color CCD videobased microscope system that allows you to clearly view small objects on any TV monitor or video projector. Unlike conventional optical microscopes that are complicated and intimidating for the viewer to use, the 7310 is an easy-to-use and friendly video-based system. High resolution video viewing eliminates the operator eyestrain and fatigue associated with conventional and binocular microscopes and the unnatural "hologram effect" of optical projection systems.

The 7310 guided LED light surrounds the lens and automatically provides the best illumination for you to obtain the optimum viewing angle and color of the target object on the video monitor. By using the advanced automatic gain control of DSP technology, it gives the user distortion-free microscope quality images.

With the frame freeze button and memory switch, it allows you to freeze the images with one, or one-two frame on the screen. Image retention on hard copy and image storage are possible by simply connecting the video output of 7310 directly to an optional Color Video Printer, Video Tape Recorder (VTR), or Personal Computer (PC with appropriate image capture card installed).

Two illumination heads of contact and non-contact measurement are available. The user can use the one that meets versatile applications of top-view angle or oblique-view angle. The compact size allows it to be hand held for observation anywhere, anytime. More than one person can observe the same clear image on the color monitor for discussion getting the best results and solutions.

The Chroma video microscope offers the sophisticated inspection methods in the applications of semiconductor, SMD PCB, electronics, tab and wire bonding, hybrid circuit, metal works, quality control, textiles, etc. The versatile and easy-to-use product introduces wholly new ways of treatment. It makes you work faster and more effectively than before.

Resistor



20X Contact



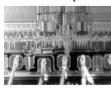
### 40X Contact with Measurement Master

Screw

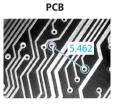


100X Non-Contact with Measurement Master

#### Die Chip



200X Non-Contact



20X Non-Contact with Measurement Master

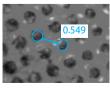


40X Oblique



100X Non-Contact

#### Halftone Dot

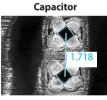


200X Non-Contact with Measurement Master





20X Non-Contact



100X Non-Contact with Measurement Master



200X Contact

#### **Fiber Connector**



1000X Non-Contact

### Video Microscope

### Model 7310

A731026

A730001

A731027

A730015

MAGNIFICATION LENS

Model

| SPECIFICATIONS             |  | [                |
|----------------------------|--|------------------|
| Model                      | 7310   |                  |
| Camera                     |  | ľ                |
| Image Pickup Sensor        | 1/3 inch CCD                                     |                  |
| Total Pixels               |  | Ì                |
| NTSC                       | 811 (H) x 508 (V)                                |                  |
| PAL                        | 795 (H) x 596 (V)                                |                  |
| Scanning Method            | 2:1 interlaced                                   |                  |
| Scanning Frequency         |  |                  |
| NTSC                       | 15.734 KHz (H) x 59.94 Hz (V)                    |                  |
| PAL                        | 15.625 KHz (H) x 50.00 Hz (V)                    |                  |
| S/N                        | 46dB   |                  |
| AGC                        | DSP Control                                      |                  |
| White Balance              | Automatic  | $\left  \right $ |
| <b>Operating Environme</b> | ent  | $\left  \right $ |
| Operating<br>Temperature   | -5 to 40°C                                       |                  |
| Operating Humidity         | 35 to 80% R.H.<br>(without condensation)         |                  |
| Light Source               |  |                  |
| Lamp                       | White LED  | Ì                |
| Service Life of Lamp       | 5000 hrs (avg.)                                  |                  |
| Color Temperature          | 7100°k (max)                                     |                  |
| Intensity Regulation       | Auto   |                  |
| Others                     |  |                  |
| Still Picture              | 1, 1/2 frame                                     |                  |
| Supply Voltage             | 1Ø 110~240V $\pm$ 10% VLN, 47~63Hz ; DC 12V 0.5A |                  |
| <b>Power Consumption</b>   | Less than 6W                                     |                  |
|                            | Probe (without Lens Head):                       |                  |
|                            | 57 x 50 x 160 mm /                               | $\left  \right $ |
| Dimension                  | 2.24 x 1.97 x 6.30 inch                          |                  |
| (H x W x D)                | Stand:   | L                |
|                            | 60 x 125 x 190 mm /                              | ĺ                |
|                            | 2.36 x 4.92 x 7.48 inch                          | ľ                |
|                            | Probe (without Lens Head):                       | ŀ                |
| Weight                     | 220g / 0.48 lbs                                  |                  |
| Comore Duck -              | Stand: 1.0 kg / 2.2 lbs                          | İ                |
| Camera Probe               | 1.5m / 59.05 inch                                |                  |
| Length                     |  |                  |
| Outputs<br>Video Output    |  |                  |
| Video Output               | VBS1.0Vp-p/75Ω RCA Type                          |                  |

#### **ORDERING INFORMATION**

A731034 : USB Video Grabber

7310: Video Microscope -NTSC, Adapter (Mark I) 7310: Video Microscope -PAL, Adapter (Mark I) A730001:20X Magnification Lens A730002: 40X Magnification Lens A730003: 200X Magnification Lens A730007: 100X Magnification Lens A730009: Suitcase A730011: 400X Magnification Lens A730012: 650X Magnification Lens (Constant Focus) A730013: 1000X Magnification Lens A730015: 35X Polarization Magnification Lens A730016: 40X LWD Magnification Lens A730025 : Copy Stand (Mark I) A731008 : Long Rod for Copy Stand A731026: 5X-15X Adjustable Magnification Lens A731027: 20X Polarization Magnification Lens A731028: 40X Polarization Magnification Lens A731029: 650X Adjustable Magnification Lens (Adjustable Focus) A731030: Remote cable for freeze

| mouer                                  |                              | 70701020                | 70,20001  | R/3102/             | A750015                 |
|--|------------------------------|-------------------------|---|---------------------|-------------------------|
| Magnification o                        | n 14" monitor                | 5-15X                   | 20X   | 20X<br>Polarization | 35X<br>Polarization     |
| Illumination Hea                       |                              | Non-contact             | Contact,<br>Non-contact,<br>Oblique,<br>Diffusion | Non-contact         | Contact                 |
|  | Horizontal<br>length         | 56 / 18.7mm             | 14mm  | 14mm                | 8mm                     |
| View Area                              | Vertical<br>length           | 42 / 14mm               | 11mm  | 11mm                | 6mm                     |
|  | Diagonal<br>length           | 70 / 23.4mm             | 17.8mm  | 17.8mm              | 10mm                    |
| Depth-Of-Field                         |                              | ≦18/7mm                 | ≦8.8mm  | ≦8.8mm              | ≦3.3mm                  |
| Working distanc<br>(non-contact light  |                              | 160 / 40mm              | 50mm  | 40mm                | (Contact type<br>only)  |
| Model                                  |                              | A730002                 | A730028   | A730016             | A730007                 |
| Magnification or                       | Magnification on 14" monitor |                         | 40X<br>Polarization                               | 40X LWD             | 100X                    |
| Illumination Hea                       | Illumination Head            |                         | Non-contact                                       | None                | Contact<br>Non-contact  |
|  | Horizontal<br>length         | 7.5mm                   | 7.5mm   | 7.5mm               | 2.8mm                   |
| View Area                              | Vertical<br>length           | 6mm                     | 6mm   | 6mm                 | 2.2mm                   |
|  | Diagonal<br>length           | 9.6mm                   | 9.6mm   | 9.6mm               | 3.56mm                  |
| Depth-Of-Field                         |                              | ≦3.85mm                 | ≦3.85mm ≦3.5mm                                    |                     | ≦0.55mm                 |
| Working Distance<br>(non-contact light |                              | 30mm                    | 18mm  | 179.5mm             | 4mm                     |
| Model                                  |                              | A730003                 | A730011   | A731029             | A730013                 |
| Magnification or                       | 14" monitor                  | 200X                    | 400X  | 650X                | 1000X                   |
| Illumination Hea                       |                              | Contact,<br>Non-contact | Contact,<br>Non-contact                           | adjustable<br>Focus | Contact,<br>Non-contact |
|  | Horizontal<br>length         | 1.4mm                   | 0.7mm   | 0.43mm              | 0.28mm                  |
| View Area                              | Vertical<br>length           | 1.1mm                   | 0.52mm  | 0.32mm              | 0.21mm                  |
|  | Diagonal<br>length           | 1.78mm                  | 0.87mm  | 0.53mm              | 0.35mm                  |
| Depth-Of-Field                         |                              | ≦0.22mm                 | ≦0.055mm  | ≦0.07mm             | ≦0.066mm                |
| Working Distance<br>(non-contact light |                              | 4mm                     | 2.5mm   | 1.4mm               | 3.6mm                   |

Turnkey Test & Automation

9-2

### Sub-nanometer 3D Optical Profiler

### Model 7503



#### **KEY FEATURES**

- Up to 0.1 nm height resolution for measurement
- Use white light interference measurement technique to do nondestructive and rapid surface texture measurement and analysis
- Modulized design to select parts based on test demands or budget concerns
- Work with color or monochrome camera to do 2D measurement and enable the measuring microscope function
- Equipped with electric nose gear to mount various lens for switch programmatically
- LED or halogen light source for selection
- Measurement range 150 mm x150 mm
- Integrate low magnification lens (5X & 2.5X ratio) for large area 3D measurement
- Provide various surface measurement parameters, such as sectional difference, included angle, area, dimension, roughness, waviness, film thickness and flatness
- Equipped with dark point and boundary error correction algorithms
- Friendly user interface with simple graphical control system and 3D graphics display
- Exchangeable file format to save and read various 3D profile file formats
- Powerful STA (Surface Texture Analysis) Master software providing more than 150 lines and surfaces profiling parameters
- Automated rapid self calibration to ensure the system's measurement capability
- Provide Chinese/English user interface for switch
- Provide measu rement script for auto test

## Œ

Chroma 7503 is a sub-nano 3D Optical Profiler developed using the technology of white light interference to measure and analyze the surface profile of micro-nano structures with sophisticated scanning system and innovative algorithms. It can work with color or monochrome camera as required for 2D and microscope measurements.

The latest system modular design of Chroma 7503 has flexible configurations that can comply with diversified test applications. When equipped with electric nose gear, maximum 5 types of lens can be mounted and switched directly for use without changing manually. In addition the equipped electrical adjustment mobile platform is able to adjust and position the sample automatically. The large scanning range of vertical and horizontal axis is applicable for various auto measurements. Nondestructive and rapid surface texture measurement as well as analysis can be done on the sample without any preprocessing that is most suitable for R&D, production, process improvement and academic research.

The height resolution Chroma 7503 is up to 0.1 nm and it can achieve 100mm when Z vertical axis is used to measure the scanning stroke. Also the horizontal axis is able to reach sub-micro resolution with scanning range up to  $150 \times 150$ mm when a PC is used to control the mobile platform as demand. The fast calibration procedure and algorithm theory enables the system calibration result to be traced to NIST standard. Combined with several innovative, robust and reliable algorithms, Chroma 7503 has the quality of high precision and large scale measurement.

The configured auto scanning platform is able to find the best focus position via the automated vertical axis mobile platform with rapid autofocus algorithm. Moreover, the tilt adjustment platform is able to level the unit under test within a few seconds without complex operations.

The commercial white light interference analyzers frequently use the centroid algorithm to calculate the surface height. Since the light diffraction causes incorrect height calculation of some positions and results wrong profiling data. Chroma 7503 applies the most advanced 3D Profiler Master software along with the interference signal process algorithm of Chroma to analyze the spectrum of white light interference and prevent the boundary error problem. The system has dark point process function to filter out and correct the data that is incapable of creating interference to reduce the error in measurement. Since the dark point process runs while the data is retrieving, the dark point filter function can be executed effectively; meanwhile the correction is made by referencing the surrounding data that makes the measurement more robust and reliable.

STA (Surface Texture Analysis) Master software analyzes and corrects the data of surface texture, also provides complete profiles in icon. It has more than 150 lines or surfaces profiling parameters including roughness, ripple, flatness, apex and valley. The high pass filter, low pass filter, fast Fourier transformation and cusp removal space filter tools allow the user to filter out the high/low/ bandpass signals. The software has polynomial fitting, region growth, the entire surface and multiple area leveling tools that can used in data processing and analysis flexibly.

In many hi-tech industries such as semiconductor, flat panel display, fiber communication, MEMS, biomedical and electronic packaging, the accuracy of micro structure surface texture determines the performance and function of the product, thus it needs to be monitored for quality during manufacturing. Chroma 7503 has many surface measurement parameters such as section height, included angle, area, dimension, roughness, ripple, film thickness and flatness that can meet the requirements of the industries and R&D units.

Chroma 7503 has 2D and 3D measurements with fast switch of ratio and large area map interlinking function that can cope with various applications' needs. Furthermore, the flexible modular design allows customization for practical use to gain the balance between price and performance. Chroma 7503 is the best choice for improving efficiency and saving cost.

#### **ORDERING INFORMATION**

**7503 :** Sub-nanometer 3D Optical Profiler **Imaging system:** 640x480 pixel (mono), 640x480 pixel (color), 1000x1000 pixel (mono) <sup>\*1</sup>, 1000x1000 pixel (color) <sup>\*1</sup>

Interference objective lens:

2.5X <sup>\*2</sup>, 5X, 10X, 20X, 50X, 100X **Conventional objective lens:** 5X, 10X, 20X, 50X, 100X

**Tube lens:** 0.45X, 0.5X, 1.0X

Nose gear:

None, Manual rotary 5 holes, Electric rotary 5 holes Light Source:

White light LED, Halogen, Mono LED **Anti-vibration table** 

Software: STA Master

### Sub-nanometer 3D Optical Profiler

### **Model 7503**

#### **Application Examples**

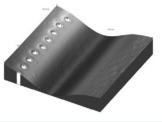


LCD-Photo Spacer



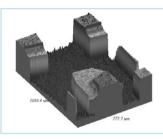


PCB-Laser Via

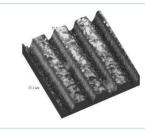




Material-Rough Surface



MEMS-Hard Disk Read Head



lat Panel

hotovoltaic Test

Automated

Electronics Power

Battery Test &

Component Passive

Electrical

Semiconductor/

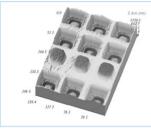
Measurement PXI Test &

Purpose

Manufacturing Execution System

urnkey Test &

PCB-Wire high, wide, pitch



Semiconductor-Thin Film Transistor

**MEMS-Printer Nozzle** 

| Model                      |               |     | 7503   |  |  |  |  |
|----------------------------|---------------|-----|--|--|--|--|--|
| Measurement                |               |     | Noncontact 3D & 2D measurements  |  |  |  |  |
|                            |               |     | 640x480 pixel (mono), 640x480 pixel (color)  |  |  |  |  |
| Imaging system (CCD vide   | eo camera)    |     | Optional 1000x1000 pixel (mono), 1000x1000 pixel (color) *1  |  |  |  |  |
| Interference objective len | S             |     | 2.5X <sup>*2</sup> , 5X, 10X, 20X, 50X, 100X   |  |  |  |  |
| Conventional objective ler | ns            |     | 5X, 10X, 20X, 50X, 100X  |  |  |  |  |
| Supported tube lens ratio  |               |     | 0.45X, 0.5X, 1.0X  |  |  |  |  |
| Nose gear                  |               |     | Standard : Electric rotary 5 holes   |  |  |  |  |
| Nose gear                  |               |     | Optional : None, Manual rotary 5 holes   |  |  |  |  |
| Light Source               |               |     | White light LED  |  |  |  |  |
| 3                          |               |     | Optional Halogen   |  |  |  |  |
| Measurement Mode *3        |               |     | PSI, VSI   |  |  |  |  |
|                            | Stroke        |     | 150 mm   |  |  |  |  |
| XY automatic platform      | Resolution    |     | 2 μm (auto version)  |  |  |  |  |
|                            | Load capacity |     | $\leq$ 1.1 Kg (without carrying tray)  |  |  |  |  |
|                            | Control mode  |     | Auto   |  |  |  |  |
| Level Measurement Range    | 2             |     | 150 x 150 mm   |  |  |  |  |
|                            | Stroke        |     | 100 mm electrical platform, optional for 100 mm manual platform  |  |  |  |  |
| Z axis                     | Resolution    |     | < 0.5 µm (Electrical platform)   |  |  |  |  |
| Level adjustment platform  | <u>.</u><br>ו |     | Manual 2 axes , $\pm$ 6°   |  |  |  |  |
| PZT Scan                   | Stroke        |     | 100 μm, optional 400 μm  |  |  |  |  |
|                            | Accuracy      | VSI | $\leq 1.5 \%^{*4}$   |  |  |  |  |
|                            | (Step Height) | PSI | ≦5.0 % <sup>*</sup> 5  |  |  |  |  |
| Vertical direction         | Repeatability | VSI | $\leq$ 0.14 % <sup>*4</sup>  |  |  |  |  |
|                            | (Step Height) | PSI | ≦1.7 % <sup>*</sup> 5  |  |  |  |  |
|                            | Scan speed    | PZT | 12 μm / sec  |  |  |  |  |
| Operating system           |               |     | Microsoft Window <sup>®</sup> 7 (32-bit)   |  |  |  |  |
| Operating environment      |               |     | Noise : ≤ 60db   |  |  |  |  |
| operating environment      |               |     | Vibration : VC-C or above  |  |  |  |  |
| Input voltage range        |               |     | 1Ø 110~240V $\pm$ 10% VLN, 47~63Hz, 50VA   |  |  |  |  |
| Operating temperature/ h   | umidity       |     | 15~35 $^\circ$ C (47 $^\circ$ F to 67 $^\circ$ F) ; less than 75 $^\circ$ relative humidity (non condensing) |  |  |  |  |
| Dimension (H x W x D)      |               |     | 1800 x 760 x 760 mm / 70.87 x 29.92 x 29.92 inch   |  |  |  |  |
| Weight                     |               |     | Approx. 220 Kg / 485 lbs <sup>*6</sup>   |  |  |  |  |
| Certification              |               |     | CE   |  |  |  |  |

Note\*1: Only support 1.0X tube lens ratio

Note\*2: 2.5X objective lens have special working distance with other objective lens

Note\*3: VSI: Vertical Scanning Interferometry; PSI: Phase Shift Interference

**Note\*4:** Measured with 8.0  $\mu$  m standard step height

Note\*5: Measured with 46nm standard step height

Note\*6: The actual weight varies with selected option

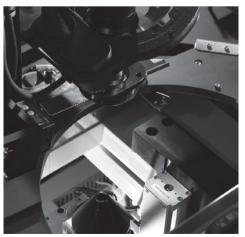
### Double Sided Wafer Inspection System

### **Model 7936**



#### **KEY FEATURES**

- It can do double side inspection simultaneously
- Maximum 8 inch wafer handling capability (10 inch inspection area)
- With inspection item framework that unique detection algorithm can be replaced or added for different customer or product
- No precise wafer loading is needed because of auto alignment function
- Edge finding to test various wafer shapes
- Defect criteria editor for versatile pass/fail criteria setting
- Defect detection rate > 98%
- Combine AOI and upstream machine data and upload a final mapping file for downstream machine
- Customized inspection report for defect analysis



Chroma 7936 double sided wafer inspection system is an automatic inspection system for afterdicing wafer chip. It can do double side inspection simultaneously. The appearance defects of wafer chip are clearly conspicuous by using advanced illumination technology. Illumination and camera acquisition mode can be adjusted for various wafer process, like vertical chip or flip chip.

Applied with high speed camera and inspection algorithms, Chroma 7936 can inspect a 2" LED wafer in 4.5 minutes; the throughput is about 35msec/ chip. Chroma 7936 also provides auto focus and warpage compensation function to overcome wafer warpage and chuck leveling issue. There are two magnifications for selection by applicable chip size or defect size. The minimum resolution of the system is 0.7um that has capability to detect 2 um defect size.

#### **System Function**

After the tape expansion process, the arrangement of dies on wafer may be formed an irregular alignment. Chroma 7936 also offers software alignment function to adjust wafer alignment angle for scan. In addition, Chroma 7936 owns a friendly user interface to reduce user's learning time. All of inspection information is visualized for easy reading, like mapping map, defect region, inspection results.

#### **Defect Analysis**

All of inspection result raw data are recorded not only pass/fail and bin data. This is easily to analysis an optimal parameter that achieves the balance overkill and underkill. The data also helps to monitor the defect trend caused by the production process, and feedback to production unit in advance.

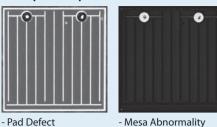
In conclusion, Chroma 7936 is an ideal cost and performance selection for wafer chip inspection process.

| Sec.  | Page Annual | Reality and Married | 170Monall | (704+c2 | Research transferration of | Reported attack to out | Tool of Delectrone to devaluated | DesCal Adv. Grave Solden Leanst | - 24 |
|-------|-------------|---------------------|-----------|---------|----------------------------|------------------------|----------------------------------|---------------------------------|------|
| 000   | 1.0         | 410                 | 28.55     | 149.52  | 0.00                       | 0.00                   | 1.00                             | 1.00                            | 11   |
| 2973  | 400         | 410                 | 21.75     | 151.10  | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 10   |
| 800   | 4.00        | 4.00                | 21.01     | 1254    | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 10   |
| 2004  | 4.00        | 400                 | 79.06     | 1.52.62 | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 10   |
| 2015  | 4.00        | 4.00                | 214       | 151.22  | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 0.0  |
| 8006  | 4.00        | 400                 | 70.05     | 149.76  | 0.00                       | 0.00                   | 1.0                              | 1.00                            | 10   |
| 100   | 4.00        | 430                 | 20.04     | 151.30  | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 0.0  |
| 100   | 4.00        | 48                  | 70.20     | 151.02  | 0.00                       | 0.00                   | 1.0                              | 1.00                            | 10   |
| 40CB. | 4.00        | 410                 | 78.55     | 152.2   | 0.00                       | 0.00                   | 0.00                             | 100                             | 10   |
| 4010  | 4.00        | 415                 | 20.04     | 151.78  | 0.00                       | 0.00                   | 0.00                             | 1.00                            | 1.0  |
| 1108  | 4.00        | 40                  | 21.0      | 140.00  | 0.00                       | 0.00                   | 1.0                              | 1.00                            | 10   |
| 1012  | 4.00        | 410                 | 75.27     | 12146   | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 10   |
| 100   | 4.00        | 400                 | 31.05     | 151.17  | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 10   |
| 8014  | 4.00        | 430                 | 79.40     | 121.37  | 0.00                       | 0.00                   | 0.00                             | 1.00                            | 10   |
| 10.5  | 4.00        | 400                 | 70.07     | 138.37  | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 10   |
| 8015  | 4.00        | 430                 | 214       | 14724   | 0.00                       | 0.00                   | 1.0                              | 0.00                            | 10   |
| 40(7  | 4.00        | 400                 | 214       | 141.0   | 0.00                       | 0.00                   | 1.0                              | 0.00                            | 10   |
| 8203  | 4.00        | 430                 | 28.98     | 14832   | 0.00                       | 0.00                   | 0.00                             | 0.00                            | 2.0  |
| 6034  | 430         | 48                  | 21.15     | 140.51  | 0.00                       | 0.00                   | 1.0                              | 1.00                            | 10   |
| 1003  | 400         | 400                 | 37.26     | 140.05  | 0.00                       | 0.00                   | 0.00                             | 10                              | 10   |

Detail defect raw data for analysis

#### **Application for vertical LED chip**

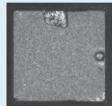
#### **LED Top Side Inspection Items**



- Pad Residue - ITO Peeling - Finger Broken
- Epi Defect
- Chipping
- Chip Residue

#### **LED Back Side Inspection Items**





- Cutting Abnormality - Pad Bump

- Chipping - Metal Lack

### Double Sided Wafer Inspection System

Model 7936

| Model                          | 7936  |
|--------------------------------|---|
| Suitable Chip and Package Type |   |
| Applicable Ring                | Grip ring holder or wafer holder  |
| Inspection Area                | 10", suit for 6" LED expanding wafer and 8" sawing wafer                        |
| Chip Size                      | 125umX125um ~1.2mmX1.2mm  |
| Chip Height                    | 10um~1.5mm  |
| Suitable Package               | Vertical chip, flip chip  |
| Inspection                     |   |
| Camera                         | 5M Color Camera X 2   |
| Light Source                   | LED Co-axis light, ring light, back light                                       |
| Magnification                  | 2X, 5X objective lens selectable  |
| Throughput                     | For LED, 2" wafer in 4.5 minutes at 2 lights                                    |
| Algorithm                      | Pad defect, mesa defect, chipping defect, double chips and emitting area defect |
| External Interface             | Provide external algorithm interface to replace or add new inspection algorithm |
| System                         |   |
| Loading/ unloading             | Auto load port X 2  |
| Warpage Compensation           | Software auto focus and mechanical fix focus column to overcome wafer warpage   |
| MTBF                           | > 2000 hours  |
| PC                             | X1  |
| Software Function              |   |
| Monitor                        | Real-time wafer map display   |
| Image Storage                  | All/ defect image saving selectable   |
| Report                         | Including chip position, defect type, inspection results                        |
| Cassette Selection             | Programmable cassette selection and scheduling                                  |
| Facility Requirement           |   |
| Dimension                      | 1200mm x 800 mm x 1550mm  |
| Weight                         | 800kg   |
| Power                          | AC 220V±10%, 50/60 Hz, 1 Φ , 2KW  |
| Compressed Air                 | 0.6 MPa   |
| Operation Temperature          | +5°C ~40 °C   |
| Operation Humidity             | 20%~65% R.H.  |

**ORDERING INFORMATION** 

7936 : Double Sided Wafer Inspection System

### Wafer Inspection System

### Model 7940



#### **KEY FEATURES**

- Inspect 6" LED wafer in 2.5 minutes with high speed architecture
- Maximum 8 inch wafer handling capability (10 inch inspection area)
- Unique detection algorithm can be replaced or added for different customer or model
- No precise wafer loading is needed because of auto alignment function
- Edge finding to test various wafer shapes
- Defect criteria editor for versatile pass/fail criteria setting
- Chip optical character defect detection rate > 98%
- Combine AOI and upstream machine data and upload a final mapping file for downstream machine
- Customized inspection report for defect analysis
- Suitable for LED, laser diodes, photo diodes, and other wafer chip



Chroma 7940 wafer inspection system is an automatic inspection system for after-dicing wafer chip. The appearance defects of wafer chip are clearly conspicuous by using advanced illumination technology. Illumination and camera acquisition mode can be adjusted for various wafer chip, like LED, laser diodes and photo diodes.

Applied with high speed camera and inspection algorithms, Chroma 7940 can inspect a 6" LED wafer in 2.5 minutes. Chroma 7940 also provides auto focus and warpage compensation function to overcome wafer warpage and chuck leveling issue. There are two magnifications for selection by applicable chip size or defect size. The minimum resolution of the system is 0.5um that has capability to detect 1.5 um defect size.

#### **System Function**

After the tape expansion process, the arrangement of dies on wafer may be formed an irregular alignment. Chroma 7940 also offers software alignment function to adjust wafer alignment angle for scan. In addition, Chroma 7940 owns a friendly user interface to reduce user's learning time. All of inspection information is visualized for easy reading, like mapping map, defect region, inspection results.

#### **Defect Analysis**

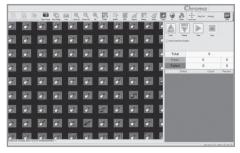
All of inspection result raw data are recorded not only pass/fail and bin data. This is easily to analysis an optimal parameter that achieves the balance of overkill and underkill. The data also helps to monitor the defect trend caused by the production process, and feedback to production unit in advance.

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|---------|------|--------------------|-----------|----------|------|-------|---|-------|-----------------|
|         | 4.00 | 4.00               | 28.55     | 146.50   | 0.00 | 0.00  | 1.00                                    | 0.00  | -8              |
| \$20.03 | 4.00 | 488                | 28.28     | 151.18   | 0.00 | 0.00  | 100                                     | 10.00 |                 |
| 8000    | #30  | 4.00               | 25.05     | 170.48   | 0.00 | 0.00  | 10.00                                   | 100   | 1.0             |
| 8008    | 4.00 | 4.00               | 25.04     | 150.00   | 0.00 | 0.00  | 0.00                                    | 0.00  | 1               |
| 8005    | # 00 | 4.00               | 21.41     | 151.22   | 0.00 | 10.00 | 100                                     | 1.00  | 1               |
| 8006    | 4.00 | 430                | 28.66     | 140.70   | 0.00 | 0.00  | 0.00                                    | 100   | 1               |
| 1008    | 4.00 | 4.00               | 21.04     | 121.90   | 0.00 | 1.00  | 1.0                                     | 1.00  | 14              |
| 8008    | 4.00 | 410                | 26.26     | 121.40   | 0.00 | 0.00  | 0.00                                    | 1.00  | 1               |
| 8009    | 4.00 | 4.00               | 28.55     | 152.8    | 0.00 | 0.00  | 0.00                                    | 0.00  | 1               |
| 8010    | 4.00 | 14.00              | 79.04     | 10.79    | 0.00 | 0.00  | jam -                                   | 1.00  |                 |
| 8011    | 4.00 | 410                | 21.65     | 140.30   | 0.00 | 0.00  | 0.00                                    | 0.00  | 10              |
| 8512    | 4.00 | 4.00               | 79.27     | 170.46   | 0.00 | 0.00  | 0.00                                    | 1.00  | 1 1 1 1 1 1 1 1 |
| 800     | 4.00 | 4.00               | 21.14     | 151.17   | 0.00 | 0.00  | 0.00                                    | 0.00  | 14              |
| 8214    | 4.00 | 4.00               | 21.45     | 151.59   | 0.00 | 0.00  | 0.00                                    | 0.00  | 1.14            |
| abc5    | 4.00 | 4.00               | 76.07     | 150.07   | 0.00 | 0.00  | 0.00                                    | 0.00  | 10              |
| 8216    | 4.00 | 4.00               | 20.42     | 147.24   | 0.30 | 0.00  | 1.00                                    | 0.00  | 1.00            |
| 8017    | 4.00 | 4.00               | 71.45     | 148.51   | 0.00 | 0.00  | 0.00                                    | 0.00  | 10              |
| 8208    | #20  | 4.00               | 21.50     | 140.92   | 0.00 | 0.00  | 0.00                                    | 0.00  | 14              |
| 80.0    | 4.00 | 4.00               | 70.09     | 149.51   | 0.00 | 0.00  | 1.00                                    | 0.00  | 1               |
| 80.00   | 4.00 | 4.00               | 22.26     | 140.05   | 0.00 | 0.00  | 0.00                                    | 1.00  | 1.0             |

Detail defect raw data for analysis

In conclusion, Chroma 7940 is an ideal cost and performance selection for wafer chip inspection process.

#### **Applications for Laser Diodes & Photo Diodes**



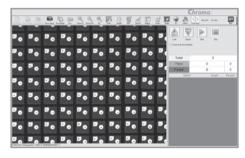
**Laser Diodes & Photo Diodes Inspection Items** 





 Photosensitive Region Defect
 Bond Pad Defect
 Passivation Film Defect -Scribe Line Defect -Chipping -Double Chip

#### **Application for LED Chips**



#### **LED Inspection Items**



- Pad Defect
- Pad Residue
- ITO Peeling
- Finger Broken
- Mesa Abnormality
   Epi Defect
- Chipping
- Chip Residue

### Wafer Inspection System

### Model 7940

| SPECIFICATIONS                 |   |  |
|--------------------------------|---|--|
| Model                          | 7940  |  |
| Suitable Chip and Package Type |   |  |
| Applicable Ring                | Suitable for grip ring or wafer frame   |  |
| Inspection Area                | 10", suitable for 6" LED expanded wafer and 8" unsawn wafer                     |  |
| Chip Size                      | 125um x 125um ~ 5mm x 5mm   |  |
| Chip Type                      | LED, laser diodes, photo diodes, and other wafer chip                           |  |
| Inspection                     |   |  |
| Magnification                  | Multiple magnification for selection, 2X, 5X                                    |  |
| Throughput                     | 6" wafer in 2.5 minutes at 2 lights For LED application                         |  |
| Algorithm                      | Provide external algorithm interface to replace or add new inspection algorithm |  |
| System                         |   |  |
| Loading/ unloading             | Auto load port x 4  |  |
| Warpage Compensation           | Software auto focus and mechanical focus supporting to overcome wafer warpage   |  |
| Software Function              |   |  |
| Monitor                        | Real-time wafer map display   |  |
| Image Storage                  | All/defect image saving selectable  |  |
| Report                         | Including chip position, defect type, inspection results                        |  |
| Cassette Selection             | Programmable cassette selection and scheduling                                  |  |
| Facility Requirement           |   |  |
| Dimension (WxDxH)              | 1600 mm x 1500 mm x 1800 mm   |  |
| Weight                         | 1800 kg   |  |
| Power                          | AC 220V $\pm$ 10%, 50/60 Hz, 1 $\oplus$ , 2.5KW                                 |  |
| Compressed Air                 | 0.6 MPa   |  |

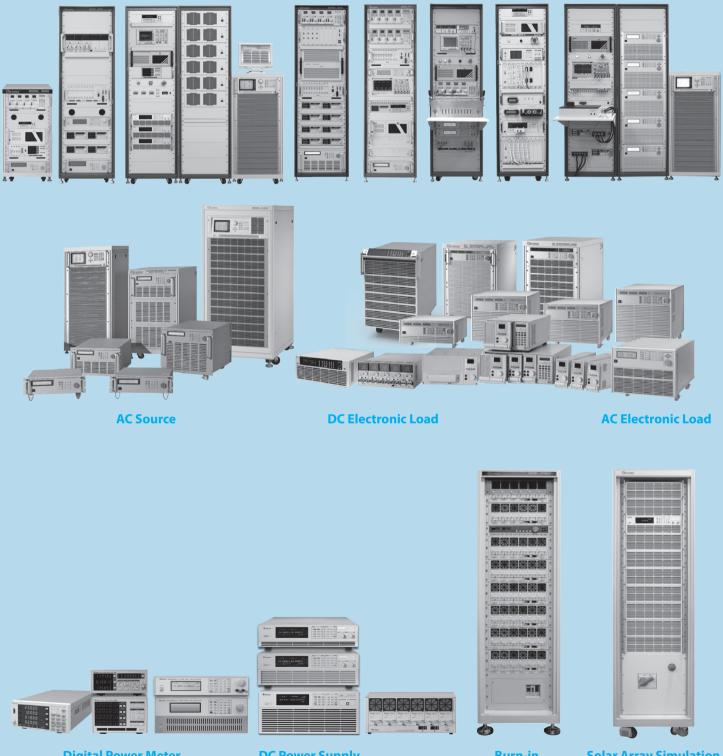
**ORDERING INFORMATION** 

7940: Wafer Inspection System

PXI Test & Measurement

| Selection Guides      | 10-1  |
|-----------------------|-------|
| DC Electronic Load    | 10-5  |
| AC Electronic Load    | 10-31 |
| AC Power Source       | 10-33 |
| Digital Power Meter   | 10-47 |
| DC Power Supply       | 10-51 |
| Automatic Test System | 10-65 |

#### Automatic Test System



**Digital Power Meter** 

**DC Power Supply** 

Burn-in **DC Power Supply**  **Solar Array Simulation** 

**DC Power Supply** 

### **Selection Guides**

| DC Electronic Load Selection G    | uide  |  |                        |  |                             |                              |
|-----------------------------------|---|--|------------------------|--|-----------------------------|------------------------------|
| Series                            | 6310A Series  | 6330A Series   | 63200A Serie           | 63200 Series   | 63600 Series                | 63800 Series                 |
| Power Rating (Modular)            | 200W,<br>100Wx2(Dual),<br>30W&250W,<br>300W, 350W,<br>600W, 1200W | 200W,<br>100Wx2(Dual)<br>30W&250W,<br>300W, 350W,<br>600W, 1200W | 4kW, 5kW,<br>6kW, 24kW | 2600W, 5200W,<br>6500W, 10000W,<br>10400W, 14500W,<br>15600W | 100Wx2(Dual),<br>300W, 400W | 1800W, 3600W,<br>4500W       |
| Current                           | Up to 240A  | Up to 240A   | Up to 2000A            | Up to 1000A  | Up to 80A                   | Up to 45A                    |
| Voltage                           | Up to 600V  | Up to 600V   | Up to 1200V            | Up to 1000V  | Up to 600V                  | Up to 500V                   |
| Configuration                     | Modular   | Modular  | Stand-Alone            | Stand-Alone  | Modular                     | Stand-Alone                  |
| Max. Channel / Mainframe          | 8   | 8  | 1                      | 1  | 10                          | 1                            |
| Operating Mode                    | CC/CR/CV/CP   | CC/CR/CV/CP  | CC/CR/CV/CP/CZ         | CC/CR/CV/CP  | CC/CR/CV/CP/CZ              | CC/CR/CV/CP/<br>DC Rectified |
| Slew Rate                         | Up to 10A/µs  | Up to 10A/µs   | Up to 200A/µs          | Up to 41A/µs   | Up to 8A/µs                 | Up to 600A/ms                |
| Dynamic Loading                   | Y   | Y  | Y                      | Y  | Y                           | -                            |
| Measurement                       | V, I, P   | V, I, P  | V, I, P, Vpeak         | V, I, P  | V, I, P, Vpeak              | V, I, P, R                   |
| External Waveform Control         | -   | -  | Y                      | Y  | Y                           | -                            |
| User Defined Waveform             | -   | -  | Y                      | -  | Y                           | -                            |
| Short Circuit Test                | Y   | Y  | Y                      | Y  | Y                           | Y                            |
| Von Point Control                 | Y   | Y  | Y                      | Y  | Y                           | -                            |
| V&I Monitor                       | -   | -  | Y                      | Y  | Y                           | Y                            |
| Synchronize Dynamic               | -   | Y  | Y                      | Y  | Y                           | -                            |
| Synchronize Control<br>Multi-load | Y   | Y  | Y                      | -  | Y                           | -                            |
| Master/Slave Parallel Mode        | -   | Y  | Y                      | Y  | Y                           | Y                            |
| Data Setting (Rotary)             | Y   | Y  | Y                      | Y  | Y                           | Y                            |
| Data Setting (Keypad)             | Y   | Y  | Y                      | Y  | -                           | Y                            |
| Status Storage (100 files)        | Y   | Y  | Y                      | Y  | Y                           | Y                            |
| Remote Controller                 | Option  | Option   | Option                 | Option   | -                           | -                            |
| GO/NG Test                        | Y   | Y  | Y                      | Y  | Y                           | -                            |
| Fan Speed Control                 | Y   | Y  | Y                      | Y  | Y                           | Y                            |
| Self Test at Power On             | Y   | Y  | Y                      | Y  | Y                           | Y                            |
| Programmable Test (10 Pro.)       | Y   | Y  | Y                      | Y  | Y                           | -                            |
| RS-232 Interface                  | Standard  | Standard   | -                      | Standard   | -                           | Standard                     |
| GPIB Interface                    | Option  | Option   | Option                 | Standard   | Option                      | Standard                     |
| USB Interface                     | Option  | Option   | Standard               | -  | Standard                    | -                            |
| Ethernet Interface                | -   | -  | Option                 | -  | Option                      | -                            |
| PAGE                              | 10-5  | 10-17  | 10-12                  | 10-16  | 10-27                       | 10-31                        |

| AC Power Source Selection Guide  |             |              |              |              |              |  |  |  |  |  |
|----------------------------------|-------------|--------------|--------------|--------------|--------------|--|--|--|--|--|
| Step 1 by Function               |             |              |              |              |              |  |  |  |  |  |
| Series                           | 6500 Series | 61500 Series | 61600 Series | 61700 Series | 61800 Series |  |  |  |  |  |
| Power Measurement                | Standard    | Standard     | Standard     | Standard     | Standard     |  |  |  |  |  |
| PLD Simulation                   | Standard    | Standard     | -            | Option       | Standard     |  |  |  |  |  |
| Arbitrary Waveform               | -           | Standard     | -            | -            | Standard     |  |  |  |  |  |
| DC Output                        | -           | Standard     | Standard     | Standard     | Standard     |  |  |  |  |  |
| Programmable Output<br>Impedance | -           | Standard     | -            | -            | -            |  |  |  |  |  |
| Harmonic Measurement             | -           | Standard     | -            | -            | Standard     |  |  |  |  |  |
| IEC Regulation Testing           | Standard    | Standard     | -            | -            | Standard     |  |  |  |  |  |
| GPIB Interface                   | Option      | Option       | Option       | Option       | Standard     |  |  |  |  |  |
| RS-232 Interface                 | Option      | Option       | Option       | Option       | Standard     |  |  |  |  |  |
| PAGE                             | 10-45       | 10-33        | 10-37        | 10-41        | 10-43        |  |  |  |  |  |

#### Step 2 by Model

| Series  | 6500 | Series | 61500   | Series  | 61600 Series |         | 61700 Series | 61800 Series |
|---------|------|--------|---------|---------|--------------|---------|--------------|--------------|
| Power   | 1 Ø  | 3Ø     | 1 Ø     | 3 Ø     | 1Ø           | 3 Ø     | 3 Ø          | 1 Ø/3 Ø      |
| 500VA   | -    | -      | 61501   | -       | 61601        | -       | -            | -            |
| 1000VA  | -    | -      | 61502   | -       | 61602        | -       | -            | -            |
| 1200VA  | 6512 | -      | -       | -       | -            | -       | -            | -            |
| 1500VA  | -    | -      | 61503   | -       | 61603        | -       | 61701        | -            |
| 2000VA  | 6520 | -      | 61504   | -       | 61604        | -       | -            | -            |
| 3000VA  | 6530 | -      | -       | -       | -            | -       | 61702        | -            |
| 4000VA  | -    | -      | 61505   | -       | 61605        | -       | -            | -            |
| 4500VA  | -    | -      | -       | -       | -            | -       | 61703        | -            |
| 6000VA  | 6560 | -      | -       | -       | -            | -       | 61704        | -            |
| 9000VA  | 65   | 90     | -       | -       | -            | -       | -            | -            |
| 12000VA | -    | -      | 61      | 511     | 61611        |         | 61705        | -            |
| 18000VA |      |        | 61      | 512     | 61           | 512     | -            | -            |
| 30000VA |      |        | 61511 + | A615103 | 61611 +      | A615103 | -            | 61830        |
| 36000VA |      |        | 61512 + | A615103 | 61612 +      | A615103 | -            | -            |
| 45000VA |      | -      |         | -       |              | -       | -            | 61845        |
| 60000VA |      | -      |         | -       | -            |         | -            | 61860        |
| PAGE    | 10   | -45    | 10      | -33     | 10           | -37     | 10-41        | 10-43        |

| Power Meter Selection Guide              |                                     |  |   |   |   |
|--|-------------------------------------|--|---|---|---|
| Model                                    | 66201                               | 66202  | 66203   | 66204   | 66205   |
| Channel                                  | 1                                   | 1  | 3   | 4   | 1   |
| Max. Voltage range                       | 500Vrms                             | 500Vrms  | 600Vrms   | 600Vrms   | 600Vrms   |
| Max. Current range                       | 4Arms                               | 20Arms   | 20Arms  | 20Arms  | 30Arms  |
| Frequency                                | 15Hz-10kHz                          | 15Hz-10kHz   | 10Hz-10kHz  | 10Hz-10kHz  | 10Hz-10kHz  |
| Graphical Display                        | -                                   | -  | -   | -   | -   |
| Result storage                           | -                                   | -  | -   | -   | -   |
| Rotary / keypad Data input               | -                                   | -  | -   | -   | -   |
| GPIB Interface                           | V                                   | V  | V   | V   | V   |
| RS-232 Interface                         | -                                   | -  | -   | -   | -   |
| USB Interface                            | V                                   | V  | V   | V   | V   |
| Centronics Interface                     | -                                   | -  | -   | -   | -   |
| Parameters                               | V, I, PF, W, VA, P,<br>CF, Vpk, Ipk | V, I, F, PF, W, Wr, Wa, P, CF,<br>Vpk, Ipk, Ip-p, THD, E | V, I, F, PF, W, VAR, VA, CF,<br>Vpk, Ipk, THD, E, EFF | V, I, F, PF, W, VAR, VA, CF,<br>Vpk, Ipk, THD, E, EFF | V, I, F, PF, W, VAR, VA, CF,<br>Vpk, Ipk, THD, E, EFF |
| AC/DC Measurement mode                   | DC, AC + DC                         | DC, AC+DC  | DC, AC+DC   | DC, AC+DC   | DC, AC+DC   |
| 40th Harmonics<br>Measurement Capability | -                                   | V  | V   | V   | V   |
| Pre-Compliance IEC 61000-3-2             | -                                   | Software   | Software  | Software  | Software  |
| DFT & DSP Technology                     | V                                   | V  | V   | V   | V   |
| Waveform display                         | Software                            | Software   | Software  | Software  | Software  |
| Waveform moving cursor                   | -                                   | -  | -   | -   | -   |
| Waveform trigger function                | -                                   | -  | -   | -   | -   |
| Recording function                       | Software                            | Software   | Software  | Software  | Software  |
| Stand alone operating                    | V                                   | V  | V   | V   | V   |
| PAGE                                     | 10-47                               | 10-47  | 10-47   | 10-47   | 10-47   |

### **Selection Guides**

| DC Power | Supply Selection | Guide                   |                              |  |                         |  |
|----------|------------------|-------------------------|------------------------------|--|-------------------------|--|
| Model    | 6                | 2000B Series /<br>1.5KW |                              | 62000H Series /<br>& 5KW & 10KW & 15KW                                     |                         | 2000P Series /<br>.2KW & 2.4KW & 5KW                                 |
| Volts    | Amps             | Model                   | Amps                         | Model  | Amps                    | Model  |
| 0-15     | 1-90             | 62015B-15-90            |                              |  |                         |  |
| 0-30     | 1-50             | 62015B-30-50            | 0-250A/<br>0-375A            | 62075H-30/<br>62100H-30  | 0-80                    | 62006P-30-80   |
| 0-40     |                  |                         | 0-125A/<br>0-250A/<br>0-375A | 62050H-40/<br>62100H-40/<br>62150H-40                                      | 0-120                   | 62012P-40-120/<br>62024P-40-120                                      |
| 0-60     | 1-25             | 62015B-60-25            |                              |  |                         |  |
| 0-80     | 1-18             | 62015B-80-18            |                              |  | 0-60                    | 62012P-80-60/<br>62024P-80-60  |
| 0-100    |                  |                         | 0-125A/<br>0-250A/<br>0-375A | 62050H-100P/<br>62100H-100P/<br>62150H-100P                                | 0-25/<br>0-50/<br>0-100 | 62006P-100-25/<br>62012P-100-50/<br>62024P-100-50/<br>62050P-100-100 |
| 0-150    | 1-10             | 62015B-150-10           | 0-40A                        | 62020H-150S  |                         |  |
| 0-300    |                  |                         |                              |  | 0-8                     | 62006P-300-8   |
| 0-450    |                  |                         | 0-11.5A/<br>0-23A/<br>0-34A  | 62050H-450/<br>62100H-450/<br>62150H-450                                   |                         |  |
| 0-600    |                  |                         | 0-8.5A/<br>0-17A/<br>0-25A   | 62050H-600/62050H-600S<br>62100H-600/62100H-600S<br>62150H-600/62150H-600S | 0-8                     | 62012P-600-8/<br>62024P-600-8  |
| 0-1000   |                  |                         | 0-10A/<br>0-15A              | 62100H-1000/<br>62150H-1000/<br>62150H-1000S                               |                         |  |
| PAGE     |                  | 10-63                   |                              | 10-55, 10-59   |                         | 10-51  |

| System Model                             | 8000  | 8010  | 8020  | 8200  | 8491  |
|--|-------|-------|-------|-------|-------|
| UUT Type                                 |       |       |       |       |       |
| Battery Charger                          | V     |       | V     |       |       |
| Switching Mode Rectifier                 | V     |       |       |       |       |
| Switching Power Supply<br>(Multi-Output) | V     | V     | V     | V     |       |
| Adapter                                  | V     |       | V     | V     |       |
| DC to DC Converter                       | V     |       |       |       |       |
| DC Power                                 | V     | V     |       |       |       |
| LED Power Driver                         |       |       |       |       | V     |
| EV Power Electronics                     | V     |       |       |       |       |
| PV Inverter                              | V     |       |       |       |       |
| Functionality                            |       |       |       |       |       |
| Open System Architecture                 | V     |       |       |       | V     |
| Optional Instrument Extendible           | V     |       |       |       | V     |
| Support Windows 98/NT/2000 or higher     | V     | V     | V     | V     | V     |
| User Permission Setting                  | V     | V     | V     | V     | V     |
| System Administrator Access Log          | V     | V     | V     |       | V     |
| Network Management                       | V     | V     | V     |       | V     |
| Support Shop Floor Control Software *1   | V     | V     | V     | V     | V     |
| Test Report Editing                      | V     | V     | V     | V     | V     |
| Test Item Editing                        | V     |       |       |       | V     |
| Test Program Editing                     | V     | V     | V     | V     | V     |
| Test Program Saving                      | V     | V     | V     | V     | V     |
| Debug Run                                | V     |       |       |       | V     |
| GO/NO GO Test                            | V     | V     | V     | V     | V     |
| Statistical Analysis Control             | V     | V     | V     | V     | V     |
| Test Report Printing                     | V     | V     | V     | V     | V     |
| On-Line Control *2                       | V     |       |       |       | V     |
| Report Wizard *3                         | V     |       |       |       | V     |
| PAGE                                     | 10-65 | 10-72 | 10-73 | 10-71 | 10-74 |

#### Notes:

#### 1. Support Shop Floor Control Software:

The system can work with Shop Floor Control Software used on manufacturing production line to attain overall factory control and remote control through internet. 2. On-Line Control:

Enables users to operate all instruments on-line via one computer screen, incorporating the test values from individual instruments to save time and resources. **3. Report Wizard:** 

#### Automatically generates various R&D reports including oscilloscope waveform and the others to meet customer's needs and reduce the report preparation time.

### Model 6310A Series



#### **KEY FEATURES**

- Max Power: 200W, 100W × 2(Dual), 30W & 250W, 300W, 350W, 600W, 1200W
- Wide range 0~600V operating voltage
- Compatibility between 6310 and 6310A
- Up to 8 channels in one mainframe, for testing multiple output SMPS
- Parallel load modules up to 1400W for high current and power application
- Synchronization with multiple loads
- Flexible CC, CR, CP and CV operation modes
- Dynamic loading with speeds up to 20kHz
- Fast response of 0.32mA/µs~10A/µs slew rate
- Minimum input resistance allowing load to sink high current at low voltage (63123A : 0.6V@70A)
- Real time power supply load transient response simulation and output measurement
- User programmable 100 sequences. Front panel input status for user-friendly operating
- High/Low limits of testing parameters to test GO/NG
- Digital I/O control
- Over current protection (OCP) testing function
- 16-bit precision voltage and current measurement with dual-range
- Remote sensing capability
- Short circuit test
- Self-test at power-on
- Full Protection: OC, OP, OT protection and OV alarm
- USB, GPIB & RS-232 interfaces



The Chroma 6310A series Programmable DC Electronic Load is suitable for the test and evaluation of multi-output AC/DC power supplies, DC/DC converters, chargers and power electronic components. It is ideal for applications in research and development, production, and incoming inspection. The system is configured by plugging the user selectable load modules into the system mainframe. The user interfaces include an ergonomically designed user friendly keypad on the front panel and the following computer interfaces: RS-232, USB or GPIB.

The 6310A series has a self-diagnosis routine to maintain instrument performance. It also provides OP, OC, OT protection and alarm indicating OV, reverse polarity protection to guarantee quality and reliability for even the most demanding engineering testing and ATE applications.

#### **Module Load Design**

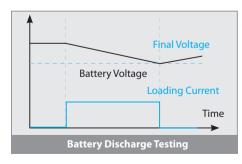
The Chroma 6314A 1400W and 6312A 700W electronic load mainframes accept the user-installable 6310A series load modules for easy system configuration and will mount in a 19" instrument rack.



#### **Timing Function**

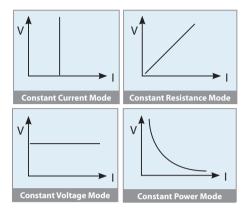
The 6310A series of loads include a unique timing<br/>& measurement function, which allows precisetime measurements in the range of 1ms to<br/>86,400s. This feature allows the user to set the final<br/>voltage & timeout values for battery discharge<br/>testing and other similar applications.24

The Timing function can be used in testing battery and super capacitor discharge, or other similar applications.

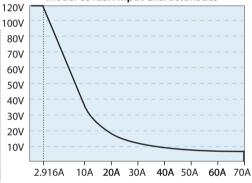


#### **Application of Specific Load Simulation**

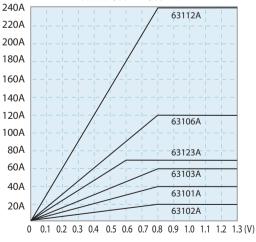
The 6310A load modules operate in constant current, constant voltage, constant power or constant resistance to satisfy a wide range of test requirements. For example, the test of a battery charger can be simulated easily by setting the load to operate in constant voltage.







Low Voltage Characteristics (Typical) Model 63101A/63102A/63103A/ 63106A/63112A/63123A



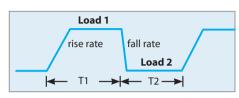
Note: All specifications are measured at load input terminals. (Ambient Temperature of  $25^{\circ}$ C)

### Model 6310A Series

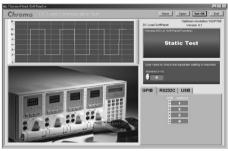
/ Test &

### **Dynamic Loading and Control**

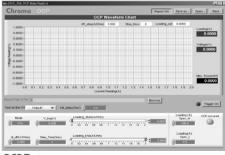
Modern electronic devices operate at very high speeds and require fast dynamic operation of their power providing components. To satisfy these testing applications, the 6310A loads offer high speed, programmable dynamic load simulation and control capability. The figure below shows the programmable parameters of the 6310A modules.



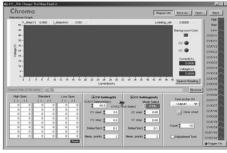
#### Soft Panel



Main Operation Menu



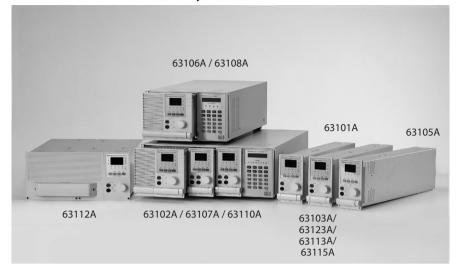
#### OCP Test



#### Charger Test



**6310A Series DC Electronic Load Family** 









A631001: Remote Controller

| Mainframe Model              | 6312A                                  | 6314A                                   |
|------------------------------|--|---|
| Number of slots              | 2                                      | 4                                       |
| <b>Operating Temperature</b> | 0~40°C                                 | 0~40°C                                  |
| Input Dating                 | 1Ø 100/200Vac $\pm$ 10% VLN, 47~63Hz ; | $100/200Vac \pm 10\% V_{LN}, 47~63Hz$ ; |
| Input Rating                 | 1Ø 115/230Vac $\pm$ 10% VLN, 47~63Hz   | 1Ø 115/230Vac $\pm$ 10% VLL, 47~63Hz    |
| Dimensions (HxWxD)           | 194x275x550mm /                        | 194x439x550mm /                         |
|                              | 7.6x10.8x21.7inch                      | 7.6x17.3x21.7inch                       |
| Weight                       | 15 kg / 33.1 lbs                       | 21.5 kg / 47.4 lbs                      |

#### **ORDERING INFORMATION**

6312A : Mainframe for 2 Load Modules 6314A : Mainframe for 4 Load Modules 63101A : Load Module 80V/40A/200W 63102A : Load Module 80V/20A/100W x 2 63103A : Load Module 80V/60A/300W 63105A : Load Module 500V/10A/300W 63106A : Load Module 80V/120A/600W 63107A : Load Module 80V/5A & 40A/30W & 250W 63108A : Load Module 500V/20A/600W 63112A : Load Module 80V/240A/1200W 63123A : Load Module 120V/70A/350W A631000 : GPIB Interface for Model 6314A/6312A Mainframe A631001 : Remote Controller A631003 : USB Interface for Model 6314A/6312A Mainframe A631005 : Softpanel for 6310A/6330A series A631006 : Rack Mounting Kit for Model 6312A Mainframe A631007 : Rack Mounting Kit for Model 6314A Mainframe A800042 : Test Fixture LED Load Simulator for LED Driver Test 63110A : Load Module 500V/2A/100W x 2 63113A : Load Module 300V/20A/300W 63115A : Load Module 600V/20A/300W

**Battery Discharge Test** 

### Model 6310A Series

| Model                       | 631   | 01A   | 63102A (           | 100Wx2)            | 631              | 03A               |  |
|-----------------------------|---|---|--------------------|--------------------|------------------|-------------------|--|
| Power                       | 20W   | 200W  | 20W                | 100W               | 30W              | 300W              |  |
| Current                     | 0~4A  | 0~40A   | 0~2A               | 0~20A              | 0~6A             | 0~60A             |  |
| /oltage *3                  | 3~0   |   | 0~8                |                    | 0~8              |                   |  |
| Typical Min. Operation      | 0.4V@2A   | 0.4V@20A                                      | 0.4V@1A            | 0.4V@10A           | 0.4V@3A          | 0.4V@30A          |  |
| /oltage (DC)*1              | 0.8V@4A   | 0.8V@40A                                      | 0.8V@2A            | 0.8V@20A           | 0.8V@6A          | 0.8V@60A          |  |
| Constant Current Mode       | 0.07@477  | 0.01@10/1                                     | 0.07@277           | 0.07@2077          | 0.07@077         | 0.07@0077         |  |
| Range                       | 0~4A  | 0~40A   | 0~2A               | 0~20A              | 0~6A             | 0~60A             |  |
| Resolution                  | 1mA   | 10mA  | 0.5mA              | 5mA                | 1.5mA            | 15mA              |  |
| Accuracy                    | 0.1%+0.1%F.S.   | 0.1%+0.2%F.S.                                 | 0.1%+0.1%F.S.      | 0.1%+0.2%F.S.      | 0.1%+0.1%F.S.    | 0.1%+0.2%F.S      |  |
| Constant Resistance Mode    | 0.170+0.170F.3.   | 0.1%+0.2%F.3.                                 | 0.1%+0.1%F.3.      | 0.1%+0.2%0F.3.     | 0.1%+0.1%0F.3.   | 0.1%+0.2%1.3      |  |
| ionstant Resistance Mode    | <b>0.0375</b> Ω~150                                     | 2(200)/(16)/(16)/(16)/(16)/(16)/(16)/(16)/(16 | <b>0.075</b> Ω~300 | (100W/(16V))       | 0.025Ω~100Ω      | (200)///16//)     |  |
| lange                       |   | ( ,   | 3.75Ω~15kΩ         |                    | 1.25Ω~5kΩ        |                   |  |
|                             | 1.875Ω~7.5kΩ  |   |                    | ( ,                |                  |                   |  |
| Resolution*5                | •   | 200W/16V)                                     | 3.333mS (1         | ,                  | 10mS (30         | ,                 |  |
|                             | 133µS (20   |   | 66.667µS (         |                    | 200µS (30        |                   |  |
| Accuracy                    | 150Ω: 0.1   |   | 300Ω: 0.1          |                    | 100Ω: 0.1        |                   |  |
| -                           | 7.5kΩ: 0.0  | 15 + 0.1%                                     | 15kΩ: 0.0          | 15 + 0.1%          | 5kΩ: 0.01S+ 0.1% |                   |  |
| Constant Voltage Mode       |   |   |                    |                    |                  |                   |  |
| Range                       | 0~8   |   | 0~8                |                    | 0~8              |                   |  |
| Resolution                  | 20r   |   | 201                |                    | 20r              |                   |  |
| Accuracy                    | 0.05% +   | 0.1%F.S.                                      | 0.05% +            | 0.1%F.S.           | 0.05% +          | 0.1%F.S.          |  |
| Constant Power Mode         |   |   |                    |                    |                  |                   |  |
| Range                       | 0~20W   | 0~200W  | 0~20W              | 0~100W             | 0~30W            | 0~300W            |  |
| Resolution                  | 5mW   | 50mW  | 5mW                | 25mW               | 7.5mW            | 75mW              |  |
| Accuracy                    | 0.5% + 0  | ).5%F.S.                                      | 0.5% + 0           | 0.5%F.S.           | 0.5% + 0         | ).5%F.S.          |  |
| Dynamic Mode                |   |   |                    |                    |                  |                   |  |
| Dynamic Mode                | C.C. N  | Лode  | C.C. M             | Лode               | C.C. N           | Node              |  |
|                             | 0.025ms ~ 50  | ms / Res: 5µs                                 | 0.025ms ~ 50       | ms / Res: 5µs      | 0.025ms ~ 50     | ms / Res: 5µs     |  |
| Г1 & T2                     | 0.1ms ~ 500ms / Res: 25µs                               |   | 0.1ms ~ 500n       | ns / Res: 25µs     | 0.1ms ~ 500m     |                   |  |
|                             | 10ms ~ 50s  | •   | 10ms ~ 50s         |                    | 10ms ~ 50s       |                   |  |
| Accuracy                    | 1µs/1ms+  | -100ppm                                       | 1µs/1ms-           | -100ppm            | 1µs/1ms+         | -100ppm           |  |
| Slew Rate                   | 0.64~160mA/μs   | 6.4~1600mA/µs                                 | 0.32~80mA/µs       | 3.2~800mA/µs       | 0.001~0.25A/µs   | 0.01~2.5A/µs      |  |
| Resolution                  | 0.64mA/µs   | 6.4mA/μs                                      | 0.32mA/µs          | 3.2mA/µs           | 0.001 0.23/1/µs  | 0.01A/µs          |  |
| Accuracy                    | 10% ±   |   | 10% =              |                    | 10% ±            |                   |  |
| Vin. Rise Time              | 10% -<br>10µs (T  |   |                    | ypical)            | 10% -<br>10µs (T |                   |  |
| Current                     | 0~4A  | 0~40A   | 0~2A               | 0~20A              | 0~6A             | 0~60A             |  |
|                             | •   |   |                    |                    |                  |                   |  |
| Resolution                  | 1mA   | 10mA  | 0.5mA              | 5mA                | 1.5mA            | 15mA              |  |
| Accuracy                    | 0.4%  | oF.S.   | 0.4%               | oF.S.              | 0.4%             | oF.S.             |  |
| Measurement Section         |   |   |                    |                    |                  |                   |  |
| Voltage Read Back           |   |   |                    |                    |                  |                   |  |
| Range                       | 0~16V   | 0~80V   | 0~16V              | 0~80V              | 0~16V            | 0~80V             |  |
| Resolution                  | 0.25mV  | 1.25mV  | 0.25mV             | 1.25mV             | 0.25mV           | 1.25mV            |  |
| Accuracy                    | 0.025% + 0  | ).025%F.S.                                    | 0.025% + 0         | ).025%F.S.         | 0.025% + 0       | ).025%F.S.        |  |
| Current Read Back           |   |   |                    |                    |                  |                   |  |
| Range                       | 0~4A  | 0~40A   | 0~2A               | 0~20A              | 0~6A             | 0~60A             |  |
| Resolution                  | 0.0625mA  | 0.625mA                                       | 0.03125mA          | 0.3125mA           | 0.09375mA        | 0.9375mA          |  |
| Accuracy                    | 0.05% + 0   | ).05%F.S.                                     | 0.05% + 0          | 0.05%F.S.          | 0.05% + 0        | ).05%F.S.         |  |
| Power Read Back*2           |   |   |                    |                    |                  |                   |  |
| Range                       | 0~20W   | 0~200W  | 0~20W              | 0~100W             | 0~30W            | 0~300W            |  |
| Accuracy                    | 0.1% + 0  |   | 0.1% + 0           |                    | 0.1% + 0         |                   |  |
| Protective Section          |   |   |                    |                    |                  |                   |  |
| Over Power Protection       | Ye  | 25  | Ye                 | 25                 | Ye               | 25                |  |
| Over Current Protection     | Ye  |   | Ye                 |                    | Ye               |                   |  |
| Over Temperature Protection | Ye  |   |                    | 25                 | Ye               |                   |  |
| Over Voltage Alarm*3        | Ye  |   | Ye                 |                    | Ye               |                   |  |
| General                     | Te  |   | Te                 |                    | i ite            |                   |  |
| Short Circuit               |   |   |                    |                    |                  |                   |  |
| Current (CC)                |   | ≒40A  |                    | ≒20A               |                  | ≒60A              |  |
|                             | -   |   | -                  |                    | -                |                   |  |
| /oltage (CV)                | -   | 0V  | -                  | 0V                 | -                | 0V                |  |
| Resistance (CR)             | -   | ≒0.0375Ω                                      | -                  | ≒0.075Ω            | -                | ≒0.025Ω           |  |
| Power (CP)                  | -   | ≒200W   | -                  | ≒100W              | -                | ≒300W             |  |
| nput Resistance             | 100kΩ (   | Typical)                                      | 100kΩ (            | (Typical)          | 100kΩ (          | Typical)          |  |
| Load Off)                   |   |   |                    |                    |                  |                   |  |
| Temperature Coefficient     | 100PPM/°0   |   | 100PPM/°           |                    | 100PPM/°0        |                   |  |
| Power                       | Supply from 6314A Mainframe Supply from 6314A Mainframe |   |                    | Supply from 63     |                  |                   |  |
| Dimensions (HxWxD)          | 172x82x489.5mm  | / 6.8x3.2x19.3inch                            | 172x82x489.5mm     | / 6.8x3.2x19.3inch | 172x82x489.5mm   | / 6.8x3.2x19.3inc |  |
| Weight                      | 4.2 kg /  |   | 4.2 kg /           |                    | 4.2 kg /         |                   |  |
| Operating Range             | 0~4   |   | 0~4                |                    | 0~4              |                   |  |
| operating hange             |   |   |                    |                    |                  |                   |  |

### Model 6310A Series

| SPECIFICATIONS-2  |   |   |  |  |                |  |   |                            |  |  |
|---|---|---|--|--|----------------|--|---|----------------------------|--|--|
| Model   | 631   | 05A   | 631  | 06A  | 6              | 3107A (3   | 0W & 250  | W)                         |  |  |
| Power   | 30W   | 300W  | 60W  | 600W   | 30W            |  | W   | 250W                       |  |  |
| Current   | 0~1A  | 0~10A   | 0~12A  | 0~120A   | 0~5A           |  | ·4A   | 0~40A                      |  |  |
| Voltage*3   |   | 00V   |  | 30V  |                |  | ~80V  |                            |  |  |
| Typical Min. Operation  | 1.0V@0.5A   | 1.0V@5A   | 0.4V@6A  | 0.4V@60A   | 0.4V@2.5A      |  | /@2A  | 0.4V@20A                   |  |  |
| Voltage (DC)*1  | 2.0V@1A   | 2.0V@10A  | 0.8V@12A   | 0.8V@120A  | 0.8V@5A        | 0.8  | /@4A  | 0.8V@40A                   |  |  |
| Constant Current Mod  |   | 0.104   | 0.124  | 0.1204   | 0.54           | 0  | 4.4   | 0 404                      |  |  |
| Range   | 0~1A  | 0~10A   | 0~12A  | 0~120A   | 0~5A           |  | -4A   | 0~40A                      |  |  |
| Resolution  | 0.25mA<br>0.1%+0.1%F.S.   | 2.5mA<br>0.1%+0.2%F.S.  | 3mA<br>0.1%+0.1%F.S.   | 30mA<br>0.1%+0.2%F.S.  | 1.25mA         |  | nA  | 10mA                       |  |  |
| Accuracy<br><b>Constant Resistance N</b>  |   | 0.1%+0.2%F.5.   | 0.1%+0.1%F.S.  | 0.1%+0.1%F.S. 0.1%+0.1%F.S.  |                |  | 0.1%+0.2%F.S.   |                            |  |  |
| constant resistance w   |   | (300W/125V)   | 12.5mΩ~509   | (600W/16V)   | 0.3Ω~1.2kΩ (30 | W/16V/)  | 0.0375 0  | ~150Ω (250W/16V            |  |  |
| Range   |   | (300W/500V)   | 0.625Ω~2.5k  |  | 15Ω~60kΩ (30)  | ,  | 1   | 7.5kΩ (250W/80V)           |  |  |
|   |   | 0W/125V)  |  | 00W/16V)   | 833µS (30W/1   |  |   | μS (250W/16V)              |  |  |
| Resolution*5  | • •   | W/500V)   |  | 00W/80V)   | 16.67µS (30W/  |  | 1   | uS (250W/80V)              |  |  |
|   |   | nS+ 0.2%  | 50Ω:0.4  |  | 1.2kΩ: 0.1S +  |  | ·   | Ω: 0.1S + 0.2%             |  |  |
| Accuracy  | 200kΩ:5   | mS+ 0.1%  | 2.5kΩ:0.0  | )4S + 0.2%   | 60kΩ: 0.01S +  | 0.1%   | 7.5k  | Q: 0.01S + 0.1%            |  |  |
| Constant Voltage Mod  | le  |   |  |  |                |  |   |                            |  |  |
| Range   |   | 00V   | 0~8  | 30V  |                | 0-   | ~80V  |                            |  |  |
| Resolution  | 125   | mV  | 201  | mV   |                | 2  | 0mV   |                            |  |  |
| Accuracy  | 0.05% +   | 0.1%F.S.  | 0.05% +  | 0.1%F.S.   |                | 0.05%  | + 0.1%F.S.  |                            |  |  |
| Constant Power Mode   | •   |   |  |  |                |  |   |                            |  |  |
| Range   | 0~30W   | 0~300W  | 0~60W  | 0~600W   | 0~30W          |  | 30W   | 0~250W                     |  |  |
| Resolution  | 7.5mW   | 75mW  | 15mW   | 150mW  | 7.5mW          | 7.5  | mW  | 62.5mW                     |  |  |
| Accuracy  | 0.5% +  | 0.5%F.S.  | 0.5% + 0   | 0.5%F.S.   |                | 0.5% +   | - 0.5%F.S.  |                            |  |  |
| Dynamic Mode  |   |   |  |  |                |  |   |                            |  |  |
| Dynamic Mode  | C.C. I  | Node  | C.C. N   | Node   |                | C.C.   | Mode  |                            |  |  |
|   | 0.025ms ~ 50  | ms / Res: 5µs   | 0.025ms ~ 50   | )ms / Res: 5µs   | 0.0            | )25ms ~ 5  | 0ms / Res:  | 5µs                        |  |  |
| T1 & T2   | 0.1ms ~ 500r  | ns / Res: 25µs  | 0.1ms ~ 500n   | 0.1ms ~ 500ms / Res: 25µs  |                |  |   |                            |  |  |
|   | 10ms ~ 50s  | / Res: 2.5ms  | 10ms ~ 50s   | 1  | 0ms ~ 50       | s / Res: 2.5   | ms  |                            |  |  |
| Accuracy  | 1µs/1ms-  | +100ppm   | 1µs/1ms-   | +100ppm  |                | 1µs/1m   | s+100ppm  | I                          |  |  |
| Slew Rate   | 0.16~40mA/µs  | 1.6~400mA/µs  | 0.002~0.5A/µs  | 0.02~5A/µs   | 0.8~200mA/µs   | 0.64~16  | 50mA/µs   | 6.4~1600mA/µs              |  |  |
| Resolution  | 0.16mA/µs   | 1.6mA/µs  | 0.002A/µs  | 0.02A/µs   | 0.8mA/µs       | 0.64r  | nA/µs   | 6.4mA/µs                   |  |  |
| Accuracy  | 10% :   | ±20µs   | 10% =  | ±20μs  |                | 10%  | ±20µs   |                            |  |  |
| Min. Rise Time  | 24µs (1   | ypical)   | 10µs (1  | īypical)   |                | 10µs   | (Typical)   |                            |  |  |
| Current   | 0~1A  | 0~10A   | 0~12A  | 0~120A   | 0~5A           | 0~   | -4A   | 0~40A                      |  |  |
| Resolution  | 0.25mA  | 2.5mA   | 3mA  | 30mA   | 1.25mA         | 1r   | mA  | 10mA                       |  |  |
| Accuracy  | 0.4%  | 6F.S.   | 0.4%   | 6F.S.  |                | 0.4  | %F.S.   |                            |  |  |
| Measurement Section   |   |   |  |  |                |  |   |                            |  |  |
| Voltage Read Back   |   |   |  |  |                |  |   |                            |  |  |
| Range   | 0~125V  | 0~500V  | 0~16V  | 0~80V  |                | ~80V   | 0~16\   |                            |  |  |
| Resolution  | 2mV   | 8mV   | 0.25mV   | 1.25mV   | 0.25mV 1       | .25mV  | 0.25m   | V 1.25mV                   |  |  |
| Accuracy  | 0.025% +  | 0.025%F.S.  | 0.025% + 0   | 0.025%F.S.   |                | 0.025% +   | - 0.025%F.S   | 5.                         |  |  |
| Current Read Back   |   |   |  |  |                |  |   |                            |  |  |
| Range   | 0~1A  | 0~10A   | 0~12A  | 0~120A   | 0~5A           |  | -4A   | 0~40A                      |  |  |
| Resolution  | 0.016mA   | 0.16mA  | 0.1875mA   | 1.875mA  | 0.078125mA     |  | 25mA  | 0.625mA                    |  |  |
| Accuracy  | 0.05% +   | 0.05%F.S.   | 0.05% + 0  | 0.05%F.S.  |                | 0.05% +  | - 0.05%F.S.   |                            |  |  |
| Power Read Back*2   |   |   |  |  |                |  |   |                            |  |  |
| Range   | 0~30W   | 0~300W  | 0~60W  | 0~600W   | 0~30W          |  | 30W   | 0~250W                     |  |  |
| Accuracy  | 0.1% +  | 0.1%F.S.  | 0.1%+0   | 0.1%F.S.   |                | 0.1% +   | - 0.1%F.S.  |                            |  |  |
| Protective Section  |   |   |  |  |                |  | Vee   |                            |  |  |
| Over Power Protection   |   | Yes   |  |  | Yes            |  |   |                            |  |  |
|   |   |   | Ye   |  |                |  | Yes   |                            |  |  |
|   |   | es<br>es  | Ye<br>Ye   |  |                |  | Yes   |                            |  |  |
| Over Temperature  | Y   |   |  | es   |                |  | Yes<br>Yes  |                            |  |  |
| Over Temperature<br>Protection  | Yı<br>Yı  | es<br>es  | Ye   | es<br>es   |                |  | Yes   |                            |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3  | Yı<br>Yı  | es  | Ye   | es<br>es   |                |  |   |                            |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br><b>General</b>  | Yı<br>Yı  | es<br>es  | Ye   | es<br>es   |                |  | Yes   |                            |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit  | Yı<br>Yı  | es<br>es<br>es  | Ye   | 25<br>25<br>25   |                |  | Yes   | ± 40A                      |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)  | Yı<br>Yı  | es<br>es<br>≒10A  | Ye   | es<br>es<br>≒ 120A   |                |  | Yes   | ≒40A<br>0V                 |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)<br>Voltage (CV)  | Yi<br>Yi<br>Yi<br>-   | es<br>es<br>≒10A<br>0V  | Ye   | es<br>es<br>≒ 120A<br>oV   |                |  | Yes   | 0V                         |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)   | Yi<br>Yi<br>Yi<br>-   | es<br>es<br>≒10A<br>0V<br>≒1.25Ω  | Ye   | es<br>es<br>≒ 120A<br>0V<br>≒ 0.0125Ω  |                |  | Yes   | 0V<br>≒0.0375Ω             |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)   | -<br>-<br>-<br>-  | es<br>es<br>=s<br>=i0A<br>0V<br>≒1.25Ω<br>≒300W   |  | es<br>es<br>=s<br>=i<br>= 120A<br>0V<br>≒ 0.0125Ω<br>≒ 600W  | -              |  | Yes<br>Yes<br><br>  | 0V                         |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)<br>Input Resistance   | -<br>-<br>-<br>-  | es<br>es<br>≒10A<br>0V<br>≒1.25Ω  |  | es<br>es<br>=s<br>=i<br>= 120A<br>0V<br>≒ 0.0125Ω<br>≒ 600W  | -              |  | Yes   | 0V<br>≒0.0375Ω             |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)   | Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.  | es<br>es<br>=s<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>10A<br>0V<br>⇒<br>1.25Ω<br>≒300W<br>(Typical)  | Υε<br>Υε<br>Υε<br>-<br>-<br>-<br>-<br>100kΩ  | es<br>es<br>⇒<br>120A<br>0V<br>≒ 0.0125Ω<br>≒ 600W<br>(Typical)  | -              | 100kΩ  | Yes<br>Yes<br><br><br><br>  | 0V<br>≒0.0375Ω<br>≒250W    |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br>General<br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient  | Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.Υ.  | es<br>es<br>=s<br>=int 10A<br>0V<br>⇒1.25Ω<br>⇒300W<br>(Typical)<br>C (Typical)   | Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ   | es<br>es<br>=s<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>0V<br>=<br>=<br>0V<br>=<br>=<br>0V<br>=<br>=<br>0V<br>=<br>=<br>0V<br>=<br>=<br>0<br>0V<br>=<br>=<br>000<br>=<br>500<br>000<br>=<br>5000<br>000<br>=<br>5000<br>000 | -              | 100PPM/  | Yes<br>Yes<br>  | 0V<br>≒ 0.0375 Ω<br>≒ 250W |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br><b>General</b><br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient<br>Power  | Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ | es<br>es<br>=s<br>=interim and a set<br>es<br>=interim and a set<br>interim and a se | Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ | es<br>es<br>=s<br>=<br>= 120A<br>0V<br>= 0.0125Ω<br>= 600W<br>(Typical)<br>C (Typical)<br>14A Mainframe  | -<br>-<br>Supp | 100kΩ<br>100PPM/<br>bly from 6                       | Yes<br>Yes<br>  | 0V<br>⇒ 0.0375Ω<br>⇒ 250W  |  |  |
| Over Current Protection<br>Over Temperature<br>Protection<br>Over Voltage Alarm*3<br><b>General</b><br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient<br>Power<br>Dimensions (HxWxD) | Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ | es<br>es<br>=s<br>=interim = 10A<br>0V<br>⇒1.25Ω<br>⇒300W<br>(Typical)<br>C (Typical)<br>14A Mainframe<br>/ 6.8x3.2x19.3inch  | Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ      | es<br>es<br>=s<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=   | -<br>-<br>Supp | 100k Ω<br>100PPM/<br>Jy from 6<br>«489.5mn           | Yes<br>Yes<br>-<br>-<br>-<br>-<br>(Typical)<br>(*C (Typical)<br>314A Mair<br>n / 6.8x3.22 | 0V<br>⇒ 0.0375Ω<br>⇒ 250W  |  |  |
| Over Temperature<br>Protection<br>Over Voltage Alarm*3<br><b>General</b><br>Short Circuit<br>Current (CC)<br>Voltage (CV)<br>Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient<br>Power  | Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ.<br>Υ             | es<br>es<br>=s<br>=interim and a set<br>es<br>=interim and a set<br>interim and a se | Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ<br>Υ                     | es<br>es<br>=s<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=<br>=   | -<br>-<br>Supp | 100k Ω<br>100PPM/<br>Jy from 6<br>κ489.5mn<br>4.5 kg | Yes<br>Yes<br>  | 0V<br>⇒ 0.0375Ω<br>⇒ 250W  |  |  |

Video & Color

Flat Panel Display

Optical Devices

PhotovoltaicTest Automated & Automation Optical Inspection

Battery Test & Automation

Passive Component

Electrical

Semiconductor/

PXI Test & Measurement

General Manufacturing T Purpose Execution System

Turnkey Test & Automation

### Model 6310A Series

| SPECIFICATIONS-3                    | 621             | 08A            | 631             | 124               | 631            | 230             |
|-------------------------------------|-----------------|----------------|-----------------|-------------------|----------------|-----------------|
|                                     |                 |                |                 |                   |                |                 |
| ower                                | 60W             | 600W           | 120W            | 1200W             | 350            |                 |
| urrent                              | 0~2A            | 0~20A          | 0~24A           | 0~240A            | 0~7A           | 0~70A           |
| oltage*3                            |                 | V00V           | 0~8             |                   | 0~1            |                 |
| pical Min. Operation Voltage        | 1.0V@1A         | 1.0V@10A       | 0.4V@12A        | 0.4V@120A         | 0.05V@3.5A     | 0.3V@35A        |
| DC)*1                               | 2.0V@2A         | 2.0V@20A       | 0.8V@24A        | 0.8V@240A         | 0.1V@7A        | 0.6V@70A        |
| onstant Current Mode                |                 |                | -               | -                 | -              |                 |
| ange                                | 0~2A            | 0~20A          | 0~24A           | 0~240A            | 0~7A           | 0~70A           |
|                                     |                 |                |                 |                   |                |                 |
| esolution                           | 0.5mA           | 5mA            | 6mA             | 60mA              | 0.125mA        | 1.25mA          |
| ccuracy                             | 0.1%+0.1%F.S.   | 0.1%+0.2%F.S.  | 0.1%+0.1%F.S.   | 0.1%+0.2%F.S.     | 0.1%+0.1%F.S.  | 0.1%+0.1%F.S    |
| onstant Resistance Mode             |                 |                |                 |                   |                |                 |
|                                     | 0.625Ω~2.5k     | 2 (600W/125V)  | 6.25mΩ~25Ω      | (1200W/16V)       | 0.015Ω~150Ω    | (350W/24V)*4    |
| ange                                |                 | (600W/500V)    | 0.3125Ω~1.25k   |                   | 2Ω~2kΩ (3      |                 |
|                                     |                 | 0W/125V)       | 40mS (12)       | · · · · ·         | 1.33mS (35     | ,               |
| esolution*5                         |                 |                |                 |                   |                |                 |
|                                     |                 | 0W/500V)       | 800µS (12       |                   | 10µS (350      |                 |
| ccuracy/                            | 2.5kΩ:50        | mS + 0.2%      | <b>25</b> Ω:0.8 | S + 0.8%          | 150Ω:67r       | nS + 0.1%       |
| ccuracy                             | 100kΩ:5         | mS + 0.1%      | 1.25kΩ:0.0      | 08S + 0.2%        | 2kΩ:5m         | S + 0.2%        |
| onstant Voltage Mode                |                 |                |                 |                   | ·              |                 |
| ange                                | 05              | 00V            | 0~8             | 80V               | 0~1            | 20\/            |
| esolution                           |                 |                |                 |                   |                |                 |
|                                     |                 | SmV            |                 |                   | 2n             |                 |
| curacy                              | 0.05% +         | 0.1%F.S.       | 0.05% +         | 0.1%F.S.          | 0.05% +        | 0.1%F.S.        |
| onstant Power Mode                  |                 |                |                 |                   |                |                 |
| ange                                | 0~60W           | 0~600W         | 0~120W          | 0~1200W           | 0~35W          | 0~350W          |
| esolution                           | 15mW            | 150mW          | 30mW            | 300mW             | 2.5mW          | 25mW            |
| ccuracy                             |                 | 0.5%F.S.       | 0.5% + 0        |                   | 0.5% + 0       |                 |
|                                     | 0.5%+           | 0.0701.0.      | 0.5%+0          | 0.5/01.5.         | 0.5%+0         |                 |
| ynamic Mode                         |                 |                |                 |                   |                | 1005            |
| ynamic Mode                         |                 | Node           | C.C. N          |                   | C.C. N         |                 |
|                                     | 0.025ms ~ 50    | )ms / Res: 5µs | 0.025ms ~ 50    | ims / Res: 5µs    | 0.025ms~50     | ms/Res: 5µs     |
| 1 & T2                              | 0.1ms ~ 500r    | ns / Res: 25µs | 0.1ms ~ 500n    | ns / Res: 25µs    | 0.1ms~500n     | ns / Res: 25µs  |
|                                     |                 | / Res: 2.5ms   | 10ms ~ 50s      | / Rest 2 5ms      | 10ms~50s       | •               |
| CCU K2 C) /                         |                 |                |                 |                   |                |                 |
| ccuracy                             |                 | +100ppm        | 1µs/1ms-        |                   | 1μs /1ms-      |                 |
| ew Rate                             | 0.32~80mA/µs    | 3.2~800mA/µs   | 0.004~1A/µs     | 0.04~10A/µs       | 0.001~0.25A/µs | 0.01~2.5A/μ     |
| esolution                           | 0.32mA/µs       | 3.2mA/µs       | 0.004A/µs       | 0.04A/µs          | 0.001A/µs      | 0.01A/µs        |
| ccuracy                             | 10% :           | ±20μs          | 10% =           | ±20µs             | 10% ±          | ±20μs           |
| lin. Rise Time                      | 24us (          | Typical)       | 10µs (1         | vpical)           | 25µs (Ty       | pical) *6       |
| urrent                              | 0~2A            | 0~20A          | 0~24A           | 0~240A            | 0~7A           | 0~70A           |
| esolution                           | 0.5mA           | 5mA            | 6mA             | 60mA              | 0.125mA        | 1.25mA          |
|                                     |                 |                |                 |                   |                |                 |
| Accuracy                            | 0.43            | %F.S.          | 0.4%            | 0Г.Э.             | 0.1%           | ) г.э.          |
| leasurement Section                 |                 |                |                 |                   |                |                 |
| oltage Read Back                    |                 |                |                 |                   |                |                 |
| ange                                | 0~125V          | 0~500V         | 0~16V           | 0~80V             | 0~24V          | 0~120V          |
| esolution                           | 2mV             | 8mV            | 0.25mV          | 1.25mV            | 0.4mV          | 2mV             |
| ccuracy                             |                 | 0.025%F.S.     | 0.025% + 0      |                   | 0.025%+0       |                 |
| urrent Read Back                    | 0.025701        |                | 0.0237011       |                   | 0.0237010      |                 |
|                                     | 0.24            | 0.204          | 0.244           | 0.2404            | 0.74           | 0 704           |
| ange                                | 0~2A            | 0~20A          | 0~24A           | 0~240A            | 0~7A           | 0~70A           |
| esolution                           | 0.03125mA       | 0.3125mA       | 0.375mA         | 3.75mA            | 0.125mA        | 1.25mA          |
| ccuracy                             | 0.05% +         | 0.05%F.S.      | 0.075% + 0      | 0.075%F.S.        | 0.04%+0        | .04% F.S.       |
| ower Read Back*2                    |                 |                |                 |                   |                |                 |
| ange                                | 0~60W           | 0~600W         | 0~120W          | 0~1200W           | 0~35W          | 0~350W          |
| ccuracy                             |                 | 0.1%F.S.       | 0.1%+0          |                   | 0.1%+0         |                 |
| · · ·                               | 0.170+          | 0.1701.5.      | 0.1% + 0        | 0.1/01.3.         | 0.1%+0         | . , /01.3.      |
| rotective Section                   | 1               |                |                 |                   |                |                 |
| ver Power Protection                |                 | es             | Ye              |                   | Ye             |                 |
| ver Current Protection              | Y               | es             | Ye              | es                | Ye             | 25              |
| ver Temperature                     |                 |                |                 |                   |                |                 |
| rotection                           | Y               | es             | Ye              | es                | Ye             | es              |
|                                     |                 |                |                 |                   | .,             |                 |
| ver Voltage Alarm*3                 | Y               | es             | Ye              | 25                | Ye             | 25              |
| eneral                              |                 |                |                 |                   |                |                 |
| nort Circuit                        |                 |                |                 |                   |                |                 |
| urrent (CC)                         | -               | ≒20A           | -               | ≒240A             | -              | ≒70A            |
| oltage (CV)                         | -               | 0V             | _               | 0V                | -              | 0V              |
| esistance (CR)                      |                 | ≒0.625Ω        |                 | ≒0.00625Ω         |                | ÷ 0.01 Ω        |
|                                     | -               |                | -               |                   | -              |                 |
| ower (CP)                           | -               | ≒600W          | -               | ≒1200W            | -              | ≒350W           |
| put Resistance (Load Off)           |                 | (Typical)      | 100kΩ           |                   | 800kΩ(         |                 |
| mperature Coefficient               | 100PPM/°        | C (Typical)    | 100PPM/°        | C (Typical)       | 100PPM/°0      | C (Typical)     |
| •                                   |                 | 14A Mainframe  | Supply from 63  |                   | Supply from 63 |                 |
| ower                                |                 |                |                 | 6.8x12.9x19.5inch | 172x82x489.5mm |                 |
|                                     | 177v16/v/00 Emm |                |                 | 110017 7817 70000 |                | 1 0.01.21 9.010 |
| imensions (HxWxD)                   | 172x164x489.5mm |                |                 |                   |                |                 |
| ower<br>imensions (HxWxD)<br>/eight | 7.3 kg /        | 16.1 lbs       | 14 kg /         | 30.8 lbs          | 4.2kg /        | 9.3 lbs         |
| imensions (HxWxD)                   | 7.3 kg /        |                |                 | 30.8 lbs          |                | 9.3 lbs         |

NOTE\*1 : Low voltage operation, under 0.8 volt, is possible at correspondingly reduced current level. Operating temperature range is 0°C to 40°C. All specifications apply for 25°C±5°C, except as noted NOTE\*2 : Power F.S. = Vrange F.S. x Irange F.S. NOTE\*3 : When the operating voltage exceeds the rated voltage for 1.02 times, a warning will occur and if it exceeds 1.1 times of the rated voltage,

it would cause permanent damage to the device.

NOTE\*4 : Please refer to user's manual for detail specifications. NOTE\*5 : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm. NOTE\*6 : The loading current should be 0.35A at least.

### Model 63110A/63113A/63115A



#### **KEY FEATURES**

- Unique LED mode for LED power driver test
- Programmable LED dynamic resistance (R<sub>d</sub>)
- Programmable internal resistance (Rr) for simulating LED ripple current
- Fast response for PWM dimming test
- Up to eight channels in one mainframe
- If the end of the en
- measurement with dual-range
- Full Protection: OC, OP, OT protection and OV alarm

As a constant current source, the LED power driver has an output voltage range with a constant output current. LED power drivers are usually tested in one of the following ways :

1. With LEDs

2. Using resistors for loading

3. Using Electronic Loads in Constant Resistance (CR) mode, or Constant Voltage (CV) mode

However, all these testing methods, each of them has their own disadvantages.

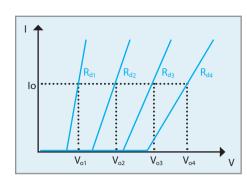
As shown on the V-I curve in Figure 1, the LED has a forward voltage V<sub>F</sub> and a dynamic resistance (Rd). When using a resistor as loading, the V-I curve of the resistor is not able to simulate the V-I curve of the LED as shown on Figure 1. This may cause the LED power driver to not start up due to the difference in V-I characteristic between the resistors and the LEDs. When using Electronic Loads, the CR and CV mode settings are set for when the LED is under stable operation and therefore, is unable to simulate turn on or PWM brightness control characteristics. This may cause the LED power driver to function improperly or trigger it's protection circuits. These testing requirements can be achieved when using a LEDs as a load; however, issues regarding the LED aging as well as different LED power drivers may require different types of LEDs or a number of LEDs. This makes it inconvenient for mass production testing.



63113A/63115A

Chroma has created the industries first LED Load Simulator for simulating LED loading with our 63110A/63113A/63115A load model from our 6310A series Electronic Loads. By setting the LED power driver's output voltage, and current, the Electronic Load can simulate the LED's loading characteristics. The LED's forward voltage and operating resistance can also be set to further adjust the loading current and ripple current to better simulate LED characteristics. The 63110A design also has increased bandwidth to allow for PWM dimming testing.

Figure 2 shows the dimming current waveform of the LED. Figure 3 shows the dimming current waveform when using 63110A as a load.The 6314A holds up to four 63110A load modules, which will result in an 8-channel 100W/channel load with standard front-panel inputs. This makes it ideal for testing single output and multiple output LED driver. Additionally, the GO/NG output port is useful for UUT's pass/fail testing on an automated production line. All modules on the 6314A/6312A mainframe share a common GPIB address to synchronize and speed up the control of the load modules and the read-back of data.





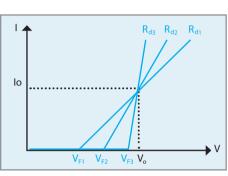


Figure 5 - Simulate different characteristic of LEDs

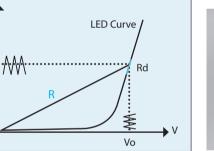
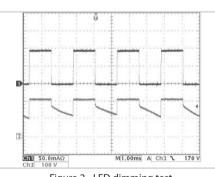


Figure 1 LED V-I Characteristics

lo



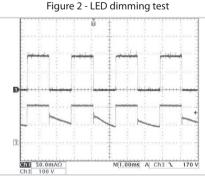


Figure 3 - 63110A dimming test



6312A: 2 in 1 Mainframe



6314A: 4 in 1 Mainframe

Compone

Passive

Semiconductor/

PXI Test &

### Model 63110A/63113A/63115A

| SPECIFICATIONS   | (2440)                              | (100)//2)  |  | 12.4  |  | 100   |
|--|-------------------------------------|--|--|---|--|---|
| Model  |                                     | (100Wx2)   | 631  |   | 631  |   |
| Power  |                                     | WOO  | 300  |   |  | OW  |
| Current  | 0~0.6A                              | 0~2A   | 0~5A   | 0~20A   | 0~5A   | 0~20A   |
| Voltage *1   | 0~.                                 | 500V   | 0~3  | V00   | 0~6  | V00V  |
| Min. Operating Voltage   | 6V                                  | @2A  | 4V@  | 20A   | 4V@  | 20A   |
| Constant Current Mode  |                                     |  |  |   |  |   |
| Range  | 0~0.6A                              | 0~2A   | 0~5A   | 0~20A   | 0~5A   | 0~20A   |
| Resolution   | 12µA                                | 40µA   | 100µA  | 400µA   | 100µA  | 400µA   |
| Accuracy   | 0.1%+                               | 0.1% F.S.  | 0.1%+0.1% F.S.   | 0.1%+0.2% F.S.  | 0.1%+0.1% F.S.   | 0.1%+0.2% F.S.  |
| <b>Constant Resistance Mo</b>  | de                                  |  | ·  |   |  |   |
| Range  |                                     | Ω (100W/100V)<br>kΩ (100W/500V)  | CRL @ CH : 0.2 Ω ~<br>CRL @ CL : 0.8 Ω ~<br>CRH @ CL : 4 Ω ~ 4                                   | 800Ω (300W/60V)<br>kΩ (300W/300V)   | CRL @ CL : 0.8 Ω ~{<br>CRH @ CL : 8 Ω ~8   | kΩ (300W/600V)  |
| Resolution*2   | CRH :                               | 62.5μS<br>6.25μS   | CRL @ CH<br>CRL @ C<br>CRH @ C   | L:25µS  | CRL @ C<br>CRL @ C<br>CRH @ C  | •   |
| Accuracy   |                                     | mS+0.2%<br>ImS+0.1%  | 0.2% (settir   | ig + range)   | 0.2% (settir   | ng + range)   |
| Constant Voltage Mode  |                                     |  |  |   |  |   |
| Range  |                                     | 500V   | 0~3  | 001/  | 0~6  | 00\/  |
| Resolution   |                                     | )mV  | 6n   |   |  | mV  |
| Accuracy   |                                     | + 0.1%F.S.   | 0.05% +  |   |  |   |
| LED Mode   | 0.03 %                              | F 0.1 %01.5.   | 0.03 % +   | 0.1 701.3.  | 0.05% + 0.1%F.S.   |   |
| LED Mode   |                                     |  | Operating Voltage  | 0 (0)//0 200)/  | Operating Voltage  | 0 (0)//0 (00)/  |
| Range  | Rd Coefficie<br>V⊧: 0~100<br>Currer | ie: 0~100V/0~500V<br>ent : 0.001~1<br>0V/0~500V<br>ht : 0~2A<br>Ω/10 Ω~10k Ω | R₄ Coefficien<br>VF: 0~60\<br>LEDL @ CH: 0~60V- 0~<br>LEDL @ CL: 0~60V- 0~<br>LEDH @ CL: 0~300V- | //0~300V<br>20A (Rd: 0.05 Ω ~50 Ω )<br>√5A (Rd: 0.8 Ω ~800 Ω )                        | R₄ Coefficie<br>VF: 0~60V<br>LEDL @ CH: 0~60V- 0~<br>LEDL @ CL: 0~60V- 0⁄<br>LEDH @ CL: 0~60V- | //0~600V<br>·20A (Rd: 0.05 Ω ~50 Ω<br>~5A (Rd: 0.8 Ω ~800 Ω                               |
| Resolution *2  | lo:0<br>Rd Coeffic<br>Rd:62.5       | νV/20mV<br>D.1mA<br>:ient : 0.001<br>μS/6.25μS<br>νV/20mV                    | Vo : 1.2r<br>lo : 100µ<br>R₀ Coeffici<br>R₀ : 400µS /<br>V₣ : 1.2rr                              | Α/400μΑ<br>ent : 0.001<br>25μS / 5μS  | Vo : 1.2rr<br>Io : 100µ<br>R₀ Coeffici<br>R₀ : 400µS/<br>V₅ : 6m\                              | A/400μA<br>ent : 0.001<br>25μS/2.5μS  |
| Dynamic Mode   |                                     |  |  |   |  |   |
| Dynamic Mode   |                                     |  | C.C. M   | Node  | C.C. I   | Node  |
| T1 & T2  |                                     |  | 0.025ms ~ 50<br>0.1ms ~ 500n<br>10ms ~ 50s   | ns / Res: 25µs  | 0.025ms ~ 50<br>0.1ms ~ 500n<br>10ms ~ 50s   | •   |
|  |                                     |  | 1µs/1ms-   | -100ppm   | 1µs/1ms-   | +100ppm   |
| Accuracy   |                                     |  |  |   |  |   |
|  |                                     |  | 0.8~200mA/µs   | 3.2~800mA/µs  | 0.8~200mA/µs   | 3.2~800mA/µs  |
| Slew Rate  |                                     |  | 0.8~200mA/µs<br>0.8mA/µs   | 3.2~800mA/μs<br>3.2mA/μs  | 0.8~200mA/μs<br>0.8mA/μs   | 3.2~800mA/µs<br>3.2mA/µs  |
| Slew Rate  |                                     |  | · · · · ·  | 3.2mA/µs  |  | 3.2mA/µs  |
| Slew Rate<br>Resolution  |                                     |  | 0.8mA/μs<br>10% ±  | 3.2mA/µs<br>20µs  | 0.8mA/µs   | 3.2mA/μs<br>±20μs   |
| Slew Rate<br>Resolution<br>Accuracy<br>Min. Rise Time  |                                     |  | 0.8mA/µs<br>10% ±<br>25µs (T   | 3.2mA/µs<br>20µs  | 0.8mA/µs<br>10% =<br>25µs (T   | 3.2mA/µs<br>±20µs<br>Typical)   |
| Slew Rate<br>Resolution<br>Accuracy<br>Min. Rise Time<br>Current   |                                     |  | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A   | 3.2mA/μs<br>20μs<br>ypical)<br>0~20A  | 0.8mA/μs<br>10% =<br>25μs (T<br>0~5A   | 3.2mA/µs<br>±20µs<br>[ypical]<br>0~20A  |
| Slew Rate Resolution Accuracy Min. Rise Time Current Resolution Resolution   |                                     |  | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA  | 3.2mA/μs<br>20μs<br>ypical)<br>0~20A<br>400μA   | 0.8mA/μs<br>10% =<br>25μs (Τ<br>0~5A<br>100μA  | 3.2mA/µs<br>±20µs<br>[ypical]<br>0~20A<br>400µA   |
| Slew Rate Resolution Accuracy Min. Rise Time Current Resolution Accuracy Measurement Section Voltage Read Back   |                                     |  | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%  | 3.2mA/μs<br>20μs<br>ypical)<br>0~20A<br>400μA<br>sF.S.                                | 0.8mA/μs<br>10% =<br>25μs (1<br>0~5A<br>100μA<br>0.49  | 3.2mA/µs<br>±20µs<br>Typical)<br>0~20A<br>400µA<br>%F.S.                                  |
| Slew Rate Resolution Accuracy Min. Rise Time Current Resolution Accuracy Min. Rise Time Current Resolution Accuracy Measurement Section Voltage Read Back Range Note Contemponent Section Reade Contemponent Reade Contemponent Section Reade Contemponent Reade Cont | 0~100V                              | <br><br><br><br><br><br>0~500V   | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%  | 3.2mA/µs<br>20µs<br>ypical)<br>0~20A<br>400µA<br>5F.S.<br>0~300V                      | 0.8mA/μs<br>10% =<br>25μs (1<br>0~5A<br>100μA<br>0.49<br>0~60V                                 | 3.2mA/µs<br>±20µs<br>Typical)<br>0~20A<br>400µA<br>6F.S.<br>0~600V                        |
| Slew Rate Resolution Accuracy Min. Rise Time Current Resolution Accuracy Min. Rise Time Current Resolution Accuracy Measurement Section Voltage Read Back Range Resolution Resolution Control  | 0~100V<br>2mV                       | <br><br><br><br><br>0~500V<br>10mV   | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%  | 3.2mA/μs<br>20μs<br>ypical)<br>0~20A<br>400μA<br>sF.S.                                | 0.8mA/μs<br>10% =<br>25μs (1<br>0~5A<br>100μA<br>0.49<br>0~60V<br>1.2mV                        | 3.2mA/µs<br>±20µs<br>Typical)<br>0~20A<br>400µA<br>6F.S.<br>0~600V<br>12mV                |
| Slew Rate Resolution Accuracy Min. Rise Time Current Resolution Accuracy Min. Rise Time Current Resolution Accuracy Measurement Section Voltage Read Back Range Resolution Resolution Control  | 0~100V<br>2mV                       | <br><br><br><br><br><br>0~500V   | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%  | 3.2mA/µs<br>20µs<br>ypical)<br>0~20A<br>400µA<br>sF.S.<br>0~300V<br>6mV               | 0.8mA/μs<br>10% =<br>25μs (1<br>0~5A<br>100μA<br>0.49<br>0~60V                                 | 3.2mA/µs<br>±20µs<br>Typical)<br>0~20A<br>400µA<br>6F.S.<br>0~600V<br>12mV                |
| Slew Rate Resolution Accuracy Min. Rise Time Current Resolution Accuracy Min. Rise Time Current Resolution Accuracy Measurement Section Voltage Read Back Range Resolution Accuracy Nature Contect Con | 0~100V<br>2mV                       | <br><br><br><br><br>0~500V<br>10mV   | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%<br>0~60V<br>1.2mV                          | 3.2mA/µs<br>20µs<br>ypical)<br>0~20A<br>400µA<br>sF.S.<br>0~300V<br>6mV               | 0.8mA/μs<br>10% =<br>25μs (1<br>0~5A<br>100μA<br>0.49<br>0~60V<br>1.2mV                        | 3.2mA/μs<br>±20μs<br>Typical)<br>0~20A<br>400μA<br>6F.S.<br>0~600V<br>12mV                |
| Min. Rise Time         Current         Resolution         Accuracy         Measurement Section         Voltage Read Back         Range         Resolution         Accuracy         Current Read Back   | 0~100V<br>2mV                       | <br><br><br><br><br>0~500V<br>10mV   | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%<br>0~60V<br>1.2mV                          | 3.2mA/µs<br>20µs<br>ypical)<br>0~20A<br>400µA<br>sF.S.<br>0~300V<br>6mV<br>.025% F.S. | 0.8mA/μs<br>10% =<br>25μs (1<br>0~5A<br>100μA<br>0.49<br>0~60V<br>1.2mV                        | 3.2mA/µs<br>±20µs<br>Typical)<br>0~20A<br>400µA<br>6F.S.<br>0~600V<br>12mV                |
| Slew Rate     Resolution       Resolution     Accuracy       Min. Rise Time     Current       Resolution     Accuracy       Measurement Section     Voltage Read Back       Range     Resolution       Resolution     Accuracy   | 0~100V<br>2mV<br>0.025%+            | <br><br><br><br><br><br>0~500V<br>10mV<br>0.025% F.S.                        | 0.8mA/μs<br>10% ±<br>25μs (T<br>0~5A<br>100μA<br>0.4%<br>0~60V<br>1.2mV<br>0.025%+0              | 3.2mA/µs<br>20µs<br>ypical)<br>0~20A<br>400µA<br>sF.S.<br>0~300V<br>6mV               | 0.8mA/µs<br>10% =<br>25µs (1<br>0~5A<br>100µA<br>0.49<br>0~60V<br>1.2mV<br>0.025%+0            | 3.2mA/µs<br>±20µs<br>Typical)<br>0~20A<br>400µA<br>6F.S.<br>0~600V<br>12mV<br>0.025% F.S. |

NOTE\*1 : If the operating voltage exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device.

**NOTE\*2**: S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

### Model 63200A Series



#### Ultra High Power Density 6kW@4U Voltage 0.015%+0.015%F.S. Current 0.04%+0.4%F.S.

#### **KEY FEATURES**

- Rated power up to 240kW: 4kW, 5kW, 6kW, 24kW
- Voltage range: 150V, 600V, 1200V
- Current range: 2,000A max. per unit
- CC, CR, CV & CP operation modes
- CR+CC, CR+CV, CC+CV complex modes
- Up to 10 units master/slave parallel control
   Dynamic synchronous control in static and dynamic loads
- User defined waveform (UDW)
- CZ mode for turn on capacitive load simulation
- External loading current simulation
- Auto frequency sweep up to 50kHz
- Real time power supply load transient response simulation & Vpk+/- measurement
- User programmable 250 sequential front panel input status
- Ultra high precision voltage & current measurement
- Precision high speed digitizing measurement/data capture
- Voltage, current & Pmax measurement for OCP/OLP tesing
- Timing & discharging measurement for batteries
- Instant overpower loading
- Short circuit simulation
- Smart fan control
- Full protection: OC (adjustable), OT, OP
- (adjustable) protection & OV warning
- Standard USB, optional Ethernet & GPIB interfaces

The 63200A series high power DC electronic loads are designed for testing a wide range of power conversion products including AC/DC and server power supplies, DC/DC converters, EV batteries, automotive charging stations, and other power electronics components.

The 63200A series have three operating voltage choices, 150V, 600V & 1,200V, with models covering power levels from 4kW to 24kW and up to 2,000A in a single unit.

The DC loads have unique user defined waveform (UDW) capability and external analog modulating input for simulating real-world, custom waveforms. Another distinct feature is the dynamic auto-frequency sweep function, which enables detecting a UUTs worst case output deviation across a wide range of current frequencies.

As each model of the 63200A series has 3 power ranges, they can precisely measure the voltage and current in real time. Since short circuit testing is one of the essential power testing items, the 63200A series provides short circuit simulation to effectively solve the application demands for power and automated testing. With the vacuum florescent

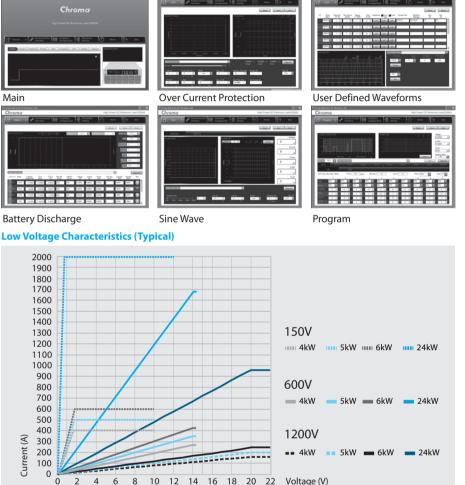


display (VFD) and rotary knob, the 63200A series loads offer versatile front panel operation. Users are able to control the 63200A family remotely via standard USB or optional Ethernet and GPID interfaces. The embedded PWM fan speed control reduces noise caused by fans.



Flippable Front Panel for 7U/10U/13U models

Softpanel



#### 訂購資訊

63204A-150-400: High Power DC Electronic Load 150V / 400A/ 4kW 63205A-150-500 : High Power DC Electronic Load 150V / 500A / 5kW 63206A-150-600: High Power DC Electronic Load 150V / 600A / 6kW 63224A-150-2000 : High Power DC Electronic Load 150V / 2000A / 24kW 63204A-600-280: High Power DC Electronic Load 600V / 280A / 4kW 63205A-600-350 : High Power DC Electronic Load 600V / 350A / 5kW 63206A-600-420: High Power DC Electronic Load 600V / 420A / 6kW 63224A-600-1680 : High Power DC Electronic Load 600V / 1680A / 24kW 63204A-1200-160: High Power DC Electronic Load 1,200V / 160A / 4kW 63205A-1200-200 : High Power DC Electronic Load 1,200V / 200A / 5kW 63206A-1200-240 : High Power DC Electronic Load 1,200V / 240A / 6kW 63224A-1200-960 : High Power DC Electronic Load 1,200V / 960A / 24kW A600009: GPIB cable (200cm) A600010: GPIB cable (60cm) A632000 : Softpanel for 63200A Series A632006 : NI USB-6211 Bus-Powered Multifunction DAQ A636000 : GPIB interface A636009 : Ethernet & USB interfaces

Test &

### Model 63200A Series

**User Defined Waveforms** 

|--|--|

| SPECIFICATIONS-1                       |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
|--|-----------|--------------------------------|-------------|----------------|------------------------------|---------------|----------------|---------------------------|----------------------|-----------|-------------------------------|------------|
| Model                                  | 632       | 204A-150-4                     | 100         | 63             | 205A-150-                    | 500           | 63             | 206A-150-                 | 600                  | 632       | 24A-150-2                     | 000        |
| Voltage*2                              |           | 0~150V                         |             |                | 0~150V                       |               |                | 0~150V                    |                      |           | 0~150V                        |            |
| Current                                |           | 0~400A                         |             |                | 0~500A                       |               |                | 0~600A                    |                      |           | 0~2,000A                      |            |
| Power*3                                |           | 0~4.000W                       |             |                | 0~5,000W                     |               |                | 0~6,000W                  |                      |           | 0~24,000W                     | 1          |
| Static mode                            |           | .,                             |             | <u> </u>       | 0 0,00011                    |               |                | 0 0,00011                 |                      | 1         |                               |            |
|  |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
| Min. voltage                           | 0.18V     | 0.9V                           | 1.8V        | 0.15           | 0.75V                        | 1.5V          | 0.18V          | 0.9V                      | 1.8V                 | 0.18V     | 0.9V                          | 1.8V       |
| @ full current                         | @40A      | @200A                          | @400A       | @50A           | @250A                        | @500A         | @60A           | @300A                     | @600A                | @200A     | @1,000A                       | @2,000A    |
|  |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
| Constant current mode                  |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
| Range                                  | 40A       | 200A                           | 400A        | 50A            | 250A                         | 500A          | 60A            | 300A                      | 600A                 | 200A      | 1,000A                        | 2,000A     |
| Accuracy*4                             | 0.0       | 05%+0.05%                      | F.S.        | 0.0            | 5%+0.05%                     | F.S.          | 0.0            | )5%+0.05%                 | F.S.                 | 0.0       | 05%+0.05%                     | F.S.       |
| Constant resistance mode               |           |                                |             |                |                              |               |                |                           |                      |           |                               | (1.11.0)   |
| Denera                                 |           | 75Ω~75Ω(                       | · · ·       |                | 5Ω~50Ω(                      | . ,           |                | 5Ω~50Ω(                   | . ,                  |           | 3Ω~12.5Ω                      | · /        |
| Range                                  |           | Ω~300Ω(<br>2~1,500Ω(           | ,           |                | Ω~200Ω (<br>~1,000Ω (        | . ,           |                | Ω~200Ω (<br>~1,000Ω (     | . ,                  |           | 5Ω~50Ω (<br>Ω~250Ω (          | · ·        |
| Accuracy                               |           | et*(0.2%)+0.                   |             |                | et*(0.2%)+0                  |               |                | et*(0.2%)+0               |                      |           | et*(0.2%)+0                   |            |
| Constant voltage mode                  | VIII/113C | (0.270)10.                     | Z /0 II .J. | VIII/1/3C      | (0.2/0)10                    | .2 /0 11 .3.  | VIII/113C      | (0.2/0)10                 | .2 /0 11 .3.         | VIII/113C | t (0.270)10                   | .270 11.5. |
| Range                                  | 16V       | 80V                            | 150V        | 16V            | 80V                          | 150V          | 16V            | 80V                       | 150V                 | 16V       | 80V                           | 150V       |
| Accuracy                               | -         | 25%+0.025%                     |             |                | 5%+0.025%                    |               | -              | 25%+0.0259                |                      | -         | 25%+0.0259                    |            |
| Constant power mode                    | 0.02      | 57010.0257                     |             | 0.02           |                              |               | 0.02           |                           |                      | 0.02      |                               |            |
| Range                                  | 400W      | 2,000W                         | 4,000W      | 500W           | 2,500W                       | 5,000W        | 600W           | 3,000W                    | 6,000W               | 2,400W    | 12,000W                       | 24,000W    |
| Accuracy *5                            |           | ,00000<br>.2%+0.2%F.           |             |                | ,2%+0.2%F.                   |               |                | .2%+0.2%F                 |                      |           | .2%+0.2%F                     |            |
| Constant impedance mode                | 0         | .2 /01 0.2 /01.                | 5.          | 0              | .2 /01 0.2 /01               |               | 0              | .2 /01 0.2 /01            |                      | 0         | .2 /01 0.2 /01                |            |
| Range                                  |           |                                |             |                | -50 000uE ·                  | R∟: as CR ; L | s• 0 1uH-16    | uH · Rs· 30r              | $n\Omega - 20\Omega$ |           |                               |            |
| CC+CV                                  |           |                                |             | CL. 50µ1       | , , ,                        | er to CC & C  |                |                           | 1132 2032            |           |                               |            |
| CR+CV                                  |           |                                |             |                |                              | er to CR & C  |                |                           |                      |           |                               |            |
| CR+CC                                  |           |                                |             |                |                              | er to CR & C  |                |                           |                      |           |                               |            |
| Dynamic mode                           |           |                                |             |                |                              |               | e speenreut    |                           |                      |           |                               |            |
|  | 0.0       | 20~99.999r                     | ns/         | 0.0            | 20~99.999                    | ms/           | 0.0            | 20~99.999                 | ms/                  | 0.0       | 20~99.999                     | ms/        |
| T1 & T2                                |           | )ms~99,999                     |             |                | )ms~99,999                   |               |                | )ms~99,99                 |                      |           | )ms~99,999                    |            |
| Accuracy                               | 1         | μs+100ppr                      | n           | 1              | μs+100ppr                    | n             | 1              | μs+100ppi                 | n                    | 1         | μs+100ppr                     | n          |
|  | 0.4       | mA/µs~4A                       | /µs         | 0.5mA/µs~5A/µs |                              |               | 0.5mA/µs~6A/µs |                           |                      | 2n        | nA/µs~20A                     | /µs        |
| Slew rate                              |           | nA/µs~20A/                     | •           | 2mA/µs~25A/µs  |                              |               |                | nA/µs~30A                 |                      |           | nA/µs~100/                    |            |
|  |           | nA/µs~40A/                     | •           | 5mA/µs~50A/µs  |                              |               | 5mA/µs~60A/µs  |                           |                      |           | nA/µs~200/                    | · ·        |
| Accuracy                               |           | 5% ± 10µs                      |             | 5% ± 10μs      |                              |               |                | 5% ± 10µs                 |                      |           | 5% ± 10µs                     |            |
| Min. rise time *6                      | 1         | 0μs (Typica                    | l)          | 1              | 0μs (Typica                  | al)           | 1              | 0μs (Typica               | al)                  | 1         | 0μs (Typica                   | l)         |
| Measurement                            |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
| Voltage read back                      |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
| Range                                  | 16V       | 80V                            | 150V        | 16V            | 80V                          | 150V          | 16V            | 80V                       | 150V                 | 16V       | 80V                           | 150V       |
| Accuracy                               | 0.01      | 5%+0.015%                      | 6F.S.       | 0.01           | 5%+0.0159                    | %F.S.         | 0.01           | 5%+0.0159                 | %F.S.                | 0.01      | 5%+0.015%                     | %F.S.      |
| Current read back                      |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |
| Range                                  | 40A       | 200A                           | 400A        | 50A            | 250A                         | 500A          | 60A            | 300A                      | 600A                 | 200A      | 1,000A                        | 2,000A     |
| Accuracy                               | 0.0       | 4%+0.04%                       | F.S.        | 0.0            | 4%+0.04%                     | F.S.          | 0.0            | 04%+0.05%                 | F.S.                 | 0.0       | 04%+0.04%                     | F.S.       |
| Power read back                        |           | 0 4 0 0 0 1 1 1                |             |                | 0 5 00014                    |               |                | 0 ( 000)11                |                      |           | 0. 04.00014                   | 1          |
| Range                                  |           | 0~4,000W                       | c           |                | 0~5,000W                     |               |                | 0~6,000W                  |                      |           | 0~24,000W                     |            |
| Accuracy *5                            | 0         | .1%+0.1%F.                     | 5.          | 0              | .1%+0.1%F                    | .5.           | 0              | .1%+0.1%F                 | .5.                  | 0         | .1%+0.1%F                     | 5.         |
| Protection                             |           | loc (Cattalat                  | .)          |                | loc (Cattalit                | 2)            |                | los (Cattalit             |                      |           | loc (Cattalul                 |            |
| Over Current                           |           | és (Settable)<br>és (Settable) | ·           |                | és (Settable<br>és (Settable |               |                | es (Settable              | ,                    |           | es (Settable)                 | ·          |
| Over Power                             | Ŷ         |                                | =)          | Ŷ              |                              | 2)            | Ϋ́Υ            | es (Settable              | 2)                   | Ŷ         | es (Settable                  | =)         |
| Over Temperature<br>Over Voltage Alarm |           | Yes<br>Yes                     |             |                | Yes<br>Yes                   |               |                | Yes                       |                      |           | Yes                           |            |
| Reverse Alarm                          |           | Yes                            |             |                | Yes                          |               |                | Yes                       |                      |           | Yes                           |            |
| General                                |           | 162                            |             |                | ies                          |               |                | ies                       |                      |           | ies                           |            |
| Input Resistance (Load Off)            | 90        | 0kΩ(Typic                      | al)         | 90             | 0kΩ(Typic                    | al)           | 90             | )0kΩ(Typic                | al)                  | 00        | )0kΩ(Typic                    | al)        |
|  |           | 428 x 647                      |             |                | 428 x 647                    |               |                | 428 x 647                 |                      |           | 428 x 670.                    |            |
| Dimension (HxWxD)                      |           | ( 428 x 647<br>16.85 x 25.4    |             |                | (428 x 647<br>16.85 x 25.4   |               |                | 428 x 647<br>16.85 x 25.4 |                      |           | ( 428 x 670.<br>( 16.85 x 26. |            |
| Weight                                 |           | 5kg / 77.2lk                   |             |                | 5kg / 77.2lk                 |               |                | 5kg / 77.2ll              |                      |           | 0kg / 330.69                  |            |
| Operating Temp                         |           | 0~40°C                         |             | J              | 0~40°C                       |               | J              | 0~40°C                    |                      | 1.50      | 0~40°C                        |            |
| Line Voltage                           | 100~2     | 40 VAC / 47                    | ~63Hz       | 100~2          | 40 VAC / 47                  | /~63Hz        | 100~2          | 40 VAC / 47               | /~63Hz               | 100~2     | 40 VAC / 47                   | ~63Hz      |
| Power Consumption                      |           | 200VA(max                      |             |                | 200VA(max                    |               |                | 200VA(max                 |                      |           | 800VA(max                     |            |
| EMC & Safety                           |           | CE                             | ,           |                | CE                           | ,             |                | CE                        | ,                    |           | CE                            | ,          |
|  |           |                                |             |                |                              |               |                |                           |                      |           |                               |            |

Model 63200A Series

| SPECIFICATIONS-2                  |         | •                                       |           |                                  |   |                             |                       |   |                     |   |                                      |            |  |  |
|-----------------------------------|---------|---|-----------|----------------------------------|---|-----------------------------|-----------------------|---|---------------------|---|--------------------------------------|------------|--|--|
| Model                             | 632     | 204A-600-                               | 280       | 632                              | 205A-600-3  | 350                         | 632                   | 206A-600-                                     | 420                 | 632   | 24A-600-1                            | 680        |  |  |
| Voltage*2                         |         | 0~600V                                  |           |                                  | 0~600V  |                             | 0~600V                |   |                     | 0~600V  |                                      |            |  |  |
| Current                           |         | 0~280A                                  |           |                                  | 0~350A  |                             |                       | 0~420A  |                     | 0~1,680A  |                                      |            |  |  |
| Power*3                           |         | 0~4,000W                                | 1         |                                  | 0~5,000W  |                             | 0~6,000W              |   |                     | 0~24,000W                                       |                                      |            |  |  |
| Static mode                       | 1       | .,                                      |           |                                  | 0 0,00011   |                             | · · · ·               |   |                     |   |                                      |            |  |  |
| Min. voltage                      | 1.4V    | 7V                                      | 14V       | 1.4V                             | 7V  | 14V                         | 1.4V                  | 7V  | 14V                 | 1.4V  | 7V                                   | 14V        |  |  |
| @ full current                    | @28A    | @140A                                   | @280A     | @35A                             | @175A   | @350A                       | @42A                  | @210A   | @420A               | @168A   | @840A                                | @1,680A    |  |  |
| Constant current mode             |         |   | -         |                                  |   | -                           | _                     |   | -                   |   |                                      |            |  |  |
| Range                             | 28A     | 140A                                    | 280A      | 35A                              | 175A  | 350A                        | 42A                   | 210A  | 420A                | 168A  | 840A                                 | 1,680A     |  |  |
| Accuracy*4                        | 0.0     | 5%+0.05%                                | F.S.      |                                  | 5%+0.05%  | F.S.                        | 0.0                   | 5%+0.05%                                      | F.S.                | 0.0   | 5%+0.05%                             | 1          |  |  |
| Constant resistance mod           |         |   |           |                                  |   |                             |                       |   |                     | 1   |                                      |            |  |  |
|                                   | 1       | 5Ω~750Ω                                 | (80V)     | 0.05                             | Ω~500Ω(   | 80V)                        | 0.05                  | Ω~500Ω  | (80V)               | 0.013   | 3Ω~125Ω                              | (80V)      |  |  |
| Range                             |         | ~3,000Ω (                               | ( ,       |                                  | ~2,000 Ω (  | ,                           |                       | ~2,000 Ω (                                    | ,                   |   | Ω~500Ω(                              | • •        |  |  |
| 5                                 | 3Ω~     | ~6,000Ω(6                               | 500V)     | 2Ω~4,000Ω (600V) 2Ω~4,000Ω (600V |   |                             |                       | 500V)   | 0.5 Ω               | ~1,000Ω (                                       | (600V)                               |            |  |  |
| Accuracy                          | Vin/Rse | t*(0.2%)+0                              | .2% IF.S. | Vin/Rse                          | t*(0.2%)+0  | .2% IF.S.                   | Vin/Rse               | et*(0.2%)+0                                   | .2% IF.S.           | Vin/Rse   | t*(0.2%)+0                           | ).2% IF.S. |  |  |
| Constant voltage mode             |         |   |           |                                  |   |                             |                       |   |                     |   |                                      |            |  |  |
| Range                             | 80V     | 150V                                    | 600V      | 80V                              | 150V  | 600V                        | 80V                   | 150V  | 600V                | 80V   | 150V                                 | 600V       |  |  |
| Accuracy                          | 0.02    | 5%+0.025                                | %F.S.     | 0.025%+0.025%F.S.                |   |                             | 0.02                  | 25%+0.025                                     | %F.S.               | 0.02  | 25%+0.0259                           | %F.S.      |  |  |
| Constant power mode               |         |   |           |                                  |   |                             |                       |   |                     |   |                                      |            |  |  |
| Range                             | 400W    | 2,000W                                  | 4,000W    | 500W                             | 2,500W  | 5,000W                      | 600W                  | 3,000W  | 6,000W              | 2,400W  | 12,000W                              | 24,000W    |  |  |
| Accuracy *5                       |         | .2%+0.2%F                               |           |                                  | 2%+0.2%F.   | ,                           |                       | .2%+0.2%F                                     | .,                  |   | .2%+0.2%F                            | ,          |  |  |
| Constant impedance mo             | · · · · |   |           |                                  | 0.2,011   |                             | 0                     |   |                     |   |                                      |            |  |  |
| Range                             |         |   |           | C+ 30µE-                         | 50.000uE ·  | $R_{1} \cdot as CR \cdot I$ | s• 0 1uH-16           | UH · Rs· 30                                   | m () - <b>20</b> () |   |                                      |            |  |  |
| CC+CV                             |         |   |           | CL. 50µ1                         | $L: 30\mu$ F-50,000μF ; R <sub>L</sub> : as CR ; Ls: 0.1μH-16μH ; Rs: 30m Ω-20 Ω<br>Refer to CC & CV specifications |                             |                       |   |                     |   |                                      |            |  |  |
| CR+CV                             |         |   |           |                                  | Refer to CC & CV specifications<br>Refer to CR & CV specifications  |                             |                       |   |                     |   |                                      |            |  |  |
| CR+CC                             |         |   |           |                                  |   | er to CR & C                | · ·                   |   |                     |   |                                      |            |  |  |
|                                   |         |   |           |                                  | nele  | er to ch a c                | c specificat          | .10115  |                     |   |                                      |            |  |  |
| Dynamic mode                      | 0.0     | 20.00.000                               |           | 0.0                              | 20.00.000   |                             | 0.0                   | 20.00.000                                     |                     | 0.0   | 20.00.000                            |            |  |  |
| T1 & T2                           |         | 20~99.999<br>)ms~99,999                 |           |                                  | 20~99.999r<br>)ms~99,999  |                             |                       | 20~99.999<br>)ms~99,99                        |                     |   | 20~99.999<br>)ms~99,99               |            |  |  |
| Accuracy                          |         | µs+100pp                                |           |                                  | µs+100ppr   |                             |                       | µs+100pp                                      |                     |   | µs+100pp                             |            |  |  |
| Slew rate                         | 2r      | nA/μs~1.4/<br>nA/μs~7A/<br>1A/μs~14A    | ′μs       | 2m                               | nA/μs~1.75<br>A/μs~8.75A<br>A/μs~17.5A  | \/μs                        | 2m                    | mA/μs~2.1.<br>A/μs~10.5 <i>ι</i><br>nA/μs~21A | A/μs                | 10r   | 1A/μs~8.4A<br>nA/μs~42A<br>nA/μs~84A | -<br>γ/µs  |  |  |
| Accuracy                          |         | 5% ± 10µ                                | •         |                                  | $5\% \pm 10\mu s$   | •                           |                       | $5\% \pm 10\mu$                               | •                   |   | $5\% \pm 10\mu$                      | •          |  |  |
| Min. rise time *6                 |         | 0µs (Typica                             |           | 20µs (Typical)                   |   |                             |                       | 0µs (Typica                                   |                     |   | 0µs (Typica                          |            |  |  |
| Measurement                       |         | 000000000000000000000000000000000000000 | ,         |                                  | 01-0 (1)1-10-   | ,                           |                       | ope (Types                                    | ,                   |   |                                      |            |  |  |
| Voltage read back                 |         |   |           |                                  |   |                             |                       |   |                     |   |                                      |            |  |  |
| Range                             | 80V     | 150V                                    | 600V      | 80V                              | 150V  | 600V                        | 80V                   | 150V  | 600V                | 80V   | 150V                                 | 600V       |  |  |
| Accuracy                          |         | 5%+0.015°                               |           |                                  | 5%+0.015%   |                             |                       | 5%+0.015                                      |                     |   | 5%+0.015                             |            |  |  |
| Current read back                 | 0.01    | 57010.015                               | /01.J.    | 0.01                             | 5/010.015/  |                             | 0.01                  | 57010.015                                     | /01.J.              | 0.01  | 57010.015                            | /01.3.     |  |  |
| Range                             | 28A     | 140A                                    | 280A      | 35A                              | 075A  | 350A                        | 42A                   | 210A  | 420A                | 168A  | 040A                                 | 1,680A     |  |  |
| Accuracy                          |         | 4%+0.04%                                |           |                                  | 4%+0.04%  |                             |                       |   |                     |   |                                      |            |  |  |
| Power read back                   | 0.0     | 4%0+0.04%                               | )г.э.     | 0.0                              | 4%+0.04%  | г.э.                        | 0.0                   | 4%+0.05%                                      | )г.э.               | 0.0   | 4%+0.04%                             | JF.J.      |  |  |
|                                   |         | 0 4 0 0 0 \\                            | 1         |                                  | 0 5 000\\/  |                             |                       | 0 6 000\\                                     | 1                   |   | 0 24 00014                           | 1          |  |  |
| Range                             | 0       | 0~4,000W                                |           | 0                                | 0~5,000W  |                             | 0                     | 0~6,000W                                      |                     |   | 0~24,000W                            |            |  |  |
| Accuracy *5                       | 0.      | .1%+0.1%F                               | .3.       | 0                                | .1%+0.1%F.  | з.                          | 0                     | .1%+0.1%F                                     |                     | 0   | .1%+0.1%F                            |            |  |  |
| Protection                        |         |   | <u> </u>  |                                  |   | <u>```</u>                  |                       |   | <u>,</u>            |   |                                      | <u>\</u>   |  |  |
| Over Current                      |         | es (Settabl                             | ,         |                                  | es (Settable)   | -                           |                       | es (Settabl                                   |                     |   | es (Settabl                          | -          |  |  |
| Over Power                        | Y       | es (Settabl                             | e)        | Y                                | es (Settable  | 2)                          | Y                     | es (Settabl                                   | e)                  | Y   | es (Settabl                          | e)         |  |  |
| Over Temperature                  |         | Yes                                     |           |                                  | Yes   |                             |                       | Yes   |                     |   | Yes                                  |            |  |  |
| Over Voltage Alarm                |         | Yes                                     |           |                                  | Yes   |                             |                       | Yes   |                     |   | Yes                                  |            |  |  |
| Reverse Alarm                     |         | Yes                                     |           |                                  | Yes   |                             |                       | Yes   |                     |   | Yes                                  |            |  |  |
| General                           |         |   |           |                                  |   |                             |                       |   |                     |   |                                      |            |  |  |
| Input Resistance<br>(Load Off)    | 1       | MΩ(Typica                               | al)       | 1                                | MΩ(Typica   | l)                          | 1                     | MΩ(Typica                                     | al)                 | 1   | MΩ(Typica                            | al)        |  |  |
| Dimension (HxWxD)                 |         | 428 x 647<br>16.85 x 25.4               |           |                                  | 428 x 647<br>16.85 x 25.4   |                             |                       | ( 428 x 647<br>16.85 x 25.                    |                     |   | (428 x 670<br>16.85 x 26             |            |  |  |
| Weight                            |         | 5kg / 77.2ll                            |           |                                  | 5kg / 77.2lk  |                             |                       | 5kg / 77.2l                                   |                     | 22.62 x 16.85 x 26.40 inch<br>150kg / 330.69lbs |                                      |            |  |  |
| Operating Temp                    |         | 0~40°C                                  |           |                                  | 0~40°C  |                             |                       | 0~40°C  |                     |   | 0~40°C                               |            |  |  |
|                                   |         |   |           | 100.2                            |   |                             |                       |   |                     |   |                                      |            |  |  |
| Line Voltage                      | 100~2   | 40 VAC / 47                             | 7~63Hz    | 100~240 VAC / 47~63Hz            |   |                             | 100~240 VAC / 47~63Hz |   |                     | 100~240 VAC / 47~63Hz                           |                                      |            |  |  |
| Line Voltage<br>Power Consumption |         | 40 VAC / 47<br>200VA(max                |           | 200VA(max)                       |   |                             |                       | 200VA(max                                     |                     |   | 800VA(max                            |            |  |  |

Video & Flat Panel LED/ Color Display Lighting

Optical Photovoltaic Test Automated Devices & Automation Optical Inspection

 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Automation
 Component
 Safety
 IC

### Model 63200A Series

| Model                             | 632                               | 04A-1200-                            | 160    | 632  | 05A-1200-                 | 200           | 632                       | 06A-1200                             | -240              | 632                   | 24A-1200  | -960     |  |
|-----------------------------------|-----------------------------------|--------------------------------------|--------|--|---------------------------|---------------|---------------------------|--------------------------------------|-------------------|-----------------------|---|----------|--|
| Voltage*2                         | 002                               | 0~1,200V                             |        | 0.02   | 0~1,200V                  |               |                           | 0~1,200V                             |                   |                       | 0~1,200V  |          |  |
| Current                           |                                   | 0~160A                               |        |  | 0~200A                    |               |                           | 0~240A                               |                   | 0~960A                |   |          |  |
| Power*3                           |                                   | 0~4,000W                             |        |  | 0~5,000W                  |               |                           | 0~6,000W                             |                   |                       | 0~24.000W   | /        |  |
| Static mode                       |                                   | 0 4,000                              |        |  | 0 5,00011                 |               | <u> </u>                  | 0 0,00011                            |                   | <u> </u>              | 24,0001   | <u> </u> |  |
| Min. voltage                      | 2V                                | 10V                                  | 20V    | 2V   | 10V                       | 20V           | 2V                        | 10V                                  | 20V               | 2V                    | 10V   | 20V      |  |
| @ full current                    | @16A                              | @80A                                 | @160A  | @20A   | @100A                     | @200A         | @24A                      | @120A                                | @240A             | @96A                  | @480A   | @960A    |  |
| Constant current mode             |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Range                             | 16A                               | 80A                                  | 160A   | 20A  | 100A                      | 200A          | 24A                       | 120A                                 | 240A              | 96A                   | 480A  | 960A     |  |
| Accuracy*4                        | 0.0                               | 4%+0.06%                             | F.S.   | 0.0  | 4%+0.06%                  | F.S.          | 0.0                       | 04%+0.06%                            | F.S.              | 0.04%+0.06%F.S.       |   |          |  |
| Constant resistance mode          |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Range                             | 0.6                               | Ω~1.5kΩ(<br>Ω~6kΩ(60<br>~30kΩ(12     | (V00   | 0.1 Ω ~1kΩ (150V)<br>0.4 Ω ~4kΩ (600V)<br>10 Ω ~20kΩ (1200V) |                           |               | 0.4                       | Ω~1kΩ (1)<br>Ω~4kΩ (6)<br>~20kΩ (12  | (V0C              | 0.1                   | 0.025Ω-0.25kΩ (150V)<br>0.1Ω-1kΩ (600V)<br>2.5Ω-5kΩ (1200V) |          |  |
| Accuracy                          |                                   | t*(0.2%)+0                           |        |  | t*(0.2%)+0.               |               |                           | et*(0.2%)+0                          |                   |                       | t*(0.2%)+0  |          |  |
| Constant voltage mode             |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Range                             | 150V                              | 600V                                 | 1,200V | 150V   | 600V                      | 1,200V        | 150V                      | 600V                                 | 1,200V            | 150V                  | 600V  | 1,200V   |  |
| Accuracy                          |                                   | 5%+0.025%                            | · ·    |  | 5%+0.025%                 |               |                           | 25%+0.025                            |                   |                       | 5%+0.0259   |          |  |
| Constant power mode               | 0.02                              |                                      |        | 0.02   | /                         |               | 0.02                      |                                      |                   | 0.02                  | 2,0.0.020   |          |  |
| Range                             | 400W                              | 2,000W                               | 4,000W | 500W   | 2,500W                    | 5,000W        | 600W                      | 3,000W                               | 6.000W            | 2,400W                | 12,000W   | 24,000   |  |
| Accuracy *5                       |                                   | 2%+0.2%F                             |        |  | 2%+0.2%F.                 | ,             |                           | 2%+0.2%F                             |                   |                       | 2%+0.2%F  | 1 1      |  |
| Constant impedance mode           | 0.                                | 2 /0 1 0.2 /01                       | 5.     | 0.   | 2 /0 1 0.2 /01.           | 5.            | 0                         | .2 /01 0.2 /01                       |                   | 0.                    | 2 /01 0.2 /01   |          |  |
| Range                             |                                   |                                      |        | C 30uE-  | 50 000uE ·                | R∟: as CR ; L | s: 0 1uH-16               | UH · Re· 30                          | $m \cap -20 \cap$ |                       |   |          |  |
| CC+CV                             |                                   |                                      |        | ςι. συμι   | · · ·                     | er to CC & C  | · · ·                     | -                                    | 1132 2032         |                       |   |          |  |
| CR+CV                             |                                   |                                      |        |  |                           | er to CR & C  |                           |                                      |                   |                       |   |          |  |
| CR+CV<br>CR+CC                    |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
|                                   |                                   |                                      |        |  | Rele                      | er to CR & C  | c specificat              | .10115                               |                   |                       |   |          |  |
| Dynamic mode<br>T1 & T2           | 0.020~99.999ms/<br>100ms~99,999ms |                                      |        |  | 20~99.999r                |               |                           | 20~99.999                            |                   |                       | 20~99.999   |          |  |
| A                                 |                                   | ,                                    |        |  | ms~99,999                 |               |                           | )ms~99,99                            |                   |                       | )ms~99,999  |          |  |
| Accuracy                          |                                   | µs+100ppr                            |        |  | μs+100ppr                 |               |                           | µs+100pp                             |                   |                       | µs+100ppi   |          |  |
| Slew rate                         | 1r                                | nA/μs~0.8/<br>nA/μs~4A/<br>nA/μs~8A/ | μs     | 0.2mA/μs~1.A/μs<br>1mA/μs~5A/μs<br>2mA/μs~10A/μs             |                           |               | 11                        | mA/μs~1.2/<br>mA/μs~6A/<br>nA/μs~12A | μs                | 5n                    | 1A/μs~4.8A<br>1A/μs~24A<br>nA/μs~48A                        | /μs      |  |
| Accuracy                          |                                   | $5\% \pm 10\mu$ s                    |        | 5% ± 10µs  |                           |               | 5% ± 10μs                 |                                      |                   | 5% ± 10µs             |   |          |  |
| Min. rise time *6                 | 2                                 | 0μs (Typica                          | l)     | 20µs (Typical)   |                           |               | 20µs (Typical)            |                                      |                   | 20µs (Typical)        |   |          |  |
| Measurement                       |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Voltage read back                 |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Range                             | 150V                              | 600V                                 | 1,200V | 150V   | 600V                      | 1,200V        | 150V                      | 600V                                 | 1,200V            | 150V                  | 600V  | 1,200V   |  |
| Accuracy                          | 0.01                              | 5%+0.015%                            | 6F.S.  | 0.01   | 5%+0.015%                 | 6F.S.         | 0.01                      | 5%+0.015                             | %F.S.             | 0.01                  | 5%+0.0159   | %F.S.    |  |
| Current read back                 |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Range                             | 16A                               | 80A                                  | 160A   | 20A  | 100A                      | 200A          | 24A                       | 120A                                 | 240A              | 96A                   | 480A  | 960A     |  |
| Accuracy                          | 0.0                               | 4%+0.06%                             | F.S.   | 0.0  | 4%+0.06%                  | F.S.          | 0.0                       | )4%+0.06%                            | F.S.              | 0.0                   | 4%+0.06%  | F.S.     |  |
| Power read back                   |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Range                             |                                   | 0~4,000W                             |        |  | 0~5,000W                  |               |                           | 0~6,000W                             |                   |                       | 0~24,000W   | /        |  |
| Accuracy *5                       | 0.                                | .1%+0.1%F.                           | S.     | 0.   | 1%+0.1%F.                 | S.            | 0                         | .1%+0.1%F                            |                   |                       | 1%+0.1%F  |          |  |
| Protection                        |                                   |                                      |        |  |                           |               |                           |                                      |                   |                       |   |          |  |
| Over Current                      | Y                                 | es (Settable                         | 2)     | Y  | es (Settable              | 2)            | Y                         | es (Settabl                          | e)                | Y                     | es (Settable  | e)       |  |
| Over Power                        |                                   | es (Settable                         |        |  | es (Settable              |               |                           | es (Settabl                          | -                 |                       | es (Settable  |          |  |
| Over Temperature                  |                                   | Yes                                  | -,     |  | Yes                       | -,            |                           | Yes                                  | -,                |                       | Yes   | -1       |  |
| Over Voltage Alarm                |                                   | Yes                                  |        |  | Yes                       |               |                           | Yes                                  |                   |                       | Yes   |          |  |
| Reverse Alarm                     |                                   | Yes                                  |        |  | Yes                       |               |                           | Yes                                  |                   |                       | Yes   |          |  |
| General                           |                                   | 105                                  |        |  | 105                       |               |                           | .05                                  |                   |                       | 105   |          |  |
| Input Resistance (Load Off)       | 2                                 | MΩ(Typica                            | 1)     | 2  | MΩ(Typica                 | 1)            | 2                         | MΩ (Typica                           | al)               |                       | MΩ(Typica   | al)      |  |
| Dimension (HxWxD)                 | 175 x                             | 428 x 647<br>16.85 x 25.4            | mm /   | 175 x  | 428 x 647<br>16.85 x 25.4 | mm /          | 175 x 428 x 647 mm /      |                                      |                   | 175 >                 | 428 x 647<br>16.85 x 25.4                                   | mm /     |  |
| Waight                            |                                   |                                      |        |  |                           |               | 6.97 x 16.85 x 25.47 inch |                                      |                   |                       |   |          |  |
| Weight                            | 3.                                | 5kg / 77.2lk<br>0~40°C               | 15     | 3.   | 5kg / 77.2lk<br>0~40°C    | 15            | 35kg / 77.2lbs            |                                      |                   | 150kg / 330.69lbs     |   |          |  |
| Operating Temp                    | 100.0                             |                                      | 6211-  | 100.0  |                           | 6211-         | 100.0                     | 0~40°C                               | 6211-             | 0~40°C                |   |          |  |
| Line Voltage                      |                                   | 40 VAC / 47                          |        |  | 40 VAC / 47               |               |                           | 40 VAC / 47                          |                   | 100~240 VAC / 47~63Hz |   |          |  |
| Power Consumption<br>EMC & Safety | 4                                 | 200VA(max                            | )      |  | 200VA(max                 | )             |                           | 200VA(max                            | .)                | 800VA(max)            |   |          |  |
| EIVIL & NATETY                    |                                   | CE                                   |        |  | CE                        |               | CE                        |                                      |                   | CE                    |   |          |  |

1. The specifications are guaranteed to meet specified performance at temperature range of  $25\pm5$ °C.

2. If the operating voltage exceeds the rated voltage for 1.05 times, it would cause permanent damage to the device.

3. The power rating specifications at ambient temperature =  $25^{\circ}$ C.

4. If the operating current is below range 0.2%, the accuracy specification is 0.1% F.S.

5. Power F.S. = Vrange F.S.x Irang F.S.

6. The specification is valid only for loading current > 4% F.S.

7. The short circuit function simulates full power loading and thus it cannot perform mechanical short circuit.



### Model 63200 Series



#### **KEY FEATURES**

- Power Rating: 2.6kW, 5.2kW, 6.5kW, 10kW, 10.4kW, 14.5kW, 15.6kW
- Voltage range: 0~80V/0~600V/0~1000V
- Current range: Up to 1000A
- CC, CR, CV, CP load modes
- Master/Slave paralleling control mode, allow synchronous load control under static and dynamic loading mode (Up to 93.6kW)
- Dynamic loading: Up to 20kHz
- Only need 1V to draw rated current
- Programmable slew rate, up to 41A/µs
- Measurement: Voltage / Current / Power/ Resistance
- Large LED/LCD display
- External loading waveform simulation
- Short circuit simulation and short circuit current measurement
- Full protection: OC, OP, OT protection and OV, reverse alarm
- Versatile remote controller
- GPIB & RS-232 interfaces

The Chroma Electronic Loads 63200 series are designed for DC power source, power electronic devices and components testing. The high power rating, parallel and synchronization capabilities make them the ideal tool for testing the high power UUT such as SMR,UPS, battery, and fuel cell.

The 63200 series offers 12 different models with power range from 2600 watts to 15600 watts, current from 50A to 1000A and up to 500V input voltage. The 4 load modes setup provide different load simulations for various application occasions. The CC/CR modes are designed to test constant voltage type of power supply. CV mode is used to test battery charger and current source, while CP mode is ideal for battery testing by simulating the real discharge curve.

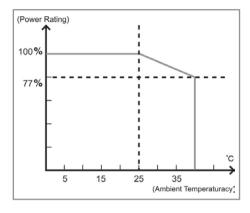
The 63200 series can draw its rated current under very low voltage (1V typical) even under the highest specified slew rate. This unique feature guarantees the best loading performance to a low voltage power supply. With the unique external waveform simulation and Master /Slave control capability, the 63200 series electronic loads allow users to parallel and synchronize more than one load together from an internal or external loading control signal. This feature provides unlimited load simulation and the possibility of power expansion.

The 63200 series also supply necessary measurement functions and short circuit simulation that extend the test capability for even the most demanding engineering tests and ATE applications. With the LCD display and rotary knob, the 63200 electronic loads offer versatile



front panel operations. Users are able to control the 63200 family remotely via GPIB, RS-232 or APG (Analog Programming) interface.

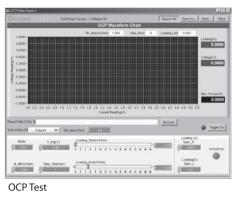
Chroma 63200 series loads are built in fan speed control to minimize the audio noise. The self-diagnosis routine and the full protections against OP, OC, OT and alarm indicating OV, reverse polarity to ensure the best quality and reliability.



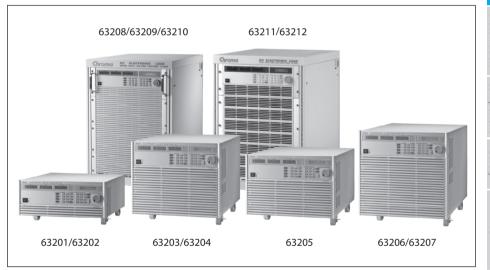
#### Soft Panel



#### Battery Discharge Test



#### 63200 Series DC Electronic Load Family



#### **ORDERING INFORMATION**

63201 : DC Electronic Load 80V/300A/2.6kW 63202 : DC Electronic Load 600V/50A/2.6kW 63203 : DC Electronic Load 80V/600A/5.2kW 63204 : DC Electronic Load 600V/100A/5.2kW 63205 : DC Electronic Load 80V/180A/6.5kW 63206: DC Electronic Load 80V/600A/10.4kW 63207 : DC Electronic Load 80V/300A/10.4kW 63208 : DC Electronic Load 80V/600A/15.6kW 63209 : DC Electronic Load 80V/1000A/15.6kW 63210 : DC Electronic Load 600V/150A/14.5kW 63211 : DC Electronic Load 1000V/150A/15.6kW 63212 : DC Electronic Load 1000V/150A/10kW A632001 : Remote Controller A632002 : Load Cable 38mm/247A/200cmx2 A632003 : Load Cable 80mm/350A/200cmx2 A632004 : Sync. Link Box for 6330A & 63200 series A632005 : Softpanel for 63200 series

A632006 : NI USB-6211 Bus-Powered Multifunction DAQ



PXI Test &

Test &

Passive

### Model 63200 Series

| SPECIFICATIONS-1      |                     |  |                        |  |                                    |                                 |
|-----------------------|---------------------|--|------------------------|--|------------------------------------|---------------------------------|
| Model                 | 632                 | 201                                    | 632                    | 202                                    | 632                                | 203                             |
| Power *1              | 260W                | 2600W                                  | 260W                   | 2600W                                  | 520W                               | 5200W                           |
| Current               | 0~30A               | 0~300A                                 | 0~5A                   | 0~50A                                  | 0~60A                              | 0~600A                          |
| /oltage *2            | 0~8                 | 30V                                    | 0~600V                 |  | 0~8                                | 30V                             |
| Win. Operating        | 0.5V @ 15A          | 0.5V @ 150A                            | 1.5V @ 2.5A            | 1.5V @ 25A                             | 0.5V @ 30A                         | 0.5V @ 300A                     |
| /oltage               | 1V @ 30A            | 1V @ 300A                              | 3V @ 5A                | 3V @ 50A                               | 1V @ 60A                           | 1V @ 600A                       |
| Constant Current mod  | le                  |  |                        |  |                                    |                                 |
| Range                 | 0~30A               | 0~300A                                 | 0~5A                   | 0~50A                                  | 0~60A                              | 0~600A                          |
| Resolution            | 7.7mA               | 77mA                                   | 1.4mA                  | 14mA                                   | 16mA                               | 160mA                           |
| Accuracy              | 0.1%+0.1%F.S.       | 0.2%+0.1%F.S.                          | 0.1%+0.1%F.S.          | 0.2%+0.1%F.S.                          | 0.1%+0.1%F.S.                      | 0.2%+0.1%F.S.                   |
| Constant Resistance M | lode                |  |                        |  | ·,                                 |                                 |
| Range                 | 0.005~20Ω           | 0.25~1000Ω                             | 0.25~1000Ω             | 10~40000Ω                              | 0.0025~10Ω                         | 0.125~500 Ω                     |
| Resolution*3          | 52mS                | 1.04mS                                 | 1.2mS                  | 28.8µS                                 | 104mS                              | 2.1mS                           |
| Accuracy*4            | 0.104S+0.35%        | 0.9S+0.1%                              | 0.0046S+0.35%          | 0.04S+0.1%                             | 0.208S+0.35%*5                     | 1.2S+0.1%                       |
| ccuracy*6 (Vin>7V)    | 0.104S+0.35%        | 0.0021S+0.35%                          | 0.0046S+0.35%          | 114µS+0.35%                            | 0.208S+0.35%                       | 0.00425+0.35%                   |
| Constant Voltage mod  |                     | 0.0021310.3370                         | 0.0010310.3370         | 114µ010.0070                           | 0.200310.3370                      | 0.0042310.3370                  |
| Range                 | 0~16V               | 0~80V                                  | 0~150V                 | 0~600V                                 | 0~16V                              | 0~80V                           |
| Resolution            | 4mV                 | 20mV                                   | 40mV                   | 162mV                                  | 4mV                                | 20mV                            |
|                       |                     | 0.1%F.S.                               | 401117                 |  | 0.05%+                             |                                 |
| Accuracy              |                     | 0.170F.3.                              | 0.05%+                 | 0.1706.3.                              | 0.05%+                             | 0.170F.3.                       |
| Constant Power mode   | 0.6~260W            | 6~2600W                                | 0.625~260W             | 6.25~2600W                             | 1.2 52014/                         | 12~5200W                        |
| lange                 |                     |  | 3.125mW                | 31.25mW                                | 1.2~520W                           |                                 |
| Resolution            | 7.5mW               | 75mW                                   |                        |  | 22.5mW                             | 225mW                           |
| Accuracy              | 0.5%+0.5%F.S.       |  | 0.5%+0.5%F.S.          |  | 0.5%+0.5%F.S.                      |                                 |
| Dynamic mode          |                     |  |                        |  |                                    |                                 |
| Timing                | 0.005 10            | 1 20                                   | 0.025 10               | 1 20                                   | 0.005 40                           | 1 20                            |
| 1&T2                  | 0.025~10ms          | 1ms~30s                                | 0.025~10ms             | 1ms~30s                                | 0.025~10ms                         | 1ms~30s                         |
| lesolution            | 1µs                 | 1ms                                    | 1µs                    | 1ms                                    | 1µs                                | 1ms                             |
| Accuracy              | 1µs+100ppm          | 1ms+100ppm                             | 1µs+100ppm             | 1ms+100ppm                             | 1µs+100ppm                         | 1ms+100ppm                      |
| lew rate              | 5mA~1.25A/µs        | 50mA~12.5A/µs                          | 0.8mA~0.2A/µs          | 8mA~2A/µs                              | 10mA~2.5A/µs                       | 100mA~25A/µs                    |
| lesolution            | 5mA/μs              | 50mA/µs                                | 0.8mA/µs               | 8mA/μs                                 | 10mA/µs                            | 100mA/µs                        |
| Accuracy              |                     | ± 20µs                                 | 10% ±                  | •                                      | 10% ±                              | •                               |
| Ain. Rise Time        | 24µs (1             | ypical)                                | 24µs (t                | ypical)                                | 24µs (t                            | ypical)                         |
| Current               |                     |  |                        |  |                                    |                                 |
| Range                 | 0~30A               | 0~300A                                 | 0~5A                   | 0~50A                                  | 0~60A                              | 0~600A                          |
| Resolution            | 7.7mA               | 77mA                                   | 1.4mA                  | 14mA                                   | 16mA                               | 160mA                           |
| Accuracy              | 0.4%                | 6F.S.                                  | 0.4%                   | 6F.S.                                  | 0.4%                               | 6F.S.                           |
| Measurement           |                     |  |                        |  |                                    |                                 |
| /oltage Read Back     |                     |  |                        |  |                                    |                                 |
| Range                 | 0~16V               | 0~80V                                  | 0~150V                 | 0~600V                                 | 0~16V                              | 0~80V                           |
| Resolution            | 0.6mV               | 2.6mV                                  | 5.1mV                  | 21mV                                   | 0.6mV                              | 2.6mV                           |
| Accuracy              | 0.05%+0             | ).05%F.S.                              | 0.05%+0                | 0.05%F.S.                              | 0.05%+0                            | ).05%F.S.                       |
| Current Read Back     | ·                   |  |                        |  |                                    |                                 |
| Range                 | 0~30A               | 0~300A                                 | 0~5A                   | 0~50A                                  | 0~60A                              | 0~600A                          |
| Resolution            | 1mA                 | 10mA                                   | 0.18mA                 | 1.8mA                                  | 2mA                                | 20mA                            |
| Accuracy              | 0.1%+0              | ).1%F.S.                               | 0.1%+0                 |  | 0.1%+0                             |                                 |
| ower Read Back        |                     |  |                        |  |                                    |                                 |
| Range                 | 0~260W              | 0~2600W                                | 0~260W                 | 0~2600W                                | 0~520W                             | 0~5200W                         |
| Accuracy*7            |                     | ).3%F.S.                               |                        | 0.3%F.S.                               | 0.3%+0                             |                                 |
| ieneral               | 0.07010             |  | 0.57010                |  | 0.57010                            |                                 |
| Short Circuit         |                     |  |                        |  |                                    |                                 |
| urrent                | 30A                 | 300A                                   | 5A                     | 50A                                    | 60A                                | 600A                            |
| nput Rating           | 1Ø 100/200Vac $\pm$ | 10% VLN, 47~63Hz ;<br>10% VLN, 47~63Hz | 1Ø 100/200Vac $\pm$    | 10% VLN, 47~63Hz ;<br>10% VLN, 47~63Hz | 1Ø 100/200Vac ±<br>1Ø 115/230Vac ± | 10% V <sub>LN</sub> , 47~63Hz ; |
| Dimension             |                     | x 589 mm /                             |                        | ( 589 mm /                             |                                    | ( 589 mm /                      |
| Dimension             |                     | x 23.2 inch                            |                        |  |                                    |                                 |
|                       | 0.7 × 1/.)          |  | 6.9 x 17.3 x 23.2 inch |  | 6.9 x 17.3 x 23.2 inch             |                                 |
| (H x W x D)<br>Weight |                     | 56.13 lbs                              | 30 kg / 66.13 lbs      |  | 63 kg / 138.89 lbs                 |                                 |

### Model 63200 Series

| SPECIFICATIONS-2         |               |  |                         |  |  |                    |
|--------------------------|---------------|--|-------------------------|--|--|--------------------|
| Model                    | 63            | 204  | 63                      | 205  | 632  | 06                 |
| Power*1                  | 520W          | 5200W  | 650W                    | 6500W  | 1040W  | 10400W             |
| Current                  | 0~10A         | 0~100A   | 0~18A                   | 0~180A   | 0~60A  | 0~600A             |
| /oltage*2                |               | 600V   |                         | 80V  | 0~8  |                    |
|                          | 1.5V @ 5A     | 1.5V @ 50A   | 0.5V @ 9A               | 0.5V @ 90A   | 0.5V @ 30A                                   | 0.5V @ 300A        |
| Ain. Operating           | -             |  |                         |  |  |                    |
| -                        | 3V @ 10A      | 3V @ 100A  | 1V @ 18A                | 1V @ 180A  | 1V @ 60A                                     | 1V @ 600A          |
| Constant Current mod     |               | 0.1001   | 0.404                   | 0.1001   | 0.004  | 0.0004             |
| lange                    | 0~10A         | 0~100A   | 0~18A                   | 0~180A   | 0~60A  | 0~600A             |
| Resolution               | 2.8mA         | 28mA   | 5.2mA                   | 52mA   | 21mA   | 170mA              |
| Accuracy                 | 0.1%+0.1%F.S. | 0.2%+0.1%F.S.  | 0.1%+0.2%F.S.           | 0.1%+0.2%F.S.  | 0.1%+0.2%F.S.                                | 0.1%+0.2%F.S.      |
| Constant Resistance M    | lode          |  |                         |  |  |                    |
| lange                    | 0.125~500Ω    | <b>5~20000</b> Ω   | <b>0.008~32</b> Ω       | 0.4~1600Ω  | <b>0.0025~10</b> Ω                           | <b>0.125~500</b> Ω |
| Resolution*3             | 2.3mS         | 57.56µS  | 35mS                    | 0.7mS  | 112.5mS                                      | 2.25mS             |
| Accuracy*4               | 0.0046S+0.35% | 0.08S+0.1%   | 0.07S+0.35%             | 0.75S+0.1%   | 0.225S+0.35% *5                              | 1.2S+0.1%          |
| ccuracy*6 (Vin>7V)       | 0.0046S+0.35% | 115.51µS+0.35%   | 0.07S+0.35%             | 0.0014S+0.35%  | 0.225S+0.35%                                 | 0.0045S+0.35%      |
| onstant Voltage mod      | e             |  |                         |  |  |                    |
| lange                    | 0~150V        | 0~600V   | 0~16V                   | 0~80V  | 0~16V  | 0~80V              |
| lesolution               | 40mV          | 162mV  | 4mV                     | 20mV   | 4mV  | 20mV               |
|                          |               | +0.1%F.S.  |                         | 0.1%F.S.   | 0.05%+0                                      | -                  |
| ccuracy                  | 0.05%-        | FU.1%F.3.  | 0.05%+                  | 0.170F.3.  | 0.05%+0                                      | J. 1 70F.J.        |
| Constant Power mode      | 1.25 52014    | 10 5 500000  | 0.24 45014              | 26 650014  | 1.2. 404014                                  | 10 10 100          |
| Range                    | 1.25~520W     | 12.5~5200W   | 0.36~650W               | 3.6~6500W  | 1.2~1040W                                    | 12~10400W          |
| Resolution               | 6.25mW        | 62.5mW   | 4.6mW                   | 46mW   | 22.5mW                                       | 225mW              |
| Accuracy                 | 0.5%+0.5%F.S. |  | 0.5%+0.5%F.S.           |  | 0.5%+0.5%F.S.                                |                    |
| Dynamic mode             |               |  |                         |  |  |                    |
| iming                    |               |  |                         |  |  |                    |
| 1&T2                     | 0.025~10ms    | 1ms~30s  | 0.025~10ms              | 1ms~30s  | 0.025~10ms                                   | 1ms~30s            |
| lesolution               | 1µs           | 1ms  | 1µs                     | 1ms  | 1µs  | 1ms                |
| Accuracy                 | 1µs+100ppm    | 1ms+100ppm   | 1µs+100ppm              | 1ms+100ppm   | 1µs+100ppm                                   | 1ms+100ppm         |
| lew rate                 | 1.6mA~0.4A/µs | 16mA~4A/µs   | 3mA~0.75A/µs            | 30mA~7.5A/µs   | 10mA~3A/µs                                   | 100mA~25A/µs       |
| Resolution               | 1.6mA/µs      | 16mA/µs  | 3mA/µs                  | 30mA/µs  | 12mA/µs                                      | 100mA/µs           |
| ccuracy                  |               | ± 20μs   | -                       | ± 20µs   | 10% ±  |                    |
| Ain. Rise Time           |               | (typical)  |                         | typical)   | 20µs (ty                                     |                    |
| Current                  | 2τμ3          | (typical)  | 2μ3 (                   | typical)   | 20μ3 (t)                                     | (pical)            |
|                          | 0.104         | 0.1004   | 0.104                   | 0.1004   | 0.004  | 0.000              |
| Range                    | 0~10A         | 0~100A   | 0~18A                   | 0~180A   | 0~60A  | 0~600A             |
| Resolution               | 2.8mA         | 28mA   | 5.2mA                   | 52mA   | 21mA   | 170mA              |
| Accuracy                 | 0.4           | %F.S.  | 0.49                    | %F.S.  | 0.4%   | )F.S.              |
| Neasurement              |               |  |                         |  |  |                    |
| /oltage Read Back        |               |  |                         |  |  |                    |
| Range                    | 0~150V        | 0~600V   | 0~16V                   | 0~80V  | 0~16V  | 0~80V              |
| Resolution               | 5.1mV         | 21mV   | 0.6mV                   | 2.6mV  | 0.6mV  | 2.6mV              |
| Accuracy                 | 0.05%+        | 0.05%F.S.  | 0.05%+0                 | 0.05%F.S.  | 0.05%+0                                      | .05%F.S.           |
| Current Read Back        |               |  | ·                       |  |  |                    |
| Range                    | 0~10A         | 0~100A   | 0~18A                   | 0~180A   | 0~60A  | 0~600A             |
| Resolution               | 0.35mA        | 3.5mA  | 0.7mA                   | 7mA  | 2.6mA  | 21mA               |
| Accuracy                 |               | 0.1%F.S.   |                         | 0.1%F.S.   | 0.1%+0                                       |                    |
| Power Read Back          | 0.170+        | 0.1701.0.  | 0.170                   | ,01.5.   | 0.1/0+0                                      |                    |
|                          | 0.52014/      | 0.520014/  | 0 65014                 | 0.650014/  | 0.104014/                                    | 0 10/0014/         |
| Range                    | 0~520W        | 0~5200W  | 0~650W                  | 0~6500W  | 0~1040W                                      | 0~10400W           |
| Accuracy*7               | 0.3%+         | 0.3%F.S.   | 0.3%+0                  | 0.3%F.S.   | 0.3%+0                                       | .3%F.S.            |
| ieneral                  |               |  |                         |  |  |                    |
| hort Circuit             |               |  |                         |  |  |                    |
| urrent                   | 10A           | 100A   | 18A                     | 180A   | 60A  | 600A               |
| nput Rating              |               | 10% V <sub>LN</sub> , 47~63Hz ;<br>= 10% V <sub>LN</sub> , 47~63Hz |                         | 10% V <sub>LN</sub> , 47~63Hz ;<br>10% V <sub>LN</sub> , 47~63Hz | 1Ø 100/200Vac $\pm$ 1<br>1Ø 115/230Vac $\pm$ |                    |
| Simonolon                |               | x 589 mm /   |                         |  | 443.7 x 440 :                                |                    |
| Jimension                | 200 / 10      |  | 310 x 440 x 589 mm /    |  |  |                    |
| Dimension<br>(H x W x D) | 13.9 x 17.    | 3 x 23.2 inch  | 12.2 x 17.3 x 23.2 inch |  | 17.5 x 17.3 x 23.2 inch                      |                    |
| H x W x D)<br>Weight     |               | 3 x 23.2 inch<br>138.89 lbs  |                         | x 23.2 inch<br>142.20 lbs  | 17.5 x 17.3 x<br>90 kg / 19                  |                    |

Video & Flat Panel LED/ Color Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

### Model 63200 Series

| SPECIFICATIONS-3      |                     |  |                       |  |                           |  |
|-----------------------|---------------------|--|-----------------------|--|---------------------------|--|
| Model                 | 632                 | 207                                    | 632                   | 208  | 63                        | 209                                    |
| Power *1              | 1040W               | 10400W                                 | 1560W                 | 15600W   | 1560W                     | 15600W                                 |
| Current               | 0~30A               | 0~300A                                 | 0~60A                 | 0~600A   | 0~100A                    | 0~1000A                                |
| Voltage*2             | 0~8                 |  |                       | 30V  |                           | 80V                                    |
| Min. Operating        | 0.5V @ 15A          | 0.5V @ 150A                            | 0.5V @ 30A            | 0.5V @ 300A  | 0.5V @ 50A                | 0.5V @ 500A                            |
| voltage               | 1V @ 30A            | 1V @ 300A                              | 1V @ 60A              | 1V @ 600A  | 1V @ 100A                 | 1V @ 1000A                             |
| Constant Current mod  |                     |  | it e cont             |  |                           | ing room                               |
| Range                 | 0~30A               | 0~300A                                 | 0~60A                 | 0~600A   | 0~100A                    | 0~1000A                                |
| Resolution            | 10.3mA              | 82mA                                   | 21mA                  | 163mA  | 34.2mA                    | 274mA                                  |
| Accuracy              | 0.1%+0.2%F.S.       | 0.1%+0.2%F.S.                          | 0.1%+0.2%F.S.         | 0.1%+0.2%F.S.  | 0.1%+0.2%F.S.             | 0.1%+0.2%F.S.                          |
| Constant Resistance N |                     |  |                       |  |                           |  |
| Range                 | 0.005~20Ω           | 0.25~1000Ω                             | 0.0025~10Ω            | 0.125~500Ω   | 0.0015~6Ω                 | 0.075~300Ω                             |
| Resolution*3          | 55.7mS              | 1.1mS                                  | 110mS                 | 2.22mS   | 186.5mS                   | 3.73mS                                 |
| Accuracy *4           | 0.111S+0.35%        | 0.9S+0.1%                              | 0.22S+0.35% *5        | 1.2S+0.1%  | 0.373S+0.35% *5           | 1.2S+0.1%                              |
| Accuracy *6 (Vin>7V)  | 0.111S+0.35%        | 0.0022S+0.35%                          | 0.22S+0.35%           | 0.0044S+0.35%  | 0.373S+0.35%              | 0.0075S+0.35%                          |
| Constant Voltage mo   |                     | 0.00120.000070                         | 0.220 . 0.35 /0       | 0.00110.00070  | 0.0, 00, 0.00, 0          | 0.007.00.0007/0                        |
| Range                 | 0~16V               | 0~80V                                  | 0~16V                 | 0~80V  | 0~16V                     | 0~80V                                  |
| Resolution            | 4mV                 | 20mV                                   | 4mV                   | 20mV   | 4mV                       | 20mV                                   |
| Accuracy              | 0.05%+              |  | 0.05%+                |  |                           | 0.1%F.S.                               |
| Constant Power mode   |                     |  | 0100701               |  | 0100/01                   |  |
| Range                 | 0.744~1040W         | 6~10400W                               | 1.2~1560W             | 12~15600W  | 2.5~1560W                 | 20~15600W                              |
| Resolution            | 9.3mW               | 75mW                                   | 22.5mW                | 225mW  | 31.255mW                  | 250mW                                  |
| Accuracy              | 0.5%+0              | -                                      | 0.5%+0                |  |                           | 0.5%F.S.                               |
| Dynamic mode          | 0.0,110             |  | 0.0,110               |  | 0.57010.5701.5.           |  |
| Timing                |                     |  |                       |  |                           |  |
| T1&T2                 | 0.025~10ms          | 1ms~30s                                | 0.025~10ms            | 1ms~30s  | 0.025~10ms                | 1ms~30s                                |
| Resolution            | 1µs                 | 1ms                                    | 1µs                   | 1ms  | 1µs                       | 1ms                                    |
| Accuracy              | 1µs+100ppm          | 1ms+100ppm                             | 1µs+100ppm            | 1ms+100ppm   | 1µs+100ppm                | 1ms+100ppm                             |
| Slew rate             | 6mA~1.5A/μs         | 50mA~12.5A/µs                          | 12mA~3A/µs            | 100mA~25A/µs   | 20mA~5A/µs                | 166mA~41.6A/µs                         |
| Resolution            | 6mA/μs              | 50mA/µs                                | 12mA/µs               | 100mA/µs   | 20mA/µs                   | 166mA/µs                               |
| Accuracy              | 10% ±               | · · ·                                  | 10% ±                 |  |                           | ± 20µs                                 |
| Min. Rise Time        | 20µs (t             | •                                      | 20µs (t               | •  | 1                         | typical)                               |
| Current               |                     | ) [,                                   |                       | , je ,   |                           | .,                                     |
| Range                 | 0~30A               | 0~300A                                 | 0~60A                 | 0~600A   | 0~100A                    | 0~1000A                                |
| Resolution            | 10.3mA              | 82mA                                   | 21mA                  | 163mA  | 34.2mA                    | 274mA                                  |
| Accuracy              | 0.49                | -                                      | 0.4%                  |  |                           | %F.S.                                  |
| Measurement           |                     |  |                       | · · · · ·  |                           |  |
| Voltage Read Back     |                     |  |                       |  |                           |  |
| Range                 | 0~16V               | 0~80V                                  | 0~16V                 | 0~80V  | 0~16V                     | 0~80V                                  |
| Resolution            | 0.6mV               | 2.6mV                                  | 0.6mV                 | 2.6mV  | 0.6mV                     | 2.6mV                                  |
| Accuracy              | 0.05%+0             |  |                       | 0.05%F.S.  |                           | 0.05%F.S.                              |
| Current Read Back     |                     |  |                       |  |                           |  |
| Range                 | 0~30A               | 0~300A                                 | 0~60A                 | 0~600A   | 0~100A                    | 0~1000A                                |
| Resolution            | 1.3mA               | 11mA                                   | 2.7mA                 | 21mA   | 4.5mA                     | 36mA                                   |
| Accuracy              | 0.1%+0              |  | 0.1%+0                |  | 0.1%+                     | 0.1%F.S.                               |
| Power Read Back       |                     |  |                       |  |                           |  |
| Range                 | 0~1040W             | 0~10400W                               | 0~1560W               | 0~15600W   | 0~1560W                   | 0~15600W                               |
| Accuracy*7            | 0.3%+0              | .3%F.S.                                | 0.3%+0                | ).3%F.S.   | 0.3%+0                    | ).3%F.S.                               |
| General               |                     |  |                       |  |                           |  |
| Short Circuit         |                     |  |                       |  |                           |  |
| Current               | 30A                 | 300A                                   | 60A                   | 600A   | 100A                      | 1000A                                  |
| Input Rating          | 1Ø 100/200Vac $\pm$ | 10% VLN, 47~63Hz ;<br>10% VLN, 47~63Hz | 1Ø 100/200Vac $\pm$   | 10% V <sub>LN</sub> , 47~63Hz ;<br>10% V <sub>LN</sub> , 47~63Hz | 1Ø 100/200Vac ±           | 10% VLN, 47~63Hz ;<br>10% VLN, 47~63Hz |
| Dimension             | 443.7 x 440         |  |                       | x 700 mm /   | 1                         | 5x700mm/                               |
|                       | 17.5 x 17.3         |  |                       |  |                           |  |
| (H x W x D)           | 17.3 × 17.3         | X Z J.Z IIICII                         | 30 x 21.5 x 27.6 inch |  | 30x21.5x27.6inch(cabinet) |  |
| (H x W x D)<br>Weight | 90 kg / 1           |  |                       | 374.45 lbs   | 170 kg / 374.45 lbs       |  |

### Model 63200 Series

| SPECIFICATIONS-4     |               |  |               |  |                                       |                                      |
|----------------------|---------------|--|---------------|--|---------------------------------------|--------------------------------------|
| Nodel                | 63            | 210  | 63            | 211  | 633                                   | 212                                  |
| Power *1             | 1450W         | 14500W   | 15600W        | 15600W   | 10000W                                | 10000W                               |
| urrent               | 0~15A         | 0~150A   | 0~30A         | 0~150A   | 0~30A                                 | 0~150A                               |
| oltage*2             | 0~6           | 500V   | 10~1000V      |  | 10~1                                  | 000V                                 |
| Ain. Operating       | 1.5V @ 7.5A   | 1.5V @ 75A   | 5V @ 15A      | 5V @ 75A   | 5V @ 15A                              | 5V @ 75A                             |
| oltage               | 3V @ 15A      | 3V @ 150A  | 10V @ 30A     | 10V @ 150A   | 10V @ 30A                             | 10V @ 150A                           |
| onstant Current mod  |               | 57@150/(   | 101 @ 50/1    | 107 @ 150/(  | 101 @ 50/1                            | 101@150/1                            |
|                      | 0~15A         | 0~150A   | 0~30A         | 0~150A   | 0~30A                                 | 0~150A                               |
| lange                |               |  |               |  |                                       |                                      |
| esolution            | 4.9mA         | 39mA   | 7.5mA         | 37.5mA   | 7.5mA                                 | 37.5mA                               |
| ccuracy              | 0.1%+0.1%F.S. | 0.2%+0.1%F.S.  | 0.1%+0.1%F.S. | 0.2%+0.1%F.S.  | 0.1%+0.1%F.S.                         | 0.2%+0.1%F.S.                        |
| onstant Resistance M |               |  |               |  |                                       |                                      |
| ange                 | 0.1~400Ω      | 5~20000Ω   | 0.2~200Ω      | 8~8000Ω  | 0.2~200Ω                              | 8~8000Ω                              |
| esolution*3          | 3.21mS        | 80.1µS   | 14.3mS        | 360µS  | 14.3mS                                | 360µS                                |
| ccuracy *4           | 0.0128S+0.35% | 0.092S+0.1%  | 28.7mS+0.5%   | 715µS+0.5%   | 28.7mS+0.5%                           | 715µS+0.5%                           |
| ccuracy *6 (Vin>7V)  | 0.0128S+0.35% | 317.7µS+0.35%  |               |  |                                       |                                      |
| onstant Voltage mod  | e             |  |               |  |                                       |                                      |
| ange                 | 0~150V        | 0~600V   | 0~250V        | 0~1000V  | 0~250V                                | 0~1000V                              |
| esolution            | 40mV          | 162mV  | 62.5mV        | 250mV  | 62.5mV                                | 250mV                                |
| ccuracy              |               | 0.1%F.S.   |               | 0.1%F.S.   | 0.05%+                                | 0.1%F.S.                             |
| onstant Power mode   | 0.00 /01      |  | 0.00701       |  | 0.00701                               |                                      |
| ange                 | 5~1450W       | 50~14500W  | 2.5~1560W     | 20~15600W  | 2.5~1000W                             | 20~10000W                            |
| esolution            | 25mW          | 250mW  | 390mW         | 3.9W   | 2.5~1000W                             | 2.5W                                 |
|                      | -             |  |               |  |                                       |                                      |
|                      | 0.5%+0.5%F.S. |  | 0.5%+0.5%F.S. |  | 0.5%+0.5%F.S.                         |                                      |
| ynamic mode          |               |  |               |  |                                       |                                      |
| iming                |               |  |               |  |                                       |                                      |
| 1&T2                 | 0.025~10ms    | 1ms~30s  | 0.025~10ms    | 1ms~30s  | 0.025~10ms                            | 1ms~30s                              |
| esolution            | 1µs           | 1ms  | 1µs           | 1ms  | 1µs                                   | 1ms                                  |
| ccuracy              | 1µs+100ppm    | 1ms+100ppm   | 1µs+100ppm    | 1ms+100ppm   | 1µs+100ppm                            | 1ms+100ppm                           |
| lew rate             | 3mA~0.75A/µs  | 25mA~6A/µs   | 5mA~1.25A/µs  | 25mA~6.25A/µs  | 5mA~1.25A/µs                          | 25mA~6.25A/µ                         |
| esolution            | 3mA/µs        | 25mA/µs  | 5mA/µs        | 25mA/μs  | 5mA/µs                                | 25mA/µs                              |
| ccuracy              | 10% :         | ± 20µs   | 10% :         | ± 20µs   | 10% =                                 | ± 20µs                               |
| Ain. Rise Time       |               | (typical)  | 1             | typical)   | 24 µs (                               | typical)                             |
| urrent               | <b>i</b>      |  |               |  |                                       |                                      |
| lange                | 0~15A         | 0~150A   | 0~30A         | 0~150A   | 0~30A                                 | 0~150A                               |
| lesolution           | 4.9mA         | 39mA   | 0.6mA         | 3mA  | 0.6mA                                 | 3mA                                  |
|                      |               | %F.S.  |               | %F.S.  |                                       | %F.S.                                |
| leasurement          | 0.4           |  | 0.4           |  | 0.45                                  |                                      |
|                      |               |  |               |  |                                       |                                      |
| /oltage Read Back    | 0.4501/       | 0.000/   | 0.0501/       | 0.10001  | 0.0501/                               | 0.10001                              |
| lange                | 0~150V        | 0~600V   | 0~250V        | 0~1000V  | 0~250V                                | 0~1000V                              |
| lesolution           | 5.1mV         | 21mV   | 5mV           | 20mV   | 5mV                                   | 20mV                                 |
| ccuracy              | 0.05%+0       | 0.05%F.S.  | 0.05%+0       | 0.05%F.S.  | 0.05%+0                               | 0.05%F.S.                            |
| urrent Read Back     |               |  |               |  |                                       |                                      |
| lange                | 0~15A         | 0~150A   | 0~30A         | 0~150A   | 0~30A                                 | 0~150A                               |
| lesolution           | 0.64mA        | 5.1mA  | 0.6mA         | 3mA  | 0.6mA                                 | 3mA                                  |
| ccuracy              | 0.1%+0        | D.1%F.S.   | 0.1%+0        | 0.1%F.S.   | 0.1%+0                                | 0.1%F.S.                             |
| ower Read Back       |               |  |               |  |                                       |                                      |
| lange                | 0~1450W       | 0~14500W   | 0~1560W       | 0~15600W   | 0~1000W                               | 0~10000W                             |
| .ccuracy*7           |               | D.3%F.S.   |               | 0.3%F.S.   |                                       | 0.3%F.S.                             |
| ieneral              | 0.5701        |  | 0.57010       |  | 0.57010                               |                                      |
|                      |               |  |               |  |                                       |                                      |
| hort Circuit         | 154           | 1504   | 204           | 1504   | 204                                   | 1504                                 |
| Turrent              | 15A           | 150A   | 30A           | 150A   | 30A                                   | 150A                                 |
| nput Rating          |               | 10% V <sub>LN</sub> , 47~63Hz ;<br>10% V <sub>LN</sub> , 47~63Hz |               | 10% V <sub>LN</sub> , 47~63Hz ;<br>10% V <sub>LN</sub> , 47~63Hz | 1Ø 100/200Vac ± 1Ø 115/230Vac ±       | 10% VLN, 47~63Hz<br>10% VLN, 47~63Hz |
| Dimension            |               | 5x700mm/   | 1             | 5x700mm/   |                                       | 5x700mm/                             |
|                      |               |  |               |  |                                       |                                      |
| H x W x D)           |               | binch(cabinet)   |               | binch(cabinet)   |                                       | binch(cabinet)                       |
| Veight               | <u>y</u>      | 374.45 lbs   | <b>y</b>      | 374.45 lbs   | · · · · · · · · · · · · · · · · · · · | 374.45 lbs                           |
| afety & EMC          | (             | E  | (             | E  | 0                                     | E                                    |

**NOTE\*1**: The power rating specifications at ambient temperature=25°C and see the diagram below for power derating.

NOTE\*2: If the operating voltage exceeds the rated voltage for 1.1 times, it would cause permanent damage to the device.

**NOTE\*3 :** S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

NOTE\*4 : The Vin must be greater than min. operating voltage of each model.

**NOTE\*5 :** Setting error will be 1% for R<0.005  $\Omega$  at CRL range.

**NOTE\*6 :** The Vin must be greater than 7V of each model.

**NOTE\*7**: Power F.S. = Vrange F.S. x Irange F.S.

10-20

General Manufacturing T Purpose Execution System

Video & Color

Flat Panel Display

Lighting

### Model 6330A Series

|                        |                                 |               |   | mmm                    |
|------------------------|---------------------------------|---------------|---|------------------------|
| B0000                  | Certerior estato intercentinati |               |   | Opposed sites into and |
| 0.0000                 | 0.0000                          | 80000         | 80000 .<br>00000  |                        |
| 8 8 8<br>10 01 01 0000 | 8 8 8<br>61 01 CY 0010          | CC ON CV BONG | 00 CA (14 (15 (15 (16 (16 (16 (16 (16 (16 (16 (16 (16 (16 |                        |
| inmer.                 |                                 | owne.         |   | 8888                   |
|                        |                                 | 0.0           | 0.0   |                        |
|                        |                                 |               |   |                        |
|                        |                                 |               | and an other party of                                     |                        |
|                        |                                 |               |   | Ē                      |

#### **KEY FEATURES**

- Improve operating speeds of load for auto test system integration
- Synchronous paralleling control mode, allow Synchronous load control under static and dynamic Loading mode up to 6000W
- Up to 8 channels in one mainframe, fit for testing Multiple output SMPS.
- GPIB, RS-232 & USB Interfaces
- Max Power: 200W, 100W x 2(Dual), 30W&250W, 300W, 350W, 600W, 1200W
- Voltage Range:0~80V/0~120V/0~500V/0~600V
- CC, CR, CV, CP operating modes
- Dynamic loading with speed up to 20kHz
- Programmable slew rate, up to 10A/µs
- Only need 0.6V to draw rated current (63323A)
- Individual panel meters
- Real time power supplies load transient response simulation and output measurement
- 16-bit precision voltage and measurement with dual-range selection
- Remote sensing capability
- Short circuit test
- Self-test at power-on
- CE marking

Chroma Model 6330A series high speed DC electronic improves CPU clock, baud rate, parser and added synchronic parallel function for fast operation, which is ideal for auto test system integration to increase your manufacturing test throughput. Plugging the user selectable load modules into the system mainframe can also provide easy system configuration and future reconfiguration configure the system.

The 6330A family offers 12 types of modular loads with power ranging from 30 watts to 1200 watts, current from 0.5mA to 240A, and voltage measurement from 0.5mV to 500V. Each load is isolated and floating, programmable in dual current range and measuring voltage range, and capable of synchronizing with other modules for control operating. The load can be operated in constant current, constant voltage, and constant resistance.



With Synchronic parallel control capability, 6330A series loads allow users to parallel and synchronize more than one load together from an internal loading control signal. This feature provides synchronic dynamic loading test for multi-output power and high power test solution.

Real time measurement of voltage, current, is integrated into each 6330A load module using a 16-bit precision measurement circuit. The user can perform on line voltage measurement and adjustment, or simulate short circuit test using the simple keypad on the front panel.

The 6330A have self-diagnosis routine to maintain instrumental performance all the time. It is also protected against OP, OC, OT protection, and alarm indicating OV, reverse polarity to guarantee quality and reliability for even the most demanding engineering testing and ATE application.

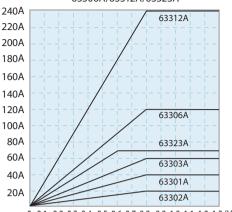
The FET technology accomplishes minimuminput resistance and enables the load to sink highcurrent even at very low voltage. For example, 120Vmodel 63303A is capable of sinking 60A at 1Voutput, and well-suited for testing the new 3V lowvoltage power supplies. Low voltage operation,down to zero volt, is possible at correspondinglyreduced current level. (see below)

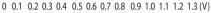
Chroma has created the industries first LED Load Simulator for simulating LED loading with our 63310A load model from our 6330A series Electronic Loads. By setting the LED power driver's output voltage, and current, the Electronic Load can simulate the LED's loading characteristics. The LED's forward voltage and operating resistance can also be set to further adjust the loading current and ripple current to better simulate LED characteristics. The 63310A design also has increased bandwidth to allow for PWM dimming testing.





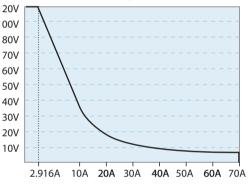
Low Voltage Characteristics (Typical) Model 63301A/63302A/63303A/ 63306A/63312A/63323A





Note: All specifications are measured at load input terminals. (Ambient Temperature of 25°C)

#### Model 63323A Input Characteristics



### Model 6330A Series

| SPECIFICATIONS-1               |  |                   |                           |                    |                           |                  |
|--------------------------------|--|-------------------|---------------------------|--------------------|---------------------------|------------------|
| Model                          | 633  | D1A               | 63302A (                  | 100Wx2)            | 633                       |                  |
| Power                          | 20W  | 200W              | 20W                       | 100W               | 30W                       | 300W             |
| Current                        | 0~4A   | 0~40A             | 0~2A                      | 0~20A              | 0~6A                      | 0~60A            |
| /oltage *3                     | 0~8  | VOV               | 0~8                       | 30V                | 0~80V                     |                  |
| /in. Operation Voltage (DC) *1 | 0.4V@2A  | 0.4V@20A          | 0.4V@1A                   | 0.4V@10A           | 0.4V@3A                   | 0.4V@30A         |
| Typical)                       | 0.8V@4A  | 0.8V@40A          | 0.8V@2A                   | 0.8V@20A           | 0.8V@6A                   | 0.8V@60A         |
| Constant Current Mode          | 0.010 111  | 0.07@10/1         | 0.0102/1                  | 0.01@2011          | 0.010011                  | 0.01@00/1        |
| Range                          | 0~4A   | 0~40A             | 0~2A                      | 0~20A              | 0~6A                      | 0~60A            |
| 3                              | 1mA  | 10mA              | 0.5mA                     | 5mA                | 1.5mA                     | 15mA             |
| Resolution                     |  |                   |                           |                    |                           |                  |
| Accuracy                       | 0.1%+0.1%F.S.  | 0.1%+0.2%F.S.     | 0.1%+0.1%F.S.             | 0.1%+0.2%F.S.      | 0.1%+0.1%F.S.             | 0.1%+0.2%F.S     |
| Constant Resistance Mode       |  |                   |                           |                    |                           |                  |
| lange                          | <b>0.0375</b> Ω ~150                                 | Ω (200W/16V)      |                           | Ω (100W/16V)       | 0.025Ω~100Ω               | 2 (300W/16V)     |
| lange                          | 1.875Ω~7.5kΩ   | 2 (200W/80V)      | 3.75Ω~15kΩ                | 2 (100W/80V)       | 1.25Ω~5kΩ                 | (300W/80V)       |
| Resolution*5                   | 6.667mS (2   | 200W/16V)         | 3.333mS (1                | 100W/16V)          | 10mS (30                  | 0W/16V)          |
| resolution 5                   | 133µS (200W/80V)                                     |                   | 66.667µS (                | 100W/80V)          | 200µS (30                 | 0W/80V)          |
|                                | 150 Ω: 0.1S + 0.2%                                   |                   | 300 Ω: 0.                 | 1S + 0.2%          | 100Ω:0.                   | 1S+ 0.2%         |
| Accuracy                       | $7.5k\Omega$ : 0.01S + 0.1%                          |                   |                           | 1S + 0.1%          | 5kΩ:0.0                   |                  |
| Constant Voltage Mode          | 7.51(32.0.0  | 15 1 0.170        | 151(32.0.0                | 1510.170           | 51(32.0.0                 | 151 0.170        |
|                                | 0.9  | 0\/               | 0.0                       | 201/               | 0.0                       | 201/             |
| Range                          | 0~80V<br>20mV  |                   | 0~8                       |                    | 0~8                       |                  |
| Resolution                     |  |                   |                           | mV                 | 20r                       |                  |
| Accuracy                       | 0.05% +  | 0.1%F.S.          | 0.05% +                   | 0.1%F.S.           | 0.05% +                   | 0.1%F.S.         |
| Constant Power Mode            |  |                   |                           |                    |                           |                  |
| Range                          | 0~20W  | 0~200W            | 0~20W                     | 0~100W             | 0~30W                     | 0~300W           |
| Resolution                     | 5mW  | 50mW              | 5mW                       | 25mW               | 7.5mW                     | 75mW             |
| Accuracy                       | 0.5% + 0   | ).5%F.S.          | 0.5% +                    | 0.5%F.S.           | 0.5% + 0                  | ).5%F.S.         |
| Ovnamic Mode                   |  |                   |                           |                    |                           |                  |
| Dynamic Mode                   | C.C. N   | Iode              |                           | Node               | C.C. M                    | Ande             |
|                                | 0.025ms ~ 50   |                   | 0.025ms ~ 50              |                    | 0.025ms ~ 50              |                  |
| 51 0 TO                        |  |                   |                           |                    |                           |                  |
| T1 & T2                        | 0.1ms ~ 500ms / Res: 25µs<br>10ms ~ 50s / Res: 2.5ms |                   | 0.1ms ~ 500ms / Res: 25µs |                    | 0.1ms ~ 500ms / Res: 25µs |                  |
|                                |  |                   | 10ms ~ 50s / Res: 2.5ms   |                    | 10ms ~ 50s / Res: 2.5ms   |                  |
| Accuracy                       | 1µs/1ms+   | -100ppm           | 1µs/1ms-                  |                    | 1µs/1ms-                  | -100ppm          |
| ilew Rate                      | 0.64~160mA/µs  | 6.4~1600mA/µs     | 0.32~80mA/µs              | 3.2~800mA/µs       | 0.001~0.25A/µs            | 0.01~2.5A/µs     |
| Resolution                     | 0.64mA/µs  | 6.4mA/µs          | 0.32mA/µs                 | 3.2mA/µs           | 0.001A/µs                 | 0.01A/µs         |
| Accuracy                       | 10% ±  | 20us              | 10% =                     | ±20us              | 10% ±                     | 20us             |
| Vin. Rise Time                 | 10µs (T  |                   | 10µs (Typical)            |                    | 10µs (Typical)            |                  |
| Current                        | 0~4A   | 0~40A             | 0~2A                      | 0~20A              | 0~6A                      | 0~60A            |
| Resolution                     | 1mA  | 10mA              | 0.5mA                     | 5mA                | 1.5mA                     | 15mA             |
|                                | 0.4%   |                   |                           |                    | 0.4%                      |                  |
| Accuracy                       | 0.4%   | )F.J.             | 0.4%                      | 0F.3.              | 0.4%                      | DF.J.            |
| Measurement Section            |  |                   |                           |                    |                           |                  |
| /oltage Read Back              |  |                   |                           |                    |                           |                  |
| Range                          | 0~16V  | 0~80V             | 0~16V                     | 0~80V              | 0~16V                     | 0~80V            |
| Resolution                     | 0.25mV   | 1.25mV            | 0.25mV                    | 1.25mV             | 0.25mV                    | 1.25mV           |
| Accuracy                       | 0.025% + 0   | ).025%F.S.        | 0.025% + 0                | 0.025%F.S.         | 0.025% + 0                | ).025%F.S.       |
| Current Read Back              |  |                   | 1                         |                    | 1                         |                  |
| Range                          | 0~4A   | 0~40A             | 0~2A                      | 0~20A              | 0~6A                      | 0~60A            |
| Resolution                     | 0.0625mA   | 0.625mA           | 0.03125mA                 | 0.3125mA           | 0.09375mA                 | 0.9375mA         |
|                                | 0.0625111A   |                   |                           |                    |                           |                  |
| Accuracy                       | 0.05% + (  | J.03%F.S.         | 0.05%+                    | 0.05%F.S.          | 0.05% + 0                 | J.US%F.S.        |
| Power Read Back*2              |  |                   | 0.000                     |                    | 0.0                       |                  |
| lange                          | 0~20W  | 0~200W            | 0~20W                     | 0~100W             | 0~30W                     | 0~300W           |
| Accuracy                       | 0.1% + 0   | ).1%F.S.          | 0.1%+                     | 0.1%F.S.           | 0.1%+0                    | 0.1%F.S.         |
| Protective Section             |  |                   |                           |                    |                           |                  |
| Over Power Protection          | Ye   | S                 | Ye                        | es                 | Ye                        | 25               |
| Over Current Protection        | Ye   |                   | Yes                       |                    | Yes                       |                  |
| Over Temperature Protection    | Ye   | -                 |                           | 25                 | Yes                       |                  |
| Over Voltage Alarm*3           | Ye   |                   |                           | 25                 | Yes                       |                  |
| Seneral                        |  | -                 |                           | -                  |                           | -                |
|                                |  |                   |                           |                    |                           |                  |
| Short Circuit                  | 1  | : 404             |                           | : 204              |                           |                  |
| Current (CC)                   | -  | ≒40A              | -                         | ≒20A               | -                         | ≒60A             |
| oltage (CV)                    | -  | 0V                | -                         | 0V                 | -                         | 0V               |
| lesistance (CR)                | -  | ≒ <b>0.0375</b> Ω | -                         | ≒ <b>0.075</b> Ω   | -                         | ≒ <b>0.025</b> Ω |
| ower (CP)                      | -  | ≒200W             | -                         | ≒100W              | -                         | ≒300W            |
| nput Resistance                |  |                   |                           | ( <b>T</b> · I)    |                           | <b>T</b> : D     |
| Load Off)                      | 100kΩ (  | Typical)          | 100kΩ                     | (Typical)          | 100kΩ (                   | Typical)         |
| Concentration Coefficient      | 100PPM/°C  | (Typical)         | 1000014/%                 | C (Typical)        | 100PPM/°0                 | (Typical)        |
|                                |  |                   |                           |                    |                           |                  |
| Power                          | Supply from 633                                      |                   | Supply from 63            |                    | Supply from 63            |                  |
| Dimension (H x W x D)          | 172x82x489.5mm                                       |                   |                           | / 6.8x3.2x19.3inch | 172x82x489.5mm            |                  |
| Neight                         | 4.2 kg /   |                   |                           | 9.3 lbs            |                           |                  |
| -                              |  |                   |                           |                    | 4.2 kg / 9.3 lbs          |                  |
| Operating Range                | 0~4  | 0°C               | 0~4                       | 0°C                | 0~4                       | 0°C              |

Video & Color

Flat Panel Display

Optical Devices

### Model 6330A Series

| Model Power Current  |   |   |   |   |  |  |
|--|---|---|---|---|--|--|
|  | 6330  | 05A   | 6330  | 06A   |  |  |
| Current  | 30W   | 300W  | 60W   | 600W  |  |  |
|  | 0~1A  | 0~10A   | 0~12A   | 0~120A  |  |  |
| Voltage*3  | 0~50  | 00V   | 0~8   | OV  |  |  |
| Min. Operation Voltage (DC) *1   | 1.0V@0.5A   | 1.0V@5A   | 0.4V@6A   | 0.4V@60A  |  |  |
| (Typical)  | 2.0V@1A   | 2.0V@10A  | 0.8V@12A  | 0.8V@120A   |  |  |
| Constant Current Mode  |   |   |   |   |  |  |
| Range  | 0~1A  | 0~10A   | 0~12A   | 0~120A  |  |  |
| Resolution   | 0.25mA  | 2.5mA   | 3mA   | 30mA  |  |  |
| Accuracy   | 0.1%+0.1%F.S.   | 0.1%+0.2%F.S.   | 0.1%+0.1%F.S.   | 0.1%+0.2%F.S.   |  |  |
| Constant Resistance Mode   | 0.17010.1701.5.   | 0.17010.2701.3.   | 0.17010.1701.5.   | 0.1/010.2/01.3.   |  |  |
| constant resistance mode   | 1.25Ω~5kΩ   | (300\\//125\/)  | 12.5mΩ~ 50Ω   | ) (600\\//16\/)   |  |  |
| Range  | 50Ω~200kΩ   |   | 0.625Ω~2.5kΩ  |   |  |  |
|  |   | (   |   |   |  |  |
| Resolution*5   | 200µS (300  |   | 20mS (60  |   |  |  |
|  | 5µS (300)   | -   | 400µS (60   |   |  |  |
| Accuracy   | 5kΩ:20m   |   | <b>50</b> Ω:0.4   |   |  |  |
|  | 200kΩ:5n  | nS+ 0.1%  | <b>2.5</b> kΩ:0.0   | 4S + 0.2%   |  |  |
| Constant Voltage Mode  |   |   |   |   |  |  |
| Range  | 0~50  |   | 0~8   |   |  |  |
| Resolution   | 125   |   | 20n   |   |  |  |
| Accuracy   | 0.05% +   | 0.1%F.S.  | 0.05% +   | 0.1%F.S.  |  |  |
| Constant Power Mode  |   |   |   |   |  |  |
| Range  | 0~30W   | 0~300W  | 0~60W   | 0~600W  |  |  |
| Resolution   | 7.5mW   | 75mW  | 15mW  | 150mW   |  |  |
| Accuracy   | 0.5% + 0  | ).5%F.S.  | 0.5% + 0  | ).5%F.S.  |  |  |
| Dynamic Mode   |   |   |   |   |  |  |
| Dynamic Mode   | C.C. N  | Node  | C.C. N  | lode  |  |  |
|  | 0.025ms ~ 50  | ms / Res: 5us   | 0.025ms ~ 50ms / Res: 5µs   |   |  |  |
| T1 & T2  | 0.1ms ~ 500m  |   | 0.1ms ~ 500m  |   |  |  |
|  | 10ms ~ 50s /  | •   | 10ms ~ 50s / Res: 2.5ms   |   |  |  |
| Accuracy   | 1µs/1ms+  |   | 1µs/1ms+100ppm  |   |  |  |
| Slew Rate  | 0.16~40mA/µs  | 1.6~400mA/μs  | 0.002~0.5A/µs   | 0.02~5A/µs  |  |  |
| Resolution   | 0.16mA/µs   | 1.6mA/μs  |   | 0.02~3Α/μs<br>0.02Α/μs  |  |  |
|  | • •   | •   | 0.002A/µs   | •   |  |  |
| Accuracy   | 10% ±   |   | 10% ±20μs   |   |  |  |
| Min. Rise Time   | 24µs (T   | /1 ·  | 10µs (Typical)  |   |  |  |
| Current  | 0~1A  | 0~10A   | 0~12A   | 0~120A  |  |  |
| Resolution   | 0.25mA  | 2.5mA   | 3mA   | 30mA  |  |  |
| Accuracy   | 0.4%  | bF.S.   | 0.4%  | F.S.  |  |  |
| Measurement Section  |   |   |   |   |  |  |
| Voltage Read Back  |   |   |   |   |  |  |
| Range  | 0~125V  | 0~500V  | 0~16V   | 0~80V   |  |  |
| Resolution   | 2mV   | 8mV   | 0.25mV  | 1.25mV  |  |  |
| Accuracy   | 0.025% + 0  | ).025%F.S.  | 0.025% + 0.025%F.S.   |   |  |  |
| Current Deed Deels   |   |   |   |   |  |  |
| Current Read Back  | 0~1A  | 0~10A   | 0.101   |   |  |  |
|  |   |   | 0~12A   | 0~120A  |  |  |
| Range  |   |   | 0~12A<br>0.1875mA   | 0~120A<br>1.875mA   |  |  |
| Range<br>Resolution  |   | 0.16mA  | 0.1875mA  | 1.875mA   |  |  |
| Range Resolution Accuracy  | 0.05% + 0   |   |   | 1.875mA   |  |  |
| Range Resolution Accuracy Power Read Back*2  | 0.05% + 0   | 0.05%F.S.   | 0.1875mA<br>0.05% + 0   | 1.875mA<br>0.05%F.S.  |  |  |
| Range Resolution Accuracy Power Read Back*2  | 0.05% + 0<br>0~30W  | 0.05%F.S.   | 0.1875mA<br>0.05% + 0<br>0~60W  | 1.875mA<br>0.05%F.S.<br>0~600W  |  |  |
| Range Resolution Resolution Power Read Back*2 Range Accuracy Range Resolution Range Resolution Range Resolution Range Resolution Resolutio Resolution Reso | 0.05% + 0   | 0.05%F.S.   | 0.1875mA<br>0.05% + 0   | 1.875mA<br>0.05%F.S.<br>0~600W  |  |  |
| Range Resolution Resolution Power Read Back*2 Range Accuracy Protective Section Range Resolution Re | 0.05% + 0<br>0~30W<br>0.1% + 0  | 0.05%F.S.<br>0~300W<br>0.1%F.S.   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.  |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Over Power Protection  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>%5   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.  |  |  |
| Range Resolution Resolution Power Read Back*2 Range Accuracy Protective Section Over Power Protection Over Current Protection Note Power Protection Resolution Protection Resolution Protection Resolution Protection Resolution Protection Resolution Protection Resolution Resolu | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>s   |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Protective Section         Over Power Protection       Over Current Protection         Over Temperature Protection       Protection  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0~300W<br>0~300W<br>0.1%F.S.<br>25<br>25  | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>s<br>s<br>s   |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Protective Section         Over Power Protection       Over Current Protection         Over Temperature Protection       Over Voltage Alarm*3  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye  | 0~300W<br>0~300W<br>0.1%F.S.<br>25<br>25  | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>s<br>s<br>s   |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Protective Section         Over Power Protection       Over Current Protection         Over Temperature Protection       Over Voltage Alarm*3  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0~300W<br>0~300W<br>0.1%F.S.<br>25<br>25  | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>s<br>s<br>s   |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Protective Section         Over Power Protection       Over Current Protection         Over Temperature Protection       Over Voltage Alarm*3         General       Short Circuit  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>%<br>%<br>%   |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Power Protection         Over Power Protection       Over Current Protection         Over Temperature Protection       Over Voltage Alarm*3         General       Short Circuit         Current (CC)       Image Protection  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25  |  |  |
| Range       Resolution         Accuracy       Accuracy         Power Read Back*2         Range       Accuracy         Protective Section       Over Power Protection         Over Power Protection       Over Current Protection         Over Temperature Protection       Over Voltage Alarm*3         General       Short Circuit         Current (CC)       Voltage (CV)  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss  |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Power Protection         Over Power Protection       Over Current Protection         Over Voltage Alarm*3       General         Short Circuit       Current (CC)         Voltage (CV)       Resistance (CR)  | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye  | 1.875mA     0.05%F.S.     0~600W     0.1%F.S.     s     s     s     s     s     =     120A     0V     ≒ 0.0125Ω   |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Power Protection         Over Power Protection       Over Current Protection         Over Temperature Protection       Over Voltage Alarm*3         General       Short Circuit         Current (CC)       Voltage (CV)         Resistance (CR)       Note Circuit   | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss  |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Power Read Back*2         Over Power Protection       Over Current Protection         Over Current Protection       Over Voltage Alarm*3         General       Short Circuit         Current (CC)       Voltage (CV)         Resistance (CR)       Power (CP)  | 0.05% + 0<br>0.05% + 0<br>0.05% + 0<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye   | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>-<br>-<br>-   | 1.875mA         0.05%F.S.         0~600W         0.1%F.S.         ss         ss |  |  |
| Range         Resolution         Accuracy         Power Read Back*2         Range         Accuracy         Protective Section         Over Power Protection         Over Current Protection         Over Voltage Alarm*3         General         Short Circuit         Current (CC)         Voltage (CV)         Resistance (CR)         Power (CP)         Input Resistance   | 0.05% + 0<br>0~30W<br>0.1% + 0<br>Ye<br>Ye  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye  | 1.875mA         0.05%F.S.         0~600W         0.1%F.S.         ss         ss |  |  |
| Range       Resolution         Accuracy       Power Read Back*2         Range       Accuracy         Protective Section       Pover Protection         Over Power Protection       Over Current Protection         Over Current Protection       Over Voltage Alarm*3         General       Short Circuit         Current (CC)       Voltage (CV)         Resistance (CR)       Power (CP)         Input Resistance       (Load Off)   | 0.05% + 0<br>0.05% + 0<br>0.05% + 0<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye   | 0.05% F.S. $0~300W$ $0.1% F.S.$ $25$ $25$ $25$ $25$ $25$ $25$ $25$ $25$   | 0.1875mA<br>0.05% + 0<br>0~60W<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>-<br>-<br>-   | 1.875mA         0.05%F.S.         0~600W         0.1%F.S.         ss         ss |  |  |
| Range         Resolution         Accuracy         Power Read Back*2         Range         Accuracy         Protective Section         Over Power Protection         Over Current Protection         Over Voltage Alarm*3         General         Short Circuit         Current (CC)         Voltage (CV)         Resistance (CR)         Power (CP)         Input Resistance         (Load Off)         Temperature Coefficient  | 0.05% + 0<br>0.05% + 0<br>0.05% + 0<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (<br>100PPM/*0   | 0.05% F.S. $0~300W$ $0.1% F.S.$ $25$ $25$ $25$ $25$ $35$ $35$ $35$ $35$ $35$ $35$ $35$ $3$  | 0.1875mA<br>0.05% + C<br>0~60W<br>0.1% + C<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (<br>100PPM/°C  | 1.875mA<br>0.05%F.S.<br>0~600W<br>0.1%F.S.<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>ss<br>s   |  |  |
| Range         Resolution         Accuracy         Power Read Back*2         Range         Accuracy         Protective Section         Over Power Protection         Over Current Protection         Over Voltage Alarm*3         General         Short Circuit         Current (CC)         Voltage (CV)         Resistance (CR)         Power (CP)         Input Resistance         (Load Off)         Temperature Coefficient         Power  | 0.05% + 0<br>0.05% + 0<br>0.05% + 0<br>0.1% + 0<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$ | 0.1875mA<br>0.05% + C<br>0~60W<br>0.1% + C<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (<br>100PPM/°C<br>Supply from 633                               | 1.875mA0.05%F.S.0~600W0.1%F.S.ss  |  |  |
| Resolution         Accuracy         Power Read Back*2         Range         Accuracy         Protective Section         Over Power Protection         Over Current Protection         Over Voltage Alarm*3         General         Short Circuit         Current (CC)         Voltage (CV)         Resistance (CR)         Power (CP)         Input Resistance         (Load Off)         Temperature Coefficient         Power         Dimension (HxWxD)  | 0.05% + 0     0.05% + 0     0.05% + 0     0.1% + 0     7e     Ye     Ye     Ye     Ye     100kΩ (     100PPM/*0     Supply from 63:     172x82x489.5mm /                                  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$<br>$\frac{1}{25}$ | 0.1875mA<br>0.05% + C<br>0~60W<br>0.1% + C<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (<br>100PPM/°C<br>Supply from 633<br>172x164x489.5mm            | 1.875mA         0.05%F.S.         0~600W         0.1%F.S.         ss         ss |  |  |
| RangeResolutionAccuracyPower Read Back*2RangeAccuracyProtective SectionOver Power ProtectionOver Current ProtectionOver Voltage Alarm*3GeneralShort CircuitCurrent (CC)Voltage (CV)Resistance (CR)Power (CP)Input Resistance(Load Off)Temperature CoefficientPowerDimension (HxWxD)Weight  | 0.05% + 0     0.05% + 0     0.05% + 0     0.1% + 0     0.1% + 0     Ye     Ye     Ye     Ye     Ye     Ye     100kΩ (     100PPM/°0     Supply from 63:     172x82x489.5mm /     4.2 kg / | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25   | 0.1875mA<br>0.05% + C<br>0~60W<br>0.1% + C<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (<br>100PPM/C<br>Supply from 633<br>172x164x489.5mm<br>7.3 kg / | 1.875mA         0.05%F.S.         0~600W         0.1%F.S.         ss         ss |  |  |
| RangeResolutionAccuracyPower Read Back*2RangeAccuracyProtective SectionOver Power ProtectionOver Current ProtectionOver Voltage Alarm*3GeneralShort CircuitCurrent (CC)Voltage (CV)Resistance (CR)Power (CP)Input Resistance(Load Off)Temperature CoefficientPowerDimension (HxWxD)  | 0.05% + 0     0.05% + 0     0.05% + 0     0.1% + 0     7e     Ye     Ye     Ye     Ye     100kΩ (     100PPM/*0     Supply from 63:     172x82x489.5mm /                                  | 0.05%F.S.<br>0~300W<br>0.1%F.S.<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35<br>35   | 0.1875mA<br>0.05% + C<br>0~60W<br>0.1% + C<br>Ye<br>Ye<br>Ye<br>Ye<br>Ye<br>100kΩ (<br>100PPM/°C<br>Supply from 633<br>172x164x489.5mm            | 1.875mA         0.05%F.S.         0~600W         0.1%F.S.         ss         ss |  |  |

### Model 6330A Series

| SPECIFICATIONS-3<br>Model  |   | 633074 (20            | )W & 250W)                |   | 623                       | 808A   |  |
|--|---|-----------------------|---------------------------|---|---------------------------|--|--|
| Power  | 30W   |                       | )W                        | 250W  | 60W                       | 600W   |  |
| Current  | 0~5A  |                       | -4A                       | 0~40A   | 0~2A                      | 0~20A  |  |
| /oltage*3  | 0-54  | <u> </u>              | 80V                       | 0.401   |                           | 500V   |  |
| Vin. Operation Voltage (DC) *1   | 0.4V@2.5A   | -                     | /@2A                      | 0.4V@20A  | 1.0V@1A                   | 1.0V@10A   |  |
| (Typical)  | 0.8V@5A   |                       | @2A<br>/@4A               | 0.8V@40A  | 2V@2A                     | 2V@20A   |  |
| Constant Current Mode  | 0.0V@JA   | 0.80                  | @4A                       | 0.01@40A  | 2V@2A                     | 2V@20A   |  |
| Range  | 0~5A  | 00                    | -4A                       | 0~40A   | 0~2A                      | 0~20A  |  |
| Resolution   | 1.25mA  |                       | nA                        | 10mA  | 0.5mA                     | 5mA  |  |
| Accuracy   | 0.1%+0.1%F.S.   |                       | 0.1%F.S.                  | 0.1%+0.2%F.S.   | 0.1%+0.1%F.S.             | 0.1%+0.2%F.S   |  |
| Constant Resistance Mode   | 0.170+0.1701.3.   |                       |                           | 0.170+0.1701.3.   | 0.170+0.2701.3            |  |  |
|  | 0.3Ω~1.2kΩ (30\   | N/16\/)               | 0.0375 (                  | 2~150Ω (250W/16V)   | 0.625 () ~2.5k            | (600)/(125 |  |
| Range  | 0.3 Ω ~1.2kΩ (30W/16V)         0.0375 Ω ~150 Ω (250W/16V)         0.625 Ω ~2.5kΩ (600W/125V)           15 Ω ~60kΩ (30W/80V)         1.875 Ω ~7.5kΩ (250W/80V)         25 Ω ~100kΩ (600W/500V) |                       |                           |   |                           |  |  |
|  | 833µS (30W/1  |                       |                           | 57μS (250W/16V)   | 400µS (600W/300V)         |  |  |
| Resolution*5   | 16.67µS (30W/8  |                       |                           | 3μS (250W/80V)  |                           | 0W/500V)   |  |
|  | <u>1.2kΩ:0.1S+0</u>   |                       |                           | $\Omega\Omega: 0.1S + 0.2\%$                                  | · · ·                     | mS+ 0.2%   |  |
| Accuracy   | $1.2 \times 22 \cdot 0.13 + 0.000$  |                       |                           | $\Omega_{22} 0.13 \pm 0.2\%$<br>$\Omega_{22} 0.015 \pm 0.1\%$ |                           | mS+ 0.2%   |  |
|  | OUK 12: 0.015 + 0   | J.1%                  | /.5                       | (12:0.015 + 0.1%)   | TUUK \2:5                 | 1115+0.1%  |  |
| Constant Voltage Mode  |   | 0                     | 001/                      |   | 0.1                       | 001/   |  |
| Range  |   |                       | 80V<br>mV                 |   |                           | 500V   |  |
| Resolution   |   |                       |                           |   |                           | 5mV  |  |
| Accuracy   |   | 0.05% +               | 0.1%F.S.                  |   | 0.05% +                   | 0.1%F.S.   |  |
| Constant Power Mode  | 0.2014/   |                       | 2014/                     | 0.25014   | 0 0011                    | 0.00014  |  |
| Range  | 0~30W   |                       | 30W                       | 0~250W  | 0~60W                     | 0~600W   |  |
| Resolution   | 7.5mW   |                       | mW                        | 62.5mW  | 15mW                      | 150mW  |  |
| Accuracy   | 0.5% + 0  |                       | 0.5%F.S.                  |   | 0.5% +                    | 0.5%F.S.   |  |
| Dynamic Mode   |   |                       |                           |   |                           |  |  |
| Dynamic Mode   |   |                       | Mode                      |   |                           | Mode   |  |
|  |   | 0.025ms ~ 50          | •                         |   | 0.025ms ~ 50ms / Res: 5µs |  |  |
| T1 & T2  |   | 0.1ms ~ 500r          | 0.1ms ~ 500ms / Res: 25µs |   |                           |  |  |
|  | 10ms ~ 50s / Res: 2.5ms   |                       |                           |   |                           | / Res: 2.5ms   |  |
| Accuracy   | 1µs/1m  |                       | 1µs/1ms+100ppm            |   |                           | +100ppm  |  |
| Slew Rate  | 0.8~200mA/µs  |                       | 50mA/μs                   | 64~1600mA/µs  | 0.32~80mA/µs              | 3.2~800mA/µ  |  |
| Resolution   | 0.8mA/µs  |                       | nA/μs                     | 64mA/µs   | 0.32mA/µs                 | 3.2mA/µs   |  |
| Accuracy   |   |                       | ±20µs                     |   |                           | ±20μs  |  |
| Vin. Rise Time   |   |                       | Typical)                  |   | 24µs (Typical)            |  |  |
| Current  | 0~5A  | 0~                    | 0~4A 0~40A                |   | 0~2A                      | 0~20A  |  |
| Resolution   | 1.25mA  |                       | mA                        | 10mA  | 0.5mA                     | 5mA  |  |
| Accuracy   |   | 0.40                  | %F.S.                     |   | 0.4                       | %F.S.  |  |
| Measurement Section  |   |                       |                           |   |                           |  |  |
| Voltage Read Back  |   |                       |                           |   |                           |  |  |
| Range  | 0~16V   | 0~80V                 | 0~16V                     | 0~80V   | 0~125V                    | 0~500V   |  |
| Resolution   | 0.25mV  | 1.25mV                | 0.25m\                    | / 1.25mV  | 2mV                       | 8mV  |  |
| Accuracy   |   | 0.025% +              | 0.025%F.S.                |   | 0.025% +                  | 0.025%F.S.   |  |
| Current Read Back  |   |                       |                           |   |                           |  |  |
| Range  | 0~5A  | 0~                    | -4A                       | 0~40A   | 0~2A                      | 0~20A  |  |
| Resolution   | 0.078125mA  | 0.062                 | 0.625mA 0.625mA           |   | 0.03125mA                 | 0.3125mA   |  |
| Accuracy   |   | 0.05% +               | 0.05%F.S.                 |   | 0.05% + 0.05%F.S.         |  |  |
| Power Read Back*2  |   |                       |                           |   |                           |  |  |
| Range  | 0~30W   | 0~3                   | 0~30W 0~250W              |   | 0~60W                     | 0~600W   |  |
| Accuracy   |   | 0.1% +                | 0.1%F.S.                  |   | 0.1% +                    | 0.1%F.S.   |  |
| Protective Section   |   |                       |                           |   |                           |  |  |
| Over Power Protection  |   | Y                     | es                        |   | Y                         | es   |  |
| Over Current Protection  |   | Y                     | 'es                       |   | Y                         | es   |  |
| Over Temperature Protection  |   | Y                     | 'es                       |   | Y                         | es   |  |
| Over Voltage Alarm*3   |   | Y                     | 'es                       |   | Y                         | es   |  |
| General  |   |                       |                           |   |                           |  |  |
| Short Circuit  |   |                       |                           |   |                           |  |  |
| Current (CC)   | -   |                       | -                         | ≒40A  | -                         | ≒20A   |  |
| /oltage (CV)   | -   | 1                     | -                         | 0V  | -                         | 0V   |  |
|  | -   |                       | -                         | =0.0375Ω  | -                         | ≒0.625Ω  |  |
|  |   | 1                     | -                         | ⇒250W   | -                         | = 600W   |  |
| Resistance (CR)  | -   | 1                     |                           |   |                           |  |  |
| Resistance (CR)<br>Power (CP)  | -   |                       |                           | 100kΩ (Typical)   |                           |  |  |
| Resistance (CR)<br>Power (CP)<br>Input Resistance  | -   |                       |                           |   |                           |  |  |
| Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)  | -   |                       |                           |   |                           |  |  |
| Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient                               | -   |                       |                           | 100PPM/°C (Typical)   | me                        |  |  |
| Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient<br>Power                      |   | (82)¥489 5mm          |                           | 100PPM/°C (Typical)<br>pply from 6334A Mainfra                |                           | 1/68x65x193inch  |  |
| Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient<br>Power<br>Dimension (HxWxD) | - 172)  | (82x489.5mm<br>4 5 kg | / 6.8x3.2x19.             | 100PPM/°C (Typical)<br>pply from 6334A Mainfra                | 172x164x489.5mn           | n / 6.8x6.5x19.3inch   |  |
| Resistance (CR)<br>Power (CP)<br>Input Resistance<br>(Load Off)<br>Temperature Coefficient                               | - 172   |                       |                           | 100PPM/°C (Typical)<br>pply from 6334A Mainfra                | 172x164x489.5mn           | n / 6.8x6.5x19.3inch<br>16.1 lbs   |  |

Turnkey Test & Automation

### Model 6330A Series

| SPECIFICATIONS-4  |   |   |  |  |  |  |
|---|---|---|--|--|--|--|
| Model   |   | 12A   | 633  |  |  |  |
| Power   | 120W  | 1200W   |  | W  |  |  |
| Current   | 0~24A   | 0~240A  | 0~7A   | 0~70A  |  |  |
| Voltage*3   |   | 80V   |  | 20V  |  |  |
| Min. Operation Voltage  | 0.4V@12A  | 0.4V@120A                                       | 0.05V @ 3.5A                                       | 0.3V @ 35A                                     |  |  |
| (DC) *1 (Typical)   | 0.8V@24A  | 0.8V@240A                                       | 0.1V @ 7A  | 0.6V @ 70A                                     |  |  |
| <b>Constant Current Mode</b>  |   |   |  |  |  |  |
| Range   | 0~24A   | 0~240A  | 0~7A   | 0~70A  |  |  |
| Resolution  | 6mA   | 60mA  | 0.125mA  | 1.25mA   |  |  |
| Accuracy  | 0.1%+0.1%F.S.                                       | 0.1%+0.2%F.S.                                   | 0.1%+0.1%F.S.                                      | 0.1%+0.1%F.S.                                  |  |  |
| <b>Constant Resistance Mo</b>   | de  |   |  |  |  |  |
|   |   | 2 (1200W/16V)                                   | 0.015 Ω ~150 Ω                                     | (350W/24V)*4                                   |  |  |
| Range   |   | Ω (1200W/80V)                                   |  | 350W/120V)                                     |  |  |
|   |   | 00W/16V)  |  | 0W/24V)*4                                      |  |  |
| Resolution*5  | 80µS (12  |   |  | DW/120V)                                       |  |  |
|   |   | 3S+ 0.8%  | $150\Omega: 67\text{mS} + 0.1\%$                   |  |  |  |
| Accuracy  |   |   | $2k\Omega: 5mS + 0.2\%$                            |  |  |  |
|   |   | .08S+ 0.2%                                      | 2K12:5M5 + 0.2%                                    |  |  |  |
| Constant Voltage Mode   |   |   | 1  |  |  |  |
| Range   |   | 80V   | 0~1  |  |  |  |
| Resolution  |   | mV  |  | nV   |  |  |
| Accuracy  | 0.05% +   | 0.1%F.S.  | 0.05% +  | 0.1%F.S.                                       |  |  |
| Constant Power Mode   |   |   |  |  |  |  |
| Range   | 0~120W  | 0~1200W   | 0~35W  | 0~350W   |  |  |
| Resolution  | 30mW  | 300mW   | 2.5mW  | 25mW   |  |  |
| Accuracy  |   | 0.5%F.S.  | 0.5% + 0   | · · · · ·                                      |  |  |
| Dynamic Mode  |   |   |  |  |  |  |
| Dynamic Mode  |   | Node  | C.C. N   | /ODF   |  |  |
|   |   | )ms / Res: 5µs                                  |  |  |  |  |
| T1 & T2   |   | ns / Res: 25µs                                  | 0.025ms~50ms/Res: 5µs                              |  |  |  |
| 11 0 12   |   | •   | 0.1ms~500ms / Res: 25μs                            |  |  |  |
|   |   | / Res: 2.5ms                                    | 10ms~50s / Res: 2.5ms                              |  |  |  |
| Accuracy  |   | +100ppm   |  | +100ppm  |  |  |
| Slew Rate   | 0.004~1A/µs   | 0.04~10A/µs                                     | 0.001~0.25A/µs                                     |  |  |  |
| Resolution  | 0.004A/µs   | 0.04A/µs  | 0.001A/µs  | 0.01A/µs                                       |  |  |
| Accuracy  | 10% :   | ±20μs   | 10% =  | ± 20µs   |  |  |
| Min. Rise Time  | 10µs (1   | Гурісаl)  | 25μs (Typical) *6                                  |  |  |  |
| Current   | 0~24A   | 0~240A  | 0~7A   | 0~70A  |  |  |
| Resolution  | 6mA   | 60mA  | 0.125mA  | 1.25mA   |  |  |
| Current Accuracy  | 0.49  | %F.S.   | 0.1%   | 6 F.S.   |  |  |
| Measurement Section   |   |   |  |  |  |  |
| Voltage Read Back   |   |   |  |  |  |  |
| Range   | 0~16V   | 0~80V   | 0~24V  | 0~120V   |  |  |
| Resolution  | 0.25mV  | 1.25mV  | 0.4mV  | 2mV  |  |  |
|   |   |   | 0.025%+0.015% F.S.                                 |  |  |  |
| Accuracy  | 0.025% +  | 0.025%F.S.                                      | 0.025%+0   | .01370 Г.З.                                    |  |  |
| Current Read Back   | 0.244   | 0.2404  | 0.74   | 0.704  |  |  |
| Range   | 0~24A   | 0~240A  | 0~7A   | 0~70A  |  |  |
| Resolution  | 0.375mA   | 3.75mA  | 0.125mA  | 1.25mA   |  |  |
| Accuracy  | 0.075% +  | 0.075%F.S.                                      | 0.04%+0  | .04% F.S.                                      |  |  |
| Power Read Back*2   |   |   |  |  |  |  |
| Range   | 0~120W  | 0~1200W   | 0~35W  | 0~350W   |  |  |
| Accuracy  | 0.1% +  | 0.1%F.S.  | 0.1%+0   | .1% F.S.                                       |  |  |
| Protective Section  |   |   |  |  |  |  |
| Over Power Protection   | Y   | es  | Ye   | es   |  |  |
| Over Current Protection   |   | es  | Yes  |  |  |  |
| Over Temperature  |   |   |  |  |  |  |
| Protection  | Ye  | es  | Yes  |  |  |  |
|   |   | 25  | Yoc  |  |  |  |
| Over Voltage Alarm*3  | Y   | = 3   | Yes  |  |  |  |
| General<br>Chart Circuit  |   |   |  |  |  |  |
| Short Circuit   |   | : 2404  |  | . 70 4   |  |  |
| Current (CC)  | -   | ≒240A   | -  | ≒70A   |  |  |
| Voltage (CV)  | -   | OV  | -  | 0V   |  |  |
| Resistance (CR)   | -   | ≒0.00625Ω                                       | -  | ≒ 0.01 Ω                                       |  |  |
| Power (CP)  | -   | ≒1200W  | -  | ≒ 350W   |  |  |
| Innut Resistance  |   |   |  |  |  |  |
|   | TUUK \2   | (Typical)                                       | <b>800k</b> Ω(                                     | (iypical)                                      |  |  |
| (Load Off)  |   |   | 100PPM/°   | C (Typical)                                    |  |  |
|   | 100PPM/°  | C (Typical)                                     | 100PPM/°C (Typical)                                |  |  |  |
| (Load Off)  |   |   | Supply from 6334A Mainframe                        |  |  |  |
| (Load Off)<br>Temperature Coefficient<br>Power                                | Supply from 63                                      | 34A Mainframe                                   | Supply from 63                                     | 34A Mainframe                                  |  |  |
| (Load Off)<br>Temperature Coefficient<br>Power<br>Dimension (HxWxD)           | Supply from 63<br>172x329x495mm /                   | 34A Mainframe<br>6.8x12.9x19.5inch              | Supply from 63<br>172x82x489.5mm                   | 34A Mainframe<br>/ 6.8x3.2x19.3inch            |  |  |
| (Load Off)<br>Temperature Coefficient<br>Power<br>Dimension (HxWxD)<br>Weight | Supply from 63<br>172x329x495mm /<br>14 kg /        | 34A Mainframe<br>(6.8x12.9x19.5inch<br>30.8 lbs | Supply from 63<br>172x82x489.5mm<br>4.2kg /        | 34A Mainframe<br>/ 6.8x3.2x19.3inch<br>9.3 lbs |  |  |
| (Load Off)<br>Temperature Coefficient<br>Power<br>Dimension (HxWxD)           | Supply from 63<br>172x329x495mm /<br>14 kg /<br>0~4 | 34A Mainframe<br>6.8x12.9x19.5inch              | Supply from 63<br>172x82x489.5mm<br>4.2kg /<br>0~4 | 34A Mainframe<br>/ 6.8x3.2x19.3inch            |  |  |

**NOTE\*1 :** Low voltage operation, under 0.8 volt, is possible at correspondingly reduced current level. Operating temperature range is 0°C to 40°C. All specifications apply for 25°C ± 5°C, except as noted **NOTE\*2 :** Power F.S.=Vrange F.S. x Irange F.S. **NOTE\*3 :** When the operating voltage exceeds the rated voltage for 1.02 times, a warning will occur and if it exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device.

**NOTE\*4** : Please refer to user's manual for detail specifications.

**NOTE \*5** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

**NOTE \*6** : The loading current should be 0.35A at least.

#### ORDERING INFORMATION

6332A: Mainframe for 2 Load Modules 6334A: Mainframe for 4 Load Modules 63301A: Load Module 80V/40A/200W 63302A: Load Module 80V/20A/100W x 2 63303A: Load Module 80V/60A/300W 63305A: Load Module 500V/10A/300W 63306A: Load Module 80V/120A/600W 63307A: Load Module 80V/5A & 40A/30W & 250W 63308A: Load Module 500V/20A/600W 63312A: Load Module 80V/240A/1200W 63323A: Load Module 120V/70A/350W A631000: GPIB Interface for Model 6334A/6332A Mainframe A631001: Remote Controller A631003: USB Interface for Model 6334A/6332A Mainframe A631005: Softpanel for 6310A/6330A series A631006: Rack Mounting Kit for Model 6332A Mainframe A631007: Rack Mounting Kit for Model 6334A Mainframe A632004: Sync. Link Box for 6330A/63200 Series A800042: Test Fixture **LED Load Simulator for LED Driver Test** 63310A: Load Module 500V/2A/100W x 2 63313A: Load Module 300V/20A/300W 63315A: Load Module 600V/20A/300W

# High Speed DC Electronic Load

# Model 6330A Series

| SPECIFICATIONS             |                                     |   |   |  |   |   |
|----------------------------|-------------------------------------|---|---|--|---|---|
| Model                      | 63310A (                            | 100Wx2)   | 633   | 313A   | 63315A                                  |   |
| Power                      | 10                                  | W   | 30  | OW   | 30                                      | OW  |
| Current                    | 0~0.6A                              | 0~2A  | 0~5A  | 0~20A  | 0~5A                                    | 0~20A   |
| Voltage *1                 | 0~5                                 | 00V   | 0~3   | 300V   | 0~6                                     | 00V   |
| Min. Operating Voltage     | e 6Ve                               | ¢2A   | 4V@   | 20A  | 4V@                                     | 20A   |
| <b>Constant Current Mo</b> | ode                                 |   |   |  |   |   |
| Range                      | 0~0.6A                              | 0~2A  | 0~5A  | 0~20A  | 0~5A                                    | 0~20A   |
| Resolution                 | 12µA                                | 40µA  | 100µA   | 400µA  | 100µA                                   | 400µA   |
| Accuracy                   | 0.1%+0                              | 0.1% F.S.   | 0.1%+0.1% F.S.  | 0.1%+0.2% F.S.   | 0.1%+0.1% F.S.                          | 0.1%+0.2% F.S.  |
| Constant Resistance        | Mode                                |   |   | ,  |   |   |
| Range                      |                                     | Ω (100W/100V)<br>Ω (100W/500V)  | CRL @ CL : 0.8 Ω ~  | 200Ω (300W/60V)<br>800Ω (300W/60V)<br>łkΩ (300W/300V)  | CRL @ CL : 0.8 Ω ~                      | 200Ω (300W/60V)<br>800Ω (300W/60V)<br>8kΩ (300W/600V)       |
| Resolution*2               | CRH :                               | 52.5μS<br>6.25μS  | CRL @ 0   | Η : 100μS<br>CL : 25μS<br>CL : 5μS   | CRL @ C                                 | Η :100μS<br>CL : 25μS<br>CL : 2.5μS                         |
| Accuracy                   |                                     | nS+0.2%<br>mS+0.1%  | 0.2% (setti   | ng + range)  | 0.2% (setti                             | ng + range)   |
| Constant Voltage Mo        |                                     |   |   |  |   |   |
| Range                      | 1                                   | 00V   | 0~3   | 300V   | 0~6                                     | 600V  |
| Resolution                 |                                     | mV  |   | mV   |   | mV  |
| Accuracy                   | -                                   | 0.1%F.S.  | 0.05% + 0.1%F.S.  |  |   | 0.1%F.S.  |
| LED Mode                   | 0.05701                             | 0.1701.5.   | 0.03701   | 0.1701.5.  | 0.03701                                 | 0.1701.5.   |
| Range                      | R₄ Coefficie<br>V⊧: 0~100<br>Curren | e: 0~100V/0~500V<br>nt : 0.001~1<br>V/0~500V<br>t : 0~2A<br>/10Ω~10kΩ | V⊧ : 0~60<br>LEDL @ CH : 0~60V- 0<br>LEDL @ CL : 0~60V- 0 | nt : 0.001~1<br>V/0~300V<br>~20A (Rd: 0.05 Ω~50 Ω)<br>~5A (Rd: 0.8 Ω~800 Ω)<br>- 0~5A (Rd: 4 Ω~4k Ω) |   | ~5A (Rd: 0.8 Ω ~800 Ω                                       |
| Resolution *2              | lo:0<br>Ra Coeffici<br>Ra:62.5µ     | V/20mV<br>.1mA<br>ent : 0.001<br>IS/6.25µS<br>V/20mV                  | lo : 100μ<br>R₄ Coeffic<br>R₄ : 400μS /                   | mV/6mV<br>ιΑ/400μΑ<br>ient : 0.001<br>/ 25μS / 5μS<br>nV/ 6mV  | lo : 100μ<br>R₀ Coeffici<br>R₀ : 400μS/ | nV/12mV<br>A/400μA<br>ient : 0.001<br>25μS/2.5μS<br>// 60mV |
| Dynamic Mode               |                                     |   |   |  |   |   |
| Dynamic Mode               | -                                   | -   | C.C.  | Mode   | C.C.                                    | Mode  |
| T1 & T2                    | -                                   | -   | 0.1ms ~ 500r  | Dms / Res: 5µs<br>ns / Res: 25µs<br>/ Res: 2.5ms   | 0.1ms ~ 500r                            | )ms / Res: 5μs<br>ns / Res: 25μs<br>/ Res: 2.5ms            |
| Accuracy                   | -                                   | -   | 1µs/1ms   | +100ppm  | 1µs/1ms-                                | +100ppm   |
| Slew Rate                  | -                                   | -   | 0.8~200mA/µs  | 3.2~800mA/µs   | 0.8~200mA/µs                            | 3.2~800mA/µs  |
| Resolution                 | -                                   | -   | 0.8mA/µs  | 3.2mA/µs   | 0.8mA/µs                                | 3.2mA/µs  |
| Accuracy                   | -                                   | -   | · ·   | ±20μs  | · · ·                                   | ±20µs   |
| Min. Rise Time             | -                                   | -   |   | Typical)   |   | Typical)  |
| Current                    | -                                   | -   | 0~5A  | 0~20A  | 0~5A                                    | 0~20A   |
| Resolution                 |                                     |   | 100µA   | 400µA  | 100µA                                   | 400µA   |
| Accuracy                   |                                     | -   | 0.4%F.S.  |  | 0.4%F.S.                                |   |
| Measurement Sectio         |                                     |   | 5.4   |  | 5.47                                    |   |
| Voltage Read Back          |                                     |   |   |  |   |   |
|                            | 0~100V                              | 0~500V  | 0~60V   | 0~300V   | 0~60V                                   | 0~600V  |
| Range<br>Resolution        |                                     | 1   | 1   | 1  |   |   |
|                            | 2mV                                 | 10mV  | 1.2mV   | 6mV  | 1.2mV                                   | 12mV  |
| Accuracy                   | 0.025%+0                            | 0.025% F.S.   | 0.025%+0  | 0.025% F.S.  | 0.025%+0                                | 0.025% F.S.   |
| Current Read Back          |                                     |   |   |  |   |   |
| Range                      | 0~0.6A                              | 0~2A  | 0~5A  | 0~20A  | 0~5A                                    | 0~20A   |
| Resolution                 | 12µA                                | 40µA  | 100µA   | 400µA  | 100µA                                   | 400µA   |
| Accuracy                   | 0.05%+0                             | 05% ES  | 0.05%+0   | ).05% F.S.   | 0.05%+0                                 | 0.5% ES   |

**NOTE\*1** : If the operating voltage exceeds 1.1 times of the rated voltage, it would cause permanent damage to the device. **NOTE\*2** : S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

| Mainframe Model       | 6332A   | 6334A   |
|-----------------------|---|---|
| Number of slots       | 2   | 4   |
| Operating Temperature | 0~40°C  | 0~40°C  |
| Input Pating          | 1Ø 100/200Vac $\pm$ 10% V <sub>LN</sub> , 47~63Hz ; | 1Ø 100/200Vac $\pm$ 10% V <sub>LN</sub> , 47~63Hz ; |
| Input Rating          | 1Ø 115/230Vac ± 10% VLN, 47~63Hz                    | 1Ø 115/230Vac ± 10% VLN, 47~63Hz                    |
| Dimension (HxWxD)     | 194x275x550mm / 7.6x10.8x21.7inch                   | 194x439x550mm / 7.6x17.3x21.7inch                   |
| Weight                | 15 kg / 33.1 lbs                                    | 21.5 kg / 47.4 lbs                                  |

PXITest & General Ma Measurement Purpose Exec

Video & Flat Panel LED/ Color Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

> Power Electronics

 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Automation
 Component
 Safety
 IC

### Model 63600 Series



#### **KEY FEATURES**

- Max. Power : 100W x 2(Dual), 300W & 400W
- Voltage Range : up to 600V
- 5 module mainframe Max. 2000W, load modules up to 400W/ea
- Up to 10 channels in one mainframe, fit for testing multiple output SMPS
- 0.4V @ 80A (Typical) low voltage operating characteristics
- Flexible CC, CR, CV and CP operation modes
- CZ mode for turn on capacitive load simulation
- Parallel mode for high current and power application up to 2kW
- User defined waveform
- Multi Channel synchronous control
- Auto frequency sweep up to 50kHz
- Real time power supply load transient response simulation and Vpk+/- measurement
- User programmable 100 sequential front panel input status for user-friendly operating
- Precision voltage and current measurement
- Precision high speed digitizing measurement/ data capture
- Voltage, Current and Pmax measurement for OCP/OLP testing
- Timing measurement for batteries
- Short circuit simulation
- Self-test at power-on
- Full Protection : OC, OP, OT protection and OV alarm
- Ethernet, USB and GPIB interfaces

**Power Rating** 

100% 87.5%



Chroma's 63600 Series DC Electronic Loads are designed for testing multi-output AC/DC power supplies, DC/DC converters, chargers, batteries, adapters, and power electronic components. They are excellent for research, development, production, and incoming inspection applications.

The 63600's state of the art design uses DSP technology to simulate non-linear loads using an unique CZ operation mode allowing realistic loading behavior.

The 63600 series can draw its rated current under very low voltage (0.4V typical). This unique feature guarantees the best loading performance for modern Point-of-Load conditions and fuel cells.

The 63600 series can simulate a wide range of dynamic loading applications, with programmable load levels, slew rates, duration, and conducting voltage. The 63600 also has a dynamic sweep function to meet the test requirements of ATX power supplies. The instrument allows up to 100 sets of system operating status which can be stored in the EEPROM and recalled instantly for automated testing application.

Real time measurement of voltage and current are integrated into each 63600 load module using a 16-bit measurement circuit with three current ranges. The user can perform online voltage measurements and adjustments or simulate short circuit test using the simple keypad on the front panel.

With the VFD display and rotary knob, the 63600 loads offer versatile front panel operation. Users are able to control the 63600 family remotely via Ethernet, USB, or GPIB interface.

Also included in the 63600 are self-diagnostic routines and full protections against OP, OC, OT and alarm indicating OV, reverse polarity. This ensures the quality and reliability of the 63600 and provides protection of units under test.

#### **ORDERING INFORMATION**

**63600-1** : 63600 mainframe for single module **63600-2** : 63600 mainframe for 2 modules **63600-5** : 63600 mainframe for 5 modules (Max. 10 channels)

**63601-5** : 63600 mainframe for 5 modules (Only one slot for dual channel load module, Max. 6 channels)

63610-80-20 : DC Load module, 80V / 20A / 100Wx2 63630-80-60 : DC Load module, 80V / 60A / 300W 63630-600-15 : DC Load module, 600V / 15A / 300W 63640-80-80 : DC Load module, 80V / 80A / 400W 63640-150-60 : DC Load Module, 150V / 60A / 400W A632006 : NI USB-6211 Bus-Powered Multifunction DAQ

A636000 : GPIB interface for 63600-2 / 63600-5 / 63601-5 mainframe A636001 : Ethernet interface for 63600-2/63600-5 mainframe A636003 : External signal board (Test Pin) for 63600-2 / 63600-5 / 63601-5 mainframe A636005 : External signal board (BNC) for 63600-2 / 63600-5 / 63601-5 mainframe A636007 : Rack mounting kit for 63600-2 mainframe A636008 : Rack mounting kit for 63600-5/63601-5 mainframe (for Europe only) A636009 : Ethernet & USB interfaces for 63601-5 mainframe A636010: Ethernet interface for 63601-5 mainframe



Model 63600-2



Model 63600-5



Note \*1 : None digital interface option

Note \*2 : The dual channel module 63610-80-20 can only be placed at the rightmost slot.

Ambient Temperature

35 40



# Model 63600 Series

| SPECIFICATIONS-1                       |   | (2(10.00.20   |                      |                   | (2(20.00.00   |                      |
|--|---|---|----------------------|-------------------|---|----------------------|
| Model                                  |   | 63610-80-20   |                      | 63630-80-60       |   |                      |
| Configuration                          |   | 100Wx2  |                      |                   | 300W  |                      |
| Voltage *1 *8                          |   | 0~80V   |                      |                   | 0~80V   |                      |
| Current                                | 0~0.2A  | 0~2A  | 0~20A                | 0~0.6A            | 0~6A  | 0~60A                |
| Power *2                               | 0~16W   | 0~30W   | 0~100W               | 0~30W             | 0~60W   | 0~300W               |
| Static Mode                            |   |   |                      |                   |   |                      |
| Typical Min. Operating<br>Voltage (DC) | 0.5V@0.2A                                       | 0.5V@2A   | 0.5V@20A             | 0.5V@0.6A         | 0.5V@6A   | 0.5V@60A             |
| Constant Current Mode                  |   |   |                      |                   |   |                      |
| Range                                  | 0~0.2A  | 0~2A  | 0~20A                | 0~0.6A            | 0~6A  | 0~60A                |
| Resolution                             | 0.01mA  | 0.1mA   | 1mA                  | 0.01mA            | 0.1mA   | 1mA                  |
| Accuracy                               |   | 0.1%+0.1%F.S.   |                      | '                 | 0.1%+0.1%F.S.   |                      |
| Constant Resistance Mo                 | de  |   |                      |                   |   |                      |
| Range                                  | CRM   | L : 0.04~80 Ω (100W/6<br>l: 1.44~2.9k Ω (100W/1<br>l : 5.76~12k Ω (100W/8 | 6V)                  | CRM               | _:0.015~30Ω (300W/6<br>M:0.3~600Ω (300W/16<br>H:1.5~3kΩ (300W80 | 5V)                  |
| Resolution *9                          |   | 0.3288mS  |                      |                   | 0.9864mS  | • /                  |
| Accuracy *3                            |   | 0.1%+0.075S (6V)<br>0.1%+0.01S (16V)<br>0.1%+0.00375S (80V)               |                      |                   | 0.1%+0.25 (6V)<br>0.1%+0.035 (16V)<br>0.1%+0.015 (80V)          |                      |
| Constant Voltage Mode                  |   |   |                      |                   |   |                      |
| Range                                  | 0~6V  | 0~16V   | 0~80V                | 0~6V              | 0~16V   | 0~80V                |
| Resolution                             | 0.1mV   | 1mV   | 1mV                  | 0.1mV             | 1mV   | 1mV                  |
| Accuracy                               |   | 0.05%+0.1%F.S.  |                      |                   | 0.05%+0.1%F.S.  |                      |
| Constant Power Mode                    |   |   |                      |                   |   |                      |
| Range                                  | 0~2W  | 0~10W   | 0~100W               | 0~6W              | 0~30W   | 0~300W               |
| Resolution *9                          | 1mW   | 10mW  | 100mW                | 3.2mW             | 32mW  | 320mW                |
| Accuracy *4                            |   | 0.3%+0.3%F.S.   | 1001111              | 5.211100          | 0.3%+0.3%F.S.   | 52011177             |
| Dynamic Mode - CC                      |   |   |                      |                   |   |                      |
| •                                      | 1   | 1 5\/   |                      |                   | 1 5\/   |                      |
| Ain. Operating Voltage                 | 1.5V  |   |                      | 100               | 1.5V  | 11-                  |
| requency                               | 100Hz~50kHz/0.01Hz~1kHz 100Hz~50kHz/0.01Hz~1kHz |   |                      |                   |   |                      |
| Duty                                   | 1~99% (Min. Rise Time Dominated)                |   |                      | 1~99%             | (Min. Rise Time Domi  | nated)               |
| Accuracy                               |   | 1µs/1ms+100ppm  |                      |                   | 1µs/1ms+100ppm  |                      |
| Slew Rate                              | 0.04A/ms~0.02A/µs                               | 0.4A/ms~0.2A/µs   | 4A/ms~2A/µs          | 0.12A/ms~0.06A/µs | 1.2A/ms~0.6A/µs   | 12A/ms~6A/µ          |
| Resolution                             | 0.01mA/µs                                       | 0.1mA/µs  | 1mA/µs               | 0.01mA/µs         | 0.1mA/µs  | 1mA/µs               |
| Accuracy                               |   | 10% ±20µs   |                      |                   | 10% ±20µs   |                      |
| Vin. Rise Time                         |   | 10 µs   |                      |                   | 10 µs   |                      |
| Current                                |   |   |                      |                   |   |                      |
| Range                                  | 0~0.2A  | 0~2A  | 0~20A                | 0~0.6A            | 0~6A  | 0~60A                |
| Resolution                             | 0.01mA  | 0.1mA   | 1mA                  | 0.01mA            | 0.1mA   | 1mA                  |
| xt Wave Mode(20kHz) :                  | СС  |   |                      |                   | · · · · · · · · · · · · · · · · · · ·                           |                      |
| Range                                  | 0~0.2A  | 0~2A  | 0~20A                | 0~0.6A            | 0~6A  | 0~60A                |
| .evel                                  |   | 0~10V   |                      |                   | 0~10V   |                      |
| Accuracy                               |   | 0.5%F.S.  |                      |                   | 0.5%F.S.  |                      |
| Veasurement                            |   |   |                      |                   |   |                      |
| /oltage Read Back                      |   |   |                      |                   |   |                      |
| Range                                  | 0~6V  | 0~16V   | 0~80V                | 0~6V              | 0~16V   | 0~80V                |
| Resolution                             | 0.1069mV  | 0.2849mV  | 1.3537mV             | 0.1069mV          | 0.2849mV  | 1.3537mV             |
| Accuracy *5                            | 0.025%+(  |   | 0.01%+<br>0.025%F.S. | 0.025%+0          |   | 0.01%+<br>0.025%F.S. |
| Current Read Back                      | I   |   | 0.020701.0.          |                   |   | 0.025701.5.          |
|  | 0~0.2A  | 0~2A  | 0~20A                | 0~0.6A            | 0~6A  | 0~60A                |
| Range<br>Resolution                    | 0.003349mA                                      | 0~2A<br>0.034628mA  | 0.329561mA           | 0.009942mA        | 0~6A<br>0.101748mA  | 1.009878mA           |
| Accuracy *5                            | 0.005549IIIA                                    | 0.034628mA  | 0.52950 IIIIA        | 0.009942IIIA      | 0.05%+0.05%F.S.   | 1.009070IIIA         |
| Power Read Back                        | 1   | 0.03%+0.03%F.3.   |                      |                   | 0.03%+0.03%F.3.   |                      |
|  | 0.1614/   | 0.2014/   | 0 10014/             | 0.2014/           | 0.0011  | 0.2001//             |
| lange                                  | 0~16W   | 0~30W   | 0~100W               | 0~30W             | 0~60W   | 0~300W               |
| ccuracy *5                             |   | 0.1%+0.1%F.S.   |                      |                   | 0.1%+0.1%F.S.   |                      |
| oltage Monitor                         | 1   |   |                      |                   |   |                      |
| Bandwidth                              |   | 20 kHz  |                      |                   | 20 kHz  |                      |
| Range                                  | 0~6V  | 0~16V   | 0~80V                | 0~6V              | 0~16V   | 0~80V                |
| Dutput                                 |   | 0~10V   |                      |                   | 0~10V   |                      |
| Accuracy                               |   | 0.5%F.S.  |                      |                   | 0.5%F.S.  |                      |
|  |   |   |                      |                   |   |                      |
| Current Monitor                        |   |   |                      |                   | 20 kHz  |                      |
| Current Monitor<br>Bandwidth           |   | 20 kHz  |                      |                   | 20 KHZ  |                      |
| Bandwidth                              | 0~0.2A  | 20 kHz<br>0~2A  | 0~20A                | 0~0.6A            | 0~6A  | 0~60A                |
|  | 0~0.2A  |   | 0~20A                | 0~0.6A            |   | 0~60A                |

Video & Color

Flat Panel LED/ Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Automation
 Component
 Safety
 IC

PXI Test & Measurement

General Manufacturing T Purpose Execution System

## Model 63600 Series

| SPECIFICATIONS-2<br>Model                                   |            | (2(20,00,45        |            |            | 62640.00.00                |            |           | COC 40 450 CO    |           |
|---|------------|--------------------|------------|------------|----------------------------|------------|-----------|------------------|-----------|
|   |            | 63630-600-15       |            |            | 63640-80-80                |            |           | 63640-150-60     |           |
| Configuration   |            | 300W               |            |            | 400W                       |            |           | 400W             |           |
| Voltage *1 *8   |            | 0~600V             |            |            | 0~80V                      |            |           | 0~150V           | 1         |
| Current   | 0~0.15A    | 0~1.5A             | 0~15A      | 0~0.8A     | 0~8A                       | 0~80A      | 0~1A      | 0~6A             | 0~60A     |
| Power *2  | 0~90W      | 0~300W             | 0~300W     | 0~60W      | 0~60W                      | 0~400W     | 0~90W     | 0~400W           | 0~400W    |
| Static Mode   |            |                    |            |            |                            |            |           |                  |           |
| Typical Min. Operating                                      | 2V@0.15A   | 2V@1.5A            | 2V@15A     | 0.4V@0.8A  | 0.4V@8A                    | 0.4V@80A   | 0.3V@1A   | 0.3V@6A          | 0.9V@30A  |
| Voltage (DC)  | 2V@0.15A   | 2V@1.5A            | 21@13A     | 0.40@0.0A  | 0.40@0A                    | 0.4V@00A   | 0.51@17   | 0.51@0A          | 1.8V@60A  |
| Constant Current Mo   | de         | ·                  | ^          |            | ·                          |            |           | ^                |           |
| Range   | 0~0.15A    | 0~1.5A             | 0~15A      | 0~0.8A     | 0~8A                       | 0~80A      | 0~1A      | 0~6A             | 0~60A     |
| Resolution  | 0.005mA    | 0.05mA             | 0.5mA      | 0.01mA     | 0.1mA                      | 1mA        | 0.02mA    | 0.1mA            | 1mA       |
| Accuracy  | 0.00011111 | 0.1%+0.1%F.S.      | 0.5111/1   | 0.011171   | 0.1%+0.1%F.S.              |            |           | 0.04%+0.04%F.S   |           |
| Constant Resistance I                                       | Mode       | 0.17010.1701.3.    |            |            | 0.17010.1701.3.            |            |           | 0.047010.04701.  |           |
| Constant nesistance i                                       |            | .133~270Ω(300      | W//20\/)   | CDL 1      | 0.01~20Ω (400 <sup>v</sup> | M/(CM)     | CDL       | ).03~60Ω(400V    | V//16\/)  |
| Damara  |            |                    |            |            |                            |            |           |                  |           |
| Range   |            | 1.92~4kΩ(300W      |            |            | ).36~720Ω (400             |            |           | ).64~800Ω(400    |           |
|   | CRH:2      | 08~200kΩ(300\      | V/600V)    | CRH:1      | .45~2.9kΩ (400             | W/80V)     | CRH : 6.  | 25~1.5kΩ(400)    | W/150V)   |
| Resolution *9   |            | 0.2435mS           |            |            | 1.322mS                    |            |           | 1mS              |           |
|   |            | 0.1%+0.02S (80V    | ')         | 0          | 0.1%+0.275S (6V            | /)         |           | .1%+0.067S (16   | ,         |
| Accuracy *3   | 0.         | 1%+0.0005S (150    | OV)        | 0          | .1%+0.0365 (16)            | V)         | 0.1       | %+0.006255 (8    | 0V)       |
|   | 0.         | 1%+0.0003S (600    | OV)        | 0.1        | 0.01375S (80               | 0V)        | 0.        | 1%+0.002S (150   | OV)       |
| Constant Voltage Mo   | de         |                    |            |            |                            |            |           |                  |           |
| Range   | 0~80V      | 0~150V             | 0~600V     | 0~6V       | 0~16V                      | 0~80V      | 0~16V     | 0~80V            | 0~150V    |
| Resolution  | 1mV        | 10mV               | 10mV       | 0.1mV      | 1mV                        | 1mV        | 1mV       | 1mV              | 10mV      |
| Accuracy  | 111.4      | 0.05%+0.1%F.S.     |            |            | 0.05%+0.1%F.S.             |            | -         | .025%+0.025%F    |           |
| Accuracy 0.05%+0.1%F.S. 0.025%+0.025%F.S. 0.025%+0.025%F.S. |            |                    |            |            |                            |            |           |                  |           |
|   |            | 0 2014/            | 0.20014/   | 0~8W       | 0~40W                      | 0 400144   | 0~8W      | 0 40144          | 0~400W    |
| Range   | 0~6W       | 0~30W              | 0~300W     |            |                            | 0~400W     |           | 0~40W            |           |
| Resolution *9   | 5.625mW    | 56.25mW            | 562.5mW    | 4mW        | 40mW                       | 400mW      | 4mW       | 40mW             | 400mW     |
| Accuracy *4   |            | 0.3%+0.3%F.S.      |            |            | 0.3%+0.3%F.S.              |            |           | 0.3%+0.3%F.S.    |           |
| Dynamic Mode - CC   |            |                    |            |            |                            |            |           |                  |           |
| Min. Operating  |            | 3V                 |            |            | 1.5V                       |            |           | 1.8V             |           |
| Voltage   |            | 21                 |            |            | 1.5 V                      |            |           | 1.0 V            |           |
| Frequency   | 100H       | z~50kHz/0.01Hz     | ~1kHz      | 100Hz      | z~50kHz/0.01Hz             | ~1kHz      | 100Hz     | ~50kHz/0.01Hz    | z~1kHz    |
| Duty  | 1~99% (M   | Min. Rise Time Do  | ominated)  | 1~99% (N   | Ain. Rise Time Do          | ominated)  | 1~99% (N  | 1in. Rise Time D | ominated) |
| Accuracy  | · · · ·    | 1µs/1ms+100ppi     |            | · · ·      | µs/1ms+100pp               |            | · · · ·   | µs/1ms+100pp     | , ,       |
|   | 0.03A/ms   | 0.3A/ms            | 3A/ms      | 0.16A/ms   | 1.6A/ms                    | 16A/ms     | 0.2A/ms   | 1.2A/ms          | 12A/ms    |
| Slew rate   | ~0.015A/µs | ~0.15A/µs          | ~1.5A/µs   | ~0.08A/µs  | ~0.8A/µs                   | ~8A/µs     | ~0.1A/µs  | ~0.6A/µs         | ~6A/µs    |
| Resolution  | 0.005mA/µs | 0.05mA/µs          | 0.5mA/µs   | 0.01mA/µs  | 0.1mA/μs                   | 1mA/μs     | 0.02mA/µs | 0.1mA/μs         | 1mA/μs    |
|   | 0.005mA/µs |                    | 0.5mA/µs   | 0.0111A/µs |                            | TΠΑ/μs     | 0.02mA/µs |                  | ΠΠΑ/μs    |
| Accuracy  |            | 10% ±20µs          |            |            | $10\% \pm 20\mu s$         |            |           | 10% ± 20µs       |           |
| Min. Rise Time  |            | 10 µs              |            |            | 10 µs                      |            |           | 10 µs            |           |
| Current   |            |                    |            | 1          |                            |            |           |                  |           |
| Range   | 0~0.15A    | 0~1.5A             | 0~15A      | 0~0.8A     | 0~8A                       | 0~80A      | 0~1A      | 0~6A             | 0~60A     |
| Resolution  | 0.005mA    | 0.05mA             | 0.5mA      | 0.01mA     | 0.1mA                      | 1mA        | 0.02mA    | 0.1mA            | 1mA       |
| Ext Wave Mode(20kH  | z) : CC    |                    |            |            |                            |            |           |                  |           |
| Range   | 0~0.15A    | 0~1.5A             | 0~15A      | 0~0.8A     | 0~8A                       | 0~80A      | 0~1A      | 0~6A             | 0~60A     |
| Level   |            | 0~10V              |            |            | 0~10V                      |            |           | 0~10V            |           |
| Accuracy  |            | 0.5%F.S.           |            |            | 0.5%F.S.                   |            |           | 0.5%F.S.         |           |
| Measurement   |            | 2.10 / 0.101       |            |            |                            |            |           |                  |           |
| Voltage Read Back   |            |                    |            |            |                            |            |           |                  |           |
| Range   | 0~80V      | 0~150V             | 0~600V     | 0~6V       | 0~16V                      | 0~80V      | 0~16V     | 0~80V            | 0~150V    |
| Resolution  |            |                    |            |            |                            |            |           |                  |           |
| Resolution  | 1.4194mV   | 2.661mV            | 10.645mV   | 0.1069mV   | 0.2849mV                   | 1.3537mV   | 0.27mV    | 1.3mV            | 2.5mV     |
| Accuracy *5   | 0.025%+    | -0.01%F.S.         | 0.01%+     | 0.025%+    | 0.01%F.S.                  | 0.01%+     | 0         | .025%+0.01%F.    | S.        |
| -   |            |                    | 0.025%F.S. |            |                            | 0.025%F.S. |           |                  |           |
| Current Read Back   |            |                    |            |            |                            |            |           |                  |           |
| Range   | 0~0.15A    | 0~1.5A             | 0~15A      | 0~0.8A     | 0~8A                       | 0~80A      | 0~1A      | 0~6A             | 0~60A     |
| Resolution  | 0.00275mA  | 0.0266mA           | 0.255mA    | 0.013695mA | 0.138766mA                 | 1.31406mA  | 0.02mA    | 0.1mA            | 1mA       |
| Accuracy *5   |            | 0.05%+0.05%F.S     |            |            | 0.05%+0.05%F.S             | 5.         |           | 0.04%+0.04%F.S   | 5.        |
| Power Read Back   |            |                    |            |            |                            |            |           |                  |           |
| Range   | 0~90W      | 0~300W             | 0~300W     | 0~60W      | 0~60W                      | 0~400W     | 0~8W      | 0~40W            | 0~400W    |
| Accuracy *5   | 0 9000     | 0.1%+0.1%F.S.      | 0 50011    | 0.0011     | 0.1%+0.1%F.S.              | 0 10011    | 0.011     | 0.1%+0.1%F.S.    |           |
| Voltage Monitor   |            | 5.17010.1701.5.    |            |            | 0.17010.1701.3.            |            |           | 0.17010.1701.3.  |           |
| Bandwidth   |            | 20 11-             |            |            | 20 1/1-                    |            |           | 20 64-           |           |
| Danuwidth   | 0.0011     | 20 kHz             | 0 (00)/    | 0.01       | 20 kHz                     | 0.001      | 0.101     | 20 kHz           | 0.4501    |
|   | 0~80V      | 0~150V             | 0~600V     | 0~6V       | 0~16V                      | 0~80V      | 0~16V     | 0~80V            | 0~150V    |
| Range   |            | 0~10V              |            |            | 0~10V                      |            |           | 0~10V            |           |
| Range<br>Output   |            |                    |            |            | 0.5%F.S.                   |            |           | 0.5%F.S.         |           |
| Range<br>Output<br>Accuracy                                 |            | 0.5%F.S.           |            |            | 0.071.001                  |            |           |                  |           |
| Range   |            | 0.5%F.S.           |            |            |                            |            |           |                  |           |
| Range<br>Output<br>Accuracy                                 |            | 0.5%F.S.<br>20 kHz |            |            | 20 kHz                     |            |           | 20 kHz           |           |
| Range<br>Output<br>Accuracy<br>Current Monitor<br>Bandwidth | 0~0.15A    |                    | 0~15A      | 0~0.8A     |                            | 0~80A      | 0~1A      |                  | 0~60A     |
| Range<br>Output<br>Accuracy<br>Current Monitor              | 0~0.15A    | 20 kHz             | 0~15A      | 0~0.8A     | 20 kHz                     | 0~80A      | 0~1A      | 20 kHz           | 0~60A     |

# Model 63600 Series

| GENERAL SPECIFICATION          |                                   |                  |                                       |                  |                  |
|--------------------------------|-----------------------------------|------------------|---------------------------------------|------------------|------------------|
| Model                          | 63610-80-20                       | 63630-80-60      | 63630-600-15                          | 63640-80-80      | 63640-150-60     |
| Program mode                   |                                   |                  |                                       |                  |                  |
| Sequence No.                   |                                   |                  | 100/Program                           |                  |                  |
| Dwell / SEQ                    |                                   | 0.               | 1ms ~ 30s (Resolution : 0.1           | ms)              |                  |
| Load Setting                   |                                   | Ref              | er to Static mode specifica           | tions            |                  |
| Spec Check                     |                                   |                  | Voltage/Current/Power                 |                  |                  |
| Protection                     |                                   |                  |                                       |                  |                  |
| Over Power                     |                                   |                  | Yes                                   |                  |                  |
| Over Current                   |                                   |                  | Yes                                   |                  |                  |
| Over Voltage Alarm*8           |                                   |                  | Yes                                   |                  |                  |
| Over Temperature               |                                   |                  | Yes                                   |                  |                  |
| Reverse                        |                                   |                  | Yes                                   |                  |                  |
| Interface                      |                                   |                  |                                       |                  |                  |
| USB                            |                                   |                  | Standard                              |                  |                  |
| Ethernet                       |                                   |                  | Optional                              |                  |                  |
| GPIB                           |                                   |                  | Optional                              |                  |                  |
| System BUS                     |                                   |                  | Master/Slave                          |                  |                  |
| Dout                           |                                   |                  |                                       |                  |                  |
| No. of bits                    |                                   |                  | 2 bits per mainframe                  |                  |                  |
| Level - H                      |                                   |                  | 1.8V/3.3V/5V switchable               |                  |                  |
| Level - L                      | <0.6V@lsink=10mA                  |                  |                                       |                  |                  |
| Drive                          | Pull_up resistor = $4.7 k \Omega$ |                  |                                       |                  |                  |
| Din (TTL Compatible, Rising E  |                                   |                  |                                       |                  |                  |
| No. of bits                    |                                   |                  | 2 bits per mainframe                  |                  |                  |
| External Trig. for Digitizing  |                                   |                  | · · · · · · · · · · · · · · · · · · · |                  |                  |
| No. of bits                    |                                   |                  | 1 bit per mainframe                   |                  |                  |
| External Trig. for Auto Sequer | nces (TTL Compatible, Risi        | ng Edge)         |                                       |                  |                  |
| No. of bits                    |                                   |                  | 1 bit per mainframe                   |                  |                  |
| Load ON - O/P                  |                                   |                  | · · · · · · · · · · · · · · · · · · · |                  |                  |
| Level                          |                                   | TTI              | Compatible, Level, Active             | High             |                  |
| Short ON - O/P                 |                                   |                  |                                       |                  |                  |
|                                |                                   | 2 c              | hannels per 63600-1 mainf             | rame             |                  |
| No. of channels                |                                   |                  | hannels per 63600-2 mainf             |                  |                  |
|                                |                                   |                  | hannels per 63601-5 mainf             |                  |                  |
|                                | 10 channels per 63600-5 mainframe |                  |                                       |                  |                  |
| Level                          |                                   | TTI              | Compatible, Level, Active             | High             |                  |
| Short circuit                  |                                   |                  |                                       |                  |                  |
| Current *6                     |                                   |                  | Set to 100% of rated current          | 1                | 1                |
| Input Resistance (Load Off)    | 700kΩ(Typical)                    | 700k Ω (Typical) | 2MΩ(Typical)                          | 700kΩ(Typical)   | 700k Ω (Typical) |
| Dimensions (HxWxD)             |                                   |                  | 86 x 514 mm / 5.6 x 3.4 x 2           | 1                |                  |
| Weight                         | 5 kg / 11 lbs                     | 4 kg / 8.8 lbs   | 5 kg / 11 lbs                         | 4.5 kg / 9.9 lbs | 4.5 kg / 9.9 lbs |
| Operating Temperature          |                                   |                  | 0~40°C                                |                  |                  |
| Storage Temperature            |                                   |                  | -20~80°C                              |                  |                  |
| Power                          |                                   |                  | Supply from mainframe                 |                  |                  |
| EMC & Safety                   |                                   |                  | CE                                    |                  |                  |

NOTE\*1: The maximum current loading below the minimum operating voltage (0.5V) will follow a derating curve.

**NOTE\*2**: The 400W power rating of the 63640-80-80 specified at an ambient temperature of 35°C, please refer to the power rating curve on the right.

**NOTE\*3**: Does not apply to setting current < 0.25% full scale current in high range. Does not apply to setting current < 0.05% full scale current in low and middle range.

NOTE\*4: The full scale is Vmax x Imax.

NOTE\*5: The DC level measurements are made over a period of 20ms, and does not measure any transient signals in the DC measurements.

**NOTE\*6**: Its limits are the maximum power and maximum current of the current ragne.

**NOTE\*7 :** The 63600 is guaranteed to meet specified performance at temperature range of  $25 \pm 5$  °C.

NOTE\*8 : If the operating voltage exceeds the rated voltage for 1.1 times, it would cause permanent damage to the device.

NOTE\*9: Please refer to user's manual for detail specifications, and S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

#### Softpanel

| The Alline Pa |         |                   |             | · ····       | -  |
|---------------|---------|-------------------|-------------|--------------|--|
| CMR01021      | Garomia | 2                 | figures and | And American | 11 191 AN  |
|               |         |                   |             |              |  |
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**Battery Discharge Test** 

User Defined Waveform

PXITest & Gener Measurement Purpo

Main Operation Menu

All specifications are subject to change without notice.

### Programmable AC&DC Electronic Load Model 63800 Series

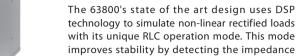


#### **KEY FEATURES**

- Power Rating : 1800W, 3600W, 4500W
- Voltage Range : 50Vrms ~ 350Vrms
- Current Range : Up to 18Arms, 36Arms, 45Arms
- Peak Current : Up to 54A, 108A, 135A
- Parallel / 3-Phase Function (AC mode only)
- Frequency Range : 45 ~ 440Hz, DC
- Crest Factor Range : 1.414 ~ 5.0
- Power Factor Range : 0 ~ 1 lead or lag (Rectified mode)
- CC, CR, CV, CP for DC Loading
- Constant & Rectified Load Modes for AC Loading
- Analog Voltage & Current Monitor
- Timing Measurement for Battery, UPS, Fuse and Breaker tests
- Measurement : V, I, PF, CF, P, Q, S, F, R, Ip+/and THDv
- Short circuit simulation
- Full Protection : OC, OP, OT protection and OV alarm
- GPIB & RS-232 interfaces

Chroma's 63800 Series AC&DC Electronic Loads are designed for testing uninterruptible power supplies(UPS), Off-Grid Inverters, AC sources and other power devices such as switches, circuit breakers, fuses and connectors.

The Chroma 63800 Loads can simulate load conditions under high crest factor and varying power factors with real time compensation even when the voltage waveform is distorted. This special feature provides real world simulation capability and prevents over-stressing thereby giving reliable and unbiased test results.



RS-232

GPIB

technology to simulate non-linear rectified loads with its unique RLC operation mode. This mode improves stability by detecting the impedance of the UUT and dynamically adjusting the load's control bandwidth to ensure system stability.

Comprehensive measurements allow users to monitor the output performance of the UUT. Additionally, voltage & current signals can be routed to an oscilloscope through analog outputs. The instrument's GPIB/RS-232 interface options provide remote control & monitor for system integration. Built-in digital outputs may also be used to control external relays for short circuit (crowbar) testing.

Chroma's 63800 Loads feature fan speed control ensuring low acoustic noise. The diagnosis/ protection functions include self-diagnosis routines and protection against over-power, over-current, over-temperature and alarm indicating over-voltage.

#### Parallel / 3-Phase Control

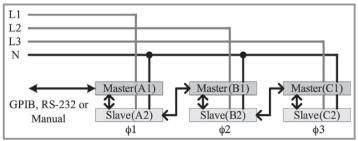
The 63800 series provides parallel and 3-phase functions for high power and three phase applications. All the models within the 63800 series can be used together for both parallel and 3-phase functions as well as paralleled AC Load units in a 3-phase configuration, providing excellent flexibility and cost savings for the 63800 series AC load. Parallel and 3-phase controls are made easy by linking the AC Load units together and control of all AC load units is performed through the Master Unit.





L N Master(A1)  $\Leftrightarrow$  Slave(A2)  $\Leftrightarrow$  Slave(A3)  $\Leftrightarrow$  Slave(A4)  $\Leftrightarrow$  Slave(A5) GPIB, RS-232 or Manual

Parallel connection

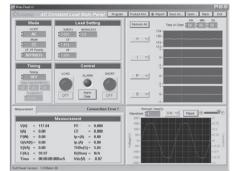


Parallel/3-Phase Y connection

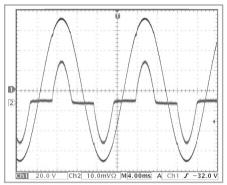
#### Softpanel



#### Main Operation Menu

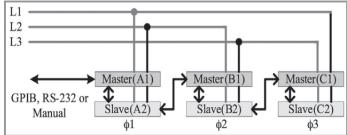


#### AC Load



#### **ORDERING INFORMATION**

63802 : Programmable AC & DC Electronic Load 350V/18A/1800W 63803 : Programmable AC & DC Electronic Load 350V/36A/3600W 63804 : Programmable AC & DC Electronic Load 350V/45A/4500W A638001 : Rack Mounting Kit for Model 63802 A638002 : Rack Mounting Kit for Model 63803/63804



Parallel/3-Phase Delta connection

# Programmable AC&DC Electronic Load Model 63800 Series

| SPECIFICATIONS                |   |  |  |
|-------------------------------|---|--|--|
| Model                         | 63802   | 63803  | 63804  |
| Power                         | 1800W   | 3600W  | 4500W  |
| Current                       | 0 ~ 18Arms (54 Apeak, continue)   | 0 ~ 36Arms (108 Apeak, continue)   | 0 ~ 45Arms (135 Apeak, continue)   |
| Voltage*1                     | 50 ~ 350Vrms (500 Vpeak)  | 50 ~ 350Vrms (500 Vpeak)   | 50 ~ 350Vrms (500 Vpeak)   |
| Frequency                     | 45 ~ 440Hz, DC  | 45 ~ 440Hz, DC   | 45 ~ 440Hz, DC   |
| AC Section                    | 43 ~ 440Hz, DC  | 43 ~ 440Hz, DC   | 43 ~ 440HZ, DC   |
| Constant Current Mode         |   |  |  |
| Range                         | 0 ~ 18Arms, Programmable  | 0 ~ 36Arms, Programmable   | 0 ~ 45Arms, Programmable   |
| Accuracy                      | 0.1% + 0.2%F.S.   | 0.1% + 0.2%F.S.  | 0.1% + 0.2%F.S.  |
| Resloution                    | 2mA   | 5mA  | 5mA  |
| Constant Resistance Mode      | 2007  | JIIA   | JIIA   |
| Range                         | 2.77 $\Omega \sim 2.5 \mathrm{k} \Omega$ , Programmable                                       | 1.39 $\Omega$ ~2.5k $\Omega$ , Programmable  | 1.11 $\Omega$ ~2.5k $\Omega$ , Programmable  |
| Accuracy                      | 0.5% + 0.5%F.S.   | 0.5% + 0.5%F.S.  | 0.5% + 0.5% F.S.   |
| Resloution*2                  | 20µS  | 50μS   | 50µS   |
| Constant Power Mode           | 20μ5  | 50μ5   | C40C   |
|                               | 1800W, Programmable   | 3600W, Programmable  | 4500W, Programmable  |
| Range                         | -   | -  | -  |
| Accuracy                      | 0.5% + 0.5%F.S.   | 0.2% + 0.3%F.S.  | 0.2% + 0.3%F.S.  |
| Resloution                    | 0.375W  | 1.125W   | 1.125W   |
| Crest Factor (under CC, CP m  | -   |  | 1 414 50 December 1  |
| Range                         | 1.414 ~ 5.0, Programmable   | 1.414 ~ 5.0, Programmable  | 1.414 ~ 5.0, Programmable  |
| Accuracy                      | (0.5% / Irms) + 1% F.S.   | (0.5% / Irms) + 1%F.S.   | (0.5% / Irms) + 1%F.S.   |
| Resloution                    | 0.005   | 0.005  | 0.005  |
| Power Factor                  | 0 1 lead an leas Drammark   | 0 1 lead on less Drammark l  | 0 1 lead at less Discussion 1 1  |
| Range                         | 0 ~ 1 lead or lag, Programmable   | 0 ~ 1 lead or lag, Programmable  | 0 ~ 1 lead or lag, Programmable  |
| Accuracy                      | 1%F.S.  | 1%F.S.   | 1%F.S.   |
| Resloution                    | 0.001   | 0.001  | 0.001  |
| Rectified Load Mode           |   |  |  |
| Operating Frequency           |   | 45Hz ~ 70Hz  |  |
| RLC Mode                      |   | Parameter : Ip(max), R <sub>s</sub> , L <sub>s</sub> , C, R <sub>L</sub>   |  |
|                               | Parameter : lp(max),  | Parameter : Ip(max),   | Parameter : lp(max),   |
| Constant Power Mode           | Power setting=200W ~ 1800W,   | Power setting=200W ~ 3600W,  | Power setting=200W ~ 4500W,  |
|                               | PF=0.4 ~ 0.75   | PF=0.4 ~ 0.75  | PF=0.4 ~ 0.75  |
| Inrush Current Mode           |   | Parameter : Ip(max), R <sub>s</sub> , L <sub>s</sub> , C, R <sub>L</sub> , Phase   |  |
|                               | 80A (peak current)  | 160A (peak current)  | 200A (peak current)  |
| R <sub>s</sub> Range          | 0~9.999Ω  | 0~9.999Ω   | 0~9.999Ω   |
| L <sub>s</sub> Range          | 0 ~ 9999µH  | 0 ~ 9999µH   | 0 ~ 9999µH   |
| C Range                       | 100 ~ 9999µF  | 100 ~ 9999μF   | 100 ~ 9999μF   |
| R <sub>L</sub> Range          | 2.77 ~ 9999.99 Ω  | 1.39 ~ 9999.99 Ω   | 1.11 ~ 9999.99 Ω   |
| DC Section                    |   |  |  |
| Voltage Range                 | 7.5V ~ 500V   | 7.5V ~ 500V  | 7.5V ~ 500V  |
| Current Range                 | 0A ~ 18A  | 0A ~ 36A   | 0A ~ 45A   |
| Min. operating voltage        | 7.5V  | 7.5V   | 7.5V   |
| Rise time                     | 75µs  | 75µs   | 75µs   |
| Operating Mode                |   | CC, CV, CR, CP, DC Rectified   |  |
| Short Circuit Simulation      | Use   | the CR mode loading under max. power r   | ating  |
| Measurement Section           |   |  |  |
| DVM Range                     | 350V <sub>rms</sub> (500V <sub>peak</sub> )   | 350V <sub>rms</sub> (500V <sub>peak</sub> )  | 350V <sub>rms</sub> (500V <sub>peak</sub> )  |
| DVM Accuracy                  | 0.1% + 0.1%F.S.   | 0.1% + 0.1%F.S.  | 0.1% + 0.1%F.S.  |
| DVM Resloution                | 10mV  | 10mV   | 10mV   |
| DAM Range                     | 18A <sub>rms</sub> (80A <sub>peak</sub> )   | 36A <sub>rms</sub> (160A <sub>peak</sub> )   | 45A <sub>rms</sub> (200A <sub>peak</sub> )   |
| DAM Accuracy(<70Hz)           | 0.1% + 0.2%F.S.   | 0.1% + 0.2%F.S.  | 0.1% + 0.2%F.S.  |
| DAM Accuracy(>70Hz)           | 0.1% (1+CF <sup>2</sup> x kHz)+0.2% F.S.  | 0.1% (1+CF <sup>2</sup> x kHz)+0.2% F.S.   | 0.1% (1+CF <sup>2</sup> x kHz)+0.2% F.S.   |
| DAM Resloution                | 1.0mA   | 1.0mA  | 1.0mA  |
| Other Parameter               | P(1   | W), S(VA), Q(VAR), CF, PF, Freq, R, Ip-, Ip+, T  | HUV  |
| Others                        |   |  |  |
| Vmonitor                      | $\pm$ 500V / $\pm$ 10V (Isolated)   | $\pm$ 500V / $\pm$ 10V (Isolated)  | $\pm$ 500V / $\pm$ 10V (Isolated)  |
| Imonitor                      | $\pm$ 80A / $\pm$ 10V (Isolated)  | $\pm 200A / \pm 10V$ (Isolated)  | $\pm 200A / \pm 10V$ (Isolated)  |
|                               |   | OCP : 38.4Arms ;   | OCP : 48Arms ;   |
| Ducto ati an                  | OCP : 19.2Arms ;  |  |  |
| Protection                    | OV alarm: 360Vrms (DC : 510VDC)   | OV alarm: 360Vrms (DC : 510VDC)  | OV alarm: 360Vrms (DC : 510VDC)  |
|                               |   | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 3840W ; OTP   |  |
| Remote Interface              | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 1920W ; OTP  | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 3840W ; OTP<br>GPIB, RS-232   | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 4800W ; OTP   |
|                               | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 1920W ; OTP<br>1Ø 100~115Vac                         | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 3840W ; OTP<br>GPIB, RS-232<br>± 10% VLN, 47~63Hz ; 1Ø 200~230Vac ±                         | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 4800W ; OTP<br>10% VLN, 47~63Hz                         |
| Remote Interface              | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 1920W ; OTP<br>1Ø 100~115Vac<br>177 x 440 x 595 mm / | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 3840W ; OTP<br>GPIB, RS-232<br>± 10% VLN, 47~63Hz ; 1Ø 200~230Vac ±<br>310 x 440 x 595 mm / | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 4800W ; OTP<br>10% VLN, 47~63Hz<br>310 x 440 x 595 mm / |
| Remote Interface Input Rating | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 1920W ; OTP<br>1Ø 100~115Vac                         | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 3840W ; OTP<br>GPIB, RS-232<br>± 10% VLN, 47~63Hz ; 1Ø 200~230Vac ±                         | OV alarm: 360Vrms (DC : 510VDC)<br>OPP : 4800W ; OTP<br>10% VLN, 47~63Hz                         |

NOTE\*1: If the operating voltage exceeds the rated voltage for 1.1 times, it would cause permanent damage to the device. NOTE\*2: S (siemens) is the SI unit of conductance, equal to one reciprocal ohm.

/ideo &

### Model 61500 Series



#### 500VA~90kVA

#### **KEY FEATURES**

- Compact size and weight attributable to advance PWM technology
- AC+DC output mode for voltage DC offset simulation
- Programmable output impedance for IEC 61000-3-3
- IEC 61000-4-11, IEC 61000-4-14, IEC 61000-4-28 voltage dips and frequency variation simulation
- Harmonics, interharmonics waveform synthesizer for IEC 61000-4-13 testing
- Power line disturbance simulation capability
- Programmable voltage and current limit settings
- Comprehensive measurement capability, including current harmonics
- High output current crest factor, ideal for inrush current testing
- Turn on, turn off phase angle control
- TTL signal which indicates output transient
- Optional analog programmable interface
- 2 units combined in series for high Voltage source (Model 61501~61505)
- 3 units combined to 3-phase power output (Model 61501~61505)
- Optional GPIB and RS-232 interface (Model 61501~61505)
- Easy use graphic user interface: softpanel (Option)
- Softpanel for IEC regulation test
- Capable of delivering power output up to 90KVA by implementing Master-slave parallel operation

Model 61505~61504



The 61500 series AC power source defines new standard for high performance AC power source. It equips with all the powerful features. Such as power line disturbance simulation, programmable output impedance, comprehensive measurement function, wave-shape synthesis and regulation test software. Chroma also provides software for aerospace testing, including MIL-STD-704F, RTCA DO-160D, ABD100. These features make Chroma 61500 ideal for commercial, power electronics, avionics, marine, military and regulation test applications from bench-top testing to mass productions.

The 61500 series line up range from 500VA up to 90kVA, with one or three phase output. This allows user to have maximum choices from R/D design verification, guality assurance, to production testina.

Using the state-of-the-art PWM technology, the Chroma 61500 AC source is capable of delivering up to 6 times of peak current (Model 61501~61505) versus to its maximum rated current which makes it ideal for inrush current \* A615011: Aerospace softpanel for MIL-STD-704F testing.

By using advanced DSP technology, 61500 AC power source offers precision and high speed power and harmonics measurements such as RMS voltage, RMS current, true power, power factor, current crest factor and up to 40 orders of current harmonics components.

The 61500 AC power source allows users to compose different harmonic components to synthesize your own harmonic distorted wave-shapes. The AC+DC and DC mode also extend the applications to simulate the natural waveform, Chroma 61500 also provides an external analog input, to amplify the analog signal from arbitrary signal generator. Thus, it is capable to simulate the unique waveform observed in the field.

With the versatile programmable output impedance and regulation test software, the 61500 AC power source allows users to perform Pre-compliance test against IEC 61000-4-11 and compliance test against IEC 61000-4-13/-4-14/-4-28 immunity test regulations and IEC 61000-3-2/-3-3 emission test regulations by incorporating a flicker meter.

### **ORDERING INFORMATION**

61501: Programmable AC Source 0~300V, 15~1kHz / 500VA, 1Ø 61502 : Programmable AC Source 0~300V,

15~1kHz / 1kVA, 1Ø

61503: Programmable AC Source 0~300V, 15~1kHz / 1.5kVA, 1Ø

61504: Programmable AC Source 0~300V, 15~1kHz / 2kVA, 1Ø

61505: Programmable AC Source 0~300V, 15~1kHz/4kVA, 1Ø

61511: Programmable AC Source 0~300V, 15~1.5kHz / 12kVA, 1 or 3Ø

61512: Programmable AC Source 0~300V, 15~1.5kHz / 18kVA, 1 or 3Ø

A615001 : Remote Interface for 61501~61505 and 61601~61605 (External V Input, RS-232 Interface, GPIB Interface)

A615002 : Remote interface board (LAN and USB) for Model 61500/61600/61700 Series

A615003 : AC voltage transform unit for Model 61500/61600 Series

A615007 : Softpanel for Model 61500/61600 Series A615008 : DC Noise Filter (Max. 16A)

- \* A615010 : Aerospace softpanel for RTCA DO-160G standard
- standard

A615103 : Parallelable power stage unit 18kVA, 1 or 3Ø, for 61511/61512/61611/61612 A615104 : Input/Output terminals for parallel

connecting 2 units of 61511/61512/61611/61612/ A615103

A615105 : Input/Output terminals for parallel connecting 3 units of 61511/61512/61611/61612/ A615103

A615106 : Reverse Current Protection unit for 61511/61512/61611/61612

\* Call for availability

Option for 277VLN/480VLL (5Wires) AC input voltage are available with 61511/61512/ 61611/61612/ A615103 models, please contact Chroma sales representative for detailed information.

Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.



A615103 Parallelable Power stage Unit 18KVA

All specifications are subject to change without notice.

# Model 61500 Series

| SPECIFICATIONS-1         |   |   |   |
|--------------------------|---|---|---|
| Model                    | 61501   | 61502   | 61503   |
| Output Phase             | 1   | 1   | 1   |
| Output Rating -AC        |   |   |   |
| Power                    | 500VA   | 1000VA  | 1500VA  |
| Voltage                  | '   |   |   |
| Range/Phase              | 150V/300V/Auto  | 150V/300V/Auto  | 150V/300V/Auto  |
| Accuracy                 | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.   |
| Resolution               | 0.1V  | 0.1V  | 0.1V  |
|                          | 0.3% @ 50/60Hz  | 0.3% @ 50/60Hz  | 0.3% @ 50/60Hz  |
| Distortion*1             | 1% @ 15-1kHz  | 1% @ 15-1kHz  | 1% @ 15-1kHz  |
| Line Regulation          | 0.1%  | 0.1%  | 0.1%  |
| Load Regulation*2        | 0.2%  | 0.2%  | 0.2%  |
| Max. Current             | 0.270   | 0.270   | 0.270   |
| RMS                      | 44/24 (150)//200)/)                                   | <u>84/44 (150)//200)/)</u>                            | 124/64 (150)//200)/)                                  |
| -                        | 4A/2A (150V/300V)                                     | 8A/4A (150V/300V)                                     | 12A/6A (150V/300V)                                    |
| Peak                     | 24A/12A (150V/300V)                                   | 48A/24A (150V/300V)                                   | 72A/36A (150V/300V)                                   |
| Frequency                |   |   |   |
| Range                    | DC, 15 ~ 1kHz   | DC, 15 ~ 1kHz   | DC, 15 ~ 1kHz   |
| Accuracy                 | 0.15%   | 0.15%   | 0.15%   |
| Resolution               | 0.01 Hz   | 0.01 Hz   | 0.01 Hz   |
| Output Rating-DC         |   |   |   |
| Power                    | 250W  | 500W  | 750W  |
| Voltage                  | 212V/424V   | 212V/424V   | 212V/424V   |
| Current                  | 2A/1A (212V/424V)                                     | 4A/2A (212V/424V)                                     | 6A/3A (212V/424V)                                     |
| Programmable Output Imp  | bedance   |   |   |
| Range                    |   | 0Ω +200μH ~ 1Ω +1mH                                   |   |
| Harmonics & Interharmoni | cs Simulation   |   |   |
| Bandwidth                | 2400Hz  | 2400Hz  | 2400Hz  |
| Input Rating             | · · · · · · · · · · · · · · · · · · ·                 |   |   |
| Voltage Operating Range  | 1Ø 100~240V±10%V <sub>LN</sub>                        | 1Ø 100~240V±10%V <sub>LN</sub>                        | 1000000000000000000000000000000000000                 |
| Frequency Range          | 47~63Hz   | 47~63Hz   | 47~63Hz   |
| Current (per phase)      | 10A Max. @ 90V  | 18A Max. @ 90V  | 22A Max. @ 90V  |
| Power Factor*4           | 0.97 Min.   | 0.97 Min.   | 0.98 Min.   |
| Measurement              | 0.57 min.   | 0.97 min.   | 0.50 mm   |
| Voltage                  |   |   |   |
|                          | 150V/300V   | 150V/300V   | 150V/300V   |
| Range                    | 0.2%+0.2%ES.  | 0.2%+0.2%F.S.   |   |
| Accuracy                 |   |   | 0.2%+0.2%F.S.   |
| Resolution               | 0.1V  | 0.1V  | 0.1V  |
| Current                  |   |   |   |
| Range (peak)             | 24A   | 48A   | 72A   |
| Accuracy (RMS)           | 0.4%+0.3%F.S.   | 0.4%+0.3%F.S.   | 0.4%+0.3%F.S.   |
| Accuracy (peak)          | 0.4%+0.6%F.S.   | 0.4%+0.6%F.S.   | 0.4%+0.6%F.S.   |
| Power                    |   |   |   |
| Accuracy                 | 0.4%+0.4%F.S.   | 0.4%+0.4%F.S.   | 0.4%+0.4%F.S.   |
| Resolution               | 0.1W  | 0.1W  | 0.1W  |
| Harmonics                |   |   |   |
| Range                    | 2~40 orders   | 2~40 orders   | 2~40 orders   |
| Others                   |   |   |   |
| Interface                |   | GPIB, RS-232 (Optional)                               |   |
| Temperature              |   |   |   |
| Operating                | 0 ~ 40°C  | 0 ~ 40°C  | 0~40°C  |
| Storage                  | -40 ~ +85°C   | -40 ~ +85°C   | -40 ~ +85°C   |
|                          | 10 103 0  | CE ( include EMC & LVD )                              | 10 105 C  |
| -                        |   |   |   |
| Safety & EMC             | 133 35 x 482 6 x 569 5 mm /                           | ,   | 133 35 x 482 6 x 560 5 mm /                           |
| -                        | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch |

Note\*1: Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2**: Load regulation is tested with sine wave and remote sense.

Note\*3: Model 61505 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

Note\*4 : Input power factor is tested on input 220V, full load condition.

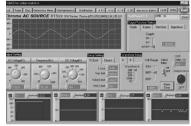
Purpose

Optical

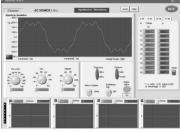
Test &

# Model 61500 Series

#### Softpanel



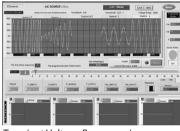
Main Operation Menu



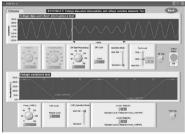
Distorted Waveform Editor



Aerospace Testing : MIL-STD-704F



Transient Voltage Programming



Voltage Dip, Short, Variation Regulation Test



Aerospace Testing : RTCA DO-160G

| SPECIFICATIONS-2                        |   |  |
|---|---|--|
| Model                                   | 61504                                     | 61505  |
| Output Phase                            | 1   | 1  |
| Output Rating -AC                       |   |  |
| Power                                   | 2000VA                                    | 4000VA                                       |
| Voltage                                 |   |  |
| Range/Phase                             | 150V/300V/Auto                            | 150V/300V/Auto                               |
| Accuracy                                | 0.2%+0.2%F.S.                             | 0.2%+0.2%F.S.                                |
| Resolution                              | 0.1V                                      | 0.1V   |
| Distortion*1                            | 0.3% @ 50/60Hz<br>1% @ 15-1kHz            | 0.3% @ 50/60Hz<br>1% @ 15-1kHz               |
| Line Regulation                         | 0.1%                                      | 0.1%   |
| Load Regulation*2                       | 0.2%                                      | 0.2%   |
| Max. Current                            |   |  |
| RMS                                     | 16A/8A (150V/300V)                        | 32A/20A (150V/300V)                          |
| Peak                                    | 96A/48A (150V/300V)                       | 192A/96A (150V/300V)                         |
| Frequency                               |   |  |
| Range                                   | DC, 15 ~ 1kHz                             | DC, 15 ~ 1kHz                                |
| Accuracy                                | 0.15%                                     | 0.15%  |
| Resolution                              | 0.01 Hz                                   | 0.01 Hz                                      |
| Output Rating-DC                        | 0.01112                                   | 0.01112                                      |
| Power                                   | 1000W                                     | 2000W  |
| Voltage                                 | 212V/424V                                 | 212V/424V                                    |
| Current                                 | 8A/4A (212V/424V)                         | 16A/8A (212V/424V)                           |
| Programmable Output Impeda              |   | 100/00 (2120/4240)                           |
| Range                                   |   | ~1Ω +1mH                                     |
| Harmonics & Interharmonics Si           | <b>i</b>                                  | ~ 152 +11111                                 |
| Bandwidth                               | 2400Hz                                    | 2400Hz                                       |
|   | 2400H2                                    | 2400H2                                       |
| Input Rating<br>Voltage Operating Range | 10100.2401 + 10061                        | $2(3,200,240)(\pm 100)(1, *2)$               |
| Frequency Range                         | 1Ø 100~240V±10%V <sub>LN</sub><br>47~63Hz | 3Ø 200~240V±10%V <sub>LN</sub> *3<br>47~63Hz |
| Current (per phase)                     | 28A Max. @ 90V                            | 14A Max. @ 190V                              |
| Power Factor*4                          | 0.98 Min.                                 | 0.98 Min.                                    |
|   | 0.96 10111.                               | 0.98 Milli.                                  |
| Measurement                             |   |  |
| Voltage                                 | 150\//200\/                               | 150\//200\/                                  |
| Range                                   | 150V/300V<br>0.2%+0.2%E.S.                | 150V/300V                                    |
| Accuracy                                |   | 0.2%+0.2%F.S.                                |
| Resolution                              | 0.1V                                      | 0.1V   |
| Current                                 | 064                                       | 1024   |
| Range (peak)                            | 96A                                       | 192A   |
| Accuracy (RMS)                          | 0.4%+0.3%F.S.                             | 0.4%+0.3%F.S.                                |
| Accuracy (peak)                         | 0.4%+0.6%F.S.                             | 0.4%+0.6%F.S.                                |
| Power                                   | 0.40/+0.40/55                             |  |
| Accuracy                                | 0.4%+0.4%F.S.                             | 0.4%+0.4%F.S.                                |
| Resolution                              | 0.1W                                      | 0.1W   |
| Harmonics                               |   |  |
| Range                                   | 2~40 orders                               | 2~40 orders                                  |
| Others                                  |   |  |
| Interface                               | GPIB, RS-23                               | 2 (Optional)                                 |
| Temperature                             |   |  |
| Operating                               | 0 ~ 40°C                                  | 0 ~ 40°C                                     |
| Storage                                 | -40 ~ +85°C                               | -40 ~ +85°C                                  |
| Safety & EMC                            | CE ( include                              | ·  |
| Dimension                               | 133.35 x 482.6 x 569.5 mm /               | 266.7 x 482.6 x 569.5 mm /                   |
| (HxWxD)                                 | 5.25 x 19 x 22.42 inch                    | 10.5 x 19 x 22.42 inch                       |
| Weight                                  | 20 kg / 44.05 lbs                         | 41 kg / 90.31 lbs                            |

Note\*1 : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

Note\*2: Load regulation is tested with sine wave and remote sense.

**Note\*3 :** Model 61505 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

Note\*4: Input power factor is tested on input 220V, full load condition.

### Model 61500 Series

| SPECIFICATIONS-3   |                        |                                   |  |                                 |  |  |
|--|------------------------|-----------------------------------|--|---------------------------------|--|--|
| Model  | 61511                  | 61512                             | 61511+A615103  | 61512+A615103                   |  |  |
| Output Phase   |                        |                                   | 1 or 3 selectable                                    |                                 |  |  |
| Output Rating-AC   |                        |                                   |  |                                 |  |  |
| Power  | 12kVA                  | 18kVA                             | 30kVA  | 36kVA                           |  |  |
| Each phase   | 4kVA                   | 6 kVA                             | 10kVA  | 12kVA                           |  |  |
| Voltage  |                        |                                   |  |                                 |  |  |
| Range  |                        |                                   | 0~150V/0~300V  |                                 |  |  |
| Accuracy   |                        |                                   | 0.1%+0.2%F.S.  |                                 |  |  |
| Resolution   |                        |                                   | 0.1 V  |                                 |  |  |
| Distortion *1  |                        | 0.3% @50/60                       | )Hz,1%@15~1kHz,1.5%@>1kHz                            |                                 |  |  |
| ine regulation   |                        |                                   | 0.1%   |                                 |  |  |
| _oad regulation *2   |                        |                                   | 0.2%   |                                 |  |  |
| Temp. coefficient  |                        | 0.02                              | 2% per degree from 25°C                              |                                 |  |  |
| Max Current (1-phase mode)                                   |                        | 0.02                              | n per degree nom 25 C                                |                                 |  |  |
| RMS  | 96A / 48A              | 144A / 72A                        | 240A / 120A  | 288A / 144A                     |  |  |
| Peak (CF=4)  |                        | 576A / 288A                       | 960A / 480A  | 1152A / 576A                    |  |  |
| . ,  |                        | 370A / 200A                       | 900A / 480A  | 1152A/ 570A                     |  |  |
| Max Current (each phase in 3                                 | •                      | 404 / 244                         | 004 / 404  | 064 (494                        |  |  |
| RMS  | 32A / 16A              | 48A / 24A                         | 80A / 40A  | 96A / 48A                       |  |  |
| Peak (CF=4)  | 128A / 64A             | 192A / 96A                        | 320A / 160A  | 384A / 192A                     |  |  |
| Frequency  |                        |                                   |  |                                 |  |  |
| Range  |                        |                                   | DC, 15-1.5kHz  |                                 |  |  |
| Accuracy   |                        |                                   | 0.005%   |                                 |  |  |
| Resolution   |                        |                                   | 0.01 Hz  |                                 |  |  |
| Phase  |                        |                                   |  |                                 |  |  |
| Range  |                        |                                   | 0 ~ 360°   |                                 |  |  |
| Resolution   |                        |                                   | 0.3 <sup>°</sup>                                     |                                 |  |  |
| Accuracy   |                        |                                   | <0.8°@50/60Hz  |                                 |  |  |
| DC Output (1-phase mode)                                     |                        |                                   |  |                                 |  |  |
| Power  | 6kW                    | 9kW                               | 15kW   | 18kW                            |  |  |
| Voltage  | 212V / 424V            | 212V / 424V                       | 212V / 424V  | 212V / 424V                     |  |  |
| Current  | 48A / 24A              | 72A / 36A                         | 120A / 60A   | 144A / 72A                      |  |  |
| OC Output (3-phase mode)                                     |                        |                                   | 12011/0011   | , , , , , , , , , , , , , , ,   |  |  |
| Power  | 2kW                    | 3kW                               | 5kW  | 6kW                             |  |  |
| /oltage  | 212V / 424V            | 212V / 424V                       | 212V/424V  | 212V / 424V                     |  |  |
| 3  | 16A / 8A               | 212V/424V<br>24A/12A              |  | 48A / 24A                       |  |  |
| Current  | 10A / 8A               | 24A/12A                           | 40A / 20A  | 40A / 24A                       |  |  |
| nput AC Power (each phase)                                   |                        |                                   |  |                                 |  |  |
| AC type  |                        | •                                 | ase, Delta or Y connecting                           |                                 |  |  |
| Voltage Operating Range*3                                    |                        | 3Ø 200~24                         | 40V±10%V <sub>LN</sub> (Delta: L-L, Y: L-N)          |                                 |  |  |
| Frequency Range  |                        |                                   | 47-63 Hz   |                                 |  |  |
| Max. Current   | Delta: 80A Y: 70A      | Delta: 120A Y: 90A                | Delta: 200A Y: 160A                                  | Delta: 240A Y: 180A             |  |  |
| Measurement  |                        |                                   |  |                                 |  |  |
| Voltage  |                        |                                   |  |                                 |  |  |
| Range  |                        |                                   | 150V / 300V  |                                 |  |  |
| Accuracy   |                        |                                   | 0.1%+0.2%F.S.  |                                 |  |  |
| Resolution   |                        |                                   | 0.1 V  |                                 |  |  |
| Current  |                        |                                   |  |                                 |  |  |
| Range  | 128/32/8 A peak        | 192/48/12 A peak                  | 320/80/20 A peak                                     | 384/96/24 A peak                |  |  |
| Accuracy (RMS)   |                        |                                   | 0.4%+0.3%F.S.  |                                 |  |  |
| Accuracy (peak)  |                        |                                   | 0.4%+0.6%F.S.  |                                 |  |  |
| Resolution   |                        |                                   | 0.1 A  |                                 |  |  |
| Power  |                        |                                   |  |                                 |  |  |
| Accuracy   |                        |                                   | 0.4%+0.4% F.S  |                                 |  |  |
| Resolution   |                        |                                   |  |                                 |  |  |
|  |                        |                                   | 0.1 W  |                                 |  |  |
| Others   |                        |                                   |  |                                 |  |  |
| Vaveform Synthesis   |                        |                                   | 40 orders @ 50/60Hz                                  |                                 |  |  |
| larmonic Measurement   |                        |                                   | Current 40 orders @ 50/60Hz                          |                                 |  |  |
| Programmable Impedance                                       |                        | 20                                | $\Omega + 200 \mu\text{H} \sim 1\Omega + 1\text{mH}$ |                                 |  |  |
| Efficiency*4   |                        |                                   | 0.75 (Typical)                                       |                                 |  |  |
| Protect  |                        | U                                 | VP, OCP, OPP, OTP, FAN                               |                                 |  |  |
|  |                        | GPIB, RS-                         | 232, USB, Ethernet (standard)                        |                                 |  |  |
|  |                        |                                   |  |                                 |  |  |
| Interface  |                        |                                   |  |                                 |  |  |
| Interface<br>Temperature                                     |                        |                                   | 0°C ~40°C  |                                 |  |  |
| Interface<br>Temperature<br>Operating                        |                        |                                   |  |                                 |  |  |
| I <b>nterface<br/>Temperature</b><br>Operating<br>Storage    |                        |                                   | -40°C~85°C   |                                 |  |  |
| Interface<br>Temperature<br>Operating<br>Storage<br>Humidity |                        |                                   | -40°C~85°C<br>30 %~90 %                              |                                 |  |  |
| Interface<br>Temperature<br>Operating<br>Storage             | 1163 v 546 v 700 mm // | Cf<br>15.78 x 21.5 x 27.56 inch*5 | -40°C~85°C<br>30 %~90 %<br>E ( include EMC & LVD )   | x 21.5 x 27.56 inch x 2 units*5 |  |  |

Note\*1 : Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2**: Load regulation is tested with sine wave and remote sense.

**Note\*3 :** Models with 277V<sub>LN</sub>/480V<sub>LL</sub>(5 Wires) AC input voltage are available upon request.

Note\*4 : Efficiency is tested on input voltage 230V.

Note\*5 : Dimensions (HxWxD) with wheel sets : 1246 x 546 x 700mm / 49.05 x 21.5 x 27.56 inch.

Turnkey Test & Automation

Video & Color

Flat Panel LED/ Display Lighting

### Model 61600 Series



#### 500VA~90kVA

#### **KEY FEATURES**

- Built-in PFC, provide input power factor over 0.98 (full load)
- AC+DC output mode for voltage DC offset simulation
- Programmable voltage and current limit setting
- Comprehensive measurement capability, V, Hz, Irms, Ipk, Iinrush, P, VAR, VA, PF, CF of current and etc.
- High output current crest factor, ideal for inrush current testing
- Turn on, turn off phase angle control
- One-key recall for 9 different voltage and frequency
- Programmable slew rate setting for changing voltage and frequency
- Analog input for power amplifier
- Optional Analog programming interface
   Optional GPIB and RS-232 interface
- (Model 61601~61605) ■ Full protection: OP, OC, OV and OT protection
- Easy use graphic user interface: softpanel (option)
- Capable of delivering power output up to 90KVA by implementing Master-Slave operation

The Chroma Model 61600 series Programmable AC Power Source delivers pure, instrument grade AC and DC power at very low cost. The 61600 AC power source offers output voltage



from 0 to 300VAC, and frequency from 15 to 1.5kHz. A easy-use software can let users edit an auto-run profile and record the measuring data during the test. It is suitable for commercial, avionics, marine, and military applications from bench-top testing to mass productions.

The 61600 AC power source generates very clean AC output with typical distortion less than 0.3%. With power factor correction circuit, the 61600 AC power source yields higher efficiency and deliver more output power .

Using the state-of-the-art PWM technology, the Chroma 61600 AC source is capable of delivering up to 6 times of peak current versus to its maximum rated current which makes it ideal for inrush current testing.

By using advanced DSP technology, 61600 AC power source offers precision and high speed measurements such as RMS voltage, RMS current, true power, power factor, and current crest factor.

The AC+DC and DC mode extend the applications when users need DC voltage component. The 61600 AC power source also provides an external analog input, to amplify the analog signal from arbitrary signal generator. Thus, it is capable to simulate the unique waveform which observed in the field.

With the LCD display and rotary knob, the Chroma 61600 AC power source offers versatile front panel operation. Users may also control the 61600 remotely via GPIB, RS-232 or APG (Analog Programming) interface.

The self-diagnosis routine and the full protections against OPP, OCP, OVP and OTP ensure the quality and reliability for even the most demanding engineering testing and ATE application.

#### **ORDERING INFORMATION**

**61601 :** Programmable AC Source 0~300V, 15~1kHz / 500VA, 1Ø **61602 :** Programmable AC Source 0~300V,

15~1kHz / 1kVA, 1Ø 61603 : Programmable AC Source 0~300V,

15~1kHz / 1.5kVA, 1Ø

**61604 :** Programmable AC Source 0~300V, 15~1kHz / 2kVA, 1Ø

**61605 :** Programmable AC Source 0~300V, 15~1kHz / 4kVA, 1Ø

**61611 :** Programmable AC Source 0~300V, 15~1.5kHz / 12kVA, 1 or 3Ø

**61612 :** Programmable AC Source 0~300V, 15~1.5kHz / 18kVA, 1 or 3Ø

A615001 : Remote Interface for 61501~61505 and 61601~61605 (External V Input, RS-232 Interface, GPIB Interface)

**A615002**: Remote interface board (LAN and USB) for Model 61500/61600/61700 Series

A615003 : AC voltage transform unit for Model 61500/61600 Series

A615007 : Softpanel for Model 61500/61600 Series A615008 : DC Noise Filter (Max. 16A)

**A615103 :** Parallelable power stage unit 18kVA, 1 or 3Ø, for 61511/61512/61611/61612

A615104 : Input/Output terminals for parallel connecting 2 units of 61511/61512/61611/61612/ A615103

A615105 : Input/Output terminals for parallel connecting 3 units of 61511/61512/61611/61612/ A615103

**A615106 :** Reverse Current Protection unit for 61511/61512/61611/61612

Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.



Model 61605~61604



Model 61605





Model 61611, 61612

A615103 Parallelable Power stage Unit 18KVA

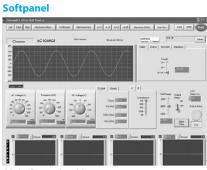
# Model 61600 Series

| SPECIFICATIONS-1        |   |   |   |
|-------------------------|---|---|---|
| Model                   | 61601   | 61602   | 61603   |
| Output phase            | 1   | 1   | 1   |
| Dutput Rating - AC      |   |   |   |
| Power/Phase             | 500VA   | 1000VA  | 1500VA  |
| /oltage                 |   |   |   |
| Range/Phase             | 150V/300V/Auto  | 150V/300V/Auto  | 150V/300V/Auto  |
| Accuracy                | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.   |
| Resolution              | 0.1V  | 0.1V  | 0.1V  |
| Distantion #1           | 0.3% @ 50/60Hz  | 0.3% @ 50/60Hz  | 0.3% @ 50/60Hz  |
| Distortion *1           | 1% @ 15~1kHz  | 1% @ 15~1kHz  | 1% @ 15~1kHz  |
| ine Regulation          | 0.1%  | 0.1%  | 0.1%  |
| oad Regulation *2       | 0.2%  | 0.2%  | 0.2%  |
| Max. Current/Phase      | · · · · · ·   |   |   |
| RMS                     | 4A/2A (150V/300V)   | 8A/4A (150V/300V)                                     | 12A/6A (150V/300V)                                    |
| peak                    | 24A/12A (150V/300V)   | 48A/24A (150V/300V)                                   | 72A/36A (150V/300V)                                   |
| Frequency               |   |   |   |
| Range                   | DC, 15~1kHz   | DC, 15~1kHz   | DC, 15~1kHz   |
| Accuracy                | 0.15%   | 0.15%   | 0.15%   |
| Resolution              | 0.01 Hz   | 0.1370<br>0.01 Hz                                     | 0.01 Hz   |
|                         | 0.01 HZ   | 0.01 HZ   | 0.01 Hz   |
| Dutput Rating - DC      | 25014/  | F00W/   | 75014   |
| Power                   | 250W  | 500W  | 750W  |
| /oltage                 | 212V/424V   | 212V/424V   | 212V/424V   |
| Current                 | 2A/1A (212V/424V)   | 4A/2A (212V/424V)                                     | 6A/3A (212V/424V)                                     |
| nput Rating             |   |   |   |
| /oltage Operating Range | 1Ø 100~240V±10%V <sub>LN</sub>  | $100^{-240V \pm 10\%V_{LN}}$                          | $100^{-240V \pm 10\%V_{LN}}$                          |
| requency Range          | 47~63Hz   | 47~63Hz   | 47~63Hz   |
| Current                 | 10A Max. @ 90V  | 18A Max. @ 90V  | 22A Max. @ 90V  |
| Power Factor *4         | 0.97 Min.   | 0.97 Min.   | 0.98 Min.   |
| Neasurement             |   |   |   |
| /oltage                 |   |   |   |
| Range/Phase             | 150V/300V   | 150V/300V   | 150V/300V   |
| Accuracy                | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.   |
| Resolution              | 0.1V  | 0.1V  | 0.1V  |
| Current                 | i de la companya de l |   |   |
| Range (peak)            | 24A   | 48A   | 72A   |
| Accuracy (RMS)          | 0.4%+0.3%F.S.   | 0.4%+0.3%F.S.   | 0.4%+0.3%F.S.   |
| Accuracy (peak)         | 0.4%+0.6%F.S.   | 0.4%+0.6%F.S.   | 0.4%+0.6%F.S.   |
| Power                   |   |   |   |
| Accuracy                | 0.4%+0.4%F.S.   | 0.4%+0.4%F.S.   | 0.4%+0.4%F.S.   |
| Resolution              | 0.1W  | 0.1W  | 0.4%1.5.  |
| Others                  | 0.177   | 0.177   | 0.177   |
|                         |   | CDIP DS 222 (Ontional)                                |   |
| nterface                |   | GPIB, RS-232 (Optional)                               |   |
| <b>Temperature</b>      | 0.40°C  |   |   |
| Dperating               | 0~40°C  | 0~40°C  | 0~40°C  |
| itorage                 | -40 ~ +85°C   | -40 ~ +85°C   | -40 ~ +85°C   |
| Safety & EMC            |   | CE ( include EMC & LVD )                              |   |
| Dimension (H x W x D)   | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch   | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch |
|                         |   |   |   |

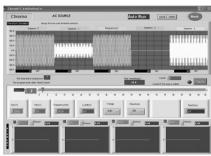
Note\*1: Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load. Note\*3: Load regulation is tested with sinewave and remote sense. Note\*3: Model 61605 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V. Note\*4: Input power factor is tested on input 220V, full load condition.

PXI Test &

# Model 61600 Series



Main Operation Menu



Auto Run (for ON/OFF Burn in test)

| SPECIFICATIONS-2        |   |  |
|-------------------------|---|--|
| Model                   | 61604   | 61605  |
| Output phase            | 1   | 1  |
| Output Rating - AC      |   |  |
| Power/Phase             | 2000VA  | 4000VA   |
| Voltage                 |   |  |
| Range/Phase             | 150V/300V/Auto  | 150V/300V/Auto                                       |
| Accuracy                | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.  |
| Resolution              | 0.1V  | 0.1V   |
| Distortion *1           | 0.3% @ 50/60Hz  | 0.3% @ 50/60Hz                                       |
|                         | 1% @ 15~1kHz  | 1% @ 15~1kHz   |
| Line Regulation         | 0.1%  | 0.1%   |
| Load Regulation *2      | 0.2%  | 0.2%   |
| Max. Current/Phase      |   |  |
| RMS                     | 16A/8A (150V/300V)                                    | 32A/20A (150V/300V)                                  |
| peak                    | 96A/48A (150V/300V)                                   | 192A/96A (150V/300V)                                 |
| Frequency               |   |  |
| Range                   | DC, 15~1kHz   | DC, 15~1kHz  |
| Accuracy                | 0.15%   | 0.15%  |
| Resolution              | 0.01 Hz   | 0.01 Hz  |
| Output Rating - DC      |   |  |
| Power                   | 1000W   | 2000W  |
| Voltage                 | 212V/424V   | 212V/424V  |
| Current                 | 8A/4A (212V/424V)                                     | 16A/8A (212V/424V)                                   |
| Input Rating            |   |  |
| Voltage Operating Range | $100^{-240V \pm 10\%V_{LN}}$                          | $3\emptyset 200 \sim 240V \pm 10\% V_{LN} *3$        |
| Frequency Range         | 47~63Hz   | 47~63Hz  |
| Current                 | 28A Max. @ 90V  | 14A Max. @ 190V                                      |
| Power Factor *4         | 0.98 Min.   | 0.98 Min.  |
| Measurement             |   |  |
| Voltage                 |   |  |
| Range/Phase             | 150V/300V   | 150V/300V  |
| Accuracy                | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.  |
| Resolution              | 0.1V  | 0.1V   |
| Current                 |   |  |
| Range (peak)            | 96A   | 192A   |
| Accuracy (RMS)          | 0.4%+0.3%F.S.   | 0.4%+0.3%F.S.  |
| Accuracy (peak)         | 0.4%+0.6%F.S.   | 0.4%+0.6%F.S.  |
| Power                   |   |  |
| Accuracy                | 0.4%+0.4%F.S.   | 0.4%+0.4%F.S   |
| Resolution              | 0.1W  | 0.1W   |
| Others                  |   |  |
| Interface               | GPIB, RS-232  | 2 (Optional)   |
| Temperature             |   |  |
| Operating               | 0~40°C  | 0~40°C   |
| Storage                 | -40 ~ +85°C   | -40 ~ +85°C  |
| Safety & EMC            | CE ( include  | EMC & LVD )  |
| Dimension (H x W x D)   | 133.35 x 482.6 x 569.5 mm /<br>5.25 x 19 x 22.42 inch | 266.7 x 482.6 x 569.5 mm /<br>10.5 x 19 x 22.42 inch |
| Weight                  | 20 kg / 44.05 lbs                                     | 41 kg / 90.31 lbs                                    |

**Note\*1 :** Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

Note\*2: Load regulation is tested with sinewave and remote sense.

**Note\*3 :** Model 61605 can also use single-phase connecting method of input AC power, the maximum input current is 28A @ 190V.

Note\*4 : Input power factor is tested on input 220V, full load condition.

### Model 61600 Series

| SPECIFICATIONS-3              | (1(1)                                     | (1(1))                     | C1C11 + AC1E102                       | C1C12 + AC1E102      |  |  |
|-------------------------------|---|----------------------------|---------------------------------------|----------------------|--|--|
| Model<br>Output Phase         | 61611                                     | 61612                      | 61611+A615103<br>electable            | 61612+A615103        |  |  |
|                               |   | 1 OF 3 S                   | electable                             |                      |  |  |
| Dutput Rating-AC              | 12kVA                                     | 18kVA                      | 30kVA                                 | 36kVA                |  |  |
|                               |   |                            |                                       |                      |  |  |
| ach phase                     | 4kVA                                      | 6kVA                       | 10kVA                                 | 12kVA                |  |  |
| /oltage                       |   | 0.450                      | 1/2 2221                              |                      |  |  |
| lange                         |   |                            | //0~300V                              |                      |  |  |
| Accuracy                      |   |                            | -0.2%F.S.                             |                      |  |  |
| Resolution                    |   |                            | .1 V                                  |                      |  |  |
| Distortion *1                 |   |                            | 015~1kHz,1.5%@>1kHz                   |                      |  |  |
| ine regulation                |   |                            | .1%                                   |                      |  |  |
| Load regulation *2            |   |                            | .2%                                   |                      |  |  |
| Temp. coefficient             |   | 0.02% per de               | gree from 25°C                        |                      |  |  |
| Max. Current (1-phase mode)   |   |                            |                                       |                      |  |  |
| RMS                           | 96A / 48A                                 | 144A / 72A                 | 240A / 120A                           | 288A / 144A          |  |  |
| Peak (CF=4)                   | 384A / 192A                               | 576A / 288A                | 960A / 480A                           | 1152A / 576A         |  |  |
| Aax. Current (each phase in 3 | -phase mode)                              |                            |                                       |                      |  |  |
| RMS                           | 32A / 16A                                 | 48A / 24A                  | 80A / 40A                             | 96A / 48A            |  |  |
| eak (CF=4)                    | 128A / 64A                                | 192A / 96A                 | 320A / 160A                           | 384A / 192A          |  |  |
| requency                      |   |                            |                                       |                      |  |  |
| ange                          |   | DC, 15                     | 5-1.5kHz                              |                      |  |  |
| Accuracy                      |   | 0.0                        | 005%                                  |                      |  |  |
| Resolution                    |   | 0.0                        | )1 Hz                                 |                      |  |  |
| Phase                         |   |                            |                                       |                      |  |  |
| Range                         |   | 0~                         | · 360°                                |                      |  |  |
| Resolution                    |   |                            | ).3°                                  |                      |  |  |
| Accuracy                      |   |                            | 50/60Hz                               |                      |  |  |
| OC Output (1-phase mode)      |   | <0.0 @                     | 50/00112                              |                      |  |  |
| Power                         | 6kW                                       | 9kW                        | 15kW                                  | 18kW                 |  |  |
| /oltage                       | 212V / 424V                               | 212V / 424V                | 212V / 424V                           | 212V / 424V          |  |  |
| Current                       | 48A / 24A                                 | 72A / 36A                  | 120A / 60A                            | 144A / 72A           |  |  |
|                               | 40A / 24A                                 | 72A7 30A                   | 120A7 00A                             | 144A / 72A           |  |  |
| DC Output (3-phase mode)      | 2kW                                       | 3kW                        | 5kW                                   | 6kW                  |  |  |
|                               | 2KVV<br>212V / 424V                       |                            | 212V / 424V                           | 212V / 424V          |  |  |
| /oltage                       |   | 212V / 424V                |                                       |                      |  |  |
| Current                       | 16A / 8A                                  | 24A / 12A                  | 40A / 20A                             | 48A / 24A            |  |  |
| nput AC Power (each phase)    |   |                            |                                       |                      |  |  |
| AC type                       |   |                            | or Y connecting                       |                      |  |  |
| Voltage Operating Range *3    |   |                            | %V <sub>LN</sub> (Delta: L-L, Y: L-N) |                      |  |  |
| Frequency Range               |   |                            | 63 Hz                                 |                      |  |  |
| Max. Current                  | Delta: 80A Y: 70A                         | Delta: 120A Y: 90A         | Delta: 200A Y: 160A                   | Delta: 240A Y: 180A  |  |  |
| Neasurement                   |   |                            |                                       |                      |  |  |
| /oltage                       |   |                            |                                       |                      |  |  |
| Range                         |   | 150\                       | //300V                                |                      |  |  |
| Accuracy                      |   | 0.1%+                      | -0.2%F.S.                             |                      |  |  |
| Resolution                    |   | 0                          | .1 V                                  |                      |  |  |
| Current                       |   |                            |                                       |                      |  |  |
| Range                         | 128/32/8 A peak                           | 192/48/12 A peak           | 320/80/20 A peak                      | 384/96/24 A peak     |  |  |
| Accuracy (RMS)                |   | 0.4%+                      | -0.3%F.S.                             |                      |  |  |
| Accuracy (peak)               | 0.4%+0.6%F.S.                             |                            |                                       |                      |  |  |
| Resolution                    |   | 0                          | .1 A                                  |                      |  |  |
| Power                         |   |                            |                                       |                      |  |  |
| Accuracy                      |   | 0.4%+                      | -0.4% F.S                             |                      |  |  |
| Resolution                    |   |                            |                                       |                      |  |  |
| fficiency *4                  | 0.1 W                                     |                            |                                       |                      |  |  |
| Protect                       | 0.75 (Typical)<br>UVP, OCP, OPP, OTP, FAN |                            |                                       |                      |  |  |
| nterface                      |   |                            | Ethernet (Standard)                   |                      |  |  |
|                               |   | Ur 10, NJ-ZJZ, UJD,        | , Ethemet (Standard)                  |                      |  |  |
| Temperature                   |   | ~°C                        |                                       |                      |  |  |
| Dperating                     |   |                            | ~40°C                                 |                      |  |  |
| itorage                       |   |                            | C~85°C                                |                      |  |  |
| Humidity                      |   |                            | 5~90%                                 |                      |  |  |
| Safety & EMC                  |   |                            | e EMC & LVD )                         |                      |  |  |
| Dimension (H x W x D)         |   | 5.78 x 21.5 x 27.56 inch*5 | 1163 x 546 x 700 mm / 45.78           |                      |  |  |
| Weight                        | 229.4 kg / 505.29 lbs                     | 242.4 kg / 533.92 lbs      | 480 kg / 1057.27 lbs                  | 495 kg / 1090.31 lbs |  |  |

Note\*1: Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2**: Load regulation is tested with sine wave and remote sense.

**Note\*3 :** Models with  $277V_{LN}/480V_{LL}(5 \text{ Wires})$  AC input voltage are available upon request.

**Note\*4 :** Efficiency is tested on input voltage 230V.

Note\*5 : Dimensions (HxWxD) with wheel sets : 1246 x 546 x 700mm / 49.05 x 21.5 x 27.56 inch.

Manufacturing T Execution System

Turnkey Test & Automation

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-lat Panel

Optical Devices

Photovoltaic Test & Automation

# Model 61700 Series



#### 1.5kVA~12kVA

#### **KEY FEATURES**

- Output Rating: Power: 1.5kVA, 3Ø (61701);
   3kVA, 3Ø (61702); 4.5KVA, 3Ø (61703);
   6kVA, 3Ø (61704); 12kVA, 3Ø (61705)
   Voltage: 0-150V/0-300V
- Frequency: 15~1.2kHz
- Phase angle: 0~360° Programmable
- Built-in PFC, provides input power factor of over 0.98
- AC+DC output mode
- Comprehensive measurement capability,V, Irms, Ipk, Iinrush, P, PF, CF of current etc.
- Programmable r.m.s. current limit
- Turn on, turn off phase angle control
- Full protection: OP, OC, OV and OT protection
- Optional GPIB and RS-232 interface
- Advanced PWM technology delivers high power density in a compact rack-mountable package
- User-definable power-on status
- Built-in output isolation relays
- Easy use graphic user interface: softpanel (Option)
- Optional function for transient voltage output, including LIST, PULSE, STEP and INTERHARMONICS mode

The Chroma Programmable AC Power Source model 61700 series delivers pure, 5-wire, 3-phase AC power. Unlike the traditional 3-phase AC power source, it includes low power rating models at very low cost. Users can program voltage and frequency, measure the critical characteristics of the output on its LCD display. It delivers the right solution to simulate all kinds of input condition of UUT to be utilized in R&D and QA. It is also suitable for commercial applications from laboratory testing to mass productions.

The 61700 supplies the output voltage from 0 to 300VAC and it can be set individually for each phase. Users also can set the phase angle from 0° to 360°. These kinds of function make the 61700 series can simulate unbalance 3-phase power. Because of the wide output frequency from 15 to 1200Hz, it is suitable for avionics, marine and military application. The AC+DC mode extends the output function to simulate abnormal situation when power line contains DC offset.



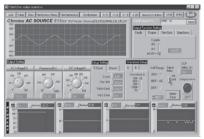
The 61700 series uses the state-of-the-art PWM technology, so it is capable to generate very clean AC output with typical distortion less than 0.3%. With power factor correction circuit, the 61700 series yields higher efficiency and deliver more output power.

By using advanced DSP technology, the 61700 series offers precision and high speed measurements such as RMS voltage, RMS current, true power, power factor, and current crest factor, etc.

The 61700 series offers an optional function to output transient voltage. The function includes LIST, PULSE, STEP and INTERHARMONICS mode. Users can easily program variant waveform for immunity test. The 61700 series can also be controlled by a powerful and user friendly softpanel through GPIB or RS-232 interface. Besides that, the softpanel includes a waveform editor that can edit up to 40th order harmonic components. By this way, the 61700 series get the ability to output distorted waveform as users like.

The self-diagnosis routine and protections against over power, over current, over voltage, over temperature and fan fail, the 61700 series ensure the quality and reliability for even the most demanding engineering testing and production line application.

#### Softpanel



Softpanel of 61700 Series : Main page

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Aerospace Testing : MIL-STD-704F

#### **ORDERING INFORMATION**

61701 : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 1.5kVA 61702 : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 3kVA 61703 : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 4.5kVA 61704 : Programmable AC Source 0~300V/DC, 15~1.2kHz, 3Ø 6kVA 61705 : Programmable AC Source 0~300V, 15~1.2kHz, 3Ø 12kVA A615001 : Remote Interface Board for 61500/ 61600/61700 Series (RS-232 Interface, GPIB Interface) A615002 : Remote interface board (LAN and USB) for Model 61500/61600/61700 Series A615010: Aerospace softpanel for RTCA DO-160G standard

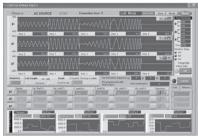
\* A615011 : Aerospace softpanel for MIL-STD-704F standard

A617001 : Softpanel for Model 61700 Series A617002 : Transient voltage output function, including WAVEFORM, LIST, PULSE, STEP and INTERHARMONICS mode

\* Call for availability

Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.





Optional Function : LIST Mode Voltage Transient Output

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Aerospace Testing : RTCA DO-160G All specifications are subject to change without notice.

# Model 61700 Series

| SPECIFICATIONS           |   |   |   |   |   |
|--------------------------|---|---|---|---|---|
| Model                    | 61701   | 61702   | 61703   | 61704   | 61705   |
| AC Output Rating         |   |   |   |   |   |
| Max. Power               | 1500VA  | 3000VA  | 4500VA  | 6000VA  | 12000VA   |
| Per Phase                | 500VA   | 1000VA  | 1500VA  | 2000VA  | 4000VA  |
| Voltage (per phase)      |   |   |   |   |   |
| Range                    | 150V/ 300V  | 150V/ 300V  | 150V/ 300V  | 150V/ 300V  | 150V/ 300V  |
| Accuracy                 | 0.2%+0.2%F.S.                                       | 0.2%+0.2%F.S.                                       | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.                                       | 0.2%+0.2%F.S.                                       |
| Resolution               | 0.1V  | 0.1V  | 0.1V  | 0.1V  | 0.1V  |
|                          | 0.3%@50/60Hz  | 0.3%@50/60Hz  | 0.3%@50/60Hz  | 0.3%@50/60Hz  | 0.3%@50/60Hz  |
| Distortion *1            | 1.5% @ 15~1.2kHz                                    | 1.5% @ 15~1.2kHz                                    | 1.5% @ 15~1.2kHz  | 1.5% @ 15~1.2kHz                                    | 1.5% @ 15~1.2kHz                                    |
| Line regulation          | 0.1%  | 0.1%  | 0.1%  | 0.1%  | 0.1%  |
| Load regulation *2       | 0.1%  | 0.2%  | 0.2%  | 0.1%  | 0.2%  |
| -                        | 0.270   |   |   |   | 0.2%  |
| Temp. coefficient        |   |   | 0.02% per degree from 25  | L   |   |
| Max. Current (per phas   |   |   |   |   |   |
| RMS                      | 4A/2A   | 8A/4A   | 12A/6A  | 16A/8A  | 32A/20A   |
| beak                     | 24A/12A   | 48A/24A   | 72A/36A   | 96A/48A   | 192A/96A  |
| Frequency                |   |   |   |   |   |
| Range                    | DC, 15~1.2kHz                                       | DC, 15~1.2kHz                                       | DC, 15~1.2kHz   | DC, 15~1.2kHz                                       | DC, 15~1.2kHz                                       |
| Accuracy                 | 0.15%   | 0.15%   | 0.15%   | 0.15%   | 0.15%   |
| Phase Angle              |   |   |   |   |   |
| Range                    | 0~360°  | 0~360°  | 0~360°  | 0~360°  | 0~360°  |
| Resolution               | 0.3°  | 0.3°  | 0.3°  | 0.3°  | 0.3°  |
| Accuracy                 | < 0.8°@50/60Hz                                      | < 0.8°@50/60Hz                                      | < 0.8°@50/60Hz  | < 0.8°@50/60Hz                                      | < 0.8°@50/60Hz                                      |
| DC Output Rating (per    | -   | 0.0 000000  | < 0.0 @ 00/00/12  | (0.0 @30/00112                                      | 0.0 @ 00/00/12                                      |
| Power                    | 250W  | 500W  | 750W  | 1kW   | 2kW   |
|                          |   |   |   |   |   |
| /oltage                  | 212V/424V   | 212V/424V   | 212V/424V   | 212V/424V   | 212V/424V   |
| Current                  | 2A/1A   | 4A/2A   | 6A/3A   | 8A/4A   | 16A/8A  |
| nput 3-Phase Power (p    | er phase)   |   |   |   |   |
| Voltage Operating        | 3Ø 100~240  | V+10%V  |   | $3\emptyset 200 \sim 240V \pm 10\%V_{LN}$           |   |
| Range                    |   | 2.1   |   |   |   |
| -requency range          | 47~63Hz   | 47~63Hz   | 47~63Hz   | 47~63Hz   | 47~63Hz   |
| Current                  | 9A Max.   | 16A Max.  | 10A Max.  | 14A Max.  | 28A Max.  |
| Power factor *3          | 0.97 Min.   | 0.98 Min.   | 0.98 Min.   | 0.98 Min.   | 0.98 Min  |
| Measurement              |   |   |   |   |   |
| Voltage (Line-Neutral)   |   |   |   |   |   |
| Range                    | 150V/300V   | 150V/300V   | 150V/300V   | 150V/300V   | 150V/300V   |
| Accuracy                 | 0.2%+0.2%F.S.                                       | 0.2%+0.2%F.S.                                       | 0.2%+0.2%F.S.   | 0.2%+0.2%F.S.                                       | 0.2%+0.2%F.S.                                       |
| Resolution               | 0.1V  | 0.1V  | 0.1V  | 0.1V  | 0.1V  |
| Current (per phase)      | 0.17  | 0.11  | 0.11  | 0.17  | 0.11  |
|                          | 244   | 404   | 724   | 064   | 1024  |
| Range (peak)             | 24A   | 48A   | 72A   | 96A   | 192A  |
| Accuracy (RMS)           | 0.4%+0.3%F.S.                                       | 0.4%+0.3%F.S.                                       | 0.4%+0.3%F.S.   | 0.4%+0.3%F.S.                                       | 0.4%+0.3%F.S.                                       |
| Accuracy (peak)          | 0.4%+0.6%F.S.                                       | 0.4%+0.6%F.S.                                       | 0.4%+0.6%F.S.   | 0.4%+0.6%F.S.                                       | 0.4%+0.6%F.S.                                       |
| Resolution               | 0.01A   | 0.01A   | 0.01A   | 0.01A   | 0.01A   |
| Power (per phase)        |   |   |   |   |   |
| Accuracy                 | 0.4%+0.4% F.S.                                      | 0.4%+0.4% F.S.                                      | 0.4%+0.4% F.S.  | 0.4%+0.4% F.S.                                      | 0.4%+0.4% F.S.                                      |
| Resolution               | 0.1W  | 0.1W  | 0.1W  | 0.1W  | 0.1W  |
| Others                   |   |   |   |   |   |
| Efficiency *4            | 68 %  | 77 %  | 81 %  | 82%   | 82%   |
| Protection               |   |   | UVP, OCP, OPP, OTP, FAN   |   |   |
| Temperature Range        |   |   | , , , , , , , , . , |   |   |
| Operating                |   |   | 0°C~40°C  |   |   |
|                          |   |   |   |   |   |
|                          |   |   | -40°C~85°C  |   |   |
| Storage                  |   |   | 30 %~90 %   |   |   |
| Humidity                 |   |   |   |   |   |
| Humidity<br>Safety & EMC |   |   | CE  |   |   |
| -                        | 400 x 482.6 x 600.5 mm /<br>15.75 x 19 x 23.64 inch | 400 x 482.6 x 600.5 mm /<br>15.75 x 19 x 23.64 inch | CE<br>400 x 482.6 x 600.5 mm /<br>15.75 x 19 x 23.64 inch   | 400 x 482.6 x 600.5 mm /<br>15.75 x 19 x 23.64 inch | 896.4 x 546 x 699.9 mm<br>35.28 x 21.5 x 27.56 inch |

Note\*1: Maximum distortion is tested on output 125VAC (150V RANGE) and 250VAC (300V RANGE) with maximum current to linear load.

**Note\*2**: Load regulation is tested with sinewave and remote sense.

Note\*3 : Input power factor is tested on input 220V, full load condition

Note\*4: Efficiency is tested on input voltage 110V for 61701 and 61702, 220V for 61703, 61704 and 61705.

Note\*5 : For dimension including the wheel set, please add 80mm to overall height.

/ideo & Flat Panel LED/ Color Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

Battery Test & Passive Electrical Semiconductor/ Automation Component Safety IC

PXI Test & Measurement

General Manufacturing T Purpose Execution System

Turnkey Test & Automation

### **Regenerative Grid Simulator**



#### **KEY FEATURES**

- Power rating
   61830 : 30kVA
   61845: 45kVA
   61860: 60kVA
- Voltage range: 0-300V
- Frequency: DC, 30Hz-100Hz
- Full regenerative capability based on 100% of output current rating
- Specifically designed for PV inverter, Smart Grid and EV related test applications
- Single phase or three-phase output selectable
   Programmable slew rate settin for changing
- voltage and frequency Programmable voltage and current limit
- Turn on, turn off phase angle control
- TTL signal which indicates Output transient
- The signal which indicates Output transient
   LIST, PULSE, STEP mode functions for testing Power Line Disturbance (PLD) simulation
- Voltage dips, short interruption and voltage variation simulation
- Harmonics, inter-harmonics waveform synthesizer
- Comprehensive measurement capability, including current harmonics
- Analog programmable interfaces
- Remote interface: GPIB, RS-232, USB and Ethernet
- Provide parallel feature for meeting high power test applications (Three phase only)

Market demand for Distributed Resource (DR) products such as PV inverters and wind energy systems is steadily growing as the world strives for clean renewable energy sources. This demand has created a need for rigorous regulation testing to standards such IEEE 1547 / IEC 61000-3-15 / IEC 62116 ensuring proper and safe operation of on-grid products. It has become critical to manufacturers to conduct these tests to prove compliance and to relieve product liability concerns. Chroma's new 61800 family of Grid Simulators has been designed to fulfill these test requirements by providing a full 4 guadrant, fully regenerative, grid simulator with advanced features for compliance, safety and product verification testing.

The 61800 regenerative grid simulator allows users to vary relevant parameters in order to simulate real world grid environments and



conditions. Supported variations include frequency, phase angle, voltage amplitude, voltage drops in either single or three phase modes. Unbalanced three phase conditions can easily be simulated. And most importantly, the regenerative feature of the 61800 grid simulator provides an effective energy saving method since energy generated by unit under test is fed back to the grid instead of dissipated as heat during operation.

The 61800 grid simulator could also meet test requirements with smart grid and EV related test applications, such as Vehicle to Grid (V2G) and Energy Storage System (ESS) testing. The 61800 is also capable of meeting IEC regulatory standards' (such as IEC 61000-3-2/-3-3/-3-11/-3-12) requirement for AC supply.

The 61800 regenerative grid simulator is not only limited to product development during R&D. Its extensive features are also valuable during design and quality verification as well as throughout various production stages. Using state-of-the-art digital control technology the 61800 can deliver up to 300VAC at output frequencies ranging from 30Hz to 100Hz. The AC+DC feature allows for applications which require a DC offset bias.

The 61800 series is also able to provide precision measurements such as RMS voltage, RMS current, true power, power factor, current crest factor and many others. By applying advanced DSP technology, the 61800 can easily simulate power line disturbance (PLD) using LIST, PULSE and STEP modes. Additional features such as the waveform synthesis function allows users to program various distorted harmonic waveforms which are required by some regulatory standards. GPIB (IEEE488.2), RS-232, USB and Ethernet interface are available to control the 61800 grid simulator remotely.

#### 60kVA x 5 = 300kVA



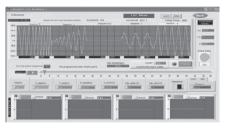
### Softpanel



Main Operation Menu



**Distorted Waveform Editor** 



Transient Voltage Programming

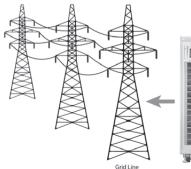
#### **ORDERING INFORMATION**

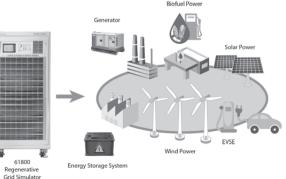
61830 : Regenerative Grid Simulator 30kVA 61845 : Regenerative Grid Simulator 45kVA 61860 : Regenerative Grid Simulator 60kVA A618001 : Softpanel for 61800 Series A618002 : Terminals for parallel connecting B618001 : 400 V<sub>LN</sub> HV option

Support higher than 300V output voltage capability, please contact Chroma sales representative for detailed information.



#### Implement for Micro Grid Testing





All specifications are subject to change without notice.

# **Regenerative Grid Simulator**

# Model 61800 Series

| SPECIFICATIONS                      |  |   |  |
|-------------------------------------|--|---|--|
| Model                               | 61830                                    | 61845                                   | 61860  |
| AC Output Rating                    | ·  | ·                                       |  |
| Output Phase                        | 1 or 3 selectable                        | 1 or 3 selectable                       | 1 or 3 selectable                            |
| Max. Power                          | 30kVA                                    | 45kVA                                   | 60kVA  |
| Per Phase                           | 10kVA                                    | 15kVA                                   | 20kVA  |
| Voltage                             | 1  |   |  |
| Range                               | 0~300VLN/0~520VLL                        | 0~300VLN/0~520VLL                       | 0~300VLN/0~520VLL                            |
| Accuracy                            | 0.1%+0.2%F.S.                            | 0.1%+0.2%F.S.                           | 0.1%+0.2%F.S.                                |
| Resolution                          | 0.1V                                     | 0.1V                                    | 0.1V   |
|                                     | < 0.5% @ 50/60Hz                         | < 0.5% @ 50/60Hz                        | < 0.5% @ 50/60Hz                             |
| Distortion *1                       | < 0.8% @ 30Hz~100Hz                      | < 0.8% @ 30Hz~100Hz                     | < 0.8% @ 30Hz~100Hz                          |
| Line regulation                     | 0.10%                                    | 0.10%                                   | 0.10%  |
| Load regulation                     | 0.20%                                    | 0.20%                                   | 0.20%  |
| Max. Current (1-Phase Mode)         |  |   |  |
| RMS                                 | 150A                                     | 225A                                    | 300A   |
| Peak                                | 450A                                     | 675A                                    | 900A   |
| Max. Current (each phase in 3-      | Phase Mode)                              |   |  |
| RMS                                 | 50A                                      | 75A                                     | 100A   |
| Peak                                | 150A                                     | 225A                                    | 300A   |
| Frequency                           |  |   |  |
| Range                               | 30Hz ~ 100Hz                             | 30Hz ~ 100Hz                            | 30Hz ~ 100Hz                                 |
| Accuracy                            | 0.01%                                    | 0.01%                                   | 0.01%  |
| DC Output (1-Phase Mode) *2         |  |   |  |
| Power                               | 15kW                                     | 22.5kW                                  | 30kW   |
| Voltage                             | 424V                                     | 424V                                    | 424V   |
| Current                             | 75A                                      | 112.5A                                  | 150A   |
| DC Output (3-Phase Mode)            |  |   |  |
| Power                               | 5kW                                      | 7.5kW                                   | 10kW   |
| Voltage                             | 424V                                     | 424V                                    | 424V   |
| Current                             | 25A                                      | 37.5A                                   | 50A  |
| <b>Harmonics Synthesis Function</b> |  |   |  |
| Harmonics range                     | up to 50 ł                               | narmonics order @ 50/60Hz fundamental   | frequency                                    |
| Input Rating                        |  |   |  |
|                                     | 3Ø 200~220V±10%V <sub>LL</sub> , 47~63Hz | 3Ø 200~220V±10%VLL, 47~63Hz             | 3Ø 200~220V±10%VLL, 47~63Hz                  |
| Voltage Operating Range *3          | 3Ø 380~400V±10%VLL, 47~63Hz              | 3Ø 380~400V±10%VLL, 47~63Hz             | 3Ø 380~400V±10%VLL, 47~63Hz                  |
|                                     | 3Ø 440~480V±10%VLL, 47~63Hz              | 3Ø 440~480V±10%VLL, 47~63Hz             | 3Ø 440~480V±10%VLL, 47~63Hz                  |
|                                     | 125A Max./Phase                          | 190A Max./Phase                         | 250A Max./Phase                              |
|                                     | (3Ø 200~220V±10%VLL)<br>65A Max./Phase   | (3Ø 200~220V±10%VLL)<br>100A Max./Phase | (3Ø 200~220V±10%VLL)<br>130A Max./Phase      |
| Current                             | $(30380 - 400V \pm 10\% V_{LL})$         | (3Ø 380~400V ± 10%VLL)                  | (3Ø 380~400V±10%VLL)                         |
|                                     | 58A Max./Phase                           | 87A Max./Phase                          | 115A Max./Phase                              |
|                                     | (3Ø 440~480V±10%V <sub>LL</sub> )        | (3Ø 440~480V±10%V <sub>LL</sub> )       | $(3\emptyset 440 \sim 480V \pm 10\% V_{LL})$ |
| Power factor                        |  | 0.99 (Typical)                          |  |
| Measurement                         |  |   |  |
| Voltage                             |  |   |  |
| Range                               | 0~300V                                   | 0~300V                                  | 0~300V                                       |
| Accuracy                            | 0.1%+0.2%F.S.                            | 0.1%+0.2%F.S.                           | 0.1%+0.2%F.S.                                |
| Current                             |  |   |  |
| Range (peak)                        | 150A                                     | 225A                                    | 300A   |
| Accuracy (RMS)                      | 0.4%+0.3%F.S.                            | 0.4%+0.3%F.S.                           | 0.4%+0.3%F.S.                                |
| Accuracy (peak)                     | 0.4%+0.6%F.S.                            | 0.4%+0.6%F.S.                           | 0.4%+0.6%F.S.                                |
| Power                               |  |   |  |
| Accuracy                            | 0.4%+0.4% F.S.                           | 0.4%+0.4% F.S.                          | 0.4%+0.4% F.S.                               |
| Others                              | ·<br>·                                   | ·<br>                                   | ·<br>  |
| Efficiency                          |  | 80% (Typical)                           |  |
| Protection                          |  | OVP, OCP, OPP, OTP, FAN                 |  |
| Safety & EMC                        |  | CE (include EMC & LVD)                  |  |
| •                                   | 1740 x 780 x 1000 mm                     | 1740 x 780 x 1000 mm                    | 1740 x 780 x 1000 mm                         |
| Dimension (H x W x D)               | (include wheel set)                      | (include wheel set)                     | (include wheel set)                          |
| Weight                              | 850kg                                    | 850kg                                   | 870kg  |
|                                     |  |   |  |

**Note\*1**: Maximum distortion is tested on output 250V with maximum current to linear load **Note\*2**: The DC function is mainly intended as DC offset for AC+DC output voltage function **Note\*2**: Must be specified at time of order. All inputs are 1 + 20, 2 wire (CND) /ideo &

lat Panel

<sup>p</sup>hotovoltaic Test

Automated Optical Inspection

Test &

Passive

Semiconductor/

PXI Test &

### Model 6500 Series



#### 1200VA~9000VA

#### **KEY FEATURES**

- Direct Digital Synthesis (DDS) waveform generation
- Programmable Sine, Square, or Clipped Sine waveform output
- Programmable voltage, current limit, frequency, phase, and distortion
- Power line disturbances simulation capability
- 30 factory installed harmonic waveforms in the waveform library
- User programmable harmonic waveforms
- User programmable sequential output waveforms for auto-execution
- Powerful measurement of Vrms, Irms, Ipk+, Ipk-, power, frequency, crest factor, power factor, inrush current, VA, VAR, etc.
- Built-in power factor correction circuit provides input power factor of over 0.98 to meet the IEC regulations
- Advanced PWM technology to deliver high power output in a light and compact rackmountable package
- Built-in output isolation relays
- User-definable power-on state
- TTL output to signal any output transition for ATE application
- Analog Programming Interface for external amplitude control
- Optional GPIB, RS-232 interface
- List mode transient power line disturbances simulation for Voltage Dip & Variation to meet IEC 61000-4-11
- Easy use graphic user interface: softpanel (Option)

The global AC power testing requirements demand more sophisticated AC Power Source that is capable of simulating a wide variety of AC line conditions, harmonic waveforms, accurate power measurement and analysis. The Chroma 6500 series Programmable AC Power Source delivers the right solution to simulate all kinds of normal/abnormal input conditions and measure the critical characteristics of the product under test. It can be used for R&D design characterization, production testing, and QA verification of commercial, industrial and aerospace electronic products.

The 6500 series delivers maximum rated power for any output voltage up to 300 Vac, and at any frequency between 15Hz to 2000Hz. It is suitable for commercial applications (47-63Hz); for avionics, marine, military applications at 400Hz or higher frequency; or for electrical motor, air-conditioner test applications at 20Hz. All models generate very clean sine or square waveforms output with typical distortion less than 0.5%.



The 6500 series has built-in Direct Digital Synthesis (DDS) Waveform Generator to provide user programmable high precision waveform. For testing products under AC line distortion conditions, clipped sinewave can be generated with 0% to 43% distortion and amplitude from 0% to 100%. It also can simulate all kinds of power line disturbances such as cycle dropout, transient spike, brown out, phase angle, voltage and frequency ramp up (ramp down), etc.. Up to 30 harmonic waveforms are factory installed, and testing for compliance to AC line harmonic immunity standards can be easily achieved in the field.

The 6500 series has built-in 16-bit precision measurement circuit to offer precision and high speed measurement of Vrms, Irms, Ipk+, Ipk-, power, frequency, crest factor, power factor,

#### **ORDERING INFORMATION**

6512: Programmable AC Source 0~300V/15~2kHz / 1.2kVA 6520 : Programmable AC Source 0~300V/15~2kHz/2kVA 6530 : Programmable AC Source 0~300V/15~2kHz/3kVA 6560-2: Programmable AC Source 0~500V/45~1kHz / 6kVA I/P 3Ø 220V 6560-3 : Programmable AC Source 0~500V/45~1kHz / 6kVA I/P 3Ø 380V 6590-2: Programmable AC Source 0~300V/45~1kHz / 9kVA 1Ø or 3Ø, 3000VA per phase, I/P 3Ø 220V 6590-3: AC Power Source 0~300V/45~1kHz / 9kVA 1Ø or 3Ø, 3000VA per phase, I/P 3Ø 380V A650001 : Remote Interface for Model 6500 Series (External V Reference, RS-232 interface, Printer Interface, GPIB Interface, Special I/O Port, System I/O Port) A650002: 19" Rack Mounting Kit for Model 6512/6520/6530 A650003 : Softpanel for Model 6500 Series A610004 : Universal Socket Center for

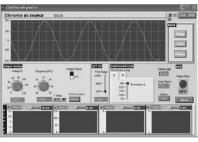
Model 6512/6520/6530/ 6560 Series

inrush current, VA, VAR, etc. It is designed as an integral part of the PMS Power Measurement System. By adding the 6630 Power Analyzer it becomes an ATE for testing IEC 61000-3-2 harmonic and IEC 61000-3-3 flicker measurement.

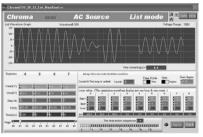
The 6500 series is very easy to operate from the front panel keypad, or from a remote controller via GPIB, RS-232 BUS or APG (Analog Programming) interface. Instrument drivers are available to integrate the AC source into any ATE application operating under Labview control.

Designed with self diagnostic routine and protected against over load, over power, over temperature, over current and fan fail, the instrument offers quality and reliability for even the most demanding production line applications.

#### Softpanel



Main operation menu



List Mode: Transient voltage programming

### 6500 Series Programmable AC Source Family



All specifications are subject to change without notice.

### Model 6500 Series

| SPECIFICATIONS     | (512  | (520   | (520   | 6560   | 6500   |
|--------------------|---|--|--|--|--|
| Model              | 6512  | 6520   | 6530   | 6560   | 6590   |
| Output Phase       | 1   | 1  | 1  | 1 (parallel or series)                                 | 1 or 3 selectable                                    |
| Output Ratings     |   |  |  |  |  |
| Power              | 1200VA  | 2000VA   | 3000VA   | 6000VA   | 3000VA per phase,<br>9000VA total                    |
| /oltage            |   |  |  |  |  |
| Range/phase        | 150V / 300V / Auto  | 150V / 300V / Auto   | 150V / 300V / Auto   | 150V / 300V (parallel)<br>300V / 500V (series)         | 150V / 300V  |
| Accuracy           | 0.2% +0.2%of F.S.   | 0.2% +0.2%of F.S.  | 0.2% +0.2%of F.S.  | 0.2% +0.2%of F.S.                                      | 0.2% +0.2%of F.S.                                    |
| Resolution         | 0.1V  | 0.1V   | 0.1V   | 0.1V   | 0.1V   |
| Distortion *1      | 1% (15~45Hz)<br>0.5% (> 45~500Hz)<br>1% (> 500~1kHz)                | 1% (15~45Hz)<br>0.5% (> 45~500Hz)<br>1% (> 500~1kHz)               | 1% (15~45Hz)<br>0.5% (> 45~500Hz)<br>1% (> 500~1kHz)               | 1% (45~1kHz)   | 1% (45~1kHz)   |
| in a Degulation    | 2% (> 1K~2kHz)  | 2% (> 1K~2kHz)   | 2% (> 1K~2kHz)   | 0.10/  | 0.10/  |
| ine Regulation     | 0.1%  | 0.1%   | 0.1%   | 0.1%   | 0.1%   |
| Load Regulation *2 | 0.1%  | 0.1%   | 0.1%   | 0.2% (series), 0.8% (parallel)                         | 0.2%   |
| Temp. Coefficient  | 0.02% per°C   | 0.02% per°C  | 0.02% per°C  | 0.02% per°C  | 0.02% per°C  |
| Max. Current/Phas  | e   |  |  |  |  |
| RMS                | 12A/6A (150V / 300V)  | 20A/10A (150V / 300V)  | 30A/15A (150V / 300V)  | 60/30/15A (150/300/500V)                               | 30A/15A (150V / 300V)<br>90A/45A total               |
| peak               | 36A/18A (15~100Hz)<br>30A/15A (>100~1KHz)<br>24A/12A (>1K~2KHz)     | 60A/30A (15~100Hz)<br>50A/25A (>100~1KHz)<br>40A/20A (>1K~2KHz)    | 90A/45A (15~100Hz)<br>75A/38A (>100~1KHz)<br>60A/30A (>1K~2KHz)    | 180/90/45A (45~100Hz)<br>150/75/38A (>100~1KHz)        | 90A/45A (45~100Hz)<br>75A/38A (>100~1KHz)            |
| Frequency          |   |  |  |  |  |
| Range              | 15 ~ 2kHz   | 15 ~ 2kHz  | 15 ~ 2kHz  | 45 ~ 1kHz  | 45 ~ 1kHz  |
| Accuracy           | 0.15%   | 0.15%  | 0.15%  | 0.15%  | 0.15%  |
| Resolution         | 0.01Hz (15 ~ -99.9Hz)<br>0.1Hz (100 ~ 999.9Hz)<br>0.2Hz (1k ~ 2kHz) | 0.01Hz (15 ~ 99.9Hz)<br>0.1Hz (100 ~ 999.9Hz)<br>0.2Hz (1k ~ 2kHz) | 0.01Hz (15 ~ 99.9Hz)<br>0.1Hz (100 ~ 999.9Hz)<br>0.2Hz (1k ~ 2kHz) | 0.01Hz (45 ~ 99.9Hz)<br>0.1Hz (100 ~ 999.9Hz)          | 0.01Hz (45 ~ 99.9Hz)<br>0.1Hz (100 ~ 999.9Hz)        |
| Input Ratings      | , , , , , , , , , , , , , , , , , , ,                               |  | , , ,  | · /  |  |
| Voltage Operating  |   |  |  |  |  |
| Range              |   | $10200 \sim 240V \pm 10\%V_{LN}$                                   |  | 3Ø 200~240   | $V \pm 10\%V_{LN}$                                   |
| Frequency Range    | 47 ~ 63Hz   | 47 ~ 63Hz  | 47 ~ 63Hz  | 47 ~ 63Hz  | 47 ~ 63Hz  |
| Current            | 10A max.  | 15A max.   | 23A max.   | 23A max./phase   | 23A max./phase                                       |
| Power Factor       | 0.95 min. under full load   | 0.97 min. under full load  | 0.98 min. under full load  | 0.98 min. under full load                              | 0.98 min. under full load                            |
| Measurement        |   |  |  |  |  |
| Voltage/Phase      |   |  |  |  |  |
| Range              | 0 ~ 150V / 0 ~ 300V   | 0~150V/0~300V  | 0~150V/0~300V  | 0~150V/0~300V  | 0 ~ 150V / 0 ~ 300V                                  |
| Accuracy (RMS)     | 0.25% + 0.1% F.S.   | 0.25% + 0.1% F.S.  | 0.25% + 0.1% F.S.  | 0.25% + 0.1% F.S.                                      | 0.25% + 0.1% F.S.                                    |
| Resolution         | 0.25% + 0.1% + .5.  | 0.25% + 0.1% +.5.  | 0.25% + 0.1% +.5.  | 0.25%10.1%1.5.   | 0.25% + 0.1% +.5.                                    |
| Current/Phase      | 0.17  | 0.1V   | 0.1V   | 0.17   | 0.1 V  |
|                    | 0~60A   | 0 1004   | 0 1404   | 0 2004   | 0~140A   |
| Range (peak)       |   | 0~100A   | 0~140A   | 0 ~ 280A   |  |
| Accuracy (RMS)     | 0.4% + 0.25%F.S.  | 0.4% + 0.15%F.S.   | 0.4% + 0.1%F.S.  | 0.4% + 0.1%F.S.  | 0.4% + 0.1%F.S.                                      |
| Accuracy (peak)    | 0.4% + 0.5%F.S.   | 0.4% + 0.3% F.S.   | 0.4% + 0.2% F.S.   | 0.4% + 0.2% F.S.                                       | 0.4% + 0.2% F.S.                                     |
| Resolution         | 0.01A   | 0.01A  | 0.01A  | 0.01A  | 0.01A  |
| Power/Phase        |   |  |  |  |  |
| Accuracy           | 1% F.S. ( CF<6)   | 1% F.S. ( CF<6)  | 1% F.S. ( CF<6)  | 1% F.S. ( CF<6)  | 1% F.S. ( CF<6)                                      |
| Resolution         | 0.01W   | 0.01W  | 0.01W  | 0.01W  | 0.01W  |
| Frequency          |   |  |  | /  |  |
| Range              | 15 ~ 2kHz   | 15 ~ 2kHz  | 15 ~ 2kHz  | 45~1kHz  | 45~1kHz  |
| Accuracy           | 0.01% +2 count  | 0.01% +2 count   | 0.01% +2 count   | 0.01% +2 count   | 0.01% +2 count                                       |
| Resolution         | 0.01Hz  | 0.01Hz   | 0.01Hz   | 0.01Hz   | 0.01Hz   |
| Others             |   |  |  |  |  |
| Efficiency         | 80% typical   | 80% typical  | 80% typical  | 80% typical  | 80% typical  |
| Protection         |   |  | OPP, OLP, OTP, FAN Fai   | il   |  |
| Temperature        |   |  |  |  |  |
| Operating          | 0 ~ 40°C  | 0 ~ 40°C   | 0~40°C   | 0~40°C   | 0~40°C   |
| Storage            | -40 ~ +85°C   | -40 ~ +85°C  | -40 ~ +85°C  | -40 ~ +85°C  | -40 ~ +85°C  |
|                    |   |  | Include LVD and EMC Requ   | I  |  |
|                    |   |  |  |  |  |
| Safety & EMC       | 221.5 x 425 x 567 mm /  | 221.5 x 425 x 567 mm /   | 221.5 x 425 x 567 mm /   | 765.94 x 546 x 700 mm /                                | 888.5 x 546 x 700 mm /                               |
|                    | 221.5 x 425 x 567 mm /<br>8.72 x 16.73 x 22.32 inch                 |  | 221.5 x 425 x 567 mm /<br>8.72 x 16.73 x 22.32 inch                | 765.94 x 546 x 700 mm /<br>30.16 x 21.5 x 27.56 inch*3 | 888.5 x 546 x 700 mm /<br>34.98 x 21.5 x 27.56 inch* |

**Note\*1 :** Test under output voltage from half to full range.

**Note\*2**: Test with sinewave & with remote sense.

Note\*3 : For dimension including the wheel set, please add 80mm to overall height.

Video & Flat Panel LED/ Color Display Lighting

### **Digital Power Meter**

### Model 66200 Series



#### 66205

#### **KEY FEATURES**

- Embedded high speed DSP, 16 bits Analog/ Digital converters
- 5mA minimum current range(66203/66204) and 0.1mW power resolution
- Meets ENERGY STAR / IEC 62301 / ErP ecodesign / SPEC POWER measurement requirement
- Meets IEC 61000-4-7 standard requirement for harmonics measurement (66205)
- Accumulated energy methods for unstable power measurement
- User-define criteria for automatic PASS/FAIL judgment
- Half rack width and small 2U height, suitable for system integration
- Dual shunts for current range selection providing high accuracy over a wide current range (66202)
- THD and user-specify orders distortion measurement (66202)
- Inrush current and Energy measurement (66202)
- Optional remote interface: USB or GPIB+USB
- Voltage/current harmonics measurement up to 50 orders
- Capable of displaying input waveform DC component measurement reading
- Half rack width and suitable for system integration, 2U height (66201/66202,66205)
- 3U height, 4 input modules design (66203/66204)
- Support different wiring configuration power measurement (1P2W/1P3W/3P3W/3P4W) (66203/66204)
- Support external shunt and CT for higher current measurement application (66204)
- SMART Range function provides seamless power measurement capability (66205)
- Capable of extending current measurement range up to 30A (66205)
- USB (Host) interface provides data logging functionality (66205)
- Optional remote interface: USB or GPIB+USB
- Support GPIB, USB, RS232, Ethernet (LXI) interface (66205)



66203/66204



66201/66202



Chroma Digital Power Meter 66200 series provide both single and multiple phase power measurement solution designed for measurement of AC or AC+DC power signals and related parameters common to most electronic products. Instead of traditional analog measurement circuits, the Power Meter 66200 uses state-ofthe-art DSP digitizing technology. The internal 16 bits analog/digital converters with sampling rates of up to 250kHz provide both high speed and high accuracy measurements. The instrument provides excellent function and stability compared to other power meters of same class currently available on the market. It includes a front panel 4 display area with 5 digits, 7-segment LED readouts as well as optional remote control using USB or GPIB interfaces.

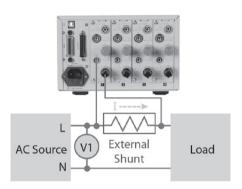
The 66200 series Power Meter is also designed to meet ENERGY STAR/IEC 62301/ErP ecodesian/ SPEC POWER measurement requirements. The instrument provides 5mA (66203/66204) minimum current range and 0.1mW power resolution providing less than 2% uncertainty for No-Load mode power measurement. Included are not only traditional averaging methods but also accumulated energy approach method used to calculate active power data. In this way, users can achieve accurate readings even if power consumption levels are not stable or operating on in non-linear modes (i.e. hiccup modes). The Model 66202 can even measure Total-Harmonic-Distortion (THD) and to user-specify distortion orders. Thus, the instrument can easily measure distortion values up to and including the 13th harmonic as required by ENERGY STAR requirements. The 66200 Power Meter also includes limit test GO/NG functions. This feature allows users to set pass/fail limits to automatically display PASS/FAIL according to these user-define criteria.

The 66201 includes simple measurement functions designed for testing at low power levels (maximum current 4A). Examples of these devices are AC adapters, battery chargers, LCD monitors and similar devices. Included measurement data is Voltage (Vrms, Vpeak+, Vpeak-), Current (Irms, Ipeak+, Ipeak-), Power (W, Power Factor, Apparent Power VA, Reactive Power VAR), Current Crest Factor and Frequency. The Model 66201 Power meter is competitively priced to be suitable for bench-top testing and automated production line testing.

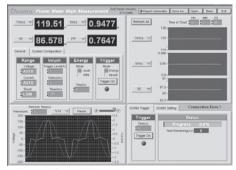
The 66202 includes a 2-shunt design to get 66202 highly accurate for both low and high current measurements. Besides the parameters measured on Model 66201, it also provides Inrush Current, Total Harmonic Distortion of V/I and Energy measurement. With these practical functions, The Model 66202 is suitable for meeting the demanding tasks of R&D and quality control departments.

The 66203/66204 are packaged in a 3U high, half rack enclosure suitable for bench top or system integration. The power meters are capable of supporting external shunts and CT for higher current application. The 4 channel 66204 is suitable for input and output parameter measurement and efficiency of 3 phase PV inverters can be calculated with measurement of the DC voltage/current at the input side of the inverter.

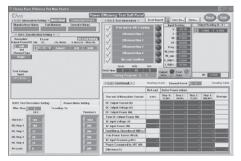
The 66203/66204 power meters include a 2-shunt design to provide high accurate readings for both low and high current measurements. The power meters also support features such as Inrush current, Total Harmonic Distortion of V/I, and Energy measurements. With these practical functions, the 66203/66204 power meters are suitable for meeting the demanding tasks of R&D, production and quality control departments.



66203/66204 Power Meters support external shunt function for high current (>20A) measurement application.



Softpanel for Model 66200 Series



Power Efficiency Test Softpanel

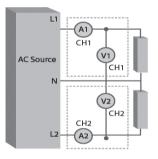
## Digital Power Meter

### Model 66200 Series

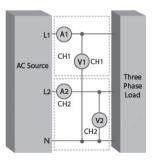
The multi-channel of 66203/66204 Power Meters are capable of supporting different wiring modes. As shown the instruments can be configured for single and 3 phase configurations by selection preset modes.

AC Source

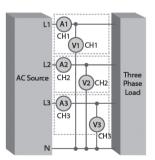
1P2W (Single Phase Two Wire)



1P3W (Single Phase Three Wire)



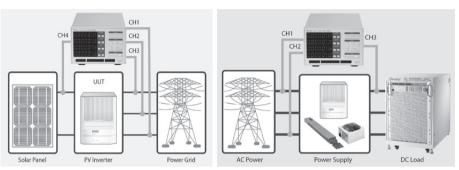
3P3W (Three Phase Three Wire)



3P4W (Three Phase Four Wire)

Each channel of 66203/66204 has the ability to provide independent measurements; hence the meters are suitable for multi-point measurement applications such as PV inverter testing. Instruments are designed for measuring DC input parameters as well as three phase AC readings on the output side. The overall efficiency for the PV inverter can easily be obtained by built-in functions. In order to meet high voltage applications (up to 1200Vrms) Chroma offers an HV option kit.

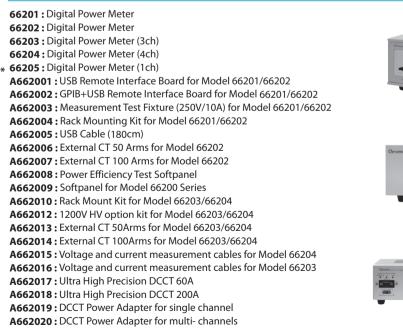
User could also implement 3P3W (Three Phase Three Wire) wiring mode for three phase power measurement application. Such as Power Supplies.



Support Ultra High Precision DCCT 60A/200A Optional Kit for High Current Measurement Application



#### ORDERING INFORMATION



\* Call for availability

A662003

A662019

A662020

# **Digital Power Meter**

### Model 66200 Series

| Model                    | 66201   | 66202   |
|--------------------------|---|---|
| Channel                  | 1   | 1   |
| Parameters               | V, Vpk, I, Ipk, W, VA, VAR, PF, CF_I, F   | V, Vpk, I, Ipk, Is, W, VA, VAR, PF, CF_I, F, THD_V, THD_I, Energy                           |
| /oltage                  |   |   |
| Range                    | 150/300/500Vrms (CF = 1.6)  | 150/300/500Vrms (CF = 1.6)  |
|                          | DC, 15Hz - 1kHz: 0.1% of rdg + 0.08% of rng   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.08% of rng   |
| Accuracy                 | 1kHz - 10kHz: (0.1+0.05*KHz)% of rdg + 0.08% of rng   | 1kHz - 10kHz: (0.1+0.05*KHz)% of rdg + 0.08% of rng   |
|                          |   | 15Hz - 1kHz: 0.1% of rdg + 0.08% of rng   |
| Harmonics Accuracy       |   | 1kHz - 10kHz: (0.1+0.05*KHz)% of rdg + 0.08% of rng   |
| Input Resistance         | 1MΩ   | 1ΜΩ   |
| Current                  |   |   |
| Range                    | 0.01/0.1/0.4/2 Arms (CF=4) *1   | SHUNT H : 0.2/2/8/20Arms (CF=2@0.2/2/8A, CF = 4@ 20A<br>SHUNT L : 0.01/0.1/0.4/2Arms (CF=4) |
|                          |   | SHUNT H:  |
|                          |   | 0.2A Range:   |
|                          |   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.12% of rng   |
|                          |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.12% of rng  |
|                          | 0.01A Range:  | 2A/8A/20A Range:  |
|                          | DC, 15Hz - 1kHz: 0.1% of rdg + 0.25% of rng   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng  |
|                          | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.25% of rng  | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng   |
| Accuracy *2              | -   | -   |
|                          | 0.1A/0.4A/2A Range:   | SHUNT L:  |
|                          | DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng  | 0.01A Range:  |
|                          | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.25% of rng   |
|                          |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.25% of rng  |
|                          |   | 0.1A/0.4A/2A Range:   |
|                          |   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng  |
|                          |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng   |
|                          |   | SHUNT H:  |
|                          |   | 0.2A Range:   |
|                          |   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.12% of rng   |
|                          |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.12% of rng  |
|                          |   | 2A/8A/20A Range:  |
|                          |   | DC, 15Hz - 1kHz: 0.1% of rdg + 0.1% of rng  |
|                          |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng   |
| Harmonics Accuracy       |   |   |
|                          |   | SHUNT L:  |
|                          |   | 0.01A Range:  |
|                          |   | DC, $15$ Hz - 1kHz: 0.1% of rdg + 0.25% of rng  |
|                          |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.25% of rng  |
|                          |   | 0.1A/0.4A/2A Range:   |
|                          |   | DC, $15Hz - 1kHz$ : 0.1% of rdg + 0.1% of rng   |
| Devuer                   |   | 1kHz - 10kHz: (0.1+0.05 x kHz)% + 0.1% of rng   |
| Power                    | 1 5W 1000W 12 ranges  | 1 5W - 10kW 24 ranges   |
| Range                    | 1.5W ~ 1000W, 12 ranges<br>47Hz~63Hz : 0.1% of rdg + 0.1% of rng                              | 1.5W ~ 10kW, 24 ranges<br>47Hz~63Hz : 0.1% of rdg + 0.1% of rng                             |
| Accuracy                 | 4/Hz~03H2 : 0.1% of rdg + 0.1% of rdg<br>15Hz~1kHz : (0.1+ 0.2/PF x kHz)% of rdg+0.18% of rng | 4/Hz~63HZ : 0.1% 6Frdg + 0.1% 6Frdg<br>15Hz~1kHz : (0.1+ 0.2/PF x kHz)% of rdg+0.18% of rng |
| Power Factor accuracy *3 | 0.006+(0.003/PF) x kHz  | 0.006+(0.003/PF) x kHz  |
| Frequency                | 0.000 (0.003/11) / KIIZ   |   |
| Range                    | DC, 15Hz ~ 10kHz  | DC, 15Hz ~ 10kHz  |
| Measuring Condition      | Voltage (10 ~ 100% of the voltage range)  | Voltage (10 ~ 100% of the voltage range)  |
| Others                   |   |   |
| Display Resolution       |   | 5 Digits  |
| Display update rate      | ſ   | ).25~2 sec  |
| nput Voltage             |   | /~ 250V, 50Hz/ 60Hz, 30VA   |
| nterface                 |   | USB or GPIB+USB   |
| Operating Temperature    | •   | 0°C ~ 40°C  |
|                          |   | 10°C ~ 85°C   |
| Storage<br>Safety & EMC  |   |   |
| Dimension (H x W x D)    |   | lude EMC & LVD)   |
|                          | δδ x 212 x 348.1 mm / 3.46 x δ  | 3.35 x 13.7 inch (excluding projections)  |

The specifications are valid only after the power meter is turned on more than one hour in a thermally stable environment.

**Note\*1**: The maximum measurable current of 66201 is 4 Arms.

**Note\*2**: The current accuracy applies temperature range  $23 \pm 1^{\circ}$ C for 0.01A & 0.2A(CF=2). For all the other current ranges, the spec. applied under  $23 \pm 5^{\circ}$ C. **Note\*3**: The PF spec. applies only when the signals are higher then 50% of the selected voltage and current ranges.

# Model 66200 Series

| SPECIFICATIONS-2      |                       |   |   |  |  |
|-----------------------|-----------------------|---|---|--|--|
| Model                 | 66203                 | 66204   | 66205 *1  |  |  |
| Channel               | 3                     | 4   | 1   |  |  |
| Parameters            | V, Vp                 | ok, I, Ipk, Is, W, VA, VAR, PF, CFi, F, THD V, TH   | ID I, Energy                                      |  |  |
| Voltage               |                       |   |   |  |  |
| Range                 |                       | 300V/600Vrms (CF=2 ),<br>on up to 1200Vrms  | 15V/30V/60V/150V/300V/600Vrms (CF=2 ),<br>6 range |  |  |
| Accuracy              | 1                     | DC, 10Hz to 1kHz : 0.1% RD + 0.08% F<br>kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.0  | 8% RNG  |  |  |
| Harmonics Accuracy    | 1                     | 10Hz to 1kHz : 0.1% RD + 0.08% RN<br>kHz to 10kHz: (0.1+0.05*kHz)% RD + 0.0   |   |  |  |
| Input Resistance      |                       | <b>2M</b> Ω   |   |  |  |
| Current               |                       |   |   |  |  |
| Range                 | 5mA/20mA/50mA/200mA/  | 5mA/20mA/50mA/200mA/500mA/2A/5A/20Arms (CF=4)   |   |  |  |
| Accuracy              | 1                     | DC, 10Hz to 1kHz : 0.1% RD + 0.1% R<br>kHz to 10kHz : (0.1+0.05 x kHz)% RD + 0.   |   |  |  |
| Harmonics Accuracy    | 1                     | 10Hz to 1kHz : 0.1% RD + 0.1% RNG<br>1kHz to 10kHz : (0.1+0.05 x kHz)% RD + 0.1% RNG  |   |  |  |
| Power                 | -                     |   |   |  |  |
| Range                 | 75mW ~ 12k            | (W (48 ranges)  | 75mW ~ 18kW (60 ranges)                           |  |  |
| Accuracy              | 10Hz ~ 1KHz : 0.1     | DC, 47Hz ~ 63Hz : 0.1% RD + 0.1% RNG<br>10Hz ~ 1KHz : 0.1% RD + 0.18% RNG<br>1KHz ~ 10KHz : (0.1+0.1 x kHz)% RD + 0.18% RNG |   |  |  |
| Power Factor accuracy |                       | 0.001+(15ppm/PF) x Hz   | (0.1+0.1xkHz+0.3/PFxkHz)% RD+0.18% RNG            |  |  |
| Frequency             |                       |   |   |  |  |
| Range                 |                       | DC, 10Hz ~ 10kHz  |   |  |  |
| Measuring Condition   |                       | Voltage (10 ~ 100% of the voltage rar   | nge)  |  |  |
| Others                |                       |   |   |  |  |
| Display Resolution    |                       | 5 Digits  |   |  |  |
| Display Update Rate   | 0.25sec/0.5s          | sec/1sec/2sec   | 50ms/100ms/250ms/500ms/1s/2s/5s                   |  |  |
| Input Voltage         | 100~240V±10%, 50/60Hz |   |   |  |  |
| Interface             | USB+GPIE              | USB+GPIB+USB (Host)+<br>RS232+Ethernet (LXI) *1   |   |  |  |
| Operation Temperature |                       | 0°C ~ 40°C  |   |  |  |
| Storage               |                       | -40°C ~ 85°C  |   |  |  |
| Safety & EMC          |                       | CE (include EMC & LVD)  |   |  |  |
| Dimension (H x W x D) | 133 x 212 x 420 mm    | / 5.25 x 8.25 x 16.3 inch   | 88 x 212 x 348mm / 3.46 x 8.35 x 13.7 inch        |  |  |
| Weight                | 7.5 kg / 16.5 lbs     | 8.5 kg / 18.7 lbs   | Approx. 4kg / 8.8 lbs                             |  |  |

Note\*1 : Call for availability

The specifications are valid only after the power meter is turned on more than one hour in a thermally stable environment.

Turnkey Test & Automation

# Model 62000P Series



#### 600W, 1200W, 2400W, 5000W

#### **KEY FEATURES**

- Wide range of voltage & current combinations with constant power
- Voltage range: 0 ~ 600V
   Current range: 0 ~ 120A
   Power range: 600W, 1200W, 2400W, 5000W
- Digital encoder knobs, keypad and function keys
- Power Factor Correction (0.95)
- High-speed Programming
- Precision V&I Measurements
- Current sharing for parallel operation with Master/Slave Control
- Voltage Ramp function : Time Range (5ms~99 hours)
- Auto Sequencing Programming : 10 Programs /100 Sequences / 8 bit TTL
- Voltage & Current Slew Rate Control
- OVP, Current Limit, Thermal protection
- Remote sense, 5V line loss compensation
- APG (Analog Programmable Interface) with Isolated Analog Interface Card
- Optional GPIB control with SCPI
- Optional Ethernet/LXI interface
- Standard RS-232 & USB interface
- LabView and Labwindows
- CE Certified

Chroma's new 62000P Series of programmable DC power supplies offer many unique advantages for ATE integration and testing. These advantage include a constant power operating envelope, precision readback of output current and voltage, output trigger signals as well as the ability to create complex DC transients waveforms to test device behavior to spikes, drops, and other voltage deviations.Designed for automated testing DC-DC converters and similar products, the 62000P sets a new standard for high accuracy programmable DC supplies.

The 62000P Series includes 12 different models ranging from 600W to 5000W, up to 120A and up to 600V. Due to their constant power operating envelope a single instrument can provide both high voltage/low current AND low voltage/ high current thereby reducing the number of supplies needed in typical ATE applications.

The 62000P also includes 16 bit readback capability for accurate voltage and current readings. This means systems no longer need complex shunt/multiplexers to make accurate readings of the UUT's input parameters. The instruments also include I/O ports providing 8 bit TTLs, DC-ON, fault output signal and remote inhibit as well as a output trigger signal for system timing measurements.



Another unique capability of the 62000P supplies is their ability to create complex DC transient waveforms. This capability allows devices to be tested to DC voltage dropouts, spikes and other voltage variations making them an ideal choice for airborne device testing, inverter testing and other devices which will experience voltage interrupts. Applications include DC/DC Converter & Inverter voltage drop test, engine start-up simulation, battery automated charging, electronic product life cycle test, and etc.

#### Master/Slave Parallel & Serial Control

When high power is required, it is common to connect two or more power supplies in parallel or series. The 62000P Series supplies have a smart Master / Slave control mode making series/ parallel operation fast and simple. In this mode the master scales values and downloads data to slave units so programming is simple and current sharing automatic.

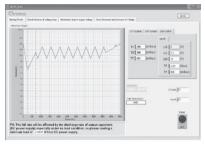


Model 62050P-100-100

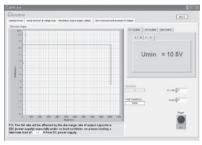
#### Soft Panel



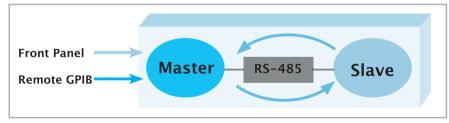
#### Transient Voltage Programming



#### ISO 16750-2 4.5.3 Starting Profile



ISO 16750-2 4.5.1 Momentary Drop In Supply Voltage



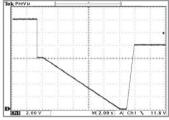
#### Master/Slave Parallel & Serial Control

#### **ORDERING INFORMATION**

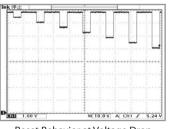
62006P-30-80: Programmable DC Power Supply 30V/80A/600W 62006P-100-25: Programmable DC Power Supply 100V/25A/600W 62006P-300-8: Programmable DC Power Supply 300V/8A/600W 62012P-40-120: Programmable DC Power Supply 40V/120A/1200W 62012P-80-60: Programmable DC Power Supply 80V/60A/1200W 62012P-100-50: Programmable DC Power Supply 100V/50A/1200W 62012P-600-8: Programmable DC Power Supply 600V/8A/1200W 62024P-40-120 : Programmable DC Power Supply 40V/120A/2400W 62024P-80-60: Programmable DC Power Supply 80V/60A/2400W 62024P-100-50 : Programmable DC Power Supply 100V/50A/2400W 62024P-600-8: Programmable DC Power Supply 600V/8A/2400W 62050P-100-100 : Programmable DC Power Supply 100V/100A/5000W A620004 : GPIB Interface for Model 62000P Series A620006 : Rack mounting kit for Model 62000P Series (2U model) A620009 : Softpanel for 62000P Series A620015 : Rack mounting kit for Model 62050P-100-100 A620023 : Ethernet/LXI Interface for Model 62000P Series

# Model 62000P Series

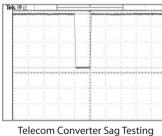
| ELECTRICAL SPECIFIC    | ATIONS-1          |                     |                       |                         |                   |                     |
|------------------------|-------------------|---------------------|-----------------------|-------------------------|-------------------|---------------------|
| Model                  | 62006P-30-80      | 62006P-100-25       | 62006P-300-8          | 62012P-40-120           | 62012P-80-60      | 62012P-100-50       |
| Output Ratings         |                   |                     |                       |                         |                   |                     |
| Output Voltage         | 0~30V             | 0~100V              | 0~300V                | 0-40V                   | 0~80V             | 0~100V              |
| Dutput Current         | 0~80A             | 0~25A               | 0~8A                  | 0-120A                  | 0~60A             | 0~50A               |
| Output Power           | 600W              | 600W                | 600W                  | 1200W                   | 1200W             | 1200W               |
| ine Regulation         |                   |                     |                       |                         |                   |                     |
| /oltage                | 0.01%+2mV         | 0.01%+6mV           | 0.01%+18mV            | 0.01%+2mV               | 0.01%+8mV         | 0.01%+10mV          |
| Current                | 0.01%+25mA        | 0.01%+5mA           | 0.03%+20mA            | 0.01%+25mA              | 0.01%+10mA        | 0.01%+12mA          |
| Load Regulation        | ·                 |                     |                       |                         |                   |                     |
| /oltage                | 0.01%+3mV         | 0.01%+10mV          | 0.01%+50mV            | 0.01%+3mV               | 0.01%+12mV        | 0.01%+18mV          |
| Current                | 0.01%+10mA        | 0.01%+5mA           | 0.03%+40mA            | 0.01%+10mA              | 0.01%+20mA        | 0.01%+28mA          |
| /oltage Measurement    |                   |                     |                       |                         |                   |                     |
| Range                  | 6V/30V            | 20V/100V            | 60V/300V              | 8V/40V                  | 16V/80V           | 20V/100V            |
| Accuracy               | 0.05% + 0.05%F.S. | 0.05% + 0.05%F.S.   | 0.05% + 0.05%F.S.     | 0.05% + 0.05%F.S.       | 0.05% + 0.05%F.S. | 0.05% + 0.05%F.S.   |
| Current Measurement    |                   |                     |                       |                         |                   |                     |
| Range                  | 16A/80A           | 5A/25A              | 1.6A/8A               | 24A / 120A              | 12A/60A           | 10A/50A             |
| Accuracy               | 0.1% + 0.2%F.S.   | 0.1% + 0.2%F.S.     | 0.1% + 0.1%F.S.       | 0.1% + 0.1%F.S          | 0.1% + 0.1%F.S.   | 0.1% + 0.1%F.S.     |
| Output Noise (0 ~ 20MI | Hz)               |                     |                       |                         |                   |                     |
| /oltage Ripple (P-P)   | 60 mV             | 85 mV               | 180 mV                | 90 mV                   | 100 mV            | 100 mV              |
| Voltage Ripple (rms)   | 8 mV              | 10 mV               | 90 mV                 | 10 mV                   | 10 mV             | 15 mV               |
| Current Ripple (rms)   | 60 mA             | 10 mA               | 60 mA                 | 120 mA                  | 30 mA             | 20 mA               |
| OVP Adjustment         | 110% of Vset to   | 110% of Vset to     | 110% of Vset to       | 110% of Vset to         | 110% of Vset to   | 110% of Vset        |
| Range                  | 110% of Vmax      | 110% of Vmax        | 110% of Vmax          | 110% of Vmax            | 110% of Vmax      | to 110% of Vmax     |
| Slew Rate Range        |                   |                     |                       |                         |                   |                     |
| Voltage                | 0.001V - 5V/ms    | 0.001V - 10V/ms     | 0.01V - 10V/ms        | 0.001V - 5V/ms          | 0.001V - 10V/ms   | 0.001V - 10V/ms     |
| Current                | 0.001A - 1A/ms    | 0.001A - 1A/ms      | 0.001A - 1A/ms        | 0.001A - 1A/ms          | 0.001A - 1A/ms    | 0.001A - 1A/ms      |
| Programming Respons    | e Time (Typical)  |                     |                       |                         |                   |                     |
| Rise Time              |                   | 4.0                 |                       |                         | -                 |                     |
| (Full & No Load)       | 6 ms              | 10 ms               | 30 ms                 | 8 ms                    | 8 ms              | 10 ms               |
| Fall Time              | 350ms(max)        | 300 ms(max)         | 2.5 s(max)            | 460 ms(max)             | 240 ms(max)       | 300 ms(max)         |
| Efficiency             | 0.75              | 0.75                | 0.75                  | 0.8                     | 0.8               | 0.8                 |
| Drift (8 hours)        |                   |                     |                       |                         |                   |                     |
| Voltage                | 0.02% of Vmax     | 0.02% of Vmax       | 0.02% of Vmax         | 0.02% of Vmax           | 0.02% of Vmax     | 0.02% of Vmax       |
| Current                | 0.04% of Imax     | 0.04% of Imax       | 0.04% of Imax         | 0.04% of Imax           | 0.04% of Imax     | 0.04% of Imax       |
| Temperature Coefficie  |                   |                     |                       |                         |                   |                     |
| Voltage                | 0.02% of Vmax/°C  | 0.02% of Vmax/°C    | 0.02% of Vmax/°C      | 0.02% of Vmax/°C        | 0.02% of Vmax/°C  | 0.02% of Vmax/°C    |
| Current                | 0.04% of Imax/°C  | 0.04% of Imax/°C    | 0.04% of Imax/°C      | 0.04% of Imax/°C        | 0.04% of Imax/°C  | 0.04% of Imax/°C    |
| Transient Response     |                   |                     |                       |                         |                   |                     |
| Time                   | 3 mS              | 3 mS                | 3mS                   | 3mS                     | 3 mS              | 3 mS                |
| 10 % step change       | 150 mV            | 180 mV              | 600 mV                | 150 mV                  | 250 mV            | 250 mV              |
| Voltage limit @        | 4.50)/            | 5001                | 0001/                 | 2021                    | 1001              | 5001                |
| Series Mode            | 150V              | 500V                | 800V                  | 200V                    | 400V              | 500V                |
| AC Input Operating     |                   |                     | 10 100 2401/-         | 100/1/ 47 6211          |                   |                     |
| Voltage Ranges         |                   |                     | 10/100~240Vac ±       | 10% Vln, 47~63 Hz       |                   |                     |
| Operating              | 0.40°C            | 0.40°C              | 0.40°C                | 0.40°C                  | 0.40°C            | 0.40°C              |
| Temperature            | 0~40°C            | 0~40°C              | 0~40°C                | 0~40°C                  | 0~40°C            | 0~40°C              |
| Dimension ( H x W x D) |                   |                     | 89 x 430 x 425 mm / 3 | .5 x 16.93 x 16.73 inch |                   |                     |
| Weight                 | 12kg / 26.43 lbs  | 12.1 kg / 26.65 lbs | 11.2 kg / 24.67 lbs   | 12kg / 26.43 lbs        | 13 kg / 28.63 lbs | 12.1 kg / 26.65 lbs |



Battery Voltage Dropout



Reset Behavior at Voltage Drop of ISO 16750-2



Sag Testing Output Voltage

預置

Output Voltage Slew Rate Control

Video & Flat Panel LED/ Color Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

> Power Electronics

 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Automation
 Component
 Safety
 IC

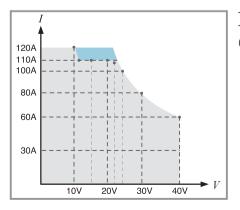
PXI Test & Measurement

General Purpose

Model 62000P Series

| ELECTRICAL SPECIFICATIO              | DNS-2                                   |                   |                     |                   |                   |  |
|--------------------------------------|---|-------------------|---------------------|-------------------|-------------------|--|
| Model                                | 62012P-600-8                            | 62024P-40-120     | 62024P-80-60        | 62024P-100-50     | 62024P-600-8      | 62050P-100-100   |
| Output Ratings                       |   |                   |                     |                   |                   |  |
| Output Voltage                       | 0~600V                                  | 0-40V             | 0~80V               | 0~100V            | 0-600V            | 0~100V   |
| Output Current                       | 0~8A                                    | 0-120A*1          | 0~60A               | 0~50A             | 0-8A              | 0~100A   |
| Output Power                         | 1200W                                   | 2400W*1           | 2400W               | 2400W             | 2400W             | 5000W  |
| Line Regulation                      |   |                   |                     |                   |                   |  |
| Voltage                              | 0.01%+18mV                              | 0.01%+2mV         | 0.01%+8mV           | 0.01%+10mV        | 0.01%+18mV        | 0.01%+8mV  |
| Current                              | 0.03%+20mA                              | 0.01%+25mA        | 0.01%+10mA          | 0.01%+12mA        | 0.03%+20mA        | 0.01%+24mA   |
| Load Regulation                      |   |                   |                     |                   |                   |  |
| Voltage                              | 0.01%+50mV                              | 0.01%+3mV         | 0.01%+12mV          | 0.01%+18mV        | 0.01%+50mV        | 0.01%+12mV   |
| Current                              | 0.03%+40mA                              | 0.01%+10mA        | 0.01%+20mA          | 0.01%+28mA        | 0.03%+40mA        | 0.01%+56mA   |
| Voltage Measurement                  |   |                   |                     |                   | '                 |  |
| Range                                | 120V/600V                               | 8V / 40V          | 16V/80V             | 20V/100V          | 120V / 600V       | 20V/100V   |
| Accuracy                             | 0.05% + 0.05%F.S.                       | 0.05% + 0.05%F.S. | 0.05% + 0.05%F.S.   | 0.05% + 0.05%F.S. | 0.05% + 0.05%F.S. | 0.05% + 0.05%F.S.  |
| Current Measurement                  |   |                   |                     |                   |                   |  |
| Range                                | 1.6A/8A                                 | 24A / 120A        | 12A/60A             | 10A/50A           | 1.6A / 8A         | 20A/100A   |
| Accuracy                             | 0.1% + 0.1%F.S.                         | 0.1% + 0.1%F.S.   | 0.1% + 0.1%F.S.     | 0.1% + 0.1%F.S.   | 0.1% + 0.1%F.S.   | 0.1% + 0.1%F.S.  |
| Output Noise (0 ~ 20MHz)             |   |                   |                     |                   |                   |  |
| Voltage Ripple (P-P)                 | 180 mV                                  | 90 mV             | 100 mV              | 100 mV            | 200 mV            | 50 mV  |
| Voltage Ripple (rms)                 | 90 mV                                   | 10 mV             | 10 mV               | 15 mV             | 180 mV            | 15 mV  |
| Current Ripple (rms)                 | 60 mA                                   | 120 mA            | 30 mA               | 20 mA             | 120 mA            | 40 mA  |
|                                      | 110% of Vset                            | 110% of Vset      | 110% of Vset        | 110% of Vset      | 110% of Vset      | 110% of Vset   |
| OVP Adjustment Range                 | to 110% of Vmax                         | to 110% of Vmax   | to 110% of Vmax     | to 110% of Vmax   | to 110% of Vmax   | to 110% of Vmax  |
| Slew Rate Range                      |   |                   |                     |                   |                   |  |
| Voltage                              | 0.01V - 10V/ms                          | 0.001V - 5V/ms    | 0.001V - 10V/ms     | 0.001V - 10V/ms   | 0.01V - 10V/ms    | 0.001V - 10V/ms  |
| Current                              | 0.001A - 1A/ms                          | 0.001A - 1A/ms    | 0.001A - 1A/ms      | 0.001A - 1A/ms    | 0.001A - 1A/ms    | 0.001A - 2A/ms   |
| Programming Response Ti              |   | 0.00111 11(11)    | 0.00111 11(11)      | 0.00177 17(7115   | 0.00111 17(11)5   |  |
| Rise Time (Full & No Load)           | 60 ms                                   | 8 ms              | 8 ms                | 10 ms             | 60 ms             | 10 ms  |
| Fall Time                            | 5 s(max)                                | 460ms(max)        | 240 ms(max)         | 300 ms(max)       | 5 s(max)          | 850 ms(max)  |
| Efficiency                           | 0.8                                     | 0.8               | 0.85                | 0.85              | 0.8               | 0.85   |
| Drift (8 hours)                      | 0.0                                     | 0.0               | 0.05                | 0.05              | 0.0               | 0.05   |
| Voltage                              | 0.02% of Vmax                           | 0.02% of Vmax     | 0.02% of Vmax       | 0.02% of Vmax     | 0.02% of Vmax     | 0.02% of Vmax  |
| Current                              | 0.02% of Vinax                          | 0.02% of Vinax    | 0.02% of Vinax      | 0.02% of Vinax    | 0.02% of Vinax    | 0.02% of Imax  |
|                                      | 0.04% 01 1118                           | 0.04% 01 1118     | 0.04% 01 1118       | 0.04% 01 11118    | 0.04% 01 11118    | 0.04% 01 11118   |
| Temperature Coefficient              | 0.02% of Vmax/°C                        | 0.02% of Vmax/°C  | 0.02% of Vmax/°C    | 0.02% of Vmax/°C  | 0.02% of Vmax/°C  | 0.02% of Vmax/°C   |
| Voltage<br>Current                   |   | 0.02% of Vmax/ C  |                     |                   | 0.02% of Vmax/ C  |  |
|                                      | 0.04% of Imax/°C                        |                   | 0.04% of Imax/°C    | 0.04% of Imax/°C  |                   | 0.04% of Imax/°C   |
| Transient Response Time              | 3mS                                     | 3mS               | 3mS                 | 3mS               | 3mS               | 3mS  |
| 10 % step change                     | 600 mV                                  | 150 mV            | 250 mV              | 250 mV            | 600mV             | 250 mV   |
| Voltage limit @<br>Series Mode       | 800V                                    | 200V              | 400V                | 500V              | 800V              | 500 V  |
| AC Input Operating<br>Voltage Ranges | 1Ø 100~240Vac<br>± 10% VLN,<br>47~63 Hz |                   | 1Ø 200~240Vac ±     | 10% Vln, 47~63 Hz |                   | $\begin{array}{l} 3 \ensuremath{\emptyset}\ 200 \math{\sim}\ 240 \mbox{Vac}\ \pm\ 10 \mbox{V}_{\mbox{LL}},\\ \text{or}\ 3 \ensuremath{\emptyset}\ 380 \mbox{\sim}\ 400 \mbox{Vac}\ \pm\ 10 \mbox{W}_{\mbox{LL}},\\ V_{\mbox{LL}}\ 47 \mbox{\sim}\ 63 \mbox{ Hz} \end{array}$ |
| <b>Operating Temperature</b>         | 0~40°C                                  | 0~40°C            | 0~40°C              | 0~40°C            | 0~40°C            | 0~40°C   |
| Dimension (H x W x D)                |   | 89 x 430 x 4      | 25 mm / 3.5 x 16.93 | x 16.73 inch      |                   | 176 x 428 x 566 mm /<br>6.93 x 16.85 x 22.28 inch  |
| Weight                               | 11.2 kg / 24.67lbs                      | 13 kg / 28.63 lbs | 12.2 kg / 26.87 lbs | 13 kg / 28.63 lbs | 13 kg / 28.63 lbs | 28 kg / 61.67 lbs  |
| Note *1 • The Max power lim          |   |                   |                     | -                 | 5                 | <u> </u>   |

Note \*1 : The Max. power limit of 2400W is under output 22V~40V , and see the diagram below for operating power envelope.



The blue area is over specification due to low voltage (<22V) & high current output(>110A). The following is operation power envelope :

(10V/120A), (11V/110A), (15V/110A), (20V/110A), (22V/109A), (24V/100A), (30V/80A), (40V/60A).

# Model 62000P Series

| GENERAL SPECIFICATIONS  |                              |
|---|------------------------------|
| Programming & Measurement Resolution  |                              |
| Voltage (Front Panel)   | 10 mV                        |
| Current (Front Panel)   | 10 mA                        |
| /oltage (Remote Interface))   | 0.003% of Vmax               |
| Current (Remote Interface))   | 0.003% of Imax               |
| Voltage (Analog Programming Interface)  | 0.04% of Imax                |
| Current (Analog Programming Interface)  | 0.04% of Imax                |
| Programming Accuracy  | 0.04% 01 1118X               |
|   | 0.1% of Vmay                 |
| Voltage Programming (Front Panel and Remote Interface)                                      | 0.1% of Vmax<br>0.2% of Vmax |
| Voltage Programming (Analog Programming Interface)  |                              |
| Current Programming (Front Panel and Remote Interface)                                      | 0.3% of Imax                 |
| Current Programming (Analog Programming Interface)  | 0.3% of Imax                 |
| Programming Response Time   |                              |
| Rise Time: For a programmed 5% to 95% step in output voltage. (Full & NoLoad)               | See Electrical Specification |
| Fall Time: For a programmed 95% to 5% step in output voltage.                               | See Electrical Specification |
| (The fall time will be affected by the external loading from UUT.)                          | · .                          |
| Vout setting (USB send command to DC Power Supply receiver)                                 | 10ms                         |
| Measure Voltage, Current (under USB command using Fetch)                                    | 10ms                         |
| Measure Voltage, Current (under USB command using Measure)                                  | 70ms                         |
| Analog Programming Interface  |                              |
| Voltage and Current Programming inputs  | 0~10Vdc or 0~5Vdc of F.S.    |
| Voltage and Current monitor   | 0~10Vdc or 0~5Vdc of F.S.    |
| Isolation: Maximum working voltage of any analog programming signal                         | 70Vdc                        |
| with respect to chassis potential   |                              |
| Auxiliary Power Supply  |                              |
| Output Voltage  | 12Vdc                        |
| Maximum current source capability   | 10mA                         |
| Remote Inhibit Function (I/O)   |                              |
| Use to disable the output of DC Power Supply; Active Low                                    | TTL                          |
| DC-ON Output Signal   |                              |
| Indicate the output status, Active High   | TTL                          |
| Fault Output Signal   |                              |
| Indicate if there is a fault/protection occurred, Active Low                                | TTL                          |
| Series & Parallel operation function with Master / Slave control                            |                              |
| Voltage limit @ Series Mode   | See Electrical Specification |
| Number of DC Power Supplies allowed @ master / slave control mode                           | 5                            |
| Auto Sequencing Programmable Function   |                              |
| Number of program   | 10                           |
| Number of sequence  | 100                          |
| Time Range  | 5ms ~ 15000S                 |
| TTL signal out  | 8 bits                       |
| TTL source capability   | 7 mA                         |
| Auto Sequencing Programmable Function (Step Mode)   |                              |
| Start Voltage Range   | 0 ~ full scale               |
| End Voltage Range   | 0 ~ full scale               |
| Total Run Time Range (hhh:mm:ss.sss)  | 10ms ~ 99 hours              |
| Slew Rate Control Function  |                              |
| Voltage slew rate range (The fall rate will be affected by the discharge rate of the output | capacitors                   |
| especially under no load condition.)  | See Electrical Specification |
| Current slew rate range of current  | See Electrical Specification |
| Minimum transition time   | 0.5 ms                       |
| Remote Sense  | 0.5 115                      |
| veniore Sense   | 5V                           |

Turnkey Test & Automation

### Model 62000H Series



#### **KEY FEATURES**

- Power range: 5KW / 10KW / 15KW
- Voltage range: 0 ~ 1000V
- Current range: 0 ~ 375A
- High power density (15KW in 3U)
- Easy Master / Slave parallel & series operation up to 150KW
- Precision V&I Measurements
- High-speed programming
- Voltage & Current Slew Rate Control
- Digital encoder knobs, keypad and function keys
- Current sharing operation
- Voltage ramp function
- (time range: 5 ms ~ 99 hours)
   Auto Sequencing Programming: 10 Programs / 100 Sequences
- OVP, Current Limit, Thermal protection
- Standard Analog Programming interface
- Standard USB / RS-232 / RS485 interface
- Optional GPIB / Ethernet interface
- Remote output ON / OFF (I / P)
- Remote sense line drop compensation
- LabView and Labwindows
- CE Certified



Master/Slave Parallel Operation - 150kW

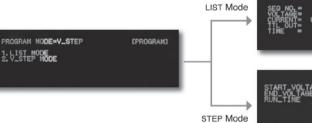


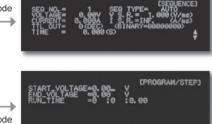
Chroma's new 62000H Series of programmable DC power supplies offer many unique advantages for telecom, automated test system & integration, industrial, battery charge & simulation for hybrid cars and solar panel simulation. These advantage include high power density of 15KW in 3U, precision readback of output current and voltage, output trigger signals as well as the ability to create complex DC transients waveforms to test device behavior to spikes, drops, and other voltage deviations.

The 62000H Series includes different models ranging from 5KW to 15KW, with current ranges up to 375A and voltage ranges up to 1000V. The 62000H can easily parallel up to ten units capable of 150KW with current sharing for bulk power applications, for example, battery bank simulation of 450V/150A/67.5KW for electric vehicle and military use.

There are 100 user programmable input status on the front panel for automated test application and life cycle ON/OFF test. In addition, the 62000H has a 16 bit digital control with bright vacuum fluorescent display readout. The 62000H series DC power supply are very easy to operate either from the front panel keypad or from the remote controller via USB / RS-232 / RS485 / APG (Standard) and GPIB & Ethernet (optional). Its compact size with 3U only can be stacked on a bench in a standard rack without any difficulties.

Another unique capability of the 62000H supplies is their ability to create complex DC transient waveforms. This capability allows devices to be tested to DC voltage dropouts, spikes and other voltage variations making them an ideal choice for aerospace device testing, inverter testing and other devices which will experience voltage interrupts. Applications include DC/DC Converter & Inverter voltage drop test, engine start-up simulation, battery automated charging, electronic product life cycle test, etc.





### **ORDERING INFORMATION**

| Power Rating | 62000H Series Programmable DC Power Supply                         |
|--------------|--|
|              | 62050H-40 : Programmable DC Power Supply 40V/125A/5KW              |
| 5KW          | 62050H-450 : Programmable DC Power Supply 450V/11.5A/5KW           |
| SKW          | 62050H-100P *1 : Programmable DC Power Supply 100V/125A/5KW        |
|              | 62050H-600 : Programmable DC Power Supply 600V/8.5A/5KW            |
|              | 62075H-30 : Programmable DC Power Supply 30V/250A/7.5KW            |
|              | 62100H-30 : Programmable DC Power Supply 30V/375A/11KW             |
|              | 62100H-40 : Programmable DC Power Supply 40V/250A/10KW             |
| 10KW         | 62100H-100P *1 : Programmable DC Power Supply 100V/250A/10KW       |
|              | 62100H-450 : Programmable DC Power Supply 450V/23A/10KW            |
|              | 62100H-600 : Programmable DC Power Supply 600V/17A/10KW            |
|              | 62100H-1000 : Programmable DC Power Supply 1000V/10A/10KW          |
|              | 62150H-40 : Programmable DC Power Supply 40V/375A/15KW             |
|              | 62150H-100P *1 : Programmable DC Power Supply 100V/375A/15KW       |
| 15KW         | 62150H-450 : Programmable DC Power Supply 450V/34A/15KW            |
|              | 62150H-600 : Programmable DC Power Supply 600V/25A/15KW            |
|              | 62150H-1000 : Programmable DC Power Supply 1000V/15A/15KW          |
|              | A620024 : GPIB Interface for 62000H series (Factory installed)     |
| Options      | A620025 : Ethernet Interface for 62000H series (Factory installed) |
|              | A620026 : Rack Mounting kit for 62000H series                      |

Note \*1 : Model 62000H-100P (input 380Vac) will be available in May, 2016 Note \*2 : Please specify GPIB or Ethernet Interface (alternative) at time of order. Note \*3 : All models output power are available for 200/220Vac, 380/400Vac and 440/480Vac (600V/1000V models) line voltage.

Note \*4 : Call for availability. (30V/40V/450V for 200/220 Vac and 440/480 Vac line voltage)

# Model 62000H Series

| ELECTRICAL SPECIFICATI                                 |                    |                 |                       |  |                      |                   |               |              |
|--|--------------------|-----------------|-----------------------|--|----------------------|-------------------|---------------|--------------|
| Model  | 62075H-30          | 62050H-40       | 62050H-100P*1         | 62050H-450                             | 62050H-600           | 62100H-30         | 62100H-40     | 62100H-100P* |
| Output Ratings   |                    |                 |                       |  |                      |                   |               |              |
| Output Voltage   | 0-30V              | 0-40V           | 0-100V                | 0-450V                                 | 0-600V               | 0-30V             | 0-40V         | 0-100V       |
| Output Current   | 0-250A             | 0-125A          | 0-125A                | 0-11.5A                                | 0-8.5A               | 0-375A            | 0-250A        | 0-250A       |
| Output Power   | 7500W              | 5000W           | 5000W                 | 5000W                                  | 5000W                | 11250W            | 10000W        | 10000W       |
| Line Regulation  |                    |                 | ,                     |  |                      |                   |               |              |
| Voltage  |                    |                 |                       | ±0.                                    | 01% F.S.             |                   |               |              |
| Current  |                    |                 |                       |  | 05% F.S.             |                   |               |              |
| Load Regulation  | <u> </u>           |                 |                       |  | 03701.3.             |                   |               |              |
| •  |                    |                 |                       | +0                                     | 020/ 55              |                   |               |              |
| Voltage  |                    |                 |                       |  | 02% F.S.             |                   |               |              |
| Current  |                    |                 |                       | ±0                                     | .1% F.S.             |                   |               |              |
| Voltage Measurement                                    | 1                  | I               | 1                     | 1                                      |                      | 1                 |               | 1            |
| Range  | 6V / 30V           | 8V / 40V        | 20V / 100V            | 90V / 450V                             | 120V / 600V          | 6V / 30V          | 8V / 40V      | 20V/100V     |
| Accuracy   |                    |                 |                       | 0.05% -                                | + 0.05% F.S.         |                   |               |              |
| Current Measurement                                    |                    |                 |                       |  |                      |                   |               |              |
| Range  | 50A / 250A         | 25A / 125A      | 25A / 125A            | 2.3A / 11.5A                           | 1.7A / 8.5A          | 75A / 375A        | 50A / 250A    | 50A / 250A   |
| Accuracy   |                    |                 | ,                     | 0.1% -                                 | + 0.1% F.S.          |                   |               |              |
| Output Noise & Ripple                                  | 1                  |                 |                       |  |                      |                   |               |              |
| Voltage Noise (P-P)                                    | 60mV               | 60mV            | 100mV                 | 300mV                                  | 350mV                | 60mV              | 60mV          | 100mV        |
| <b>3</b>   |                    |                 |                       |  |                      |                   |               |              |
| Voltage Ripple (rms)                                   | 15mV               | 15mV            | 20mV                  | 450mV                                  | 600mV                | 15mV              | 15mV          | 20mV         |
| Current Ripple (rms)                                   | 100mA              | 50mA            | 100mA                 | 20mA                                   | 15mA                 | 150mA             | 100mA         | 100mA        |
| OVP Adjustment Range                                   |                    |                 |                       |  |                      |                   |               |              |
| Range  |                    |                 | 0-110% progi          | rammable from                          | front panel, rem     | ote digital input | 5             |              |
| Accuracy   |                    |                 |                       | $\pm$ 1% of fu                         | ll-scale output      |                   |               |              |
| <b>Programming Response Ti</b>                         | me                 |                 |                       |  |                      |                   |               |              |
| Rise Time: Full Load                                   | 6ms                | 8ms             | 10ms                  | 60ms                                   | 60ms                 | 6ms               | 8ms           | 10ms         |
| Rise Time: No Load                                     | 6ms                | 8ms             | 10ms                  | 60ms                                   | 60ms                 | 6ms               | 8ms           | 10ms         |
| Fall Time: Full Load                                   | 6ms                | 8ms             | 10ms                  | 60ms                                   | 60ms                 | 6ms               | 8ms           | 10ms         |
| Fall Time: 10% Load                                    | 100ms              | 100ms           | 625ms                 | 250ms                                  | 250ms                | 100ms             | 100ms         | 625ms        |
|  |                    |                 |                       |  |                      |                   |               |              |
| Fall Time: No Load                                     | 1s                 | 1s              | 2.5s                  | 2.5s                                   | 2.5s                 | 1s                | 1s            | 2.5s         |
| Slew Rate Control                                      |                    |                 |                       |  |                      |                   |               | 1            |
| Voltage slew rate range                                | 0.001V/ms ~        | 0.001V/ms ~     | 0.001V/ms ~           | 0.001V/ms~                             | 0.001V/ms ~          | 0.001V/ms ~       | 0.001V/ms ~   | 0.001V/ms ~  |
|  | 5V/ms              | 5V/ms           | 10V/ms                | 7.5V/ms                                | 10V/ms               | 5V/ms             | 5V/ms         | 10V/ms       |
| Current slew rate range                                |                    |                 |                       | 0.001A~1                               | A/ms, or INF         |                   |               |              |
| Min. transition time                                   |                    |                 |                       | 0                                      | .5ms                 |                   |               |              |
| Transient Response Time                                | Rec                | overs within 1m | ns to +/- 0.75% of st | eady-state outp                        | out for a 50% to 1   | 00% or 100% to    | 50% load chan | ge(1A/µs)    |
| Efficiency (Typical)                                   | 0.87               | 0.87            | 0.93                  | 0.87                                   | 0.87                 | 0.87              | 0.87          | 0.93         |
| Drift (30 minutes)                                     |                    |                 |                       |  |                      |                   |               |              |
| Voltage  |                    |                 |                       | 0.04%                                  | of Vmax              |                   |               |              |
| Current  |                    |                 |                       |  | 6 of Imax            |                   |               |              |
| Drift (8 hours)  |                    |                 |                       | 0.007                                  | oorinnax             |                   |               |              |
| . ,  |                    |                 |                       | 0.020                                  | ( of)/mov            |                   |               |              |
| Voltage  |                    |                 |                       |  | 6 of Vmax            |                   |               |              |
| Current  |                    |                 |                       | 0.049                                  | % of Imax            |                   |               |              |
| Temperature Coefficient                                |                    |                 |                       |  |                      |                   |               |              |
| Voltage  |                    |                 |                       |  | of Vmax/°C           |                   |               |              |
| Current  |                    |                 |                       | 0.06%                                  | of Imax/°C           |                   |               |              |
| ok Prevu   | Te <u>k</u> 徑止     |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       | ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | ·····                |                   |               |              |
|  |                    | ······          | <b>D</b>              |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
| M 2.00 V M 2.00 S A Chi L                              | 11.8 V 3111 1.00 V |                 | A Ch1 / 5.24 V        |  | 0 s A Ch1 J 5.90 V   |                   |               |              |
| Battery Voltage Dropout Reset Behavior at Voltage Drop |                    |                 |                       | Engine Starting                        |                      |                   |               |              |
| of ISO 16750-2   |                    |                 | -2                    | of ISO 1675                            | 50-2                 |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       | /                                      |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |
| M 10.0 S A Chi L                                       | 104mV Den 1.00     | V M 100m        | s A Ch1 / 5.24 V 800  | 10.0 V M 1.1                           | 00 s A Ch1 J -3.20 V |                   |               |              |
| Battery Voltage Slow                                   |                    | om Converter S  |                       | Output Voltage S                       |                      |                   |               |              |
| Decrease & Decrease profi                              |                    | Sin converter S | ag leading (          | Control                                |                      |                   |               |              |
| Decrease & Decrease prom                               |                    |                 |                       | Control                                |                      |                   |               |              |
|  |                    |                 |                       |  |                      |                   |               |              |

Video & Flat Panel LED/ Color Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

 Battery Test &
 Passive
 Electrical
 Semiconductor/

 Automation
 Component
 Safety
 IC

PXI Test & General Manufacturing T Measurement Purpose Execution System

# Model 62000H Series

| ELECTRICAL SPECIFIC     | ATIONS -2   |  |                             |                     |                       |   |                      |                           |
|-------------------------|---|--|-----------------------------|---------------------|-----------------------|---|----------------------|---------------------------|
| Model                   | 62100H-450  | 62100H-600   | 62100H-1000                 | 62150H-40           | 62150H-100P*1         | 62150H-450                              | 62150H-600           | 62150H-1000               |
| Output Ratings          |   |  |                             |                     |                       |   |                      |                           |
| Output Voltage          | 0-450V  | 0-600V   | 0-1000V                     | 0-40V               | 0-100V                | 0-450V                                  | 0-600V               | 0-1000V                   |
| Output Current          | 0-23A   | 0-17A  | 0-10A                       | 0-375A              | 0-375A                | 0-34A                                   | 0-25A                | 0-15A                     |
| Output Power            | 10000W  | 10000W   | 10000W                      | 15000W              | 15000W                | 15000W                                  | 15000W               | 15000W                    |
| Line Regulation         |   |  |                             |                     |                       |   |                      |                           |
| Voltage                 |   |  |                             | ±0.                 | .01% F.S.             |   |                      |                           |
| Current                 |   |  |                             |                     | .05% F.S.             |   |                      |                           |
| Load Regulation         |   |  |                             |                     |                       |   |                      |                           |
| Voltage                 | ±0.02% F.S.   | ±0.02% F.S.  | ±0.05% F.S.                 | ±0.02% F.S.         | ±0.02% F.S.           | ±0.02% F.S.                             | ±0.02% F.S.          | ±0.05% F.S.               |
| Current                 | _ 0.02 /01.3.   | $\pm 0.02\%$ F.S.   $\pm 0.$ |                             |                     |                       |   |                      |                           |
| Voltage Measurement     |   |  |                             |                     |                       |   |                      |                           |
| Range                   | 90V/450V  | 120V/600V  | 200V/1000V                  | 8V/40V              | 20V/100V              | 90V/450V                                | 120V/600V            | 200V/1000V                |
| Accuracy                | 500/4500  | 1200/0000  | 2000/10000                  |                     | + 0.05%F.S.           | 500/4500                                | 1200/0000            | 2001/10001                |
| Current Measurement     |   |  |                             | 0.0570              | 1 0.05 /01.5.         |   |                      |                           |
| Range                   | 4.6A/23A  | 3.2A/17A   | 4A/10A                      | 75A/375A            | 75A/375A              | 6.8A/34A                                | 5A/25A               | 6A/15A                    |
| Accuracy                | 4.0/725/7   | 5.2/(1///  | 477107                      |                     | + 0.1%F.S.            | 0.077,5477                              | 510,2510             | 0/0/15/0                  |
| Output Noise & Ripple   |   |  |                             | 0.170               | 1 0.1701.5.           |   |                      |                           |
| Voltage Noise(P-P)      | 300mV   | 350mV  | 2550mV                      | 60mV                | 100mV                 | 300mV                                   | 350mV                | 2550mV                    |
| Voltage Ripple(rms)     | 450mV   | 600mV  | 1500mV                      | 15mV                | 20mV                  | 450mV                                   | 600mV                | 1500mV                    |
| Current Ripple(rms)     | 40mA  | 30mA   | 180mA                       | 150mA               | 100mA                 | 60mA                                    | 45mA                 | 270mA                     |
| OVP Adjustment Range    |   | John   | TOOTIA                      | TJOINA              | TOOTIA                | UUIIA                                   | JIIA                 | 2701174                   |
| Range                   |   |  | 0-110                       | % programmab        | le from front panel   | romoto digital                          | inputs               |                           |
| Accuracy                | 0-110% programmable from front panel, remote digital inputs<br>± 1% of full-scale output                    |  |                             |                     |                       |   |                      |                           |
| Programming Response    | Time  |  |                             | <u> </u>            | 170 OI Tull-Scale Out | put                                     |                      |                           |
| Programming Response    | e nine  |  | 25ms (30% F.S.              |                     |                       |   |                      | 25ms(50% F.S.             |
| Rise Time:Full Load     | 60ms  | 60ms   | CC Load)                    | 8ms                 | 10ms                  | 60ms                                    | 60ms                 | CC Load)                  |
| Rise Time:No Load       | 60ms  | 60ms   | 25ms                        | 8ms                 | 10ms                  | 60ms                                    | 60ms                 | 25ms                      |
| Fall Time: Full Load    | 60ms  | 60ms   | 25ms (50% F.S.<br>CC Load)  | 8ms                 | 10ms                  | 60ms                                    | 60ms                 | 25ms(50% F.S.<br>CC Load) |
| Fall Time: 10% Load     | 250ms   | 250ms  | 120ms (10% F.S.<br>CC Load) | 100ms               | 625ms                 | 250ms                                   | 250ms                | 80ms(10% F.S.<br>CC Load) |
| Fall Time: No Load      | 2.5s  | 2.5s   | 3s                          | 1s                  | 2.5s                  | 2.5s                                    | 2.5s                 | 3s                        |
| Slew Rate Control       |   |  |                             |                     |                       |   |                      |                           |
| Voltage slew rate range | 0.001V/ms<br>~7.5V/ms   | 0.001V/ms<br>~10V/ms   | 0.001Vms~<br>40V/ms         | 0.001V/ms<br>~5V/ms | 0.001V/ms<br>~10V/ms  | 0.001V/ms<br>~7.5V/ms                   | 0.001V/ms<br>~10V/ms | 0.001V/ms<br>~40V/ms      |
| Current slew rate range | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,   |  |                             |                     | .1A/ms, or INF        | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | 10,000               |                           |
| Min. transition time    |   |  |                             |                     | ).5ms                 |   |                      |                           |
| Transient Response      |   |  |                             |                     |                       |   |                      |                           |
| Time                    | Recovers within 1ms to +/- 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change(1A/µs) |  |                             |                     |                       |   |                      |                           |
| Efficiency (Typical)    | 0.87  | 0.87   | 0.85                        | 0.87                | 0.93                  | 0.87                                    | 0.87                 | 0.87                      |
| Drift (30 minutes)      |   |  |                             |                     |                       |   |                      |                           |
| Voltage                 | 0.04% of Vmax   |  |                             |                     |                       |   |                      |                           |
| Current                 | 0.06% of Imax   |  |                             |                     |                       |   |                      |                           |
| Drift (8 hours)         |   |  |                             |                     |                       |   |                      |                           |
| Voltage                 |   |  |                             | 0.029               | 6 of Vmax             |   |                      |                           |
| Current                 |   |  |                             | 0.049               | % of Imax             |   |                      |                           |
| Temperature Coefficien  | t   |  |                             |                     |                       |   |                      |                           |
| Voltage                 | 0.04% of Vmax/°C  |  |                             |                     |                       |   |                      |                           |
| Current                 | 0.06% of Imax/°C  |  |                             |                     |                       |   |                      |                           |

#### Soft Panel

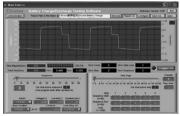


**Program Sequences Function** 

ISO 16750-2 Standard for Voltage Transient Test



GS-95024 Standard for Voltage Transient Test



Battery Charge Test

### Model 62000H Series

Video & Color

Flat Panel LED/ Display Lighting

Optical PhotovoltaicTest Automated Devices & Automation Optical Inspection

Battery Test & Passive Electrical Semiconductor/ Automation Component Safety IC

PXI Test & Measurement

General Manufacturing T Purpose Execution System

Turnkey Test & Automation

| Programming & Measure  | ment Resolution   |   |   |   |  |  |  |
|--|---|---|---|---|--|--|--|
| /oltage (Front Panel )   |   |   | 10mV / 100mV (Vo < 10V / 100V / 6   |   |  |  |  |
| Current (Front Panel)  |   | 0.1mA / 1mA / 10 mA (lo < 10A / 100A / 1000A)                                 |   |   |  |  |  |
| /oltage (Digital Interface)  |   | 0.002% of Vmax  |   |   |  |  |  |
| Current (Digital Interface)  |   |   | 0.002% of Imax  |   |  |  |  |
| oltage (Analog Interface )   |   | 0.04% of Vmax   |   |   |  |  |  |
| urrent (Analog Interface )   |   |   | 0.04% of Imax   |   |  |  |  |
| emote Interface  |   |   |   |   |  |  |  |
| nalog programming  |   |   | Standard  |   |  |  |  |
| ISB  |   | Standard  |   |   |  |  |  |
| S-232  |   |   | Standard  |   |  |  |  |
| S485   |   | Standard  |   |   |  |  |  |
| ;PIB   |   | Optional  |   |   |  |  |  |
| thernet  |   |   | Optional  |   |  |  |  |
| ystem BUS(CAN)   |   |   | Standard for master/slave control   |   |  |  |  |
| rogramming Accuracy  |   |   |   |   |  |  |  |
| oltage (Front Panel and D  | •   |   | 0.1% of Vmax  |   |  |  |  |
| Current (Front Panel and D   | igital Interface )  |   | 0.3% of Imax  |   |  |  |  |
| oltage (Analog Interface)  |   |   | 0.2% of Vmax  |   |  |  |  |
| Current (Analog Interface)   |   |   | 0.3% of Imax  |   |  |  |  |
| PIB Command Response   | e Time  |   |   |   |  |  |  |
| out setting  |   |   | nd command to DC source receiver  |   |  |  |  |
| 1easure V & I  |   | Unde  | r GPIB command using Measure <2   | 5ms   |  |  |  |
| nalog Interface (I/O)  |   |   |   |   |  |  |  |
| oltage and Current Progra  |   | 0-10Vdc / 0-5Vdc / 0-5k ohm / 4-20 mA of F.S.                                 |   |   |  |  |  |
| oltage and Current monit   | or output (O/P)   |   | 0-10Vdc / 0-5Vdc / 4-20mA of F.S.   |   |  |  |  |
| xternal ON/OFF (I/P)   |   | TTL:Active Low or High(Selective)   |   |   |  |  |  |
| OC_ON Signal (O/P)   |   | Level by user define. (Time delay = 1 ms at voltage slew rate of 10V/ms.)     |   |   |  |  |  |
| CV or CC mode Indicator (C   | D/P)  | TTL Level High=CV mode ; TTL Level Low= CC mode                               |   |   |  |  |  |
| DTP Indicator (O/P)  |   | TTL: Active Low   |   |   |  |  |  |
| ystem Fault indicator(O/P  |   | TTL: Active Low   |   |   |  |  |  |
| Auxiliary power supply(O/I   | P)  | Nominal supply voltage : 12Vdc / Maximum current sink capability: 10mA        |   |   |  |  |  |
| afety interlock(I/P)   |   |   | Time accuracy: <100ms   |   |  |  |  |
| Remote inhibit(I/P)  |   |   | TTL: Active Low   |   |  |  |  |
| eries & Parallel Operati   |   | Master / Slave control via CAN  | for 10 units up to 150KW. (Series: t  | wo units / Parallel: ten units  |  |  |  |
| Auto Sequencing(List Mo  | ode)  |   |   |   |  |  |  |
| lumber of program  |   |   | 10  |   |  |  |  |
| lumber of sequence   |   | 100   |   |   |  |  |  |
| Owell time Range   |   | 5ms - 15000S  |   |   |  |  |  |
| rig. Source  |   | Manual / Auto / External  |   |   |  |  |  |
| Auto Sequencing (Step N  | lode)   |   |   |   |  |  |  |
| itart voltage  |   | 0 to Full scale   |   |   |  |  |  |
| nd voltage   |   | 0 to Full scale   |   |   |  |  |  |
| Run time   |   | 10ms - 99hours  |   |   |  |  |  |
| nput Specification   |   |   |   |   |  |  |  |
|  |   | 3Ø 200~220Vac ± 10% VLL   |   |   |  |  |  |
| AC input voltage 3phase , 3 wire + ground  |   | 3Ø 380~400Vac $\pm$ 10% VLL   |   |   |  |  |  |
| AC input voltage 3phase , 3  | 3 wire + ground   |   | 3Ø 440~480Vac ± 10% VLL   |   |  |  |  |
|  | 3 wire + ground   |   | (= (0))   |   |  |  |  |
|  |   |   | 47-63 Hz  |   |  |  |  |
| C frequency range  | 200/220 Vac   | 5KW Model : 39A   | 10KW Model : 69A  | 15KW Model : 93A  |  |  |  |
| C frequency range  | 200/220 Vac<br>380/400 Vac  | 5KW Model : 22A   | 10KW Model : 69A<br>10KW Model : 37A  | 15KW Model : 50A  |  |  |  |
| C frequency range  | 200/220 Vac   |   | 10KW Model : 69A  |   |  |  |  |
| C frequency range  | 200/220 Vac<br>380/400 Vac  | 5KW Model : 22A<br>5KW Model : 19A  | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A  | 15KW Model : 50A<br>15KW Model : 44A  |  |  |  |
| C frequency range<br>Nax Current (each phase)  | 200/220 Vac<br>380/400 Vac<br>440/480 Vac                                 | 5KW Model : 22A<br>5KW Model : 19A<br><100V mod                               | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A<br>lel: 5% of full scale voltage per line(   | 15KW Model : 50A<br>15KW Model : 44A<br>10% total)                              |  |  |  |
| C frequency range<br>Max Current (each phase)<br>General Specification<br>Maximum Remote Sense L   | 200/220 Vac<br>380/400 Vac<br>440/480 Vac<br>ine Drop Compensation        | 5KW Model : 22A<br>5KW Model : 19A<br><100V mod                               | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A<br>lel: 5% of full scale voltage per line(<br>del :2% of full scale voltage per line   | 15KW Model : 50A<br>15KW Model : 44A<br>10% total)                              |  |  |  |
| C frequency range<br>Nax Current (each phase)<br>Iteneral Specification<br>Naximum Remote Sense L<br>Operating Temperature Ra  | 200/220 Vac<br>380/400 Vac<br>440/480 Vac<br>ine Drop Compensation<br>nge | 5KW Model : 22A<br>5KW Model : 19A<br><100V mod                               | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A<br>lel: 5% of full scale voltage per line(<br>del :2% of full scale voltage per line<br>0°C ~ 50°C *2  | 15KW Model : 50A<br>15KW Model : 44A<br>10% total)                              |  |  |  |
| AC frequency range<br>Max Current (each phase)<br>General Specification<br>Maximum Remote Sense L<br>Operating Temperature Rang<br>Storage Temperature Rang  | 200/220 Vac<br>380/400 Vac<br>440/480 Vac<br>ine Drop Compensation<br>nge | 5KW Model : 22A<br>5KW Model : 19A<br><100V mod<br>>100V mod                  | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A<br>lel: 5% of full scale voltage per line(<br>del :2% of full scale voltage per line<br>0°C ~ 50°C *2<br>-40°C ~ +85°C                                       | 15KW Model : 50A<br>15KW Model : 44A<br>10% total)<br>(4% total)                |  |  |  |
| AC input voltage 3phase,<br>AC frequency range<br>Max Current (each phase)<br>General Specification<br>Maximum Remote Sense L<br>Operating Temperature Rang<br>Storage Temperature Rang<br>Dimension (HxWxD) | 200/220 Vac<br>380/400 Vac<br>440/480 Vac<br>ine Drop Compensation<br>nge | 5KW Model : 22A<br>5KW Model : 19A<br><100V mod<br>>100V mod<br>132.8 x       | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A<br>lel: 5% of full scale voltage per line(<br>del :2% of full scale voltage per line<br>0°C ~ 50°C *2<br>-40°C ~ +85°C<br>428 × 610 mm / 5.23 × 16.85 × 24.0 | 15KW Model : 50A<br>15KW Model : 44A<br>10% total)<br>(4% total)<br>2 inch      |  |  |  |
| AC frequency range<br>Max Current (each phase)<br>General Specification<br>Maximum Remote Sense L<br>Operating Temperature Rang<br>Storage Temperature Rang  | 200/220 Vac<br>380/400 Vac<br>440/480 Vac<br>ine Drop Compensation<br>nge | 5KW Model : 22A<br>5KW Model : 19A<br><100V mod<br>>100V mod<br>132.8 x<br>5k | 10KW Model : 69A<br>10KW Model : 37A<br>10KW Model : 32A<br>lel: 5% of full scale voltage per line(<br>del :2% of full scale voltage per line<br>0°C ~ 50°C *2<br>-40°C ~ +85°C                                       | 15KW Model : 50A<br>15KW Model : 44A<br>10% total)<br>(4% total)<br>2 inch<br>5 |  |  |  |

Note\*1: Preliminary specification for Model 62000H-100P

Note\*2 : The operating temperature range is  $0^{\circ}C \sim 40^{\circ}C$  for Model 62100H-1000/62150H-1000

Note\*3 : The weight is approx. 35kg/77.09 lbs for Model 62100H-1000

### Model 62000H-S Series



#### **Solar Array Simulator**

#### **KEY FEATURES**

- Voltage range : 0 ~150V/600V/1000V/1500V 3U/15kW high power density module with easy master/slave parallel operation up to
- 1.5MW
- Fast transient response solar array simulation
- Simulation of multiple solar cell material's I-V characteristic (fill factor)
- Simulation of dynamic irradiation intensity and temperature level from clear day to cloud cover conditions
- Shadowed I-V curve output simulation (4096 points)
- Low leakage current (< 3mA)</p>
- Precision V & I measurements
- Auto I-V program: 100 I-V curves & Dwell time 1~15,000s
- Static & dynamic MPPT efficiency test
- Data recorded via softpanel
- Standard USB / RS232 / RS485 interface
- Optional GPIB / Ethernet interface
- Real time analysis of PV inverter's MPPT tracking via softpanel
- Free graphic user interface softpanel for operation
- Support up to six-channel SAS control for multi-MPPT testing
- Build-in dynamic MPPT test profile of EN50530, Sandia, CGC/GF004, CGC/GF035, NB/T 32004





The latest programmable solar array simulator power supply 62000H-S Series released by Chroma provide simulation of Voc (open circuit voltage) up to 1000V and lsc (short circuit current) up to 25A. The 62000H-S provides an industry leading power density in a small 3U high package. The solar array simulator is highly stable and has a fast transient response design, which are both advantageos to MPPT performance evaluation on PV inverter devices.

The 62000H-S Series has many unique advantages including high speed & precision digitizing measurement circuits with a 100kHz A/D, 25kHz D/A controlled I-V curve and a digital filter mechanism. It can simulate an I-V curve accurately and response the mains ripple effect from the PV inverter. In addition, the built-in EN50530/Sandia SAS I-V model in the standalone unit can easily program the Voc, Isc, Vmp, and Imp parameters for I-V curve simulation, without a PC controller.

The real solar array is influenced by various weather conditions such as irradiation, temperature, rain and shade by trees or clouds, which will affect the I-V curve output. The 62000H-S Series is capable of storing up to 100 I-V curves into the simulator memory, with a programmed time interval range of 1-15,000 seconds. It can simulate the I-V curve from the early morning to nightfall for PV inverter testing or dynamic I-V curve transient testing.

The 62000H-S Series has a built-in 16 bit digital control and precision voltage & current measurement circuits with a voltage accuracy of 0.05%+0.05%FS and a current accuracy of 0.1%+0.1%F.S. It is ideal for real time MPPT analysis and tracking monitoring for PV inverters through our softpanel. The user can also enable the data recording function on the softpanel during the static MPPT performance test.

When high power solar array simulation is required it is common to connect two or more power modules in parallel. The 62000H-S Series with a current range up to 25A and a voltage range up to 1000V offers a high power density envelope maximum of 15KW in a 3U package. It can easily parallel up to ten units in a Master/Slave configuration to provide 150kW with current sharing and synchronized control signals for commercial PV inverter (10kW - 100kW) testing. The 62000H series supplies have a smart Master/ Slave control mode that makes the parallel operation fast and simple. In this mode, the master scales values and downloads data to slave units so that the programming is as simple as using a standalone unit.

The 62000H-S series DC power supplies are very easy to operate from the front panel keypad or from the remote controller via USB / RS232/ RS485/APG (standard) and GPIB & Ethernet (optional). Its compact size (3U) makes it ideal for both benchtop and standard racking.

#### **ORDERING INFORMATION**

| Power<br>Rating | 62000H-S Series Programmable DC Power Supply   |
|-----------------|--|
| 2kW             | 62020H-150S : Programmable DC Power Supply 150V/40A/2kW with Solar Array Simulation    |
| 5kW             | 62050H-600S : Programmable DC Power Supply 600V/8.5A/5kW with Solar Array Simulation   |
| 10kW            | 62100H-600S : Programmable DC Power Supply 600V/17A/10kW with Solar Array Simulation   |
| 4.51.344        | 62150H-600S : Programmable DC Power Supply 600V/25A/15kW with Solar Array Simulation   |
| 15kW            | 62150H-1000S : Programmable DC Power Supply 1000V/15A/15kW with Solar Array Simulation |
|                 | A620024 : GPIB Interface for 62000H series (Factory installed)                         |
|                 | A620025 : Ethernet Interface for 62000H series (Factory installed)                     |
|                 | A620026 : 19" Rack Mounting kit for 62000H series                                      |
| Ontions         | A620027 : Parallelable Power Stage 15kW for 62150H-600S                                |
| Options         | A620028 : Parallelable Power Stage 15kW for 62150H-1000S                               |
|                 | A620029 : Control and Supervisor Unit for 150kW~1.5MW                                  |
|                 | A620030 : 19" Rack (41U) for 62000H-S series (380Vac input)                            |
|                 | B620000 : 19" Rack Mounting Kit for 62020H-150S (2U)                                   |

**Note 1 :** GPIB or Ethernet Interface (alternative), please specified at time of order. Note 2: Call for more information regarding the customized solar array simulator of 150kW~1.5MW.

Note 3 : All models output power are available for 200/220Vac, 380/400Vac and 440/480Vac line voltage.



Model 62020H-150S



Parallelable Power Stage A620027/A620028 All specifications are subject to change without notice.

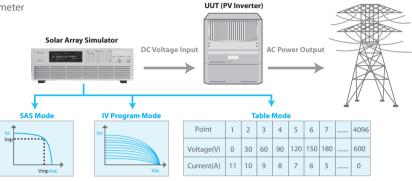
# Model 62000H-S Series

#### Solar Array I-V Curve Simulation Power Supply

The Model 62000H-S Series has a built in EN50530/Sandia SAS model that can easily program the Voc, Isc, Vmp, Imp parameters to simulate different solar cell materials I-V characteristic outputs with fast response time. Moreover, the TABLE mode is capable of saving a 128~4096 point array of user programmed voltages and currents via a remote interface. It can easily create a shadowed I-V curve and the I-V PROGRAM mode can save up to 100 I-V curves and dwell time intervals (1-15,000s) in memory. These advantages provide steady repetitive control conditions required for PV Inverter design as well as for verification testing. The solar array simulator is ideal for the following testing:

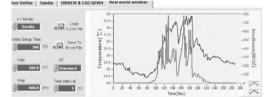
- Design and verify the maximum power tracking circuit and algorithm of the PV inverter
- Verify the high/low limit of operating input voltage allowed for the PV inverter.
- Verify the high/low limit of operating input voltage allowed for the inverter's maximum power point
- Verify the static maximum power point tracking efficiency of the PV inverter.
- Measure and verify the overall efficiency & conversion efficiency of PV inverter. \*
- Verify the maximum power point tracking performance of the inverter for dynamic curves (EN50530, Sandia, CGC/GF004, CGC/GF035, and NB/T 32004)
- Verify the maximum power point tracking performance of the inverter under different time period conditions spanning from morning to nightfall
- Verify the maximum power point tracking mechanism of the inverter for the I-V curve when the solar array is shaded by clouds or trees
- Simulate the I-V curve under the actual environmental temperatures within burn-in room to do inverter burn-in testing.

\*Requires an extra power meter



#### **Real World Waether Simulation**

The real world weather simulation function allows the user to import real conditions of irradiation and temperature profiles of a whole day from excel file to Softpanel, in order to simulate the irradiation intensity and temperature level from early morning to nightfall. It can also set the interval time resolution to 1s for I-V curve update rate and enable the user to perform MPPT tracking tests under the simulation of actual weather environments.



0:

**Real World Weather Simulation** 

Chroma

#### Solar Array I-V Curve Simulation Softpanel

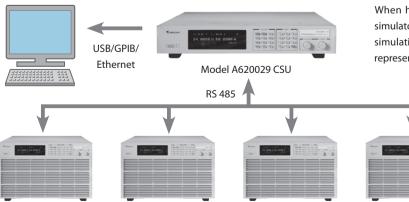
The model 62000H-S Series includes a graphical user Interface software through remote digital interface (USB / GPIB / Ethernet / RS232) control. The user can easily program the I-V curve of the 62000H-S Series as well as the I-V & P-V curve for real-time testing. In addition it will display the MPPT status for the PV inverter. Readings and the report function with real-time monitoring using the softpanel are shown below.

#### Simulates different solar cell materials I-V characteristic (Fill factor)

The purpose of the PV inverter is to convert the dc voltage (from solar array) to the ac power (utility). The better a PV inverter can adapt to the various irradiation & temperature conditions of sun, the more power that can be fed into the utility grid over time. So, the MPPT performance is a very important factor for PV generation system. The model 62000H-S Series is capable of simulating different types of standard crystalline, multi-crystalline and thin-film fill factor\* parameters to verify the MPPT tracking algorithm mechanism and efficiency.

#### \*Fill Factor = (Imp\*Vmp)/(Isc\*Voc)

#### Customization solar array simulator 1500V/60A/90kW



#### Note :

When high voltage 1500V is required, the customized solar array simulator system of 1500V/60A/90kW which can provide the I-V curve simulation for PV Inverter testing, please contact with Chroma sales representative for detailed information.

Solar Array Simulation SoftPanel

All specifications are subject to change without notice.

Model 62000H-S Series

| Output Decempt         0-40A         0-85A         0-17A         0-25A         0-15A           Output Decempt         2000W         10000W         15000W         120V / 600V         200V / 100V         200V         100V         100V         100V         100V   | ELECTRICAL SPECIFICATI  | IONS-WITH SOLAR ARR  | AY SIMULATION              |                             |                             |                      |  |  |  |
|---|-------------------------|----------------------|----------------------------|-----------------------------|-----------------------------|----------------------|--|--|--|
| Output Utalge<br>Output Utalge0-600V0-600V0-000V0-0100VOutput Utalge0-63.6.80-17.80-23.6.80-15.8.Output Utalge<br>Itale Regulation10000W10000W15000W15000WVallage<br>Current  | MODEL                   | 62020H-150S          | 62050H-600S                | 62100H-600S                 | 62150H-600S                 | 62150H-1000S         |  |  |  |
| Output Decempt         0-40A         0-85A         0-17A         0-25A         0-15A           Output Decempt         2000W         10000W         15000W         120V / 600V         200V / 100V         200V         100V         100V         100V         100V   | Output Ratings          |                      |                            |                             |                             |                      |  |  |  |
| Output Forwarf         2000W         5000W         1000W         15000W         15000W           Voltage         +/- 0.01% F.S.   | Output Voltage          | 0-150V               | 0-600V                     | 0-600V                      | 0-600V                      | 0-1000V              |  |  |  |
| Line Segulation  Line Segulation  Line Segulation  Line Segulation  Lorrent  orrent  Lorrent | Output Current          | 0-40A                | 0-8.5A                     | 0-17A                       | 0-25A                       | 0-15A                |  |  |  |
| Voltage+/- 0.01% F.S.Load RegulationVoltage MessurementCurrentVoltage MessurementRange60V / 120V / 600V120V / 600V120V / 600V200V / 100VRange60V / 150V120V / 600V120V / 600V200V / 100VCurrent MessurementRange16A / 40A34A / 85A6.8A / 17A10A / 25A6.01% / 25CVoltage Moise/PP440 mV1500 mV1500 mV2500 mVVoltage Moise/PP440 mV1500 mV1500 mV1500 mV2500 mVVoltage Moise/PP440 mV1500 mV1500 mV1500 mV1500 mV2500 mVVoltage Moise/PP440 mV1500 mV1500 mV1500 mV1500 mVVoltage Moise/PP440 mV1500 mV<   | Output Power            | 2000W                | 5000W                      | 10000W                      | 15000W                      | 15000W               |  |  |  |
| Voltage+/- 0.01% F.S.Load RegulationVoltage MessurementCurrentVoltage MessurementRange60V / 120V / 600V120V / 600V120V / 600V200V / 100VRange60V / 150V120V / 600V120V / 600V200V / 100VCurrent MessurementRange16A / 40A34A / 85A6.8A / 17A10A / 25A6.01% / 25CVoltage Moise/PP440 mV1500 mV1500 mV2500 mVVoltage Moise/PP440 mV1500 mV1500 mV1500 mV2500 mVVoltage Moise/PP440 mV1500 mV1500 mV1500 mV1500 mV2500 mVVoltage Moise/PP440 mV1500 mV1500 mV1500 mV1500 mVVoltage Moise/PP440 mV1500 mV<   | Line Regulation         |                      |                            |                             |                             |                      |  |  |  |
| Current<br>Load Regulation<br>Load Regulation <b< td=""><td></td><td></td><td></td><td>+/- 0.01% F.S.</td><td></td><td></td></b<>                                    |                         |                      |                            | +/- 0.01% F.S.              |                             |                      |  |  |  |
| Voltage<br>Current-+ 0.05% FLS.Voltage MeasurementVoltage MeasurementCurrent MeasurementRange16A/40A3.4A / 8.5A6.8A / 17A10A / 25A6.6A / 15AAccuracy0.15% + 0.5% FLS.Current MeasurementVoltage Noise(P-P)450 mV150 mV150 mV150 mV2550 mVOthtage Noise(P-P)450 mV150 mV550 mV650 mV2550 mVOthtage Noise(P-P)450 mV150 mV550 mV650 mV2550 mVOthtage Noise(P-P)450 mV150 mV550 mV550 mV2550 mVCurrent Ripple(rms)80 mA150 mA300 mA450 mA270mAOthtage RippletingRange0-110% programmable from front panel, remote digital inputs.Accuracy+/ 1% of full-scale outputProgramming Response TimeRange0-110% programmable from front panel, remote digital inputs.Accuracy+/ 1% of full-scale outputRange0-110% programmable from front panel, remote digital inputs.Accuracy+/ 1% of full-scale outputRange0-110% for for all scale outputAccuracy-/ 1% of full-scale outputAccuracy-/ 1% of full-scale outputAccuracy-/ 1% of full-scale outputAccuracy-/ 1% of   | Current                 |                      |                            | +/- 0.05% F.S.              |                             |                      |  |  |  |
| Voltage<br>Current-+ 0.05% FLS.Voltage MeasurementVoltage MeasurementCurrent MeasurementRange16A/40A3.4A / 8.5A6.8A / 17A10A / 25A6.6A / 15AAccuracy0.15% + 0.5% FLS.Current MeasurementVoltage Noise(P-P)450 mV150 mV150 mV150 mV2550 mVOthtage Noise(P-P)450 mV150 mV550 mV650 mV2550 mVOthtage Noise(P-P)450 mV150 mV550 mV650 mV2550 mVOthtage Noise(P-P)450 mV150 mV550 mV550 mV2550 mVCurrent Ripple(rms)80 mA150 mA300 mA450 mA270mAOthtage RippletingRange0-110% programmable from front panel, remote digital inputs.Accuracy+/ 1% of full-scale outputProgramming Response TimeRange0-110% programmable from front panel, remote digital inputs.Accuracy+/ 1% of full-scale outputRange0-110% programmable from front panel, remote digital inputs.Accuracy+/ 1% of full-scale outputRange0-110% for for all scale outputAccuracy-/ 1% of full-scale outputAccuracy-/ 1% of full-scale outputAccuracy-/ 1% of full-scale outputAccuracy-/ 1% of   | Load Regulation         |                      |                            |                             |                             |                      |  |  |  |
| Current Mean Part Park Park Park Park Park Park Park Park   |                         |                      |                            | +/- 0.05% F.S.              |                             |                      |  |  |  |
| Voltage Measurement         Voltage Measurement         Voltage Main Measurement           Range         66W / 150V         120V / 600V         120V / 600V         120V / 600V         200V / 1000V           Current Measurement         0.05% + 0.05% F.S.         Current Measurement   | -                       |                      |                            |                             |                             |                      |  |  |  |
| Bang         60V / 150V         120V / 600V         120V / 600V         120V / 600V         200V / 1000V           Accuracy         0.05% + 0.05% + 0.05% + 5.         0.05% + 0.001 / ms - 0.01 / ms - 0.001 / ms - 0.01 / ms - 0.001 / ms - 0.001 / ms - 0.01 / ms - 0.001 / ms - 0.001 / ms - 0.01 / ms - 0.001 / ms - 0.001 / ms - 0.001 / ms - 0.001 / ms - 0.01 / ms - 0.001   | Voltage Measurement     |                      |                            |                             |                             |                      |  |  |  |
| Accuracy         0.05% + 0.05% F.S.           Current Measurement<br>Range         16A / 40A         3.4A / 8.5A         6.8A / 17A         10A / 25A         6A / 15A           Range         0.1% + 0.1% F.S.         0.1% + 0.1% F.S.         0.0%         2550 mV           Voltage Ripple(ms)         65 mV         650 mV         650 mV         650 mV         2550 mV           Voltage Ripple(ms)         65 mV         650 mV </td <td><u> </u></td> <td>60V / 150V</td> <td>120V / 600V</td> <td>120V / 600V</td> <td>120V / 600V</td> <td>200V / 1000V</td>   | <u> </u>                | 60V / 150V           | 120V / 600V                | 120V / 600V                 | 120V / 600V                 | 200V / 1000V         |  |  |  |
| Current Neasurement         IAA / 40A         3.4A / 8.5A         6.8A / 17A         10A / 25A         6A / 15A           Range         0.1% + 0.1% F.5.         Output Noise&Ripple         GA / 15A         Accuracy         0.1% + 0.1% F.5.         GA / 15A         Accuracy         Output Noise&Ripple         GA / 15A         Accuracy         0.1% + 0.1% F.5.         GA / 15A         Accuracy         Current Ripple(ms)         65 m V         650 m V         1500 m V         1500 m V         1500 m V         2550 m V         Current Ripple(ms)         80 m A         150 m V         650 m V         650 m V         650 m V         2550 m V         270m A           OVP Adjustment Range         Accuracy        110% programmable from front panel, remote digital inputs.         Accuracy        110% full-scale output   |                         |                      |                            |                             |                             |                      |  |  |  |
| Range         16A / 40A         3.4A / 8.5A         6.8A / 17A         10A / 25A         6A / 15A           Accuracy         0.1% + 0.1%F.5.         0.1% + 1%F.5.         0.1% + 0.1%F.5.         0.01%F.5.         0.01%  |                         |                      |                            | 0.0370 1 0.03701.3.         |                             |                      |  |  |  |
| Accuracy         0.1% + 0.1%F.S.           Outgut Noise&Ripple         0.0% + 0.1%F.S.           Outgut Noise&Ripple(rms)         65 mV         650 mV         650 mV         1500 mV         1500 mV         1950 mV           Voltage Noise(P-P)         450 mV         650 mV         650 mV         1950 mV         1950 mV           Current Ripple(rms)         80 mA         150 mA         300 mA         450 mA         270mA           OVP Adjustment Range         0-110% programmable from front panel, remote digital inputs.         Accuracy         +/-1% of full-scale output           Programming Response Time         Rise Time: S0KES. CC Load         10ms (6.66A loading)         30ms         30ms         25ms           Rise Time: S0KES. CC Load         10ms (6.66A loading)         30ms         30ms         25ms         Fail Time: S0KES. CC Load         38ms (1.33A loading)         100ms         100ms         000ms         25ms           Fail Time: No Load         30ms         1.2s         1.2s         3 s         3s           Stem Rate Contol         0.001V/ms - 20V/ms         0.001V/ms - 20V/ms         0.001V/ms - 0.1A/ms, 0.001A/ms - 0.1A/ms, or 1A/ms, or 1A/   |                         | 16A / 40A            | 344/854                    | 6 8A / 17A                  | 10A / 25A                   | 6A / 15A             |  |  |  |
| Outgut Noise&Ripple         Vision V         1500 mV         1500 mV         1500 mV         2550 mV           Voltage Riple(rms)         65 mV         650 mV         650 mV         650 mV         1950 mV         1950 mV           Ottage Ripple(rms)         80 mA         150 mA         300 mA         450 mA         270mA           OVP Adjustmer Range         0-110% programmable from front panel, remote digital inputs.         Accuracy         I/- 1% of full-scale output           Programming Response Time         -         I/- 1% of full-scale output         I// 1% of full-scale output           Rise Time: S0%FS. CCL Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Fall Time: S0%FS. CCL Load         30ms (33 loading)         100ms         100ms         80ms           Fall Time: S0%FS. CCL Load         30ms         1.2s         1.2s         1.2s         3 s           Stew Rate Range         0.001V/ms - 15V/ms         0.001V/ms - 20V/ms         0.001V/ms - 0.10/ms         0.001V/ms - 0.10/ms           Current Slew Rate Range         0.001V/ms - 1A/ms, or INF         0.011/ms - 0.10/ms         0.001V/ms - 0.10/ms         0.001V/ms - 0.10/ms           Voltage Ripe Rate Range         0.001V/ms - 1A/ms, or INF         0.011/ms - 0.10/ms         0.001V/ms - 0.10/ms         <   |                         | 10/17 40/1           | 5.477 0.577                |                             | 10/(7/25/(                  | 0/(/ 15/(            |  |  |  |
| Voltage Ripple(ms)         450 mV         1500 mV         1500 mV         1500 mV         2550 mV           Voltage Ripple(ms)         65 mV         650 mV         650 mV         650 mV         650 mV         1950 mV           Current Ripple(ms)         80 mA         1500 mA         300 mA         450 mA         270mA           OVP Adjustment Range         0-110% programmable from front panel, remote digital inputs.         270mA           Range         0-110% programmable from front panel, remote digital inputs.         270mA           Reg Time: Solv6F.5. CCL Load         10ms (6.66 A loading)         30ms         30ms         30ms         25ms           Rise Time: Solv6F.5. CCL Load         10ms (6.66 A loading)         30ms         30ms         30ms         25ms           Fall Time: Solv6F.5. CCL Load         83ms (1.33 A loading)         100ms         100ms         100ms         800ms           Sale Rate Control         0.0011/ms - 13/ms         0.0011/ms - 0.14/ms   |                         |                      |                            | 0.1/0 1 0.1/01.3.           |                             |                      |  |  |  |
| Voltage Ripple(rms)         65 mV         650 mV         650 mV         650 mV         1950 mV           Current Ripple(rms)         80 mA         150 mA         300 mA         450 mA         270 mA           OVP Adjustment Range         0-110% programmable from front panel, remote digital inputs.         Accuracy         Input Schedular         Input Schedu  |                         | 450 mV               | 1500 mV                    | 1500 mV                     | 1500 mV                     | 2550 mV              |  |  |  |
| Current Ripple(rms)         80 mA         150 mA         300 mA         450 mA         270mA           OVP Adjustment Range         0-110% programmable from front panel, remote digital inputs.  | -                       |                      |                            |                             |                             |                      |  |  |  |
| OVP Adjustment Range         0-110% programmable from front panel, remote digital inputs.         Accuracy           Accuracy         +/-1% of full-scale output         Accuracy           Programming Response Time         Imme         Official Source         Source           Rise Time: 50%F5. CC Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Fall Time: 50%F5. CC Load         38ms (1.33 loading)         100ms         100ms         80ms           Fall Time: 50%F5. CC Load         300ms         1.2s         1.2s         3.s           Star Rate Control         300ms         0.001V/ms - 15V/ms         0.001V/ms - 0.1A/ms, 0.001V/ms - 0.1A/ms, 0.001A/ms - 0.000% to 100%           Minimum Transition Time         0.27 (Typical)         0.5ms         0.001 A/ms - 0.1A/ms, 0.001 A/ms - 0.1A/ms, 0.001 A/ms - 0.1A/ms, 0.000 A/ms - 0.002% to 100%   |                         |                      |                            |                             |                             |                      |  |  |  |
| Range         0-110% programmable from front panel, remote digital inputs.           Accuracy         +/-1% of full-scale output           Programming Response Time         25ms           Rise Time: 50%F5, CC Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Rise Time: 50%F5, CC Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         25ms           Fall Time: 50%F5, CC Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         30ms         30ms         25ms           Fall Time: 10%F5, CC Load         83ms (1.33A loading)         100ms         100ms         100ms         80ms         80ms           Salew Rate Control         0.0011/ms - 15V/ms         0.0011/ms - 0.14/ms,         0.0011/ms - 0.14/ms,         0.0011/ms - 0.14/ms,         0.0014/ms - 0.14/ms,  |                         | 60 IIIA              | ISUIIIA                    | 500 MA                      | 450 MA                      | 270MA                |  |  |  |
| Accuracy         +/- 1% of full-scale output           Programming Response Time           Rise Time: 50%FS, CC Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Rise Time: 50%FS, CC Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Fall Time: 10%FS, CC Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Fall Time: 10%FS, CC Load         83ms (13.34 loading)         100ms         1100ms         100ms         80ms.           Fall Time: 10% Load         300ms         1.2s         1.2s         1.2s         3s           Slew Rate Range         0.0011//ms - 15V/ms         0.0011//ms - 0.1A/ms,         0.0011/ms - 0.1A/ms,         0.0011/ms - 0.1A/ms, </td <td></td> <td></td> <td>0.1100/ 1949 949 949</td> <td></td> <td>n ata dinital in nuta</td> <td></td>   |                         |                      | 0.1100/ 1949 949 949       |                             | n ata dinital in nuta       |                      |  |  |  |
| Programming Response Time           Rise Time: 50%F.S. CC Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         25ms           Rise Time: No. Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         30ms         25ms           Fall Time: 50%F.S. CC Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         30ms         30ms         30ms         25ms           Fall Time: 10%F.S. CC Load         83ms (1.3A loading)         100ms         1.2s         1.2s         3.s           Stew Rate Control         0.001V/ms - 20V/ms         0.001V/ms - 0.001W/ms - 0.001V/ms - 0.1A/ms,         0.001V/ms - 0.00/ms or 100% to 50% load change(1A/us)         Efficiency         0.77 (Typical)         0.77 (Typical)         0.87 (Typical)         0.87 (Typical)         0.87 (Typical)         0.87 (Typical)         0.002% of Vmax <td< td=""><td>3</td><td></td><td></td><td></td><td></td><td></td></td<>   | 3                       |                      |                            |                             |                             |                      |  |  |  |
| Rise Time: 50%F.S. CC Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         25ms           Rise Time: No Load         10ms (6.66A loading)         30ms         30ms         30ms         30ms         25ms           Fall Time: 50%F.S. CC Load         83ms (1.33A loading)         100ms         100ms         80ms         25ms           Fall Time: No Load         300ms         1.2s         1.2s         1.2s         3           Stew Rate Control         5001 A/ms - 15V/ms         0.001V/ms - 20V/ms         0.001V/ms - 0.1/ms, 0.001A/ms - 0.1/ms, 0.000/ms = 0.0.7/ms - 0.002/ms of lmax         0.0002/ms of   |                         |                      |                            | +/- 1% of full-scale output | <u>[</u>                    |                      |  |  |  |
| Rise Time: No Load         10ms         30ms         30ms         30ms         30ms         25ms           Fall Time: 50%FS, CC Load         10ms (6.66A loading)         30ms   |                         |                      |                            |                             |                             |                      |  |  |  |
| Fall Time: 50%F.S. CC Load         10ms (6.66A loading)         30ms         30ms         30ms         25ms           Fall Time: 10%F.S. CC Load         83ms (1.33A loading)         100ms         100ms         80ms           Fall Time: 10%F.S. CC Load         83ms (1.33A loading)         100ms         100ms         80ms           Fall Time: 10%F.S. CC Load         300ms         1.2s         1.2s         3s           Stew Rate Control         0.0011/ms - 15V/ms         0.0011/ms - 20V/ms         0.0011/ms - 20V/ms         0.0011/ms - 0.1A/ms,           Voltage Slew Rate Range         0.0011/ms - 15V/ms         0.0011/ms - 0.1A/ms,         0.001  |                         |                      |                            |                             |                             |                      |  |  |  |
| Fall Time: 10%F.S. CC Load         83ms (1.33A loading)         100ms         100ms         100ms         80ms           Fall Time: No Load         300ms         1.2s         1.2s         1.2s         3.5           Slew Rate Control         Voltage Slew Rate Range         0.001V/ms - 15W/ms         0.001V/ms - 20V/ms         0.001V/ms - 20V/ms         0.001V/ms - 20V/ms         0.001V/ms - 40V/ms           Current Slew Rate Range         0.001A/ms - 1A/ms, or INF         0.001A/ms - 0.1A/ms, or INF         0.001K/ms - 0.1A/ms, or INF         0.001K/ms - 0.1A/ms, Or INF         0.  |                         |                      |                            |                             |                             |                      |  |  |  |
| Fall Time: No Load         300ms         1.2s         1.2s         1.2s         3s           Slew Rate Control         Voltage Slew Rate Range         0.001V/ms - 15V/ms         0.001V/ms - 20V/ms         0.001V/ms - 20V/ms         0.001V/ms - 40V/ms           Current Slew Rate Range         0.001V/ms - 11/ms,<br>or INF         0.0011/ms - 0.1A/ms,<br>or INF         0.001/  |                         |                      |                            |                             |                             |                      |  |  |  |
| Siew Rate Control         0.0011/ms - 15V/ms         0.0011/ms - 20V/ms         0.0011/m   |                         | 83ms (1.33A loading) |                            |                             |                             | 80ms                 |  |  |  |
| Voltage Slew Rate Range         0.001 V/ms - 15V/ms         0.001 V/ms - 20V/ms         0.001 V/ms - 20V/ms         0.001 V/ms - 40V/ms           Current Slew Rate Range         0.001 A/ms - 1 A/ms,<br>or INF         0.001 A/ms - 0.1 A/ms,<br>O.000 A/ms - 0.1 A/ms,<br>O.007 A/ms - 0.1 A/ms,<br>O.007 A/ms - 0.1 A/ms,<br>O.007 A/ms - 0.1 A/ms,<br>O.007 A/ms - 0.1 A/ms,<br>O/ms of Imax         0.001 A/ms - 0.1 A/ms,<br>O/ms of Imax         0.00   | Fall Time: No Load      | 300ms                | 1.2s                       | 1.2s                        | 1.2s                        | 3s                   |  |  |  |
| Current Slew Rate Range0.001A/ms - 1A/ms,<br>or INF0.001A/ms - 0.1A/ms,<br>or INF0.001A/ms - 0.1A/ms,<br>OID%0.001A/ms - 0.1A/m   | Slew Rate Control       |                      |                            |                             |                             |                      |  |  |  |
| Current Slew Rate Range         or INF         or INF <thor inf<="" th=""></thor>   | Voltage Slew Rate Range | 0.001V/ms - 15V/ms   | 0.001V/ms - 20V/ms         | 0.001V/ms - 20V/ms          | 0.001V/ms - 20V/ms          | 0.001V/ms - 40V/ms   |  |  |  |
| or INF         or INF <thor inf<="" th=""> <thor inf<="" th=""> <thor inf<="" td="" th<=""><td>Current Slew Rate Range</td><td>0.001A/ms - 1A/ms,</td><td>0.001A/ms - 0.1A/ms,</td><td>0.001A/ms - 0.1A/ms,</td><td>0.001A/ms - 0.1A/ms,</td><td>0.001A/ms - 0.1A/ms,</td></thor></thor></thor>   | Current Slew Rate Range | 0.001A/ms - 1A/ms,   | 0.001A/ms - 0.1A/ms,       | 0.001A/ms - 0.1A/ms,        | 0.001A/ms - 0.1A/ms,        | 0.001A/ms - 0.1A/ms, |  |  |  |
| Recovers within 1ms to +/- 0.75% of steady-state output for a 50% to 100% or 100% to 50% load change(1A/us)           Efficiency         0.77 (Typical)         0.87 (Typical)           Programming & Measurement Resolution         0.87 (Typical)         10 mV         10 mV         10 mV         100mV           Current (Front Panel)         10 mV         10 mV         10 mV         10 mV         100mV         100mV           Outrage (Front Panel)         10 mV         10 mV         10 mV         10 mV         100mV         100mV           Current (Front Panel)         1mA         1mA         1mA         1mA         1mA         1mA           Voltage (Digital Interface)         0.002% of Vmax         0.002% of Vmax         0.002% of Vmax         0.002% of Vmax           Current (Analog Interface)         0.004% of Vmax         0.004% of Vmax         0.004% of Vmax         0.004% of Vmax           Voltage (Front Panel and Digital Interface)         0.1% of Vmax         0.3% of Imax         0.3% of Imax           Voltage (Analog Interface)         0.2% of Vmax         0.3% of Imax         0.3% of Imax           Voltage (Analog Interface)         0.2% of Vmax         0.3% of Imax         0.3% of Imax           Voltage (Analog Interface)         0.2% of Vmax         0.3% of Imax         0.3% of Imax  | current siew nate nange | or INF               | or INF                     | or INF                      | or INF                      | or INF               |  |  |  |
| Efficiency       0.77 (Typical)       0.87 (Typical)         Programming & Measurement Resolution       Voltage (Front Panel)       10 mV       10 mV       10 mV       100mV         Current (Front Panel)       1 mA       1 mA       1 mA       1 mA       1 mA         Voltage (Digital Interface)       0.002% of Vmax       0.002% of Vmax       0.002% of Vmax         Current (Digital Interface)       0.002% of Vmax       0.002% of Vmax       0.002% of Vmax         Voltage (Analog Interface)       0.04% of Vmax       0.04% of Vmax       0.04% of Vmax         Current (Analog Interface)       0.04% of Vmax       0.04% of Vmax       0.04% of Vmax         Current (Front Panel and Digital Interface)       0.1% of Vmax       0.1% of Vmax       0.1% of Imax         Voltage (Analog Interface)       0.2% of Vmax       0.3% of Imax       0.3% of Imax         Voltage (Analog Interface)       0.2% of Vmax       0.3% of Imax       0.1% of Vmax         Current (Analog Interface)       0.3% of Imax       0.3% of Imax       0.1% of Vmax         Current (Analog Interface)       0.3% of Imax       0.1% of Vmax       0.1% of Vmax <td>Minimum Transition Time</td> <td></td> <td></td> <td>0.5ms</td> <td></td> <td></td>  | Minimum Transition Time |                      |                            | 0.5ms                       |                             |                      |  |  |  |
| Programming & Measurement Resolution       10 mV  | Transient response time | Recovers within      | 1ms to +/- 0.75% of steady | /-state output for a 50% to | 0 100% or 100% to 50% loa   | ad change(1A/us)     |  |  |  |
| Programming & Measurement Resolution       10 mV  | Efficiency              | 0.77 (Typical)       |                            | 0.87 (1                     | īvpical)                    |                      |  |  |  |
| Voltage (Front Panel)         10 mV         10 mV         10 mV         10 mV           Current (Front Panel)         1mA         1mA         1mA         1mA         1mA           Voltage (Digital Interface)   |                         |                      |                            |                             |                             |                      |  |  |  |
| Current (Front Panel)1mA1mA1mA1mA1mAVoltage (Digital Interface)0.002% of VmaxCurrent (Digital Interface)0.002% of ImaxVoltage (Analog Interface)0.04% of VmaxCurrent (Analog Interface)0.04% of ImaxProgramming AccuracyVoltage (Front Panel and<br>Digital Interface)Current (Front Panel and<br>Digital Interface)0.1% of VmaxCurrent (Front Panel and<br>Digital Interface)0.3% of ImaxVoltage (Analog Interface)0.2% of VmaxCurrent (Front Panel and<br>Digital Interface)0.2% of VmaxCurrent (Front Panel and<br>Digital Interface)0.3% of ImaxVoltage (Analog Interface)0.2% of VmaxCurrent (Front Panel and<br>Digital Interface)0.3% of ImaxNumber of program0.3% of ImaxNumber of program10Number of sequence100Dwell time Range1s - 15,000S   |                         |                      | 10 mV                      | 10 mV                       | 10 mV                       | 100mV                |  |  |  |
| Voltage (Digital Interface)       0.002% of Vmax         Current (Digital Interface)       0.002% of Vmax         Voltage (Analog Interface)       0.04% of Vmax         Current (Analog Interface)       0.04% of Imax         Programming Accuracy       0.04% of Vmax         Voltage (Front Panel and Digital Interface)       0.1% of Vmax         Current (Front Panel and Digital Interface)       0.3% of Imax         Voltage (Analog Interface)       0.3% of Imax         Current (Front Panel and Digital Interface)       0.3% of Imax         Voltage (Analog Interface)       0.2% of Vmax         Current (Front Panel and Digital Interface)       0.3% of Imax         Portage (Analog Interface)       0.3% of Imax         Voltage (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)       10         Number of program       10         Number of sequence       100         Dwell time Range       1s - 15,000S  | 5 ( )                   | 1mA                  |                            |                             |                             |                      |  |  |  |
| Current (Digital Interface)0.002% of ImaxVoltage (Analog Interface)0.04% of VmaxCurrent (Analog Interface)0.04% of ImaxProgramming AccuracyVoltage (Front Panel and<br>Digital Interface)0.1% of VmaxCurrent (Front Panel and<br>Digital Interface)0.3% of ImaxVoltage (Analog Interface)0.3% of ImaxCurrent (Front Panel and<br>Digital Interface)0.3% of ImaxVoltage (Analog Interface)0.2% of VmaxVoltage (Analog Interface)0.3% of ImaxVoltage (Analog Interface)0.3% of ImaxVoltage (Analog Interface)0.3% of ImaxVoltage (I-V program)Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )Auto Sequencing (I-V program)10Number of program10Number of sequence100Dwell time Range1s - 15,000S  |                         |                      |                            |                             |                             |                      |  |  |  |
| Voltage (Analog Interface)       0.04% of Vmax         Current (Analog Interface)       0.04% of Imax         Programming Accuracy         Voltage (Front Panel and         Digital Interface)       0.1% of Vmax         Current (Front Panel and         Digital Interface)         Current (Front Panel and         Digital Interface)         Voltage (Analog Interface)         Current (Front Panel and         Digital Interface)         Voltage (Analog Interface)         Number of program 1         Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)         Number of program       10         Number of sequence       100         Dwell time Range       1s - 15,000S  | 5 . 5                   |                      |                            |                             |                             |                      |  |  |  |
| Current (Analog Interface)       0.04% of Imax         Programming Accuracy         Voltage (Front Panel and<br>Digital Interface)       0.1% of Vmax         Current (Front Panel and<br>Digital Interface)       0.3% of Imax         Voltage (Analog Interface)       0.2% of Vmax         Voltage (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)       10         Number of program       100         Number of sequence       100         Dwell time Range       1s - 15,000S  |                         |                      |                            |                             |                             |                      |  |  |  |
| Programming Accuracy         Voltage (Front Panel and<br>Digital Interface)       0.1% of Vmax         Current (Front Panel and<br>Digital Interface)       0.3% of Imax         Voltage (Analog Interface)       0.2% of Vmax         Voltage (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)       10         Number of program       100         Dwell time Range       1s - 15,000S  |                         |                      |                            |                             |                             |                      |  |  |  |
| Voltage (Front Panel and<br>Digital Interface)       0.1% of Vmax         Current (Front Panel and<br>Digital Interface)       0.3% of Imax         Voltage (Analog Interface)       0.2% of Vmax         Voltage (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)       10         Number of program       100         Duell time Range       1s - 15,000S   | ÷                       |                      |                            | 0.0470 01 11110             |                             |                      |  |  |  |
| Digital Interface)       0.1% of Vmax         Current (Front Panel and       0.3% of Imax         Digital Interface)       0.2% of Vmax         Voltage (Analog Interface)       0.2% of Vmax         Current (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)       10         Number of program       100         Dumber of sequence       1s - 15,000S   |                         |                      |                            |                             |                             |                      |  |  |  |
| Current (Front Panel and<br>Digital Interface)       0.3% of Imax         Voltage (Analog Interface)       0.2% of Vmax         Current (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)         Number of program       10         Number of sequence       100         Dwell time Range       1s - 15,000S  |                         | 0.1% of Vmax         |                            |                             |                             |                      |  |  |  |
| Digital Interface)     0.3% of Imax       Digital Interface)     0.2% of Vmax       Voltage (Analog Interface)     0.2% of Vmax       Current (Analog Interface)     0.3% of Imax       Parallel Operation*1     Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )       Auto Sequencing (I-V program)     10       Number of program     100       Dwell time Range     1s - 15,000S   | 3                       |                      |                            |                             |                             |                      |  |  |  |
| Voltage (Analog Interface)       0.2% of Vmax         Current (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)         Number of program       10         Number of sequence       100         Dwell time Range       1s - 15,000S  |                         | 0.3% of Imax         |                            |                             |                             |                      |  |  |  |
| Current (Analog Interface)       0.3% of Imax         Parallel Operation*1       Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )         Auto Sequencing (I-V program)       Image         Number of program       10         Number of sequence       100         Dwell time Range       1s - 15,000S  | <b>J</b>                |                      |                            | 0.20/ aft/man               |                             |                      |  |  |  |
| Parallel Operation*1         Master / Slave control via CAN for 10 units up to 150KW. (Parallel: ten units )           Auto Sequencing (I-V program)         Interview           Number of program         10           Number of sequence         100           Dwell time Range         1s - 15,000S  |                         |                      |                            | -                           |                             |                      |  |  |  |
| Auto Sequencing (I-V program)         Number of program       10         Number of sequence       100         Dwell time Range       1s - 15,000S   | -                       |                      | M                          |                             |                             |                      |  |  |  |
| Number of program     10       Number of sequence     100       Dwell time Range     1s - 15,000S   |                         |                      | Master / Slave control via | a CAN for 10 units up to 15 | OKW. (Parallel: ten units ) |                      |  |  |  |
| Number of sequence     100       Dwell time Range     1s - 15,000S  |                         | gram)                |                            |                             |                             |                      |  |  |  |
| Dwell time Range 1s - 15,000S   |                         |                      |                            |                             |                             |                      |  |  |  |
|   | Number of sequence      |                      |                            |                             |                             |                      |  |  |  |
| Trig. Source Manual / Auto  | Dwell time Range        |                      |                            | 1s - 15,000S                |                             |                      |  |  |  |
|   | Trig. Source            |                      |                            |                             |                             |                      |  |  |  |

Note\*1 : Max. Power is 20kW for 62020H-150S

Note\*2: There is parallel mode for DC power supply when the I-V curve function is enabled

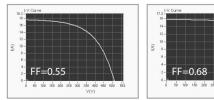
Note\*3: None APG interface for A620027/A620028

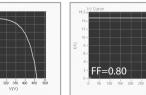
### Programmable DC Power Supply

### Model 62000H-S Series

| <b>GENERAL SPECIFICATIONS</b>              | ;                 |  |                              |                              |  |   |  |  |
|--|-------------------|--|------------------------------|------------------------------|--|---|--|--|
| MODEL                                      |                   | 62020H-150S  | 62050H-600S                  | 62100H-600S                  | 62150H-600S  | 62150H-1000S                            |  |  |
| Remote Interface                           |                   |  |                              |                              |  |   |  |  |
| Analog programming                         |                   | Standard   |                              |                              |  |   |  |  |
| USB  |                   | Standard   |                              |                              |  |   |  |  |
| RS232                                      |                   |  |                              | Standard                     |  |   |  |  |
| RS485                                      |                   |  |                              | Standard                     |  |   |  |  |
| GPIB                                       |                   |  |                              | Optional                     |  |   |  |  |
| Ethernet                                   |                   |  |                              | Optional                     |  |   |  |  |
| System bus(CAN)                            |                   |  | Standar                      | d for master/slave co        | ntrol  |   |  |  |
| <b>GPIB Command Response T</b>             | ïme               | 1  |                              |                              |  |   |  |  |
| Vout setting                               |                   |  | GPIB send comm               | nand to DC source red        | ceiver <20ms   |   |  |  |
| Measure V&I                                |                   |  | Under GPIB co                | ommand using Measu           | ure <25ms  |   |  |  |
| Analog Interface (I/O) *3                  |                   | 1  |                              |                              |  |   |  |  |
| Voltage and Current Program                | ming Inputs (I/P) | )  | 0-10Vdc / 0-5                | /dc / 0-5k ohm / 4-20        | mA of F.S.   |   |  |  |
| Voltage and Current monitor                |                   |  |                              | : / 0-5Vdc / 4-20mA o        |  |   |  |  |
| External ON/OFF (I/P)                      |                   |  |                              | ve Low or High(Selec         |  |   |  |  |
| DC_ON Signal (O/P)                         |                   | l evel h   |                              |                              | ge slew rate of 10V/m  | 15.)                                    |  |  |
| CV or CC mode Indicator (O/F               | 2)                | Leven  |                              | V mode ; TTL Level Lo        |  | ,                                       |  |  |
| OTP Indicator (O/P)                        | /                 |  | TTE Level High=e             | TTL: Active Low              |  |   |  |  |
| System Fault indicator(O/P)                |                   |  | TTL: Active Low              |                              |  |   |  |  |
| Auxiliary power supply(O/P)                |                   | Nominal supply voltage : 12Vdc / Maximum current sink capability: 10mA |                              |                              |  |   |  |  |
| Safety interlock(I/P)                      |                   | Time accuracy: <100ms  |                              |                              |  |   |  |  |
| Remote inhibit(I/P)                        |                   | TTL: Active Low  |                              |                              |  |   |  |  |
| Auto Sequencing(List Mode                  | 2)                |  |                              | TTL. ACTIVE LOW              |  |   |  |  |
| Number of program                          | =)                | 10   |                              |                              |  |   |  |  |
| Number of sequence                         |                   |  |                              | 100                          |  |   |  |  |
| Dwell time Range                           |                   |  |                              | 5ms - 15000S                 |  |   |  |  |
|  |                   |  | Max                          | nual / Auto / External       |  |   |  |  |
| Trig. Source                               | 4-)               |  | IVId                         | nual / Auto / External       |  |   |  |  |
| Auto Sequencing (Step Moo<br>Start voltage | ue)               |  |                              | 0 to Full scale              |  |   |  |  |
|  |                   |  |                              | 0 to Full scale              |  |   |  |  |
| End voltage                                |                   |  |                              | 10ms - 99hours               |  |   |  |  |
| Run time                                   |                   |  |                              | Toms - 99nours               |  |   |  |  |
| Input Specification                        |                   | 1  |                              | 20 202 222                   | /ac $\pm$ 10% V <sub>LL</sub>  |   |  |  |
| AC Input Volatage 3Phase, 3V               | Vira Cround       | 1Ø 200~220Vac  |                              |                              | $ac \pm 10\% V_{LL}$   |   |  |  |
| AC Input volatage SFilase, SV              | vile+Glound       | $\pm$ 10% V <sub>LN</sub>  |                              |                              | $ac \pm 10\% V_{LL}$   |   |  |  |
|  |                   |  |                              | 47 ~ 63Hz                    |  |   |  |  |
| AC Frequency range                         | 200/220Vac        | 15.2A  | 39A                          | 47 ~ 03H2<br>69A             | 93A  | 93A                                     |  |  |
| Max Current (each phase)                   | 380/400Vac        | 15.2A  | 22A                          | 37A                          | 50A  | 50A                                     |  |  |
| max current (each phase)                   | 440/480Vac        |  | 19A                          | 32A                          | 44A  | 44A                                     |  |  |
| General Specification                      |                   |  | 12/1                         | 5211                         | , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,  | , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, |  |  |
| Maximum Remote Sense Line                  | P Drop            |  |                              |                              |  |   |  |  |
| Compensation                               | ыор               |  | 2% of full sc                | ale voltage per line (4      | l% total)  |   |  |  |
| Operating Temperature Range                | <u>م</u>          |  |                              | 0°C ~ 40°C                   |  |   |  |  |
| Storage Temperature Range                  | -                 |  |                              | -40°C ~ +85°C                |  |   |  |  |
| Dimension (HxWxD)                          |                   | 89 x 428 x 465 mm/<br>3.5 x 16.85 x 16.73 inch                         | 132.8 r                      |                              | $-40 \text{ C} \sim +85 \text{ C}$<br>im x 428 mm x 610 mm / 5.23 x 16.85 x 24.02 inch |   |  |  |
| Weight                                     |                   | Approx. 17 kg /<br>37.44 lbs   | Approx. 23 kg /<br>55.70 lbs | Approx. 29 kg /<br>63.88 lbs | Approx. 35 kg /<br>77.09 lbs   | Approx. 35 kg /<br>77.09 lbs            |  |  |
| mengine                                    |                   |  |                              |                              | 1119105  |   |  |  |

Note\*3: None APG interface for A620027/A620028





Thin-Film

Standard Crystalline Array

High-efficiency Crystalline

Turnkey Test & Automation

### Modular DC Power Supply

### Model 62000B Series



#### **KEY FEATURES**

- Voltage range: 1 ~ 150V
- Current range: 0 ~ 2000A (System)
- Power range: 1.5kW per module up to 120kW per system
- N+1 Redundancy
- High Power Density (464 mW / cm<sup>3</sup> = 7.13 W/ln<sup>3</sup>)
- Hot-swappable
- Remote Sense
- Remote ON / OFF
- CAN BUS Control
- DC OK Signal Output

Chroma's new 62000B series of Modular DC Power Supplies offer many unique features for Burn-in and plating applications. The features include a N+1 redundancy, high power densities, hot-swappable maintenance, remote ON/OFF and programmable control via the CAN BUS.

The 62000B family offers 5 types of power module with ranging from 1V to 150V, current from 10A to 90A, and offers two mainframe type of six and three position. The six position mainframe can envelop in up to six power modules paralleled operation for 9KW power output. The 62000B can easily parallel up to fourteen mainframe to 120KW with current sharing and CAN BUS control for bulk power applications.

The Modular DC Power Supplies of 62000B are very cost effective with high power density and low current ripple. These instruments have be designed for burn-in applications such as DC-DC converters, power inverters, telecom powers, battery chargers and many other types of electronic devices.

Modern power factor correction circuitry is incorporated in 62000B providing an input power factor above 0.98 to meet the IEC requirements. This PFC correction circuity not only reduces the input current but also raises the operating efficiency to over 80% Optional graphic SoftPanels and CAN BUS control allow for control and monitoring of the power system using an easy to use graphical interface.

#### **Hot-swap Operation**

Equipped with the functionality of N+1 redundancy and hot-swap, the 62000B Series of modular DC power supplies are most applicable for 24 hours non-stop applications such as the SMD plating production lines, as well as product life burn-in test for IT products like DC converters, inverters, fans, motors, switch components, and routers.

CAN USB GPIB APG RS-232 Ethernet

For continuous operation applications the modular hot-swap design allows engineers to replace the failure unit on-site without shutting down the entire system.



#### **High Power Applications with CSU**

The 62000B modular power supplies are capable of providing high power output up to 120KW/2000A with minimum specification degradation via CSU(Control & Supervisor Unit). Each chassis is designed to accommodate a maximum of 9KW and include current sharing capability to ensure system stability. In addition, for convenient control of even large power systems, a Control & Supervisor unit is provided to set and display output and protection circuits via a standard CAN BUS communication protocol.



Control & Supervisor Unit

|            |     | 62000 | MODEL |      |      |  | hroma          |    |
|------------|-----|-------|-------|------|------|--|----------------|----|
|            |     |       |       |      | K _  | k .                                      |                | e  |
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|            | -   | ÷     | 1.1   |      | 12   | 131                                      | 4              | 70 |
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|            |     |       |       |      |      |  |                |    |

#### **ORDERING INFORMATION**

(F

**62000B-3-1 :** Three Position 62000B Mainframe **62000B-6-1 :** Six Position 62000B Mainframe **62015B-15-90 :** DC Power Supply Module, 15V/90A/1350W

**62015B-30-50 :** DC Power Supply Module, 30V/50A/1500W

62015B-60-25 : DC Power Supply Module, 60V/25A/1500W

62015B-80-18 : DC Power Supply Module, 80V/18A/1440W

62015B-150-10 : DC Power Supply Module, 150V/10A/1500W

A620007 : Control & Supervisor Unit A620008 : CAN BUS Interface for mainframe A620010 : Rack Mounting Kit for mainframe A620011 : Ethernet Interface for CSU A620012 : AD-Link PCI 7841 CAN BUS Card A620013 : 19" Rack (23U) for 62000B Series A620014 : 19" Rack (41U) for 62000B Series A620016 : Rack Mounting Kit for CSU A620017 : Softpanel for 62000B Series A620018 : NI USB-8473 high-speed USB to CAN interface A620019 : USB Interface Control Box

for mainframe & CSU

**A620020 :** GPIB Interface Control Box for mainframe & CSU

**A620021 :** Analog Interface Control Box for mainframe

**A620022 :** RS-485 Interface Control Box for mainframe & CSU

| AVAILABLE POWER RATINGS                             |      |       |       |       |       |  |
|---|------|-------|-------|-------|-------|--|
| Current Power<br>Rating Rating<br>Voltage<br>Rating | 9KW  | 18KW  | 27KW  | 36KW  | 45KW  |  |
| 15V   | 540A | 1080A | 1620A | 2160A | 2700A |  |
| 30V   | 300A | 600A  | 900A  | 1200A | 1500A |  |
| 60V   | 150A | 300A  | 450A  | 600A  | 750A  |  |
| 80V   | 108A | 216A  | 324A  | 432A  | 540A  |  |
| 150V  | 60A  | 120A  | 180A  | 240A  | 300A  |  |
| Paralleled unit<br>of mainframe                     | 1    | 2     | 3     | 4     | 5     |  |

**Note :** Call for more information on customization of high power system (>2000A)

|                                | re As Oper  | n Save f               | Default               | Connection Error ! |                 |          |
|--------------------------------|-------------|------------------------|-----------------------|--------------------|-----------------|----------|
| Voltage (V)                    | Current (A) | Voltage<br>Reading (V) | Current<br>Reading (A |                    | CV/CC<br>Status | Output   |
| Basic Control<br>Power Cycling | OCP Enable  | Alarm Status           | OVP OC                |                    |                 |          |
| On Time                        |             | Off Time               | Gycl                  | e Elapsed Tin      | ne To           | tal Time |

Softpanel for Model 62000B Series

### Modular DC Power Supply

### Model 62000B Series

| SPECIFICATIONS  |                   |  |  |                         |                                       |  |  |  |
|---|-------------------|--|--|-------------------------|---------------------------------------|--|--|--|
| Model   | 62015B-15-90      | 62015B-30-50   | 62015B-60-25                                   | 62015B-80-18            | 62015B-150-10                         |  |  |  |
| Electrical Specifications                                 |                   |  |  |                         |                                       |  |  |  |
| Output Ratings  |                   |  |  |                         |                                       |  |  |  |
| Output Power  | 1350W             | 1500W  | 1500W  | 1440W                   | 1500W                                 |  |  |  |
| Output Voltage  | 1~15V             | 1~30V  | 1~60V  | 1~80V                   | 1~150V                                |  |  |  |
| Output Current  | 1~90A             | 1~50A  | 1~25A  | 1~18A                   | 1~10A                                 |  |  |  |
| Line Regulation   |                   | 1  | 0.1% F.S.                                      | 1                       |                                       |  |  |  |
| Load Regulation *1  |                   | 1% F.S.  |  |                         |                                       |  |  |  |
| Programming Accuracy                                      |                   |  | 1% F.S.  |                         |                                       |  |  |  |
| Measurement Accuracy                                      |                   |  | 1% F.S.  |                         |                                       |  |  |  |
| Output Noise (20MHz)                                      |                   |  |  |                         |                                       |  |  |  |
| Voltage Noise (P-P)                                       | 100mV             | 100mV  | 200mV  | 200mV                   | 400mV                                 |  |  |  |
| Voltage Ripple (rms)                                      | 30mV              | 30mV   | 50mV   | 50mV                    | 100mV                                 |  |  |  |
| Current Ripple (rms)                                      | 0.9A              | 0.5A   | 0.25A  | 0.18A                   | 0.1A                                  |  |  |  |
| Efficiency  | > 87% @ full load |  |  | @ full load             | 0.111                                 |  |  |  |
| Furn on over shoot voltage *2                             |                   | 1  | 5% of nominal outp                             | <b>C</b>                |                                       |  |  |  |
| Transient Response Time *3                                |                   |  | < 5 ms   |                         |                                       |  |  |  |
| AC Input Voltage  |                   |  |  |                         |                                       |  |  |  |
| Six Position Mainframe                                    |                   | $30/200 \sim 240 \text{Vac} + 10$  | )% Vµ or 3Ø 380~400\                           | /ac ±10% V⊥, 47~63 I    |                                       |  |  |  |
| Three Position Mainframe                                  |                   |  | $0 \sim 240 \text{Vac} \pm 10\% \text{V}_{LN}$ |                         |                                       |  |  |  |
| nput Power Factor   |                   | 1020   | > 0.98@ full load                              | 47°03112                |                                       |  |  |  |
| Protection Function                                       |                   |  | 20.20@10110000                                 |                         |                                       |  |  |  |
| OVP   |                   | Automatic  | ally shuts down at 115                         | % of set value          |                                       |  |  |  |
| Adjustment Range  | 1~16V             | 1~31V  | 1~65V  | 1~83V                   | 1~155V                                |  |  |  |
|   | 1,4100            | -  |  |                         | 1,21334                               |  |  |  |
| OTP   |                   | Current limit (0 ~ 100%) / OCP Shutdown at 115% of F.S.<br>Automatically shuts down if internal limit is reached |  |                         |                                       |  |  |  |
| I/O Signal  |                   | Automatically  | 7 shuts down in interna                        |                         |                                       |  |  |  |
| Remote ON/OFF (I/P)                                       |                   | Dru cont   | tact (closed = enabled                         | ) vice verse            |                                       |  |  |  |
| AUX Voltage   |                   |  | it mainframe (by trimr                         |                         |                                       |  |  |  |
|   |                   |  |  | P / OCP / OTP / AC Faul | +)                                    |  |  |  |
| DC OK Signal Type (O/P)                                   | unicel)           | Dry contact (closed  |  | - / OCP / OTP / AC Fau  | ()                                    |  |  |  |
| Programming Response Time *4 (Ty<br>Rise Time (Full Load) | (pical)           |  | d E0% to OE0% stop in a                        | itaut valtaga i 100mg   |                                       |  |  |  |
| Rise Time (No Load)                                       |                   |  | d 5% to 95% step in ou                         |                         |                                       |  |  |  |
| . ,   |                   |  | d 5% to 95% step in ou                         |                         |                                       |  |  |  |
| Fall Time (Full Load)                                     |                   |  | d 95% to 5% step in o<br>ned 95% to 5% step in |                         |                                       |  |  |  |
| Fall Time (No Load)                                       |                   | 1 5  | d command to DC mo                             | 1 5                     |                                       |  |  |  |
| Vout Setting  |                   |  |  |                         |                                       |  |  |  |
| Measurement V & I   |                   |  | AN command using fe                            |                         |                                       |  |  |  |
| Delay Time  | For outp          | out ON/OFF enable and  | d disable (under CAN                           | command) : 5s(Single    | Mainframe)                            |  |  |  |
| General Specifications                                    |                   | 21/  |  |                         |                                       |  |  |  |
| Remote Sensing  |                   | 3V   | max. line loss comper                          |                         |                                       |  |  |  |
| Parallel Operation  |                   |  | Current Sharing (±5                            | %)                      |                                       |  |  |  |
| Operating Temperature                                     |                   |  | 0 ~ 50°C                                       |                         |                                       |  |  |  |
| Humidity Range  |                   | 0  | ~ 90% RH. Non-conde                            |                         |                                       |  |  |  |
| Remote Interface  |                   |  | CAN BUS (optional                              | )                       |                                       |  |  |  |
| Safety & EMC  |                   |  | CE   |                         |                                       |  |  |  |
|   |                   |  |  | 7.48 x 18.35 inch (6200 | · · · · · · · · · · · · · · · · · · · |  |  |  |
| Dimension (H x W x D)                                     | Mai               |  |  | .44 x 18.35 inch (6200  | JR-3-1)                               |  |  |  |
|   |                   |  | 67.5 x 377.5 mm / 5.4                          |                         |                                       |  |  |  |
|   |                   |  | me : 14 Kg / 30.8 lbs (6                       |                         |                                       |  |  |  |
| Weight  |                   | Mainfra  | ame : 8 Kg / 17.6 lbs (6                       |                         |                                       |  |  |  |
|   |                   | Module : 4 Kg / 8.8 lbs  |  |                         |                                       |  |  |  |

Note\*1: For 50% step load variation with remote sense at maximum output voltage

Note\*2 : based on rise time of 100ms

Note\*3 : Time for the output voltage to recover within 1% of its rated for a load changed of 25%

Note\*4 : Six Position Mainframe through CAN



#### **KEY FEATURES**

- Open architecture software platform - Support instrument with GPIB / RS-232 or RS-485 / I<sup>2</sup>C /CAN BUS interfaces
  - User editable test item
  - User editable test program
  - User editable report format
  - Statistical report
  - On-line control function
  - User authority control
  - Release control
  - Activity log
  - Master / Slave control mode
  - Multi-UUT test capability for single-output PSU
  - Support bar code reader
  - Support Shop-floor control
  - Remote monitoring via internet
- Test command optimizer helps to improve test speed
- Capable of coding for any power supply testing applications
- Comprehensive hardware modules provide high accuracy and repetitive measurements
- High test throughput by system default test items
- Cost effective
- Other hardware expandable upon request
- Windows 98/NT/2000/XP/7 based software

This auto test system uses the unique test command optimization technology to prevent the repeating control commands from sending to the system hardware devices. This improves the system test speed dramatically and makes Chroma 8000, which uses open software architecture, highly efficient as a close or optimized auto test system.

To meet the power supply test requirements, Chroma Power Supply Auto Test System model 8000 has built in 56 ready-made test items. Users may create new test items based on new test requirements using the test item editing function, which gives users the capability to expand the test items unlimitedly.



With the powerful report, statistic and management functions, Chroma Power Supply Auto Test System model 8000 is able to provide complete tools to generate various test documents and perform system administration. Because the test and statistical reports are equally important nowadays for R/D evaluation, OA verification and mass production tests. So these save users a great deal of time for paper work.

Working under Windows 98/NT/2000/XP/7 operation system, Chroma 8000 Power Supply Auto Test System is able to get all the resources provided by Windows; thus, it can easily export the test results to network or to your web-page for remote manufacturing monitoring.

#### **COMPREHENSIVE TEST ITEMS OUTPUT PERFORMANCES**

- 1. DC output voltage 2. DC output current
- 3. Peak-Peak noise
- 4. RMS noise
- 5. Current ripple\*
- 6. Efficiency
- 7. In-test adjustment
- 8. Power good signal
- 9. Power fail signal
- 10. P/S ON signal
- 11. Extended measure
- 12. Waveform capture
- 13. Overshoot voltage

#### INPUT CHARACTERISTICS

- 14. Input Inrush current
- 15. Input RMS current
- 16. Input peak current 17. Input power
- 18. Current harmonics
- against regulations
- 19. Input power factor
- 20. Input voltage ramp
- 21. Input freq. ramp
- 22. AC cycle drop out
- 23. PLD simulation

#### **REGULATION TESTS**

- 24. Current regulation
- 25. Voltage regulation
- 26. Total regulation

#### TIMING AND TRANSIENT

- 27. Power up sequence
- 28. Power down sequence
- 29. Transient response time
- 30. Transient spike
- 31. Turn ON time
- 32. Rise time
- 33. Fall time
- 34. Hold-up time
- 35. Extra timing

### 36. Tracking

#### **PROTECTION TESTS**

37. Short circuit 38. OV protection 39. UV protection 40. OL protection 41. OP protection

Model 8000

#### SPECIAL TESTS

- 42. Fan speed
- 43. Correlation test
- 44. UUT measurement verification test

#### SPECIAL FEATURE

- 45. Can BUS read/ write
- 46. I<sup>2</sup> C read/ write\*
- 47 GPIB read/write
- 48 RS-232 read/write
- 49. RS-485 read/ write\*
- 50. TTL signal control
- 51. Relay control
- 52. Bar code scan\*
- 53. DMM measure

\* These test items need to be created by users by using test item editor due to the variety of the UUTs, and unlimited customized or user defined test items are allowed.

#### **DC to DC Converter Testing**

Software: Special Design Test Items (Load Fault Power Dissipation Test, Switching Frequency Test, Synchnization Frequency Test)

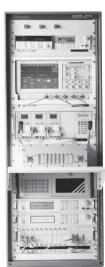
#### Hardware: Create Standard Test Fixture platform (Receiver)



DC to DC Converter Test Fixture



DC to DC Converter



DC to DC Converter ATS

10-65

# Model 8000

### **PV Inverter Testing**

The Chroma 8000 ATS is equipped with optimized standard test items for PV inverters (the Unit Under Test), It meets IEEE1547, 1547.1, UL1741, GB/T 19939, CGC/GF004 preliminary test requirements. The user is only required to define the test conditions and specifications for the standard test items to perform the test.



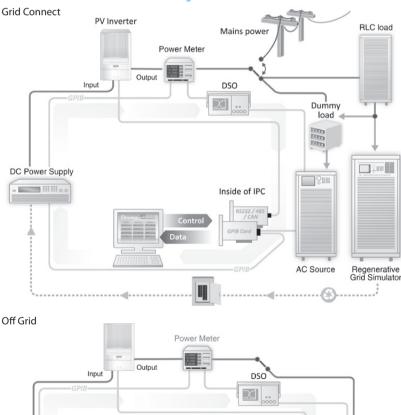
**PV Inverter ATS** 

Micro Inverter ATS (Parallel 4 DUTs)

AC Load

Inside of IPC

#### Grid Connected PV Inverter Test Block Diagram



#### **Optimized Equipment & Test Items**

The optimized test item covers 5 types of power supply test requirements. The OUTPUT PERFORMANCE test verifies the output characteristics of the UUT. The INPUT CHARACTERISTIC test checks the UUT input parameters. TIMING & TRANSIENT tests the timing and transient states during protection. The PROTECTION TESTS trigger and test the protection circuit, the SPECIAL TEST provides means to test the most sophisticated UUT when unique test routines are needed.

#### **Output Performances**

- 1. Output Voltage
- 2. Output Current
- 3. Output Power
- 4. Output Power Factor
- 5. EFF (CEC/European/Conversion/Max)
- 6. DC injection Current
- 7. THD
- 8. Current Harmonic Test
- 9. Night Time Power Consumption

#### **Input Characteristics**

- 10. Input Voltage
- 11. Input MPPT Voltage
- 12. Input Current
- 13. Input Power
- 14. Input MPPT Power

#### **Timing & Transient**

15. OVP/UVP Trip Time
 16. OFP/UFP Trip Time
 17. Anti-Islanding Trip Time \*
 18. Re On-Grid Time

#### **Protection Tests**

19. OV/UV Protection 20. OF/UF Protection 21. Anti-Islanding \*

#### **Special Tests**

22. MPPT Efficiency23. MPPT Time24. MPPT Record25. RS232/485/CAN communication

\* The A800067 RLC load is required. This system can test automatically and meet regulations of multiple anti-islanding protection test conditions to save test time. It not only fits R&D and QC, but also very suitable for production line. lat Panel

DC Power Supply

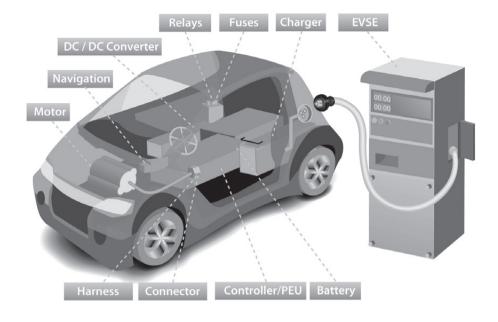
### Model 8000

#### **EV Power Electroncs Test Solutions**

The power conversion section of the EV/HEV is composed of several power electronic units, which include the AC or DC EVSE (EV Supply Equipment), onboard charger, DC/DC converter, motor driver, etc. The Chroma 8000 addresses the specialized requirements involved in testing the power electronics during not only the development phase, but also the production phase.

The following pictures of the Chroma ATS show some applications for EV/HEV. The system will not only perform the tests and report it to an isolated PC, but it will also network to the shop-floor (MES) system for production line for data log-in, analysis and monitoring.

#### **Power Electronics Devices in Electric Vehicle**



#### **Motor Driver ATS**

For EV Motor driver & PCBA testing

- For Motor driver PCBA components voltage/ emperature/signal/ communication/ protection function testing
   For Motor driver over voltage/
- For Motor driver over voltage/ over current/over temperature protection/ load regulation/ power testing



Motor Driver ATS

#### **EVSE ATS**

It is a customized system based on Chroma 8000 ATS specializing in verification of EV Supply Equipment (EVSE) and complying with SAE-J1772 in programming the test items for operation. ■ Meets SAE-J1772, CNS15511, GB/T18487, GB/T27930,

GB/T20234 standards
 Simulates various AC grid situation and EV charging mode



EVSE ATS

#### EV OBC & DC-DC Converter ATS

The automated test equipment are customized for EV OBC and DC to DC converter

- Meets all test requirements of EV on-board charger (OBC) and DC to DC converter
- Integrated connecting panelsExclusive test items
- Fully complies with QC/T 895 and GB/T 24347 test requirements



OBC & DC-DC Converter ATS

#### **EV AC/DC Charging Compatibility ATS**

- To simulates various states of EVSE to make sure AC charging compatibility before electric vehicle delivery
- Based on the requirements of different regulations to simulate EVSE for testing if electric vehicle can do accurate action or response appropriately when the signal contains error
- Testing response action of electric vehicle for EVSE transmission signal limit value in regulation to make sure the compatibility of miscellaneous EVSE



EV AC/DC Charging Compatibility ATS

### Model 8000

DC charging station which delivers DC in higher power rating with fast

charging capability to the Electric Vehicle battery pack directly.

DC output - DC charging station

# Video & Color Flat Panel Display Photovoltaic Test & Automation



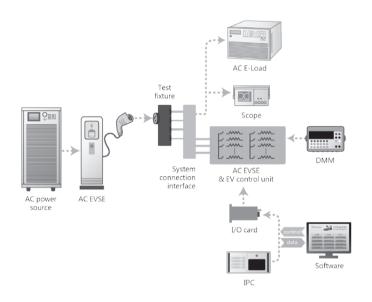
urnkey Test &



#### **Electric Vehicle Supply Equipment testing Structure**

#### AC output - AC charging station

AC charging station which delivers AC with lower power rating to the OBC (on board charger) of Electric Vehicle for AC to DC power conversion and the DC power is implemented for charging the Electric Vehicle battery pack.



#### .... **—**OIII 1 1 DC power supply DC E-Load or Regenerative battery simulator Test fixture 1.2 mm X Scope DC EVSE & EV control unit System AC powe DC EVSE connection source interface I/O card Software DC E-Load IPC

#### **Electric Vehicle and Charging Station Interoperability Test**

AC input -

020 ...

AC charging station simulation for electric vehicle AC charging function testing.

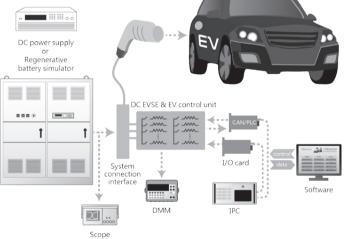


Digital power mete I/O card System connection interface X AC power Scope source IPC DC power supply Function DMM

generator

### DC input -

DC charging station simulation for Electric Vehicle DC charging function testing.



#### SPECIFICATIONS-1

#### Accurate and highly reliable hardware devices:

| Power Meter               |           |           |           |           |  |  |
|---------------------------|-----------|-----------|-----------|-----------|--|--|
| Model                     | 66201     | 66202     | 66203     | 66204     |  |  |
| Measurement Channel       | 1         | 1         | 3         | 4         |  |  |
| Power measurement range   | 12 ranges | 24 ranges | 48 ranges | 48 ranges |  |  |
| Voltage measurement range | 3 ranges  | 3 ranges  | 6 ranges  | 6 ranges  |  |  |
| Current measurement range | 4 ranges  | 8 ranges  | 8 ranges  | 8 ranges  |  |  |
| Front panel display       | Yes       | Yes       | Yes       | Yes       |  |  |
| Front panel editable      | Yes       | Yes       | Yes       | Yes       |  |  |
| Harmonics measurement     | No        | Yes       | Yes       | Yes       |  |  |

\* Please refer to respective product catalogs for detail specifications.

| Electronic Load           |                       |                       |                       |                       |  |  |
|---------------------------|-----------------------|-----------------------|-----------------------|-----------------------|--|--|
| Model                     | 6310A series          | 6330A series          | 63200 series          | 63600 series          |  |  |
| Load mode                 | CC/CR/CV              | CC/CR/CV              | CC/CR/CV/CP           | CC/CR/CV/CP/CZ        |  |  |
| Power rating              | 30-1200W              | 30-1200W              | 2000-12000W           | 100-400W              |  |  |
| Voltage range             | 1-500V                | 1-500V                | 1-600V                | 1-600V                |  |  |
| Current range             | Up to 240A            | Up to 240A            | Up to 1000A           | Up to 80A             |  |  |
| Slew rate                 | Up to 10A/µs          | Up to 10A/µs          | Up to 41.6A/µs        | Up to 8A/µs           |  |  |
| Measurements              | Voltage/Current/Power | Voltage/Current/Power | Voltage/Current/Power | Voltage/Current/Power |  |  |
| Monitoring output         | No                    | No                    | Current               | Voltage/Current       |  |  |
| Current share measurement | No                    | No                    | No                    | No                    |  |  |
| Noise measurement         | No                    | No                    | No                    | No                    |  |  |
| Voltage sense input       | Yes                   | Yes                   | Yes                   | Yes                   |  |  |
| Sync dynamic              | No                    | Yes                   | Yes                   | Yes                   |  |  |

\* Please refer to respective product catalogs for detail specifications.

| AC Source                |              |              |              |              |              |              |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Model                    | 6400 series  | 6500 series  | 61500 series | 61600 series | 61700 series | 61800 series |
| Power rating             | 1500-9000VA  | 1200-9000VA  | 500-18000VA  | 500-18000VA  | 1500-12000VA | 30-60KVA     |
| Voltage range            | 0-100V/600V  | 0-300V       | 0-300V       | 0-300V       | 0-300V       | 0-300V       |
| Output phase             | 1 or 3 phase | 1 or 3 phase | 1 or 3 phase | 1 or 3 phase | 3 phase      | 3 phase      |
| DC output                | No           | No           | Yes          | Yes          | Yes          | Yes          |
| Output measurement       | Yes          | Yes          | Yes          | Yes          | Yes          | Yes          |
| Harmonic measurement     | No           | No           | Yes          | No           | No           | Yes          |
| Waveform simulation      | No           | Yes          | Yes          | No           | Yes          | Yes          |
| Programmable impedance   | No           | No           | Yes          | No           | No           | No           |
| Harmonic synthesis       | No           | Yes          | Yes          | No           | Yes          | Yes          |
| Inter-harmonic synthesis | No           | No           | Yes          | No           | Yes          | Yes          |

\* Please refer to respective product catalogs for detail specifications.

| DC Source                            |                            |               |  |  |  |
|--------------------------------------|----------------------------|---------------|--|--|--|
| Model                                | 62000P series              | 62000H series |  |  |  |
| Power rating                         | 600,1200,2400,5000W        | 10KW,15KW     |  |  |  |
| Voltage range                        | 0-100V/600V                | 0-600V/1000V  |  |  |  |
| Programmable current limit           | Yes                        | Yes           |  |  |  |
| Programmable OV point                | Yes                        | Yes           |  |  |  |
| Analog programming                   | Yes                        | Yes           |  |  |  |
| Remote sensing                       | Yes                        | Yes           |  |  |  |
| Line-drop compensation               | 5V                         | 10%/4%        |  |  |  |
| * Please refer to respective product | catalogs for detail specif | ications      |  |  |  |

Please refer to respective product catalogs for detail specifications.

| Digital Measurement Card          |                                    |  |  |  |
|-----------------------------------|------------------------------------|--|--|--|
| Model                             | A800068                            |  |  |  |
| Input DC Voltage Range            | 6V/30V/120V/500V                   |  |  |  |
| Noise Measurement range           | 500mV/5V/25V                       |  |  |  |
| Resolution                        | 10 bit                             |  |  |  |
| Bandwidth                         | 100MHz                             |  |  |  |
|                                   | HPF : 6Hz, 2KHz                    |  |  |  |
| Filter                            | LPF : 2k, 10k, 100k, 500k, 1M, 4M, |  |  |  |
|                                   | 10M, 20M, 100M Hz                  |  |  |  |
| Input Impedance                   | 50 ohm / 0.95M ohm (DC)            |  |  |  |
| AC mode AC Voltage range          | 20V/150V/300V (rms)                |  |  |  |
| <b>Resolution / Sampling Rate</b> | 16 bit / 1MS/s                     |  |  |  |

#### Other hardware devices :

Digital Multimeter (Agilent-34401A / Keithley 2000), other types or brands of DMM supported upon request

Digital Storage Oscilloscope (Tektronix TDS-1000/2000/3000/5000/7000 series ,DPO-2000/3000/4000/5000/7000 series), other types or brands of DSO supported upon request

### **Model 8000**

### **SPECIFICATIONS-2**

| System Controller |                           |
|-------------------|---------------------------|
| Model             | PC/IPC                    |
| CPU               | Pentium III 600 or faster |
| SRAM              | 256KB                     |
| DRAM              | 512MB or higher           |
| Hard drive        | 8.3GB or higher           |
| CD-ROM            | 40X or faster             |
| Monitor           | 15"                       |
| Keyboard          | 101 keys                  |
| I/O               | Mouse/Print port          |
| System Interface  | GPIB/RS-232               |
| System I/O        | DIO Card                  |
| GPIB board        | NI-PCI GPIB Card          |

| Timing/Noise Analyzer       |                           |                      |                    |  |  |
|-----------------------------|---------------------------|----------------------|--------------------|--|--|
| Model                       | 6011                      | 80611                | 80614              |  |  |
| NO. of input module         | Up to 10                  | Up to 10             | Up to 4            |  |  |
| Noise measurement range     | 2V/0.4V                   | 2V/0.4V              | 2V/0.4V            |  |  |
| Low Pass Filter             | Up to 20MHz               | Up to 20MHz          | Up to 20MHz        |  |  |
| Input circuit               | Differential input        | Differential input   | Differential input |  |  |
| Timing range                | 0-64 second               | 0-64 second          | 0-64 second        |  |  |
| NO. of trigger input        | 4 sets                    | 6 sets               | 6 sets             |  |  |
| NO. of comparator           | 2 Input module            | 4 Input module       | 4 Input module     |  |  |
| Controllable TTL bits       | 16 output                 | 16 output / 16 input | No                 |  |  |
| Controllable floating relay | 6                         | 8                    | 6                  |  |  |
| NO. of multiplex input      | 10                        | 10                   | No                 |  |  |
| NO. of multiplex output     | 2 for DMM &. 2<br>for DSO | 1 for DMM            | No                 |  |  |

| <b>ON/OFF Controller</b>  |                 |           |
|---------------------------|-----------------|-----------|
| Model                     | 6013            | 80613     |
| Input                     | AC/DC           | AC/DC     |
| ON/OFF range - AC         | 0-360 deg       | 0-360 deg |
| Voltage range - AC        | 250V            | 277V      |
| Current range - AC        | 30A             | 30A       |
| Voltage range - DC        | 200V            | 200V      |
| Current range - DC        | 40A             | 60A       |
| Measurement<br>Capability | By external DMM | Internal  |
| Control Interface         | Via Chroma 6011 | RS 485    |

| Short Circuit/OVP Tester       |                     |                     |
|--------------------------------|---------------------|---------------------|
| Model                          | 6012                | 80612               |
| NO. of input terminal          | Up to 6             | Up to 6             |
| Short circuit impedance        | < 0.1 ohm           | < 0.05 ohm          |
| Short current measurement      | Yes                 | Yes                 |
| Sync. Signal for short circuit | 6 relay signal      | 6 relay signal      |
| OVP/UVP testing                | Internal / External | Internal / External |
| Internal impedance range       | 1K-1M ohm           | 100-1M ohm          |
| External OVP/UVP source        | DC source           | DC source           |
| Measurement Capability         | By external DMM     | Internal            |
| Control Interface              | Via Chroma 6011     | RS 485              |

#### **ORDERING INFORMATION**

8000 : Switching Power Supply Auto Test System 6011/80611/80614 : Timing/Noise Analyzer 6011N/80611N: Timing/Noise module 6012/80612 : Short Circuit/OVP Tester 6013/80613 : ON/OFF Controller 5004ATM : System Controller A800003:8000 software Package A800004 : 19" Rack for Model 8000

A800005 : PCI BUS GPIB Card (National Instrument) A800027 : Test Fixture for Model 8000

A800068 : Digital Measurement Card

DC Load Module: Refer to 6310A, 63200, 6330A,63600 Series

Digital Power Meter: Refer to Model 66200 Series

AC Source : Refer to Model 6400, 6500, 61500, 61600, 61700, 61800 Series DC Source : Refer to Model 62000H, 62000P Series

Turnkey Test & Automation



#### **KEY FEATURES**

User editable test program

- User editable report format
- User authority control
- Release control
- Activity log
- Comprehensive hardware modules provide high accuracy repetitive and measurements
- High test throughput by system default test items
- Cost effective
- Windows 98/NT/2000/XP/7 based software

Chroma Power Supply Auto Test System model 8200 provides complete solution for PC ATX power supply, adapter and battery charger testing. The application oriented system structure makes it the most cost effective test equipment for initial test in power supply production line.

To meet the power supply test requirements, Chroma Power Supply Auto Test System model 8200 has built in 20 ready-made test items. Users can simply enter the test conditions and test the power supply features while proceeding.

With the report and management functions, Chroma Power Supply Auto Test System model 8200 is able to provide versatile tools to establish test documents and perform system administration.

Meanwhile, Chroma Power Supply Auto Test System model 8200 can be upgraded to Chroma model 8000, the ultimate power supply auto test system, to fit the future test needs by changing system software and adding new hardware devices.

### GPIB CE

#### **GENERAL TEST ITEMS**

- 1. DC output voltage 2. DC output current
- 3. Voltage regulation
- 4. Current regulation
- 5. Turn ON time
- 6. Hold-up time
- 7. Power good signal
- 8. P/S ON signal
- 9. Efficiency
- 10. Input RMS current
- 11. Input peak current
- 12. Input power
- 13. Input power factor14. Short circuit test
- 15. Short circuit current
- 16. OV protection
- 17. OL protection
- 18. OP protection
- 19. In-test adjustment

#### LED DRIVER TEST ITEMS

- 1. LED & Current Harmonics Test
- 2. LED & Discharge Load Test
- 3. LED & Hold On Adjust Test
- 4. LED & Input / Output Test
- 5. LED & Inrush Current Test
- 6. LED & Open Voltage Test
- 7. LED & OVP Test
- 8. LED & Power Saving Mode Test
- 9. LED & Regulation Test
- 10. LED & Short Circuit Test
- 11. LED & Static Test
- 12. LED & System Setup

#### SPECIFICATIONS

| AC Source                |              |              |              |
|--------------------------|--------------|--------------|--------------|
| Model                    | 6500 series  | 61500 series | 61600 series |
| Power rating             | 1200-9000VA  | 500-18000VA  | 500-18000VA  |
| Voltage range            | 0-300V       | 0-300V       | 0-300V       |
| Output phase             | 1 or 3 phase | 1 or 3 phase | 1 or 3 phase |
| DC output                | No           | Yes          | Yes          |
| Output measurement       | Yes          | Yes          | Yes          |
| Harmonic measurement     | No           | Yes          | No           |
| Waveform simulation      | Yes          | Yes          | No           |
| Programmable impedance   | No           | Yes          | No           |
| Harmonic synthesis       | Yes          | Yes          | No           |
| Inter-harmonic synthesis | No           | Yes          | No           |

\* Please refer to respective product catalogs for detail specifications.

#### **ORDERING INFORMATION**

8200 : Switching Power Supply Auto Test System A820001 : PCI BUS AD Card A800004 :19" Rack for Model 8200 A800005 : PCI BUS GPIB Card (National Instrument) A820002 : 8200 software Package A800027 : Test Fixture for Model 8200 A600013 : Adapter for A600011/A600012 Test Fixture (PC Standard) A600014 : Adapter for A600011/A600012 Test Fixture (PC Standard) DC Load Module : Refer to Model 6310A, 6330A, 63600 Series AC Source : Refer to Model 6400, 6500,61500, 61600, 61800 Series

Model 8200

\* Please refer to Model 8000's specifications for detail instruments

### PC Power Supply ATS



#### **KEY FEATURES**

- Equipped with both of the test performance of 6000 ATS and the flexible hardware architecture of 8000 ATS
- Provide optimized standard test items for the Unit Under Test (PC Power Supply) to deliver excellent test performance
- Easy-to-use software function specifically designed to meet the production line needs
- Flexible software platform with the following functions
- User editable test program
- User editable test report format
- Test report generator
- Statistical report
- User authority control
- Release control
- Activity log
- Support bar code reader
- New test items and expandable hardware allows the Chroma 8010 ATS to meet the new testing requirements in the PC power industry - Output voltage monotonic rise test
  - Average efficiency test that complies with EPA & 80Plus
- Windows 98/2000/NT/XP/7(32 bits) based software
- Offer the best performance/price ratio

Chroma 8010 PC Power Supply ATS is the test system of choice for PC power testing on the production line. Its test performance not only compares favorably with the Chroma 6000 ATS, but also has the flexibility of the Chroma 8000ATS hardware architecture. Available for selection are a range of hardware devices including AC/DC Power Supply, Electronic Load, Timing/Noise Analyzer, Power Meter and Extended Measurement Controller.

Chroma 8010 ATS was designed specifically with PC power supply characteristics in mind, with customized standard test items providing excellent test performance and optimized for mass production. The software provides a user friendly interface and intuitive controls suited for the production line.

All specifications are subject to change without notice.

| RS-232 | GPIB   | Œ           | PFC            |
|--------|--------|-------------|----------------|
|        | RS-232 | RS-232 GPIB | R5-232 GPIB CE |

New test items and expandable hardware allows the Chroma 8010 ATS to meet the new testing requirements in the PC power industry such as voltage monotonic rise test, average efficiency test to comply with EPA requirements and various other tests.

Chroma 8010 ATS software runs under the user friendly Windows 98/2000/NT/XP/7(32 bits) operating environment, providing the test engineer a dedicated PC power supply testing system with easy access to Windows resources.

### **OPTIMIZED TEST ITEMS**

#### OUTPUT PERFORMANCES

- 1. DC output voltage
- Peak-to-peak noise
   RMS noise
  - RIVIS HOISE
- 4. Efficiency
- In-test adjustment
   Power good (PG) signal
- 7. Power fail (PF) signal
- 8. PS/ON signal
- 9. Extended measure
- 10. Overshoot voltage

#### INPUT CHARACTERISTICS

- 11. Input inrush current 12. Input RMS current
- 13. Input power
- 14. Input power factor
- 15. Input voltage ramp
- 16. Input frequency ramp
- 17. AC cycle drop out

#### **REGULATION TESTS**

- 18. Line regulation
- 19. Load regulation
- 20. Combine regulation
- 21. Dynamic load regulation22. Sync.dynamic load regulation

#### TIMING AND TRANSIENT

- 23. Transient spike
- 24. Power up sequence
- 25. Rise time
- 26. Fall time
- 27. Power off time
- 28. Extended measure

#### **PROTECTION TESTS**

- 29. Short circuit30. Over voltage protection
- 31. Over load protection

#### SPECIAL TESTS

32. Voltage monotonic test 33. Average efficiency test

34. Power on/off cycle test

#### SPECIAL FEATURE

35. TTL signal control36. Relay control

#### **ORDERING INFORMATION**

8010 : PC Power Supply ATS
6011/80611/80614 : Timing/Noise Analyzer
80611N : Timing/Noise module
8126 : Extended Controller
5004ATM : System Controller
A800027 : Test Fixture
A800004 : 19" Rack for Model 8010
A800068 : Digital Measurement Card
DC Load Module : Refer to Model 6330A Series
Digital Power Meter : Refer to Model 66200 Series
AC Source : Refer to Model 6500, 61500, 61600 Series
DC Source : Refer to Model 6200P Series

\* Please refer to Model 8000's specifications for detail instruments

#### 規格表

| Extended Controller         |                      |
|-----------------------------|----------------------|
| Model                       | 8126                 |
| Short circuit               |                      |
| Input channel               | 10                   |
| Input Voltage Rating        | 60Vdc                |
| Input Current Rating        | 20Adc                |
| Short relay                 | 30A continuous       |
| OVP                         |                      |
| Output channel              | 10                   |
| Dc source input             | 1                    |
| Input Voltage Rating        | 60Vdc                |
| Input Current Rating        | 20A continuous       |
| Floating Relay              |                      |
| Туре                        | SPST                 |
| No. of Relay                | 6                    |
| Rating                      | 5A                   |
| External Relay              |                      |
| No. of Relay                | 1 via rear panel     |
| Rating                      | 5A                   |
| Timing (For Power Good / Po | wer Fail Time)       |
| Input channel               | 2                    |
| Input Voltage Rating        | 5.5Vdc               |
| Range                       | 0-6.4Sec             |
| Accuracy                    | 1mS                  |
| Resolution                  | 100µs                |
| Trigger Reference Voltage   | 3Vdc / 4.5Vdc Select |
| Reference Voltage Accuracy  | ± 0.1V               |
| Input Current Rating        | 20Adc                |
| Input Voltage Rating        | 5.5Vdc               |
| Range                       | 0-6.4Sec             |
|                             |                      |

PXI Test &

### Model 8010

### Adapter/Charger ATS

### Model 8020



#### **KEY FEATURES**

- Be able to test multiple UUTs concurrently that improve productivity significantly
- Equipped with both of the test performance of 6000 ATS and the flexible hardware architecture of 8000 ATS
- Provide optimized standard test items for the Unit Under Test (adapter/charger) to deliver excellent test performance
- Easy-to-use software function specially
- designed to meet the production line needs
   Flexible software platform with the following functions
  - Test Program editor
  - Test Report format editor
  - Test Report Generator
  - Statistics Analysis Report editor
  - User level setting
  - Release control
  - Activity log
- Supporting bar code reader
- New test items and extended hardware are able to expand to fulfill the new requirements for adapter/chcrger industry
  - Average efficiency test that complies with Energy Star
- Rack specially designed more meet to the production line
- Windows 98/2000/NT/XP/7 based software

Chroma 8020 Adapter/Charger ATS is the best test system for testing Adapter and Charger in the production line. 8020 is able to test multiple UUTs concurrently that improve productivity significantly, the hardware architecture is also as flexible as Chroma 8000 ATS. There are many hardware devices available for selection such as AC Power Supply, Electronic Load, Timing/Noise Analyzer and Power Meter.

Chroma 8020 has standard test items specially customized and optimized for the features of Adapter and Charger that provides excellent test performance to meet the requirements of mass production. Meanwhile, the software equipped is very friendly and easy to operate that is suitable for production line use.



New test items and extended hardware are expanded to Chroma 8020 ATS for the new test requirements in the Adapter/Charger industry, such as average efficiency to comply with Energy Star requirement, and etc.

Chroma 8020 ATS runs under the easy-to-learn Windows 98/2000/NT/XP/7 environment with a specialized power test system for test engineers so that they can utilize the Windows resources easily.

### **OPTIMIZED TEST ITEMS**

#### OUTPUT PERFORMANCES

- 1. DC output voltage
- 2. DC output current
- 3. DC output power
- 4. Peak-to-peak noise 5. RMS noise
- 6. Efficiency
- 7. In-test adjustment
- 8. Overshoot voltage

#### **INPUT CHARACTERISTICS** 9. Input inrush current

- 10. Input RMS current
- 11. Input power
- 12. Input power factor
- 13. AC cycle drop out
- 14. Input voltage ramp

#### **REGULATION TESTS**

- 15. Line regulation
- 16. Load regulation
- 17. Combine regulation
- 18. Dynamic load regulation
   19. Sync. dynamic load regulation
- 19. Sync. dynamic Iodd regulatic

#### TIMING AND TRANSIENT

- 20. Power up sequence
- 21. Rise time
- 22. Fall time
- 23. Power off time

#### **PROTECTION TESTS**

- 24. Short circuit25. Over load protection
- 26. Over voltage protection

#### SPECIAL TESTS

27. Average efficiency test28. ID Pin Singnal measurement29. Quick Charge 2.0 Charger test30. Pump Express Charger test31. Type C USB PD test

#### SPECIAL FEATURE

32. TTL signal control 33. Relay control

#### ORDERING INFORMATION

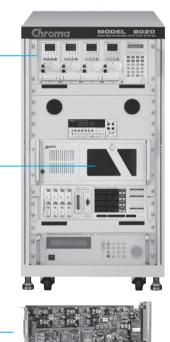
8020 : Adapter / Charger ATS 80611/80614 : Timing/Noise Analyzer 80611N : Timing/Noise Module 84903 : Control Card 84904 : DMM Card 5004ATM : System Controller A800004 : 19" Rack for Model 8020 A800068 : Digital Measurement Card A802001 : 4+4 Multi-UUT Test Fixture A806101/A806103 : 100 MHz HF MUX Module A806102/A806104 : Digital Output Module DC Load Module : Refer to Model 6330A, 63600 Series Digital Power Meter : Refer to Model 66200 Series AC Source : Refer to Model 6500, 61500, 61600 Series I/O Card : ADLink 7230

\* Please refer to Model 8000's specifications for detail instruments



A802001: 4+4 Multi-UUT Test Fixture

The 63600 High Speed DC Electronic Load is applied to verify PUMP Express Charger.



The 84903 Control Card is applied to verify Quick Charge 2.0 charger.



The 84904 DMM Card is applied to measure the voltage of charger ID pin.

### **LED Power Driver ATS**

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#### **KEY FEATURES**

- For LED Power Driver testing
- Capable to test Multi-UUT/Multi-output concurrently that improve productivity
- Provide optimized standard test items for the Unit Under Test (LED Power Driver) to deliver excellent test performance
- Open architecture software
- Expandable hardware support
- Support instrument with GPIB/RS-232/RS-485/l<sup>2</sup>C interface
- User editable test library
- User editable test programs
- User editable reports
- Statistical report
- On-line Softpanel
- User authority control
- Release control
- Activity log
- Support bar code reader

Windows 98/2000/NT/XP/7 based software

Chroma 8491 LED Power Driver ATS is the ultimate test system for LED Power Driver. It is able to test Multi-UUT/Multi-output concurrently improving productivity significantly. The hardware devices available for selection include AC/DC Power Supply, Power Meter, PCI interface function card, Transducer Unit and the industries first LED Load simulator for simulating LED loading with 6330A series Electronic Loads.

The PCI interface function card - LED Power Driver Measurement Card & Control Card, they measure Dimming Current / Frequency / Duty & provide BL control signal(DC level, PWM, SM BUS), and Enable ON/OFF signal. Furthermore the Timing / Noise Card is using in Ripple Current measurement at 20MHz bandwidth.



The Chroma 8491 ATS is equipped with optimized standard test items for LED power driver testing. The user is only required to define the test conditions and specifications for the standard test items to perform the test.

Chroma 8491 ATS software runs under the user friendly Windows 98/2000/NT/XP/7 operating environment, providing the test engineer a dedicated LED Power Driver testing system with easy access to Windows resources.

#### **OPTIMIZED TEST ITEMS**

#### OUTPUT PERFORMANCES

- 1. Output Voltage
- 2. Output Current
- 3. Ripple Current (RMS & p-p) 4. Dimming Current
- Dimming Current
   Dimming Frequency
- 6. Dimming Duty
- 7. Efficiency
- 8. In-test adjustment
- 9. Turn ON Overshoot Current

#### INPUT CHARACTERISTICS

- 10. Input Inrush Current
- 11. Input RMS Current 12. Input Peak Current
- 13. Input Power
- 14. Current Harmonics
- 15. Input Power Factor
- 16. Input Voltage Ramp
- 17. Input Freq. Ramp
- 18. AC Cycle Drop Out
- 19. PLD Simulation

#### **REGULATION TESTS**

- 20. Current Regulation 21. Voltage Regulation
- 22. Total Regulation

#### TIMING & TRANSIENT

23. Turn ON Time 24. Hold Up Time 25. Rise Time 26. Fall Time

#### **PROTECTION TESTS**

27. Short Circuit28. OV Protection29. OL Protection \*30. OP Protection \*

#### SPECIAL TESTS

31. GPIB Read/Write 32. RS-232 Read/Write

\* If UUT is constant voltage output

#### **ORDERING INFORMATION**

8491 : LED Power Driver ATS A800068 : Digital Measurement Card A849008 : Control Unit 84911 : LED Power Driver Measurement Card 84903 : Control Card A849101 : Transducer Unit A849102 : Transducer Module 400mA/500V A849103 : Transducer Module 1600mA/500V A849104 : Transducer Module 20A/500V 6011 / 80611 / 80614 : Timing / Noise Analyzer 6011N / 80611N : Timing / Noise Module 6012 / 80612 : Short Circuit/OVP Tester 6013 / 80613 : ON / OFF Controller DC Load Module : Refer to Model 6310A, 6330A,

63600 Series

Model 8491

Digital Power Meter : Refer to Model 66200 Series AC Source : Refer to Model 6500, 61500, 61600 Series DC Source : Refer to Model 62000P Series

\* Please refer to Model 8000's specifications for detail instruments



#### 84911 : LED Power Driver Measurement Card



#### A849101 : Transducer Unit



8491: LED Power Driver ATS

Passive

PXI Test &

Manufacturing

/ Test &

### LED Power Driver ATS

SPECIFICATIONS-1

### Model 8491

| Transducer Unit                    |                    | A849101   |  |  |  |
|------------------------------------|--------------------|---|--|--|--|
| No. of slot                        |                    | 8   |  |  |  |
| Input Voltage Range                |                    | 95~240 Vac @ 50 / 60Hz                              |  |  |  |
| Dimension (HxWxD)                  |                    | 221.5 x 450 x 500 mm / 8.72 x 17.72 x 19.69 inch    |  |  |  |
|                                    |                    |   |  |  |  |
| Transducer Module 400mA/500V       |                    | A849102   |  |  |  |
| Input                              |                    |   |  |  |  |
|                                    | Range              | 0~80V / 0~500V                                      |  |  |  |
| Vrms                               | Bandwidth          | 200 KHz @ -3dB                                      |  |  |  |
|                                    | Accuracy           | 0.3%+0.2%F.S.                                       |  |  |  |
|                                    | Range              | 0~100mA / 0~200mA / 0~400mA                         |  |  |  |
| rms                                | Bandwidth          | 200KHz @ -3dB                                       |  |  |  |
|                                    | Accuracy           | 0.5%+0.5%F.S.                                       |  |  |  |
|                                    | Range              | 0~50mAp-p / 0~100mAp-p / 0~150mAp-p<br>20MHz @ -3dB |  |  |  |
| Ripple Current(rms & p-p)          | Bandwidth          | 20MHz @ -3dB  |  |  |  |
|                                    | Accuracy           | 0.5%+0.5%F.S.                                       |  |  |  |
|                                    | Range              | 2.5Vp-р / 20Vp-р                                    |  |  |  |
| /oltage Ripple/Noise (rms & p-p)   | Bandwidth          | 20MHz @ -3dB  |  |  |  |
|                                    | Accuracy           | 1% F.S.   |  |  |  |
| 3dB Tolerance                      |                    | ±1dB  |  |  |  |
| Dutput                             |                    |   |  |  |  |
| 9 Pin D-sub(to 84911 M card)       | Range              | 4Vpk  |  |  |  |
| BNC(to 80611N card)                | Range              | 2Vp-p   |  |  |  |
| Fransducer Module 1600mA/500V      |                    | A849103   |  |  |  |
| nput                               |                    |   |  |  |  |
|                                    | Range              | 0~80V / 0~500V                                      |  |  |  |
| /rms                               | Bandwidth          | 200KHz @ -3dB                                       |  |  |  |
|                                    | Accuracy           | 0.3%+0.2%F.S.                                       |  |  |  |
|                                    | Range              | 0~400mA / 0~800mA / 0~1600mA                        |  |  |  |
| rms                                | Bandwidth          | 200KHz @ -3dB                                       |  |  |  |
|                                    | Accuracy           | 0.5%+0.5%F.S.                                       |  |  |  |
|                                    | Range              | 0~100mAp-p / 0~400mAp-p / 0~800mAp-p                |  |  |  |
| Ripple Current (rms & p-p)         | Bandwidth          | 20MHz @ -3dB  |  |  |  |
|                                    | Accuracy           | 0.5%+0.5%F.S.                                       |  |  |  |
|                                    | Range              | 2.5Vp-p / 20Vp-p                                    |  |  |  |
| /oltage Ripple/Noise (rms & p-p)   | Bandwidth          | 20MHz @ -3dB  |  |  |  |
|                                    | Accuracy           | 1% F.S.   |  |  |  |
| 3dB Tolerance                      |                    | ±1dB  |  |  |  |
| Dutput                             |                    |   |  |  |  |
| 9 Pin D-sub(to 84911 M card)       | Range              | 4Vpk  |  |  |  |
| BNC(to 80611N card)                | Range              | 2Vp-p   |  |  |  |
|                                    |                    |   |  |  |  |
| A849104 Transducer Module 20A/500V |                    | A849104   |  |  |  |
| nput                               | Pango              | 020\/ / 0500\/                                      |  |  |  |
| lum a                              | Range<br>Bandwidth | 0~80V / 0~500V                                      |  |  |  |
| /rms                               |                    | 200KHz @ -3dB                                       |  |  |  |
|                                    | Accuracy           | 0.3%+0.2%F.S.                                       |  |  |  |
|                                    | Range<br>Bandwidth | 0~5A / 0~10A / 0~20A                                |  |  |  |
| rms                                |                    | 200KHz @ -3dB                                       |  |  |  |
|                                    | Accuracy           | 0.5%+0.5%F.S.                                       |  |  |  |
| Cipple Current/rms ( = =)          | Range              | 0~1.25Ap-p / 0~5Ap-p / 0~10Ap-p                     |  |  |  |
| Ripple Current(rms & p-p)          | Bandwidth          | 20MHz@-3dB  |  |  |  |
|                                    | Accuracy           | 0.5%+30mA@5A, 0.5%+60mA@10A/20A                     |  |  |  |
|                                    | Range              | 2.5Vp-p / 20Vp-p                                    |  |  |  |
| /oltage Ripple/Noise(rms & p-p)    | Bandwidth          | 20MHz @ -3dB  |  |  |  |
| 2 dD Televence                     | Accuracy           | 1%F.S.  |  |  |  |
| -3dB Tolerance                     |                    | ±1dB  |  |  |  |
| Output                             | Domme              |   |  |  |  |
| 9 Pin D-sub(to 84911 M card)       | Range              | 4Vpk  |  |  |  |
| BNC(to 80611N card)                | Range              | 2Vp-p   |  |  |  |

### **LED Power Driver ATS**

### Model 8491

#### SPECIFICATIONS-2

| LED Driver<br>Measurement Card   | 84911  |  |  |  |  |  |
|--|--|--|--|--|--|--|
| Vac measurement  |  |  |  |  |  |  |
| Input Voltage  | 4Vpk max.  |  |  |  |  |  |
|  | •  |  |  |  |  |  |
| Vpk+ / Vpk- / Vpp measu  |  |  |  |  |  |  |
| Range  | 4Vpk   |  |  |  |  |  |
| Bandwidth  | 10k-200kHz   |  |  |  |  |  |
| Resolution   | 14bits   |  |  |  |  |  |
| Accuracy   | 0.5%+0.5%F.S.(100-100kHz)  |  |  |  |  |  |
| riccuracy  | 1%+0.5%F.S.(100K-200kHz)   |  |  |  |  |  |
| Vrms measurement   |  |  |  |  |  |  |
| Range  | 4Vrms~2Vrms / 2Vrms~1Vrms / 1Vrms~0.5Vrms  |  |  |  |  |  |
| Bandwidth  | 10k-200kHz   |  |  |  |  |  |
| Resolution   | 14bits   |  |  |  |  |  |
| Accuracy   | 14bits<br>1%+0.2%F.S.(100-100kHz)<br>1.5%+0.2%F.S.(100K-200kHz)  |  |  |  |  |  |
| Accuracy   | 1.5%+0.2%F.S.(100K-200kHz)   |  |  |  |  |  |
| lac measurement  |  |  |  |  |  |  |
| Input Voltage  | 4Vpk max.  |  |  |  |  |  |
| lpk+ / lpk- / lpp measure  | ement  |  |  |  |  |  |
| Range  | 4Vpk   |  |  |  |  |  |
| Bandwidth  | 10k-200kHz   |  |  |  |  |  |
| Resolution   |  |  |  |  |  |  |
| nesolution   | 14bits   |  |  |  |  |  |
| Accuracy   | 0.5%+0.5%F.S.(100-100kHz)<br>1%+0.5%F.S.(100K-200kHz)  |  |  |  |  |  |
| Irms measurement   |  |  |  |  |  |  |
| inns measurement   | 4Vrms~2Vrms / 2Vrms~1Vrms / 1Vrms~0.5Vrms  |  |  |  |  |  |
| Range  | 0.5Vrms~0.25Vrms / 0.25Vrms~0.125Vrms /<br>0.125Vrms~0.06Vrms  |  |  |  |  |  |
| Bandwidth  | 10K-200KHz   |  |  |  |  |  |
| Resolution   | 14bits   |  |  |  |  |  |
|  | 1%+0.2%F.S.(10K-100kHz)  |  |  |  |  |  |
| Accuracy   | 1.5%+0.2%F.S.(100K-200kHz)   |  |  |  |  |  |
| Pac measurement  |  |  |  |  |  |  |
| Range  | V range x I range  |  |  |  |  |  |
| Bandwidth  | 10K-200KHz   |  |  |  |  |  |
| Resolution   | 14bit  |  |  |  |  |  |
| Resolution   | 1%+0.2%F.S.(10K-100kHz)  |  |  |  |  |  |
| Accuracy   | 2%+0.3%F.S.(10K-200kHz)  |  |  |  |  |  |
| Frequency measuremen   |  |  |  |  |  |  |
| Range  | 10Hz-35KHz   |  |  |  |  |  |
| Resolution   | 1Hz  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Accuracy   | 0.1%reading  |  |  |  |  |  |
| Input  | Via voltage/current input  |  |  |  |  |  |
| Timing measurement   |  |  |  |  |  |  |
| -  |  |  |  |  |  |  |
|  | External x1(AC ON/Enable, A849101) and   |  |  |  |  |  |
| Trigger input  | External x1(AC ON/Enable, A849101) and<br>Vmeasurement input and Imeasurement input  |  |  |  |  |  |
| Trigger input<br>Trigger level   | Vmeasurement input and Imeasurement input  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range  | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.  |  |  |  |  |  |
| Trigger input<br>Trigger level   | Vmeasurement input and Imeasurement input  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range  | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.  |  |  |  |  |  |
| Trigger input Trigger level Range Resolution   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current   |  |  |  |  |  |
| Trigger input Trigger level Range Resolution Accuracy  | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current   |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure  | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy  | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy<br>Timing range  | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec   |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy<br>Timing range<br>Burst Mode measurem   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec   |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy<br>Timing range<br>Burst Mode measureme<br>Frequency   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy<br>Timing range<br>Burst Mode measureme<br>Frequency<br>Range                                      | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy<br>Timing range<br>Burst Mode measureme<br>Frequency<br>Range<br>Resolution                        | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz  |  |  |  |  |  |
| Trigger input Trigger level Range Resolution Accuracy Timing measure Resolution Accuracy Timing range Burst Mode measureme Frequency Range Resolution Accuracy   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz  |  |  |  |  |  |
| Trigger input Trigger level Range Resolution Accuracy Timing measure Resolution Accuracy Timing range Burst Mode measureme Frequency Range Resolution Accuracy Duty(Ton)   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz<br>0.1Hz  |  |  |  |  |  |
| Trigger input<br>Trigger level<br>Range<br>Resolution<br>Accuracy<br>Timing measure<br>Resolution<br>Accuracy<br>Timing range<br>Burst Mode measureme<br>Frequency<br>Range<br>Resolution<br>Accuracy            | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz  |  |  |  |  |  |
| Trigger input Trigger level Range Resolution Accuracy Timing measure Resolution Accuracy Timing range Burst Mode measureme Frequency Range Resolution Accuracy Duty(Ton)   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz<br>0.1Hz  |  |  |  |  |  |
| Trigger input Trigger level Range Resolution Accuracy Timing measure Resolution Accuracy Timing range Burst Mode measureme Frequency Range Resolution Accuracy Duty(Ton) Range                                   | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz<br>0.1Hz<br>0.1Wreading<br>3us-90ms  |  |  |  |  |  |
| Trigger input Trigger input Trigger level Range Resolution Accuracy Timing measure Resolution Accuracy Timing range Burst Mode measureme Frequency Range Resolution Accuracy Duty(Ton) Range Resolution          | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz<br>0.1Hz<br>0.1Hz<br>0.1%reading<br>3us-90ms<br>1us  |  |  |  |  |  |
| Trigger input Trigger input Trigger level Range Resolution Accuracy Timing measure Resolution Accuracy Timing range Burst Mode measureme Frequency Range Resolution Accuracy Duty(Ton) Range Resolution Accuracy | Vmeasurement input and Imeasurement input<br>5% ~ 95%F.S.<br>2mV for voltage / 2mV for current<br>1%setting<br>0.01uS / 0.1mS<br>0.1uS / 0.1mS<br>0.1uS / 1mS<br>65uS / 650msec<br>ent<br>10Hz-35KHz<br>0.1Hz<br>0.1Hz<br>0.1Hz<br>0.1Hz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10Hz-35KHz<br>10 |  |  |  |  |  |

| Control Card                   | 84903  |  |  |  |  |
|--------------------------------|--|--|--|--|--|
| BL control                     |  |  |  |  |  |
| DC level control               |  |  |  |  |  |
| Program level                  | 0 ~ 10V  |  |  |  |  |
| Resolution                     | 11 bits  |  |  |  |  |
| Level Accuracy                 | 0.5 % setting + 0.1 % F.S.                               |  |  |  |  |
| Sourcing current               | 20mA   |  |  |  |  |
| PWM control                    |  |  |  |  |  |
| Program level                  | 0 ~ 10V  |  |  |  |  |
| Resolution                     | 7 bits   |  |  |  |  |
| Accuracy                       | 2 % + 1 % F.S (No Load) /<br>5.5% +1% F.S. (20mA output) |  |  |  |  |
| Sourcing current               | 20mA   |  |  |  |  |
| Frequency                      | 20Hz ~ 10kHz / 10kHz ~ 100kHz                            |  |  |  |  |
| Freq. Resolution               | 1Hz  |  |  |  |  |
| Freq. Accuracy                 | 0.1% (10kHz) / 1% (100kHz)                               |  |  |  |  |
| Duty                           | 0 % ~ 100 % (10kHz) / 5% ~ 95% (100kHz)                  |  |  |  |  |
| Duty Resolution                | 1 %  |  |  |  |  |
| Duty Accuracy                  | Error Max : 100nS  |  |  |  |  |
| SMBUS control                  | ·  |  |  |  |  |
| DC Output                      | 5V   |  |  |  |  |
| SM DATA                        | Bidirectional  |  |  |  |  |
| SM CLK                         | Bidirectional  |  |  |  |  |
| BLI measurement (DC)           |  |  |  |  |  |
| Range                          | 0 ~ 20mA   |  |  |  |  |
| Resolution                     | 15 bits  |  |  |  |  |
| Accuracy                       | 0.1% reading + 1% F.S.                                   |  |  |  |  |
| Analog output (Enable          | V and Vsave1, 2)   |  |  |  |  |
| Channel                        |  |  |  |  |  |
| No. of channel                 | 1 for Enable 2 for Vsave                                 |  |  |  |  |
| DC level output                |  |  |  |  |  |
| Program level                  | 0 ~ 10V  |  |  |  |  |
| Resolution                     | 11 bits  |  |  |  |  |
| Level Accuracy                 | 0.5 % setting + 0.1 % F.S.                               |  |  |  |  |
| Sourcing current               | 20mA   |  |  |  |  |
| Analog I measurement           | (ldc)  |  |  |  |  |
| Range                          | 0 ~ 20mA   |  |  |  |  |
| Resolution                     | 15 bits  |  |  |  |  |
| Accuracy                       | 0.1% reading + 1% F.S.                                   |  |  |  |  |
| Digital I/O                    |  |  |  |  |  |
| No. of channel                 | 12 bits For Output 4 bits For Input                      |  |  |  |  |
| Output type                    | Open collector   |  |  |  |  |
|                                | < 30mS   |  |  |  |  |
| Measurement speed              | PCI  |  |  |  |  |
| Measurement speed<br>Interface |  |  |  |  |  |

| Battery Cell Formation System               | 11-1  |
|---|-------|
| Automatic Battery Cell Test Equipment       | 11-2  |
| Battery Cell Charge & Discharge Test System | 11-3  |
| Regenerative Battery Pack Test System       | 11-5  |
| Battery Pack ATS                            | 11-13 |
| -   |       |

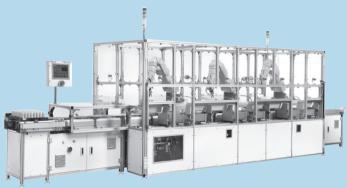
### **Overview**



**Battery Cell Formation System** 



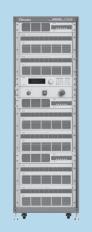
OCV/ACR Test Equipment Barcode Binding Equipment Rework Sorter



**Grouping Equipment** 



Battery Cell Charge & Discharge Test System





**Regenerative Battery Pack Test System** 



**Battery Pack ATS** 

### **Battery Cell Formation System**

### Model 17000





#### **KEY FEATURES**

- ERM (Energy Recycling Module) recycles discharged energy
- BVT (Battery Voltage Tracking) reduces power consumption while battery charging
- AC Energy Recycling : regenerate to grid
- Plug-in module design simplifies service and maintenance
- Real-time outer-loop resistance check
- System safety/test reliability through PLC/IPC monitoring of all sensors (temperature, smoke, device type and battery tray position)
- Systems are linked as a LAN offering remote monitoring and control
- Automated handling and sorting are available
- Automated calibration fixture with the smallsize and wireless communication can calibrate and verify multiple channels at once, coordinate the production route with MES

Chroma 17000 series is specifically designed for the formation of Lithium Ion and Lithium Polymer secondary batteries. The 17000 series is a complete turn-key system, including carrier trays, robust battery probe contacts, high quality charge/discharge modules and intuitive software all under computer control.

#### Linear Type

Patented Battery Voltage Tracking (BVT) DC-DC conversion power modules minimize power consumption in battery charging, and Energy Recycle Modules (ERM) recycle the discharged energy directly back to the DC power system for increased power efficiency.

#### Switching Type

Regenerative design with low heat consumption, discharge energy Regenerate to electricity grid, this power source will transfer the battery discharged energy to charging channels to lower system power requirement. On the other hand, once discharging energy is higher than battery charging and system requirement, this converter will transfer the power back to facility grid. These power saving designs provide a planet friendly solution along with cost savings by reducing energy consumption.

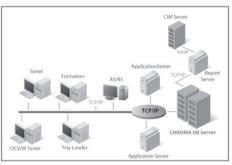
The intuitive software provides a flexible selection in the charge/discharge channel, current rating, and modules under test. These features allow the Series 17000 to be used for final cell development, pilot line production, high volume production and ongoing reliability monitoring/ quality control.



Hot Swap & Redundant DC Power Supplies



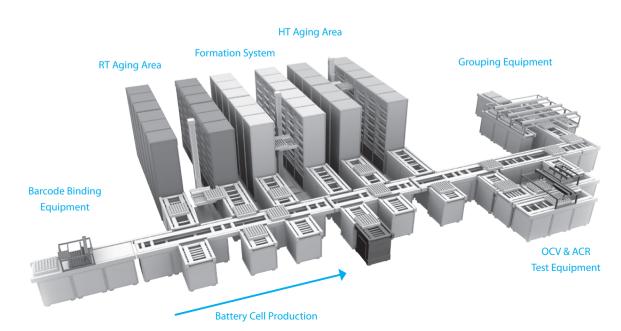
Plug In & Precise Electronic Modules



With Manufacturing Execution System

#### **ORDERING INFORMATION**

17000: Battery Cell Formation System



### Automatic Battery Cell Test Equipment

### Model 17800/17900 Series



17800: OCV/ACR Test Equipment

#### **KEY FEATURES**

- High-Precision Measurement
- High Sampling Rate
- Automated Test Equipment
- Remote Control/Management
- Customization and Automation
- High Efficiency & Reliability
- Avoid Operation Error
- Remote Control/Management

Chroma specifically developed battery cell test solution which is an integrated solution for battery cell formation & grading processes. From battery cell formation procedure to grouping process, Chroma 17900 series are customized with professional planning service which includes manufacturing flow path planning, test station/ equipment planning, test data management and so on to create high performance manufacturing capability.

Measuring OCV (Open Circuit Voltage) and ACR (AC Resistance) are one of the most important tests during battery cell manufacturing. In order to have high-speed and high-reliability OCV/ ACR measurement readings, customized Chroma 17800 can follow customers' manufacturing process flow to test a batch of battery cell OCV/ ACR with in process tray or any other carrying method. Chroma 17800 can be designed to test both OCV/ ACR in a time sequence or individually. Highspeed measurement can catch a batch of battery cell accurate readings and upload to test result database by Ethernet. Through customized probing unit can totally fit the tray size and battery cell size. Automated contact design improves the reliability of electrodes connection and keeps the contact consistence.

Chroma 17900 Automatic Equipment includes following automated equipment. Chroma 17910 Barcode Binding Equipment links the serial numbers of battery cell & its carrying tray. Then upload them to server or management system. This link provides a traceability of each battery cell. Furthermore, its high efficiency and low cost advantages bring improvement of manufacturing performance. Chroma 17920 Rework Sorter helps to pick defect battery cell up during whole formation processes at rework station. According to the definitions of flow path planning in MES, operators will know how to deal with those battery cells. This function properly controls process flow and also avoids quality issues by unexpected operation errors.

Chroma 17930 Grouping Equipment is automated grading equipment. It will follow pre-defined criteria to grade battery cells with specific ranks. Different rank of battery cell will be moved to different outgoing tray by grouping equipment. Users can define the grading criteria by battery cell characteristics and test results from formation processes. Automatic grouping equipment helps the grading process to be more reliable and avoid unexpected operation errors.

#### **ORDERING INFORMATION**

17800 : OCV/ACR Test Equipment 17910 : Barcode Binding Equipment 17920 : Rework Sorter 17930 : Grouping Equipment



17910: Barcode Binding Equipment



17920: Rework Sorter



17930: Grouping Equipment

### Battery Cell Charge & Discharge Test System Model 17011



#### **KEY FEATURES**

- High precision output and measurement up to 0.02%
- Independent operation and test
- Channel parallel output function maximum 1200A
- High Sampling Rate up to 10ms
- CC/CC-CV/CP/CV charge/discharge modes
- Flexible ( $\Delta t$ ,  $\Delta V$ ,  $\Delta I$ ,  $\Delta Q$ ,  $\Delta W$ ), data acquisition
- Real-time data acquisition and log (Q, Vt, It, time) and step termination status (Q, V\_end, I\_end, time)
- Linear circuit design, low ripple current (17202-5-20 & 17202-5-30)
- Build-in two battery DCIR test modes for rapid and accurate results
- Build-in EDLC capacitance (F) and DCIR test functions to provide prompt and accurate test results (17202-5-20 & 17202-5-30 only)
- Real-time outer loop resistance monitoring
   Modular design for easy installation and
- maintenance (17202-5-20 & 17202-5-30 only) Composed with redundancy DC power
- supply, avoid the effect for long term test during power down(62000B only)
   Discharging energy recycle function
- Discharging energy recycle function (A691103 only)
   Programmable ACR > LC Functions
- Programmable ACR \ LC Functions (option A172010)

#### **FUNCTIONS**

- Battery charge & discharge test
- Battery capacity and DCIR test
- EDLC charge & discharge test
- (17202-5-20 & 17202-5-30 only) EDLC capacitance and DCR
- (17202-5-20 & 17202-5-30 only)
- LIC Charge and Discharge Test
- LIC capacitance and DCR

#### **APPLICATIONS**

- Charge & discharge life cycle test
- OQC test
- IQC test
- Battery characteristic analysis
- Material test
- Production trial run
- Battery cell voltage balance

Chroma 17011 Programmable Charge/Discharge Test System is a high precision equipment designed specifically for testing Lithium-ion secondary battery, and Electrical Double Layer Capacitors (EDLC). It is suitable for cycle life testing, incoming and shipping inspection, product characteristics screening, material experiment and small batch trial run. The system is composed of Chroma 17200 Series Charge/ Discharge Tester with Chroma 62000B Series Modular DC Power Supply or Chroma A691103 DC/AC Bi-directional Converter. Chroma 17011 has fast output and measurement recording capability with highly accurate specification to assure the test quality. Its stable performance is applicable for various tests requiring reliable data. The flexible programming function is capable of sending recipe to each channel for independent test. Moreover, the design of multichannel architecture can be configured based on the test requirement. The test channel supports parallel output that can be setup flexibly for large current tests.

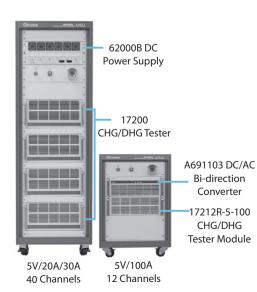
When 17011 system configure 17212R-5-100 for high current charge/discharge testing application, Chroma A691103 DC/AC Bi-direction converter will be the DC power source. This power source will transfer the battery discharged energy to charging channels to lower system power requirement. On the other hand, once discharging energy is higher than battery charging and system requirement, this converter will transfer the power back to facility grid. This feature will not only recycling energy and decreasing AC power requirement, but also reduce heat effect. It helps to reduce air condition costs and extend system life.

Chroma 17011 uses Ethernet interface to connect an external computer to control and program each channel independently with multiple test modes built in. It is able to implement the charge and discharge tests of CC-CV, CC, CV, CP, battery DCIR tests, Waveform tests.

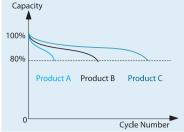
The built-in IEC 62391 (same as EIAJ-2377) for capacitance and DCR measurement solution are supplied for EDLC tests, which allows the user to utilize the standard to calculate the capacitance and internal resistance value without programming and data calculation.

Integrating Chroma A172010 ACR test switch fixture and ACR meter are able to measure 1kHz ACR and leakage current, while integrating Chroma 51101 are able to measure temperature. Each channel can specify up to eight temperature record points, data recorded in statements.

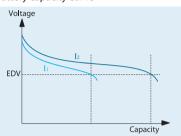
Multiple safety designs are made for Chroma 17011 for testing such as contact check and polarity check to confirm the circuit status before the test starts, also to ensure the safety of charge and discharge. It has over voltage, over current and loop resistance detecting functions to make sure the safety of test process. It also has data archive mechanism to store the data in memory without loss.



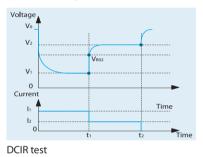




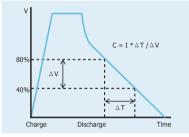
#### Battery capacity curve



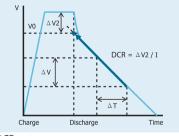
Cycle life testing curve



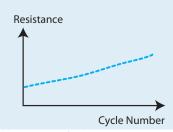
**Electrical Double Layer Capacitor Test** 



Capacitance test







ACR test curve (1kHz)

### Battery Cell Charge & Discharge Test System Model 17011

Chroma A172010 ACR Test Switch Fixture One fixture measures 10 DUTs One System controls eight fixtures



#### Chroma 51101 Thermal/Multi-function Data Logger

Optional temperature channel (8ch/card) available

Test 64 temperature channels maximum

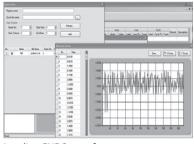


|   | 8<br>H<br>V      | Depter Ver<br>Volupi<br>Sarrett<br>Case/V<br>Revision                  |   |   | Digity Value *  |   | Digita Value A<br>Volique<br>Carteilt<br>Carteilt<br>Carteilt              | Conta P       |
|---|------------------|--|---|---|---|---|--|---------------|
|   | 0                | Terped   |   | 0 | Terpest H   | 0 | Terpest H  | <b>H</b> (re) |
| 9 | 8<br>H<br>V<br>0 | Disfer 19<br>Volupe<br>Gunet<br>Capacite<br>Recognite<br>Temperal      | 1 |   | Digitity table *<br>Voltage<br>Cansist<br>Capacity<br>Temperat #          |   | Chyller Value *<br>Unitop<br>Carlett<br>Carpenty<br>Resisten<br>Temperat # |               |
| 9 | 8<br>H<br>V<br>0 | Deploy Vol<br>Vintope<br>Current<br>Coposity<br>Resistant<br>Tangarati |   |   | Orginy Value A<br>Vicinge<br>Carrelt<br>Carrelt<br>Resident<br>Terrynal B |   | Orging         Value         P           Carsett                           | 1             |
| 8 | 8<br>#<br>7      | Biglig Val<br>Volage<br>Conset<br>Capacity<br>Baselan<br>Tartyanat     |   |   | Onging Value A<br>Vicings<br>Consult<br>Consult<br>Resident<br>Tangana B  |   | Display Value A<br>Volupe<br>Convert<br>Convert<br>Resettant<br>Tungarut B | 1             |
| 9 | 8<br>#<br>#<br>0 | Deplay Val<br>Volage<br>Canet<br>Canet<br>Resident<br>Temperat         |   |   | Dapley Value *  |   | Digite Value *<br>U-logo<br>Conesti<br>Copusity<br>Resetters<br>Tomperat # |               |

Multi-channel Real-time Monitoring Window

| Report Format   | 174                 |  |                                 |  |   |  |                                     |  |
|---|---------------------|--|---------------------------------|--|---|--|-------------------------------------|--|
| Dista Dista   | 1.0                 | Piece Costs Name - 4. charge to discharge 4<br>Senal Number -<br>Senal Number - 20   |                                 |  |   |  |                                     |  |
|   |                     |  | -                               | gebend   |   |  | -ter                                |  |
|   |                     |  |                                 |  |   |  |                                     |  |
| Recipe: 44 charge to doch   | 10,00               |  | 10                              | 10   | /   | 0.15 Cenerol(14)<br>0.15 0   | - and                               |  |
| Pacipal AA charge to doch<br>zonolloga/01512 M Te<br>Zonolloga/01512 M  | Manual Contract     | <u>h</u> A <u>i</u>  |                                 | 2000   | 1000  | 0.3<br>0.05<br>30%   |                                     |  |
| Recipe 44 charge to dech<br>zonotecen/1 rst(1 m)<br>zonotecen/1 rst(1 m)<br>zonotecen/1 rst(1 m)  | Manager Contraction |  | USSO DEST TAME O                | VOLTAGE  | CURRENT   |  | \$547,6                             |  |
| Recipe: [44 charge to dech<br>[2010]0000[1150][18] Te<br>[2011]0000[1150][18]<br>[2011]000[150][18]<br>[2014]000<br>[2014]000<br>[2014]000<br>[2014]000<br>[2014]000<br>[2014]000<br>[2014]000[100][100][100][100][100][100][10 | Manual Contract     | 2011/08/02 上午 09:08:17   | 100                             | 2 4993   | CURRENT<br>2.4979   | soliti   | 5547/5<br>Me                        |  |
| Pacipa: [44 charge to disch<br>zonolgion/[115]] [8]<br>2011@2010[15]] [8]<br>Cat No<br>Denial No<br>11<br>12  | Manager Comment     | 2011.66.62 上午 09.08 17<br>2011.66.62 上午 09.08 18   |                                 |  | CURRENT   | 0.3<br>0.05<br>30%   | \$547,6                             |  |
| Receipt (At charge to doch<br>(2008/00/01/01/01/01/01/01/01/01<br>(2019/00/01/01/01/01/01/01/01<br>(2019/00/01/01/01/01/01/01/01/01<br>(2019/01/01/01/01/01/01/01/01/01/01/01/01/01/  | Manager Comment     | 2011-08-02 上午 09-08 17<br>2011-08-02 上午 09-08 19<br>2011-08-02 上午 09-08 19   | 100<br>200                      | 2 4993<br>2 4999   | CURRENT<br>2.4979<br>2.4979   | solitication of the second sec | STATUS<br>Vda<br>Vda                |  |
| Recipe (4A charge to doch<br>2010/06/03/01/03/01 (10)<br>2011/06/03/01/03/01 (10)<br>Central No<br>11<br>12<br>13<br>14<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15<br>15   | Manager Comment     | 2011.66.62 上午 09.08 17<br>2011.66.62 上午 09.08 18   | 100<br>200<br>300               | 2.4993<br>2.4993<br>2.4993                               | CUERENT<br>2.4979<br>2.4979<br>2.4979                               | 0.3 0.00<br>3000<br>0 0<br>0   | STATUS<br>Mie<br>Mie                |  |
| Pacque (44: charge to direct<br>2010/07/07/07/07/07/07/07/07/07/07/07/07/07   | Manager Comment     | 2011-05402 上平 09-08-17<br>2011-05402 上平 09-08-19<br>2011-05402 上平 09-08-19<br>2011-05402 上平 09-08-20   | 100<br>200<br>300<br>400        | 2 4003<br>2 4003<br>2 4003<br>2 4003<br>2 4003           | CURRENT<br>2.4979<br>2.4979<br>2.4979<br>2.4979<br>2.4979           | 50%  | STA3(4)<br>Me<br>Me<br>Me           |  |
| Data Balanci<br>Recepe (44. charge to doch<br>2000/00.001 (151) (8) To<br>2000/00.001 (151) (8)<br>Let No<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10<br>10   | Manager Comment     | 2011-06-02 上午 09-08-17<br>2011-06-02 上千 09-08-19<br>2011-06-02 上千 09-08-19<br>2011-06-02 上千 09-08-20<br>2011-06-02 上千 09-08-20<br>2011-06-02 上千 09-08-21 | 100<br>200<br>300<br>400<br>500 | 2 4993<br>2 4993<br>2 4993<br>2 4993<br>2 4993<br>2 4993 | CURRENT<br>2 4979<br>2 4979<br>2 4979<br>2 4979<br>2 4979<br>2 4979 | 0.45 ACTY<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0  | STA3(d)<br>Ide<br>Ide<br>Ide<br>Ide |  |

Graphic Analysis



#### Loading FUDS waveform current

#### **ORDERING INFORMATION**

17011 : Battery Cell Charge & Discharge Test System

17200-5-10: Programmable Charge/Discharge Tester Frame for 5 modules

17202-5-20: Programmable Charge/Discharge Tester Module 5V/20A, 2 channels

17202-5-30: Programmable Charge/Discharge Tester Module 5V/30A, 2 channels

17212R-5-100: Programmable Charge/Discharge Tester Module 5V/100A, 12 channels

62000B-3-1: 62000B Series Mainframe for 3 Modules

62000B-6-1: 62000B Series Mainframe for 6 Modules

62015B-24-62: Modular DC Power Supply 24V/62.5A/1500W (For 17202-5-20 & 17202-5-30 only)

51101-64 : Thermal Multi-function Data Logger 64 channel (option)

A172010: ACR test switch fixture

#### A691103 : DC/AC Bi-direction Converter

All specifications are subject to change without notice.

| SPECIFICATIONS                          | •              |   |                                   |   |                                      |  |   |  |
|---|----------------|---|-----------------------------------|---|--------------------------------------|--|---|--|
| Frame                                   |                | 17200-5-10                                    |                                   | 17200-                                    | 5-10                                 |  |   |  |
| Module                                  |                | 17202-5-20                                    |                                   | 17202-                                    | 5-30                                 |  | 17212R-5-100                              |  |
| Maximum<br>Voltage/Current              |                | 5V/20A  |                                   | 5V/30                                     |                                      |  | 5V/100A                                   |  |
| Maximum<br>Channel                      | 2 ch/          | module, 10 ch/frame<br>(maximum)              | 2 ch                              | /module, 1<br>(maxim                      | 0 ch/frame<br>um)                    | 12 c   | hannels / set (fixed)                     |  |
| Parallelable<br>Current                 |                | 40A, 100A, 200A                               |                                   | 60A, 150A                                 | , 300A                               | 2  | 00A, 300A, 400A,<br>600A, 1200A           |  |
| Control Method                          |                | CV/CP/DCIR charge,<br>discharge models        |                                   | CC/CV/CP/DCIR charge,<br>discharge models |                                      |  | CV/CP/DCIR charge,<br>ischarge models     |  |
| Voltage                                 |                |   |                                   |   |                                      |  |   |  |
| Setting Range                           |                | 0 mV ~ 5000 mV,<br>resolution 1mV             | 0 mV ~ 5000 mV,<br>resolution 1mV |   | 0mV~5000mV *2,<br>resolution 1mV     |  |   |  |
| Reading Range                           |                | mV ~ +5199.9 mV,<br>resolution 0.1mV          |                                   | 0 mV ~ +51<br>resolution                  | ,                                    | 0.0 mV ~ +5199.9 mV,<br>resolution 0.1mV                             |   |  |
| Accuracy                                | ± (0           | .02% rdg.+0.02% F.S.)                         | ± (0                              | ).02% rdg                                 | +0.02% F.S.)                         | ± (0.  | 02% rdg.+0.02% F.S.)                      |  |
| Current                                 |                |   |                                   |   |                                      |  |   |  |
| Setting Range                           | 3A             | 1mA ~ 3,000mA ,<br>resolution 1mA             | 4A                                | resolu                                    | 4,000mA ,<br>ition 1mA               | 100A   | 10mA ~ 100.0A,                            |  |
|   | 20A            | 0.01A ~ 20.00A ,<br>resolution 0.01A          | 30A                               |   | ~ 30.00A ,<br>tion 0.01A             | 100/1  | resolution 10mA                           |  |
| Pooding Pongo                           | ЗA             | 0.0mA~ 3,150.0mA,<br>resolution 0.1mA         | 4A                                |   | 4,200.0mA,<br>tion 0.1mA             | 100A   | 0A ~ 105.00A,                             |  |
| Reading Range                           | 20A            | 0.000A ~ 21.000A ,<br>resolution 0.001A       | 30A                               |   | ~ 31.500A,<br>ion 0.001A             | TUUA   | resolution 1mA                            |  |
| A                                       | 3A             | ± (0.02% rdg.+<br>0.02% rng.)                 | 4A                                | $\pm$ (0.05% rdg +                        |                                      | 1004   | ± (0.05% rdg.+                            |  |
| Accuracy                                | 20A            | ± (0.03% rdg.+<br>0.03% rng.)                 | 30A                               |   | 05% rdg.+<br>5% rng.)                | 100A   | 0.05% rng.)                               |  |
| Power                                   |                |   |                                   |   |                                      |  |   |  |
| Setting Range                           | 15W            | 10 mW ~ 15,000 mW,<br>resolution 1 mW         | 20W                               |   | • 20,000 mW,<br>tion 1 mW            | 500W   | 0.05W ~ 500.00W,                          |  |
| Setting Range                           | 100W           | 0.05 W ~ 100.00 W,<br>resolution 0.01 W       | 150W                              |   | ~ 150.00 W,<br>ion  0.01 W           | 50077  | resolution 0.01W                          |  |
| Reading Range                           | 15W            | 0.0 mW ~ 15,600.0<br>mW,<br>resolution 0.1 mW | 20W                               |   | 21,000.0 mW,<br>on 0.1 mW            | 500W   | 0.000 W ~ 520.000 W,<br>resolution 0.001W |  |
|   | 100W           | 0.000 W ~ 104.000 W,<br>resolution 0.001 W    | 150W                              |   | ~ 160.000 W,<br>on  0.001 W          |  |   |  |
| A                                       | 15W            | ± (0.04% rdg.+<br>0.04% rng.)                 | 20W                               |   | )7% rdg.+<br>7% rng.)                | 500144   | ± (0.07% rdg.+                            |  |
| Accuracy                                | 100W           | ± (0.05% rdg.+<br>0.05% rng.)                 | 150W                              | ± (0.0                                    | )7% rdg.+<br>7% rng.)                | 500W   | 0.07% rng.)                               |  |
| Flow Edit<br>Capability                 |                | Max   |                                   |   | one flow: 500 s<br>e step: 999999    |  |   |  |
| Data Storage                            |                | Battery mode<br>EDLC mode : 1                 | : 100ms                           | s~60min                                   |                                      |  | 10ms~60min                                |  |
| Power<br>Requirement                    |                | DC 23.8~<br>(Chroma 62000                     |                                   | 2.75~47.25V, 11kW<br>hroma A691103)       |                                      |  |   |  |
| Frame Dimension $(H \times W \times D)$ | <u> </u>       |   |                                   |   |                                      |  | n x 428 mm x 688 mm                       |  |
| Weight<br>(Full Module)                 |                | Appro   | x. 63 Kg                          | J   |                                      |  | Approx. 40 Kg                             |  |
| Model\Function                          | EDLC<br>Functi | Energy<br>on Regeneration                     | DC Po                             |   |                                      |  | tion has higher<br>he current and         |  |
| model (i unction                        | I UIICU        | negeneration                                  | Jouree                            |   |                                      | npling rate, thus the current and wer accuracy specification of EDLC |   |  |
|   |                | <pre> x</pre>                                 | 6201                              | 5B-24-62                                  | mode is a bit lower than battery mod |  |   |  |
| 17202-5-20<br>17202-5-30                |                | / x<br>/ x                                    |                                   | 5B-24-62<br>5B-24-62                      | mode is a bi                         | t lower t  |   |  |

cause a voltage drop, when DUT is discharging at full current, the minimum discharge voltage will be 1V.

### **Regenerative Battery Pack Test System**

### Model 17020



#### **KEY FEATURES**

- Regenerative battery energy discharge
  - Energy saving
  - Environment protection
  - Low heat output
- Channels paralleled for higher currents
- Charge / discharge mode (CC, CV, CP)
  - Constant current
  - Constant voltage
  - Constant power
- Driving cycle simulation (Power/Current)
- High precision measurement accuracy
- Fast current conversion
- Smooth current without over shoot
- Testing data analysis function
- Data recovery protection (after power failure)
- Independent protection of multi-channel
- Total harmonic distortion: less than 5% of rated power

Chroma's 17020 is a high precision system specifically designed for secondary battery modules and pack tests. Accurate sources and measurements ensure the test quality that is suitable to perform repetitive and reliable tests that are crucial for battery modules / packs, for both incoming or outgoing inspections as well as capacity, performance, production and qualification testing.

Chroma's 17020 system architecture offers regenerative discharge designed to recycle the electric energy sourced by the battery module either back to the channels in the system performing a charging function or to the utility mains in the most energy efficient manner. This feature saves electricity, reduces the facilities thermal foot print and provides a green solution by reducing the environmental impact on our planet.

Chroma's 17020 system is equipped with multiple independent channels to support dedicated charge / discharge tests, on multiple battery modules / packs, each with discrete test characteristics. The channels can easily be paralleled to support higher current requirements. This feature provides the ultimate flexibility between high channel count and high current testing.

## **(F**

Chroma's 17020 system has flexible programming functions and may be operated with Chroma's powerful Battery Pro software. Battery Pro utilizes the system to create cycling tests from basic charge or discharge to complex drive cycle testing for each channel or channel groups. A thermal chamber control can be integrated into a profile and triggered by time or test results yielding a dynamic profile. Battery Pro's features allows quick and intuitive test development to eliminate the need of tedious scripting or programming by a software engineer.

17020's Regenerative Module / Battery Pack Test System uses bi-directional AC-DC converter and bi-directional DC-DC tester with a battery charge/ discharge controller that is composed of the three standalone units.

#### **Flexible System Configuration**

17020 Regenerative Battery Pack Test System can be configured to specified requirements and expandable to 60 channels.

The driving cable can connect the front panel or rear outlet, users can choose their own.

#### 22 22 Terminals V-sense 0 人間 ● 人 8 **B** 1 Л 16 channels

8 channels

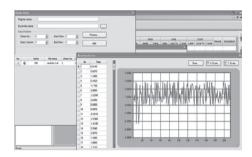
32 channels

#### **Operating Mode**

- Constant current (CC) mode
- Constant voltage (CV) mode
- Constant power (CP) mode
- Constant voltage-limit current mode (CC-CV)
- Waveform current mode
- DCIR mode
- Rest

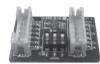
#### **Driving Cycle Simulation**

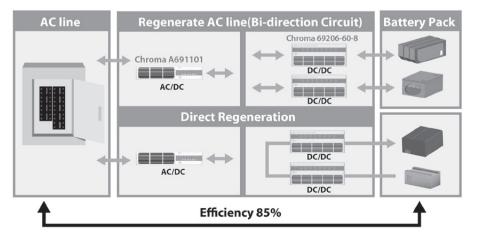
The battery pack always is used at quick and unregular current condition. The system simulates the real condition on battery pack by working condition simulator.



#### **Temperature Measurement**

- Temperature measured for each channel within the range of  $0 \sim 90^{\circ}C \pm 2^{\circ}C$
- 4 sets of measurements (Max) per channel to measure the battery surface temperature





All specifications are subject to change without notice.

### Model 17020

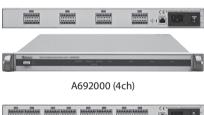
#### **Software Integration**

- BMS communication interface : Collect the BMS data to controls the charge/ discharge profile and protection setting
- Data logger : Collect the data logger to controls the charge/ discharge profile and protection setting.
- Thermal Chambers : It synchronize temperature control with charge/discharge profile (See Model 51101-64 page)



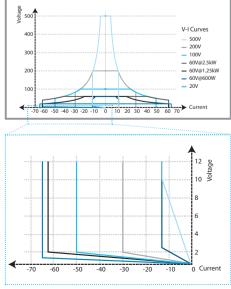
#### **BMS Communication Unit**

- Communication interface : CANBus, SMBus, RS485
- Sampling Rate : 100ms/ch





#### V-I curve of operating



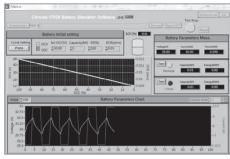
Low Voltage Discharge

#### **Battery simulator Soft-panel (Option)**

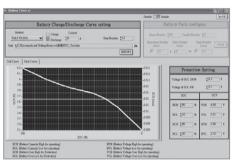
The soft-panel can simulate the battery capacity and DC impedance of battery cell. And it includes voltage-SOC curve simulation. The output voltage of battery simulator follows the user-defined curve. The function is suitable for testing chargers, inverters and motor drives.

#### **Graphic User Interface - Battery Pro**

BatteryPro is specifically designed to meet the various requirements for testing secondary battery packs with high safety and stability. Charge and discharge protection aborts tests when abnormal conditions are detected. Data loss, storage and recovery are protected against power failure.

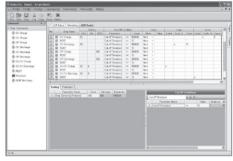


Battery simulator softpanel

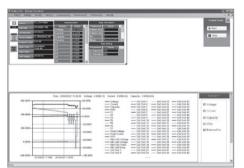


Voltage-SOC curve simulation

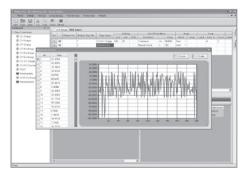
Chroma 17020 **Regenerative Battery Pack Test System** ER B H/W Configur 0 BatteryPro







#### Recipe executor



Waveform simulator editor

Flat Panel Display

Lighting

hotovoltaic Test

Electronic

#### 11-6 Continued on next page —

/ Test &

### Regenerative Battery Pack Test System

Model 17020

| SPECIFICATIONS                 |                            |                            |                            |                            |                            |                            |                          |
|--------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------------------------|
| Model                          |                            |                            |                            | 17020                      |                            |                            |                          |
| Voltage                        | 20V                        | 60V                        | 60V                        | 60V                        | 100V                       | 200V                       | 500V                     |
| Current                        | 65A                        | 13A                        | 62.5A                      | 62.5A                      | 50A                        | 30A                        | 13A                      |
| Power                          | 1.25kW                     | 600W                       | 1.25kW                     | 2.5kW                      | 2.5kW                      | 2.5kW                      | 2.5kW                    |
| Channels                       | 4~40                       | 8~56                       | 4~40                       | 4~24                       | 4~24                       | 4~24                       | 4~24                     |
| Max. Power<br>(Parallelable)   | 50kW                       | 33.6kW                     | 50kW                       | 60kW                       | 60kW                       | 60kW                       | 60kW                     |
| Max. Current<br>(Parallelable) | 2600A                      | 728A                       | 2500A                      | 1500A                      | 1200A                      | 720A                       | 312A                     |
| Charge / Discharge m           | node per channel           |                            | ·                          |                            | ·                          |                            | ·                        |
| Voltage Range                  | 0~20V                      | 0~60V.                     | 0~60V                      | 0~60V                      | 0~100V                     | 0~200V                     | 0~500V                   |
| Voltage Accuracy               | 0.1% stg.+<br>0.05% F.S.   | 0.1% stg.+<br>0.05% F.S.   | 0.1% stg. +<br>0.05% F.S.  | 0.1% stg. +<br>0.05% F.S.  | 0.1% stg. +<br>0.05%F.S.   | 0.1% stg. +<br>0.05%F.S.   | 0.1% stg. +<br>0.05%F.S. |
| Voltage Resolution             | 0.5mV                      | 1mV                        | 2mV                        | 2mV                        | 3mV                        | 5mV                        | 10mV                     |
| Current                        | 65A                        | 13A                        | 62.5A                      | 62.5A                      | 50A                        | 30A                        | 13A                      |
| Current Accuracy               | 0.1% stg.+<br>0.05% F.S.   | 0.1% stg. +<br>0.05% F.S.  | 0.1% stg. +<br>0.05% F.S.  | 0.1% stg. +<br>0.05% F.S.  | 0.1% stg. +<br>0.05%F.S.   | 0.1% stg. +<br>0.05%F.S.   | 0.1% stg.+<br>0.05% F.S. |
| Current Resolution             | 5mA                        | 1mA                        | 5mA                        | 5mA                        | 5mA                        | 5mA                        | 1mA                      |
| Power                          | 1.25kW                     | 600W                       | 1.25kW                     | 2.5kW                      | 2.5kW                      | 2.5kW                      | 2.5kW                    |
| Power Accuracy                 | 0.2% stg.+<br>0.1% F.S.    | 0.2% stg. +<br>0.1% F.S.   | 0.2% stg. +<br>0.1% F.S.   | 0.2% stg. +<br>0.1% F.S.   | 0.2% stg. +<br>0.1%F.S.    | 0.2% stg. +<br>0.1%F.S.    | 0.2% stg.+<br>0.1% F.S.  |
| Power Resolution               | 0.1W                       | 0.1W                       | 0.3W                       | 0.3W                       | 0.5W                       | 0.5W                       | 0.5W                     |
| Measurement per cha            |                            | 1                          | 1                          | ,                          | 1                          | 1                          | 1 0.0.1                  |
| Voltage Range                  | 0~20V                      | 0~60V                      | 0~60V                      | 0~60V                      | 0~100V                     | 0~200V                     | 0~500V                   |
| Voltage Accuracy               | 0.02% rdg.<br>+ 0.02% F.S. | 0.02% rdg<br>+ 0.02% F.S |
| Voltage Resolution             | 0.5mV                      | 1mV                        | 2mV                        | 2mV                        | 3mV                        | 5mV                        | 10mV                     |
| Current Range                  | 24A/65A                    | 4.8A/13A                   | 24A/62.5A                  | 24A/62.5A                  | 20A/50A                    | 12A/30A                    | 4.8A/13A                 |
| Current Accuracy               | 0.1% rdg.<br>+ 0.05% rng.  | 0.1% rdg.<br>+ 0.05% rnd |
| Current Resolution             | 5mA                        | 1mA                        | 5mA                        | 5mA                        | 5mA                        | 5mA                        | 1mA                      |
| Power Range                    | 1.25kW                     | 600W                       | 1.25kW                     | 2.5kW                      | 2.5kW                      | 2.5kW                      | 2.5kW                    |
| Power Accuracy                 | 0.12% rdg.<br>+ 0.07% rng. | 0.12% rdg<br>+ 0.07% rng |
| Power Resolution               | 0.1W                       | 0.1W                       | 0.3W                       | 0.3W                       | 0.5W                       | 0.5W                       | 0.5W                     |
| Others - 17020 Powe            | r / Channels               |                            |                            |                            |                            |                            |                          |
| Voltage                        | 20V                        | 20V                        | 20V                        | 20V                        | 60V                        | 60V                        | 60V                      |
| Current                        | 130A                       | 260A                       | 520A                       | 2600A                      | 125A                       | 125A                       | 250A                     |
| Power                          | 2.5KW                      | 5KW                        | 10KW                       | 50KW                       | 2.5KW                      | 5KW                        | 10KW                     |
| Channels                       | 2 - 20                     | 1 - 10                     | 1 - 5                      | 1                          | 2 - 20                     | 2 - 12                     | 1-6                      |
| Model                          |                            |                            |                            | 17020                      |                            |                            |                          |
| Voltage                        | 60V                        | 60V                        | 60V                        | 100V                       | 100V                       | 100V                       | 100V                     |
| Current                        | 500A                       | 750A                       | 1500A                      | 100A                       | 200A                       | 400A                       | 600A                     |
| Power                          | 20KW                       | 30KW                       | 60KW                       | 5KW                        | 10KW                       | 20KW                       | 30KW                     |
| Channels                       | 1-3                        | 1 - 2                      | 1                          | 2 - 12                     | 1 - 6                      | 1 - 3                      | 1 - 2                    |
| Model                          |                            |                            |                            | 17020                      |                            |                            |                          |
| Voltage                        | 200V                       | 200V                       | 200V                       | 500V                       | 500V                       | 500V                       | 500V                     |
| Current                        | 60A                        | 120A                       | 60A                        | 26A                        | 52A                        | 156A                       | 312A                     |
| 0                              |                            | 10////                     | 201/14/                    |                            | 10//11/                    | 201/11/                    | CO1/11/                  |

10KW

1-6

30KW

1 - 2

5KW

2 - 12

10KW

1-6

5KW

2 - 12

30KW

1 - 2

312A 60KW

1

Power

Channels

### Regenerative Battery Pack Test System Model 17020

| GENERAL SPECIFICATIONS      |  |
|-----------------------------|--|
| Measurement by A692003      |  |
| Temperature Range           | 0~90°C   |
| Temperature Accuracy        | ±2°C   |
| Temperature Resolution      | 0.1°C  |
| Temperature Coefficient     |  |
| Voltage / Current           | 50ppm/ °C  |
| AC power                    |  |
| Voltage Range               | 1Ø 100~240V ± 10%<br>3Ø 200~220Vac ± 10% V <sub>LL</sub><br>3Ø 380~400Vac ± 10% V <sub>LL</sub><br>47~63Hz for input AC power  |
| Current THD                 | < 5% at rated power  |
| Power Factor                | > 0.9 at rated power   |
| Others                      |  |
| Protection                  | UVP, OCP, OPP, OTP, FAN, FAN, Short  |
| Efficiency (Typical)        | 85~90%   |
| Data Acquisition Rate to PC | Minimum 40ms@ 4CH independent<br>Minimum 10ms@ 4CH parallel<br>Minimum 600ms@ 60CH independent<br>Minimum 100ms@ 60CH parallel |
| PC Interface                | Ethernet   |
| Operating Temperature       | $0^{\circ}C \sim 40^{\circ}C$  |
| Storage Temperature         | -40°C ~ 85°C   |
| Safety & EMC                | CE   |
| Dimension (H x W xD)        |  |
| 5kW ~ 20kW                  | 120cm x 60cm x 90cm  |
| 20kW ~ 30kW                 | 170cm x 60cm x 90cm  |
| 40kW ~ 60kW                 | 170cm x 60cm x 90cm x 2 racks  |

#### **ORDERING INFORMATION**

A692000

A692001

| <b>Regenerative Ba</b> | ttery Pack Test System Model 17020       |   |         |
|------------------------|--|---|---------|
| Power Range            | Voltage                                  | Current                                     | Channel |
| 600W                   | 60V                                      | 13A   | 8~56    |
| 1.25kW                 | 20V / 60V                                | 65A / 62.5A                                 | 4~40    |
| 2.5kW                  | 20V / 60V / 60V / 100V / 200V / 500V     | 130A / 125A / 62.5A / 50A / 30A / 13A       | 4~20    |
| 5kW                    | 20V / 60V / 60V / 100V / 200V / 500V     | 260A / 250A / 125A / 100A / 60A / 26A       | 2~10    |
| 10kW                   | 20V / 60V / 60V / 100V / 200V / 500V     | 520A / 500A / 250A / 200A / 120A /52A       | 1~5     |
| 20kW                   | 20V / 60V / 60V / 100V / 200V / 500V     | 1040A / 1000A / 500A / 400A / 240A / 104A   | 1~3     |
| 50kW                   | 20V / 60V / 60V / 100V / 200V / 500V     | 2600A / 2500A / 1250A / 1000A / 600A / 260A | 1       |
| 60kW                   | 60V / 100V / 200V / 500V                 | 1500A / 1200A / 720A / 312A                 | 1       |
| Others and Optio       | ons                                      |   |         |
| 51101-64               | Thermal/Multi-function Data logger 64 ch | nannels                                     |         |
| A170201                | IPC for battery test system              |   |         |
| A692003                | Thermal sensor with cable                |   |         |

Video & Color

Flat Panel Display

LED/ Lighting

Optical Devices

Photovoltaic Test & Automation

Automated Optical Inspection

Power Electronics

Test &

BMS data communication unit 4 Channels

BMS data communication unit 8 Channels

### **Regenerative Battery Pack Test System**

### Model 17030



### Ethemet CE

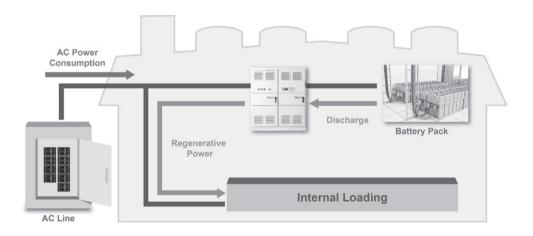
Chroma's 17030 system include a driving cycle simulation function. Since automotive battery packs are used at quick and irregular intervals, the 17030 incudes the capability to create seamless transitions between maximum charge and maximum discharge (or maximum discharge and maximum charge) with a rapid 50 ms conversion. This feature allows for charge/discharge mode simulations of real world driving scenarios. The system simulates the real conditions on the battery pack in its working condition.

Chroma's 17030 system has flexible programming functions and includes Chroma's powerful Battery Pro software. Battery Pro is a user friendly software environment allowing for the creation of a wide range of test scenarios from basic charge and discharge to complex drive cycle testing. Battery Pro's features allows quick and intuitive test development to eliminate the need for tedious scripting or programming by a software developer.

There are multiple safety features built into the 17030 including battery polarity checks, overvoltage protection, overcurrent protection and over temperature protection. In the unlikely event of a power or computer communication loss, the data is securely stored within the system in non-volatile memory thereby protecting against potential data loss and allowing for continuous flow after restart.

#### **Regenerative Energy**

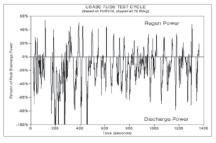
- Regenerate power to grid, Low heat dissipation, reduce air-conditioner loads and facility power consumption
- THD under 5% at rated power
- The PF over 0.9 at rated power
- Efficiency above 85% when operated above 20% of rated power

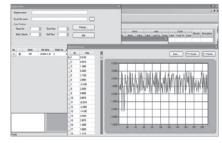


#### Driving Cycle Simulation (Power/ Current Waveform mode)

Simulate real automotive working conditions by defining quick and irregular charging and discharging conditions.

- Import dynamic charge/discharge waveforms to simulate the DRIVE CYCLE or other actual applications via .xls file formats
- Supports 720,000 points within driving profile memory for saving profiles of each channel
- Minimum transition time ( $\Delta t$ ) = 10ms





Support FUDS test

Loading FUDS waveform current

#### **KEY FEATURES**

- Supports high power battery certification: IEC, SAE, GB, and etc.
- Regenerative battery discharge, Saves energy, environment-friendly and provides low heat dissipation
- Driving cycle simulator
- Industry Leading Accuracy
- 10ms Data acquisition
- Charge / discharge mode
  - Constant Current
  - Constant Voltage
  - Constant Power
- Customized rating power
  - Voltage range : 10~1200V
  - Current range : 0~1000A
  - Power range : 90~500kW
  - (Parallel up to 2 units)
- System Integration:
  - Chamber Control
  - Multi-channels voltage/
  - temperature measurement (Max 256CH)
  - BMS Communication

Chroma's 17030 is an automated regenerative test system specifically designed for high power battery pack tests. Accurate power sources and measurements ensure test quality suitable for repetitive and reliable testing of crucial battery packs. Applications include incoming inspections capacity validation, production and certification testing.

Chroma's 17030 system architecture offers regenerative discharging designed to recycle the electric energy sourced by the battery pack. This feature saves electricity, reduces the facilities costs, reduces the thermal foot print and provides a green solution by reducing the environmental impact to the planet.

#### **Software Function - Battery Pro**

The 17030 Test system is specifically designed to meet the various requirements for testing secondary battery packs with high safety and stability. Charge and discharge protection aborts tests when abnormal conditions are detected. Data loss, storage and recovery are protected against power failure.

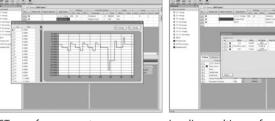
- Real-time battery pack status browse
- Icon Manager: Test status of each channel is managed through different icons, easy to read and understand
- Authority management: Allows for multiple user authority
- Fault record tracking: Records abnormal states of each channel independently

#### **Recipe editor**

- 255 charge/discharge conditions
- Sets dual layer loops (cycle & loop) with 9999 loops per layer
- Ability to edit dynamic charge/discharge waveform
- 10ms current switching speed in waveform current mode
- Testing modes: CV/CC/CP/CC-CV/Waveform current/DCIR) Cut-off conditions (time, current, capacity, cut-off voltage, cut-off current, etc.)









**Battery Pro Main Page** 



DST waveform current

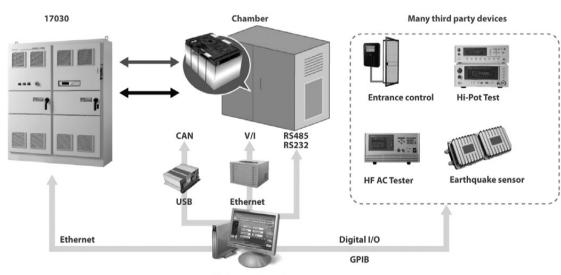
Loading multi-waveform

#### **Software Integration**

Battery Pro can communicate to most thermal chambers for life and temperature testing .

Status browser

Many third party devices can be integrated into the 17030 via standard interface protocols (discrete I/O interface, GPIB, etc).



System configuration

ORDERING INFORMATION

| Model 17030 Regen         | erative Battery Pack Test S | System                       |          |
|---------------------------|-----------------------------|------------------------------|----------|
| Power Range               | Voltage                     | Current                      | Channel  |
| 90kW                      | 450V                        | 200A                         | 1        |
| 180kW                     | 450V                        | 200A                         | 2        |
| TOUKVV                    | 700V                        | 300A                         | 1        |
| 210kW                     | 900V                        | 500A                         | 1        |
| 250kW                     | 700V                        | 500A                         | 1        |
|                           | 900V                        | 500A                         | 1        |
| 280kW                     | 700V                        | 200A                         | 2        |
| 300kW                     | 700V                        | 1000A                        | 1        |
| 500kW                     | 1200V                       | 700A                         | 1        |
| <b>Others and Options</b> |                             |                              |          |
| 51101-64                  | Thermal/Multi-fund          | ction Data logger 64 channel | (option) |
| A170201                   | IPC for battery test        | system                       |          |
| A692003                   | Thermal sensor (0~          | 90°C) and cable (30cm)       |          |

/ Test &

### Regenerative Battery Pack Test System Model 17030

| SPECIFICATION              | IS-1                   |  |  |  |  |  |  |  |  |
|----------------------------|------------------------|--|--|--|--|--|--|--|--|
| Model                      |                        |  |  | 17030 *                                      |  |  |  |  |  |
| Channel                    |                        | 1  | 2  | 1  | 1  | 1  |  |  |  |
| Max Power *1               |                        | 90kW   | 180kW  | 180kW  | 250kW  | 210kW  |  |  |  |
| Max Power /Per             | channel                | 90kW   | 90kW   | 180kW  | 250kW  | 210kW  |  |  |  |
| Max Voltage                |                        | 450V   | 450V   | 700V   | 700V   | 900V   |  |  |  |
| Max Current / Pe           | er channel             | 200A   | 200A   | 300A   | 500A   | 500A   |  |  |  |
| <b>Constant Volta</b>      | ge Mode                |  |  |  |  |  |  |  |  |
| Voltage Range *            | 2                      | 15-450Vdc                                    | 15-450Vdc                                    | 15-700Vdc                                    | 15-700Vdc                                    | 19-900 Vdc                                   |  |  |  |
| Voltage accurac            | су.                    | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     |  |  |  |
| Voltage resoluti           |                        | 10mV   | 10mV   | 15mV   | 15mV   | 20mV   |  |  |  |
| Constant Curre             |                        |  | 1  |  |  |  |  |  |  |
| Maximum Curre              |                        | 200A   | 200A   | 300A   | 500A   | 500A   |  |  |  |
| Current accurac            | V                      | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     |  |  |  |
| Current resoluti           | /                      | 10mA   | 10mA   | 15mA   | 20mA   | 20mA   |  |  |  |
| Constant Powe              |                        |  |  | 19   | 201101                                       |  |  |  |  |
| Max Power / Per            |                        | 90kW   | 90kW   | 180kW  | 250kW  | 210kW  |  |  |  |
| Power accuracy             |                        | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     |  |  |  |
| Power resolutio            |                        | 5W   | 5W   | 10W  | 20W  | 20W  |  |  |  |
| Current Rising T           |                        | 10ms with 0.2 Ω                              | $10 \text{ ms with } 0.2 \Omega$             |  |  |  |
| (10% to 90% Lo             |                        | Resistive load                               |  |  |  |
| Ripple Noise (DC Current)  |                        | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      |  |  |  |
| Overshoot                  |                        | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      |  |  |  |
| Measurement                | *3                     | < 1 % I . J.                                 | < 1 701. <b>.</b> .                          | < 1 /01.5.                                   | < 1 701 . <b>J</b> .                         | < 1 /01.5.                                   |  |  |  |
|                            |                        |  |  |  |  |  |  |  |  |
| Voltage Read B             | баск                   | 0~450V                                       | 0~450V                                       | 0~700V                                       | 0~700V                                       | 0~900V                                       |  |  |  |
| range                      |                        |  |  |  |  |  |  |  |  |
| accuracy                   |                        | 0.05% rdg.+0.05% F.S.                        |  |  |  |
| resolution                 |                        | 10mV   | 10mV   | 15mV   | 15mV   | 20mV   |  |  |  |
| Current Read B             | ack                    | 0.0004                                       | 0.0004                                       | 0.2004                                       | 0.5004                                       | 0.5004                                       |  |  |  |
| High range                 |                        | 0~200A                                       | 0~200A                                       | 0~300A                                       | 0~500A                                       | 0~500A                                       |  |  |  |
| accuracy                   |                        | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     |  |  |  |
| Low range                  |                        | 0~50A  | 0~50A  | 0~75A  | 0~125A                                       | 0~125A                                       |  |  |  |
| accuracy                   |                        | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     |  |  |  |
| resolution                 |                        | 10mA   | 10mA   | 15mA   | 20mA   | 20mA   |  |  |  |
| Power Read Ba              | ck                     |  |  |  |  |  |  |  |  |
| Power range                |                        | 90kW   | 90kW   | 180kW  | 250kW  | 250kW  |  |  |  |
| Power accuracy             |                        | 0.2% F.S.                                    |  |  |  |
| Power resolutio            | n                      | 5W   | 5W   | 10W  | 20W  | 20W  |  |  |  |
| Thermal Senso              | r                      |  |  |  |  |  |  |  |  |
| range                      |                        | 0°C ~90°C                                    |  |  |  |
| accuracy                   |                        | ±0.2°C                                       | ±0.2°C                                       | ±0.2°C                                       | ±0.2°C                                       | ±0.2°C                                       |  |  |  |
| resolution                 |                        | 0.1°C  | 0.1°C  | 0.1°C  | 0.1°C  | 0.1 °C                                       |  |  |  |
| AC Input                   |                        |  |  |  |  |  |  |  |  |
| Line voltage / Fi          | requency <sup>*4</sup> |  | 3Ø 200V/22                                   | $20V/380V/440V/480V \pm 5$                   | %, 47~63Hz                                   |  |  |  |  |
| Others                     |                        |  |  |  |  |  |  |  |  |
| Audible noise le           | evel (in 1m distance)  | Under 80dB                                   |  |  |  |  |  |  |  |
| Efficiency (Typic          | cal)                   |  |  | 85%  |  |  |  |  |  |
| Interface *5               |                        |  |  | Ethernet                                     |  |  |  |  |  |
| Operation Temp             | perature               |  |  | 0 °C ~ 40 °C                                 |  |  |  |  |  |
| Dimension                  | Transformer            | 1111 x 813 x 686mm /<br>43.75 x 32 x 27 inch | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch |  |  |  |
| $(H \times W \times D)$ *6 |                        | 1982 x 1982 x 915mm /                        | 1982 x 1982 x 915mm                          |  |  |  |
| ,                          | Power Enclosure        | 78 x 78 x 36 inch                            |  |  |  |
|                            |                        | approx. 465 kg /                             | approx. 710 kg /                             | approx. 640 kg /                             | approx. 710 kg /                             | approx. 710 kg /                             |  |  |  |
| NA(-:                      | Transformer            | approx. 1025 lbs                             | approx. 1560 lbs                             | approx. 1400 lbs                             | approx. 1560 lbs                             | approx. 1560 lbs                             |  |  |  |
| Weight *7                  | Power Enclosure        | approx. 1140 kg /                            | approx. 1600 kg /                            | approx. 1140 kg /                            | approx. 1140 kg /                            | approx. 1270 kg /                            |  |  |  |
|                            |                        |  |  |  |  |  |  |  |  |

### Regenerative Battery Pack Test System Model 17030

| SPECIFICATIONS-2<br>Model    | <u> </u>           |  | 170  | 30 *   |  |  |  |
|------------------------------|--------------------|--|--|--|--|--|--|
| Channel                      |                    | 1  | 2  | 1  | 1  |  |  |
| Max Power *1                 |                    | 250kW  | 2<br>280kW                                   | 300kW  | 500kW                                      |  |  |
| Max Power / Per ch           | annal              | 250kW  | 140kW  | 300kW  | 500kW                                      |  |  |
|                              | dinei              | 900V   |  |  |  |  |  |
| Max Voltage                  | h a m a l          |  | 700V   | 700V   | 1200V                                      |  |  |
| Max Current / Per c          |                    | 500A   | 200A   | 1000A  | 700A                                       |  |  |
| Constant Voltage             | Mode               |  |  |  | 22.42221/1                                 |  |  |
| Voltage Range *2             |                    | 19-900 Vdc                                   | 15-700Vdc                                    | 15-700Vdc                                    | 30-1200Vdc                                 |  |  |
| Voltage accuracy             |                    | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                   |  |  |
| Voltage resolution           |                    | 20mV   | 15mV   | 15mV   | 30mV                                       |  |  |
| Constant Current             | Mode               |  |  |  |  |  |  |
| Maximum Current              |                    | 500A   | 200A   | 1000A  | 700A                                       |  |  |
| Current accuracy             |                    | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                   |  |  |
| Current resolution           |                    | 20mA   | 10mA   | 40mA   | 30mA                                       |  |  |
| Constant Power M             | lode               |  |  |  |  |  |  |
| Max Power / Per ch           | annel              | 250kW  | 140kW  | 300kW  | 500kW                                      |  |  |
| Current accuracy             |                    | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                   |  |  |
| Power resolution             |                    | 20W  | 10W  | 20W  | 40W  |  |  |
| Current Rising Time          | 2                  | <b>10ms with 0.2</b> Ω                       | 10ms with 0.2 Ω                              | 10ms with 0.2Ω                               | 10ms with 0.2 Ω                            |  |  |
| (10% to 90% Load)            |                    | Resistive load                               | <b>Resistive</b> load                        | <b>Resistive</b> load                        | Resistive load                             |  |  |
| Ripple Noise (DC Cu          | urrent)            | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                    |  |  |
| Overshoot                    |                    | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                      | <1%F.S.                                    |  |  |
| Measurement *3               |                    |  |  | ·  |  |  |  |
| Voltage Read Back            |                    |  |  |  |  |  |  |
| Range                        |                    | 0~900V                                       | 0~700V                                       | 0~700V                                       | 0~1200V                                    |  |  |
| Accuracy                     |                    | 0.05% rdg.+0.05% F.S.                        | 0.05% rdg.+0.05% F.S.                        | 0.05% rdg.+0.05% F.S.                        | 0.05% rdg.+0.05% F.S.                      |  |  |
| Resolution                   |                    | 20mV   | 15mV   | 15mV   | 30mV                                       |  |  |
| Current Read Back            |                    | 20111  | 13111  | 151114                                       | 50111                                      |  |  |
| High range                   |                    | 0~500A                                       | 0~200A                                       | 0~1000A                                      | 0~700A                                     |  |  |
| Accuracy                     |                    | 0.1% F.S.                                    | 0.1%F.S.                                     | 0.1%F.S.                                     | 0.1%F.S.                                   |  |  |
|                              |                    |  |  |  |  |  |  |
| Low range                    |                    | 0~125A                                       | 0~50A  | 0~250A                                       | 0~175A                                     |  |  |
| Accuracy                     |                    | 0.2% F.S.                                    | 0.2%F.S.                                     | 0.2%F.S.                                     | 0.2%F.S.                                   |  |  |
| Resolution                   |                    | 20mA   | 10mA   | 40mA   | 30mA                                       |  |  |
| Power Read Back              |                    |  |  |  |  |  |  |
| Power range                  |                    | 250kW  | 140kW  | 300kW  | 500kW                                      |  |  |
| Power accuracy               |                    | 0.2% F.S.                                    | 0.2% F.S.                                    | 0.2% F.S.                                    | 0.2% F.S.                                  |  |  |
| Power resolution             |                    | 20W  | 10W  | 20W  | 40W  |  |  |
| Thermal Sensor               |                    |  |  | 1  |  |  |  |
| Range                        |                    | 0°C ~90°C                                    | 0°C ~90°C                                    | 0°C ~90°C                                    | 0°C ~90°C                                  |  |  |
| Accuracy                     |                    | ±0.2°C                                       | ±0.2°C                                       | ±0.2°C                                       | ±0.2°C                                     |  |  |
| Resolution                   |                    | 0.1°C  | 0.1°C  | 0.1°C  | 0.1°C                                      |  |  |
| AC Input                     |                    |  |  |  |  |  |  |
| Line voltage / Frequ         | uency *4           |  | 3Ø 200V/220V/380V/44                         | 0V/480V ±5%, 47~63Hz                         |  |  |  |
| Others                       |                    |  |  |  |  |  |  |
| Audible noise level          | (in distance)      |  | Unde   | r 80dB                                       |  |  |  |
| Efficiency (Typical)         |                    | 85%  |  |  |  |  |  |
| Interface *5                 |                    |  | Ethe   | ernet  |  |  |  |
| Operation Tempera            | iture              |  |  | 40 °C  |  |  |  |
| Dimension                    | Transformer        | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch | 1257 x 1041 x 813mm /<br>49.5 x 41 x 32 inch | 1257 x 1041 x 813mm<br>49.5 x 41 x 32 inch |  |  |
| $(H \times W \times D)^{*6}$ | Power<br>Enclosure | 1982 x 1982 x 915mm /<br>78 x 78 x 36 inch   | 1982 x 1982 x 915mm /<br>78 x 78 x 36 inch   | 1982 x 1982 x 915mm /<br>78 x 78 x 36 inch   | 2286 x 5030 x 609mm<br>90 x 198 x 24 inch  |  |  |
|                              | Transformer        | approx. 710 kg /<br>approx. 1560 lbs         | approx. 710 kg /<br>approx. 1560 lbs         | approx. 710 kg /<br>approx. 1560 lbs         | approx. 1420 kg /<br>approx. 3120 lbs      |  |  |
| Weight <sup>*7</sup>         |                    | approx. 1500 lbs                             |  |  |  |  |  |

Note\*1: Customized rated power: Voltage 10~1200V; max Current 1000A; Power 90~500kW

Note\*2: The output range of voltage is referred by the cabling. The connection between the device and battery is 3 meters long as standard accessory. Note\*3: 20us sampling rate for calculating battery capacity and energy

Note\*4: The transformer is for isolation and to accommodate various facility voltages

Note\*5: The interface from PC to 17030 is through Ethernet

Note\*6: The dimension is for reference. The dimensions are subject to change base on real condition

Note\*7 : The weight is for reference. The weight are subject to change base on real condition

urnkey Test &

/ideo & Color

Flat Panel LED/ Display Lighting

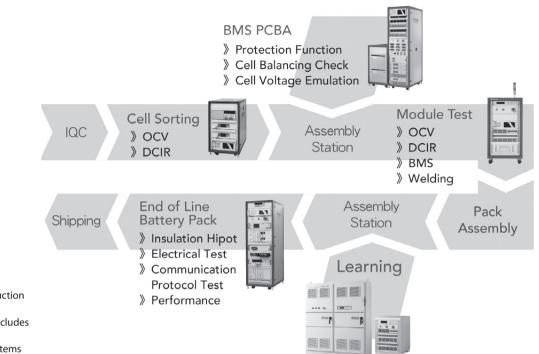
### **Battery Pack ATS**

## Model 8700









#### **KEY FEATURES**

- Specifically designed for battery production line, or battery development testing
- The application range of this system includes battery modules for electric vehicles, motor vehicles, and power storage systems

Increases QA efficiency by up to 80%

- Inspection of BMS functions, connector withstand voltage, consistency, and performance of battery module
- Charge/discharge power range : 5kW~500kW Charge/discharge voltage range : 0V~1200V Charge/discharge current range : 0A~2600A
- Standard test items include insulation resistance, electrical tests, software/ communication, and battery performance testing
- Able to create test fixture to connect the customized battery module with the automated switch control
- The control system is an easy to use open software platform that supports shop floor control integration with Manufacturing Execution System (MES)

#### **Battery Cell/ Module/Pack Test Solutions**

In order to increase testing coverage and the efficiency of the power storage battery industry, Chroma ATE has developed an automated inspection system that can be applied to the EOL (End Of Line) of battery pack production for testing assembly defects, Battery Management System (BMS) communication, internal power switches, battery balancing circuits/consistency, and temperature distribution, etc. before battery packs are shipped out of the factory.

The comprehensive PASS/FAIL tests can be used in production lines, in a development phase nearing completion and used during battery pack acceptance inspection for EV or energy storage station.

#### **BMS PCBA Automated Test System**

- 2~32 series cell voltage simulation
- Support active and passive balance test
- Flexible hardware architecture that can select a variety of hardware devices
- The test items can be expanded to meet the demands for inspecting tests.
- Support dual-output of battery module
- Resistor measurement (ID pin/NTC)
- BMS IC Firmware program & Parameter download BMS data compare
- Support BMS interface: CANBus/RS485/RS232
- Support BMS power consumption measurement
- BMS IC V/I/T calibration
- Over voltage protection test
- Under voltage protection test
- Over charge current protection test
- Over discharge current protection test
- Over temperature protection test



### **Battery Pack ATS**

### Model 8700

#### **Battery Cell Automated Test System**

- Pass/fail validation for battery cell production
- OCV, ACIR and DCIR measurement for multi-channels
- Charge/discharge power range : 100W~400W
- Charge/discharge voltage/current range: 0V~80V/0A~80A



Battery Cell ATS

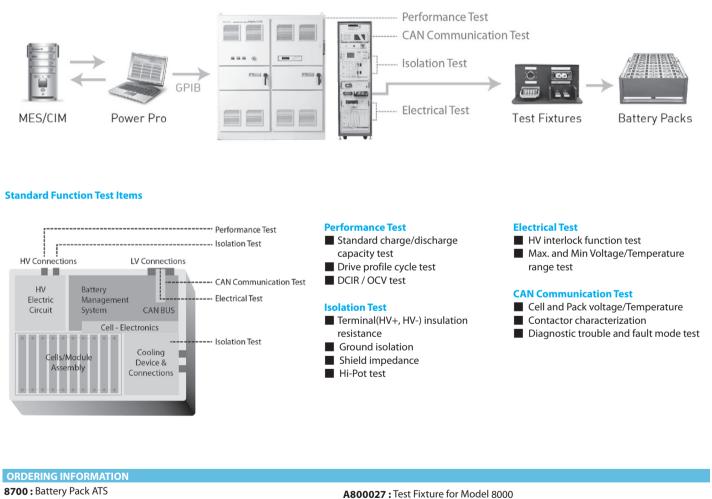
#### **Battery Module Automated Test System**

- Pass/Fail validation for battery module production
- Inspection of BMS functions for voltage/ temperature measurement accuracy as well as the distribution consistency of voltage/DC resistance/temperature for each serial cell of battery pack
- Charge/discharge power range: 2.5kW~50kW
   Charge/discharge voltage/current range: 0V~200V/0A~2600A



Battery Module ATS

#### **Architecture of Battery Pack Automated Test System**



#### 6011/80611/80614 : Timing/Noise Analyzer 6011N/80611N : Timing/Noise module 6012/80612 : Short Circuit/OVP Tester 6013/80613 : ON/OFF Controller 5004ATM : System Controller A800003 : 8000 software Package A800004 : 19" Rack for Model 8000 A800005 : PCI BUS GPIB Card (National Instrument)

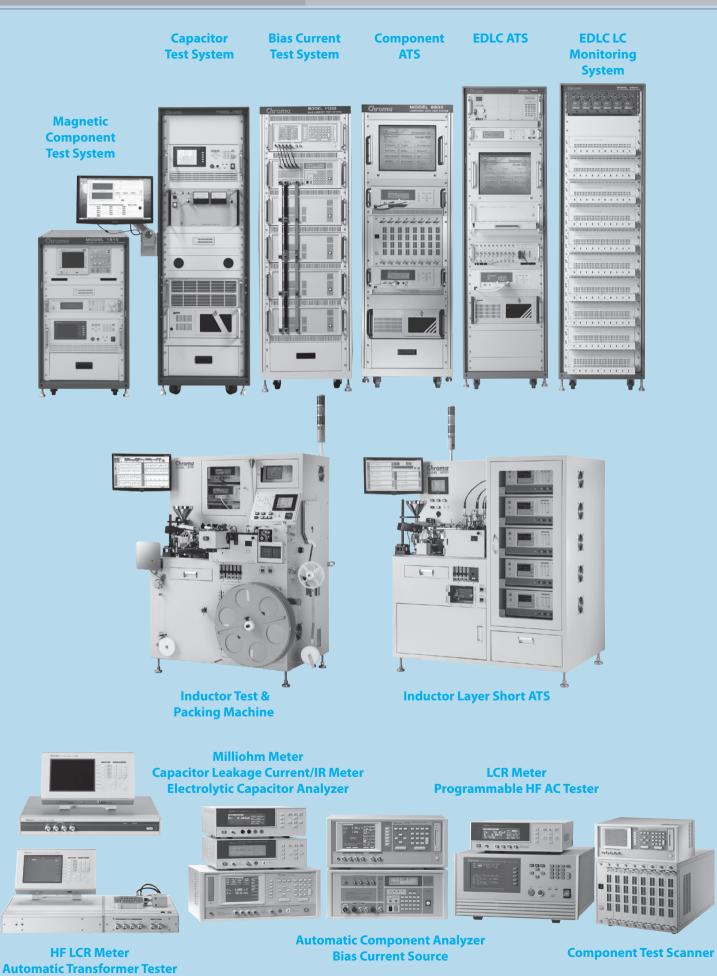
#### A800068 : Digital Measurement Card DC Load Module: Refer to 6310A, 63200, 6330A,63600 Series Digital Power Meter : Refer to Model 66200 Series AC Source : Refer to Model 6400, 6500, 61500, 61600, 61700, 61800 Series DC Source : Refer to Model 62000H, 62000P Series

\* Please refer to Model 8000's specifications for detail instruments

/ Test &

| Selection Guides                              | 12-1  |
|---|-------|
| LCR Meter/Automatic Transformer Test System   | 12-3  |
| Electrolytic Capacitor Analyzer               | 12-15 |
| Programmable HF AC Tester                     | 12-19 |
| Milliohm Meter                                | 12-21 |
| Component Test Scanner                        | 12-22 |
| Automatic Test System                         | 12-23 |
| Options of Passive Component Test Instruments | 12-33 |

### **Overview**



### **Selection Guides**

| LCR Meter Select | ion Guide                                    |   |  |       |
|------------------|--|---|--|-------|
| Model            | Frequency Range                              | Impedance Range                                   | Description  | Page  |
| 11020            | 100Hz, 120Hz, 1kHz                           | 0.1pF ~ 4.00 F                                    | High speed capacitance inspection  | 12-7  |
| 11021            | 100Hz, 120Hz, 1kHz, 10kHz                    | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$  | Digital bin-sorting and comparator functions, up to 1kHz only optional   | 12-4  |
| 11021-L          | 1kHz, 10kHz, 40kHz, 50kHz                    | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$  | Digital bin-sorting and comparator functions   | 12-4  |
| 11022            | 50/60/100/120/1k/10k/<br>20k/40k/50k/100k Hz | 0.01mΩ ~100MΩ                                     | Digital high speed measurement in all test frequencies,<br>excellent low-impedance measurement accuracy,<br>bin-sorting and comparator functions | 12-5  |
| 11025            | 50/60/100/120/1k/10k/<br>20k/40k/50k/100k Hz | $0.01m\Omega\sim 100M\Omega$                      | Identical Model 11022, and add transformer testing function  | 12-5  |
| 11050 (New)      | 1KHz~10MHz                                   | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$  | wide range test frequency, high speed measurement, and excellent accuracy  | 12-3  |
| 11050-5M (New)   | 60Hz~5MHz                                    | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$  | wide range test frequency, high speed measurement, and excellent accuracy  | 12-3  |
| 1062A            | 40Hz~200kHz, 30 points                       | $0.01 \text{m}\Omega \sim 100 \text{M}\Omega$     | Excellent low impedance measurement accuracy and comparator function   | 12-6  |
| 1075             | 20Hz~200kHz                                  | $0.01 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$ | Excellent low impedance measurement accuracy and bin-sorting function  | 12-6  |
| 3252             | 20Hz~200kHz                                  | $0.1 \text{m}\Omega \sim 100 \text{M}\Omega$      | LCR + transformer testing and frequency characteristics analysis function<br>Built-in 1A/8mA bias current source optional                        | 12-10 |
| 3302             | 20Hz~1MHz                                    | <b>0.1m</b> Ω ~ 100MΩ                             | Identical Model 3252 1MHz edition  | 12-10 |

| Auto Transformer Test System Selection Guide |                 |  |  |       |  |
|--|-----------------|--|--|-------|--|
| Model  | Frequency Range | Impedance Range                                  | Description  | Page  |  |
| 13350 + A133502                              | 20Hz ~ 200kHz   | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$ | Transformer L/C/Z/DCR/Turns-ratio/Pin-short/<br>Balance scanning test function | 12-8  |  |
| 3250 + A132501                               | 20Hz ~ 200kHz   | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$ | Transformer L/C/Z/DCR/Turns-ratio/Pin-short/<br>Balance scanning test function | 12-10 |  |
| 3250 + A132501                               | 20Hz ~ 200kHz   | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$ | Transformer L/C/Z/DCR/Turns-ratio/Pin-short/<br>Balance scanning test function | 12-10 |  |
| 3252 + A132501                               | 20Hz ~ 200kHz   | $0.1 \text{m}\Omega \sim 100 \text{M}\Omega$     | Identical Model 3250 and add LCR Meter function                                | 12-10 |  |
| 3302 + A132501                               | 20Hz ~ 1MHz     | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$ | Identical Model 3252 1MHz edition  | 12-10 |  |
| 3312 + A132501                               | 20Hz ~ 1MHz     | $0.1 \mathrm{m}\Omega \sim 100 \mathrm{M}\Omega$ | Identical Model 3302 and add Telecom parameter measurement function            | 12-12 |  |

| Bias Current Source / Test System Selection Guide |                 |                 |  |       |  |  |
|---|-----------------|-----------------|--|-------|--|--|
| Model   | Frequency Range | Impedance Range | Description  | Page  |  |  |
| 1310  | 20Hz ~ 200kHz   | 0~10A           | Economic type  | 12-13 |  |  |
| 1320  | 20Hz ~ 1MHz     | 0~20A           | Programmable, and also can be controlled by Chroma 3252/3302 combined with Chroma 1320 to extend drive current                   | 12-13 |  |  |
| 1320S   | 20Hz ~ 1MHz     | 0~20A           | Slave (1320)   | 12-13 |  |  |
| 1320-10A  | 20Hz ~ 1MHz     | 0~10A           | Identical 1320 10A edition, mainly used in PFC choke testing which higher<br>DC resistance and the DC voltage dropped exceeds 6V | 12-13 |  |  |
| 11300   | 20Hz~1MHz       | 0~300A          | Intergration of 1320S with LCR Meter for large bias current testing<br>of power choke  | 12-14 |  |  |

| <b>Electrolytic Capa</b> | Electrolytic Capacitor Tester Selection Guide |  |   |       |  |  |  |  |
|--------------------------|---|--|---|-------|--|--|--|--|
| Model                    | Primary Function                              | Test Signal  | Description   | Page  |  |  |  |  |
| 11800                    | Ripple current tester                         | 100Hz/120Hz/400Hz/1kHz,<br>0~30A DC Bias 0.5V~500V         | For load life testing of electrolytic capacitor which used in power line rectifier                              | 12-17 |  |  |  |  |
| 11801                    | Ripple current tester                         | 20k~100kHz, 0~10A,<br>DC Bias 0~500V                       | For load life testing of electrolytic capacitor<br>which used in SMPS output filter                             | 12-17 |  |  |  |  |
| 11810                    | Ripple current tester                         | 20k~1000kHz, 0~10A,<br>DC Bias 0~500V                      | For load life testing of high frequency MLCC, OS-CON, polymer capacitor that used by DC to DC converter         | 12-17 |  |  |  |  |
| 11200                    | Capacitor leakage current /<br>IR meter       | 1.0~650V/800V,<br>CC 0.5~500mA                             | For electrolytic capacitor leakage current and<br>aluminum-foil W.V. testing                                    | 12-18 |  |  |  |  |
| 13100                    | Electrolytic capacitor<br>analyzer            | AC 100Hz/120Hz/1KHz/10kHz/<br>20kHz/50kHz/100kHz, 1V/0.25V | For high and low frequency electrolytic capacitor I.Q.C.,F.Q.C. multi-parameter scanning testing (C/D/Z/ESR/LC) | 12-15 |  |  |  |  |

| Component Test Scanner Selection Guide |                         |                                    |   |       |  |  |
|--|-------------------------|------------------------------------|---|-------|--|--|
| Model                                  | <b>Primary Function</b> | Option                             | Description   | Page  |  |  |
| 13001                                  | Scanner                 | A130007 40 channels<br>scan module | For RJ-45 equipment, glass substrate, LCD glass substrate,<br>printed circuit glass, PCB, EMI filter, ICT application.<br>It could combined with Chroma 8800 Component ATE<br>for process control and data collection | 12-22 |  |  |

| Model        | Primary Fur                                     | nction   | Test Range                  | Description  | Page  |  |
|--------------|---|--|-----------------------------|--|-------|--|
| 16502        | DC, Pulse                                       | 2  |                             | Digital milliohm meter with bin-sorting, comparator function, reduce thermal EMF affection   | 12-21 |  |
| HF AC Tester | Selection Guide                                 |  |                             |  |       |  |
| Model        | Primary<br>Function                             |  | Option                      | Application Description  | Page  |  |
| 11802        | HF, HV, CV                                      | A118031 HF HV 5kV/100mA max<br>A118014 HF HV 2.5kV/200mA max<br>A118017 HF HV 8kV/100kHz max   |                             | LCD inverter transformer (ceramic capacitor, cable,         PCB) load life / withstanding voltage / breakdown voltage test         EEFI, backlight load life / lamp current test         SMPS main transformer and active PFC choke load life test         and electrical analysis         Medical equipment high frequency leakage current         safety inspection         Automobile motor corona discharge inspection, analysis         and production line | 12-19 |  |
|              | HF, HV, CV                                      | Step-up current test module + specified resonant inductor/ capacitor   |                             | Ballast capacitor / inductor ignition voltage load life test   |       |  |
|              | HF, HI, CC,<br>Bias voltage                     | Ripple Voltage Test Module<br>Chroma 11200 CLC / IR Meter<br>(for DC voltage source with discharge function)   |                             | Snubber capacitor load life test   |       |  |
|              | HF, CV,<br>Bias current<br>Temperature<br>meter | Step-up current test module<br>+ AC/DC coupling test fixture<br>Chroma DC power supply (for DC bias current)<br>Chroma 12061 Digital Multimeter<br>(for temperature measurement) |                             | DC-DC converter SMD power choke temperature rising test<br>(DC Bias current with AC ripple voltage) and electrical analysis  |       |  |
|              | HF, HV, CV<br>(or + DC source)                  | HF HV test module<br>Option Chroma DC source*3   |                             | Function as HF HV AC +DC power source<br>for FFI and SED device analysis   |       |  |
| 11803        | HF, CV,<br>Bias current<br>Temperature<br>meter | Step-up current test module<br>+ AC/DC coupling test fixture<br>Chroma DC power supply (for DC bias current)<br>Chroma 12061 Digital Multimeter<br>(for temperature measurement) |                             | ent) DC-DC converter SMD power choke temperature rising test<br>(DC Bias current with AC ripple voltage) and electrical analysis   | 12-19 |  |
| 11805        | HF, HI,<br>Bias voltage                         |  | A118015 HF, HI 33V/30A max. | Snubber capacitor load life test   | 12-19 |  |
| 11890        | HF, HV<br>HF, HV, CV                            | A118018 HF, HV 1kV/1A max.<br>A118031 HF HV 5kV/100mA max<br>A118014 HF HV 2.5kV/200mA max   |                             | High voltage capacitor load life test<br>LCD inverter transformer( ceramic capacitor, cable, PCB)<br>withstanding voltage test for production line<br>Medical equipment high frequency<br>leakage current safety inspection<br>Automobile motor corona discharge inspection<br>for production line   | 12-19 |  |
| 11891        | HF, HV, CV                                      | A118031 HF HV 5kV/100mA max<br>A118014 HF HV 2.5kV/200mA max   |                             | Passive Component<br>(inverter transformer, ceramic capacitor, cable, PCB etc.)<br>High Frequency and High Voltage Load Life Test  | 12-19 |  |

| Automatic rest system selection duite |                                   |  |  |       |  |  |  |  |
|---------------------------------------|-----------------------------------|--|--|-------|--|--|--|--|
| Model                                 | Primary Function                  | Test Signal  | Description  | Page  |  |  |  |  |
| 1810                                  | Magnetic Component<br>Test System | DC Bias Current 60A max.<br>HF AC Voltage 20kHZ~1MHZ                               | Power choke, Low Inductance Inductor   | 12-23 |  |  |  |  |
| 1820 (New)                            | Capacitor Test System             | DC Bias Voltage 3kV max.<br>HF AC Current 10kHz~200kHz                             | Film Capacitor   | 12-24 |  |  |  |  |
| 1870D (New)<br>1870D-12 (New)         | Inductor Test & Packing Machine   | Polarity test/Layer short test/BIAS current test/<br>Hipot test/ DCR test/LsQ test | Testing and packing for Chip inductor  | 12-25 |  |  |  |  |
| 1871 (New)                            | Inductor Layer Short ATS          | 5 tests simultaneously /2 test simultaneously                                      | Layer short testing and sorting for Chip inductor  | 12-26 |  |  |  |  |
| 8800                                  | Component ATS                     | L/C/R/Z/DCR/Turns-ratio/<br>Insulation Resistance (IR)                             | For RJ-45 equipment<br>(including LAN Modules, Ethernet IC, PoE IC, etc.),<br>glass substrate, LCD glass substrate,<br>printed circuit glass (including touch panel, etc),<br>PCB, EMI filter and ICT applications | 12-27 |  |  |  |  |
| 8801                                  | EDLC ATS                          | C (DC), internal resistance (DC), ESR (AC)   | For Electrical Double Layer Capacitor on<br>production lines   | 12-29 |  |  |  |  |
| 8802                                  | EDLC LC Monitoring System         | Leakage Current (LC)   | For Electrical Double Layer Capacitor on<br>production lines   | 12-31 |  |  |  |  |

### HF LCR Meter

### Model 11050 Series



#### **KEY FEATURES**

- Test Parameter : L/C/R/Z/Y/DCR/Q/D/ θ
   Test Frequency :
- 1kHz ~ 10MHz (11050) 60Hz ~ 5MHz (11050-5M)
- Test Level : 10mV ~ 5V
- Basic Accuracy : 0.1%
- Dasic Accuracy . 0.1 %
   7ms fast speed measurement
- 3 kinds of output impedance modes
- Test signal monitoring function
- Compare & bin-sorting function
- Open/short zeroing & load correction function
- Detached measurement & display unit design
- Standard Handler, RS-232C, USB storage & external bias current control interface
- Optional GPIB or LAN interface

The Chroma 11050 series HF LCR Meter is a precision test instrument featured in measuring and evaluating the passive components with accuracy and fast speed. The measured items cover the primary and secondary parameters required for testing the inductance, capacitance, resistance, quality factor and loss factor of passive components. The HF LCR Meter has broad testing frequency ranges from 1KHz~10MHz/60Hz~5MHz that are suitable for analyzing the passive components' characteristics under different frequencies. Its 0.1% basic measurement accuracy not only makes the measured results show high stability but also high reliability. The fast 15ms measurement speed can effectively increase the productivity when working with the automated machines.

In addition to the excellent measurement features of other Chroma LCR Meters, the 11050 series also has a variety of convenient functions. It has 3 kinds of output impedance modes to satisfy the demands of measuring and working with other instruments. The flexible digital display allows adjustments to its best fit based on the testing resolution while the test signal monitoring function is able to view the voltage and current actually carried on the DUT. Also the timing settings of trigger delay, measure delay and average number of times allow the measurements to work closely with the automated machines to get the most accurate results within the limited testing time.

The detached design adopted by Chroma 11050 series uses dual CPU to process the testing and display. It not only increases the testing speed but also shortens the test leads' length when applying to the automated machines in improving the accuracy of high frequency measurement.

Another feature of Chroma 11050 series is complete interface configuration. The standard interfaces include Handler and RS-232C for hardware and software to set the test conditions, trigger measurement, judge test results and collect measured data. The USB interface is able to save the device settings and control the output of DC bias current source. GPIB and LAN are optional interfaces available for purchase as per user's demand for software communication.

Owing to the design of portable electronic communication products nowadays tends to be thin with low power consumption, the test frequency of power inductors is getting higher and that makes the equivalent series resistance of component become a critical indicator to identify good or bad products. The buffer capacitor plays an important role for overall circuit reliability and in order to work normally under high voltage transient environment, the equivalent series resistance has to remain at a very low level during high frequency. The Chroma 11050 series is focused on testing passive components under high frequency during development so that it is close to the user's actual requirements with enhanced key measurement functions. The accuracy enhancement of low impedance measurements strengthens the usability of Chroma 11050 series in high frequency testing applications.

Designed with extensive considerations and enhancements of key features, Chroma 11050 series HF LCR Meter is the best selection for product characteristics analysis, fast testing in automated production line or parts incoming/ outgoing management.

#### ORDERING INFORMATION

11050 : HF LCR Meter 1kHz~10MHz 11050-5M : HF LCR Meter 60Hz~5MHz A110211 : Test fixture (DIP) A110234 : Test leads (1M) A110501 : : 4-Terminal SMD test fixture A133509 : GPIB & Handler interface A133510 : LAN & USB-H interface B110500 : Extension test lead for automation (BNC to SMA, 1M)

| Model1105011050-5MTest Parameter $L, C, R, Z, Y, UCR, Q, D, \theta$ Test SignalTest SignalTest Frequency $1kHz ~ 10MHz \pm (0.1\% + 0.01Hz)$ $6Hz ~ 5MHz \pm (0.1\% + 0.01Hz)$ Test Level $1kHz ~ 10MV ~ 5V; \pm [(10 + fm)\% + 10mV]$<br>$SY; \pm [(10 + fm)\% + 10mV]$ Test Level $1MHz: 10mV ~ 5V; \pm [(10 + fm)\% + 10mV]$<br>fm: test frequency [MHz]Output Impedance $100\Omega, 25\Omega, OFF$ Measurement Display Range $0.00001 uH ~ 99.999MH$ C $0.00001 \muF ~ 999.999M$ C $0.00001 \muF ~ 999.999M$ C $0.00001 \mu ~ 99.999M$ DCR $0.01m\Omega ~ 999.999M$ Q,D $0.00001 \sim 999.99M\Omega$ Q,D $0.00001 \sim 999.99M\Omega$ DCR $0.00001 \sim 999.99M\Omega$ Q,D $0.00001 \sim 999.99M\Omega$ Basic Accuracy $10\%$ Z $10\%$ Measurement SpeedVery Fast : Toms, Fast : 15ms, Slow : 295ms (1kHz)Measurement SpeedVery Fast : Toms, Fast : 15ms, Slow : 295ms (1kHz)Measurement FunctionsRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsGPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusRange Switching ModeAuto, HoldRange Switching ModeAuto, HoldLequivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sortingCorrectionOpen/Short Zeroing, Load Correction | SPECIFICATIONS           |   |          |  |  |  |  |  |
|--|--------------------------|---|----------|--|--|--|--|--|
| Test SignalTest SignalTest SignalTest Frequency $1kHz \sim 10MHz \pm (0.1\% + 0.01Hz)$ $60Hz \sim 5MHz \pm (0.1\% + 0.01Hz)$ $\leq 1MHz: 10mV \sim 5V; \pm [(10 + fm)\% + 10mV]$<br>$> 1MHz: 10mV \sim 1V; \pm [(10 + fm)\% + 1mV]$<br>fm: test frequency [MHz]Output Impedance $100\Omega, 25 \Omega, OFF$ Measurement Display Range $0.00001 \mu \sim 99.999MH$ C $0.00001 \mu \sim 99.999MH$ C $0.00001 \mu \sim 99.999MH$ C $0.00001 \mu \sim 99.999M$ DCR $0.01m\Omega \sim 999.99M\Omega$ Q, D $0.00001 \sim 999.99M$ Q, D $0.00001 \sim 999.99M$ $\theta$ $-90.00^{\circ} \sim 90.00^{\circ}$ Basic Accuracy $2$ Z $\pm 0.1\%$ Q $0.04^{\circ}$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | Model                    | 11050   | 11050-5M |  |  |  |  |  |
| Test Frequency $1 \text{kHz} \sim 10\text{MHz} \pm (0.1\% + 0.01\text{Hz})$ $60\text{Hz} \sim 5\text{MHz} \pm (0.1\% + 0.01\text{Hz})$ Test Level $\leq 1\text{MHz}: 10\text{mV} \sim 5\text{V}; \pm [(10 + fm)\% + 10\text{mV}]$<br>$>1\text{MHz}: 10\text{mV} \sim 1\text{V}; \pm [(10 + fm)\% + 1\text{mV}]$<br>fm: test frequency [MHz]Output Impedance $100\Omega, 25\Omega, \text{OFF}$ Measurement Display Range $100\Omega, 25\Omega, \text{OFF}$ L $0.00001\text{uH} \sim 99.999\text{MH}$ C $0.00001\text{pF} \sim 999.999\text{F}$ R, Z $0.01\text{m}\Omega \sim 999.999\text{M}\Omega$ DCR $0.01\text{m}\Omega \sim 999.99000$ Q, D $0.00001 \sim 999.99000^\circ$ Basic Accuracy $2$ Z $\pm 0.1\%$ Q $0.00001 \approx 90.00^\circ$ Basic Accuracy $2$ Z $\pm 0.1\%$ OCR $\pm 0.04^\circ$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceGPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   | Test Parameter           | L, C, R, Z, Y, DCR, Q, D, θ                                       |          |  |  |  |  |  |
| $\leq 1$ MHz: 10mV ~ 5V; $\pm [(10 + fm)\% + 10mV]$ Test Level>1MHz: 10mV ~ 1V; $\pm [(10 + fm)\% + 1mV]$<br>fm: test frequency [MHz]Output Impedance100 $\Omega$ , 25 $\Omega$ , OFFMeasurement Display Range0.00001uH ~ 99.999MHC0.00001pF ~ 999.999FR, Z0.01m $\Omega$ ~ 999.99M $\Omega$ DCR0.01m $\Omega$ ~ 999.99M $\Omega$ Q, D0.00001 ~ 999.99 $\theta$ -90.00° ~ 90.00°Basic AccuracyZZ $\pm 0.1\%$ $\theta$ $\pm 0.04^*$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceGPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | Test Signal              |   |          |  |  |  |  |  |
| Test Level>1MHz: $10mV \sim 1V; \pm [(10 + fm)\% + 1mV]$<br>fm: test frequency [MHz]Output Impedance $100\Omega, 25\Omega, OFF$ Measurement Display Range $0.00001\muH \sim 99.999MH$ C $0.00001\muF \sim 999.999F$ R, Z $0.01m\Omega \sim 999.999F$ R, Z $0.01m\Omega \sim 999.99M\Omega$ DCR $0.00001 \sim 999.99M\Omega$ Q, D $0.00001 \sim 999.99M\Omega$ Q, D $0.00001 \sim 999.99M\Omega$ $\partial$ CR $0.01m\Omega \sim 999.99M\Omega$ $\partial$ DCR $0.00001 \sim 999.99M\Omega$ $\partial$ DCR $0.00001 \sim 999.99M\Omega$ $\partial$ OUT $0.00001 \sim 999.99M\Omega$ $\partial$ CR $0.000001 \sim 999.99M\Omega$ $\partial$ CR $0.00000000000000000000000000000000000$          | Test Frequency           | 1kHz ~ 10MHz ± (0.1% + 0.01Hz) 60Hz ~ 5MHz ± (0.1% + 0.01Hz)      |          |  |  |  |  |  |
| fm: test frequency [MHz]Output Impedance $100 \Omega, 25 \Omega, OFF$ Measurement Display RangeL $0.00001 \mu H \sim 99.999 MH$ C $0.00001 pF \sim 999.999 MH$ C $0.00001 pF \sim 999.999 MD$ DCR $0.01 m \Omega \sim 999.99 M \Omega$ DCR $0.01 m \Omega \sim 999.99 M \Omega$ Q, D $0.00001 \sim 999.99 MD$ $\theta$ $-90.00^{\circ} \sim 90.00^{\circ}$ Basic AccuracyZZ $\pm 0.1\%$ DCR $\pm 0.04^{\circ}$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsTrigger ModeTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   |                          | ≦1MHz: 10mV ~ 5V; ± [(10 + fm)% + 10mV]                           |          |  |  |  |  |  |
| Output Impedance $100 \Omega, 25 \Omega, OFF$ Measurement Display RangeL $0.00001 \mu H \sim 99.999 MH$ C $0.00001 \mu F \sim 999.999 MH$ C $0.00001 \mu F \sim 999.999 F$ R, Z $0.01 m \Omega \sim 999.999 M\Omega$ DCR $0.01 m \Omega \sim 999.99 M\Omega$ Q, D $0.00001 \sim 999.99 M\Omega$ $\theta$ $-90.00^{\circ} \sim 90.00^{\circ}$ Basic AccuracyZ $\pm 0.1\%$ DCR $\pm 0.1\%$ $\theta$ $\pm 0.04^{\circ}$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   | Test Level               |   |          |  |  |  |  |  |
| Measurement Display RangeL $0.00001 \text{uH} \sim 99.999 \text{MH}$ C $0.00001 \text{pF} \sim 999.999 \text{F}$ R, Z $0.01 \text{m} \Omega \sim 999.999 \text{M} \Omega$ DCR $0.01 \text{m} \Omega \sim 999.99 \text{M} \Omega$ Q, D $0.00001 \sim 99999$ $\theta$ $-90.00^\circ \sim 90.00^\circ$ Basic AccuracyZZ $\pm 0.1\%$ DCR $\pm 0.1\%$ $\theta$ $\pm 0.04^\circ$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   |                          |   |          |  |  |  |  |  |
| L $0.00001 \text{uH} \sim 99.999 \text{MH}$ C $0.00001 \text{pF} \sim 999.999 \text{F}$ R, Z $0.01 \text{m} \Omega \sim 999.999 \text{M} \Omega$ DCR $0.01 \text{m} \Omega \sim 999.99 \text{M} \Omega$ Q, D $0.00001 \sim 999.99$ $\theta$ $-90.00^\circ \sim 90.00^\circ$ Basic AccuracyZ $\pm 0.1\%$ DCR $\pm 0.1\%$ $\theta$ $\pm 0.04^\circ$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control,<br>GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | <u> </u>                 | 100 Ω , 25 Ω , OFF  |          |  |  |  |  |  |
| C $0.00001pF \sim 999.999F$ R, Z $0.01m \Omega \sim 999.99M \Omega$ DCR $0.01m \Omega \sim 999.99M \Omega$ Q, D $0.00001 \sim 999.99$ $\theta$ $-90.00^{\circ} \sim 90.00^{\circ}$ Basic AccuracyZ $\pm 0.1\%$ DCR $\pm 0.1\%$ $\theta$ $\pm 0.04^{\circ}$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceTrigger ModeInternal, Manual, External bias current control, GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | Measurement Display Rang | e   |          |  |  |  |  |  |
| R, Z $0.01 \text{m} \Omega \sim 9999.99 \text{M} \Omega$ DCR $0.01 \text{m} \Omega \sim 999.99 \text{M} \Omega$ Q, D $0.00001 \sim 99999$ $\theta$ $-90.00^{\circ} \sim 90.00^{\circ}$ Basic AccuracyZ $\pm 0.1\%$ DCR $\pm 0.1\%$ $\theta$ $\pm 0.04^{\circ}$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control,<br>GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  |                          | 0.00001uH ~ 99.999MH  |          |  |  |  |  |  |
| DCR $0.01m \Omega \sim 999.99M \Omega$ Q, D $0.00001 \sim 999.99$ $\theta$ $-90.00^{\circ}$ Basic AccuracyZ $\pm 0.1\%$ DCR $\pm 0.1\%$ $\theta$ $\pm 0.04^{\circ}$ Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceMeasurement FunctionsTrigger ModeInternal, Manual, External bias current control,<br>GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   | C                        | 0.00001pF ~ 999.999F  |          |  |  |  |  |  |
| Q, D0.00001 ~ 99999θ-90.00° ~ 90.00°Basic AccuracyZ± 0.1%DCR± 0.1%θ± 0.04°Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   | R, Z                     | $0.01 \mathrm{m}\Omega \sim 9999.99 \mathrm{M}\Omega$             |          |  |  |  |  |  |
| $\theta$ -90.00° ~ 90.00°Basic Accuracy $Z$ Z $\pm$ 0.1%DCR $\pm$ 0.1% $\theta$ $\pm$ 0.04°Measurement SpeedVery Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)Communication InterfaceRS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | DCR                      | 0.01mΩ ~ 999.99MΩ   |          |  |  |  |  |  |
| Basic Accuracy         Z       ± 0.1%         DCR       ± 0.1%         θ       ± 0.1%         Reasurement Speed       Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)         Communication Interface       RS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)         Measurement Functions       Trigger Mode         Trigger Mode       Internal, Manual, External, Bus         Range Switching Mode       Auto, Hold         Equivalent Circuit Mode       Series, Parallel         Judgment       Compare, Bin-sorting   | Q, D                     | 0.00001   | ~ 99999  |  |  |  |  |  |
| Z     ± 0.1%       DCR     ± 0.1%       θ     ± 0.04°       Measurement Speed     Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)       Communication Interface     RS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)       Measurement Functions     Trigger Mode       Trigger Mode     Internal, Manual, External, Bus       Range Switching Mode     Auto, Hold       Equivalent Circuit Mode     Series, Parallel       Judgment     Compare, Bin-sorting   | θ                        | -90.00° ~ 90.00°  |          |  |  |  |  |  |
| DCR     ± 0.1%       θ     ± 0.04°       Measurement Speed     Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)       Communication Interface     RS-232C, Handler, USB storage, External bias current control, GPIB (option), LAN (option)       Measurement Functions     Trigger Mode       Trigger Mode     Internal, Manual, External, Bus       Range Switching Mode     Auto, Hold       Equivalent Circuit Mode     Series, Parallel       Judgment     Compare, Bin-sorting  | Basic Accuracy           |   |          |  |  |  |  |  |
| θ     ± 0.04°       Measurement Speed     Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)       Communication Interface     RS-232C, Handler, USB storage, External bias current control,<br>GPIB (option), LAN (option)       Measurement Functions     Internal, Manual, External, Bus       Range Switching Mode     Auto, Hold       Equivalent Circuit Mode     Series, Parallel       Judgment     Compare, Bin-sorting  | Z                        | ± 0.1%  |          |  |  |  |  |  |
| Measurement Speed     Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz)       Communication Interface     RS-232C, Handler, USB storage, External bias current control,<br>GPIB (option), LAN (option)       Measurement Functions     Internal, Manual, External, Bus       Range Switching Mode     Auto, Hold       Equivalent Circuit Mode     Series, Parallel       Judgment     Compare, Bin-sorting  | DCR                      | ± 0.1%  |          |  |  |  |  |  |
| Communication InterfaceRS-232C, Handler, USB storage, External bias current control,<br>GPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | θ                        | $\pm$ 0.04 $^{\circ}$   |          |  |  |  |  |  |
| Communication InterfaceGPIB (option), LAN (option)Measurement FunctionsInternal, Manual, External, BusTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting   | Measurement Speed        | Very Fast : 7ms, Fast : 15ms, Medium : 150ms, Slow : 295ms (1kHz) |          |  |  |  |  |  |
| Measurement FunctionsTrigger ModeInternal, Manual, External, BusRange Switching ModeAuto, HoldEquivalent Circuit ModeSeries, ParallelJudgmentCompare, Bin-sorting  | Communication Interface  | · · · · · · · · · · · · · · · · · · ·                             |          |  |  |  |  |  |
| Range Switching Mode     Auto, Hold       Equivalent Circuit Mode     Series, Parallel       Judgment     Compare, Bin-sorting   |                          |   |          |  |  |  |  |  |
| Range Switching Mode     Auto, Hold       Equivalent Circuit Mode     Series, Parallel       Judgment     Compare, Bin-sorting   | Trigger Mode             | Internal, Manual, External, Bus                                   |          |  |  |  |  |  |
| Judgment Compare, Bin-sorting  |                          |   |          |  |  |  |  |  |
| 5  | Equivalent Circuit Mode  | Series, Parallel  |          |  |  |  |  |  |
| Correction Open/Short Zeroing, Load Correction   | Judgment                 | Compare, Bin-sorting  |          |  |  |  |  |  |
|  | Correction               | Open/Short Zeroing, Load Correction                               |          |  |  |  |  |  |
| Others   |                          |   |          |  |  |  |  |  |
| Operating Environment         Temperature : 0°C ~ 40°C           Humidity : 10% ~ 90%         10%  | Operating Environment    |   |          |  |  |  |  |  |
| Power Consumption 60VA max.  | Power Consumption        | 60VA max.   |          |  |  |  |  |  |
| Power Requirement 100 ~ 240V ± 10% , 47Hz ~ 63Hz   | Power Requirement        | 100 ~ 240V ±10% , 47Hz ~ 63Hz                                     |          |  |  |  |  |  |
| Dimension (H x W x D) 230 x 428 x 290 mm / 9.06 x 16.85 x 11.42 inch   | Dimension (H x W x D)    | 230 x 428 x 290 mm / 9.06 x 16.85 x 11.42 inch                    |          |  |  |  |  |  |
| Weight Approx. 8 kg / 17.64 lb   | Weight                   | Approx. 8 kg / 17.64 lb   |          |  |  |  |  |  |

# LCR Meter

# Model 11021/11021-L



### **KEY FEATURES**

- Test frequencies:
- 100Hz, 120Hz, 1kHz and 10kHz (9.6kHz) (11021) 1kHz, 10kHz, 40kHz, 50kHz (11021-L)
- Basic accuracy: 0.1% (11021), 0.2% (11021-L)
- 0.1m Ω~99.99 MΩ measurement range, 4 1/2 digits resolution
- Lower harmonic-distortion affection
- Fast measurement speed (75ms)
- Standard RS-232 interface
- Optional GPIB & Handler interface
- Programmable trigger delay time is convenient for measurement timing adjustment in automatic production
- Bin-sorting function
- Comparator and pass/fail alarming beeper function
- Text mode 40x4 matrixes LCD display
- Friendly user interface
- Open/short zeroing
- On-line fireware refreshable (via RS-232)
- Input protection (1 Joule)

The Chroma 11021/11021-L LCR Meter are the most cost-effective digital LCR Meter, provides 100Hz, 120Hz, 1kHz, and 10kHz test frequencies for the 11021 and 1kHz, 10kHz, 40kHz, 50kHz test frequencies for the 11021-L. Standard RS-232 interface, optional GPIB & Handler interface, high speed and stable measurement capabilities enable the Chroma 11021/11021-L can be used for both component evaluation on the production line and fundamental impedance testing for bench-top applications.

The Chroma 11021/11021-L use lower harmonicdistortion phase-detection technology to reduce affection of measurement accuracy caused by hysteresis distortion in magnetic component or high dielectric-coefficient capacitor measurement, which is not provided in general low-end LCR Meters.

The 11021-L is the ideal selection for high frequency coil, core, choke, and etc. passive components incoming/outgoing material quality inspect and automatic production.

| PIB | HANDLER | RS-232 | CE |
|-----|---------|--------|----|
| Y   | Z       | ZY     |    |

### **ORDERING INFORMATION**

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11021 : LCR Meter 1kHz 11021 : LCR Meter 10kHz 11021-L : LCR Meter A110104 : SMD Test Cable #17 A110211 : Component Test Fixture A110212 : Component Remote Test Fixture A110232 : 4 BNC Test Cable with Clip#18 A110234 : High Frequency Test Cable A110235 : GPIB & Handler Interface A110236 : 19" Rack Mounting Kit A110242 : Battery ESR Test Kit A133004 : SMD Test Box A165009 : 4 BNC Test Cable with Probe

| SPECIFICATIONS             |  |   |  |  |  |
|----------------------------|--|---|--|--|--|
| Model                      | 11021  | 11021-L   |  |  |  |
| Measurement Parameter      | 1  |   |  |  |  |
| Primary Display            | L, C, R,  Z                                      |   |  |  |  |
| Secondary Display          | Q, D, ESR, Xs, θ                                 |   |  |  |  |
| Test Signals Information   |  |   |  |  |  |
| Test Level                 | 0.25V / 1V , ±(10% + 3 mV)                       | 50mV/ 1V, ±10%+3mV  |  |  |  |
| Test Frequency             | 100Hz, 120Hz, 1kHz, 10kHz<br>(9.6kHz)            | 1kHz, 10kHz, 40kHz, 50kHz   |  |  |  |
| Frequency Accuracy         | ±0.25%   | ±0.02%  |  |  |  |
| Output Impedance (Typical) | Varies as range resisto                          | rs 25, 100, 1k, 10k, 100k   |  |  |  |
| Measurement Display Range  |  |   |  |  |  |
| Primary Parameter          | , ,  | C: 0.01pF ~ 99.99mF,<br>~ 99.99M Ω                                      |  |  |  |
| Secondary Parameter        | Q: 0.1 ~ 9999.9, D: 0.0001 ~ 9                   | 999.9, θ:-180.00°~+180.00°  |  |  |  |
| Basic Accuracy *1          | ±0.1%  | ±0.2%   |  |  |  |
| Measurement Time (1KHz) *2 |  |   |  |  |  |
| Fast                       | Freq = 1k/10kHz : 75ms<br>Freq = 100/120Hz: 85ms | Freq = 1kHz/10kHz : 75ms<br>Freq = 40kHz : 105ms<br>Freq = 50kHz : 90ms |  |  |  |
| Medium                     | 145ms  | *3  |  |  |  |
| Slow                       | 325ms  | *4  |  |  |  |
| Trigger                    | Internal, Manua                                  | al, External, BUS   |  |  |  |
| Display                    |  |   |  |  |  |
| L, C, R,  Ζ , Q, D, R, θ   | 40 x 4 (Character N                              | lodule) LCD Display   |  |  |  |
| Function                   |  |   |  |  |  |
| Correction                 | Open/Sho   | ort zeroing   |  |  |  |
| Equivalent Circuit Mode    | Series,  | Parallel  |  |  |  |
| Interface & Input/Output   |  |   |  |  |  |
| Interface                  | RS-232 (Standard), Ha                            | ndler & GPIB (Optional)   |  |  |  |
| Output Signal              | Bin-sorting & H                                  | l/GO/LOW judge  |  |  |  |
| Comparator                 | Upper/Lower                                      | limits in value   |  |  |  |
| Bin Sorting                | 8 bin lir  | nits in %   |  |  |  |
| Trigger Delay              | 0~99   | 999mS   |  |  |  |
| General                    |  |   |  |  |  |
| Operation Environment      | Temperature : 10°C ~ 40                          | °C, Humidity < 90 % R.H.  |  |  |  |
| Power Consumption          | 50VA   | max.  |  |  |  |
| Power Requirement          | 90 ~ 132Vac or 180                               | ~ 264Vac, 47 ~ 63Hz   |  |  |  |
| Dimension (H x W x D)      | 100 x 320 x 206.4 mm                             | / 3.94 x 12.6 x 8.13 inch   |  |  |  |
| Weight                     | 4 kg / 8   | 8.81 lbs  |  |  |  |
|                            |  |   |  |  |  |

**Note\*1 :**  $23\pm5^{\circ}$ C after OPEN and SHORT correction, slow measurement speed. Refer to operation manual for detail measurement accuracy descriptions.

**Note\*2**: Measurement time includes sampling, calculation and judge test parameter measurement. **Note\*3**: Freq.=1kHz/10kHz 145ms Freq.=40kHz 185ms Freq.=50kHz 150ms

**Note\*4:** Freq.=1kHz/10kHz 325ms Freq.=40kHz 415ms Freq.=50kHz 400ms

/ Test &

# LCR Meter

# Model 11022/11025



### **KEY FEATURES**

- 0.1% basic accuracy
- Transformer test parameters (11025), Turns Ratio, DCR, Mutual Inductance
- 50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz,
   20kHz, 40kHz, 50kHz, 100kHz test frequencies
- 21ms measurement time ( $\geq$  100Hz)
- Agilent 4263B LCR Meter commands compatible
- 4 different output resistance modes selectable for non-linear inductor and capacitor measuring
- High resolution in low impedance( $0.01 \text{ m} \Omega$ ) and high accuracy 0.3% till 100m  $\Omega$  range
- Adjustable DC bias current up to 200mÅ (constant  $25 \Omega$ ) (11025)
- 1320 Bias Current Source directly control capability
- 0.01m  $\Omega$  ~ 99.99M  $\Omega$  wide measurement range (4 1/2 digits)
- Dual frequency function for automatic production
- BIAS comparator function
- Comparator function and 8/99 bin-sorting function
- Pass/fail judge result for automatic production
   Handler interface trigger edge (rising/falling) programmable
- Test signal level monitor function
- Standard GPIB, RS-232, and handler interface
- Open/short zeroing, load correction
- LabView<sup>®</sup> Driver

The Chroma 11022 and 11025 LCR Meters are the measurement instruments for passive components. They are applicable to the automatic manufacturers for passive components in material inspection. With the features of 21ms high-speed measurement and 0.1% accuracy, 11022 LCR Meter fulfills the requirements for fast production. Its functions of 8-level counting, 8/99 Bin-sorting, pass/fail judgment, and 50 sets of internal save and recall settings totally meet the production line requirements for easy operation.

The four impedance output modes can measure the results with the LCR Meters of other brands to get a common measurement standard. Chroma 11025 LCR Meter is compatible with HP 4263B LCR Meter IEEE-488.2 control interface and has three impedance output modes for selection. The measurement results can also be compared with other brand of LCR Meters. Chroma11022/11025 is the ideal selection for passive components quality assurance and automatic production.



### ORDERING INFORMATION

- 11022 : LCR Meter 11025 : LCR Meter A110104 : SMD Test Cable #17 A110211 : Component Test Fixture A110212 : Component Remote Test Fixture A110232 : 4 BNC Test Cable with Clip#18 A110234 : High Frequency Test Cable A110236 : 19" Rack Mounting Kit A110239 : 4 Terminals SMD Electrical Capacitor Test Box (Patent)
- A110242 : Battery ESR Test Kit A110244 : High Capacitance Capacitor Test Fixture A110245 : Ring Core Test Fixture A113012 : Vacuum Generator for A132574 A113014 : Vacuum Pump for A132574 A132574 : Test Fixture for SMD power choke A133004 : SMD Test Box A133019 : BNC Test Lead, 2M (single side open) A165009 : 4 BNC Test Cable with Probe

| SPECIFICATIONS                          |  |   |  |  |
|---|--|---|--|--|
| Model                                   | 11022  | 11025   |  |  |
| Test Parameter                          | L,C, R, Z , Q, D, ESR, X, θ  | L,C, R, Z, Q, D, ESR, X, $\theta$<br>DCR4, M, Turns Ratio, L2, DCR2               |  |  |
| Test Signals                            |  |   |  |  |
| Level                                   | · · · · ·  | mV; ±(10% + 3 mV)   |  |  |
| Frequency                               | 50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 40kHz, 50kHz, 100kHz ; ±0.01%  |   |  |  |
| Output Impedance<br>(Nominal Value)     | Constant 107 x : $25 \Omega$ ; Constant 320 x : $100 \Omega$<br>Constant 106x: $2 \Omega$ , for $Z \ge 10 \Omega$ ,<br>100mA (1V setting) for reactive load $\le 10 \Omega$<br>Constant 102x: $25 \Omega$ , for $Z < 1 \Omega$ , $100 \Omega$ for else |   |  |  |
| DC Bias Current<br>(Freq. $\geq$ 1kHz)  |  | 50mA max. for Constant 100 Ω<br>200mA max for Constant 25 Ω<br>(AC level ≤ 100mV) |  |  |
| Measurement Display Range               |  |   |  |  |
| C (Capacitance)                         | · · ·  | ~ 1.9999F   |  |  |
| L, M, L2 (Inductance)                   | · · ·  | ~ 99.99k  |  |  |
| Z (Impedance), ESR                      | <b>0.01m</b> Ω ~99.99MΩ  |   |  |  |
| Q (Quality Factor)                      | 0.0001 ~ 9999  |   |  |  |
| D (Dissipation Factor)                  | 100.00   | 100.00°   |  |  |
| $\theta$ (Phase Angle)                  | -180.00 ~  | ~ +180.00°  |  |  |
| Turns Ratio (Np:Ns)<br>DCR              |  | 0.9~999.99<br>0.01mΩ~99.99MΩ  |  |  |
| Basic Measurement Accuracy *1           |  | 0.0111122~99.9910122  |  |  |
| Measurement Time (Fast) *2              | 21ms   |   |  |  |
| Interface & I/O                         |  |   |  |  |
| Interface                               | handler (50pir   | n), GPIB, RS-232  |  |  |
| Output Signal                           | Bin-sorting & HI   | /GO/LOW judge   |  |  |
| Comparator                              | Upper/Lower  | limits in value   |  |  |
| Bin Sorting                             | 8/99 bin lim   | its in %, ABS   |  |  |
| Trigger Delay                           |  | 199ms   |  |  |
| Display                                 | 240 x 64 dot-ma  | atrix LCD display   |  |  |
| Function                                |  |   |  |  |
| Correction                              |  | ng, load correction   |  |  |
| Averaging                               | · · ·  | grammable   |  |  |
| Cable Length<br>Test Sig. Level Monitor |  | , 2m, 4m<br>, Current   |  |  |
| Equivalent Circuit mode                 |  | Parallel  |  |  |
| Memory (Store/ Recall)                  | ,  | nent setups   |  |  |
| Trigger                                 |  | al, External, BUS   |  |  |
| General                                 | internal, Maria  |   |  |  |
| Operation Environment                   | Temperature : 10°C~40°   | C Humidity : < 90 % R.H.  |  |  |
| Power Consumption                       |  | A max   |  |  |
| Power Requirements                      | 90 ~ 132Vac or 180   | ~ 264Vac, 47 ~ 63Hz   |  |  |
| Dimension (H x W x D)                   | 100 x 320 x 347.25 mm  | / 3.94 x 12.6 x 13.67 inch  |  |  |
| Weight                                  | 5.5 kg /   |   |  |  |

**Note\*1 :** 23  $\pm$  5°C after OPEN and SHORT correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

**Note\*2 :** Measurement time includes sampling, calculation and judge of primary and secondary test parameter measurement.

# **Precision LCR Meter**

# Model 1062A/1075



### **KEY FEATURES**

- Test frequency : 20Hz ~ 200kHz, 0.2% programmable test frequency (1075)
- Test frequency : 40Hz ~ 200kHz, 30 Steps (1062A)
- Basic accuracy : 0.1%
- 3 different output impedance modes, measurement results are compatible with other well-know LCR meters
- High resolution (0.01m Ω) and high accuracy 0.3% till 400m Ω range are the right tool for low inductance
- Large capacitance, and low impedance component measuring
- Single-function keys, clear LED display, easy to operate
- **0.01m**  $\Omega$  ~99.999m  $\Omega$  wide measurement range with 5 digits resolution
- Optional Handler & GPIB interface

### GPIB HANDLER

- 8 bin sorting and bin sum count function (1075)
- Primary parameter: HI/GO/LO and secondary parameter: GO/NG judge result (1062A)
- Alarm for GO/NG judge result
- L/C/R/Z nominal value, upper limit %, lower limit %, Q/D/R/ θ limit setting display (1062A)
- 10 bins sorting and bin sum count function (1075)
- Test signal level monitor function

The 1062A/1075 LCR Meters are the measurement instruments for passive components. They are applicable to the automatic manufacturers for passive components in material inspection and production line. This series of LCR Meters can fully fulfill the fast and accurate requirements for automatic production. The functions of 8-level counting, pass/fail judgment, and 10 sets of internal save and recall settings meet the production line requirements for speed and quality, thus make this series of LCR Metes the best measurement instruments for material and production line inspection for passive components.

### **ORDERING INFORMATION**

1062A : Precision LCR Meter 1075 : LCR Meter A110104 : SMD Test Cable #17 A110211 : Component Test Fixture A110212 : Component Remote Test Fixture A110232 : 4 BNC Test Cable with Clip#18 A110234 : High Frequency Test Cable A110239 : 4 Terminals SMD Electrical Capacitor Test Box (Patent) A110601 : GPIB & handler Interface

A133004 : SMD Test Box A165009 : 4 BNC Test Cable with Probe



Model 1075

|                            | components.   |  |  |  |  |
|----------------------------|---|--|--|--|--|
| SPECIFICATIONS             |   |  |  |  |  |
| Model                      | 1062A   | 1075   |  |  |  |
| Measurement Parameter      |   |  |  |  |  |
| Primary Display            | L,C,R, Z,∆%   | L, C, R, Z $\Delta$ , $\Delta$ %                     |  |  |  |
| Secondary Display          | Q, D,   | ESR, $\theta$  |  |  |  |
| Test Signals Information   |   |  |  |  |  |
| Test Level                 | 10mV~2.5V(non-10  | 6x mode),10mV/step                                   |  |  |  |
| Test Frequency             | 40 Hz~200 kHz, 30 steps                                   | 20 Hz~200 kHz, programmable                          |  |  |  |
| Frequency Accuracy         | ±0  | .01%   |  |  |  |
|                            |   | esistors; Constant = 1 : 25 $\Omega \pm 5\%$         |  |  |  |
| Output Impedance(Typical)  | Constant = 2 : 100 $\Omega \pm$ 5% ; Consta               | ant = $3: 2\Omega$ , for impedance $\geq 10\Omega$ ; |  |  |  |
|                            | 100mA (1V setting), fo                                    | r inductive load $\leq 10 \Omega$                    |  |  |  |
| Measurement Display Range  |   |  |  |  |  |
| Primary Parameter          | R,  Z  : 0. 01m Ω ~9999.9M Ω , L: 0.000                   | 1μH~99999.9H, C: 0.0001pF~9999.9mF                   |  |  |  |
| Secondary Parameter        |   | θ:-90.00°~+90.00°,                                   |  |  |  |
| Secondary Falameter        | ESR: $0.01 \mathrm{m}\Omega \sim 9999 \mathrm{k}\Omega$ , | , ∆% : 0.0001%~999.99%                               |  |  |  |
| Basic Accuracy *1          | ±(  | D.1%   |  |  |  |
| Measurement Time (Fast) *2 |   |  |  |  |  |
| Frequency ≧ 1kHz           | 55  | ms   |  |  |  |
| Frequency =120Hz           | 11:   | 5 ms   |  |  |  |
| Frequency =100Hz           | 130   | 130 ms   |  |  |  |
| Trigger                    | Internal, External, Manual                                |  |  |  |  |
|                            | L, C, R,  Z  : 5 digits                                   | L, C, R,  Z  : 5 digits                              |  |  |  |
| Display                    | Q, D, R, $\theta$ : 4 digits                              | Q, D, R, $\theta$ : 4 digits                         |  |  |  |
| Display                    | Freq./Voltage/Current : 3 digits                          | Freq./Voltage/Current : 3 digits                     |  |  |  |
|                            | D/Q Limit : 5 digits                                      | Bin No./Range : 1 digits                             |  |  |  |
| Function                   |   |  |  |  |  |
| Correction                 | Open/Short Zeroing  | Open/Short zeroing, Load                             |  |  |  |
| Equivalent Circuit Mode    | Series,   | Parallel   |  |  |  |
| Interface & Input/Output   |   |  |  |  |  |
| Interface                  | GPIB, Handler (24 pin)                                    | GPIB ,Handler (24 pin)                               |  |  |  |
| Output Signal              | Pass/Fail identification                                  | Sorting Signal                                       |  |  |  |
| Comparator                 | Upper limit/ Lower limit(%) setting                       |  |  |  |  |
| Bin Sorting                |   | 8 bin sorting (%)                                    |  |  |  |
| Memory                     | 1 set   | 10 set   |  |  |  |
| General                    |   |  |  |  |  |
| Operation Environment      | Temperature : 10°C ~ 40                                   | °C, Humidity : < 90 % R.H.                           |  |  |  |
| Power Consumption          |   | A max.   |  |  |  |
| Power Requirement          | 90 ~ 132Vac or 180  | ~ 264Vac, 47 ~ 63Hz                                  |  |  |  |
| Dimension (H x W x D)      | 130 x 410 x 353 mm /                                      | 5.12 x 16.14 x 13.9 inch                             |  |  |  |
| Weight                     | 6.2 kg / 13.66 lbs  |  |  |  |  |

1) Warm up time: >10 min. 2) Environment temperature:  $23 \pm 5^{\circ}$ C 3) OPEN/SHORT offset modification completed 4) D < 0.1 Note\*2: Measurement time includes all of the time for UUT measurement, calculation and primary/secondary parameters identification. Manufacturing Execution System

/ Test &

# **Capacitance Meter**

# Model 11020

| 1.2345 pF<br>o Lo | an<br>an |  |
|-------------------|----------|--|
| 00                | 44       |  |

### **KEY FEATURES**

- Test frequencies: 100Hz, 120Hz, 1kHz
- Basic accuracy: 0.1%
- High measurement speed: 5ms in 1kHz, 15ms in 100Hz/120Hz
- Large LCD display (240x64 dot-matrix)
- Wide measurement range: 0.1pF ~ 3.999F
- Standard Handler interface
- Comparator and pass/fail alarming beeper function
- Setups backup function



The Chroma 11020 Capacitance Meter is a high-speed precision Capacitance Meter. Provides 100Hz, 120Hz, and 1kHz test frequencies. Measurement time is only 5 milliseconds in 1kHz, and less than 15 milliseconds in 100Hz and 120Hz test frequencies. Combine with 0.1% basic accuracy and standard Handler interface, enable the Chroma 11020 can be used on high speed production line for various capacitors.

### **ORDERING INFORMATION**

11020 : Capacitance Meter A110104 : SMD Test Cable #17 A110211 : Component Test Fixture A110212 : Component Remote Test Fixture A110234 : High Frequency Test Cable A110236 : 19" Rack Mounting Kit A110239 : 4 Terminals SMD Electrical Capacitor Test Box (Patent) A110244 : High Capacitance Capacitor Test Fixture A133004 : SMD Test Box

| SPECIFICATIONS             |   |  |  |  |
|----------------------------|---|--|--|--|
| Model                      | 11020   |  |  |  |
| Test Parameter             | Capacitance, Dissipation factor                   |  |  |  |
| Test Signals               |   |  |  |  |
| Test Level                 | 1V(10% + 3mV)                                     |  |  |  |
| Test Frequency             | 100Hz, 120Hz, 1kHz                                |  |  |  |
| Output Impedance           | Varies as range resistors                         |  |  |  |
| Measurement Range          |   |  |  |  |
| C                          | 0.1pF~3.999F(100Hz, 120Hz), 0.01pF~399.9µF(1kHz)  |  |  |  |
| Basic Accuracy *1          | ±0.1%   |  |  |  |
| Measurement Speed(Fast) *2 |   |  |  |  |
| C, Frequency $\geq$ 1kHz   | 5ms   |  |  |  |
| C, Frequency =100Hz, 120Hz | 15ms  |  |  |  |
| D factor measurement       | 2ms   |  |  |  |
| Trigger                    | Internal, External                                |  |  |  |
| Equivalent Circuit Mode    | Series, Parallel                                  |  |  |  |
| Interface&Input/Output     |   |  |  |  |
| Interface                  | Handler (24pin)                                   |  |  |  |
| Output Signal              | HI/GO/LO judge (Capacitor),GO/NG judge (D factor) |  |  |  |
| Comparator                 | Upper/Lower limits(%, ABS)                        |  |  |  |
| Display                    | 240x64 dot-matrix LCD display                     |  |  |  |
| Correction Function        | Zeroing   |  |  |  |
| Averaging                  | 1, 2, 4, 8, 16, 32, 64                            |  |  |  |
| Memory                     | 1 instrument setups                               |  |  |  |
| General                    |   |  |  |  |
| Operation Environment      | Temperature:10°C ~ 40°C, Humidity : < 90 % RH     |  |  |  |
| Power Consumption          | 65VA max.   |  |  |  |
| Power Requirements         | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz            |  |  |  |
| Dimension (H x W x D)      | 100 x 320 x 347.25 mm / 3.94 x 12.6 x 13.67 inch  |  |  |  |
| Weight                     | 5.5 kg / 12.11 lbs                                |  |  |  |

Note\*1: The specification of accuracy is under the following conditions :

1) Warm up time : >10 min. 2) Environment temperature : 23±5°C 3) OPEN/SHORT offset modification completed

Note\*2: Measurement time includes all of the time for UUT measurement, calculation and primary/secondary parameters identification.

# Automatic Transformer Tester

# Model 13350



### **KEY FEATURES**

- Test frequency 20Hz ~ 200kHz
- Turn Ratio, Phase, L, Q, Lk, ACR, DCR, Cp, Pin short, Balance
- Basic accuracy : 0.1%
- Three different output impedance modes
- Scan unit/box including :
  - 20ch scan test unit
  - 80ch\* scan box
  - C.T.\* test fixture

### **KEY FEATURES**

- Compensation for individual channel
- \*Combine measurement unit with scanbox to reduce measurement errors
- \*USB storage interface
- \*10-100 LAN/ USB-H interface (option)
   \*Built-in programmable 100mA bias
- current (RJ-45)
- \*Test frequency, voltage and speed set separately
- \*Fail Lock function
- \*Auto Test function
- \*Equipped with external standard test on 20ch scan test unit
- \*Reduce the short-circuit loss in secondary side for leakage (Lk) test (A133502 20ch scan unit)
- \*Short-circuit pin selectable for every test item
- \*Multiple language: English & Simplified Chinese
- \*RS232 interface compatible SCPI commands

\* New features compared to Chroma 3250 Series



Acquired from many years of marketing experiences and cumulative results, Chroma 13350 is the newest generation of Automatic Transformer Tester that not only retains the merits of old 3250 model but also has many new functions including the combination of measurement unit and scan box to reduce measurement error caused by long wire, C.T. test fixture and 80/20 channels scan box support, USB interface for test conditions back-up, LAN communication interface, separate setting of test frequency/voltage/speed, Fail Lock function and Auto Test. It solves the performance and quality problems as well as human errors occurred on production line for the transformer industry today.

For instance: To reduce human errors on production line, the13350 Fail Lock function is able to lock the defect DUT (Device Under Test) when the test is done to prevent it from flowing out accidently. In order to cut down the time for placement, the 13350 Auto Test function can conduct test directly without pressing the trigger key. In addition, the 13350 adopts the design of dual CPU to increase the test speed by processing the measurement and display units simultaneously.

The compensation function of 13350 can do OPEN/SHORT for individual channel to solve the errors due to different layout on various fixtures.

13350 provides 20Hz-200kHz test frequency and scan test items to cover low voltage test parameters for various transformers including Inductance (L), Leakage (Lk), Turn-Ratio, DC Resistance (DCR), Impedance (Z), Stray Capacity (C), Quality Factor (Q), Equivalent Series Resistance (ESR), Pin Short (PS), Winding Phase (PH) and Balance.

### Applicable Test Options for Selection A133502 20 Channels Scan Box

13350 uses split screen that allows the measurement unit to integrate the 20 channels scan box without using any connecting wires to reduce measurement errors. Furthermore, the 20 channels scan box has external standard test function that can perform verification test directly without any act of disassembly.

### A133505 80 Channels Scan Box

13350 along with 80 channels scan box can mainly offer three different applications:

- 1) RJ-45 & LAN Filter test solution that can test up to 80 pins one time.
- Transformer automation solution that can place 4 transformers on one carrier for scan test simultaneously.
- Island-type production line planning that provides a time division multiplexing module to increase the equipment utilization rate.

### A133506 C.T. (Current Transformer) Test Fixture

When the 13350 works with A133506 C.T. Test Fixture, it can measure the turns, inductance and DC resistance easily and rapidly by putting in the C.T. directly.

### **ORDERING INFORMATION**

13350D : Automatic Transformer Tester -**Display Unit** 13350M-200k : Automatic Transformer Tester -Measurement Unit A133502: 20CH Scanning Box A133505: 80CH Scanning Box A133506 : C.T. test fixture A133507 : Connecting Conversion Unit (I/F of 80CH scan box / provide I/O control interface/1320 DC bias cable link / BNC terminals) A133509 : GPIB Interface A133510: LAN & USB-H Interface A133512 : Transformer Test Software B133500: Fiberglass Board (connecting A133502 with A132501 fixtures)



Model 13350 with A133505,A133507

Electron

Semiconductor/

PXI Test &

# Automatic Transformer Tester

# Model 13350

| SPECIFICATIONS Model                      |  |  |  |  |
|---|--|--|--|--|
| mouel                                     | 13350  |  |  |  |
| Main Function                             | Transformer Scanning Test  |  |  |  |
| Test Parameter                            |  |  |  |  |
|   | Ratio, Phase, Turn, L, Q, Leakage L, Balance, ACR, Cp, DCR, Pin Short  |  |  |  |
| Test Signals Information                  | ······································   |  |  |  |
| Turp                                      | 10mV~10V, ±10% 10mV/step   |  |  |  |
| Test Level Others                         | 10mV~2V, ±10% 10mV/step  |  |  |  |
| Test Turn                                 | 20Hz~200kHz, ± (0.1% + 0.01Hz), Resolution: 0.01Hz   |  |  |  |
| Frequency Others 2                        | 20Hz~200kHz, ± (0.1% + 0.01Hz), Resolution : 0.001Hz (<1kHz)   |  |  |  |
| Turn                                      | 10 $\Omega$ , when level $\leq$ 2V / 50 $\Omega$ , when level > 2V   |  |  |  |
| Output                                    | Constant = OFF : Varies as range resistors   |  |  |  |
| Impedance Others                          | Constant = 320X : 100 $\Omega$ ±5% ; Constant = 107X : 25 $\Omega$ ±5%   |  |  |  |
| Constant=106X : 100mA                     | $\pm$ 5% (1V setting); for inductive load less than 10 $\Omega$ ,10 $\Omega$ $\pm$ 10%, for impedance $\geq$ 10 $\Omega$ |  |  |  |
| Measurement Display Range                 |  |  |  |  |
| L, LK                                     | 0.00001µH~9999.99H   |  |  |  |
| С   | 0.001pF~999.999mF  |  |  |  |
| Q, D                                      | 0.00001~99999  |  |  |  |
| Z, X, R                                   | 0.0001 Ω ~999.999M Ω   |  |  |  |
| θ   | -90.00°~+90.00°  |  |  |  |
| DCR                                       | <b>0.01m</b> Ω ~99.999M Ω  |  |  |  |
| Turn,Ratio                                | 0.01~99999.99 turns (Secondary voltage less than 100 Vrms)   |  |  |  |
| Ratio (dB)                                | -39.99dB~+99.99dB (secondary voltage less than 100 Vrms)   |  |  |  |
| Pin-Short                                 | 11 pairs, between pin to pin   |  |  |  |
| Basic Accuracy                            |  |  |  |  |
| L, LK, C, Z, X, Y, R, DCR                 | ± 0.1% (1kHz if AC parameter)  |  |  |  |
| DCR                                       | ±0.5%  |  |  |  |
|   | ±0.04°(1kHz)   |  |  |  |
| Turn, Ratio (dB)                          | ±0.5% (1kHz)   |  |  |  |
| Measurement Speed (Fast)                  | 50 maas /aas   |  |  |  |
| L, LK, C, Z, X, Y, R, Q, D, θ<br>DCR      | 50 meas./sec.<br>12 meas./sec.   |  |  |  |
|   | 12 meas/sec.<br>10meas/sec.  |  |  |  |
| Turn, Ratio (dB)                          | Tumeas./sec.   |  |  |  |
| Judge Transformer Scanning PASS/FAIL judg | ge of all test parameters output from Handler interface, 100 bin sorting for Lk  |  |  |  |
| Trigger                                   | Internal, Manual, External   |  |  |  |
| Display                                   | Color 640x480 LCD panel  |  |  |  |
| Equivalent Circuit Mode                   | Series, Parallel   |  |  |  |
| Correction Function                       | Open/Short Zeroing, Load correction  |  |  |  |
| Memory                                    | 15 instrument setups, expansion is possible via memory card  |  |  |  |
| General                                   |  |  |  |  |
| Operation Environment                     | Temperature:10°C~40°C, Humidity: 10%~90% RH  |  |  |  |
| Power Consumption                         | 60 VA max.   |  |  |  |
| Power Requirement                         | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz (Auto Switch)   |  |  |  |
| · · · · · · · · · · · · · · · · · · ·     | 13350M : 58 x 280 x 300 mm / 2.28 x 11.02 x 11.8 inch  |  |  |  |
| Dimension (H x W x D)                     | 13350D : 45 x 140 x 225 mm / 1.77 x 5.51 x 10.03 inch  |  |  |  |
| Woight                                    | 13350M : Approx. 3.5 kg / 7.71 lbs   |  |  |  |
| Weight                                    | 13350D : Approx. 1.3 kg / 2.86 lbs   |  |  |  |

# **Transformer Test System**

# Model 3250/3252/3302



### **KEY FEATURES**

- Test frequency: 20Hz~200kHz/1MHz, 0.02% accuracy
- Basic accuracy: 0.1%
- Different output impedance modes, measurement results are compatible with other well-known LCR meters
- Enhanced Turn Ratio measurement accuracy for low permeability core
- Fast Inductance/ Turn Ratio measurement speed up to 80 meas./sec
- Fast DCR measurement speed up to 50 meas./sec
- Graphical and tabular display of swept frequency, voltage current and bias current measurements (3252/3302)
- Build-in 8mA bias for RJ45 transmission transformer saturation condition (option)
- Leakage inductance 100 bin sorting and balance of leakage inductance for TV inverter transformer
- ALC (Auto Level Compensation) function for MLCC measurement (3252/3302)
- Test fixture residual capacitance compensation for transformer inductance measurement
- 1320 Bias Current Source directly control capability (3252/3302)
- 320x240 dot-matrix LCD display
- Support versatile standard and custom-design test jigs
- Four-terminal test for accurate, stable DCR, inductance and turn ratio measurements
- Built-in comparator; 10 bin sorting with counter capability (3252/3302)
- Lk standard value with Lx measure value
- 4M SRAM memory card, for setup back-up between units
- Standard RS-232, Handler, and Printer Interface, option GPIB Interface for LCR function only
- 15 internal instrument setups for store/recall capability



Model 3302

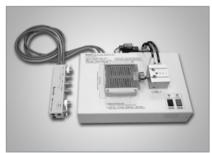


The 3250/3252/3302 Transformer Test System are the precision test systems, designed for transformer production line or incoming/ outgoing inspection in quality control process, with high stability and high reliability.

The 3250/3252 provide 20Hz-200kHz test frequencies, and 3302 provides 20Hz-1MHz test frequencies. In addition to transformer scanning test function, the 3252/3302 have LCR Meter function. In test items, The 3250/3252/3302 cover most of transformer's low-voltage test parameters which include primary test parameters as Inductance, Leakage Inductance, Turns-Ratio, DC resistance, Impedance, and Capacitance (between windings) etc.; secondary test parameters as Quality Factor and ESR etc.; and pin-short test function. High-speed digital sampling measurement technology combined with scanning test fixture (A132501) design, improve low-efficiency transformer inspection to be more accurate and faster.

The 3250/3252/3302 even provide several output impedance selection to solve inductance measurement error problem caused by different test current caused by different output impedance provided by different LCR Meters. And, equivalent turns-ratio calculated from measured inductance of windings is also provided to improve turnsratio measurement error problem caused by large leakage magnetic flux in transformer with low permeability magnetic core.

In addition to transformer scanning test function, the 3252/3302 have LCR Meter function, can be used in component incoming/outgoing inspection, analysis and automatic production line.



A132501:

Auto Transformer Scanning Box (3001A)

| Test Fixtu | re Model                | 3250 | 3252 | 3302 | 3312 |
|------------|-------------------------|------|------|------|------|
| A132547    | 4-4mm Test Fixture      | •    | •    | •    | •    |
| A132572    | 3.5/4mm Test Fixture    | •    | •    | ٠    | •    |
| A132573    | 3.2/3.5mm Test Fixture  | •    | •    | •    | •    |
| A132579    | 7.5-5mm Test Fixture    | •    | •    | •    | •    |
| A132583    | 3.0-3.0mm Test Fixture  | •    | •    | •    |      |
| A132584    | 3.5-3.5mm Test Fixture  |      |      | •    | •    |
| A132585    | 3.8-3.8 mm Test Fixture | •    | •    | •    | •    |
| A132586    | 3.0-4.0 mm Test Fixture | •    | •    | •    | •    |

### **ORDERING INFORMATION**

3250 : Automatic Transformer Test System 3250 : Automatic Transformer Test System with 8mA Bias 3252 : Automatic Component Analyzer 3252 : Automatic Component Analyzer with GPIB interface 3302 : Automatic Component Analyzer 3302 : Automatic Component Analyzer with GPIB interface 3302 : Automatic Component Analyzer with 8mA Bias 3302 : Automatic Component Analyzer

without Transformer Scan

A110104 : SMD Test Cable #17 A110211 : Component Test Fixture

A110212 : Component Remote Test Fixture

A110234 : High Frequency Test Cable A110239: 4 Terminals SMD Electrical Capacitor

Test Box (Patent)

A113012 : Vacuum Generator for A132574

A113014 : Vacuum Pump for A132574 A132501 : Auto Transformer Scanning Box (3001A)

A132563 : WINCPK Transformer Data Statistics & Analysis Software for USB port

A132574 : Test Fixture for SMD power choke

A133004 : SMD Test Box A133006: 1A Internal Bias Current Source

A133019: BNC Test Lead, 2M (singleside open)



A132563 : WINCPK Transformer Data Statistics & Analysis Software for Model 3250/3252/3302

PXI Test &

# Transformer Test System

# Model 3250/3252/3302

| SPECIFICATIO             | ONS           |  |  |  |  |  |  |
|--------------------------|---------------|--|--|--|--|--|--|
| Model                    |               | 3250   | 3252   |  | 3302   |  |  |
| <b>Main Functio</b>      | n             | Transformer Scanning Test                      |  | Transform                                | er Scanning Test + LCR Meter   |  |  |
| Test Paramet             | er            |  |  |  |  |  |  |
| Transformer So           | canning       | Turn Rat                                       | io, Phase, Turn, L, Q, Le                                  | akage L, Balano                          | ce, ACR, Cp, DCR, Pin Short  |  |  |
| LCR METER                |               |  |  | L, C, R,  Z , Y                          | , DCR, Q, D, R, X, $\theta$ , Ratio (dB)   |  |  |
| Test Signals I           | nformation    |  |  |  |  |  |  |
| Test Level               | Turn          | 10mV~10V, $\pm$ 10% 10mV/step                  |  |  |  |  |  |
| lest Level               | Others        |  | 10mV~2V  | $t_{\rm r} \pm 10\%  10 {\rm mV}_{ m c}$ | /step  |  |  |
| Tast                     | Turn          | 1kHz~200kHz, ± (0.1% + 0                       | .01Hz), Resolution: 0.0                                    | 1 Hz                                     | 1kHz~1MHz, ± (0.1%+0.01Hz), Resolution : 0.01 Hz   |  |  |
| Test<br>Frequency Others |               | 20Hz~200kHz, ± (0.1% + 0.01H                   | z), Resolution : 0.001 H                                   | z (<1kHz)                                | 20Hz~1MHz, ±(0.1%+0.01Hz),<br>Resolution 0.001 Hz (<1kHz)  |  |  |
| <b>a</b>                 | Turn          |  | 10Ω, when level≦   | ≦2 <b>V / 50</b> Ω,wh                    | en level > 2V  |  |  |
| Output                   |               |  | Constant = OFF   | : Varies as rang                         | ge resistors   |  |  |
| Impedance<br>Display     | Others        |  | nstant = $320X : 100 \Omega$ :<br>% (1V setting); for indu |  | t = 107X : 25 $\Omega$ ± 5%<br>than 10 $\Omega$ , 10 $\Omega$ ± 10%, for impedance ≥ 10 $\Omega$ |  |  |
| Measuremen               | t Display Ran | ge   |  |  |  |  |  |
| L, LK                    |               |  | 0.0000   | )1µH~99999.99                            | Н  |  |  |
| C                        |               |  | 0.0000   | 1pF~999.999m                             | ٦F   |  |  |
| Q, D                     |               |  | 0.0  | 0001~999999                              |  |  |  |
| Z, X, R                  |               |  | 0.0000   | 1 Ω ~99.9999M                            | Ω  |  |  |
| Y                        |               |  | 0.01   | nS~99.9999S                              |  |  |  |
| θ                        |               |  | -90  | .00°~+90.00°                             |  |  |  |
| DCR                      |               |  | 0.01m  | nΩ~99.999MΩ                              | 2  |  |  |
| Turn,Ratio               |               | 0.0  | 1~99999.99 turns (Sec                                      | ondary voltage                           | e less than 100 Vrms)  |  |  |
| Ratio (dB)               |               |  | 9.99dB~+99.99dB (seco                                      |  |  |  |  |
| Pin-Short                |               |  |  | between pin to                           |  |  |  |
| Basic Accurac            | cv            |  | · ·  |  |  |  |  |
| L, LK, C, Z, X, Y,       |               |  | 0.1% (1kł  | Iz if AC param                           | eter)  |  |  |
| Q, D                     | ,             |  |  | 0005(1kHz)                               |  |  |  |
| <u>θ</u>                 |               |  |  | ).03°(1kHz)                              |  |  |  |
| Turn, Ratio (dB          | 3)            |  |  | .5% (1kHz)                               |  |  |  |
| Measuremen               |               | )  |  |  |  |  |  |
| L, LK, C, Z, X, Y,       |               | ,  | 8  | Omeas./sec.                              |  |  |  |
| DCR                      |               |  |  | Omeas./sec.                              |  |  |  |
| Turn, Ratio (dB)         |               |  |  | Omeas./sec.                              |  |  |  |
| Judge                    | - /           |  | · · ·  |  |  |  |  |
| Transformer So           | canning       | PASS/FAIL judge o                              | f all test parameters ou                                   | Itput from Han                           | dler interface, 100 bin sorting for LK   |  |  |
|                          | canning       |  | •  | •  | ing & bin sum count output from  |  |  |
| LCR METER                |               |  |  |  | /FAIL judge output from Handler interface  |  |  |
| Trigger                  |               | I  |  | , Manual, Exter                          |  |  |  |
| Display                  |               |  |  | ot-matrix LCD o                          |  |  |  |
| Equivalent Ci            | ircuit Mode   |  |  | ries, Parallel                           |  |  |  |
| Correction Fu            |               |  | Open/Short Z   | eroing, Load c                           | orrection  |  |  |
| Memory                   |               | 15   | instrument setups, exp                                     | <u> </u>                                 |  |  |  |
| General                  |               |  |  |  |  |  |  |
| <b>Operation Env</b>     | vironment     |  | Temperature:10°C~4   | 40°C, Humidity                           | /: 10%~90% RH  |  |  |
| Power Consum             |               |  | 1  | 40 VA max.                               |  |  |  |
| Power Require            | •             |  | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz                     |  |  |  |  |
| Dimension (H             |               | 177 x 430 x 300 mm / 6.97 x 16.93 x 11.81 inch |  |  |  |  |  |
| Weight                   |               |  |  | kg / 20.26 lbs                           |  |  |  |
|                          |               |  | 5.2  | 9. 20.201.05                             |  |  |  |
| Model                    |               | A132501  |  |  |  |  |  |
| Standard Jig             |               | 20 pins  |  |  |  |  |  |
| Test Contact             | pin           | Four terminals cont                            | act  |  |  |  |  |
| Control                  |               |  |  |  |  |  |  |
| Button                   |               | START, RESET                                   |  |  |  |  |  |
| Indicators               |               | GO, NG   |  |  |  |  |  |
| Solenoid Valv            | ve            |  |  |  |  |  |  |
| Pressure                 |               | 0.15~0.7Mpa(1.5~7.1kg                          | gf/cm <sup>2</sup> )                                       |  |  |  |  |
| General                  |               |  |  |  |  |  |  |
| Operation Env            | vironment     | Temperature: 10°C~40°C, Humidi                 | ity: 10%~90% RH  |  |  |  |  |
| Power Consum             | nption        | 40 VA max.                                     |  |  |  |  |  |
| Power Require            |               | 90~264Vac, 47~63                               | Hz   |  |  |  |  |
| Dimension (H             |               | 90 x 270 x 220 mm / 3.54 x 10.                 |  |  |  |  |  |
| Weight                   |               | 3.2 kg / 7.05 lbs                              |  |  |  |  |  |
| .11                      |               |  |  |  |  |  |  |

# **Telecom Transformer Test System**



CE

GPIB



### **KEY FEATURES**

- Includes most test items in telecommunication transformer inspection.
- Programmable frequency : 20Hz~1MHz, 0.02% accuracy
- Basic accuracy : 0.1%
- 3 different output impedance modes, measurement results are compatible with other well-known LCR meters
- Enhanced Turn Ratio measurement accuracy for low permeability core
- ast Inductance/ Turn Ratio measurement speed up to 80 meas./sec
- Fast DCR measurement speed up to 50 meas./sec
- 1320 Bias Current Source directly control capability
- 320x240 dot-matrix LCD display
- Support versatile standard and custom-design test jigs
- Four-terminal test for accurate, stable DCR, inductance and turn ratio measurements
- Built-in comparator; 10 bin sorting with counter capability
- 4M SRAM memory card, for setup back-up between units
- Standard RS-232, Handler and Printer interface, option GPIB Interface for LCR function only
- 15 internal instrument setups for store/recall capability

The 3312 Telecom Transformer Test System is a precision test system, designed for telecom transformer production line or incoming/ outgoing inspection in quality control process, with high stability and high reliability.

The 3312 provides 20Hz-1MHz test frequencies. In addition to transformer scanning test function, the 3312 has LCR Meter function. In test items, The 3312 covers most of telecom transformer's low-voltage test parameters which include telecom test parameters as Return Loss (RLOS), Reflected Impedance (Zr), Insertion Loss (ILOS), Frequency response (FR), and Longitudinal Balance (LBAL) etc.; primary test parameters of general transformer as Inductance, Leakage Inductance, Turns-Ratio, DC resistance, Impedance, and Capacitance (between windings) etc.; secondary test parameters of general transformer as Quality Factor and ESR etc.; and pin-short test function. High-speed digital sampling measurement technology combined with scanning test fixture (A132501) design, improve low-efficiency telecom transformer inspection to be more accurate and faster.

The 3312 even provides several output impedance selection to solve inductance measurement error problem caused by different test current caused by different output impedance provided by different LCR Meters.

ORDERING INFORMATION 3312 : Telecom Transformer Test System A110104 : SMD Test Cable #17 A110211 : Component Test Fixture A110212 : Component Remote Test Fixture A110234 : High Frequency Test Cable

RS-232

HANDLER

PRINTER

- A110239 : 4 Terminals SMD Electrical Capacitor Test Box (Patent)
- A132501 : Auto Transformer Scanning Box A133004 : SMD Test Box
- A133006: 1A Internal Bias Current Source

| SPECIFICATIONS  | 5                      |   |  |  |
|---|------------------------|---|--|--|
| Model   |                        | 3312  |  |  |
| Main Function   |                        | Transformer Scanning Test + LCR Meter   |  |  |
| <b>Test Parameter</b>   |                        |   |  |  |
| Transformer Scan  | ning                   | Turn Ratio (TR), Phase, Turn Inductance (L), Quality Factor (Q),<br>Leakage Inductance (LK), Inductance Balance (BL), ACR, Capacitance,<br>DCR, Pin Short, Return Loss (RLOS), Insertion Loss (ILOS),<br>Frequency Response (FR), Longitudinal balance (LBAL) |  |  |
| LCR Meter   |                        | L, C, R, IΖΙ, Y, DCR, Q, D, R, X, θ   |  |  |
| <b>Test Signals Info</b>  | rmation                |   |  |  |
| Test Level  | Turn, ILOS,<br>Fr,LBAL | 10mV ~ 10V, $\pm$ 10% 10mV/step   |  |  |
|   | Others                 | 10mV ~ 2V, ±10% 10mV/step   |  |  |
| Test Freewood   | Turn                   | 1kHz ~ 1MHz, $\pm$ (0.1% + 0.01Hz), Resolution : 0.01 Hz  |  |  |
| Test Frequency  | Others                 | 20Hz ~ 1MHz, ± (0.1% + 0.01Hz), Resolution: 0.001 Hz (<1kHz)  |  |  |
|   | Turn, ILOS,            |   |  |  |
|   | Fr,LBAL                | 10 $\Omega$ , when level $\leq 2V$ ; 50 $\Omega$ , when level > 2V  |  |  |
| 0.1   |                        | Constant = OFF : Varies as range resistors  |  |  |
| Output  |                        | Constant = $320X : 100 \Omega \pm 5\%$  |  |  |
| Impedance   | Others                 | Constant = $107X : 25\Omega \pm 5\%$  |  |  |
|   | Others                 | Constant = 106X : 100mA $\pm$ 5% (1V setting),  |  |  |
|   |                        | for inductive load less than $10\Omega$ , $10\Omega \pm 10\%$ , for impedance $\geq 10\Omega$   |  |  |
| Mar and D   | <u> </u>               | for inductive load less than $1052, 1052 \pm 10\%$ , for impedance $\leq 1052$  |  |  |
| Measurement Ra  | ange                   | 0.00001   |  |  |
| Lx, x   |                        | 0.00001µH ~ 9999.99H  |  |  |
| C   | -                      | 0.00001pF ~ 999.999mF   |  |  |
| Q, D  |                        | 0.00001 ~ 99999   |  |  |
| Z, X, R   |                        | 0.00001 Ω~ 99.9999M Ω   |  |  |
| Y   | -                      | 0.01nS ~ 99.9999S   |  |  |
| θ   |                        | -90.00° ~ +90.00°   |  |  |
| DCR   |                        | 0.01mΩ ~ 99.999MΩ   |  |  |
| Turn  |                        | 0.01 ~ 99999.99 turns (Secondary voltage less than 100 Vrms)  |  |  |
| Pin-Short   |                        | 11 pairs, between pin to pin  |  |  |
| RLOS, ILOS, FR  |                        | -100dB ~ +100dB   |  |  |
| LBAL  |                        | 0dB ~ +100dB  |  |  |
| <b>Basic Accuracy</b>   |                        |   |  |  |
| L, LK, C, Z, X, Y, R, I   | DCR                    | $\pm$ 0.1% (1kHz if AC parameter)   |  |  |
| Q, D  |                        | ±0.0005 (1kHz)  |  |  |
| θ   |                        | ±0.03% (1kHz)   |  |  |
| Turn  |                        | ±0.5% (1kHz)  |  |  |
| RLOS  |                        | N/A (Zr : ±0.1%)  |  |  |
| ILOS, FR, LBAL  |                        | ±0.5dB  |  |  |
| <b>Measurement S</b>  | peed (Fastes           | t)  |  |  |
| L, LK, C, Z, X, Y, R, 0   | Q, D, θ                | 80meas./sec.  |  |  |
| DCR   |                        | 50meas./sec.  |  |  |
| Turn, RLOS, ILOS,   | LBAL                   | 10meas./sec.  |  |  |
| Judge   |                        |   |  |  |
| Transformer Scan  | ning                   | PASS/FAIL judge of all test parameters output from Handler interface  |  |  |
|   |                        | 10 bins for sorting & Bin sum count output from optional Handler  |  |  |
| LCR Meter   |                        | interface PASS/FAIL judgement output from standard Handler interface  |  |  |
| Trigger   |                        | Internal, Manual, External  |  |  |
| Display   |                        | 320x240 dot-matrix LCD display  |  |  |
| Equivalent Circu  | it Mode                | Series, Parallel  |  |  |
| Correction Funct  |                        | Open/Short Zeroing, Load correction   |  |  |
|   |                        | 15 instrument setups, expansion is possible via memory card   |  |  |
|   |                        | to instrument setups, expansion is possible via memory card   |  |  |
| Memory  |                        |   |  |  |
| Memory<br>General   | oment                  | Temperature: $10^{\circ}$ C ~ $40^{\circ}$ C Humidity: $100^{\circ}$ ~ $900^{\circ}$ RH   |  |  |
| Memory<br>General<br>Operation Enviror  |                        | Temperature: 10°C ~ 40°C,Humidity: 10%~90% RH   |  |  |
| Memory<br>General<br>Operation Enviror<br>Power Consumpt                      | ion                    | 140 VA max.   |  |  |
| Memory<br>General<br>Operation Environ<br>Power Consumpt<br>Power Requirement | ion<br>nt              | 140 VA max.<br>90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz   |  |  |
| Memory<br>General<br>Operation Enviror<br>Power Consumpt                      | ion<br>nt              | 140 VA max.   |  |  |

Manufacturing Turnkey Test & Execution System Automation

# **Bias Current Source**

# Model 1310/1320/1320S/1320-10A



### KEY FEATURES

### Model 1310

- Frequency response : 20Hz~200kHz
- 0.001A~10.00A, 90W output capability
- Forward / Reverse current switching capability
   Bias current sweep (2~11points), automatic or manual trigger, for core characteristics analysis
- 16x2 LCD text display
- 0.001 Ω~199.99 Ω DCR measurement capability
- Long term continued maximum power output capability
- Excellent protection circuit, keep L Meter from damage as bias current was broken abnormally

### **KEY FEATURES**

### Model 1320

- Frequency response : 20Hz~1MHz
   0.001A~20.00A, 150W output capability,
- maximum 100Adc extendable with 1320S
- Forward / Reverse current switching capability

### GPIB HANDLER

- Standard GPIB, Handler interface
- Bias current sweep (2~21points), automatic or manual trigger, for core characteristics analysis
- Direct controlled by LCR Meter 3302/3252/ 11022/11025
- 16x2 LCD text display
- $0.01 \text{m} \Omega \sim 199.99 \Omega$  DCR measurement capability
- 50 internal instruments setups for store/recall capability
- Single bias current output timer capability (24 hours)
- Long term continued maximum power output capability
- Excellent protection circuit, keep L Meter from damage as bias current was broken abnormally

The 1320 Bias Current Source output can be controlled by LCR Meter Model 3302/3252/11022/ 11025 directly. The 1320S connected externally can output current up to 100A. The bias current scan frequency triggered automatically or manually can analyze the iron core characteristics in inductor for quality inspection and product feature analysis. They are the best measurement instruments combination for inductor test.

### ORDERING INFORMATION

1310 : Bias Current Source 0~10A 1320 : Bias Current Source 0~20A 1320-10A : Bias Current Source 0~10A 13205 : Bias Current Source (Slave) A113011 : 4 Terminals Test Cable with Clip A115001 : Foot Switch #10





| SPECIFICAT  | IONS          |  |   |  |  |  |
|---|---------------|--|---|--|--|--|
| Model   |               | 1310   | 1320  | 13205                                      | 1320-10A   |  |
| <b>Bias Curren</b>                                  | nt Source     |  |   |  |  |  |
| Output Curr   | ent           | 0.00~10.00Adc<br>Forward/Reverse                 | 0.00~ 20.00Adc Forward/Reverse<br>100A extendable<br>when linked with 1320S             | 0.00~20.00Adc(Slave)<br>Forward/Reverse *2 | 0.00~10.00Adc<br>Forward/Reverse                           |  |
| Accuracy  |               | 0.000A~1.000:1%+3mA<br>1.01A~10.00A:2%           | 0.000A~1.000A : 1% +3mA<br>1.001A~5.00A:2%<br>5.01A~20.00A:2%<br>20.1A~20.0(1+X)A:3% *1 | 3%   | 0.000A~1.000A:1%+3mA<br>1.001A~5.00A:2%<br>5.01A~10.00A:2% |  |
| Scan Test   |               | Manual or Auto, 2~11 steps                       | Manual or Auto, 2~21 steps  |  | Manual or Auto, 2~21 steps                                 |  |
| Frequency F   | lesponse      | 20Hz~200kHz                                      | 20Hz~1MHz   | 20Hz~1MHz                                  | 20Hz~1MHz  |  |
| Maximum Power<br>Continued Output<br>Allowable Time |               |  | > 24 hours (I   | below 40°C)                                |  |  |
| Timer   |               |  | 0~24 hours  |  | 0~24 hours   |  |
| Delay time  |               |  | 0.0~100.0 sec/step, adjustable  |  | 0.0~100.0 sec/step, adjustable                             |  |
| <b>DCR</b> Meter                                    | Accuracy &    | Resolution                                       |   |  |  |  |
|   | <b>20m</b> Ω  |  | $2\% + 0.07 \mathrm{m}\Omega$ , $0.01 \mathrm{m}\Omega$                                 |  | <b>2%+ 0.07m</b> Ω <b>,0.01m</b> Ω                         |  |
|   | <b>200m</b> Ω |  | $2\% + 0.2m\Omega$ , $0.1m\Omega$   |  | <b>2%</b> + <b>0.2m</b> Ω , <b>0.1m</b> Ω                  |  |
| DCR Range   | 2Ω            | <b>3</b> % + 0.002 Ω ,0.001 Ω                    | 3% + 0.002 Ω ,0.001 Ω   |  | <b>3%+ 0.002</b> Ω , <b>0.001</b> Ω                        |  |
|   | 20Ω           | 3% + 0.03 $\Omega$ , 0.01 $\Omega$               | <b>3%</b> + 0.02 Ω , 0.01 Ω   |  | 3%+0.02 Ω , 0.01 Ω   |  |
|   | 200Ω          | <b>3%</b> + <b>0.3</b> Ω, <b>0.1</b> Ω           | <b>3%</b> + 0.2 Ω , 0.1 Ω   |  | 3% + 0.2 Ω , 0.1 Ω   |  |
| <b>DCV</b> Displa                                   | у             |  |   |  |  |  |
| Display Ran   | ge            |  | 0.00V~10.00Vdc  |  | 0.00V~20.00Vdc   |  |
| Accuracy  |               |  | 2% + 0.05Vdc  |  | 2% + 0.05Vdc   |  |
| Display   |               | 16 x 2 text d                                    | ot matrix LCD   |  | 16 x 2 text dot matrix LCD                                 |  |
| General   |               |  |   |  |  |  |
| Operation E   | nvironment    |  | Temperature : 10°C~40°C,  | Humidity : 10%~90 % RH                     |  |  |
| Power Cons  | umption       | 250VA max.                                       | 650VA max.  | 600VA max.                                 | 650VA max  |  |
| Power Requ  | irements      |  | 90 ~ 132Vac or 180 ~  | ~ 264Vac, 47 ~ 63Hz                        |  |  |
| Dimension (   | H x W x D)    | 132 x 410 x 351 mm /<br>5.2 x 16.14 x 13.82 inch | 177 x 4   | 430 x 450 mm / 6.97 x 16.93 x 17.7         | 72 inch  |  |
| Weight  |               | 8.8 kg / 19.38 lbs                               | 17.5 kg / 38.55 lbs   | 15.5 kg / 34.14 lbs                        | 17.5 kg / 38.55 lbs  |  |

**Note\*1 :** X is the number of linked 1320S

Note\*2: 1320S is a slave current source of 1320

# **Bias Current Test System**

# Model 11300



### 300A

### **KEY FEATURES**

- High efficiency, forward / reverse current switching capability and sweep function
- High stability, frequency response from 20Hz to 1MHz
- High accuracy, 3% output current accuracy
- Expansion capabilities, up to 300A
- Vertical design, easy to maintain
- Flexible modular test system
- Multi-channel intakes in the front panel of rack and multi-fans exhausts in the back of rack
- Multi-function four terminal test fixture
- Low ESR ( < 10m ohm) design for connecters between bias current sources
- Windows<sup>®</sup> based software



19" Rack 20U for Model 11300



Chroma 11300 bias current test system is an integration test system of LCR Meter and Bias Current Source.

It consists of Chroma 3252/3302 series Automatic Component Analyzer and Chroma 1320 series Bias Current Source. The Chroma 1320 series bias current source output can be controlled by Chroma 3252/3302 LCR meter directly. The bias current output capacity can be selected up to 300A to satisfy various testing in R&D, QC, QA, and production applications.

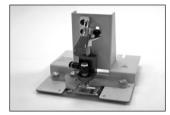
The connector between bias current sources is low ESR (<10m ohm) design to reduce heat effect and get more accurate measurement result. The multifunction four terminal test fixture supports various DUT, include SMD DUT and DIP ring core DUT.

This system provides power choke characteristic sweep graph analysis through Windows® base software or sweep function of the meter. The bias current scan triggered automatically or manually can analyze the iron core characteristics in inductor for quality inspection and product feature analysis. The Chroma 11300 is a just right test solution for magnetic choke and core used in various power supply.

Pass



A113008 : Four terminal test fixture for DIP 100A



A113009 : Four terminal test fixture for SMD 60A (combined with A113008)

| SPECIFICATIONS      |     |         |        |          |        |   |  |
|---------------------|-----|---------|--------|----------|--------|---|--|
| Model               |     | 11300   |        |          |        |   |  |
| Output Bias Current | 20A | 40A     | 80A    | 80A 100A |        |   |  |
| LCR Meter           |     |         |        |          |        |   |  |
| Model 3252/3302     | •   | •       | •      | •        | •      | * |  |
| Bias Current Source |     |         |        |          |        |   |  |
| Model 1320          | •   | •       | •      | •        | •      | * |  |
| Model 1320S         |     | 1 Set   | 2 Sets | 3 Sets   | 4 Sets | * |  |
| General             |     |         |        |          |        |   |  |
| 19"Rack             |     | 20U 35U |        |          |        |   |  |

180~264Vac, 47~63Hz

Graphical Bias Current Characteristic Analysis

Power Requirements \* Call for availability L-I Curve Software

11300 : Bias Current Test System A113008 : Four terminal test fixture for DIP 100A A113009 : Four terminal test fixture for SMD 60A (combined with A113008) A113010 : Four terminal PCB for SMD 100A (combined with A113008) A113012 : Vacuum Generator for A113009 A113014 : Vacuum Pump for A113009 A113017 : LCR Analysis Software LCR Meter : Refer to 3252, 3302 Bias Current Source : Refer to 1320, 1320S A800004 : 19" rack 20U/35U/41U for Model 11300

PXI Test &

\*

# **Electrolytic Capacitor Analyzer**

# Model 13100



### **KEY FEATURES**

- C meter provides Z/C/D/Q/ESR parameters for test
- Available 7 test frequencies from 100~100kHz for selection
- 0.1% basic measurement accuracy
- The thin-film withstand voltage results can be displayed in graph by converting them to an actual rising curve
- CPK calculation function for 1000 capacitor test results that is convenient for analyzing the production capability
- 320 x 240 dot-matrix LCD display
- 200 sets of internal memories and 4M SRAM interface card for saving and recalling the parameter settings
- Designed for100mΩ range with accuracy measurement up to 0.1mΩ
- Non-Relay switch is built in. It is safe and reliable as the discharge circuit is close to the fixed power
- Perform electric polarity test before charge to avoid the danger of explosion
- Softpanel for leakage current data statistics analysis
- Equipped with RS-232, printer and scanner controller interfaces
- Meet the test regulation of EIAJ RC-2364A
- A131001 scan box has four terminals designed for measuring accurate high frequency and low impedance (200 Vmax)



The Chroma 13100 Electrolytic Capacitor Analyzer is a general measurement instrument designed for analyzing the features of electrolytic capacitors. It has multiple functions that can be programmed based on the capacitor features by altering the settings to test metal oxidization thin-film withstand voltage, capacitor leakage current, capacitance, dissipation factor, impedance and equivalent serial resistance, etc.

Used with the special designed sequential switch test box A131001, it can complete the test for multiple capacitors or aluminum foil rapidly, accurately and simultaneously in a short time without changing any test wire.

The report printing function is capable of printing the test results correctly and completely; and the built-in data calculation function can compute the test data of the product instantly for CPK analysis. To avoid the inefficient calculation process done manually, a test software application is also available for you to create a quality report easily. It meets the EIAJ RC-2364A regulations for electrolytic capacitor test and is a test instrument of choice.

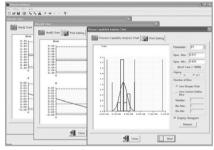
Chroma A131001 is a sequential switch test box of ten channels specially designed for Chroma 13100. Each test socket on the test box is implemented with Kelvin measurement, which is suitable for the precise measurement requirement for low impedance and low leakage current. With the SCAN function in 13100 it is able to control the C, D, Q, Z, ESR and LC tests for electrolytic capacitor to be done consecutively without switching the capacitor manually. This increases the test efficiency significantly as it costs only 1/10 of the original test time.

### **ORDERING INFORMATION**

13100 : Electrolytic Capacitor Analyzer A131001 : 10 Channels Switching Test Fixture A131002 : 4T BNC to BNC Lead



**A131001 :** 10 Channels Switching Test Fixture (200 Vmax)



13100 Softpanel

# Model 13100

| SPECIFICATIONS             |   |
|----------------------------|---|
| Model                      | 13100   |
| Main Function              | C Meter/Leakage Current Tester/Foil WV Tester/Scanner Controller                          |
| CMeter                     |   |
| Test Parameter             | Cs-D, Cs-Q, Cs-ESR, Cp-D, Cp-Q,  Z -ESR,  Z - θ   |
| Test Signals               |   |
| Level                      | 1.0V/0.25V, ±10%  |
| Frequency                  | 100Hz, 120Hz, 1kHz, 10kHz, 20kHz, 50kHz, 100kHz; ±0.01%                                   |
| Source Ro                  | $25\Omega$ , $100\Omega$ , $25\Omega$ /C.C, $100\Omega$ / $25\Omega$ four mode selectable |
| Measurement Display Range/ |   |
| C                          | 0.001pF ~ 1.9999F / ±0.1%   |
| Z, ESR                     | $0.01 \text{ m} \Omega \sim 99.99 \text{ M} \Omega / \pm 0.1\%$                           |
| D, Q                       | 0.0001 ~ 9999 / ±0.0005   |
| θ                          | -90.00° ~ +90.00° / ±0.03°  |
| Measurement Speed *2       |   |
| Fast/Medium/Slow           | Freq. = 100Hz 120Hz : 55ms / 120ms/ 750ms; Freq 1kHz : 35ms / 60ms / 370ms                |
| Function                   |   |
| Correction                 | Open / Short zeroing  |
| Averaging                  | 1~99 times  |
| Test Signal Monitor        | Vm, Im  |
| Leakage Current Tester     |   |
| Test Parameter             | LC, IR  |
| Test Signals               |   |
| Voltage                    | 1.0 V ~ 100 V, step 0.1 V;101V~650 V, step 1V; (0.5% + 0.2V)                              |
| Charge Current Limit       | V ≦ 100V: 0.5mA~500mA; V>100V: 0.5mA~150mA; step 0.5mA; (3% + 0.05mA)                     |
| Measurement Display Range/ |   |
| LC (Leakage Current)       | 0.001μA ~ 99.9mA/ ±(0.3% +0.005μA)  |
| Measurement Speed          | 45ms  |
| Function                   |   |
| Correction                 | Null zeroing  |
| Averaging                  | 1 ~ 99 times  |
| Test Voltage Monitor       | Vm: 0.0 V ~ 660.0V; (0.2%+0.1V)   |
| Charge/ Dwell Timer        | 0 ~ 999 sec.  |
| Foil WV Tester             |   |
| Test Parameter             | Tr (Rise Time), Vt (Foil Withstand Voltage), Plot [logT, Vm]                              |
| Test Signals               |   |
| Voltage Limit              | 650 V typical   |
| Constant Charge Current    | 0.5mA~100mA, step 0.5mA; (3% +0.05mA)   |
| Test Display Range         |   |
| Tr (Rise Time)             | 0.05 ~ 120.00 sec.  |
| Charge Voltage             | 0.1V ~ 660.0V   |
| Plot [logT, Vm]            | 220 plots; Vm: 1.5~10 x Vf  |
| Test Time                  | 30 ~ 600 sec.   |
| Scanner Controller         |   |
| Controllable Fixture       | Chroma A131001  |
| Test Parameter             | C parameter pair x 2, LC parameter x 1  |
| Sample Number              | 1~1000 pcs.   |
| Function                   |   |
| Correction                 | Fixture Open/ Short/ Null zeroing   |
| Comparison Limit           | Upper, Lower  |
| Statistics                 | Maximum, Minimum, Average (X bar), Cpk  |
| Interface                  | RS-232, Printer, Scanner Control Interface  |
| Display                    | 320 x 240 dot-matrix LCD display  |
| Memory (Store/Recall)      |   |
| Internal                   | 200 instrument setups   |
| 4M SRAM card (Option)      | 200 instrument setups (for copy and backup)   |
| Trigger                    | Internal, Manual, BUS, Scanner  |
| General                    |   |
| Operation Environment      | Temperature 0°C~40°C, Humidity < 90 % RH  |
| Power Consumption          | 400 VA max.   |
| Power Requirement          | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz  |
| Dimension (H x W x D)      | 177 x 430 x 301.4 mm / 6.97 x 16.93 x 11.87 inch  |
| Weight                     | 14 kg / 30.84 lbs   |
|                            |   |

**Note\*1**:  $23\pm5^{\circ}$ C after Open and Short correction, slow measurement speed, refer to Operation Manual for detail measurement accuracy descriptions **Note\*2**:  $23\pm5^{\circ}$ C after Null correction, average exceeds 10 times, refer to Operation Manual for detail measurement accuracy descriptions **Note\*3**: C/D meter in range >1 $\Omega$ , refer to Operation Manual for detail /ideo & Color

Flat Panel LED/ Display Lighting

Optical Devices

PhotovoltaicTest Automated Power Battery Test & & Automation Optical Inspection Electronics Automation

Passive

Electrical

Semiconductor/

PXI Test & Measurement

General Manufacturing T Purpose Execution System

Turnkey Test & Automation

# **Ripple Current Tester**

# Model 11800/11801/11810

ORDERING INFORMATION 11800 : Ripple Current Tester 1kHz 11801 : Ripple Current Tester 100kHz 11810 : Ripple Current Tester 1MHz A118004 : Series Test Fixture A118005 : Parallel Test Fixture A118010 : Monitoring Software for

A118028 : Series Test Fixture for Low Voltage

A118030: PCB for SMD Capacitor

A118029 : SMD Series Test Fixture for Low Voltage

Model 11800/11801



### **KEY FEATURES**

- Digital constant current output and constant peak voltage output control function
- Four terminal contact test jig design, ensure accurate monitoring of voltage dropped on capacitors under test (patent pending)
- Paired cooper-foil wiring test cable to reduce voltage drop on the current driving loop and to ensure accurate monitoring of ac level dropped on capacitors under test (patent pending)
- 0-500 V DC bias voltage source, 0.3% basic accuracy
- 0.01~30A, 100Hz/120Hz/400Hz/1kHz AC ripple current source, (±0.5% reading+0.1% of range) basic accuracy (Model 11800)
- 0.01~10A, 20kHz~100kHz AC ripple current source, 2% basic accuracy (Model 11801)
- 0.03~10A, 20kHz~1MHz AC ripple current source (Model 11810)
- Monitoring software (option) for multiple Ripple Current Testers
- Lower power consumption and lower electricity cost
- Large LCD display (320 x 240 dot-matrix)
- Alarm for indicating of normal or abnormal test termination, Tested time will be recorded if the test is terminated abnormally. An automatic discharge is always performed after test termination
- Standard RS485 interface is provided for computer monitoring
- Optional 20-fixtures Series or Parallel test jigs
   Digital timer inside
- CE marking (Model 11800/11801)

The Chroma 11800/11801/11810 Ripple Current Tester is a precision tester designed for electrolytic capacitors load life testing. Provides constant ripple current output and constant peak voltage (Vpeak = Vdc + Vac\_peak) output digital control function. Let load life testing for electrolytic capacitors becomes easier and more reliable. And, The Chroma 11800/11801/11810 use excellent output amplifier design technology to reduce power consumption and internal temperature rising. For long time testing requirement, it can reduce electricity cost and perform high stability. The Chroma 11800/11801/11810 is a just right test solution for electrolytic quality evaluation.





A118029: SMD Series Test Fixture for Low Voltage

| NO. OIL Remark                  | NO.000 Remark                      | NO 003 Remark                   |
|---------------------------------|------------------------------------|---------------------------------|
|                                 |                                    |                                 |
| KAS DEPLAY                      | MLAS DISPLAY                       | MLAS DEPLAY                     |
| UT: DO POS IDC: PARA.           | BUT: B PCB FDC: PARA.              | DUT : 35 PCS FDC: PARA.         |
| V.V.: 306.00 V /RE0: 00.00 1012 | WCK.: X00.00 V FRED: DH.00 KHz     | W.V.: XELK V FRED: 500.00 KHL   |
| LC.   3.00 A TME   3000 B 0 m   | R.C. : 3.30 A TNE: 300 B G m       | R.C.: 3.00 A THE: 3000 B [0 H   |
| yeak : 290.71 V                 | Vpeak : 296.71 V                   | iyesk : 295.71 V                |
| WA : 2.83 A                     | 1mm 1 2.89 A                       | ises : 2.89 A                   |
| MS: 298.4 Y Hem: 6.229 Y        | DM3: 278.4 Y Wms: 6,222 Y          | 5943 : 298.4 V . Week: 0.229 V  |
| IMER: 1083 * 69 = U             | TIMER: 1083 * 63 # U               | TMER: 1000 h 60 m U             |
|                                 | ( errore a                         | (m                              |
| NO. 008 Fiemark                 | NO.005 Remark                      | NO.006 Remark                   |
| EAS DISPLAY                     | MEAS DISPLAY                       | MEAS DISPLICI                   |
| UT: 20 PCB FBK: PARA.           | DUT: 20 PCS PDK: DARA              | DUT: 30 PCS FR: DARA            |
| 101.00 W FRED: 00.00 Dis        | W.V. : 306.00 V FRED : \$50.00 KHz | W.V.: 300.00 V FTER: 100.00 KHz |
| C.: 2.00 A TIME: 3000 B 0 m     | R.C. : 2.00 A THE : 2000 b 0 m     | R.C. : 100 A TME : 300 h 0 m    |
| Posk : 230,71 W                 | Npcek : 215,21 V                   | Vpcak : 255.71 V                |
|                                 | here 1 2.00 A                      | Anna 1 2.00 A                   |
|                                 |                                    |                                 |
| MS: 293.4 Y West: 6,229 V       | BUS: 295.4 V Vens: 8.229 V         | BIAS : 298.4 V Yuma : 8.220 V   |
| MCR: 1080 h 60 m 10             | TANKIN: 1000 h up m ut             | TIMERIC 1800 N GE 49 U          |

| SPECIFICA  | TIONS           |  |  |   |  |  |
|--|-----------------|--|--|---|--|--|
| Model  |                 | 11800  | 11801  | 11810   |  |  |
| <b>Ripple Cu</b>                                       | rrent Source    |  |  |   |  |  |
| Current Output Range                                   |                 | 0.01~30A   | 0.01~10A   | 0.03~10A, *3  |  |  |
| Frequency  |                 | 100Hz/120Hz/400Hz/<br>1kHz ±0.1%   | 20kHz~100kHz   | 20kHz~1MHz  |  |  |
|  | 0.010A~0.199A   |  | ± (3% + 0.005 A)                                       | 0.03~0.39A,   |  |  |
| Accuracy   | 0.20A~1.99A     | $\pm$ (0.5% of reading +   | ± (2.5% + 0.05 A)                                      | ±(3%+0.01 A), *2                                      |  |  |
| *1   | 2.0A~10A        | 0.1% of range)   | ± (2% + 0.2 A)   | 0.40~10.0A,<br>±(2%+0.05 A), *2                       |  |  |
|  | 10.0A~30A       |  |  | -   |  |  |
| Range  | tage Output     | 90Vrms / 10Arms,<br>30Vrms / 30Arms  | 15Vrms r   | naximum   |  |  |
|  | oltage Source   |  |  |   |  |  |
|  | utput Range     | D  | $C 0.5 \sim 500V, \pm (0.3\% + 0.05)$                  | 5V)   |  |  |
| Charge Cu  |                 |  | 200mA, 40W Maximum                                     |   |  |  |
| Signal Mo  | nitor Parameter | Accuracy   |  |   |  |  |
|  | 0.001A~0.199A   |  | $\pm (2\% + 0.005 \text{ A})$                          | 0.030A~0.399A:  |  |  |
| Irms   | 0.20A~1.99A     | $\pm$ (0.5% of reading +   | ± (2% + 0.05 A)  | ± (3% +0.01A),*2, *3                                  |  |  |
| (Ripple<br>Current)                                    | 2.0A~10A        | 0.1% of range)   | ± (2% + 0.2 A)   | 0.400A~10.00A:<br>±(2%+0.05A),*2,*3                   |  |  |
|  | 10.0A~30A       |  |  |   |  |  |
| Vpeak<br>(Normally, set to<br>capacitor rated voltage) |                 | Vpeak =Vdc + Vac_peak  |  |   |  |  |
| Vdc (DC Bi   | as Voltage)     | ± (0.3% + 0.05V)   |  |   |  |  |
| Vrms (Ripple Voltage)                                  |                 | $0 \sim 1.99V, \pm (0.3\% \text{ of}$<br>reading + 0.5% of range)<br>2.00~19.99V, $\pm (0.3\% \text{ of}$<br>reading + 0.1% of range)<br>20.00V~200.0V,<br>$\pm (0.3\% \text{ of reading +}$<br>0.1% of range) | ± (1% + 0.005V)  | ± (1% + 0.01V) *2                                     |  |  |
| <b>Control Fu</b>                                      | Inction         |  |  |   |  |  |
| Timer  |                 | 1 min  | ~10000 hour, 30min error p                             | er year   |  |  |
| Interface  |                 |  | RS-485 (Standard)                                      |   |  |  |
| Display  |                 | 320 x 240 dot-matrix LCD display   |  |   |  |  |
| Operation  |                 | Start, Stop, Continue  |  |   |  |  |
| Protection   |                 |  | OCP, OTP, Over Load                                    |   |  |  |
| General  |                 |  |  |   |  |  |
| -  | Environment     | Temperature : 10°C~40°C, Humidity : < 90 % RH  |  |   |  |  |
| Power Consumption                                      |                 | 3000 VA max.   | 700 VA max.  | 1000VA max.   |  |  |
| Power Req  | uirement        |  | 198 ~ 242Vac, 47 ~ 63Hz                                |   |  |  |
|  | (H x W x D)     | 221.5 x 440 x 609.8 mm /<br>8.72 x 17.32 x 24.01 inch  | 353.6 x 440 x 609.8 mm /<br>13.92 x 17.32 x 24.01 inch | 221.5 x 440 x 609.8 mm /<br>8.72 x 17.32 x 24.01 inch |  |  |
| Weight   |                 | 54 kg / 118.94 lbs   | 60 kg / 132.16 lbs                                     | 40 kg / 88 lbs  |  |  |
| Note*1:2   |                 | 5  | Uz (v 1) 101. 500kUz (v 2 5)                           |   |  |  |

**Note\*2 :** Multiple accuracy for test frequency 20~100kHz (x 1), 101~500kHz (x 2.5), 501kHz~1MHz (x 5) **Note\*3 :** Frequency > 500kHz : 0.10~10.0A only **Note\*4 :** Frequency > 500kHz : 0.100~10.00A only

# **CLC/IR Meter**

# Model 11200



### **KEY FEATURES**

- Electrolytic capacitor leakage current test function
- Insulation Resistance (IR) test function
- Constant current DC power source with discharge function
- Forward voltage function for Diode, LED, Zener Diode and Varistor
- Surge voltage test function for electrolytic capacitor (JIS C5101/5102/5140/5141)
- Option contact check function to improve test reliability
- Basic accuracy: 0.3%
- Aluminum-foil withstand voltage and rise-time test function (For EIAJ RC-2364A)
- Precision low constant current charge capability (0.5mA ± 0.05mA, meet EIAJ RC-2364A requirement for withstand voltage testing of lower WV aluminum-foil)
- Large charge current (500mA) capability to fasten charge speed
- 1.0V ~ 650V / 800V DC voltage source



- 0.001uA 20.00mA leakage current test range with 4 digits resolution
- Standard RS-232 interface
- Optional GPIB & Handler interface
- Digital timer inside
- Comparator and pass/fail alarming beeper function
- Large LCD display (240 x 64 dot-matrix)
- Friendly user interface
- Easy use graphic user interface : softpanel (Option)

The Chroma 11200 Capacitor Leakage Current/IR Meter is Chroma's newest digital leakage current meter. Provides DC 1~650 V, 0.5mA~500mA (150mA for V>100V) DC power source or DC 1~800V, 0.5mA~500mA (50mA for V>100V) DC power source. Mainly used for electrolytic capacitor leakage current testing, and aluminumfoil withstand voltage testing (EIAJ RC-2364A). And also can be used for active voltage checking or leakage current testing of absorber, Zener diode, and Neon lamp etc.

Contact failure between a DUT and the measurement plane of an automatic component handler is a factor for compare error in production line testing. Contact check using the built-in measurement function (option) improves the accuracy and efficiency of comparing.

Standard RS-232 interface, optional GPIB & Handler interface, high speed and stable measurement capabilities enable the Chroma 11200 can be used for both component evaluation on the production line and fundamental leakage current testing for bench-top applications.

### **ORDERING INFORMATION**

11200 : Capacitor Leakage Current / IR Meter 650V 11200 : Capacitor Leakage Current / IR Meter 800V 11200 : Capacitor Leakage Current / IR Meter with contact check function 650V A110235 : GPIB & Handler Interface A110236 : 19" Rack Mounting Kit A112001 : Triangle Test Fixture A112004 : Softpanel for Model 11200



A112004 : Softpanel of Model 11200

| Model                           |                 | 11200 (650V) 11200 (800V)                       |   |  |  |
|---------------------------------|-----------------|---|---|--|--|
| Main Function                   |                 | Capacitor Leakage Current / IR Meter            |   |  |  |
| Test Parameter                  |                 | LC, I   | R   |  |  |
| <b>Test Signals Information</b> |                 |   |   |  |  |
| V a lta a a                     |                 | 1.0 V~100 V, step 0.1 V;                        | 1.0 V~100 V, step 0.1 V;  |  |  |
| Voltage                         |                 | 101V~650 V,step 1V; ±( 0.5% + 0.2V)             | 101V~800V,step 1V; ±( 0.5% + 0.2V)  |  |  |
|                                 |                 | V ≦ 100V: 0.5mA~500mA, 50W max.                 | V ≦ 100V: 0.5mA~500mA, 50W max.   |  |  |
| Charge Current Limit            |                 | V > 100V: 0.5mA~150mA, 97.5W max.               | V > 100V: 0.5mA~50mA, 40W max.  |  |  |
|                                 |                 | step 0.5mA; ±( 3% + 0.05mA)                     | step 0.5mA; ±( 3% + 0.05mA)   |  |  |
| Measurement Display Ran         | ge              | LC : 0.001µA⁄                                   | ~20.00mA  |  |  |
| Basic Measurement Accura        | acy *1          | LC Reading : ±(0.                               | 3% + 0.005μA)   |  |  |
| Measurement speed               | Fast            | 77 m  | 15  |  |  |
| (Ext. Trigger, Hold Range,      | Medium          | 143 r   | ns  |  |  |
| Line Frequency 60Hz)            | Slow            | 420 r   | ns  |  |  |
| Function                        |                 |   |   |  |  |
| Correction                      |                 | Null zeroing                                    |   |  |  |
| Test Voltage Monitor            |                 | Vm: 0.0 V~660.0V; ±(0.2% of reading + 0.1V)     | 'm: 0.0 V~660.0V; $\pm$ (0.2% of reading + 0.1V) Vm: 0.0 V~900.0V; $\pm$ (0.2% of reading + 0.1V) |  |  |
| Charge Timer                    |                 | 0~999 sec.                                      |   |  |  |
| Dwell Timer                     |                 | 0.2~999 sec.                                    |   |  |  |
| Foil WV Tester                  |                 |   |   |  |  |
| Test Parameter                  |                 | Tr (Rise Time), Vt (Foil Withstand Voltage)     |   |  |  |
|                                 | Voltage Limit   | 650 V typical                                   | 800V typical  |  |  |
| Test Signals                    | Constant Charge | 0.5mA~150mA, step 0.5mA;                        | 0.5mA~50mA, step 0.5mA;   |  |  |
|                                 | Current         | $\pm$ (3% of reading + 0.05mA)                  | $\pm$ ( 3% of reading + 0.05mA)   |  |  |
| Test Display Range              | Tr (Rise Time)  | 0.05~600  | 0.0 sec.  |  |  |
| rest Display hange              | Charge Voltage  | 0.1V~660.0V                                     | 0.1V~900.0V   |  |  |
| Test Time                       |                 | 30~600  |   |  |  |
| Interface                       |                 | RS-232(Standard), Handler, GPIB (Optional)      |   |  |  |
| Display                         |                 | 240 x 64 dot-matrix LCD display                 |   |  |  |
| Trigger                         |                 | Internal, External, Manual, BUS                 |   |  |  |
| General                         |                 |   |   |  |  |
| Operation Environment           |                 | Temperature : 10°C~40°C Humidity : < 90 % RH    |   |  |  |
| Power Consumption               |                 | 400 VA max.                                     |   |  |  |
| Power Requirement               |                 | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz          |   |  |  |
| Dimension (H x W x D)           |                 | 100 x 320 x 346.1 mm / 3.94 x 12.6 x 13.63 inch |   |  |  |
| Weight                          |                 | 8 kg / 17.62 lbs                                |   |  |  |

Note\*1:23 ± 5°C after null correction. Refer to Operation Manual for detail measurement accuracy descriptions.

PXI Test &

Manufacturing Execution System

Test &

# Programmable HF AC Tester Model 11802/11803/11805/11890/11891



Programmable HF AC Tester Model 11802/11803/11805 HF Hipot Tester Model 11890 HF HV Load Life Tester Model 11891

### **KEY FEATURES**

- HF HV Load Life Test (CV and CC mode)
- HF Withstand Voltage Test (CV and CC mode)
- HF Breakdown Voltage Test (CV mode)
- Test frequency: 20kHz ~1MHz
- Wide output voltage and current range while combine with different module (Module is customized and based on the tester's power)
- Output voltage and current monitor
- Programmable output voltage waveform control
- Cycle count mode or time count mode for load life test timer
- Lower power consumption and lower temperature rising design
- Large LCD display (320 x 240 dot-matrix)
- Built-in digital timer



Chroma 11802 Series Programmable High Frequency AC Tester is a digital controlled high frequency AC source platform, can be combined with high frequency voltage/current step-up module to provide high voltage/high current. Chroma 11802 Series output test frequency is 20kHz~200kHz, which cover application frequency range for various SMPS, LCD inverter and etc.

Chroma 11802 Series provides digital functions, like programmable sine-wave output voltage controller to simulate the operation condition for DUT, and cycle count mode or timer mode for load life test, etc. Chroma 11802 Series uses tracking DC source inside for output amplifier to reduce power consumption and lower temperature rising. It reduces electricity cost and improves stability for long time testing. It is the best choice to perform quality verification for various electronic components which used under high frequency, like LCD Inverter and module, high voltage capacitors, primary of SMPS main power, CCFI, HCFI, and EEFI etc.

Chroma 11890 is the best tester for production line of HF HV electronic components withstanding voltage test, like LCD inverter transformer, ceramic capacitor, cable, PCB, automatic motor corona discharge inspection and medical equipment high frequency leakage current safety inspection. Chroma 11891 is a tester with only function HF HV Load Life Test (CV and CC mode). It is suitable for passive component load life test.

### **ORDERING INFORMATION**

- **11802 :** Programmable HF AC Tester 500VA **11803 :** Programmable HF AC Tester 800VA **11805 :** Programmable HF AC Tester 1000VA **11890 :** HF Hipot Tester 500VA **11891 :** HF HV Load Life Tester 500VA **H.F. Current Step-up Module - A118011 :** 10V/50A max. **- A118015 :** 33V/30A max. **- A118019 :** 16V/30A max. **- A118037 :** 30V/25A max. **H.F. Voltage Step-up Module - A118014 :** 2.5kV/200mA max.
- A118016: 250V/2A max.
- A118017:8kV/60mA max.
- A118018: 1kV/1A max.
- A118031: 5kV/100mA max. (with shielding)
- A118032: 1kV/500mA max.
- A118034: 2.5kV/400mA max.

| APPLIC | ATION LIST                                   |   |   |
|--------|--|---|---|
| Model  | <b>Primary Function</b>                      | Option  | Application Description   |
|        |  |   | LCD inverter transformer (ceramic capacitor, cable,<br>PCB) load life / withstanding voltage / breakdown voltage test   |
|        | HF, HV, CV                                   | A118013 HF HV 5kV/100mA max<br>A118014 HF HV 2.5kV/200mA max<br>A118017 HF HV 8kV/100kHz max  | EEFI, backlight load life / lamp current test<br>SMPS main transformer and active PFC choke load life test<br>and electrical analysis   |
|        |  | A118031 HF HV 5kV/100mA max + shielding   | Medical equipment high frequency leakage current safety inspection<br>Automobile motor corona discharge inspection,<br>analysis and production line                             |
| 11802  | HF, HV, CV                                   | Step-up current test module +<br>specified resonant inductor/ capacitor   | Ballast capacitor / inductor ignition voltage load life test  |
|        | HF, HI, CC,<br>Bias voltage                  | Ripple Current Test Module<br>Chroma 11200 CLC / IR Meter<br>(for DC voltage source with discharge function)  | Snubber capacitor load life test  |
|        | HF, CV,<br>Bias current<br>Temperature meter | Step-up current test module + AC/DC coupling test fixture<br>Chroma DC power supply (for DC bias current)<br>Chroma 12061 Digital Multimeter<br>(for temperature measurement) | DC-DC converter SMD power choke temperature rising test<br>(DC Bias current with AC ripple voltage) and electrical analysis   |
|        | HF, HV, CV<br>(or + DC source)               | HF HV test module<br>Option Chroma DC source  | Function as HF HV AC +DC power source for<br>FFI and SED device analysis  |
| 11803  | HF, CV,<br>Bias current<br>Temperature meter | Step-up current test module + AC/DC coupling test fixture<br>Chroma DC power supply (for DC bias current)<br>Chroma 12061 Digital Multimeter<br>(for temperature measurement) | DC-DC converter SMD power choke temperature rising test<br>(DC Bias current with AC ripple voltage) and electrical analysis   |
| 11890  | HF, HV, CV                                   | A118013 HF HV 5kV/100mA max<br>A118014 HF HV 2.5kV/200mA max<br>A118031 HF HV 5kV/100mA max + shielding   | LCD inverter transformer( ceramic capacitor, cable, PCB)<br>withstanding voltage test for production line<br>Medical equipment high frequency leakage current safety inspection |
|        | HF, HI, Bias voltage                         | A118015 HF, HI 33V/30A max.   | Automobile motor corona discharge inspection for production line<br>Snubber capacitor load life test  |
| 11805  | HF, HV                                       | A118013 HF, HV 1kV/1A max.  | High voltage capacitor load life test   |
| 11891  | HF, HV, CV                                   | A118013 HF HV 5kV/100mA max<br>A118014 HF HV 2.5kV/200mA max  | Passive Component<br>(inverter transformer, ceramic capacitor, cable, PCB etc.)<br>High Frequency and High Voltage Load Life Test   |

# Programmable HF AC Tester Model 11802/11803/11805/11890/11891

| SPECIFICATIONS            |                           | 44000  | 44000               | 44004                      | 44005                      | 44000                    |
|---------------------------|---------------------------|--|---------------------|----------------------------|----------------------------|--------------------------|
| Model                     |                           | 11802  | 11890               | 11891                      | 11805                      | 11803                    |
| AC Output                 |                           |  |                     |                            |                            |                          |
| Frequency                 | Range (rms)               | 20   | 0kHz~200kHz, step 1 | kHz                        | 10kHz~200kHz,<br>step 1kHz | 20kHz~1MHz,<br>step 1kHz |
| Frequency accuracy        | accuracy                  |  |                     | ±0.02%                     |                            |                          |
|                           | Range (rms)               |  | 165V maxir          | num, step 1 V              |                            | 1~143V, step 1 V         |
| Output Voltage            | accuracy                  |  |                     | $\pm$ (5% of setting + 0.5 | V)                         | ·                        |
|                           | reading                   |  |                     | $\pm$ (4% of reading + 0.5 | SV)                        |                          |
|                           | Range (rms)               |  | 0.01A ~ 3.10A       |                            | 0.05A ~ 6.20A              | 5.6A maximum             |
| Output Current            | accuracy                  |  |                     | $\pm$ (5% of setting + 0.5 | A)                         | ·                        |
|                           | reading                   |  |                     | $\pm$ (4% of reading + 0.5 | A)                         |                          |
| Maximum Output Po         | ower                      |  | 500VA               |                            | 1kVA                       | 800VA                    |
|                           | HF HV Load Life Test (CV) | •  |                     | •                          | •                          | •                        |
|                           | HF HV Load Life Test (CC) | •  |                     | •                          | •                          | •                        |
| Output mode               | HF WV Test (CV)           | •  | •                   |                            | •                          | •                        |
|                           | HF WV Test (CC)           | •  |                     |                            | •                          | •                        |
|                           | HF Breakdown Voltage Test | •  |                     |                            | •                          | •                        |
| Control Function          |                           |  |                     |                            |                            |                          |
| Timer                     | Load Life Test            | 1 min ~ 10000 hour, 30min error per year           |                     |                            |                            |                          |
| nmer                      | WV Test                   |  |                     |                            |                            |                          |
| General                   |                           |  |                     |                            |                            |                          |
| <b>Operation Environm</b> | ent                       | Temperature : 10°C~ 40°C, Humidity : < 90% RH      |                     |                            |                            |                          |
| Power Consumption         |                           | 2700 VA max.                                       |                     |                            | 3000 VA max.               | 2700 VA max.             |
| Power Requirement         |                           | 198 ~ 242Vac, 47 ~ 63Hz                            |                     |                            |                            |                          |
| Dimension (H x W x I      | D)                        | 241.5 x 440 x 609.8 mm / 8.72 x 17.32 x 24.01 inch |                     |                            |                            |                          |
| Weight                    |                           | 32 kg /70.48 lbs                                   |                     |                            |                            |                          |

| Modules      | Modules                      |         |       |   |  |                    |  |  |
|--------------|------------------------------|---------|-------|---|--|--------------------|--|--|
|              | Tester                       |         |       | Specification of Modules                    |  |                    |  |  |
|              | 11802/<br>11890/<br>11891    | 11805   | 11803 | Voltage Output                              | Max. Current Output  | Frequency<br>(kHz) |  |  |
| H.F. Current | Step-up N                    | Aodules |       |   |  |                    |  |  |
| A118011      |                              |         |       | 0.1V~10V, $\pm$ (5% of setting + 0.05V) *2  | 2.5A~50A, ±(4% of setting + 0.05A) *2                              | 200 kHz            |  |  |
| A118015      |                              | ٠       |       | 0.5V~33V, $\pm$ (5% of setting + 0.15V) *2  | 0.2A~30A, ±(4% of setting + 0.1A) *2                               | 200 kHz            |  |  |
| A118019      |                              |         |       | 0.2V~16V, $\pm$ (5% of setting + 0.1V) *2   | 0.2A~30A, ±(4% of setting + 0.1A) *2                               | 200 kHz            |  |  |
| A118037      |                              |         | •     | 0.50V~30V, $\pm$ (4% of reading + 0.3V)     | 0.5A~25.0A (500kHz), 0.5A~15.0A (1MHz),<br>±(3% of setting + 0.2A) | 1 MHz              |  |  |
| H.F. Voltage | H.F. Voltage Step-up Modules |         |       |   |  |                    |  |  |
| A118014      |                              |         |       | 0.05kV~2.50kV, ±(5% of setting + 0.01kV) *2 | 1mA~200mA, ±(4% of setting + 0.3mA) *2                             | 200 kHz            |  |  |
| A118016      |                              |         |       | 5V~250V, ±(5% of setting + 1V) *2           | 0.01A~2A, ±(4% of setting + 5mA) *2                                | 200 kHz            |  |  |
| A118017      |                              |         |       | 0.05kV~8.00kV, ±(5% of setting + 0.02kV) *2 | 60mA (100kHz)  | 200 kHz            |  |  |
| A118018      |                              | •       |       | 0.05kV~1.00kV, ±(5% of setting + 0.01kV) *2 | 0.01A~1A, ±(4% of setting + 3mA) *2                                | 200 kHz            |  |  |
| A118031      |                              |         |       | 0.05kV~5.00kV, ±(5% of setting + 0.01kV) *2 | 0.5mA~100mA, ±(4% of setting + 0.3mA) *2                           | 200 kHz            |  |  |
| A118032      |                              |         |       | 0.05kV~1.00kV, ±(5% of setting + 0.01kV) *2 | 2.5mA~500mA, ±(4% of setting + 1mA) *2                             | 200 kHz            |  |  |
| A118034      |                              | •       |       | 0.01kV~2.5kV, ±(5% of setting + 0.01kV) *2  | 1.5mA~400mA, ±(4% of setting + 0.2mA) *2                           | 200 kHz            |  |  |

Note\*1 : Under rated load and voltage correction is well performed

Note\*2: For test frequency above 100kHz, multiply the accuracy error by 2 times

Video & Color

Turnkey Test & Automation

# Milliohm Meter

# Model 16502



### **KEY FEATURES**

- Basic accuracy : 0.05%
- Pulsed test current output mode is used to reduce thermal EMFs affection on milliohm measurement
- DC test current output mode is used to fasten measurement speed for inductive DUT
- Dry-circuit test current output mode (limited Max. 20mV) is used to measure such contact resistances where the maximum open-circuit voltage must be limited to 50mV
- Temperature correction (TC function) regardless of material or temperature
- Useful temperature conversion function for motor/ coil evaluation
- 4 channels R scan with balance check function for fan motor (combined with A165017 option)
- 0.001mΩ~1.9999MΩ wide measurement range with 4½ digits resolution
- Standard RS-232 interface
- Optional GPIB & Handler interface
- Bin-sorting function
- Comparator and pass/fail alarming beeper function
- Large LCD display (240 x 64 dot-matrix)
- Friendly user interface
- LabView<sup>®</sup> Driver

The Chroma 16502 Milliohm Meter is Chroma's newest digital Milliohm Meter.  $0.001m \Omega \sim 1.9999M \Omega$  wide measurement range. DC, Pulsed, and Dry-circuit test current driving modes, enable the Chroma 16502 can be properly used in DC resistance measurement for various inductive components (coil, choke, and transformer winding etc.), cable, metallic contact (connector, relay switch etc.) and conduction materials.

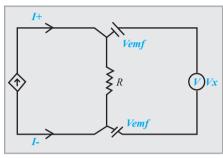
Using the A165014 Temperature Compensation Card with A165015 PT100 Temperature Probe, resistance values measured at ambient temperature can be corrected by applying a thermal coefficient so that the display shows the corresponding resistance values at any other temperature with temperature correction function. Temperature increase ( $\Delta$ t) is obtained and displayed by converting resistance measurements and ambient temperature with convenient temperature conversion function. This function is especially useful for verifying motor windings or coils, where the maximum temperature increase needs to be determined when current is applied.

Pulsed  $\pm$  function application includes power choke, switch/Relay contract, multi-braided twisted wires, metallic foil or conductive material, thermo-sensitive material (fuse, thermistor sensor) etc. Dry Circuit function application includes switch /relay contract, thermo-sensitive material (fuse, thermistor sensor) etc. DC+ function application includes high inductance

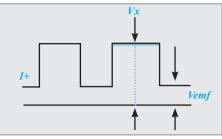


DUT, like primary of transformer (multiturn) measurement with Measurement Delay Function to avoid the test current not produced that effect by high inductance DUT during test period.

Standard RS-232 interface, optional GPIB & Handler interface, high speed and stable measurement capabilities enable the Chroma 16502 can be used for both component evaluation on the production line and milliohm measurement for bench-top applications.



Vemf = Thermoelectric EMFs



Vx - Vemf = IR Vemf = Thermoelectric EMFs

### **ORDERING INFORMATION**

16502 : Milliohm Meter A110235 : GPIB & Handler Interface A110236 : 19" Rack Mounting Kit A113012 : Vacuum Generator for A165018 A113014 : Vacuum Pump for A165018 A165013 : GPIB and Handler Interface with Temperature Compensation A165014 : Temperature Compensation Card A165015 : PT100 Temperature Probe A165016 : Pin Type Leads (flat) A165017 : 4 Channels R Scanner A165018 : Test Fixture for SMD Power Choke A165019 : Pin Type Leads (taper) A165022 : Four Terminal Test Cable

| SPECIFICATIONS                      |  |  |  |
|-------------------------------------|--|--|--|
| Model                               | 16502  |  |  |
| <b>Range Basic Measurement Accu</b> | racy *1;Test Current                                       |  |  |
| 20m Ω                               | $\pm$ (0.1% of reading + 0.03 % of range) ; 1A typical     |  |  |
| 200m Ω                              | $\pm$ (0.05% of reading + 0.03 % of range) ; 100mA typical |  |  |
| 2Ω                                  | $\pm$ (0.05% of reading + 0.03 % of range) ; 10mA typical  |  |  |
| 20 Ω                                | $\pm$ (0.05% of reading + 0.03 % of range); 1mA typical    |  |  |
| 200Ω                                | $\pm$ (0.05% of reading + 0.02 % of range); 1mA typical    |  |  |
| 2kΩ                                 | $\pm$ (0.05% of reading + 0.01 % of range); 1mA typical    |  |  |
| <b>20k</b> Ω                        | $\pm$ (0.1% of reading + 0.01% of range); 100µA typical    |  |  |
| 200kΩ                               | $\pm$ (0.2% of reading + 0.01 % of range); 10µA typical    |  |  |
| 2MΩ                                 | $\pm$ (0.3% of reading + 0.01 % of range) ; 1µA typical    |  |  |
| Test Signal                         |  |  |  |
| Drive Mode                          | DC+, DC-, Pulsed+, Pulsed -, Pulsed $\pm$ , Stand by       |  |  |
|                                     | Open Circuit Voltage less than 20mV;                       |  |  |
| Dry Circuit                         | for 200m $\Omega$ , 2 $\Omega$ , 20 $\Omega$ ranges only   |  |  |
| Measurement Time *2                 |  |  |  |
| Fast                                | 65ms   |  |  |
| Medium                              | 150ms  |  |  |
| Slow                                | 650ms  |  |  |
| Temp. Correction / Conversion       |  |  |  |
| Temperature -10.0°C ~ 39.9°         | $\pm$ (0.3% of reading+0.5°C) *3                           |  |  |
| Measurement 40.0°C ~99.9°C          | $\pm$ (0.3% of reading+1.0°C) *3                           |  |  |
| Accuracy (Option)                   | ± (0.5% of reading+1.0 C) 5                                |  |  |
| Temp. Sensor Type (Option)          | PT100/ PT500   |  |  |
| Interface & I/O                     |  |  |  |
| Interface                           | RS-232(Standard) , GPIB, Handler (Optional)                |  |  |
| Output Signal                       | Bin-sorting & Pass/Fail judge                              |  |  |
| Comparator                          | Upper/Lower limits in value                                |  |  |
| Bin Sorting                         | 8 bin limits in %, ABS                                     |  |  |
| Trigger Delay                       | 0~9999ms   |  |  |
| Trigger                             | Internal, Manual, External, BUS                            |  |  |
| Display                             | 240 x 64 dot-matrix LCD display                            |  |  |
| Correction Function                 | Zeroing  |  |  |
| General                             |  |  |  |
| Operation Environment               | Temperature : 10°C~40°C,Humidity : < 90 % R.H.             |  |  |
| Power Consumption                   | 80 VA max.   |  |  |
| Power Requirement                   | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz                     |  |  |
| Dimension (H x W x D)               | 100 x 320 x 346 mm / 3.94 x 12.6 x 13.62 inch              |  |  |
| Weight                              | 4.2 kg / 9.25 lbs  |  |  |

**Note\*1 :** 23  $\pm$  5°C after Zeroing correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

**Note\*2**: Measurement time includes sampling, calculation and judge test parameter measurement. **Note\*3**: Not include temp. sensor accuracy

# **Component Test Scanner**

# Model 13001



### **KEY FEATURES**

- Support component test scanning
- Support 8 slots for plug-in (removable), up to 320 channels for one unit
- Option A130007 40 channels scan module. input up to 500VDC for IR test without switching
- Max. 8 salve units for multiple scanner (master/slave interface)
- Support Chroma LCR meter
- Support Chroma 3302/3252/11025 turn ration function
- Support 11200 CLC/IR meter for IR test
- Standard RS-232, GPIB and USB interface
- 13001 can be installed in Chroma Component ATE model 8800
- Support ICT applications



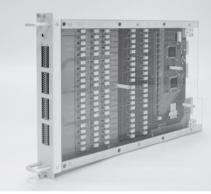
In the recent years, component is more complicated and more multiple. It makes all tests be performed which are very complicated and different. The problem is not only the course is complicated and apt to make mistakes, but also the manpower cost more.

Chroma 13001 can perform switch and scan test for L, C, R etc measurement combine with LCR Meter (Chroma model 3302/3252/11022/11025) include turn ration if the model has and IR test combine with Chroma 11200 CLC/IR Meter. It also offers short function for leakage inductance measurement. One unit could plug-in modules up to 8 slots. It is up to 320 channels for one unit if combined with 8 of option A1130007 40 channels module. It provides master and slave designed and up to 8 salve units for multiple scanner. User can control the output test circuit through RS-232, GPIB or USB interface.

Chroma 13001 can be installed in Chroma 8800 Component ATE for DUT which a lot of procedures to test like RJ-45 equipment, glass substrate, LCD glass substrate, printed circuit glass, PCB, EMI filter ICT application. The 8800 ATS can save the manpower cost, reduce the mistake, data management to improve quality and efficiency.

### **ORDERING INFORMATION**

13001 : Component Test Scanner 13001 : Component Test Scanner (Slave) A130000 : 6 BNC Test Lead A130001:4 BNC Test Lead A130002 : IR Test Lead A130005 : Long Test Lead A130007:40 Channels Scan Module



A130007: 40 Channels Scan Module

| SPECIFICATIONS          |  |  |  |  |
|-------------------------|--|--|--|--|
| Model                   | 13001 (MASTER & SLAVE)   |  |  |  |
| Mode                    | SCAN   |  |  |  |
| Interface (Master only) | RS-232 , USB , GPIB  |  |  |  |
| General                 |  |  |  |  |
| Operation Environment   | Temperature: $0^{\circ}$ C ~ 45°C, Humidity: 15% to 80% R.H@ $\leq$ 40°C |  |  |  |
| Power Consumption       | 150VA Max. (with rated load)   |  |  |  |
| Power Requirements      | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz                                   |  |  |  |
| Dimension (H x W x D)   | 310 x 440 x 573 mm / 12.2 x 17.32 x 22.56 inch                           |  |  |  |
| Weight                  | 21 kg / 46.26 lbs (13001 main frame only, without module)                |  |  |  |

| MODULE SPECIFICATIONS       |           |  |  |  |
|-----------------------------|-----------|--|--|--|
| Module                      | A130007   |  |  |  |
| Channel                     | 40        |  |  |  |
| Port                        | 80        |  |  |  |
|                             | DC 500V   |  |  |  |
| Max. voltage without switch | AC 10V    |  |  |  |
|                             | DC 1000mA |  |  |  |
| Max. Current without switch | AC 100mA  |  |  |  |

Photovoltaic Test

Optical

Inspection

Electronic

/ Test &

# Magnetic Component Test System

# Model 1810



### **KEY FEATURES**

Sine Wave Voltage : 20kHz~1MHz

- 60A max DC Bias Current
- Power Loss Detection
- Temperature Detection
- Statistic Report with Software Control
- Customized test module

GPIB RS-232 RS-485

Magnetic component's heat comes from copper loss and iron loss. The copper loss caused by flowing current and wire resistance. The iron loss including Hysteresis Loss and Eddy Current Loss, mainly comes out from AC current. The inductance of magnetic component will drop unexpectedly if the temperature gets too high.

Chroma 1810 is a test system for detecting the power loss of magnetic component. It provides DC current and AC voltage to the component, and it has a temperature sensor detects the temperature on component. The analysis reports will record the result in computer by using test program. These statistic analysis reports are important for researching and quality control department.

### **ORDERING INFORMATION**

**1810 :** Magnetic Component Test System **HF AC Tester :** Refer to Chroma Model 11802, 11803

DC Source : Refer to Chroma Model 62012P-80-60

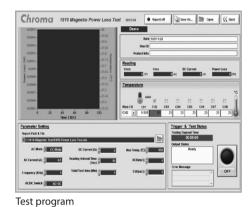
**Thermal/Multi-Function Data Logger :** Refer to Chroma Model 51101-8

A118016 : H.F. Voltage Step-up Module - 250V/2A max.

A118019 : H.F. Current Step-up Module - 16V/30A max.

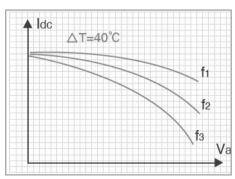
A118037 : H.F. Current Step-up Module - 30V/25A max.

Oscilloscope : Tektronix TDS3012C





A118037 : H.F. Current Step-up Module



Load Current (ldc) and AC Voltage (Vac) Curve

## **Capacitor Test System**

# Model 1820



### **KEY FEATURES**

- High frequency sine wave current : 1kHz~20kHz 10kHz~200kHz
- DC bias voltage : 5000V max.
- Capacitor endurance & temperature rising test
- Capacitor withstanding current test (frequency sweep)
- Support with software control
- Customized test module

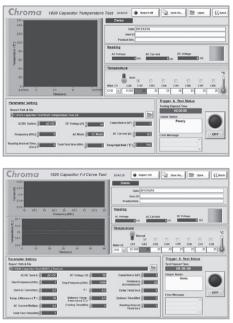


By higher withstanding voltage and lower ESR than electrolytic capacitors, the superior load life characteristic of film capacitors are suitable to be applied mainly in green energy industries such as Photovoltaic, Electric Vehicle, and wind power. When applying on circuits, high frequency large current may rise up capacitors' temperature and reduce their usable life. If the current withstanding and heat dissipation are not well-structured in the internal circuit, capacitors can even be burned. Therefore, observe the temperature rising characteristic under actual working condition is the best way to evaluate the endurance and reliability of film capacitors. It is also the verification and analysis capabilities that the capacitor manufacturers must have.

Chroma 1820 ia able to provide the test condition of adding high frequency AC current on DC high voltage that DC bias voltage can up to 5kV and AC current frequency is from 1kHz to 20kHz / 10kHz to 200kHz with 1kVA / 2kVA maximum output power. It measures the multi-point temperature accurately by 8-channel temperature data logger. In addition to the standard test modules available for choosing, we also provide the customized module evaluation and design service for the requirements of mass current test applications. The control software specially developed for this system can set the test conditions, record the test data, provide the test report, and reflect the change of temperature rising by showing the real-time temperature curve.

By the function design of the software, Chroma 1820 can not only do the long-time temperature rising test based on users' setting test condition, but also increase or decrease the AC current and switch the test frequency by product temperature rising situation for evaluating the maximum withstanding current under different application frequencies. Whatever characteristic improvement and evaluation for product research & development, or quality verification and check for IQC, Chroma 1820 is the best platform to analyze the endurance and reliability of capacitors.

### Softpanel



### ORDERING INFORMATION

1820 : Capacitor Test System

- 11805 : Programmable HF AC Tester
- 11200 : Capacitor Leakage Current/IR Meter 800V 51101-8: Thermal/Multi-function Data Logger 8ch A118015: HF Current Step-up Module
- 33V/30A max.
- A118018 : HF Voltage Step-up Module 1kV/1A max.
- A118034 : HF Voltage Step-up Module 2.5kV/400mA max.
- Glassman LT5R400: HV DC Power Supply 5kV

Test &

PXI Test &

/ Test &

# **Inductor Test & Packing Machine**

# Model 1870D Series



### **KEY FEATURES**

- Test and packing speeds from 200ppm to 1,800ppm
- Provides 4 test stations based on test requirements for users to select desired test items
- Complete list of test items: Polarity, Layer Short Circuit, IR, DCR, Ls & Rs (Q value), Bias current
- Patented high-speed polarity reversing design ensures that products on the conveyor all have the same polarity
- Each test station has an independent NG (No Good) product collection box for later quality analysis
- Circular load plate design eliminates dropped inductors
- Equipment is fast, stable and safe
- Exclusive data collection software designed for test and packing machines for monitoring product quality in real time

### **Automated Production for Power Inductors**

A power inductor is one of the most common and demanding components in magnetic and electrical products. As production capacity is rather large compared to other components, high-speed testing equipment is essential to meet measurement requirements. The basic static electrical characteristics tests for power inductor production lines include Ls, Q/ACR, DCR, polarity, withstand voltage insulation, layer short and BIAS Current tests. Chroma is able to provide fully automated production test solutions for power inductors.

The Chroma 1870D Series are high-speed test and packaging machines designed specifically for wafer-type power inductors with testing speeds up to 1,800ppm. It combines the power inductor "must test" parameters of each test station with exclusive data collection software for analyzing production data to improve productivity and quality control.

### **Graphic User Interface**



1870D Software testing parameters settings

| the factors              | Ter Michel D )  |   | . * *  |  |  |  |
|--------------------------|---|---|--|--|--|--|
| Lick<br>Tage<br>Tagethel | 109 130 Testinger Fairbig Pessible Constitute Sector  | 0 | Aver         March         P           Aver         5.5 mol         6.600         4.000           B04         10778         1073         0.000 |  |  |  |
| 0                        | The second secon  | • |  |  |  |  |
|                          | e c s o s o s o s o s o s<br>set  |   |  |  |  |  |
| •                        |   | • |  |  |  |  |
|                          | $\lim_{k \to \infty} \frac{1}{k_{\rm s}} \int_{-\infty}^{\infty} \int_{-\infty}^$ |   |  |  |  |  |
| A 2015                   | a) 2015/1020 10:16:01 Yeld rate is lower than setting value.  |   |  |  |  |  |

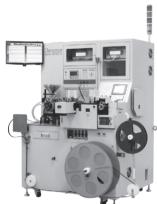
1870D Software production monitoring



1870D Software report

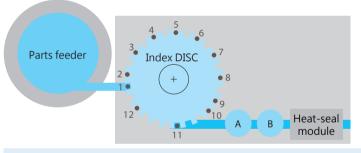
ORDERING INFORMATION

1870D : Inductor Test & Packing Machine 1870D-12 : Inductor Test & Packing Machine



1870D-12





### Stations

- 1. Feeding detect
- 2. Polarity test
- \* 3. Polarity reverse
- 4. Layer short test (works with 19301A) Insulation resistance test (works with 11200) Bias current test (works with 11300)
- 5. NG inductor discharge for station 4
- 6. Winding resistance test (works with 16502)
- 7. NG inductor discharge for station 6
- Inductor/quality factor test (works 11050 Series /3302)

- 9. NG inductor discharge for station 8
- 10. Good inductor receiver
- 11. Move to packing tape
- 12. Clean remaining inductors
- A. Reserved for number spraying station
- B. Reserved for automatic optical inspection station

\* Choose one from three alternatives to work with installation testing for the 4<sup>th</sup> station

| 1870D Application Size Maximum Productivity Unit : pcs/min |     |       |       |       |       |           |       |       |           |       |
|--|-----|-------|-------|-------|-------|-----------|-------|-------|-----------|-------|
| WxD (mm)   | 3.2 | x 2.5 | 2.5 : | x 2.0 | 2.0 x | 1.6 / 2.0 | x 1.2 |       | 1.6 x 0.8 |       |
| H (mm)   | 1.2 | 1.0   | 1.2   | 1.0   | 1.2   | 1.0       | 0.8   | 1.0   | 0.8       | 0.6   |
| Single-sided electrode                                     | 600 | 600   | 800   | 800   | 800   | 800       | 1,000 | 800   | 800       | 1,200 |
| Five-sided electrodes                                      | 900 | 900   | 1,200 | 1,200 | 1,500 | 1,500     | 1,500 | 1,500 | 1,500     | 1,800 |

\*The maximum productivity listed above does not include layer short testing, insulation resistance testing, or bias current testing.

\* Production efficiency >1,200 pcs/min with paper tape used for packing. Do not use plastic tape.

| 1870D-12 Application Size Maximum Productivity Unit : pcs/min |         |         |         |           |           |
|---|---------|---------|---------|-----------|-----------|
| WxD (mm)  | 4.0x4.0 | 6.0x6.0 | 8.0x8.0 | 10.0x10.0 | 12.0x12.0 |
| Single-sided<br>electrode                                     | 250     | 200     | 150     | 100       | 80        |

# Inductor Layer Short ATS

# Model 1871



### **KEY FEATURES**

- Test speeds from 200ppm to1,500ppm
- Provides from 2 to 5 test stations for ATS selections based on testing requirements
- Equipped with inductance measurement contact check and voltage difference compensation functions
- Patented testing probe with "Four wire system" design to test voltage's authenticity and stability
- Tested NG inductors are collected to a separate box by failed item for bad process model and cause analysis
- Circular load plate design to eliminate dropped inductors
- Exclusive data collection software designed for layer short automatic test system for monitoring product quality in real time

The Chroma 1871 is an inductor layer short automatic test system with production capacity up to 1,500ppm for mass production applications. The 1871 ATS provides multiple test items for users to select from. It won't be idled even if it was installed during the initial development stage with lower production capacity.

### **Graphic User Interface**



1871 Software testing parameters settings

# No. Test (byte) Statute (byte)

| No.   | Total Input | Pass Oty. | Fal City. | Contact Error<br>Open / Short | Yield Rate | Area | Laplacian | Diff Area | Flutter | Peak Rati |
|-------|-------------|-----------|-----------|-------------------------------|------------|------|-----------|-----------|---------|-----------|
| 1     | 816         | 72        | 616       | 65/63                         | 10.46%     | 148  | 63        | 64        | 68      | 140       |
| 2     | 816         | 77        | 590       | 69/80                         | 11.54%     | 133  | 54        | 56        | 81      | 129       |
| 3     | •           |           | -         | -                             | -          | -    | -         | -         | -       | -         |
| 4     |             |           |           |                               |            |      |           | •         |         | -         |
| 5     |             |           |           |                               |            |      |           |           |         |           |
| Total | 1632        | 149       | 1206      | 134/143                       | 10.99%     | 281  | 117       | 120       | 149     | 269       |

≜ 2015/1000 09:50:45 Yield rate is lower then setting value.

1871 Software production monitoring

### **18701 Configuration Diagram and Station Depiction**



1871 Software report

### **ORDERING INFORMATION**

1871 : Inductor Layer Short ATS

### Stations

- 1. Feeding detect
- 2. Layer short test station 1 (works with 19301A)
- 3. Layer short test station 2 (works with 19301A)
- 4. Layer short test station 3 (works with 19301A)
- Layer short test station 4 (works with 19301A)
   Layer short test station 5 (works with 19301A)
  - Cayer short test station 5 (
     Good inductor receiver
  - 8. Area NG inductor discharge
  - Area NG inductor discharge
     Laplacian NG inductor discharge
  - 10. Contact check NG inductor discharge
  - 11. Clean remaining inductors

\* Layer short test stations 3 to 5 are reserved when 2 stations are selected.

| 1871 Application Size Maximum Productivity Unit : pcs/min |     |       |       |       |       |           |       |       |           |       |
|---|-----|-------|-------|-------|-------|-----------|-------|-------|-----------|-------|
| WxD(mm)   | 3.2 | x 2.5 | 2.5   | x 2.0 | 2.0 x | 1.6 / 2.0 | x 1.2 |       | 1.6 x 0.8 |       |
| H(mm)   | 1.2 | 1.0   | 1.2   | 1.0   | 1.2   | 1.0       | 0.8   | 1.0   | 0.8       | 0.6   |
| Single-sided<br>electrode                                 | 600 | 600   | 800   | 800   | 800   | 800       | 800   | 800   | 800       | 800   |
| Five-sided<br>electrodes                                  | 900 | 900   | 1,200 | 1,200 | 1,500 | 1,500     | 1,500 | 1,500 | 1,500     | 1,500 |

\* The test condition for the above is pulse 1.0 with 5 stations of layer short testing.

lat Panel

Photovoltaic Test & Automation



/ Test &

# **Component ATS**

### **KEY FEATURES**

- Open architecture software
  - Expandable hardware support
  - Support instruments equipped with GPIB/RS-232 or RS485 interface
  - User editable test library (test Items)
  - User editable test programs
  - Statistical report
  - User privilege control
  - Test item/ program release control
  - Activity log
  - Support barcode reader
- Test command editor helps to improve test speed
- Comprehensive hardware modules provide highly accurate, repetitive measurements
- High test throughput by system test items
- High test throughput generated by system test items
- Cost effective
- Hardware expandable upon request
- Windows 
  <sup>®</sup> 2000/ XP based software
- \* Test items can be customized or created via the test item editor based on the requirements of various UUTs.

### **APPLICATIONS**

- RJ-45 equipment (including LAN modules, Ethernet IC, PoE IC) test
- Glass substrate test (including solar panel)
- LCD glass substrate test
- Printed circuit glass (including touch panel) test
   PCB test
- EMI filter test
- Rechargeable battery test
- ICT applications



In recent years, as components become more complicated and multi-channel along with other complex problems, the cost of tests has skyrocketed for manufacturers. Chroma 8800 component automatic test system (ATS) is developed to effectively help manufacturers reduce the test cost and product risk. This system is able to complete all measurements and tests in one single test program. This powerful feature save time and reduce human operation errors that decrease the enterprise risk due to improper tests. The employment of open architecture software provides users a flexible, powerful and cost-effective automated test system that is deemed the best solution for component tests.

Chroma 8800 component automatic test system integrates different test instruments in the system based on test requirements. The open architecture software offers corresponding solutions by various test programs and products that give customers highly flexible test combinations. In addition, user expandable test items are provided for editing if new requirements arise.

This automatic test system uses a unique test command optimization technology to prevent the repetitive control commands from sending to the system hardware devices. This technology improves the system test speed dramatically. Users create new test items based on their requirements using the test item editor. The users can expand the test items as needed.

The system's integrated statistical and management functions generate various test statistical reports and performing system administration. Statistical reports are very important in factories for research and design (R/ D) evaluation, quality assurance (QA) verification and production tests. Chroma 8800's Window 2000/XP environments provide test engineers with a dedicated components automatic test system in a familiar Windows environment and allows accesses to resources provided by Windows.

Chroma 8800 component automatic test system can combine different testers and hardware according to the test requirements. For instance, Chroma 13001 performs multi-channel scan test for inductance, capacitance and resistance along with turn ration (if applicable) measurements when combining with the LCR Meters like Chroma 3302/3252/11022/11025. The 8800 can do IR test as well as leakage inductance measurement that is designed specially for short-circuit when combining with Chroma 11200 CLC/IR Meter. Chroma 13001 Component Test Scanner supports up to 320 channels per unit when 8 optional A1130007 40-channel scan modules are installed. Up to 8 slaves of Chroma 13001 can be expanded externally for an 8800 component ATS and up to 2880 channels (1 master plus 8 slaves) can be tested to fulfill the requirements for multi-channel tests.

### **ORDERING INFORMATION**

Model 8800

8800: Component Automatic Test System LCR Meter : Refer to Model 11022 / 11025 / 3302 / 3252 series

Scanner : Refer to Model 13001 series Scan Module : Refer to Model A130007 series IR Meter : Refer to Model 11200 series A800005 : PCI BUS GPIB Card (National Instrument)

# Model 8800

# notovoltaic Test Automation

**Optical Inspection** Automated

Turnkey Test & Automation

### SPECIFICATIONS

### Accurate and highly reliable hardware devices :

| System Controller |                           |
|-------------------|---------------------------|
| Model             | PC/IPC                    |
| CPU               | Pentium III 600 or faster |
| SRAM              | 256KB                     |
| DRAM              | 128MB or higher           |
| Hard drive        | 2.1GB or higher           |
| CD-ROM            | 24X or faster             |
| Monitor           | 15"                       |
| Keyboard          | 101 keys                  |
| I/O               | Mouse/Print port          |
| System Interface  | GPIB/RS-232               |
| GPIB board        | NI-PCI GPIB Card          |

| Capacitor Leakage Current/ IR Meter                      |              |  |  |  |
|--|--------------|--|--|--|
| Model  |              | 11200 (650V)   |  |  |
| Main Function  |              | Capacitor Leakage Current / IR Meter   |  |  |
| Test Parameter   |              | LC, IR   |  |  |
| <b>Test Signals Inform</b>                               | nation       |  |  |  |
| Voltage  |              | 1.0 V~100 V, step 0.1 V; 101V~650 V,<br>step 1V; ±(0.5% + 0.2V)                        |  |  |
| Charge Current Lim                                       | it           | V ≤ 100V: 0.5mA~500mA<br>V > 100V: 0.5mA~150mA, 65W max.<br>step 0.5mA; ±(3% + 0.05mA) |  |  |
| Measurement Displ  | ay Range     | LC : 0.001µA~20.00mA   |  |  |
| Basic Measurement Accuracy<br>*1                         |              | LC Reading : $\pm$ (0.3% + 0.005µA)  |  |  |
| Measurement  | Fast         | 77 ms  |  |  |
| speed  | Medium       | 143 ms   |  |  |
| (Ext. Trigger, Hold<br>Range,<br>Line Frequency<br>60Hz) | Slow         | 420 ms   |  |  |
| Function   |              |  |  |  |
| Correction   |              | Null zeroing   |  |  |
| Test Voltage Monito                                      | r            | Vm: 0.0 V~660.0V;<br>$\pm$ (0.2% of reading + 0.1V)                                    |  |  |
| Charge Timer   |              | 0~999 sec.   |  |  |
| Dwell Timer  |              | 0.2~999 sec.   |  |  |
| $N_{24} + 1 + 22 + 5^{\circ}C_{2}$                       | ftor Null co | rrection Befer to Operation Manual for   |  |  |

**Note\*1 :** 23  $\pm$  5°C after Null correction. Refer to Operation Manual for detail measurement accuracy descriptions.

| LCD Materia                      |  |
|----------------------------------|--|
| LCR Meter                        |  |
| Model                            | 11022                                    |
| Test Parameter                   | L,C, R, Ζ , Q, D, ESR, X, θ              |
| Test Signals                     |  |
| Level                            | 10 mV~1V, step 10 mV; $\pm$ (10% + 3 mV) |
|                                  | 50Hz, 60Hz, 100Hz, 120Hz,                |
| Frequency                        | 1kHz, 10kHz, 20kHz, 40kHz,               |
|                                  | 50kHz, 100kHz ; 0.01%                    |
| <b>Measurement Display Range</b> |  |
| C (Capacitance)                  | 0.001pF~1.9999F                          |
| L, M, L2 (Inductance)            | 0.001µH~99.99kH                          |
| Z (Impedance), ESR               | 0.01m~99.99MΩ                            |
| Q (Quality Factor)               | 0.0001_0000                              |
| D (Distortion Factor)            | 0.0001~9999                              |
| heta (Phase Angle)               | -180.00°~+180.00°                        |
| Measurement Accuracy *1          | ±0.1%                                    |
| Measurement Time (Fast) *2       | 21ms                                     |

**Note\*1:** 23  $\pm$  5°C after OPEN and SHORT correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions.

Note\*2: Measurement time includes sampling, calculation and judge of primary and secondary test parameter measurement

| <b>Component Test Scann</b> | er                                      |
|-----------------------------|---|
| Model                       | 13001 (MASTER & SLAVE)                  |
| Mode                        | SCAN                                    |
| Interface (Master only)     | RS-232, USB, GPIB                       |
| General                     |   |
| Operation Environment       | Temperature: 0°C ~ 45°C,                |
| operation Environment       | Humidity: 15% to 80% R.H@ $\leq$ 40°C   |
| Power Consumption           | 150VA Max. (with rated load)            |
| Power Requirements          | 90 ~ 132Vac or 180 ~ 264Vac, 47 ~ 63Hz  |
| Waight                      | Approx.20Kg                             |
| Weight                      | (13001 main frame only, without module) |
| Size(WxHxD)                 | About 430mm x 311mm x 570mm             |
|                             |   |
| Module                      | A130007                                 |
| Channel                     | 40                                      |
| Port                        | 80                                      |
| Max. voltage without        | DC 500V                                 |
| switch                      | AC 10V                                  |
| Max. Current without        | DC 1000mA                               |
| switch                      | AC 100mA                                |

Other hardware devices :

Digital Multimeter (Chroma 12061 / Agilent-34401A / Keithley 2000), other types or brands of DMM supported upon request

Digital Storage Oscilloscope (TDS-3000 / 5000 / 7000 series), other types or brands of DSO supported upon request

# EDLC ATS

# Model 8801



### **KEY FEATURES**

- Suit for electrical double layer capacitor production line automatic test, test parameter includes Static Capacitance and Internal Resistance (IR and ESR) (for EIAJ RC-2377 Test Method of Electrical Double Layer Capacitor)
- Open architecture software
  - Expandable hardware support
  - Support GPIB instruments&RS-232/RS485 interface
  - User editable test library
  - User editable test programs
  - Statistic report
  - User authority control
  - Release control
  - Activity log
  - Multi-UUT test capability for single-output PSU
  - Support barcode reader
- Measurement function: C/ IR / ESR (For EIAJ RC-2377)
- High test throughput
- Synchronized measurement in multi-channel reduce the test time
- One DC source and one DC load design
- Hardware protect circuit
- Microsoft<sup>®</sup> Word based evaluation report or UUT characterization
- Cost effective
- Other hardware expandable upon request
- Windows<sup>®</sup> 2000/ XP based software

### GPIB

The Chroma Electrical Double Layer Capacitor Automatic Test System model 8801 is the ultimate solution for EDLC (electrical double layer capacitor) testing. The system includes a various range of hardware choice such as DC Sources, Electronic Loads, Timing Analyzer and LCR Meter. This flexibility combined with its open architecture software platform gives users a flexible, powerful and cost effective test system for almost all range of EDLC.

The Chroma 8801 EDLC ATS uses a unique test command optimization technology to prevent repetitive control commands from being sent to the system hardware devices. This improve test speed dramatically and makes the Chroma 8801 an ideal choice for both high speed production applications as well as design verification.

The Chroma 8801 EDLC ATS includes a sophisticated test executive which includes pre-written test items for standard EIAJ RC-2377 EDLC tests. User may also create new test items by using a special test item editing function, which users the capability to expand the test library unlimitedly.

This open architecture software also includes statistic and management functions, making the system capable to generate various test documents and performing system administration. Because the statistical reports are critically important in modern factories for R/D evaluation, QA verification and production tests, these functions are an integral part of the system.

Working under Window 2000/XP the model 8801 provides test engineers with a dedicated EDLC test system in an easy-to-learn Windows environment and allow access to resources provided by Windows.

This auto test system uses the unique test command optimization technology to prevent the repeating control commands from sending to the system hardware devices. This improves the system test speed dramatically and makes Chroma 8801, which uses open software architecture, but still highly efficient as optimized auto test system.

### **ORDERING INFORMATION**

8801 : EDLC Automatic Test System 80611N : Timing/Noise module 5004ATM : System Controller A880100 : EDLC 10 Channels C/IR Scanner A800005 : PCI BUS GPIB Card (National Instrument) DC Load Module : Refer to Model 6330A Series DC Source : Refer to Model 62000P Series LCR Meter : Refer to Model 11022

# EDLC ATS

# Model 8801

**Timing/Noise Analyzer** 

MODEL

### SPECIFICATIONS

Accurate and highly reliable hardware devices :

| System Controller |                           |
|-------------------|---------------------------|
| MODEL             | PC/IPC                    |
| CPU               | Pentium III 600 or faster |
| SRAM              | 256kB                     |
| DRAM              | 128MB or higher           |
| Hard drive        | 2.1GB or higher           |
| CD-ROM            | 24X or faster             |
| Monitor           | 15"                       |
| Keyboard          | 101 keys                  |
| I/O               | Mouse/Print port          |
| System Interface  | GPIB/RS-232               |
| GPIB board        | NI-PCI GPIB Card          |

| LCR Meter                        |  |
|----------------------------------|--|
| Model                            | 11022                                    |
| Test Parameter                   | L,C, R, Ζ , Q, D, ESR, X, θ              |
| Test Signals                     |  |
| Level                            | 10 mV~1V, step 10 mV; $\pm$ (10% + 3 mV) |
| Frequency                        | 50Hz, 60Hz, 100Hz, 120Hz, 1kHz, 10kHz,   |
| Fiequency                        | 20kHz, 40kHz, 50kHz, 100kHz ; 0.01%      |
| <b>Measurement Display Range</b> |  |
| C (Capacitance)                  | 0.001pF~1.9999F                          |
| L, M, L2 (Inductance)            | 0.001µH~99.99kH                          |
| Z (Impedance), ESR               | 0.01m~99.99MΩ                            |
| Q (Quality Factor)               | 0.0001~9999                              |
| D (Distortion Factor)            | 0.0001~9999                              |
| heta (Phase Angle)               | -180.00°~ +180.00°                       |
| Measurement Accuracy *1          | ±0.1%                                    |
| Measurement Time (Fast) *2       | 21ms                                     |

| NO. of input module  | Up to 10  |
|--|---|
| Noise measurement range  | 2V/0.4V   |
| Low Pass Filter  | Up to 20MHz   |
| Input circuit  | Differential input  |
| Timing range   | 0~16/0~64 second/up to 8365 second  |
| NO. of trigger input   | 4 sets  |
| NO. of comparator  | 2 Input module  |
| Controllable TTL bits  | 16 output   |
| Controllable floating relay  | 6   |
| NO. of multiplex input   | 10  |
| NO. of multiplex output  | 2 for DMM & 2 for DSO   |
|  |   |
| Electronic Load  |   |
|  |   |
| MODEL  | 6330A Series  |
| MODEL<br>Load mode   | 6330A Series<br>CC/CR/CV  |
|  |   |
| Load mode  | CC/CR/CV  |
| Load mode<br>Power rating  | CC/CR/CV<br>30-1200W  |
| Load mode<br>Power rating<br>Voltage range   | CC/CR/CV<br>30-1200W<br>1-500V  |
| Load mode<br>Power rating<br>Voltage range<br>Current range  | CC/CR/CV<br>30-1200W<br>1-500V<br>Up to 240A  |
| Load mode<br>Power rating<br>Voltage range<br>Current range<br>Slew rate   | CC/CR/CV<br>30-1200W<br>1-500V<br>Up to 240A<br>Up to 10A/μs                                      |
| Load mode<br>Power rating<br>Voltage range<br>Current range<br>Slew rate<br>Measurements   | CC/CR/CV<br>30-1200W<br>1-500V<br>Up to 240A<br>Up to 10A/µs<br>Voltage/Current<br>No             |
| Load mode<br>Power rating<br>Voltage range<br>Current range<br>Slew rate<br>Measurements<br>Monitoring output  | CC/CR/CV<br>30-1200W<br>1-500V<br>Up to 240A<br>Up to 10A/μs<br>Voltage/Current                   |
| Load mode<br>Power rating<br>Voltage range<br>Current range<br>Slew rate<br>Measurements<br>Monitoring output<br>Current share                                     | CC/CR/CV<br>30-1200W<br>1-500V<br>Up to 240A<br>Up to 10A/µs<br>Voltage/Current<br>No             |
| Load mode<br>Power rating<br>Voltage range<br>Current range<br>Slew rate<br>Measurements<br>Monitoring output<br>Current share<br>measurement                      | СС/СR/CV<br>30-1200W<br>1-500V<br>Up to 240A<br>Up to 10A/µs<br>Voltage/Current<br>No<br>No       |
| Load mode<br>Power rating<br>Voltage range<br>Current range<br>Slew rate<br>Measurements<br>Monitoring output<br>Current share<br>measurement<br>Noise measurement | CC/CR/CV<br>30-1200W<br>1-500V<br>Up to 240A<br>Up to 10A/μs<br>Voltage/Current<br>No<br>No<br>No |

6011

\* Please refer to respective product catalogs for detail specifications.

| DC Source                  |               |  |  |  |
|----------------------------|---------------|--|--|--|
| MODEL                      | 62000P Series |  |  |  |
| Power rating               | 600, 1200W    |  |  |  |
| Voltage range              | 0-100V/600V   |  |  |  |
| Programmable current limit | Yes           |  |  |  |
| Programmable OV point      | Yes           |  |  |  |
| Analog programming         | Yes           |  |  |  |
| Remote sensing             | Yes           |  |  |  |
| Line-drop compensation     | 5V            |  |  |  |

\* Please refer to respective product catalogs for detail specifications.

Note\*1:23 ± 5°C after OPEN and SHORT correction. Slow measurement speed. Refer to Operation Manual for detail measurement accuracy descriptions. Note\*2 : Measurement time includes sampling, calculation and judge of primary and secondary test parameter measurement

### Other hardware devices :

Digital Multimeter (Chroma 12061/Agilent-34401A/Keithley 2000), other types or brands of DMM supported upon request

Digital Storage Oscilloscope (TDS-3000/5000/7000 series), other types or brands of DSO supported upon request

Turnkey Test & Automation

# EDLC LC Monitoring System

# Model 8802



### **KEY FEATURES**

- Suit for electrical double layer capacitor leakage current long time test
- Test parameter includes leakage current
- Charge / discharge current limit function
- Voltage programmable, 0.9A maximum charge/ discharge per-channel
- 1µA ~ 100mA, 0 ohm input resistance leakage current meter
- Multi-tank control capability
- Up to 200 channels per-tank
- Sequence timing control
- Windows base control soft-panel
- Leakage Current, charge current and discharge current limit value programmable
- Leakage current GO/NG indication on fixtures

### \* Detail specification could be depended by customer requirement

The Chroma Electrical Double Layer Capacitor Leakage Current Monitoring System model 8802 is the ultimate solution for EDLC (electrical double layer capacitor) leakage current testing. The system includes modular monitoring boxes, and a control software to offer friend and flexible setup and multi-tank control, and a high power switching-mode rectifier (SMR) power supply. The design is adaptable for long time of EDLC leakage current test and huge amount of EDLC.

The System includes modular monitoring boxes. The monitoring box offers various range of leakage current meter from  $1\mu$ A – 100mA. Each channel has individual 0 ohm input resistance leakage current meter. It suits the EDLC's low internal resistance characteristic and avoid that the meter existent effect inaccuracy leakage current measured. The box offers three circuits, charge, discharge and leakage current measurement circuit. Operators can finish the whole process in one system. Charge and leakage current circuit have design for reducing the charge

### USB

voltage alterable affection and increasing charge full voltage time. It offers 1A maximum charge / discharge per channel. The box offers leakage current GO/NG indications in front panel for each channel. The leakage current GO/NG indications will be automatic latched before enter discharge mode. Operators are easy to see every DUT test result for picking up pass or fail.

The System includes Windows<sup>®</sup> base control soft-panel. The soft-panel has multi-tank control capability. It offers sequence timing control base on one tank with setup time for charge, measurement leakage current, and discharge. The process bar is easy for operators to see the test process. Operators can set current limit values of leakage current, charge current, and discharge current through the soft-panel. The system has 2.5V – 5.0V charge voltage programmable capability.

The system includes a high power switchingmode rectifier (SMR) power supply. It offers a static state charge voltage to reduce the tiny voltage variation to speed up the leakage current result arrive and increate the leakage current accuracy.

| 0   |       | Donnect |       |       | te<br>1 75 10 |       |       | eakage C |       |       | 0              | Discharge<br>25 50 75 10 | 0 |
|-----|-------|---------|-------|-------|---------------|-------|-------|----------|-------|-------|----------------|--------------------------|---|
| ınk | 1     |         |       | Start |               |       | Quit  |          | Table |       |                | Skip                     |   |
| (Ag | 1     | 2       | 3     | 4     | 5             | 6     | 7     | 0        | 9     | 10    |                |                          |   |
| 0   | 0.080 |         |       | 0.030 | 0.034         |       | 0.042 | 0.043    | 0.014 | 0.042 |                | Read                     |   |
| 10  | 0.009 |         |       |       |               |       |       | 0.041    |       |       |                | Read                     |   |
| 20  | 0.063 |         | 0.002 | 0.001 |               |       | 0.030 |          | 0.041 |       | _              |                          |   |
| 30  | 0.009 |         |       | 0.030 |               | 0.034 | 0.042 |          |       |       |                |                          |   |
| 40  |       | 0.040   | 0.004 |       | 0.040         | 0.034 |       |          | 0.024 |       |                | Save                     |   |
| 50  | 0.014 |         | 0.001 | 0.034 | 0.030         | 0.012 | 0.033 | 0.043    | 0.014 | 0.004 | _              | _                        |   |
| 60  | 0.024 |         | 0.004 | 0.034 | 0.034         |       |       |          | 0.044 | 0.041 |                |                          |   |
| 70  |       |         |       |       |               |       |       |          |       |       | Error          |                          |   |
| 80  |       |         |       |       |               |       |       | 0.041    | 0.034 |       | Dev            |                          |   |
| 90  | 0.013 | 0.012   |       |       |               |       |       |          | 0.013 |       | and a          |                          |   |
| 100 | 0.030 | 0.042   |       |       | 0.043         | 0.024 |       |          | 0.023 |       |                |                          |   |
| 110 | 0.043 |         | 0.024 |       |               |       | 0.024 | 0.030    |       |       | RETOR OF       |                          |   |
| 120 | 0.024 |         |       |       |               |       |       | 0.041    | 0.012 |       | shebui         | code                     |   |
| 130 |       |         |       |       |               | 0.034 |       | 0.034    |       |       |                |                          |   |
| 140 |       |         |       |       |               |       |       |          |       |       | and the second |                          |   |
| 150 | 0.034 |         |       | 0.043 |               |       |       |          |       |       | 805404         |                          |   |
| 160 |       |         |       |       |               |       |       |          |       |       |                | 15                       |   |
| 170 |       |         | 0.043 | 0.044 | 0.034         |       | 0.030 | 0.054    | 0.024 |       |                |                          |   |
| 100 | 0.042 |         |       |       |               |       | 0.034 |          |       |       |                |                          |   |

### Monitoring Soft-Panel

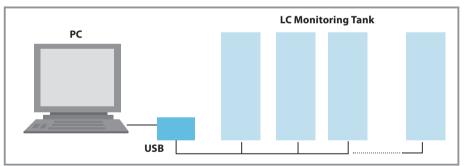
\*Leakage Current Reading Value from Software only for Reference

### **ORDERING INFORMATION**

8802 : EDLC Leakage Current Monitoring System A880200 : EDLC 20CH LC Monitoring Box DC Power Supply : Refer to Model 67300 Series\*

\* Please refer detailed information to Model 67300 Series

### Chroma 8802 EDLC LC Monitoring System



# Model 8802

|           | Current Monitoring Box* |  |  |
|-----------|-------------------------|--|--|
| Model     |                         | A880200  |  |
| Main Fu   | nction                  | EDLC Charge / Leakage Current / Discharge Monitoring Box |  |
| Charge I  | nformation              |  |  |
| -         | /oltag (from DC Power   | 2.5 ~ 6.0V, Step 0.1V, ±(1%)                             |  |
| Supply 6  | 7300 Series)            | 2.3 0.04, 500 0.14, 2 (170)                              |  |
| Charge (  | Current Limit           | 0.1A ~ 0.9A Per Channel,                                 |  |
| charge    |                         | Step 0.1A; ± (10% +0.05A); 18A max Per Box               |  |
| Leakage   | Current Judgment        |  |  |
| Accuracy  | /*1                     |  |  |
| Range     | Normal Mode             |  |  |
| 0.11mA    | 0.001mA~0.109mA         | $\pm$ (8% of reading +3% of range), Step 0.001mA;        |  |
| 1.1mA     | 0.11mA~1.09mA           | $\pm$ (8% of reading +3% of range), Step 0.01mA;         |  |
| 11mA      | 1.1mA~10.9mA            | $\pm$ (8% of reading +3% of range), Step 0.1mA;          |  |
| 110mA     | 11mA~110mA              | $\pm$ (8% of reading +3% of range), Step 1mA;            |  |
| Indicatio | on                      | LED (Red Light for Fail)                                 |  |
| Discharg  | Je Information          |  |  |
| Current   | 1                       | 0.1A ~ 0.9A Per Channel, Step 0.1A;                      |  |
| Current   | Limit                   | $\pm$ (10%+0.05A); 18A max Per Box                       |  |
| General   |                         |  |  |
| Operatio  | n Environment           | Temperature: 10°C ~ 40°C Humidity: < 90%RH               |  |
| Power Co  | onsumption              | 1000VA max   |  |
| Power Re  | quirement               | 180 ~ 264Vac, 47 ~ 63Hz                                  |  |
| Dimonsia  | on (H x W x D)          | 131 x 428 x 613 mm / 5.16 x 16.85 x 24.13 inch           |  |

Note\*1:  $23 \pm 5^{\circ}$ C after Null correction. Refer to the Operation Manual for detail measurement accuracy description

\*Detail specification could be depend by customer requirement

# **Options of Passive Component Test Instruments**

| OPTIONS | MODEL   | 11021 | 11022 | 11025 | 1061A | 1062A | 1075 | 11020 | 3250 | 3252 | 3302 | 3312 |
|---------|---|-------|-------|-------|-------|-------|------|-------|------|------|------|------|
| A110104 | SMD Test Cable  | •     | •     | •     | •     | •     | •    | •     | •    | •    | •    | •    |
| A110211 | ComponentTest Fixture                                   | •     | •     | •     | •     |       | •    |       | •    | •    | •    | •    |
| A110212 | Component Remote Test Fixture                           | •     | •     | •     | •     | •     | •    | •     | •    | •    | •    | •    |
| A110232 | 4 BNC Test Cable with Clip #18                          | •     | •     | •     | •     |       | •    |       |      |      |      |      |
| A110234 | High Frequency Test Cable                               | •     | •     | •     | •     |       | •    |       | •    | •    | •    | •    |
| A110235 | GPIB & Handler Card                                     |       |       |       |       |       |      |       |      |      |      |      |
| A110236 | 19" Rack Mounting Kit                                   | •     | •     | •     |       |       |      |       |      |      |      |      |
| A110239 | 4 Terminals SMD Electrical CapacitorTest Box (Patent)   |       | •     | •     | •     | •     | •    | •     |      | •    | •    | •    |
| A110242 | Battery ESR Test Kit                                    | •     | •     | •     |       |       |      |       |      |      |      |      |
| A110244 | High Capacitance Capacitor Test Fixture                 |       |       | •     |       |       |      |       |      |      |      |      |
| A110245 | Ring Core Test Fixture                                  |       | •     | •     |       |       |      |       |      |      |      |      |
| A118030 | PCB for SMD Capacitor                                   |       | •     | •     | •     | •     | •    | •     |      | •    | •    |      |
| A132501 | Auto Transformer Scanning Box<br>(7.5~5mm Test Fixture) |       |       |       |       |       |      |       | •    | •    | •    | •    |
| A132574 | Test Fixture for SMD Power Choke                        |       |       |       |       |       |      |       |      | •    | •    |      |
| A133004 | SMD Test Box  | •     | •     | •     | •     | •     | •    | •     | •    | •    | •    | •    |
| A133019 | BNC Test Lead, 2M (single side open)                    |       |       |       |       | •     | •    | •     |      | •    |      |      |
| A165009 | 4 BNC Test Cable with Probe                             | •     |       |       | •     | •     | •    |       |      |      |      |      |

| OPTIONS |  | MODEL | 1310 | 1320 | 11300 | 13100 | 11800 | 11801 | 11810 | 11200 | 16502 |
|---------|--|-------|------|------|-------|-------|-------|-------|-------|-------|-------|
| A110235 | GPIB & Handler Card                                      |       |      |      |       |       |       |       |       |       |       |
| A110236 | 19" Rack Mounting Kit                                    |       |      |      |       |       |       |       |       |       |       |
| A113008 | 4 Terminals Test Fixture for DIP 100A                    |       |      | •    |       |       |       |       |       |       |       |
| A113009 | 4 Terminals Test Fixture for SMD 60A                     |       |      | •    |       |       |       |       |       |       |       |
| A113010 | 4 Terminals PCB for SMD 100A                             |       |      | •    |       |       |       |       |       |       |       |
| A113011 | 4 Terminals Test Cable with Clip                         |       |      | •    |       |       |       |       |       |       |       |
| A115001 | Foot Switch #10  |       |      | •    |       |       |       |       |       |       |       |
| A118004 | Series Test Fixture                                      |       |      |      |       |       |       | •     | •     |       |       |
| A118005 | Parallel Test Fixture                                    |       |      |      |       |       |       | •     | •     |       |       |
| A118028 | Series Test Fixture for Low Voltage                      |       |      |      |       |       |       | •     | •     |       |       |
| A118029 | Series Test Fixture for Low Voltage                      |       |      |      |       |       |       | •     | •     |       |       |
| A118030 | PCB for SMD Capacitor                                    |       |      |      |       |       |       | •     | •     |       |       |
| A131001 | 10 Channels Switching Test Fixture                       |       |      |      |       | •     |       |       |       |       |       |
| A165013 | GPIB and Handler Interface with Temperature Compensation |       |      |      |       |       |       |       |       |       | •     |
| A165014 | Temperature Compensation Card                            |       |      |      |       |       |       |       |       |       |       |
| A165015 | PT100 Temperature Probe                                  |       |      |      |       |       |       |       |       |       | •     |
| A165016 | Pin Type Leads (flat)                                    |       |      |      |       |       |       |       |       |       |       |
| A165017 | 4 Channels R Scanners                                    |       |      |      |       |       |       |       |       |       |       |
| A165018 | Test Fixture for SMD Power Choke                         |       |      |      |       |       |       |       |       |       | •     |
| A165019 | Pin Type Leads (taper)                                   |       |      |      |       |       |       |       |       |       | •     |
| A165022 | 4 Terminals Test Cable                                   |       |      |      |       |       |       |       |       |       | •     |

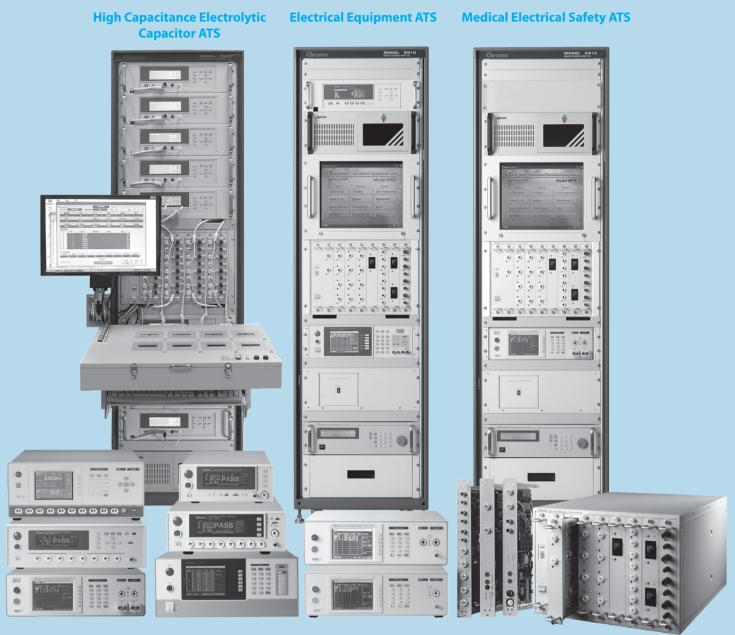
# **Options of Passive Component Test Instruments**



A165019

urnkey Test &

| Selection Guides                              | 13-1  |
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| Multi-function Electrical Analyzer            | 13-3  |
| Hipot Tester                                  | 13-9  |
| Impulse Winding Tester                        | 13-14 |
| Electrical Safety Test Scanner                | 13-17 |
| Ground Bond Tester                            | 13-19 |
| Calibrator                                    | 13-20 |
| Automatic Test System                         | 13-21 |
| Options of Electrical Safety Test Instruments | 13-24 |



Multi-function Electrical Analyzer

**Hipot Tester** 





000

**Electrical Safety** 

**Test Scanner** 



Calibrator

Impulse Winding Tester

**Ground Bond Tester** 

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# **Selection Guides**

| Electrical Safet      | y fester sei    |                     | e – Mani i un          |            |               |              |                 |                            |                    |   |       |
|-----------------------|-----------------|---------------------|------------------------|------------|---------------|--------------|-----------------|----------------------------|--------------------|---|-------|
| Model                 |                 | AC/DC HIPO          | т                      | Insulation | Resistance    | Groun        | d Bond          | Leakage Current<br>Test *1 | Impulse<br>Winding | Others  | Dage  |
| Model                 | AC/DC<br>output | Cutoff<br>current   | Flashover<br>Detection | DC output  | Range         | Current      | Range           | Power Capacity             | Test               | others  | Page  |
| 19020 (CE)            | 5kVac<br>6kVdc  | AC:10mA<br>DC:5mA   | AC:20mA<br>DC:10mA     | 1kV        | <b>50G</b> Ω  | -            | -               | -                          |                    | 10/4<br>channels                                    | 13-9  |
| 19032 (CE)            | 5kVac<br>6kVdc  | AC:40mA<br>DC:12mA  | AC:20mA<br>DC:10mA     | 1kV        | <b>50G</b> Ω  | 30A<br>60A*2 | $510m \Omega*3$ | 300V / 20A max.*2          |                    |   | 13-3  |
| 19032-P (CE)          | 5kVac<br>6kVdc  | AC:100mA<br>DC:25mA | AC:20mA<br>DC:10mA     | 1kV        | <b>50</b> G Ω | 40A          | 510mΩ*3         | 300V / 20A max.*2          |                    | 500VA<br>Floating<br>Output                         | 13-3  |
| 19035 (CE)            | 5kVac<br>6kVdc  | AC:30mA<br>DC:10mA  | AC:15mA<br>DC:10mA     | 5kV        | <b>50G</b> Ω  | -            | -               | -                          |                    | DCR<br>8 ports<br>scanner                           | 13-5  |
| 19036 (CE)            | 5kVac<br>6kVdc  | AC:100mA<br>DC:25mA | AC:20mA<br>DC:10mA     | 5kV        | <b>50G</b> Ω  | -            | -               | -                          | 6kV                | 10 ports<br>scanner                                 | 13-7  |
| 19052<br>(CE,TUV, UL) | 5kVac<br>6kVdc  | AC:30mA<br>DC:10mA  | AC:15mA<br>DC:10mA     | 1kV        | <b>50G</b> Ω  | -            | -               | -                          |                    |   | 13-1  |
| 19053 (CE)            | 5kVac<br>6kVdc  | AC:30mA<br>DC:10mA  | AC:15mA<br>DC:10mA     | 1kV        | <b>10G</b> Ω  | -            | -               | -                          |                    | 8 ports<br>scanner                                  | 13-1  |
| 19054<br>(CE,TUV, UL) | 5kVac<br>6kVdc  | AC:30mA<br>DC:10mA  | AC:15mA<br>DC:10mA     | 1kV        | <b>10G</b> Ω  | -            | -               | -                          |                    | 4 ports<br>scanner                                  | 13-1  |
| 19055 (CE)            | 5kVac<br>6kVdc  | AC:100mA<br>DC:25mA | AC:20mA<br>DC:10mA     | 5kV        | <b>50G</b> Ω  | -            | -               | -                          |                    | 500VA<br>Floating<br>Output,<br>corona<br>detection | 13-1  |
| 19056 (CE)            | 10kVac          | AC:20mA             | 20mA                   | -          | -             | -            | -               | -                          |                    |   | 13-1  |
| 19057 (CE)            | 12kVdc          | DC:10mA             | 10mA                   | 5kV        | <b>50G</b> Ω  | -            | -               | -                          |                    |   | 13-1  |
| 19057-20 (CE)         | 20kVdc          | DC:5mA              | 10mA                   | 5kV        | <b>50G</b> Ω  | -            | -               | -                          |                    |   | 13-1  |
| 19071<br>(CE,TUV, UL) | 5kVac           | AC:20mA             | AC:15mA                | -          | -             | -            | -               | -                          |                    | AC only   | 13-1  |
| 19073<br>(CE,TUV, UL) | 5kVac<br>6kVdc  | AC:20mA<br>DC:5mA   | AC:15mA<br>DC:5mA      | 1kV        | <b>50G</b> Ω  | -            | -               | -                          |                    |   | 13-1  |
| 19301A (CE)           |                 |                     |                        |            |               |              |                 |                            | 1kV                | 0.1µH min.  | 13-1  |
| 19305 (CE)            |                 |                     |                        |            |               |              |                 |                            | 6kV                | 10µH min.   | 13-1  |
| 19305-10 (CE)         |                 |                     |                        |            |               |              |                 |                            | 6kV                | 10 ports<br>scanner                                 | 13-1  |
| 19572 (CE)            | -               | -                   | -                      | -          | -             | 45A          | 510mΩ*3         |                            |                    |   | 13-19 |

Note \*1 : Leakage current Test is required by standards of Electrical Appliances, Medical Equipment, IT products, and Video/Audio Appliances etc. (IEC 60065, 60335, 60601, 60950 etc.)

Note \*2: Options

Note \*3 : It depends on current output

| Electrical | Safety T | ester Se | election | Guide | - Sub-Fu       | inction | and Rei | note |      |              |       |                |      |                |         |     |     |       |
|------------|----------|----------|----------|-------|----------------|---------|---------|------|------|--------------|-------|----------------|------|----------------|---------|-----|-----|-------|
|            |          |          |          |       | Sub-Fu         | Inction |         |      |      |              |       |                |      | Remote         | e       |     |     |       |
| Model      | OSC      | GFI      | PA       | GC    | Smart<br>Start | Scan    | HFCC    | HVCC | HSCC | Sub-<br>Step | RS232 | RS485<br>RS422 | GPIB | 9 pin<br>D-SUB | Handler | USB | LAN | Page  |
| 19020      | •        |          | •        |       |                |         |         |      |      |              | •     |                | •    |                | •       |     |     | 13-9  |
| 19032      | •        |          | •        |       | •              | •       |         |      |      |              | •     |                | •    | •              |         |     |     | 13-3  |
| 19032-P    | •        | •        | •        |       | •              | •       |         |      |      |              | •     |                | •    |                | •       | •   |     | 13-3  |
| 19035      | •        | •        | •        |       |                | •       |         |      |      | •            | •     |                | •    |                | •       |     |     | 13-5  |
| 19036      | •        | •        | •        |       |                | •       | •       |      | •    | •            | •     |                |      |                | •       | •   | •   | 13-7  |
| 19052      | •        | •        | •        | •     | •              |         |         |      |      |              | •     |                | •    | •              | •       |     |     | 13-10 |
| 19053      | •        | •        | •        | •     | •              | •       |         |      |      |              | •     |                | •    | •              |         |     |     | 13-10 |
| 19054      | •        | •        | •        | •     | •              | •       |         |      |      |              | •     |                | •    | •              |         |     |     | 13-10 |
| 19055      | •        | •        | •        |       |                | •       | •       |      |      |              | •     |                | •    | •              | •       | •   |     | 13-11 |
| 19056      | •        | •        | •        |       |                |         | •       | •    |      |              | •     |                | •    | •              |         |     |     | 13-12 |
| 19057      |          |          | •        |       |                |         | •       | •    |      |              | •     |                | •    | •              |         |     |     | 13-12 |
| 19057-20   |          |          | ٠        |       |                |         | ٠       | •    |      |              | •     |                | •    | •              |         |     |     | 13-12 |
| 19071      | •        | •        | •        | •     | •              |         |         |      |      |              |       |                |      | •              |         |     |     | 13-13 |
| 19073      | •        | •        | •        | •     | •              |         |         |      |      |              | •     | •              |      | •              |         |     |     | 13-13 |
| 19301A     |          |          |          |       |                |         |         |      |      |              | •     |                |      |                | •       | •   | •   | 13-14 |
| 19305      |          |          |          |       |                |         |         |      |      |              | •     |                |      |                | •       | •   | •   | 13-16 |
| 19305-10   |          |          | •        |       |                | •       |         |      |      |              | •     |                |      |                | •       | •   | •   | 13-16 |

| Calibrator | Selection Guide  |  |  |       |
|------------|------------------|--|--|-------|
| Model      | Primary          | Function Calibrator Level  | Description  | Page  |
| 9102       | Hipot Calibrator | AC 6Kv / DC 10kV / ACI/DCI 200mA / GB 32A, 100m $\Omega$ / IR 1000M $\Omega$ | For Hipot testing equipment calibration and verification | 13-20 |

# **Electrical Safety Analyzer**

# Model 19032/19032-P



### **KEY FEATURES**

- Floating Output Design meet EN50191 (19032-P)
- 500VA Power Rating (19032-P)
- Five instruments in one: AC Hipot, DC Hipot, Insulation Resistance, Ground Bond and Leakage Current (Option)
- Twin-Port<sup>™</sup> function (Patent)
- Programmable output voltage to 5kV AC and 6kV DC
- Insulation resistance to 50G Ω/1000V DC
- Ground bond up to 30A (Option up to 40A / 60A)
- Open/Short check(OSC)
- ARC detection (Flashover)
- Password Protected front panel lockout
- Storage of 50 Tests Setups with 100 groups recall
- Optional dynamic leakage current auto scanning (A190305/A190306/A190308/ A190350)
- Standard RS-232 Interface
- Standard GB Offset KIT, SCANNER Interface
- Optional GPIB Interface
- Optional Bar-code Scanner
- Optional EST software for test programming, data mining, statistic
- CE mark

# GPIB RS-232

### KEY FEATURES - A190308 / A190350

- Plug in to 19032/19032-P for Hipot, Line Leakage Auto Scan
- Five Different Kinds Human Body RC Network
- Four measurements mode : Normal, Reverse,
- Single Fault Normal, Single Fault Reverse Up to 20A Line Input Current Capability
- Build in A/D and Calibration Data Memory Easy
- Build in A/D and Calibration Data Memory Easy to Install
- Multiple Display Mode Voltage-LC, Amp-LC, VA-LC
- Earth LC, Enclosure LC, Patient LC and Patient Auxiliary LC Test

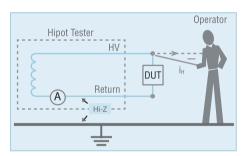
The 19032/19032-P are 5 in 1 Production Safety Analyzer. It can perform AC/DC Hipot, insulation resistance, grounding resistance and dynamic leakage current 5 safety test functions for electronic products. The dynamic leakage current scan device can be connected externally or built in to 19032 Series. It is capable of measuring the complicate safety requirements with easy installation and operation, and is the finest auto safety tester to increase production test efficiency.

Model 19032/19032-P have Twin-Port<sup>™</sup> and OSC function to minimize the test time greatly; along with the super large screen display and intelligent operation mode, 19032 is the most powerful single unit for auto safety tester.

ORDERING INFORMATION

19032-P: Electrical Safety Analyzer 500VA 19032 : Electrical Safety Analyzer A190301:8HV Scanning Box A190302: 5HV/3GC Scanner A190303: 3HV/5GC Scanner A190304:8HV Scanner A190305 : Line Leakage Current Scanner (generally) A190306 : Hipot/Line Leakage/Probe Scanner (10A) A190308 : Hipot/Line Leakage/Probe Scanner (20A) A190313: 500VA Isolation Transformer A190314: 1000VA Isolation Transformer A190316 : Dummy Load A190334 : Ground Bond 40A (19032) A190336:8HV/8GB Scanning Box A190337 : Ground Bond 60A (19032) A190338: 19001 EST Software A190343: 19" Rack Mounting Kit (19032) A190344 : HV Gun A190349: Universal Corded Product Adapter A190350: HV/LC/LAC/DC Probe Scanner (20A) A190353: 4HV/4GC Scanner A190355: 19" Rack Mounting Kit (19032-P) A190356 : GPIB Interface (19032-P)

- A190508 : GPIB Interface (19032)
- A190708 : ARC Verification Fixture







19032

| INTERNAL | <b>SCANNER</b>  |          | OR MODEL        | . 19032/190 | 32-P            |                 |               |          |          |          |               |                   |
|----------|-----------------|----------|-----------------|-------------|-----------------|-----------------|---------------|----------|----------|----------|---------------|-------------------|
| Opt      | tion            | Hij      | pot             | Ģ           | iB              |                 |               |          | LC       |          |               |                   |
| No.      | Name            | Ports    | Voltage<br>Max. | Ports       | Current<br>Max. | Power<br>output | Reading       | LC probe | Earth LC | Touch LC | Patient<br>LC | Patient Aux<br>LC |
| A190301  | 9030A<br>(Ext.) | 8 ports  |                 | -           | -               | -               | -             | -        | -        | -        | -             | -                 |
| A190336  | 9030AG          | 8 ports  |                 | 8 ports     | 40A             | -               | -             | -        | -        | -        | -             | -                 |
| A190302  | 6000-01         | 5 ports  |                 | 3 ports     | 30A             | -               | -             | -        | -        | -        | -             | -                 |
| A190303  | 6000-02         | 3 ports  |                 | 5 ports     | 30A             | -               | -             | -        | -        | -        | -             | -                 |
| A190304  | 6000-03         | 8 ports  |                 | -           | -               | -               | -             | -        | -        | -        | -             | -                 |
| A190353  | 6000-11         | 4 ports  | 5KVac           | 4 ports     | 40A *1          | -               | -             | -        | -        | -        | -             | -                 |
| A190305  | 6000-04         |          | 6KVdc           | -           | -               | 300V<br>10A     | RMS           | -        | •        | -        | -             | -                 |
| A190306  | 6000-05         | L+N to E |                 | -           | -               | 300V<br>10A     | RMS           | P1&P2    | •        | •        | •             | •                 |
| A190308  | 6000-07         | P to S   |                 | -           | -               | 300V<br>20A     | RMS           | P1&P2    | •        | •        | •             | •                 |
| A190350  | 6000-08         |          |                 | -           | -               | 300V<br>20A     | RMS &<br>Peak | P1&P2    | •        | •        | ٠             | •                 |

Note\*1: GB Max Current 40A for Model 19032-P, and 30A for Model 19032

# **Electrical Safety Analyzer**

# Model 19032/19032-P

#### SPECIFICATIONS

| Model   | 19032   | 19032-Р   |  |  |  |
|---|---|---|--|--|--|
| Mode  | ACWV/DCW  | V/ IR/ GB/ LC   |  |  |  |
| Withstanding Volt   | age Test  |   |  |  |  |
| Output Voltage  | DC : 0.05 ~ 6kV,  | AC : 0.05 ~ 5kV   |  |  |  |
| Load Regulation   | $\leq$ (1% +5V)   | $\leq$ (2% of setting +0.1% of full scale)  |  |  |  |
| Voltage Regulation  | 2   | V   |  |  |  |
| Voltage Accuracy  | $\pm$ (1% of reading+0.1% of full scale)  | $\pm$ (2% of setting +0.1% of ull scale)  |  |  |  |
| Cutoff Current  | DC : 12mA , AC : 40mA   | DC : 25mA , AC : 100mA  |  |  |  |
| Current Resolution  |   | ; 1 μΑ ΑC   |  |  |  |
| Current Accuracy  | $\pm$ (1% of reading +0.2% of full scale)   | •   |  |  |  |
| Output Frequency  | 3   | e 600Hz   |  |  |  |
| Test Time   |   | ec, continue  |  |  |  |
| Ramp Time   |   | 9 sec, Off  |  |  |  |
| Fall Time   |   | 9 sec, Off  |  |  |  |
| Waveform  |   | wave  |  |  |  |
|   |   | wave  |  |  |  |
| Insulation Resistar   |   |   |  |  |  |
| Output Voltage  |   | 95 ~ 1kV  |  |  |  |
| Voltage Resolution  |   | V   |  |  |  |
| Voltage Accuracy  | $\pm$ (1% of reading + 0.5% of full scale)  | -   |  |  |  |
| IR Range  | 0.1ΜΩ   | ~ 50G \2  |  |  |  |
| Resistance  | 0.11  | мQ  |  |  |  |
| Resolution  |   |   |  |  |  |
| Resistance  | 5% tv   | pical   |  |  |  |
| Accuracy  | 5703  | , p   |  |  |  |
| <b>Ground Bond Test</b>   |   |   |  |  |  |
| Output Current  | AC:1~30A  | AC : 3 ~ 40A  |  |  |  |
| Current Accuracy  | $\pm$ (1% of setting + 1% of full scale)  | $\pm$ (2% of setting + 0.1% of full scale)  |  |  |  |
| GR Range  | 10mΩ ~  | 510mΩ   |  |  |  |
| Resistance  |   |   |  |  |  |
| Resolution  | 0.1r  | m 12  |  |  |  |
| Resistance  |   |   |  |  |  |
| Accuracy  | $\pm$ (1% of reading + 0.1% of full scale)  | $\pm$ (1% of reading + 0.1% of full scale   |  |  |  |
| Test Method   | 4 wires   |   |  |  |  |
| Flashover Detectio  |   |   |  |  |  |
| Setting Mode  | Programma   | able setting  |  |  |  |
| Detection Current   | AC, DC : 1~30mA   | AC : 20mA, DC : 10mA  |  |  |  |
| Secure Protection   |   |   |  |  |  |
| Ground Fault  |   |   |  |  |  |
| Interrupt   | -   | 0.5mA $\pm$ 0.25mA AC   |  |  |  |
| Floating Output to  |   | <3mA, front output only   |  |  |  |
| ground  | -   | (meet EN50191)  |  |  |  |
| Panel Operation   |   |   |  |  |  |
| Lock  | Present p   | bassword  |  |  |  |
| Interlock   | VI  | ES  |  |  |  |
|   |   |   |  |  |  |
| GO/NG Judgment  |   | und Groon LED   |  |  |  |
| Indication,Alarm  |   | Ind,Green LED   |  |  |  |
| Data U.J.J.   |   | und, Red LED  |  |  |  |
| Data Hold   |   | ata memories  |  |  |  |
| 14 61   | 50 setups with up to 100 groups recall  |   |  |  |  |
|   |   |   |  |  |  |
| Interface   |   |   |  |  |  |
| Interface<br>Interface  |   | RS-232 / GPIB (Optional)  |  |  |  |
| Interface<br>Interface  |   | RS-232 / GPIB (Optional)  |  |  |  |
| Interface<br>Interface<br>General<br>Operation  | 9pin D-sub I/O control /  |   |  |  |  |
| Interface<br>Interface<br>General<br>Operation  | 9pin D-sub I/O control /  | RS-232 / GPIB (Optional)<br>Humidity : 20 % ~ 80 % RH   |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment   | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I   |   |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment<br>Power  | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I<br>No load : < 100 W With   | Humidity : 20 % ~ 80 % RH<br>No load : < 100W<br>Rated load : 1000W   |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment<br>Power  | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I   | Humidity : 20 % ~ 80 % RH<br>No load : < 100W   |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment<br>Power<br>Consumption                                       | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I<br>No load : < 100 W With<br>rated load : 800 W   | Humidity : 20 % ~ 80 % RH<br>No load : < 100W<br>Rated load : 1000W<br>Maximum load : 1200W   |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment<br>Power<br>Consumption<br>Power                              | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I<br>No load : < 100 W With<br>rated load : 800 W   | Humidity : 20 % ~ 80 % RH<br>No load : < 100W<br>Rated load : 1000W   |  |  |  |
| Memory Storage Interface Interface General Operation Environment Power Consumption Power Requirements Dimension             | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I<br>No load : < 100 W With<br>rated load : 800 W   | Humidity : 20 % ~ 80 % RH<br>No load : < 100W<br>Rated load : 1000W<br>Maximum load : 1200W   |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment<br>Power<br>Consumption<br>Power<br>Requirements              | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I<br>No load : < 100 W With<br>rated load : 800 W<br>90~132Vac or 180                         | Humidity : 20 % ~ 80 % RH<br>No load : < 100W<br>Rated load : 1000W<br>Maximum load : 1200W<br>~264Vac, 47~63Hz                         |  |  |  |
| Interface<br>Interface<br>General<br>Operation<br>Environment<br>Power<br>Consumption<br>Power<br>Requirements<br>Dimension | 9pin D-sub I/O control /<br>Temperature : 0°C ~ 40°C, I<br>No load : < 100 W With<br>rated load : 800 W<br>90~132Vac or 180<br>133 x 430 x 470 mm / | Humidity : 20 % ~ 80 % RH<br>No load : < 100W<br>Rated load : 1000W<br>Maximum load : 1200W<br>~264Vac, 47~63Hz<br>133 x 430 x 500 mm / |  |  |  |

| Model  | A190305~A190350 *<br>(6000-04~08)  |
|--|--|
| Support Mode                                 | AC/DC/IR/LC  |
| DUT Input Power<br>Capacity                  | AC : 300V / 10A / 20A max.   |
| Short Protection                             | 20A, 250V fuse for DUT shorted.  |
| Measurement Mode                             |  |
| Input Characteristic                         | DC ~ 1MHz<br>Input Impedance : 1M//20pF  |
| Measurement Mode                             | Normal, Reverse, Single Fault<br>Normal, Single Fault Reverse  |
| Measurement Devices<br>(Five measure device) | UL 544 NP, UL 544 P, UL 1563, UL<br>60601-1, IEC60601-1, UL 3101-1,<br>UL/IEC 60950, UL 1950-U1*,<br>UL 2601-U1*, IEC60990 |
| Probe Connection                             | Line to Ground, Line to P2, P1 to P2   |
| HI-LO Limit                                  |  |
| LC HI-LO Limit                               | 0 ~ 9.99mA, 1 $\mu$ A resolution   |
| Current HI-LO Limit                          | 0 ~ 19.99Amp*  |
| VA HI-LO Limit                               | 0 ~ 4400VA   |
| VA Resolution                                | 0.1VA  |
| *Different options hav                       | e different specification  |
| Model  | A190350 (6000-08)  |

| Model             | A 190330 (0000-08) |
|-------------------|--------------------|
|                   | LC DC Measurement  |
| Special Functions | U1, U2 (UL-1950)   |
|                   | Hot Swap           |
|                   |                    |

 Video & Flat Panel
 LED/
 Optical
 Photovoltaic Test
 Automated

 Color
 Display
 Lighting
 Devices
 & Automation
 Optical Inspection

# Wound Component EST Scanner

## Model 19035 Series



#### Model 19035 19035-M 19035-S

#### **FUNCTIONS**

- 5KVAC & 6KV DC Hipot Test
- 0.1MΩ~50GΩ /5kV IR Test
- 50m Ω ~100k Ω DCR Test
- 8 Channel Scanner

#### **KEY FEATURES**

- SUB-STEP Function
- Open / Short Check (OSC)
- High Speed Contact Check (HSCC)
- Flashover Detection
- Key Lock Function
- RS-232 Interface (standard\*1)
- GPIB & HANDLER (optional)
- Friendly Interface
- CE Mark





#### **Wound Component Testing Solution**

The quality verification test items for Wound Component consist of AC/DC Hipot tests, Insulation Resistance (IR) test and Impulse Winding test. Chroma integrates above tests into 19035 Wound Component EST Scanner series performing safety tests for motor, transformer, heater related wound products. The wound component manufacturers in quality verification testing not only have reliable quality but also control product quality efficiently.

The 19035 Series support 5kVac/6kVdc high voltage output to conform with withstand test requirement for Wound Component, its maximum output current can up to 30mA. Insulation Resistance (IR) test measurement range is 1M $\Omega$  to 50G  $\Omega$  and voltage output can up to 5kV. DCR can measure basic specification for Wound Component and also check the connection before testing safety withstand.

The 19035 Series also include powerful functions in Flashover detection and Open/ Short Check (OSC) as well as programmable voltage, time parameters, etc. for various DUTs features to promote testing reliability and product quality.

#### **Applications**

The 19035 is a comprehensive safety tester designed for motor, transformer, heater related wound component requirements. Most of wound components are equipped with multiple winding such as 3-phase motor, dual winding transformer, and etc.. The 19035 can be used to reach multiple points completion in one test by 8-channels scanning instead of switching test point manually. It saves test time and human cost.

The 19035 provides OSC and DCR functions to verify if bad contact or short circuit happened during test procedure. It solves the Wound Components of motor, transformer, etc occurred contact problems, so that test quality greatly enhanced and the life of test device prolonged.

#### ORDERING INFORMATION

19035 : Wound Component EST Scanner 19035-M : Wound Component EST Scanner 19035-S : Wound Component EST Scanner A165015 : PT100 temperature probe A190347 : GPIB & Handler & temperature interface A190348 : RS-232 interface A190351 : 8ch-16ch HV box for 19035 A190358 : Handler indicator A190359 : 16ch HV external scanning box (H,L,X) A190702 : 40KV HV test probe



A190351:8CH-16CH Scan Box



A190359: 16ch HV External Scanning Box (H,L,X)

# Wound Component EST Scanner

# Model 19035 Series

| SPECIFICATIONS                  |              |   |   |                           |  |
|---------------------------------|--------------|---|---|---------------------------|--|
| Model                           |              | 19035   | 19035-M   | 19035-S                   |  |
| Mode                            |              | ACV / DCV / IR / DCR -8CH   | ACV / DCV / IR / DCR -8CH   | ACV / DCR -8CH            |  |
| Channel Program                 | nmina        | H/L/X in 8CHs   | H/X in CH 1,2,3,5,6,7 ; L/X in CH 4,8   | H/L/X in 8CHs             |  |
| Withstanding Vo                 |              |   |   |                           |  |
| Output Voltage                  |              | AC:0.05 ~ 5KV   | , DC : 0.05 ~ 6kV   | AC:0.05 ~ 5KV             |  |
| Load Regulation                 |              |   | $\leq$ (1% of setting + 0.1% of full scale)   |                           |  |
| Voltage Resolutio               | n            |   | 2V  |                           |  |
| Voltage Accuracy                |              |   | $\pm$ (1% of setting + 0.1% of full scale)  |                           |  |
| Cutoff Current                  |              |   | AC : 30mA, DC : 10mA  |                           |  |
| Current Resolution              | n            |   | AC:1μA, DC:0.1 μA   |                           |  |
| Current Accuracy                |              |   | $\pm$ (1% of reading + 0.5% of range)   |                           |  |
| Output Frequency                | /            |   | 50Hz / 60Hz   |                           |  |
| Test / Ramp / Fall ,            | / Dwell Time | 0.3 ~ 999 sec., conti   | inue / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., o  | off / 0.1 ~ 999 sec., off |  |
| Waveform                        |              |   | Sine wave   |                           |  |
| <b>Insulation Resist</b>        | tance Test   |   |   |                           |  |
| Output Voltage                  |              | DC : 0.   | 05 ~ 5kV  |                           |  |
| Voltage Resolutio               | n            |   | 2V  |                           |  |
| Voltage Accuracy                |              |   | 0.1% of full range  |                           |  |
| IR Range                        |              | <b>0.1M</b> Ω   | ~ <b>50</b> G Ω   |                           |  |
| Resistance Resolu               | tion         |   | IMΩ   |                           |  |
|                                 |              |   | reading + 0.1% of full range)   |                           |  |
|                                 | ≧1000V       |   | reading + 2% of full range)   |                           |  |
| Resistance                      |              |   | of reading + 1% of full range)  |                           |  |
| Accuracy                        | 500V~1000V   |   | reading + 0.1% of full range)   |                           |  |
| Accuracy                        |              | $1G\Omega \sim 10G\Omega : \pm (7\% \text{ of reading} + 2\% \text{ of full range})$            |   |                           |  |
|                                 |              | $10G \Omega \sim 50G \Omega$ : ± (10% of reading + 1% of full range)                            |   |                           |  |
|                                 | < 500V       | $0.1M\Omega \sim 1G\Omega : \pm 3\%$ of read  | ding + (0.2*500/Vs)% of full scale  |                           |  |
| Scanner Unit                    |              | 8 ports, $\pm$ phase (4W DCR only 4 ports)  |   |                           |  |
| DC Resistance M                 | easurement   |   |   |                           |  |
| Test Signal                     |              |   | <dc 10v.="" 140ma<="" <="" dc="" td=""><td></td></dc>   |                           |  |
| Measurement mo                  |              | 2 terminals (2W) / 4 terminals(4W) measurement selectable ; Range : 50m $\Omega$ ~500k $\Omega$ |   |                           |  |
|                                 | 1Ω (4W only) |   | / $\pm$ (0.5% of reading + 0.5% of range)   |                           |  |
| Measurement                     | 10Ω          |   | ling + 0.5% of range) / $\pm$ (0.5% of reading +  |                           |  |
| Accuracy                        | 100Ω         |   | ling + 0.5% of range) / $\pm$ (0.5% of reading +  |                           |  |
| (2W/4W)                         | 1kΩ          |   | ling + 0.5% of range) / $\pm$ (0.5% of reading +  |                           |  |
| . ,                             | 10kΩ         |   | (1) $(1)$ |                           |  |
|                                 | 100kΩ        | $\pm$ (2% of read   | ling + 0.5% of range) / $\pm$ (0.5% of reading +  | - 0.05% of range)         |  |
| Flashover Detect                | tion         |   |   |                           |  |
| Setting Mode                    |              |   | Programmable setting  |                           |  |
| Detection Current               |              |   | AC : 1mA ~ 15mA, DC : 1mA ~ 10mA  |                           |  |
| Secure Protectio                |              |   | 0.4mc ofter NC have an  |                           |  |
| Fast Output Cut-o               |              | 0.4ms after NG happen   |   |                           |  |
| Ground Fault Inte               |              |   | 0.5mA ±0.25mA AC, ON/OFF<br>Present password  |                           |  |
| Panel Operation L               | UCK          |   | YES   |                           |  |
| Interlock GO/NG Judgment Window |              |   | TED   |                           |  |
| Indication, Alarm               | it window    | C0.66   | port sound Green LED: NG Lang cound   | Pad LED                   |  |
| Data Hold                       |              | GO : Short sound, Green LED; NG : Long sound, Red LED   |   |                           |  |
| Memory Storage                  |              | Least tests data memories<br>50 instrument setups with up to 20 test steps                      |   |                           |  |
| Interface                       |              |   | RS-232*1 or GPIB & Handler & Temperatu  | •                         |  |
| General                         |              | NJ-ZJZ T (Stanuaru),  | no 202 i or or lo a naticier a temperatu  |                           |  |
| Operation Enviror               | ament        | Temporat  | ture: 0°C ~ 45°C, Humidity: 15% to 95% R  | H@ < 40°C                 |  |
| Power Consumpti                 |              | Temperat  | 500VA   |                           |  |
|                                 |              |   | 90~132Vac or 180~264Vac, 47~63Hz  |                           |  |
| Power Requirements              |              |   |   |                           |  |
| Dimonsion (U v M                |              | 133x430x470mm/5.24x16.93x18.50 inch   |   |                           |  |
| Dimension (H x W<br>Weight      | X D)         |   | Approx.20 kg/44.09 lbs  | 1                         |  |

# Wound Component EST Analyzer

# Model 19036



#### **KEY FEATURES**

- 5 in 1 composite analyzer scanner (ACW / DCW/ IR / IWT / DCR)
- 5kV AC/6kV DC Hi-pot test
- 5kV Insulation Resistance test
- Impulse Winding Tester (IWT)
- IWT high sampling rate(200MHz)
- 10 channels 4-wire DCR test
- $\land$  /Y motor DCR calculation
- L/Q test with Chroma 3252/3302 (option)
- HSCC (High Speed Contact Check)
- Support max. 40 channels scanning test
- Automatic data export
- English, Traditional Chinese and Simplified Chinese User Interface
- USB waveform storage& Hand copy function
- Graphic color display
- Standard LAN, USB, RS232, HANDLER interface
- GFI (Ground Fault Interrupter) for bod protection

Chroma 19036 is the industry's first test device that combines the functions of impulse tester and hipot analyzer for testing the impulse of wound components. The tester has 5kVac/6kVdc high voltage output and 6kV impulse voltage that can comply with the wound components test demands by providing maximum 10 channels output for multichannel scanning tests to save time and labor costs.

The quality verifications of wound components include AC/DC hipot test, IR test and impulse winding test. Chroma integrates the above tests into 19036 Wound Component EST Analyzer that can perform safety tests on wound products like motors, transformers and heaters to verify their quality with efficiency.

Since the poor insulation of coil often causes layer short, cross-line short and pin short, layer short circuit test is required for coils as the reason could be initial design error, poor fabrication process or bad insulation material. Moreover, the wound components for safety tester need to be tested with Impulse Winding Tester (IWT) to check the insulation ability of windings. It can measure multiple test points in one test instead of switching test points manually.

Combining with impulse winding test function the 19036 has 6kV impulse voltage, AREA SIZE COMPARISON, DIFFERENTIAL AREA COMPARISON, FLUTTER DETECTION, LAPLACIAN DETECTION, and  $\triangle$  Peak ratio judgment that are effective methods for detecting poor coil insulation.

19036 is equipped with a patented 4-wire test port that has both Drive and Sense in compliance with hipot specification to provide 10 channels of 4-wire



test functions. Up to 40ch of scanning test can be conducted when 19036 is configured with 16ch scan box.

19036 also has HSCC functions to check for any bad contact prior test. It can solve the test fail problems caused by motor or transformer bad contact and improve the test quality as well as prolong the test equipment life  $\circ$ 

The motor test standard such as UL 1004-1 requires high power safety tester. For the user that needs to test large leakage current or perform large equipment electrical safety tests, Chroma 19036 that has the capability of outputting and measuring AC 100mA/ DC 20mA with high power hipot tests and other safety tests integrated into one is the most suitable device to bring the maximum benefit to production line and quality assurance. The 500VA design is also compliant with IEC/UL for output power requirements.

#### **Product Applications**

## Rotating Motor Component: $\triangle$ /Y-type Motor, Fan , Rotor/Stator

The application of motors from EV motor, server motor to actuator motor and fan, impulse test, hipot tests and DC resistance tests need to be performed in the fabrication process to ensure the product quality. The JB/T 7080 GB mechanical industry standards and regulations are followed for tests.

The DCR measurement on the 19036 can perform four-wire test and each single endpoint can cover Drive and Sense for 10 independent channels to test 3 DUTs in one scan. It improves the production capacity. Each channel can be set to high voltage output / reference port / close separately.

#### **Test Items for Y-type Motor**

- HSCC / OSC

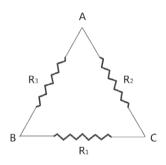




Impulse TestHi-pot –Sub step test

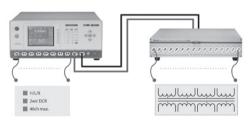
#### Winding of riangle -type and Y-type Motor

To solve the problem of unable doing DCR measurement on the  $\triangle$ -type and Y-type motor winding (no center-tapped), Chroma 19036 adds  $\triangle$ -type and Y-type motor winding DCR calculation function to get the value of R1,R2 and R3 directly.



#### **40 Channels Scanning Test**

A190359 scanner has 16 test channels and each of them can set to H (high voltage output), L (reference point) or Off. The combination of 19036 and A190359 can apply to in small amount but diversified DUTs or with multiple PINs as well as cell type production line to complete all test within one station.



#### **ORDERING INFORMATION**

19036 : Wound Component EST Analyzer A165015 : PT100 temperature probe A190359 : 16ch HV External Scanning Box A190361 : Wound Component EST Software A190362 : 16ch 4-wire HV External Scanning Box A190363 : 4-wire test cable with clip A190364 : 4-wire test cable with bare wire (1.5m) A190365 : 4-wire test cable with bare wire (3m)

# Wound Component EST Analyzer

Model 19036

| SPECIFICATIONS   |                             |  |
|--|-----------------------------|--|
| Vodel  |                             | 19036  |
| AC/DC Withstanding Test  |                             |  |
| Output Voltage   |                             | AC: 0.05~5.0kV / DC : 0.05~6.0kV   |
| Load Regulation  |                             | $\leq$ (1% of output + 0.1% of full scale)   |
| Voltage Accuracy   |                             | $\pm$ (1% of setting + 0.1% of full scale)   |
| Voltage Resolution   |                             | 2V   |
|  |                             | AC: 0.001mA~120mA (Voltage $\leq 4kV$ )  |
| Cutoff Current   |                             | AC: 0.001mA~100mA (Voltage >4kV)   |
|  |                             | DC: 0.0001mA~20mA  |
| Current Accuracy   |                             | $\pm$ (1% of reading + 0.5% of range)  |
| •  |                             | Test time:0.3 ~ 999 sec., and continue   |
| lest Timer   |                             | Ramp / Fall / Dwell time:0.1 ~ 999 sec., and off   |
| Output Frequency   |                             | 50Hz / 60Hz  |
| Vaveform   |                             | Sine wave  |
| nsulation Resistance Test  |                             |  |
| Output Voltage   |                             | DC : 0.050 ~ 5.000kV, Steps:0.002kV  |
| .oad Regulation  |                             | $\leq (1\% \text{ of output } + 0.1\% \text{ of full scale})$  |
| /oltage Accuracy   |                             | $\pm (1\% \text{ of setting } + 0.1\% \text{ of full scale})$  |
| R Range  |                             | $0.1M\Omega \sim 50G\Omega$  |
|  |                             | $1M\Omega \sim 1G\Omega : \pm (3\% \text{ of reading} + 0.1\% \text{ of full range})$                    |
|  | >1kV                        | $1G\Omega \sim 10G\Omega : \pm (7\% \text{ of reading } + 2\% \text{ of full range})$                    |
|  |                             | $\frac{10G\Omega}{10G\Omega} \sim 50G\Omega : \pm (10\% \text{ of reading} + 1\% \text{ of full range})$ |
| Posistanco Accuracy  |                             | $0.1M\Omega \sim 1G\Omega : \pm (10\% \text{ of reading} + 1\% \text{ of full range})$                   |
| esistance Accuracy   | $\geq$ 0.5kV and $\leq$ 1kV | $1G\Omega \sim 10G\Omega : \pm (7\% \text{ of reading} + 2\% \text{ of full range})$                     |
|  |                             |  |
|  | <0.5kV                      | $10G\Omega \sim 50G\Omega : \pm (10\% \text{ of reading} + 1\% \text{ of full range})$                   |
|  | <0.5KV                      | $1M\Omega \sim 1G\Omega : \pm (5\% \text{ of reading} + (0.2*500/Vs)\% \text{ of full scale})$           |
| mpulse Winding Test  |                             |  |
| Applied Voltage, Step, and E   | nergy                       | 0.1 ~ 6kV ,10V Step ,Max 0.21 Joules   |
| nductance Test Range   |                             | More than 10uH   |
| Sampling Speed   |                             | 10bit / 5ns (200MHz)   |
| Sampling Range   |                             | 11 Range   |
| Pulse Number   |                             | Pulse Number: 1~32, Dummy Pulse Number: 0~9  |
| Detection Mode   |                             | Area / Differential Area $\div$ Flutter/ Laplacian Detection/ $\triangle$ Peak ratio                     |
| OC Resistance Measurement  |                             |  |
| lest Signal  |                             | <dc 10v,="" 200ma<="" <dc="" td=""></dc>   |
| Measurement Range  |                             | 0.1mΩ~500kΩ  |
|  | 100m Ω                      | $\pm$ (0.5% of reading + 1% of full range)   |
|  | 1Ω                          | $\pm$ (0.5% of reading + 0.2% of full range)   |
|  | 10Ω                         | $\pm$ (0.5% of reading + 0.05% of full range)  |
| Aeasurement Accuracy   | 100Ω                        | $\pm$ (0.5% of reading + 0.05% of full range)  |
|  | 1kΩ                         | $\pm$ (0.5% of reading + 0.05 % of full range)   |
|  | 10kΩ                        | ± (0.5% of reading + 0.05 % of full range)   |
|  | 100kΩ                       | $\pm$ (0.5% of reading + 0.05 % of full range)   |
| lashover Detection   |                             |  |
| Detection Current  |                             | Programmable setting AC : 20mA ; DC : 10mA   |
| Contact Check Function   |                             |  |
|  |                             | OSC (open/short check)   |
| Contact Check  |                             | HFCC (High Frequency Contact Check)  |
|  |                             | HSCC (High Speed Contact Check)  |
| electrical Hazard Protection I   | unction                     |  |
| Ground Fault Interrupt   |                             | 0.5mA ±0.25mA AC, ON/OFF   |
| Key Lock   |                             | Yes (password control)   |
| Interlock  |                             | YES  |
| ndication, Alarm   |                             | GO : Short sound, Green LED; NG : Long sound, Red LED  |
| Memory Storage   |                             | 200 sets, max. 60 steps per set  |
| nterface   |                             |  |
| Standard : RS232, Handler ,U   | SB , LAN interface          |  |
| General  |                             |  |
|  |                             | Temperature: $0^{\circ}$ C ~ $45^{\circ}$ C, Humidity: 15% to 95% R.H@ $\leq 40^{\circ}$ C               |
| Operation Environment  |                             | No Load: <150W ; Rated Load: <1000W  |
| •  |                             | No Eoad. <150W , Nated Eoad. <1000W  |
| Power Consumption  |                             | 90 ~ 264Vac, 47 ~ 63Hz   |
| Operation Environment Power Consumption Power Requirements Dimension (W × H × D) |                             |  |

Video & Flat Panel LED/ Color Display Lighting

# **Multi-Channel Hipot Tester**

# Model 19020 Series



#### **KEY FEATURES**

- 10/4 channels in one design
- 10 sets of sync output and measurement
- AC/DC/IR 3 in 1 EST test
- Master/Slave link 10 units max.
- Programmable V-output and limits
- OSC (Open/Short Check)
- Flashover detection
- $\square$  1M  $\Omega$  ~50G  $\Omega$  insulation resistance test
- Standard RS-232 / Handler interface
- Optional GPIB interface
- Large LCD panel
- Panel lockup function
- Easy operating interface
- CE Mark
- High Efficiency Hipot Test Solution

#### **High Efficiency Hipot Test Solution**

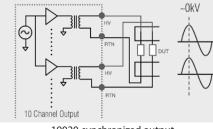
Hipot test is one of the major test items in electrical safety test. All electrical components and products including transformers, capacitors, power supplies, chargers and home appliances all require hipot test.

With more than 20 years experience in developing the instruments for test and measurement, Chroma creates the 19020 multi-channel hipot tester with a brand new architecture. It can measure the hipot leakage current of all channels at the same time and conduct tests on 100 DUTs at most simultaneously.

There is no need to purchase various Hipot testers to save the production line space if Chroma 19020 is in use. Its one time multi-channel test can increase the efficiency of electrical regulatory test. It improves the productivity and reduces the risk of test for the products that require hipot test only.

Chroma 19020 also has powerful functions in Flashover detection and Open/Short Check. It contains several international patents and is the best tool for electrical regulatory hipot test as not only reliable quality can be obtained, highly efficient test platform can be created.





19020-synchronized output

World's First Sync Hipot Test (Patent Registered) Chroma 19020 has equipped with the world's first sync hipot test function that one single unit can perform 10 channels sync output and measurements simultaneously. Maximum 10 units (master & slave) can be controlled to have 100 channels in total. They can be grouped for output to avoid creating voltage difference due to adjacent tests as well as to improve the productivity.

#### **ORDERING INFORMATION**

19020 : Multi-channel Hipot Tester
19020-4 : Multi-channel Hipot Tester (4CH)
19021 : Multi-channel Hipot Tester (AC)
19021-4 : Multi-channel Hipot Tester (AC/4CH)
19022 : Multi-channel Hipot Tester (DC/IR)
19022-4 : Multi-channel Hipot Tester (DC/IR)
19023-8-20 : Multi-channel Hipot Tester (8kVAC/4CH)
190200 : 19" Rack Mounting Kit for 19020 Series
A190201 : 3-way Scanner Box (10CH)
A190202 : 3-way Scanner Box (4CH)
A190203 : 19020 Series Hipot Tester software
A190508 : GPIB Interface

\* HV cable is option for customize requirement

| Model19020190211902219023-8-20ModelACV/DCV/IR/<br>Multi-channelACV/<br>Multi-channelDCV/IR/<br>Multi-channelACV/<br>Multi-channelWithstanding VoltageFestDC: 0.05 ~ 8kVAC: 0.05 ~ 8kVAC: 0.05 ~ 8kVLoad Regulation $\leq (1\% of setting + 0.1\% of full scale)$ Voltage ResolutionAC: 0.01 ~ 8mAUotput Voltage Accuracy $\pm (1\% of setting + 0.1\% of full scale)$ UtilizationCurrent ResolutionAC: 0.01 ~ 8mADC: 0.001 ~ 3.5mAAC: 0.01 ~ 20mACurrent ResolutionAC: 11 µ A, DC: 0.1 µ ACurrent AC: 0.01 ~ 8mADC: 0.001 ~ 3.5mAAC: 0.01 ~ 20mACurrent Accuracy1% of setting + 0.5% of full scaleOutput FrequencyS0HZ / 60HZFlashover DetectionAC: 1mA ~ 20mA; DC: 1mA ~ 10mA, step 0.1mATest Time0.01 ~ 999.9 sec, offFall Time0.1 ~ 999.9 sec, offSine waveInsulation Resistance TestDC: 0.05 ~ 1kV-Output VoltageDC: 0.05 ~ 1kV-DC: 0.05 ~ 1kVOutput VoltageDC: 0.05 ~ 1kV-DC: 0.05 ~ 1kVVoltage Resolution2VVoltage Accuracy±(2% of setting + 0.5% of full range)IR RangeIMQ ~ 10G (: ± 3% of reading + 0.1% of full range)Resistance Accuracy $\pm 2500V$ $IMQ ~ 10G (: ± 3% of reading + 0.1% of full range)IR RangeIMQ ~ 10G (: ± 3% of reading + 0.2% of full range)Resistance Accuracy\pm 2500VIMQ ~ 10G (: ± 3% of reading + 0.1% of full range)IR RangeIMQ ~ 10G (: ± 3% of reading + 0.1% of full rang$  | SPECIFICATIONS   | SPECIFICATIONS  |   |  |                  |  |
|---|--|---|---|--|------------------|--|
| Mode         ACV/DCV/IR/<br>Multi-channel         ACV/<br>Multi-channel         DCV/IR/<br>Multi-channel         ACV/<br>Multi-channel           Withstanding Voltage         AC::0.05 - 6KV         AC::0.05 - 6KV         DC::0.05 - 8KV         AC::0.05 - 8KV         AC::0.01 - 8MA         DC::0.01 - 3.5mA         AC::0.01 - 20mA           Voltage Accuracy         ±(1% of setting + 0.1% of full scale)         U         Current Resolution         AC::0.01 - 20mA         DC::0.01 + J         AC::0.01 - 20mA           Current Accuracy         0.01 - 99.0 Sec, coff         T         T         T         T           Start Time         0.1 - 99.9 Sec, coff         S         T         T         T           Start Time         0.1 - 99.9 Sec, coff         S         T         T         T           Start Time         0.1 - 99.9 Sec, coff         S         T         S         T         S         S         S         S         S         S         S         S         S         S  |  | 19020 19021 19022 19023-8-  |   |  |                  |  |
| ModeMulti-channelMulti-channelMulti-channelMulti-channelWithstanding VoltageFatVOutput Voltage $AC: 0.05 ~ 6kV$ $DC: 0.05 ~ 6kV$ $DC: 0.05 ~ 6kV$ $AC: 0.05 ~ 6kV$ $AC: 0.05 ~ 6kV$ $DC: 0.05 ~ 6kV$ $AC: 0.05 ~ 6kV$ $AC: 0.05 ~ 6kV$ $AC: 0.05 ~ 6kV$ $AC: 0.01 ~ 6kV$ $AC: 0.01 ~ 20mA$ Load Regulation $V = V$ $V = V = V = V$ $V = V = V = V = V = V = V = V = V = V =$  |  |   |   |  |                  |  |
| Output VoltageAC: $0.05 \sim 6kV$ DC: $0.05 \sim 6kV$ DC: $0.05 \sim 8kV$ AC: $0.05 \sim 8kV$ Load Regulation $\leq (1\% of setting + 0.1\% of full scale)$ Voltage Resolution $2V$ Voltage Accuracy $\pm (1\% of setting + 0.1\% of full scale)$ Cutoff CurrentAC: $0.01 \sim 10mA$ ,<br>DC: $0.001 \sim 3nA$ AC: $0.01 \sim 20mA$ Current ResolutionAC: $0.1 \sim 8mA$ DC: $0.001 \sim 3.5mA$ AC: $0.01 \sim 20mA$ Current ResolutionAC: $1.1 \mu$ A, DC: $0.1 \mu$ ACurrent ResolutionAC: $1.0 \mu$ A, DC: $0.01 \sim 3.5mA$ AC: $0.01 \sim 20mA$ Current ResolutionAC: $1.0 mA$ , $20mA$ ; DC: $1.0 mA \rightarrow 10mA$ , step $0.1 mA$ Test Time $0.03 \rightarrow 999$ sec, offTest TimeRamp Time $0.1 \sim 999$ , $9$ sec, offDecempose confileTest TimeTest TimeRamp Time $0.1 \sim 999$ , $9$ sec, offDecempose confileTest TimeRamp Time $0.1 \sim 999$ , $9$ sec, offTest TimeTest TimeOutput VoltageDC: $0.05 \sim 1kV$ $-$ DC: $0.05 \sim 1kV$ Voltage Resolution $2V$ Voltage Accuracy $2V$ Voltage Resolution $2V$ Voltage Accuracy $1MQ \sim 1GQ$ ; $\pm 7\%$ of reading $\pm 0.1\%$ of full rangeResistance Accuracy $\pm 500V$ $1MQ \sim 1GQ$ ; $\pm 7\%$ of reading $\pm 0.2\%$ of full rangeResistance Accuracy $\pm 500V$ $1MQ \sim 1GQ$ ; $\pm 7\%$ of reading $\pm 0.2\%$ of full rangeSecure Protection Function $0.3 \sim 999$ , $9.9 ce, continueMemory Storage30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection Function<$  | Mode   |   | Multi-channel                               |  | Multi-channel    |  |
| Output voltage<br>DC : 0.05 ~ 6kVAC : 0.05 ~ 6kVDC : 0.05 ~ 6kVAC : 0.05 ~ 8kVLoad Regulation $\leq (1\% \circ of setting + 0.1\% \circ of full scale)$ Voltage Resolution2VVoltage ResolutionAC : 0.01 ~ 8mADC : 0.001 ~ 3.5mAAC : 0.01 ~ 20mACurrent ResolutionC: 0.01 ~ 0mA,<br>DC : 0.001 ~ 5mAAC : 0.01 ~ 8mADC : 0.001 ~ 3.5mAAC : 0.01 ~ 20mACurrent Accuracy1% of setting + 0.5% of full scale0.001 ~ 20mAAC : 0.01 ~ 20mAOutput FrequencySUHz / 60HzSUHz / 60HzSUHZ / 60HzRamp Time0.1 ~ 999.9 sec, offSUHZ / 60HzSUHZ / 60HzFall Time0.1 ~ 999.9 sec, offSUHZ / 60HzSUHZ / 60HzNewelormSine waveSine waveSUHZ / 60HzInsulation Resistance TestUtput VoltageDC : 0.05 ~ 1kV-Output Voltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Ange1MQ ~ 50GQIR RangeIMQ ~ 50GQ : $\pm 1\%$ of reading + 0.1% of full range10GQ ~ 250GQ : $\pm 1\%$ of reading + 0.2% of full rangeResistance Accuracy $\geq 500V$ $\pm 1MQ ~ 1GQ : \pm 3\%$ of reading + 0.2% of full rangeSeve/Recall30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection FunctionVE sSave/Recall30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection LuckPresent passwordInterlockVE sGO/NG Judgment WindowGO : Short sound, Green LEDInterloc   | Withstanding Voltag  | e Test  |   |  |                  |  |
| Voltage Resolution $2V$ Voltage Accuracy $\pm (1\% of setting + 0.1\% of full scale)$ Cutoff Current $AC: 0.01 \sim 10mA$<br>$DC: 0.001 \sim 5mA$ $AC: 0.01 \sim 8mA$<br>$DC: 0.001 \sim 3.5mA$ $AC: 0.01 \sim 20mA$ Current Resolution $AC: 1 \mu A$ , $DC: 0.1 \mu A$<br>Current Accuracy $COUTHACUTACACACACACACACACACACACACACACACACACAC$   | Output Voltage   |   | AC : 0.05 ~ 6kV                             | DC : 0.05 ~ 8kV                            | AC : 0.05 ~ 8kV  |  |
| Voltage Accuracy $\pm (1\% of setting + 0.1\% of full scale)$ Cutoff Current $AC: 0.01 - 10mA, DC: 0.001 - 8mA$ $DC: 0.001 - 3.5mA$ $AC: 0.01 - 20mA$ Current Resolution $AC: 1 \mu A, DC: 0.1 \mu A$ Current Accuracy $1\% of setting + 0.5\% of full scale$ Output Frequency $50Hz / 60Hz$ Flashover Detection $AC: 1 mA - 20mA; DC: 1mA - 10mA, step 0.1mA$ Test Time $0.03 - 999.9$ sec, continueRamp Time $0.1 - 999.9$ sec, offFall Time $0.1 - 999.9$ sec, offJam valueJam valueInsulation Resistance TestJam valueJam valueJam valueVoltage Resolution $2V$ VoltageVoltageJam valueVoltage Resolution $2V$ VoltageJam valueJam valueRange $1M\Omega \sim 16\Omega: \pm 3\%$ of reading + 0.1% of full rangeIGQ $\sim 10GQ: \pm 7\%$ of reading + 0.1% of full rangeResistance Accuracy $\pm 500V$ $1M\Omega \sim 16Q: \pm 3\%$ of reading + 0.1% of full rangeResistance Accuracy $\geq 500V$ $1MQ \sim 16Q: \pm 3\%$ of reading + 0.1% of full rangeVoltage Accuracy $\pm 500V$ $1MQ \sim 16Q: \pm 3\%$ of reading + 0.1% of full rangeResistance Accuracy $\geq 500V$ $\pm 3\%$ of reading + 0.1% of full rangeSecure Protection Function $\pi G \in Son Son Son Son Son Son Son Son Son Son$   | Load Regulation  |   | $\leq$ (1% of setting +                     | - 0.1% of full scale)                      |                  |  |
| Cutoff CurrentAC: $0.01 \sim 10mA$ ,<br>DC: $0.001 \sim 5mA$ AC: $0.01 \sim 8mA$ DC: $0.001 \sim 3.5mA$ AC: $0.01 \sim 20mA$ Current ResolutionAC: $1 \mu A$ , DC: $0.11 \mu A$ Current Accuracy1% of setting $+0.5\%$ of full scaleOutput Frequency $50Hz$ / $60Hz$ Flashover DetectionAC: $1mA \sim 20mA$ ; DC: $1mA \sim 10mA$ , step $0.1mA$ Test Time $0.1 \sim 999.9$ sec, offFall Time $0.1 \sim 999.9$ sec, offDwell Time $0.1 \sim 999.9$ sec, offOutput VoltageDC: $0.05 \sim 1kV$ Output VoltageDC: $0.05 \sim 1kV$ Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% of setting + 0.5\% of full range)IR Range1M\Omega \sim 50G\OmegaResistance Accuracy\pm 500V2500V1M\Omega \sim 50G\OmegaTime0.3 \sim 999.9 sec, offMemory Storage30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection Function1M\Omega \sim 16\Omega; \pm 3\% of reading + 0.2\% of full rangeRange1M\Omega \sim 16\Omega; \pm 3\% of reading + 0.2\% of full rangeSave/Recall30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection FunctionYESGO/NG Judgment WindowO(2; Short sound, G; Reen LEDNG : Long sound, Red LEDInterlockYESGO/NG Judgment Vindow18 to 28^{2} (64 to 82^{2}), 70\% RH.Operation18 to 28^{2} (64 to 82^{2}), 70\% RH.Memory Storage30 instrument setups with up to 10 test stepsInterlace18 $   | Voltage Resolution   |   | 2   | 2V   |                  |  |
| CuttorDC : 0.001~5mÅAC : 0.01 ~ 8mÅDC : 0.001~3.5mÅAC : 0.01 ~ 20mÅCurrent Accuracy1% of setting +0.5% of full scaleOutput Frequency50Hz / 60HzPishover DetectionAC : 1mÅ ~ 20mÅ ; DC : 1mÅ ~ 10mÅ , step 0.1mÅTest Time0.03 ~ 999.9 sec, offBamp Time0.1 ~ 999.9 sec, offDwell Time0.1 ~ 999.9 sec, offWaveformSine waveInsulation Resistance Test0.005 ~ 1kVOutput VoltageDC : 0.05 ~ 1kVVoltage Accuracy $\pm 20$ of setting + 0.5% of full rangeIR Range1MQ ~ 50G QIR Range1MQ ~ 1G Q : ± 3% of reading + 0.1% of full rangeResistance Accuracy $\pm 500V$ Store1MQ ~ 1G Q : ± 3% of reading + 0.1% of full rangeIG Q ~ 10G Q : $\pm 3\%$ of reading + 0.2% of full rangeResistance Accuracy $\pm 500V$ Store1MQ ~ 1G Q : $\pm 3\%$ of reading + 0.1% of full rangeTest Time0.3 ~ 999.9 sec, continueMemory Storage30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection FunctionQ.4ms after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LEDInterlockYESGo/NG Judgment WindowNG : Long sound, Red LEDInterlockYESGorNG Judgment Window18 to 28° (64 to 82°F) 70% RH.CANBUS & data control interface are used for Max.10 units of master & slaves connectionGeneral <td>Voltage Accuracy</td> <td></td> <td><math>\pm</math>(1% of setting +</td> <td>- 0.1% of full scale)</td> <td></td>   | Voltage Accuracy   |   | $\pm$ (1% of setting +                      | - 0.1% of full scale)                      |                  |  |
| Current Accuracy1% of setting +0.5% of full scaleOutput Frequency50Hz / 60HzFlashover DetectionAC : 1mA ~ 20mA ; DC : 1mA ~ 10mA , step 0.1mATest Time0.03 ~ 999.9 sec, offBamp Time0.1 ~ 999.9 sec, offDwell Time0.1 ~ 999.9 sec, offDwell Time0.1 ~ 999.9 sec, offWaveformSine waveInsulation Resistance TestDC : 0.05 ~ 1kVOutput VoltageDC : 0.05 ~ 1kVVoltage Resolution2VVoltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Range1MQ ~ 1GQ : $\pm 3\%$ of reading + 0.1% of full rangeInsulation Resistance Test1MQ ~ 1GQ : $\pm 3\%$ of reading + 0.2% of full rangeResistance Accuracy $\pm 500V$ 1MQ ~ 1GQ : $\pm 3\%$ of reading + 0.2% of full rangeIn MQ ~ 1GQ ~ 10GQ : $\pm 7\%$ of reading + 0.2% of full range10GQ ~ 950QTest Time0.3 ~ 999.9 sec, continueMemory Storage30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection Function1MQ ~ 1GQ : ExponyPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LED<br>NG : Long sound, Red LEDIndication, AlarmGG : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS -23 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slave  | Cutoff Current   |   | AC : 0.01 ~ 8mA                             | DC : 0.001 ~ 3.5mA                         | AC : 0.01 ~ 20mA |  |
| Output Frequency $50Hz / 60Hz$ Flashover DetectionAC : 1mA ~ 20mA ; DC : 1mA ~ 10mA , step 0.1mATest Time $0.03 ~ 999.9$ sec, continueRamp Time $0.1 ~ 999.9$ sec, offFall Time $0.1 ~ 999.9$ sec, offDwell Time $0.1 ~ 999.9$ sec, offWaveformSine waveInsulation Resistance Test $0.1 ~ 999.9$ sec, offOutput VoltageDC : $0.05 ~ 1kV$ Voltage Resolution $2V$ Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Range $1M\Omega ~ 50G\Omega$ Resistance Accuracy $\geq 500V$ $4 \pm 200V$ $1G\Omega ~ 2 \pm 3\%$ of reading + $0.1\%$ of full rangeInsolation Resistance Test $1M\Omega ~ 1G\Omega : \pm 3\%$ of reading + $0.5\%$ of full rangeRange $1M\Omega ~ 10G\Omega : \pm 10\%$ of reading + $1.0\%$ of full rangeResistance Accuracy $\geq 500V$ $1G\Omega ~ 200C\Omega : \pm 10\%$ of reading + $0.1\%$ of full rangeResistance Accuracy $2500V$ $\pm 3\%$ of reading + $0.2\%$ of full rangeSave/Recall30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection Function $9.4\%$ of Sicon Sico  | Current Resolution   |   | AC : 1 μ A,                                 | DC : 0.1 μ A                               |                  |  |
| Flashover DetectionAC : 1mA ~ 20mA ; DC : 1mA ~ 10mA , step 0.1mATest Time $0.03 ~ 999.9$ sec, continueRamp Time $0.1 ~ 999.9$ sec, offFall Time $0.1 ~ 999.9$ sec, offDwell Time $0.1 ~ 999.9$ sec, offDvell Time $0.1 ~ 999.9$ sec, offVoltage Resolution $2V$ Voltage Resolution $2V$ Voltage Accuracy $\pm (2\%$ of setting $+ 0.5\%$ of full rangeRange $1M\Omega ~ 1G\Omega$ : $\pm 3\%$ of reading $+ 0.1\%$ of full rangeResistance Accuracy $1M\Omega ~ 1G\Omega$ : $\pm 10\%$ of reading $+ 0.2\%$ of full rangeResistance Accuracy $\pm 500V$ $1M\Omega ~ 1G\Omega$ : $\pm 10\%$ of reading $+ 0.2\%$ of full rangeTest Time $0.3 ~ 999.9$ sec, continueMemory Storage $30$ instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection FunctionYESFast Output Cut-off $0.4ms$ after NG happenPanel Operation LockYESOptical Lage AccuracyYESInterlockYESColl Short sound, Green LEDData HoldLeast tests data memoriesMemory Storage $30$ instrument setups with up to 10 test stepsInterlockYESColl Short sound, Green LED<   | Current Accuracy   |   | 1% of setting +                             | 0.5% of full scale                         |                  |  |
| Test Time $0.03 \sim 999.9  sec, continue         Ramp Time       0.1 \sim 999.9  sec, off         Fall Time       0.1 \sim 999.9  sec, off         Dwell Time       0.1 \sim 999.9  sec, off         Waveform       Sine wave         Insulation Resistance Test       0.1 \sim 999.9  sec, off         Output Voltage       DC : 0.05 \sim 1  kV       -         Voltage Accuracy       \pm (2\%  of  setting + 0.5\%  of  full range)         IR Range       1M\Omega \sim 50G\Omega         Resistance Accuracy       \pm (2\%  of  setting + 0.5\%  of  full  range)         Resistance Accuracy       2V \langle 500V \rangle 1G\Omega \sim 10G\Omega : \pm 3\%  of  reading + 0.1\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 10\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 7\%  of  reading + 0.2\%  of  full  range \\ 10G\Omega \sim 50G\Omega : \pm 10\%  of  full  range \\ recalled from the  intervalend + 10\%  of  full  range \\ recalled from the  intervalend + 10\%  of  full  range \\ recalled from the  intervalend + 10\%  of  full  range \\ Save/Recall & 30  instrument  setups  with up to 10  test  steps  continue \\ Remory Storage & 30  instrument  setups  with up to 1$  | Output Frequency   |   | 50Hz  | / 60Hz                                     |                  |  |
| Ramp Time0.1 ~ 999.9 sec, offFall Time0.1 ~ 999.9 sec, offDwell Time0.1 ~ 999.9 sec, offWaveformSine waveInsulation Resistance TestOutput VoltageDC : 0.05 ~ 1kVVoltage Resolution2VVoltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Range $1MQ \sim 50GQ$ Resistance Accuracy $\geq 500V$ $\pm 2500V$ $1MQ \sim 1GQ$ : $\pm 3\%$ of reading + 0.1% of full range $1GQ \sim 10GQ$ : $\pm 7\%$ of reading + 0.2% of full range $1GQ \sim 10GQ$ : $\pm 7\%$ of reading + 0.2% of full range $1GQ \sim 50GQ$ $2500V$ $1MQ \sim 1GQ$ : $2500V$ $1MQ \sim 1GQ$ : $2500V$ $2\%$ of reading + 0.2% of full range $1GQ \sim 10GQ$ : $\pm 10\%$ of reading + 0.2% of full range $1GQ \sim 10GQ$ : $\pm 20\%$ of reading + 0.0% of full range $260V$ $1MQ \sim 1GQ$ : $2500V$ $1MQ \sim 1GQ$ : $2500V$ $2\%$ of reading + 0.2% of full range $1GQ \sim 10GQ$ : $\pm 20\%$ of reading + 0.2% of full range $260V$ $2\%$ of reading + 0.2% of full range $260V$ $2\%$ of reading + 0.2% of full range $260V$ $2\%$ of reading + 0.2% of full range $10G \sim 50GQ$ $1MQ \sim 1GQ$ : $250V$ $2\%$ of reading + 0.2% of full range $260V$ $2\%$ of reading + 0.2% of full range $10G \sim 50GQ$ $1MQ \sim 1GQ$ : $260V$ $1MQ \sim 1GQ$ : $260V$ $1MQ \sim 1GQ$ : $260V$ $1MQ \sim 1GQ$ : $270V$ $2\%$ of reading + 0.2% of full range $260V$ $2$  | Flashover Detection  | AC  | : 1mA ~ 20mA ; DC : 1                       | mA ~ 10mA , step 0.1                       | mA               |  |
| Fall Time       0.1 ~ 999.9 sec, off         Dwell Time       0.1 ~ 999.9 sec, off         Waveform       Sine wave         Insulation Resistance Test       Output Voltage         Output Voltage       DC: 0.05 ~ 1kV       -         Voltage Resolution       2V         Voltage Accuracy       ±(2% of setting + 0.5% of full range)         IR Range       1M Q ~ 16Q : ± 3% of reading + 0.1% of full range         Resistance Accuracy       ± 500V         IM Q ~ 16Q : ± 3% of reading + 0.2% of full range         10G Q ~ 50G Q : ± 10% of reading + 0.2% of full range         10G Q ~ 50G Q : ± 10% of reading + 0.2% of full range         10G Q ~ 50G Q : ± 3% of reading + 0.2% of full range         10G Q ~ 50G Q : ± 3% of reading + 0.2% of full range         10G Q ~ 50G Q : ± 10% of reading + 0.2% of full range         10G Q ~ 50G Q : ± 3% of reading + 0.2% of full range         Test Time       0.3 ~ 999.9 sec, continue         Memory Storage       30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memory         Secure Protection Function       Fast Output Cut-off         Panel Operation Lock       Present password         Interlock       YES         GO/NG Judgment Window       GO : Short sound, Green LED         Indication, Alarm  | Test Time  |   | 0.03 ~ 999.9                                | sec, continue                              |                  |  |
| Dwell Time $0.1 \sim 999.9 \text{ sec. off}$ WaveformSine waveInsulation Resistance TestOutput VoltageDC: $0.05 \sim 1kV$ Output Voltage Resolution $2V$ Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% \text{ of setting } + 0.5\% \text{ of full range})$ IR Range $1M\Omega \sim 1G\Omega$ : $\pm 3\%$ of reading $+ 0.1\%$ of full rangeResistance Accuracy $2 \leq 500V$ $2 \leq 500V$ $1M\Omega \sim 1G\Omega$ : $2 = 7\%$ of reading $+ 0.2\%$ of full range $2 \leq 500V$ $1M\Omega \sim 1G\Omega$ : $2 \pm 3\%$ of reading $+ 0.2\%$ of full range $30 \otimes 2 \approx 200V$ $1M\Omega \sim 16\Omega$ : $2 \pm 3\%$ of reading $+ 0.2\%$ of full scaleTest Time $0.3 \sim 999.9 \sec$ , continueMemory Storage $30$ instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection Function $0.4ms$ after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LEDIndication, AlarmNG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneral $18 to 28^{\circ} C (64 to 82^{\circ} F), 70\% RH.$ Operation $18 to 28^{\circ} C (64 to 82^{\circ} F), 70\% RH.$ Power Requirements $90-264Vac$ ; $47-63Hz$ Dimension (HxWxD) $190x430x607 mm/7.48x16.93x23.90$ inch   | Ramp Time  |   | 0.1 ~ 999                                   | 9.9 sec, off                               |                  |  |
| WaveformSine waveInsulation Resistance TestSine waveOutput VoltageDC: $0.05 \sim 1kV$ -Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Range $1M\Omega \sim 50G\Omega$ Resistance Accuracy $\geq 500V$ $10G\Omega \sim 10G\Omega : \pm 7\% of reading + 0.1\% of full rangeResistance Accuracy\geq 500V10G\Omega \sim 50G\Omega : \pm 10\% of reading + 0.2\% of full rangeResistance Accuracy\geq 500V10G\Omega \sim 50G\Omega : \pm 10\% of reading + 0.2\% of full rangeResistance Accuracy\geq 500V\pm 500V\pm 3\% of reading + 0.2\% of full rangeResistance Accuracy\geq 500V\pm 500V\pm 3\% of reading + 0.2\% of full rangeResistance Accuracy\geq 500V\pm 3\% of reading + 0.2\% of full rangeResistance Accuracy\pm 300V\pi C = 0.2\% of reading + 0.2\% of full rangeResistance Accuracy\pm 30V\pi C = 0.2\% of reading + 0.2% of full rangeResistance Accuracy\pm 30V\pi C = 0.2\% of reading + 0.2% of full rangeResistance Accuracy\pm 30V\pi C = 0.2\% of reading + 0.2% of full rangeResistance Accuracy\pm 30V\pi C = 0.2\% of reading + 0.2% of full rangeResistance Accuracy\pm 30V\pi C = 0.2\% of reading + 0.2% of full rangeResistance Accuracy\pm 30V\pi C = 0.2\%Save/Recall30V instrument setups with up to 10 test steps can be stored into and recalled from the internal memoryGo/RG Judgment Window$   | Fall Time  |   | 0.1 ~ 999                                   | 9.9 sec, off                               |                  |  |
| Insulation Resistance TestOutput VoltageDC: $0.05 \sim 1kV$ -Voltage Resolution $2V$ Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Range $1M\Omega \sim 50G\Omega$ Resistance Accuracy $\pm (2\% of setting + 0.5\% of full range)$ Resistance Accuracy $1M\Omega \sim 1G\Omega : \pm 3\%$ of reading + 0.2% of full range $10G\Omega \sim 50G\Omega : \pm 10\% of reading + 0.2\% of full range10G\Omega \sim 50G\Omega : \pm 10\% of reading + 0.2\% of full range10G\Omega \sim 50G\Omega : \pm 10\% of reading + 10\% of full rangeTest Time0.3 \sim 999.9 sec, continueMemory StorageSave/Recall30 instrument setups with up to 10 test steps can be stored into andrecalled from the internal memorySecure Protection FunctionPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowIndication, AlarmGO : Short sound, Green LEDNG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBUS & data control interface are used for Max. 10 units of master & slaves connectionGeneralOperation18 to 28°C (64 to 82°F), 70% RH.Maximum relative humidity 80% for temperature up to 31°C (88°F)Decreasing linearly to 50% relative humidity 40°C (104°F)Power Requirements90 - 264VaC; 47 - 63HzDimension (HxWxD)190x430x607 mm/7.48x16.93x23.90 inch$  | Dwell Time   |   | 0.1 ~ 999                                   | 9.9 sec, off                               |                  |  |
| Output VoltageDC: $0.05 \sim 1kV$ -DC: $0.05 \sim 1kV$ -Voltage Resolution $2V$ Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% of setting + 0.5\% of full range)$ IR Range $1M\Omega \sim 50G\Omega$ Resistance Accuracy $20\% of reading + 0.1\% of full range$ Resistance Accuracy $2500V$ $1M\Omega \sim 16\Omega : \pm 3\% of reading + 0.2\% of full range$ $10G\Omega \sim 50G\Omega : \pm 10\% of reading + 10\% of full range$ $10G\Omega \sim 50G\Omega : \pm 10\% of reading + 10\% of full range$ $10G\Omega \sim 50G\Omega : \pm 10\% of reading + 10\% of full range$ Test Time $0.3 \sim 999.9$ sec, continueMemory StorageSave/Recall $30$ instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection FunctionPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowIndication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneralOperationOperationStandby : < 250W ; With rated load : <1000W  | Waveform   |   | Sine  | wave                                       |                  |  |
| Voltage Resolution $2V$ Voltage Accuracy $\pm (2\% \text{ of setting } + 0.5\% \text{ of full range})$ IR Range $1M\Omega \sim 50G\Omega$ Resistance Accuracy $\geq 500V$ $1G\Omega \simeq 1G\Omega : \pm 3\% \text{ of reading } + 0.1\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ $1G\Omega \simeq 750G\Omega : \pm 10\% \text{ of reading } + 0.2\% \text{ of full range}$ Test Time $0.3 \sim 99.9 \text{ sec}$ , continueMemory Storage $30$ instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection Function $785COV \oplus 785$ Panel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LEDIndication, AlarmGO : Short sound, Green LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterface $RS - 32 \& Handler (Standard), GPIB (Optional)$ CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneral $18 to 28^{\circ} (64 to 82^{\circ} F), 70\% RH.$ Operation $18 to 28^{\circ} (64 to 82^{\circ} F), 70\% RH.$ Power Requirement $90 \sim 264Vac; 42 - 63Hz$ <td>Insulation Resistance</td> <td>e Test</td> <td></td> <td></td> <td></td> | Insulation Resistance  | e Test  |   |  |                  |  |
| Voltage Accuracy $\pm (2\% \text{ of setting } + 0.5\% \text{ of full range})$ IR Range $1M\Omega \sim 50G\Omega$ IR Range $1M\Omega \sim 1G\Omega : \pm 3\% \text{ of reading } + 0.1\% \text{ of full range}$ Resistance Accuracy $\geq 500V$ $1M\Omega \sim 1G\Omega : \pm 7\% \text{ of reading } + 0.2\% \text{ of full range}$ $10G\Omega \sim 50G\Omega : \pm 10\% \text{ of reading } + 1\% \text{ of full range}$ $10G\Omega \sim 50G\Omega : \pm 10\% \text{ of reading } + 1\% \text{ of full range}$ Test Time $0.3 \sim 999.9 \text{ sec, continue}$ Memory Storage $30$ instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySave/Recall30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memorySecure Protection FunctionFast Output Cut-off $0.4\text{ms after NG happen}$ Panel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowIndication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneral18 to 28° C (64 to 82° F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88° F)<br>Decreasing linearly to 50% relative humidity at 40°C (104° F)Power ConsumptionStandby : < 250W ; With rated load : <1000W  | Output Voltage   | DC : 0.05 ~ 1kV   | -   | DC : 0.05 ~ 1kV                            | -                |  |
| IR Range $IM \Omega \sim 50G \Omega$ Resistance Accuracy $\geq 500V$ $IM \Omega \sim 1G \Omega$ : $\pm 3\%$ of reading + 0.1% of full range<br>$IG \Omega \sim 10G \Omega : \pm 7\%$ of reading + 0.2% of full range<br>$10G \Omega \sim 50G \Omega : \pm 10\%$ of reading + 1.0% of full range<br>$10G \Omega \sim 50G \Omega : \pm 10\%$ of reading + 0.2% of full range<br>$10G \Omega \sim 50G \Omega : \pm 3\%$ of reading + (0.2*500/Vs)% of full rangeTest Time $O.3 \sim 999.9$ sec, continueMemory Storage $0.3 \sim 999.9$ sec, continueSave/Recall $30$ instrument setups with up to 10 test steps can be stored into and<br>recalled from the internal memorySecure Protection Function $0.4ms$ after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WinowGO : Short sound, Green LED<br>NG : Long sound, Red LEDIndication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesRes-232 & Handler (Standard), GPIB (Optional)GANBus & data connectionGeneral18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W   | Voltage Resolution   |   | 2   | V  |                  |  |
| IR Range $IM \Omega \sim 50G \Omega$ Resistance Accuracy $\geq 500V$ $IM \Omega \sim 1G \Omega$ : $\pm 3\%$ of reading + 0.1% of full range<br>$IG \Omega \sim 10G \Omega : \pm 7\%$ of reading + 0.2% of full range<br>$10G \Omega \sim 50G \Omega : \pm 10\%$ of reading + 1.0% of full range<br>$10G \Omega \sim 50G \Omega : \pm 10\%$ of reading + 0.2% of full range<br>$10G \Omega \sim 50G \Omega : \pm 3\%$ of reading + (0.2*500/Vs)% of full rangeTest Time $O.3 \sim 999.9$ sec, continueMemory Storage $0.3 \sim 999.9$ sec, continueSave/Recall $30$ instrument setups with up to 10 test steps can be stored into and<br>recalled from the internal memorySecure Protection Function $0.4ms$ after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WinowGO : Short sound, Green LED<br>NG : Long sound, Red LEDIndication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesRes-232 & Handler (Standard), GPIB (Optional)GANBus & data connectionGeneral18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W   | Voltage Accuracy   |   | $\pm$ (2% of setting +                      | 0.5% of full range)                        |                  |  |
| Resistance Accuracy $\geq 500V$ $1G\Omega \sim 10G\Omega : \pm 7\% 06 freading + 0.2\% 06 full range10G\Omega \sim 50G\Omega : \pm 10\% 06 freading + 1\% 06 full range10G\Omega \sim 1G\Omega : \pm 1\% 06 freading + 1\% 06 full rangeResistance Accuracy< 500V\pm 3\% 06 reading + (0.2*500/Vs)\% of full scaleTest Time0.3 \sim 999.9 sec, continueMemory Storage30 instrument setups with up to 10 test steps can be stored into andrecalled from the internal memorySecure Protection Function-Fast Output Cut-off0.4ms after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LEDNG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceInterfaceRes-232 & Handler (Stardrd), GPIB (Optional)CANBus & data controlCansus & data controlIterface are used for Max. 10 units of master & slaves connectionGeneral0 \in 25\% (64 to 82°F), 70% RH.Maximum relative humidity 80% for temperature up to 31°C (88°F)Decreasing linearly to 50% relative humidity at 40°C (104'F)Power ConsumptionStandby : < 250W ; With rated load : <1000WPower Requirements90\sim 264Vac ; 47~63HzDimension (HxWxD)190x430x607 mm7.48x16.93x23.90 inch$   | IR Range   |   |   |  |                  |  |
| IM $\Omega \sim 1G \Omega$ :<br>$\pm 3\%$ of reading + (0.2*500/Vs)% of full scaleTest Time0.3 ~ 999.9 sec, continueMemory StorageSave/Recall30 instrument setups with up to 10 test steps can be stored into and<br>recalled from the internal memorySecure Protection FunctionFast Output Cut-off0.4ms after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowIndication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceInterfaceRS-232 & Handler (Standard), GPIB (Optional)Test 0 a8° C (64 to 82° F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31° C (88° F)<br>Decreasing linearly to 50% or leative humidity at 40° C (104° F)<br>Decreasing linearly to 50% or leative humidity at 40° C (104° F)Power ConsumptionStandby : < 250W ; With rated load : <1000WPower Requirements90~264Vac ; 47~63HzDimension (HxWxD)190x430x607 mm/7.48x16.93x23.90 inch  | Resistance Accuracy  | $\geq$ 500V 1G $\Omega$ ~ 10G $\Omega$ : $\pm$ 7% of reading + 0.2% of full range |   |  |                  |  |
| Memory Storage           Save/Recall         30 instrument setups with up to 10 test steps can be stored into and recalled from the internal memory           Secure Protection Function            Fast Output Cut-off         0.4ms after NG happen           Panel Operation Lock         Present password           Interlock         YES           GO/NG Judgment Window         GO : Short sound, Green LED           Indication, Alarm         GO : Short sound, Red LED           Data Hold         Least tests data memories           Memory Storage         30 instrument setups with up to 10 test steps           Interface         RS-232 & Handler (Standard), GPIB (Optional)           CANBus & data control interface are used for Max. 10 units of master & slaves connection         General           Operation Environment         18 to 28°C (64 to 82°F), 70% RH. Maximum relative humidity 80% for temperature up to 31°C (88°F). Decreasing linearly to 50% relative humidity at 40°C (104°F)           Power Consumption         Standby : < 250W ; With rated load : <1000W   |  |   |   |  |                  |  |
| Save/Recall30 instrument setups with up to 10 test steps can be stored into and<br>recalled from the internal memorySecure Protection FunctionFast Output Cut-off0.4ms after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneralOperation<br>EnvironmentNaximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W  | Test Time  |   | 0.3 ~ 999.9 s                               | sec, continue                              |                  |  |
| Save/necalirecalled from the internal memorySecure Protection FunctionFast Output Cut-off0.4ms after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WoodIndication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Statard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneralOperation<br>Environment18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W  | Memory Storage   |   |   |  |                  |  |
| Fast Output Cut-off0.4ms after NG happenPanel Operation LockPresent passwordInterlockYESGO/NG Judgment WindowGO : Short sound, Green LEDIndication, AlarmGO : Short sound, Green LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneral18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W  | Save/Recall  | 30 instrume   | nt setups with up to 1<br>recalled from the | 0 test steps can be sto<br>internal memory | pred into and    |  |
| Panel Operation Lock       Present password         Interlock       YES         GO/NG Judgment Window       GO : Short sound, Green LED         Indication, Alarm       GO : Short sound, Green LED         Data Hold       Least tests data memories         Memory Storage       30 instrument setups with up to 10 test steps         Interface       RS-232 & Handler (Standard), GPIB (Optional)         CANBus & data control interface are used for Max. 10 units of master & slaves connection         General       18 to 28°C (64 to 82°F), 70% RH.         Operation       Maximum relative humidity 80% for temperature up to 31°C (88°F)         Doccreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption       Standby : < 250W ; With rated load : <1000W   | <b>Secure Protection Fu</b>  | nction  |   |  |                  |  |
| Interlock       YES         GO/NG Judgment Window       GO : Short sound, Green LED         Indication, Alarm       GO : Short sound, Green LED         Data Hold       Least tests data memories         Memory Storage       30 instrument setups with up to 10 test steps         Interface       RS-232 & Handler (Standard), GPIB (Optional)         CANBus & data control interface are used for Max. 10 units of master & slaves connection         General       Operation         Operation       18 to 28°C (64 to 82°F), 70% RH.         Environment       Maximum relative humidity 80% for temperature up to 31°C (88°F)         Decreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption       Standby : < 250W ; With rated load : <1000W  | Fast Output Cut-off  |   | 0.4ms after                                 | NG happen                                  |                  |  |
| GO/NG Judgment Window         Indication, Alarm       GO : Short sound, Green LED<br>NG : Long sound, Red LED         Data Hold       Least tests data memories         Memory Storage       30 instrument setups with up to 10 test steps         Interface       RS-232 & Handler (Standard), GPIB (Optional)         CANBus & data control interface are used for Max. 10 units of master & slaves connection         General       18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption       Standby : < 250W ; With rated load : <1000W  | Panel Operation Lock   |   | Present                                     | password                                   |                  |  |
| Indication, AlarmGO : Short sound, Green LED<br>NG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneralOperation<br>Environment18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W  | Interlock  |   | Y   | ES   |                  |  |
| Indication, AlarmNG : Long sound, Red LEDData HoldLeast tests data memoriesMemory Storage30 instrument setups with up to 10 test stepsInterfaceRS-232 & Handler (Standard), GPIB (Optional)CANBus & data control interface are used for Max. 10 units of master & slaves connectionGeneralOperation<br>Environment18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W   | GO/NG Judgment Wi  | ndow  |   |  |                  |  |
| Memory Storage       30 instrument setups with up to 10 test steps         Interface         RS-232 & Handler (Standard), GPIB (Optional)         CANBus & data control interface are used for Max. 10 units of master & slaves connection         General         Operation<br>Environment       18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption       Standby : < 250W ; With rated load : <1000W   | Indication, Alarm  |   |   |  |                  |  |
| Interface         RS-232 & Handler (Standard), GPIB (Optional)         CANBus & data control interface are used for Max. 10 units of master & slaves connection         General         Operation         Environment         Decreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption         Standby : < 250W ; With rated load : <1000W  |  |   | Least tests da                              | ata memories                               |                  |  |
| RS-232 & Handler (Standard), GPIB (Optional)         CANBus & data control interface are used for Max. 10 units of master & slaves connection         General         Operation<br>Environment       18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption       Standby : < 250W ; With rated load : <1000W  | Memory Storage   | 3   | 0 instrument setups                         | with up to 10 test step                    | DS               |  |
| CANBus & data control interface are used for Max. 10 units of master & slaves connection         General         Operation<br>Environment       18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)         Power Consumption       Standby : < 250W ; With rated load : <1000W   | Interface  |   |   |  |                  |  |
| General         18 to 28°C (64 to 82°F), 70% RH.           Operation<br>Environment         Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)           Power Consumption         Standby : < 250W ; With rated load : <1000W   |  |   |   |  |                  |  |
| Operation<br>Environment18 to 28°C (64 to 82°F), 70% RH.<br>Maximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W   | CANBus & data control interface are used for Max. 10 units of master & slaves connection |   |   |  |                  |  |
| Operation<br>EnvironmentMaximum relative humidity 80% for temperature up to 31°C (88°F)<br>Decreasing linearly to 50% relative humidity at 40°C (104°F)Power ConsumptionStandby : < 250W ; With rated load : <1000W   | General  |   |   |  |                  |  |
| Power Requirements         90~264Vac ; 47~63Hz           Dimension (HxWxD)         190x430x607 mm/7.48x16.93x23.90 inch   |  | Maximum relative humidity 80% for temperature up to 31°C (88°F)                   |   |  |                  |  |
| Dimension (HxWxD) 190x430x607 mm/7.48x16.93x23.90 inch  | Power Consumption  | 9   | Standby : < 250W ; Wi                       | th rated load : <1000                      | V                |  |
|   | Power Requirements   |   | 90~264Va                                    | c;47~63Hz                                  |                  |  |
| Weight Approx.40 kg/88.18lbs  | Dimension (HxWxD)  |   | 190x430x607 mm/7                            | .48x16.93x23.90 inch                       |                  |  |
|   | Weight   |   | Approx.40                                   | kg/88.18lbs                                |                  |  |

All specifications are subject to change without notice.

## AC/DC/IR/SCAN Hipot Tester

# Model 19052/19053/19054



#### **KEY FEATURES**

#### 3 in 1 Tester : AC, DC, IR

- Programmable output voltage to 5kV AC and 6kV DC
- Trip current programmable to 30mA AC and 10mA DC
- Insulation resistance to 50G Ω/1000V DC
- Built-in 8 channel SCANNER (19053 only)
- Built-in 4 channel SCANNER (19054 only)
- Open/Short Check (OSC)
- Ground Fault Interrupt (GFI)
- ARC detection (Flashover)
- Storage of 50 Tests Setups with 100 Steps per setup



- Optional transformer test fixture (19053 only)
- Standard RS-232 Interface
- Optional GPIB Interface

The Chroma Hipot Tester 19052/19053/19054 provides 3 models to choose. The 19052 includes AC/DC/IR Hipot testing and insulation resistance (IR) measurements, the 19053 which combines both AC and DC Hipot tests and IR measurements with 8HV scan channel capability into a single compact unit, and the 19054 which combines both AC and DC Hipot tests and IR measurements with 4HV scan channel capability into a single compact unit. The front panels of the fevers make them easy to operate. Digital display and user friendly control allows test parameters and limits to be set easily without the high voltage activating.

#### ORDERING INFORMATION

| 19052 : Hipot Tester (AC/DC/IR)                 |
|---|
| 19053 : Hipot Tester (AC/DC/IR/8CH SCAN)        |
| <b>19054 :</b> Hipot Tester (AC/DC/IR/4CH SCAN) |
| A190344 : HV Gun                                |
| A190512 : Auto Control TR. Scan Box (3002B)     |
| A190508 : GPIB Interface                        |
| A190517 : 19" Rack Mounting Kit for Model       |
| 19052/19053/19054                               |
| A190518 : Hipot Tester software                 |
| A190702 : 40kV HV Test Probe                    |
| A190704 : Start Switch                          |
| A190708 : ARC Verification Fixture              |



A190512: Auto Control TR. Scan Box (3002B)

| SPECIFICAT   | IONS         |                             |   |  |                     |  |
|--|--------------|-----------------------------|---|--|---------------------|--|
| Model  |              |                             | 19052                                     | 19053  | 19054               |  |
| Mode   |              |                             | ACV/DCV/IR                                | ACV/DCV/   | /IR/SCAN            |  |
| Withstanding Voltage Test  |              |                             |   |  |                     |  |
| Output Voltage   |              |                             |   | AC : 0.05 ~ 5kV, DC : 0.05 ~ 6kV   |                     |  |
| Load Regula  | ition        |                             |   | ≦ (1% + 5V)  |                     |  |
| Voltage Reso   |              |                             |   | 2V   |                     |  |
| Voltage Acc  | uracy        |                             |   | $\pm$ (1% of reading + 5 counts)   |                     |  |
| Cutoff Curre   | nt           |                             |   | AC : 30mA, DC : 10mA   |                     |  |
| Current Reso   | olution      |                             |   | AC : 1μΑ, DC : 0.1μΑ   |                     |  |
| Current Accu   | uracy        |                             |   | $\pm$ (1% of reading + 5 counts)   |                     |  |
| Current Free   | quency       |                             |   | 50Hz/ 60Hz   |                     |  |
| Test Time  |              |                             |   | 0.3 ~ 999 sec, continue  |                     |  |
| Ramp up Tir  | ne           |                             |   | 0.1 ~ 999sec, off<br>Sine wave<br>0.05 ~ 1kV DC : 0.05 ~ 1kV   |                     |  |
| Waveform   |              |                             |   | Sine wave  |                     |  |
| Insulation F   | Resistance T | est                         |   |  |                     |  |
| Output Volta   | age          |                             | DC : 0.05 ~ 1kV                           | DC:0.05  | 5 ~ 1kV             |  |
| Voltage Reso   | olution      |                             | 2V  | 2\   | /                   |  |
| Voltage Acc  | uracy        |                             |   | $\pm$ (1% of reading + 5 counts)   |                     |  |
| IR Range   |              |                             | 1MΩ~ 50 GΩ                                | 1MΩ~ <sup>-</sup>  | 10 GΩ               |  |
| Resistance R   | lesolution   |                             | <b>0.1M</b> Ω                             | 0.1N   | 1Ω                  |  |
|  | ≧ 500V       | 1MΩ~2.5GΩ                   |   | $\pm$ (5% of reading + 2% of full scale)   |                     |  |
| Resistance   | ≡ 5000       | <b>2.2G</b> Ω~ <b>50G</b> Ω |   | $\pm$ (15% of reading + 1% of full scale)  |                     |  |
| Accuracy   | < 500V       | 0.1ΜΩ~250ΜΩ                 | $\pm$ (10% of reading + 2% of full scale) |  |                     |  |
|  | < 5000       | 0.22GΩ~50GΩ                 | $\pm$ (15% of reading + 1% of full scale) |  |                     |  |
| Scanner Uni  | -            |                             |   | 8 ports, ±phase  | 4 ports, ±phase     |  |
| ARC Detect   | •            | ver)                        |   |  |                     |  |
| Setting Mod  |              |                             |   | Programmable setting   |                     |  |
| Detection C  |              |                             |   | AC : 1mA ~ 15mA, DC : 1mA ~ 10mA   |                     |  |
| Secure Prot  |              | tion                        |   |  |                     |  |
| Fast Output  |              |                             | 0.4 ms after NG happen                    |  |                     |  |
| Fast DC disc   |              |                             | 0.2 sec                                   |  |                     |  |
| Ground Faul  | · ·          | GFi)                        | 0.5mA $\pm$ 0.25mA AC, Close              |  |                     |  |
| Panel Opera  |              |                             | Present password                          |  |                     |  |
| Continuity C   |              |                             |   | $1\Omega \pm 0.2\Omega$ , Off  |                     |  |
| GO/NG Judg   | /            | DW .                        |   |  | 250 1 50            |  |
| Indication, A  | larm         |                             | GO: Shor                                  | t sound, Green LED; NG: Long sound,  | RED LED             |  |
| Data Hold  |              |                             | 00.1                                      | Least tests data memories  |                     |  |
| Memory Storage   |              |                             | 99 steps                                  | s or 99 groups for total 500 memory lo   | ocations            |  |
| Remote Connector   |              |                             |   |  |                     |  |
| Real Panel connector   Input : Start, Stop, Interlock (at 11 pin terminal block) |              |                             | ck (at 11 pin terminal block only) ; Out  | put : Under test, Pass, Fall   |                     |  |
| General  |              | I                           |   | $a_{1} = a_{1} + a_{2} + a_{3} + a_{3$ | 0/ 011              |  |
| Operation Environment Power Consumption  |              |                             |   | perature: $0^{\circ}$ C ~ 40 °C, Humidity: $\leq 80$   |                     |  |
|  |              |                             |   | ad: <100 W, With rated load: $\leq$ 500 W  |                     |  |
| Power Requ   |              |                             |   | $220V(AC \pm 10\%) / 240V(AC + 5\%^{-10})$   |                     |  |
| Dimension (<br>Weight  | ΠXWXD)       |                             |   | 5 x 320 x 400 mm / 4.13 x 12.6 x 15.75 ir  |                     |  |
|  |              |                             | 15 kg / 33.4 lbs                          | 15.4 kg / 33.92 lbs  | 16.5 kg / 36.34 lbs |  |
| Certification  |              |                             | UL, TUV, CE                               | CE   | UL, TUV, CE         |  |

All specifications are subject to change without notice.

PXI Test & Measurement

Manufacturing T Execution System

/ Test &

# Hipot Analyzer



#### **FUNCTIONS**

- Hipot - AC 5kV/100mA
- DC 6kV/25mA Insulation
- 5kVmax
- 1MΩ~50GΩ

#### **KEY FEATURES**

#### 500VA output rating

- Floating output complies with EN50191
- Corona Discharge Detection (CDD, 19055-C)
- Flashover Detection
- Discharge Level Analysis (DLA)
- Open Short Check (OSC)
- High Frequency Contact Check (HFCC)
- Ground Fault Interrupt
- Standard RS-232 & HANDLER interface
- Option GPIB interface
- Key lock when fail
- Programmable voltage & test limit
- Support A190301 8HV Scanning Box

#### **APPLICATIONS**

**Motor** : The 19055 Series Hipot Analyzers with 500VA output rating can be used to test and analyze the withstand voltage of high power and leakage current for the products like motor stators and rotors with high parasitic capacitance. Corona detection can be used for turn-to-turn or turn-to-ground test to avoid winding insulation failure from corona discharge.

**Transformer**: When using a power transformer under the normal voltage, a primary side corona discharge could cause the adjacent components to be damaged if occurred. Thus, the function of Corona Discharge Detection (CDD) of 19055-C can be used to detect if there is any corona discharge occurred to improve the product quality.

**High Voltage Capacitor, Photocoupler & Insulation Material**: If any gaps, voids or impurities appeared when doing molding in the manufacturing process, the insulation capability may be affected. The Corona Discharge Detection (CDD) equipped by 19055-C is able to defect if there is any corona discharge occurred to enhance the product quality.

Chroma 19055 Series Hipot Analyzers are designed for hipot tests and analysis. The tests of AC/DC/IR can be programmed in 5kV/100mA with 500VA output rating which complies with the EN50191 requirements. (Please refer to the application notes for more detail information.)

The 19055-C has not only the AC/DC/IR tests but also a new measurement technology - Corona Discharge Detection (CDD) that can detect the following via the Discharge Level Analysis (DLA).

- Corona discharge Start Voltage (CSV)
- Flashover Start Voltage (FSV)
- BreakDown Voltage (BDV)



As to the Contact Check during Hipot test, Chroma 19055 Series is equipped with a new function of High Frequency Contact Check (HFCC) besides the Open Short Check (OSC). By conducting the Contact Check during Hipot test, it can increase the test reliability and efficiency significantly.

For convenience use, Chroma 19055 has large LCD screen for operation and judgment. In addition, the GFi human protection circuit and Floating safety output prevent the operators from electrical hazard.



Chrona Discharge in motor

Model 19055/19055-C

**ORDERING INFORMATION** 

19055 : Hipot Analyzer (AC/DC/IR) 19055-C : Hipot Analyzer (AC/DC/IR with Corona discharge detection) A190301 : 8HV Scanning Box A190355 : 19" Rack Mounting Kit A190356 : GPIB Interface A190708 : ARC (Flashover) Verification Fixture

| SPECIFICAT                                 | TIONS      |                  |   |
|--|------------|------------------|---|
| Model                                      |            |                  | 19055/19055-C   |
| Mode                                       |            |                  | ACV / DCV / IR  |
| Withstanding Voltage Test                  |            |                  |   |
| Output Volt                                | -          |                  | AC : 0.05 ~ 5KV, DC : 0.05 ~ 6KV  |
| Load Regula                                |            |                  | $\leq$ (1% of setting + 0.1% full range)  |
| Voltage Acc                                |            |                  | $\pm$ (1% of setting + 0.1% full range)   |
| Voltage Res                                | olution    |                  | 2V  |
| Cutoff Curre                               | -          |                  | AC : 100mA ; DC : 25mA  |
| Current Acc                                | uracy      |                  | $\pm$ (1% of reading + 0.5% of range)   |
| Current Res                                |            |                  | AC : 1µA, DC : 0.1µA  |
| Output Free                                | luency     |                  | 50Hz ~ 600Hz  |
| Test/Ramp/                                 | Fall/Dwell | Time             | 0.3 ~ 999 sec., continue / 0.1 ~ 999 sec.,  |
|  |            | Time             | off / 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., off   |
| Waveform                                   |            |                  | Sine wave   |
| Insulation I                               | Resistanc  | e Test           |   |
| Output Volt                                | age        |                  | DC : 0.05 ~ 5kV   |
| Voltage Res                                | olution    |                  | 2V  |
| Voltage Acc                                | uracy      |                  | $\pm$ (1% of reading + 0.1% of full scale)  |
| IR Range                                   |            |                  | 0.1MΩ ~ 50GΩ  |
| Resistance F                               | Resolutior | า                | 0.1ΜΩ   |
|  |            | 1MΩ ~ 1GΩ        | $\pm$ (3% of reading + 0.1% of full scale)  |
|  | >1kV       | 1GΩ ~ 10GΩ       | $\pm$ (7% of reading + 2% of full scale)  |
| <b>.</b>                                   |            | 10GΩ ~ 50GΩ      | $\pm$ (10% of reading + 1% of full scale)   |
| Resistance                                 |            | 1MΩ ~ 1GΩ        | $\pm$ (3% of reading + 0.1% of full scale)  |
| Accuracy                                   | 0.5kV      | 1GΩ ~ 10GΩ       | $\pm$ (7% of reading + 2% of full scale)  |
|  | ~1kV       | 10GΩ ~ 50GΩ      | $\pm$ (10% of reading + 1% of full scale)   |
|  | <500V      | 0.1MΩ ~ 1GΩ      | $\pm$ (3% of reading + (0.2 x 500/Vs)% of full scale)   |
| Flashover D                                | Detection  |                  |   |
| Setting Mod                                | le         |                  | Programmable setting  |
| Detection C                                |            |                  | AC: 20mA;DC: 10mA   |
| Contact Ch                                 | eck Func   | tion             |   |
| HFCC                                       |            |                  | High frequency contact check  |
| OSC (open/s                                | short che  | ck)              | 600Hz, 0.1s   |
|  |            | otection Functio | -   |
| Floating out                               |            |                  | Leakage current <3 mA   |
| Fast Output                                |            | ,                | 0.4ms after NG happen   |
| Ground Fau                                 |            | ot               | $0.5$ mA $\pm 0.25$ mA AC, ON/OFF   |
| Panel Opera                                |            |                  | Present password  |
| Interlock                                  | LUCH LUCK  | ·                | YES   |
|  | ament W    | indow            |   |
| GO/NG Judgment Window<br>Indication, Alarm |            |                  | GO : Short sound, Green LED ; NG : Long sound, Red LED  |
| Memory Storage                             |            |                  | 100 sets, max. 50 steps per set   |
| Interface                                  | Juge       |                  | roo sets, max so steps per set  |
| Interface                                  |            |                  | RS-232, Handler interface (Standard), GPIB interface (Optional  |
| General                                    |            |                  | is 252, handler interface (stalidard), Grib interface (Optional   |
| Operation E                                | nvironm    | nt               | Tomporatura $0^{\circ}$ $\therefore 45^{\circ}$ $\square$ |
|  |            | ent.             | Temperature: $0^{\circ}$ C ~ 45°C, Humidity: 15% to 95% R.H@ $\leq$ 40°C  |
| Power Cons                                 |            |                  | 500VA<br>90~132Vac or 180~264Vac, 47~63Hz   |
| Power Requ                                 |            |                  |   |
| Dimension                                  |            | )                | 130 x 430 x 500 mm / 5.12 x 16.93 x 19.69 inch  |
| Weight                                     |            |                  | Approx. 20kg / 44.09 lbs  |

#### All specifications are subject to change without notice.



## **Hipot Analyzer**

# Model 19056/19057 Series



#### **KEY FEATURES**

- 10kV AC & 20kV DC withstand voltage test
- **0.1**M $\Omega$ ~50G $\Omega$  insulation impedance test
- BDV (BreakDown Voltage test)
- HVCC (High Voltage Contact Check)
- OSC (Open Short Check)
- GFI (Ground Fault Interrupt) human protection circuit
- Fast charge/discharge function
- Programmable output & test limit
- Standard RS232 & HANDLER interface
- Optional GPIB interface
- Key lock function

SPECIFICATIONS



Chroma 19056/19057 Hipot Analyzer is an equipment specially designed for testing and analyzing ultra-high withstand voltage. The series of models include 10kVac/12kVdc/20kVdc with maximum AC20mA/DC10mA output can perform AC/DC withstand voltage and insulation resistance tests with contact check during production line test. In addition to the patented OSC (Open Short Check), High Voltage Contact Check is added to test the components with high insulation capability when high voltage outputs to improve the testing reliability and efficiency.

The Hipot Analyzer provides high withstand voltage analysis for optical couplers, HV relays, HV switches and PV modules, which have better insulation capability.

Charge and discharge are required for capacitive components when doing DC withstand voltage test. The Hipot Analyzers have fast charge function that can increase the production test efficiency.

#### **ORDERING INFORMATION**

19056 : Hipot Analyzer AC10kV 19057 : Hipot Analyzer DC12kV/IR 19057-20 : Hipot Analyzer DC20kV/IR A190316 : Dummy Load A190355 : 19" Rack mounting kit A190356 : GPIB interface A190519 : HV contact check box (HVCC) A190702 : 40kV HV test probe A190708 : ARC verification fixture

| SPECIFICAT          | TIONS             |                 |  |   |  |
|---------------------|-------------------|-----------------|--|---|--|
| Model               |                   |                 | 19056  | 19057   | 19057-20   |
| Mode                |                   |                 | ACV  | DCV / IR  | DCV / IR   |
|                     | ing Voltage       | Test            |  |   |  |
| Output Volt         |                   |                 | AC: 0.1~10kV   | DC: 0.1~12kV  | DC : 0.1 ~ 20kV  |
| Load Regula         | ation             |                 |  | (1% of output + 10V), Rated load  |  |
| Voltage Acc         | curacy            |                 | ± (1% of setting + 0.<br>10V resolu  |   | $\pm$ (1.5% of setting + 0.1% of full scale), 10V resolution |
| Voltage Reg         | gulation          |                 |  | 2V  |  |
| Cutoff Curre        | ent               |                 | 0.01~20mA  | 0.001~10mA  | 0.001~5 mA   |
| Current Acc         | curacy            |                 | $\begin{array}{c} 0.100 \text{mA} \sim 2.999 \text{mA}: \\ \pm (1\% \text{ of reading} + 0.3\% \text{ of full range}) \\ 3.00 \text{mA} \sim 20.00 \text{mA}: \\ \pm (1.5\% \text{ of reading} + 0.3\% \text{ of full range}) \end{array}$ |   | - 0.5% of full range)  |
| Current Res         | olution           |                 |  | AC : 1 μ A, DC : 0.1 μ A  |  |
| Output Free         |                   |                 | 50Hz / 60Hz  |   |  |
| Test/Ramp/          | 'Fall/Dwell Ti    | me              | 0.3 ~ 999 sec., continue /   | 0.1 ~ 999 sec., off / 0.1 ~ 999 sec., of  | ff / 0.1 ~ 999 sec., off                                     |
| Waveform            |                   |                 |  | Sine wave   |  |
| Insulation          | <b>Resistance</b> | lest 🛛          |  |   |  |
| Output Volt         | tage              |                 | -  | DC:0.   | 1 ~ 5kV  |
| Voltage Res         | olution           |                 | -  | 2   | 2V   |
| Voltage Acc         | curacy            |                 | -  | 1% of setting + 0.5% of full scale  | 1.5% of setting + 0.5% of full scale                         |
| IR Range            |                   |                 | -  | <b>0.1M</b> Ω   | ~ <b>50G</b> Ω   |
| Resistance F        | Resolution        |                 | -  | 0.1   | MΩ   |
|                     |                   | 1MΩ ~ 1GΩ       |  | $ \begin{array}{c} \pm \text{ (3\% of reading + 0.5\% of full scale)} \\ \pm \text{ (5\% of reading + 1\% of full scale)} \end{array} $ |  |
| Resistance          | $\geq$ 0.5kV      | 1GΩ ~ 10GΩ      | ]  |   |  |
| Accuracy            |                   | 10GΩ ~ 50GΩ     | -  | $\pm$ (10% of reading + 1% of full scale)   |  |
|                     | <0.5kV            | 1MΩ ~ 1GΩ       | ]  | $\pm$ 5% of reading + (0.5*300/Vs)% of full scale   |  |
| Flashover [         | Detection         |                 |  |   |  |
| Setting Mod         | de                |                 |  | Programmable setting  |  |
| Detection C         | Current           |                 | AC : 20mA  | DC:10mA   | DC : 10mA  |
| <b>Contact Ch</b>   | eck Functio       | n               |  |   |  |
| Contact Che         | eck               |                 | OSC (open/short check)<br>HVCC(High Voltage contact check)   | HVCC(High Voltage contact check)  | HVCC(High Voltage contact check)                             |
| <b>Electrical H</b> | lazard Prote      | ection Function |  |   |  |
| Ground Fau          | It Interrupt      |                 | $0.5$ mA $\pm$ 0.25mA AC, ON/OFF   | -   | -  |
| Key Lock            |                   |                 |  | Yes (password control)  |  |
| Interlock           |                   |                 |  | YES   |  |
| GO/NG Jud           | lgment Win        | dow             |  |   |  |
| Indication, Alarm   |                   |                 | GO : Short sound, Green LED; NG : Long sound, Red LED  |   |  |
| Memory Storage      |                   |                 | 100 sets ,max. 50 steps per set  |   |  |
| Interface           |                   |                 | Standard-RS232, Han  | dler interface ,USB , SCAN ; Optiona  | I - GPIB interface   |
| General             |                   |                 |  |   |  |
| Operation E         | Environment       |                 | Temperature: 0°  | C ~ 45°C ; Humidity: 15% to 95% R.  | H@≦ 40°C   |
| Power Cons          | sumption          |                 |  | 500VA   |  |
| Power Requ          | uirements         |                 | 90   | ~132Vac or 180~264Vac, 47~63Hz  |  |
| Dimension           | (HxWxD)           |                 | 130x4  | 430x500 mm/5.12x16.93x19.69 inch  | l  |
| Weight              |                   |                 |  | 28kg / 61.7 lbs   |  |

General Manufacturing T Purpose Execution System

Jrnkey Test &

# AC/DC/IR Hipot Tester

# Model 19070 Series



#### **KEY FEATURES**

- Compact size Hipot tester
- Three instruments in one: AC Hipot, DC Hipot, Insulation Resistance (19073)
- Open/Short Check (OSC)
- ARC detection (Flashover)
- Provide reliable and stable test results
- Storage of 10 Tests Setups with 60 Steps per setup
- Ground Fault Interrupt (GFI)



Chroma 19070 series are the smallest Hipot Testers currently available in the world. Its super mini size is easy to carry and the large LCD display is suitable for viewing measurement results. These sophisticate Hipot Testers are most applicable to safety test for electronic components.

#### **ORDERING INFORMATION**

19071 : Hipot Tester (AC) 19073 : Hipot Tester (AC/DC/IR) A190344 : HV Gun A190701 : Remote Control Box A190702 : 40kV HV Test Probe A190704 : Start Switch A190706 : 19" Rack Mounting Kit for Model 19070 series A190708 : ARC Verification Fixture



A190701 : Remote Control Box



A190702:40kV HV Test Probe

| SPECIFICAT                  | IONS              |              |  |   |  |
|-----------------------------|-------------------|--------------|--|---|--|
| Model                       |                   |              | 19071  | 19073   |  |
| Mode                        |                   |              | ACV  | ACV/DCV/IR                                    |  |
|                             | ng Voltage        | Test         |  |   |  |
| Output Volt                 | age               |              | AC : 0.05 ~ 5kV  | AC : 0.05 ~ 5kV, DC : 0.05 ~ 6kV              |  |
| Load Regula                 |                   |              |  | $\leq (1\% + 5V)$                             |  |
| Voltage Res                 |                   |              |  | 2 V   |  |
| Voltage Acc                 |                   |              |  | of reading + 5 counts)                        |  |
| Cutoff Curre                |                   |              | AC:0.1mA ~ 20mA  | AC : 0.1mA ~ 20mA, DC : 0.01mA ~ 5mA          |  |
| Current Res                 |                   |              |  | : 1μΑ, DC : 0.1μΑ                             |  |
| Current Acc                 |                   |              | ±(1.0% d   | of reading + 5 counts)                        |  |
| Current Free                | quency            |              |  | 50Hz/ 60Hz                                    |  |
| Test Time                   |                   |              |  | 999 sec, continue                             |  |
| Ramp up Tir                 | ne                |              | 0.1 ~ 999 sec, off<br>Sine wave  |   |  |
| Waveform                    |                   |              |  | Sine wave                                     |  |
|                             | Resistance T      | est          |  |   |  |
| Output Volt                 | <u> </u>          |              | -  | DC:50~1000V                                   |  |
| Voltage Res                 |                   |              | -  | 2V  |  |
| Voltage Acc                 | uracy             | 4440 4000440 | -  | $\pm$ (5% of reading + 5 counts)              |  |
|                             | > = = = > /       | 1ΜΩ~1000ΜΩ   |  | $\pm$ (4% of reading + 5 counts)              |  |
| Resistance                  | ≧ 500V            | 1GΩ~10GΩ     | -  | $\pm$ (7% of reading + 5 counts)              |  |
| Accuracy                    |                   | 10GΩ~50GΩ    |  | $\pm$ (12% of reading + 5 counts)             |  |
|                             | < 500V            | 0.1MΩ~1000MΩ |  | $\pm$ (7% of reading + 5 counts)              |  |
| ARC Detect                  |                   |              |  |   |  |
| Setting Mod                 |                   |              | 5  | rammable setting                              |  |
| Detection C                 |                   |              | AC : 1mA ~ 20mA, DC : 1mA ~ 5mA  |   |  |
|                             | tection Fund      | ction        |  |   |  |
| Fast Output                 |                   |              |  | .4mS, after NG happen                         |  |
| Fast Dischar                | 5                 |              | Approx. 0.2S, Typical 0.5mA ± 0.25mAac (ON), OFF   |   |  |
| Ground Fau                  | <b>!</b>          |              | $0.5\text{mA} \pm 0.25\text{mAac (ON), OFF}$ $0.1\Omega \sim 5.0\Omega \pm 0.2\Omega, \text{ GC MODE}$ |   |  |
| Continuity (<br>Panel Opera |                   |              | 0.122 ~ 5.0  | Yes   |  |
| · · ·                       | gment Wind        | low          |  | ies   |  |
| Indication,                 | -                 | JOW          | GO: Short  | sound; NG: Long sound                         |  |
| Data Hold                   | dianin            |              | Least tests data memories  |   |  |
| Step Hold                   |                   |              |  | inal trigger ON / OFF                         |  |
| Memory Storage              |                   |              | 10 tests setups with 60 steps pre setup  |   |  |
| General                     |                   |              |  |   |  |
| Operation Environment       |                   |              | Temperature: 0°C   | ~ 40 °C, Humidity: $\leq$ 80 % RH             |  |
| <u> </u>                    | Power Consumption |              | •  | N, With rated load : $\leq 300 \text{ W}$     |  |
| Power Requ                  |                   |              |  | / / 220V / 240V, 50 / 60 Hz                   |  |
| Dimension                   |                   |              | 105 x 270 x350 mm / 4.13 x 10.74 x 13.78 inch  | 105 x 270 x350 mm / 4.13 x 10.63 x 13.78 inch |  |
| Weight                      |                   |              | 1  | 1 kg / 24.23 lbs                              |  |
| Certification               | 1                 |              |  | UL, TUV, CE                                   |  |
|                             |                   |              |  |   |  |

# **Impulsing Winding Tester**

# Model 19301A



#### **KEY FEATURES**

- 10V~1000V impulse voltage test, with 0.25V test resolution
- High impulse test sampling rate (200MHz), 10bits
- <35mS high speed mode (P1.0)</p>
- Inductance contact check function
- Inductance differential voltage compensation function
- Apply to High/low inductance test (0.1uH~100uH)
- Breakdown voltage analysis function
- Low voltage range to increase the sensibility of waveform analysis (32V/64V/128V/256V/ 512V/1024V)
- Traditional Chinese/Simplified Chinese/ English user interface
- USB port for storing waveform & screen capture
- Graphical color display
- Standard LAN, USB and RS232 interfaces

The Chroma 19301A Impulse Winding Tester applied with high/low inductance test technology has 1000V impulse voltage and 200MHz high speed sampling rate that can satisfy most of the power inductors test requirements for wide range of inductance products from 0.1uH to 100uH. The built-in Area Size Comparison, Differential Area Comparison, FLUTTER value, LAPLACIAN value,  $\Delta$ Peak ratio , and Resonant Area functions are able to inspect the coils for poor insulation effectively.

The inspection of winding components includes electrical characteristics and safety withstand voltage tests. Commonly poor insulation of coils is the root for causing layer short and output pin short-circuited during usage. The reason could result from bad initial design, poor molding process or deterioration of insulating materials; therefore, adding the coil layer short test to winding components has its necessity.

The Chroma 19301A is an equipment specifically designed for testing winding components utilizing a high voltage charged micro capacitor (low test energy) and coil under test to form an RLC parallel resonant. Analyzing the oscillation decayed waveform via a high speed and sophisticated sampling process technique can successfully detect the coils with poor insulation, also provide withstand voltage tests on winding quality and cores for power inductor components.

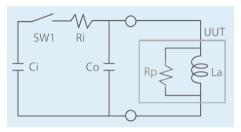


All specifications are subject to change without notice.

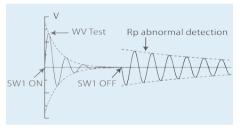


#### Δ Peak Ratio

The  $\Delta$  Peak Ratio detection, which can detect the abnormal value of resistance (Rp) of the test object, is Chroma's characteristic testing technique. There might have a small damage inside the inductor before any tests. This inductor might be able to pass the withstand voltage test (Hi-pot test), but it will fail the LS/Q or Rp test easily by using LCR meter. While the SW1 is on, the instrument is doing the withstand voltage test (WV Test). After the SW1 is off, the instrument is using the  $\Delta$  Peak Ratio detection to detect the item with abnormal Rp value, which can be detected by observing the damping decay rate.



**Rp Schematic Diagram** 

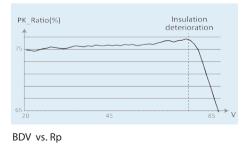


Δ Peak Ratio Waveform

#### Breakdown Voltage (B.D.V)

The Breakdown Voltage test function of Chroma 19301A uses the voltage slew rate to detect if the Area Size and Laplacian are over the set value and test the coil withstand voltage by setting the start/end voltage and the slew rate. The R&D engineers can perform the product analysis and research to improve the weakness spot of coil via this function.

The breakdown voltage test has added the  $\Delta$ Peak Ratio detection and automatic data output functions. Chroma 19301A is able to recode all the test results in its temporary memory during the test, and save those results into USB flash drive after the test. User can analyze the insulation deterioration issue by creating a chart of voltage versus Rp in Excel file from those test results.



#### **Contact Check (Patent)**

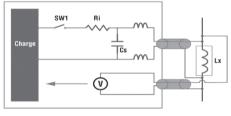
To avoid poor contact or open circuit that made the fixture probe to flash due to maximum internal voltage output and cause the DUT to be damaged, the Chroma 19301A will perform Contact Check before testing to prolong the probe's life.

#### High/Low Inductance Products Testing

Besides the low inductance products testing technology, the Chroma 19301A also covers the testing for high inductance products from 0.1uH  $\sim$  100uH. The internal inductance detection function is a very convenient operation that enables the user to learn the amount of DUT inductance, switch to proper range for testing and perform comparison under a proper waveform. A single layer short tester combined with the high/ low inductance product testing application not only shortens the time for equipment change when switching the product line but also reduces the factory facility expense.

#### **4-Wire Test**

Since the voltage detection of common 2-wire layer short test device is inside the current loop, the measured voltage is quite different from the DUT for low inductance measurement. The Chroma 19301A uses dual coaxial 4-wire detection to significantly improve the voltage accuracy for correct test results.



#### **Product Application**

#### **High Speed Automatic Testing Application**

The low inductance applied to smart phone or tablet PC tended to be slim and light on the appearance. Since fully automatic testing and packing devices are adopted for inductance production, high speed tester equipment is required to satisfy the high speed production. To fulfill this test application, the Chroma 19301A is equipped with high speed and dual coaxial 4-wire test functions that can reduce the impact of wiring length and work with the layer test automation machine to bring greater efficiency to customers.

#### **SMD Power Choke Test Fixture**

The size of low inductance Power Choke is quite small and to facilitate the testing of layer short, Chroma has developed an SMD Power Choke 4-side test fixture (patent) that can work with the 19301A inductance difference voltage compensation to assist the product developer or QA staff in improving the test efficiency.



Semiconductor/

PXI Test &

General



Flat Panel

# Impulsing Winding Tester

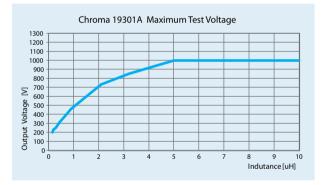
# Model 19301A

| SPECIFICATIONS                        | SPECIFICATIONS  |  |  |  |  |
|---------------------------------------|---|--|--|--|--|
| Model                                 | 19301A  |  |  |  |  |
| Channel                               | 1ch   |  |  |  |  |
| Applied Voltage(Vpeak), Step          | 10V~1000V, 1V (Note1,2)   |  |  |  |  |
| Test Inductance Range                 | 0.1uH~100uH   |  |  |  |  |
| Voltage Accuracy                      | $\pm$ [1 % of setting x (1 + 0.5 uH/Lx) + 2% of range]  |  |  |  |  |
| Sampling Speed                        | 10bit / 5ns (200MHz)  |  |  |  |  |
| Sampling Range                        | 8 Range : 0, 1, 2, 3, 4, 5, 6, 7  |  |  |  |  |
| Pulse Number                          | Pulse Number: 1~32, Dummy Pulse Number: 0~9   |  |  |  |  |
| Screen Display Resolution             | 640× 480 Dots (VGA)   |  |  |  |  |
| Waveform Display Range                | Colors Display 512×256 Dots   |  |  |  |  |
| Detection Mode                        | Area / Differential Area ; Flutter Value / Laplacian Value / ΔPeak ratio / Resonant Area                      |  |  |  |  |
| Test Time                             | Pulse 1.0 : <35mS ;<br>+20~70mS/pulse (charge interval time 20mS~70mS programmable) ;<br>+45mS when screen on |  |  |  |  |
| Electrical Hazard Protection Function |   |  |  |  |  |
| Key Lock                              | Yes (password control)  |  |  |  |  |
| Interlock                             | Yes   |  |  |  |  |
| Indication, Alarm                     | GO : Short sound, Green LED; NG : Long sound, Red LED   |  |  |  |  |
| Interface                             | RS232, Handler ,USB , LAN interface   |  |  |  |  |
| General                               |   |  |  |  |  |
| Operation Environment                 | Temperature: $0^{\circ}$ C ~ 45 $^{\circ}$ C, Humidity: 15% to 95% R.H@ $\leq$ 40 $^{\circ}$ C                |  |  |  |  |
| Power Consumption                     | No Load: <150VA ; Rated Load: <1000VA   |  |  |  |  |
| Power Requirements                    | 100~240Vac, 50 / 60Hz   |  |  |  |  |
| Dimension (W $\times$ H $\times$ D)   | 177 x 428 x 500mm / 16.85 x 6.97 x 19.69 inch   |  |  |  |  |
| Weight                                | 26kg / 57.32 lbs  |  |  |  |  |

#### Notes

\* Suggest to use Chroma's standard test wire, overlong test wire would influence maximum output voltage.

\* The maximum test voltage of using standard 1m test wire is as below:



#### **ORDERING INFORMATION**

19301A : Impulsing Winding Tester A193001 : SMD Choke Test Fixture A193002 : 1m Test Wire + Test Clip A193003 : 1m Test Wire + Flat Head Cutting A193004 : 1m Test Cable BNC to BNC (including BNC Male Connector x 2)

# **Impulsing Winding Tester**

# Model 19305 Series



#### 特點

- High impulse test sampling rate (200MHz),10bits
- 6kV impulse voltage test
- Breakdown voltage analysis function
- High speed test
- 10 channels output (19305-10)
- Support max. 40channels scanning test
   Traditional Chinese/Simplified Chinese/
- English user interface USB port for storing waveform & screen
- capture
- Graphical color display
- Standard LAN, USB and RS232 interfaces

The Chroma 19305 series Impulse Winding Tester included with one channel(19305) and 10 channels output (19305-10), the 19305 series has 6kV impulse voltage and 200MHz high speed sampling rate to improve sensitivity of discharge detection. To test more than 10uH, the built-in Area Size Comparison, Differential Area Comparison, FLUTTER value, LAPLACIAN value, and  $\Delta$ Peak ratio functions are able to inspect the coils for poor coil insulation.

The inspection of winding components includes electrical characteristics and safety withstand voltage tests. Commonly poor insulation of coils is the root for causing layer short and output pin short-circuited during usage. The reason could result from bad initial design, poor process or deterioration of insulating materials; therefore, adding the coil layer short test to winding components has its necessity.

The impulse winding test is to impose a non-destructive, high speed and low energy voltage impulse on the DUT (Device Under Test) to analyze/compare the equivalent waveform



Model 19305-10



of yield and defect products for good and no good judgment. The main function of impulse winding test is to discover the potential defects such as layer short, corona or partial discharge that is difficult to find in wound components in early phase.

The Chroma 19305 series is an equipment specifically designed for testing winding components utilizing a high voltage charged micro capacitor (low test energy) and coil under test to form an RLC parallel resonant. Analyzing the oscillation decayed waveform via a high speed and sophisticated sampling process technique can successfully detect the coils with poor insulation. Analyzer can perform impulse tests on wound components like motors, transformers wound products. Not only reliable quality but also efficient product control would be obtained when implementing it to quality verification by wound component test.

The Chroma 19305-10 can providing maximum 10 channels output for multichannel scanning tests to save time and labor costs in the manufacturers.

### Five kinds of waveform judgement for testing Area Size

- Differential Area
- Flutter Value
- Laplacian Value
- ΔPeak ratio

#### **Product Application**

Transformer, Motor, Generator, Ignition Coil, Relay, Solenoid Valve, Inductance and other coils.

#### **ORDERING INFORMATION**

19305 : Impulse Winding Tester 19305-10 : Impulse Winding Tester (10ch) A190359 : 16ch HV External Scanning Box



#### A190359: 16ch HV External Scanning Box

| SPECIFICATIONS                   |   |                                |  |
|----------------------------------|---|--------------------------------|--|
| Model                            | 19305   | 19305-10                       |  |
| Channel                          | 1ch 10ch  |                                |  |
| Applied Voltage,                 | 100V ~ 6000V  |                                |  |
| Step, and Energy                 |   | Step                           |  |
| Inductance Test Range            | More th   | an 10uH                        |  |
| Sampling Speed                   | 10bit / 5ns   | ; (200MHz)                     |  |
| Sampling Range                   | 11 Range : 1, 2, 3, 4   | l, 5, 6, 7, 8, 9, 10, 11       |  |
| Pulse Number                     | i dibe i tan  | nber: 1~32                     |  |
|                                  |   | Number: 0~9                    |  |
| Detection Mode                   | Area / Differential Area ;<br>Flutter Value / Laplacian Value / ΔPeak ratio |                                |  |
| <b>Electrical Hazard Protect</b> | ion   |                                |  |
| Key Lock                         | Yes (password control)  |                                |  |
| Interlock                        | Yes   |                                |  |
| Indication, Alarm                | GO : Short sound, Green LED ; NG : Long sound, Red LED                      |                                |  |
| Interface                        |   |                                |  |
|                                  | RS232 ,USB ,  | LAN interface                  |  |
| General                          |   |                                |  |
| Operation Environment            |   | : 0°C ~ 45°C<br>95% R.H@≦ 40°C |  |
| Power Consumption                | No Load : <150W<br>Rated Load: <100W  |                                |  |
| Power Requirements               | 100~240Va   | c, 50 / 60Hz                   |  |
| Dimension (H xW xD)              | 177 x 428 x 500 / 16.   | 85 x 6.97 x 19.69 inch         |  |
| Weight                           | 26kg / 57.32 lbs  |                                |  |

PXITest & General Manufacturing easurement Purpose Execution System

Flat Panel

Optical

Electronics

## **Electrical Safety Test Scanner**

# Model 19200



#### **KEY FEATURES**

- Support Electrical Safety Test Scanning
- Support High / Low voltage circuit insulation (Switch module)
- Support 8 slots for plug-in (removable)
- Max. 9 slaves for multiple scanners (master/slave interface)
- Standard RS-232 and USB interface
- Optional GPIB interface
- CE Mark
- 19200 can be installed in Chroma Electrical Equipment ATS model 8900

In recent years, International Electrotechnical Commission (IEC) in order to make consumers safer while using the electrical products, join more requirements to test in the standard. It makes electric to fit requirements by all tests be performed which are very complicated and different. The problem not only the course is complicated and apt to make mistakes, but also the manpower costs more.

Chroma 19200 can perform high / low voltage switch and scan all safety tests by EST Analyzer (Chroma 19032) inputs such as withstanding test; Some modules support 20A for Leakage Current test and Function Test; GB & GBF modules support 40A and Ground Floating.

Chroma 19200 can be installed in Chroma 8900 electrical equipment ATS for DUT which needs a lot of procedures to test like medical equipment, medical power, UPS, motor, etc., ATS can save the manpower cost, reduce the mistake, data management to improve quality and efficiency.



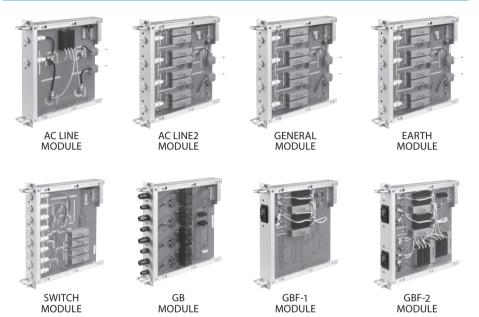
#### Removable and Master/Slave design

Because different products have different requirements and test procedures, Chroma 19200 offers different scanning modules for combinations. These modules are: AC LINE module, GENERAL module, AC LINE2 module. EARTH module, GB&GBF module and SWITCH module. Due to different modules have different functions, users are able to combine different modules for your needs.

#### High / Low voltage circuit insulation

Most of products have to perform Electrical Safety Test (high voltage) and Function Test (low voltage). Chroma 19200 supports high and low voltage isolation by SWITCH module. User can combine high and low voltage tests like LCR measurement, power performance and function test for one sequence in one station and data collecting. That improves test efficiency and reduces occurred test risk.

#### **MODULE DESCRIPTION**



| SPECIFICATION (MASTER & SL      |   |  |  |  |
|---------------------------------|---|--|--|--|
| Model                           | 19200   |  |  |  |
| Mode                            | SCAN  |  |  |  |
|                                 |   |  |  |  |
| Withstanding Voltage Test Sca   | n   |  |  |  |
| Max. Voltage                    | AC:5kV, DC:6kV  |  |  |  |
| Insulation Resistance Test Scan |   |  |  |  |
| Max. Voltage                    | DC : 5kV  |  |  |  |
| Ground Bond Test Scan           |   |  |  |  |
| Max. Current                    | 40A   |  |  |  |
| Leakage Current Test Scan       |   |  |  |  |
| Max. Voltage                    | AC 300V   |  |  |  |
| Max. Current                    | 20A   |  |  |  |
| Interface                       | RS-232 , USB (Standard), GPIB (Optional)  |  |  |  |
| General                         |   |  |  |  |
| Operation Environment           | Temperature: $0^{\circ}$ C ~ 45 $^{\circ}$ C ; Humidity: 15% to 95% R.H@ $\leq$ 40 $^{\circ}$ C |  |  |  |
| Power Consumption               | 500VA   |  |  |  |
| Power Requirements              | 90~132Vac or 180~264Vac, 47~63Hz  |  |  |  |
| Dimension (H x W x D)           | 310.8 x 438 x 495 mm / 12.24 x 17.24 x 19.49 inch   |  |  |  |
| Weight                          | 35 kg / 77.09 lbs   |  |  |  |
| Certification                   | CE  |  |  |  |

# **Electrical Safety Test Scanner**

# Model 19200

| MODULE SPECIFICATIO | <b>N</b>          |                |                |                |                |                                     |                        |                        |                |
|---------------------|-------------------|----------------|----------------|----------------|----------------|-------------------------------------|------------------------|------------------------|----------------|
| Module Name         |                   | AC LINE        | GENERAL        | AC LINE2       | EARTH          | GB                                  | GBF-1                  | GBF-2                  | SWITCH         |
| Port No.            |                   | 2              | 4              | 4              | 4              | 4                                   | 2                      | 4                      | 8              |
| HIGH/LOW switch     |                   | •              | •              | •              | •              | •                                   |                        |                        |                |
| Max. Voltage        |                   | 5KVac<br>6KVdc | 5KVac<br>6KVdc | 5KVac<br>6KVdc | 5KVac<br>6KVdc | 15V peak                            | 5KVac<br>6KVdc         | 5KVac<br>6KVdc         | 5KVac<br>6KVdc |
| Max. current        |                   | 20A            | 100mA          | 100mA          | 100mA          | 40A                                 | 40A                    | 40A                    | 100mA          |
| Test Item           | Function Type     |                | ·              |                |                |                                     |                        |                        |                |
|                     | HIGH              | •              | •              | •              |                |                                     |                        |                        |                |
| WVAC/WVDC/IR Test   | LOW               | •              | •              | •              | •              |                                     |                        |                        |                |
| GB Test             | Drive±,<br>Sense± |                |                |                |                | Earthed<br>4 channels<br>set + or - | Floating<br>1 channels | Floating<br>2 channels |                |
|                     | LINE              | •              |                |                |                |                                     |                        |                        |                |
|                     | NEUTRAL           | •              | İ              |                |                |                                     |                        |                        |                |
|                     | SENSE HIGH        |                | •              | •              |                |                                     |                        |                        |                |
| LC Test             | SENSE LOW         |                | •              |                | •              |                                     |                        |                        |                |
|                     | EARTH             |                | •              | •              | •              |                                     |                        |                        |                |
|                     | LINE2             |                |                | •              |                |                                     |                        |                        |                |

Note\*1: GB, GBF-1 and GBF-2 only can be used on frame #0

Note\*2: GBF-1 and GBF-2 have GB floating function

Note\*3: The GENERAL, ACLINE2, EARTH modules have flexible design which can be exchanged flexibly by terminals for different tests

**ORDERING INFORMATION** 

19200 : Electrical Safety Test Scanner (Master) 19200 : Electrical Safety Test Scanner (Slave) A190349 : Universal corded product adapter A190508 : GPIB Interface A192000 : AC LINE module A192002 : AC LINE2 module A192003 : GENERAL module A192004 : EARTH module A192005 : GB module A192006 : GBF-1 module A192007 : GBF-2 module A192008 : SWITCH module A192010 : Power entry adapter of GBF module A192011 : Blank Plate /ideo & Color

Flat Panel Display

Lighting

# **Ground Bond Tester**

# Model 19572



#### **KEY FEATURES**

- Wide resistance measurement range : 0.1 ~ 510 mΩ
- High performance AC current output : 45 A
- Compact size ground bond tester
- Provide reliable and stable test results
- Built-in resistance compensation function
- Standard RS-232 interface
- Optional GPIB Interface
- Compatible with the model 19070 series Hipot Tester



The 19572 are instrument dedicated to measure the grounding resistance within the range of  $0.1\sim510m\,\Omega$ . Its compact and easy to operate feature is most suitable for the grounding test in production line. By supplying high reliability and stability test results with built-in resistance compensate function; it is an economical and useful grounding tester.

#### **ORDERING INFORMATION**

**19572 :** Ground Bond Tester **A190701 :** Remote Control Box **A195702 :** GPIB Interface

| SPECIFICATIONS                   |  |
|----------------------------------|--|
| Model                            | 19572  |
| Mode                             | Ground Bond  |
| <b>Grounding Resistance Test</b> |  |
| Output Current                   | AC : 3 ~ 45A   |
| Resolution                       | 3 ~ 30A, 0.01A / 30.1 ~ 45A, 0.1A  |
| Current Accuracy                 | $\pm$ (1.5% of setting + 0.5% of full scale)   |
| Output Frequency                 | 50Hz / 60Hz  |
| Resistance Range                 | $0.1 \sim 510 \mathrm{m}\Omega$  |
| Resistance Resolution            | (R display counts/ I display counts) $\ge$ 0.2, Resolution: 1m $\Omega$  |
| Resistance Resolution            | (R display counts/ I display counts) < 0.2, Resolution: 0.1m $\Omega$  |
| Resistance Accuracy              | $\pm$ (2% of reading + 0.5% of full scale)   |
|                                  | A predetermined value can be subtracted from the measured value and the result of subtraction can be display             |
| Offset                           | The result of subtraction can be compared with a Good/NO Good judgment reference value, and the result of comparison can |
|                                  | be use for the Good/NO Good judgment   |
| Offset Range                     | 0 ~ 100m Ω   |
| Test Time                        | 0.5 ~ 999 sec., continue   |
| Waveform                         | Sine wave  |
|                                  | A no-good judgment is made when a resistance greater than the high limit value Is detected.                              |
| GO/NG Judgment                   | A no-good judgment is made when the output current is cutout and a no-good Alarm signal is delivered.                    |
|                                  | If no abnormal state is detected during the test time, a good judgment is made and a good signal is deliver.             |
| Limit                            | Hi-Limit : 0.1 ~ 510m $\Omega$ ; Low-Limit : off, 0.1m $\Omega$ ~ Hi-Limit Value, 510m $\Omega$ max.                     |
| General                          |  |
| Operation Environment            | Temperature : $0^{\circ}C \sim 40^{\circ}C$ , Humidity : $\leq 80 \%$ RH   |
| Power Consumption                | No load(Ready state) : < 100 W, With   |
|                                  | rated load : $\leq$ 880W max.  |
| Power Requirement                | 100V / 120V / 220V (AC ± 10%) / 240V (AC -10% ~ +5%), 50 / 60 Hz   |
| Dimension (H x W x D)            | 105 x 320 x 400 mm / 4.13 x 12.60 x 15.75 inch   |
| Weight                           | 16 kg / 35.24 lbs  |
| Certification                    | UL, CE   |

# **Hipot Calibrator**

# Model 9102

| Color              | Video &           |
|--------------------|-------------------|
| Display            | Flat Panel        |
| Liahtina           | LED/              |
| Devices            | Optical           |
| & Automation       | Photovoltaic Test |
| Optical Inspection | Automated         |
|                    |                   |

Turnkey Test & Automation

| Continue     |       | G MIL Net Callense and |          | -           |           |
|--------------|-------|------------------------|----------|-------------|-----------|
|              |       | WAC                    | RMS      |             |           |
| $\mathbf{O}$ |       | 0.10uH                 | LIU.UMAJ |             |           |
|              | āċ    |                        |          | őő          | 0         |
|              | ÓÖ Ör |                        |          | 100 100 100 | (A. " (A. |

#### **KEY FEATURES**

- Adequate for versatile testers
- Precise designed standard calibration kit
- Stable & accurate calibration equipment
- Standard GPIB Interface and RS-232 Interface

The 9102 Hipot Calibrators is specially designed standard devices for instrument calibration lab. The 9102 can simulate multiple loads and apply to various Hipot testers. These calibration equipment can save manufacturers a great deal of regular calibration fee.

#### **ORDERING INFORMATION**

9102 : Hipot Calibrator

| GPIB RS-232 <b>(E</b>           |  |                          |
|---------------------------------|--|--------------------------|
|                                 |  |                          |
| SPECIFICATIONS<br>Model         | 910  | <u></u>                  |
| Withstanding Voltage Test       | 910  | 12                       |
| Voltage Meter                   |  |                          |
| Range                           | AC : 2kV / 6kV, D                            |                          |
| Accuracy                        | AC : 0.3 % + 6 counts, I                     |                          |
| Resolution                      | AC . 0.5 % + 0 counts, 1<br>0.1V/            |                          |
| Current Meter                   | 0.107  |                          |
| Range                           | 200 µ A / 2mA / 2                            | $20m\Lambda/200m\Lambda$ |
| Accuracy                        | AC : 0.3% + 6counts, I                       |                          |
| Resolution                      | 10 nA/ 100nA/                                | -                        |
| Resolution                      | 36mA: 33.3kΩ, 100W                           | 1 1                      |
| Dummy Load (1.2kV max.)         | 12mA : 100kΩ , 30W ;                         |                          |
|                                 | 2.4mA : 500kΩ, 7W ;                          | ,                        |
| Grounding Resistance Test       | 2.1111.1.500(32),711,7                       |                          |
| Voltage Meter                   |  |                          |
| Range                           | AC : 6V (0.050                               | V ~ 6.000V)              |
| Accuracy                        | AC : 0.3% + 6 counts                         |                          |
| Resolution                      | 1 m  | V                        |
| Current Meter                   |  |                          |
| Range                           | AC : 45A (0.500                              | A ~ 45.000A)             |
| Accuracy                        | AC : 0.3% +                                  | 6 counts                 |
| Resolution                      | 10 m   | A                        |
| Dummy Load                      | 45A Max. : 100                               | ) m Ω , 250W             |
| Insulation Resistance Test      |  |                          |
|                                 | Value  | Accuracy                 |
|                                 | 1000 M Ω                                     | 2%                       |
| Standard Resistance(1.2kV max.) | <b>90.9 M</b> Ω                              | 1%                       |
|                                 | <b>9.9 M</b> Ω                               | 1%                       |
| General                         |  |                          |
| Operation Environment           | Temperature: 0°C ~ 40°C                      | , Humidity : ≦ 80% RH    |
| Power Requirement               | 100V / 120V / 220V                           | / 240V, 50 / 60 Hz       |
| Dimension (H X W X D)           | 89 x 430 x 400 mm / 3.5 x 16.93 x 15.75 inch |                          |
| Weight                          | 8 kg / 17.62 lbs                             |                          |
|                                 |  |                          |

## **Electrical Equipment ATS**

# Model 8900



#### **FUNCTIONS**

Support electrical safety test and function test scanning :

- AC/DC WV Test
- IR Test
- GB Test
- LC Test (all types)
- Function test
- Expandable Measurement function
  - LCR Meter
  - AC/DC Source
  - DC Load
  - Power Analyzer
  - Timing/Noise Analyzer
  - DMM
  - Oscilloscope
  - Other with GPIB or RS-232 device

#### **KEY FEATURES**

- Open architecture software
- Expandable hardware
- Editable test library
- Editable test programs
- Editable and Test Item
- Editable reports
- Statistic report
- User authority control
- Activity log
- Support Barcode reader

#### **APPLICATIONS**

- House Appliance
- SMPS/Charger/UPS
- Motor Function Test
- Large EL Capacitor
- PCB
- Medical Device
- Line Transformer



Because the requirement in standard of the electric product increase day by day,, the testing cost then increasing. In order to help the manufacturer Reduce testing cost and products risk effectively, Chroma provide 8900 electrical equipment auto test system (ATS) be the best solution by program the test of the complicated procedure like the medical equipment safety and function test and instrument safety and function test.

8900 electrical equipment ATS can completion that amount measurement and test procedure in once automatically. This strong function not only can be report formatted simply, but reduce the careless mistake of the artificial writing and improper test. Chroma 8900 electrical equipment ATS is suitable for all electrical equipment test solution within Electrical Safety Test.

Chroma 8900 electrical equipment ATS solve the Electrical Safety Test and special FUNCTION test solution. The system can combine different testers in the system accordding with different test request what your need. The software is all open architecture structure which can offer the corresponding program and the most flexible test item in accordance with special test procedure to the customer for special products.

The all open architecture software of 8900 systems includes the strong report editor and generator, statistical analysis and functions of management. Management of various types of different test reports and operation that these functions make the system have the ability to control quality and reduce risk. These statistical analysis and report function are indispensable for quality control and product line testing in a modern electrical manufacturer.

**Electrical Equipment ATS** 

Refer to Model 19032-P

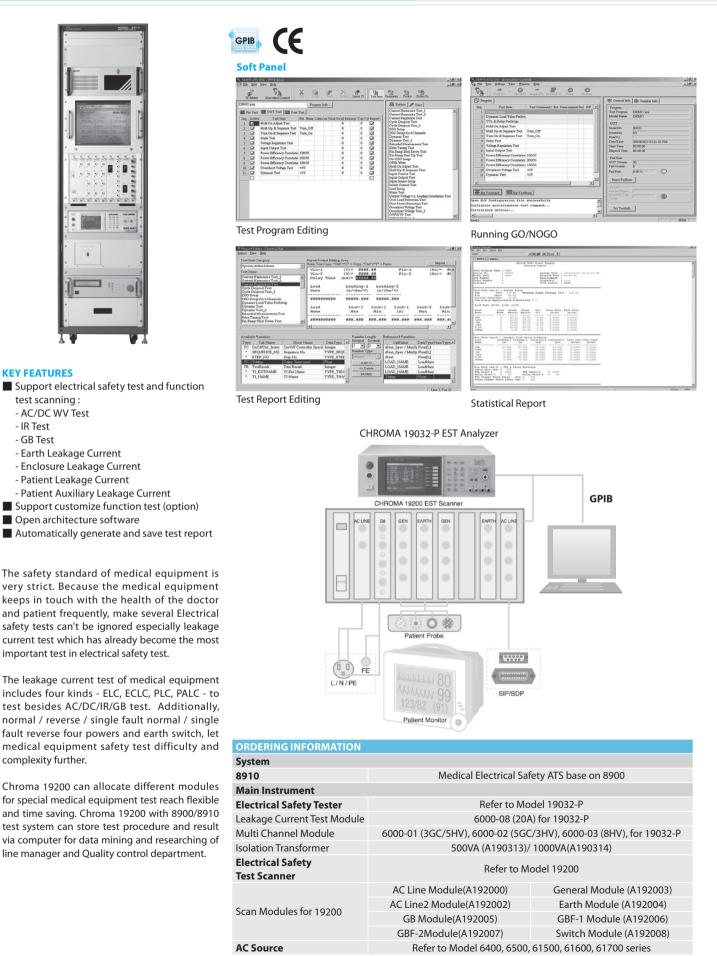
| System                      |         |
|-----------------------------|---------|
| 8900                        |         |
| Instrument                  |         |
| Electrical Safety Analyzer  |         |
| Leakage Current Test Module | 6000-05 |

ORDERING INFORMATION

| Leakage Current Test Module    | 6000-05(10A) and 6000-08(20A) for 19032-P                        |                          |  |
|--------------------------------|--|--------------------------|--|
| Multi Channel Module           | 6000-01 (3GC/5HV), 6000-02 (5GC/3HV), 6000-03 (8HV), for 19032-P |                          |  |
| Isolation Transformer          | 500VA (A190313)/ 1000VA(A190314)                                 |                          |  |
| Electrical Safety Test Scanner | Refer to Model 19200   |                          |  |
|                                | AC Line Module(A192000)  | General Module (A192003) |  |
| Scan Modules for 19200         | AC Line2 Module(A192002)   | Earth Module (A192004)   |  |
| Scari Modules for 19200        | GB Module(A192005)   | GBF-1 Module (A192006)   |  |
|                                | GBF-2Module(A192007)   | Switch Module (A192008)  |  |
| LCR Meter                      | Refer to Model 11022, 11025                                      |                          |  |
| AC Source                      | Refer to Model 6500, 61500, 61600, 61700 series                  |                          |  |
| DC Source                      | Refer to Model 62000P Series                                     |                          |  |
| Power Analyzer                 | Refer to Model 6633 series                                       |                          |  |
| Power Meter                    | Refer to Model 66200 series                                      |                          |  |
| DC Load                        | Refer to Model 6310A   | , 63200, 6330A series    |  |
| Timing/Noise Analyzer          | 6011/  | 80611                    |  |
| Timing/Noise module            | 6011N/   | 80611N                   |  |
| Cable and Accessory            |  |                          |  |
| A600009                        | GPIB Cable   | e (200 cm)               |  |
| A600010                        | GPIB Cab   | le (60cm)                |  |
| A800005                        | PCI BUS GPIB Card (National Instrument)                          |                          |  |

# Medical Electrical Safety ATS

# Model 8910



Optical

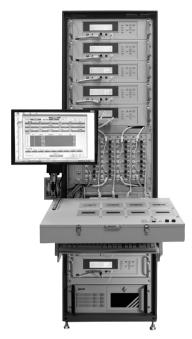
Electronics

Test &

PXI Test &

Manufacturing

# High Capacitance Electrolytic Capacitor ATS Model 1911

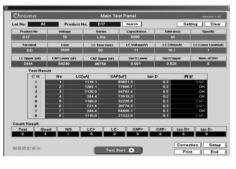


#### **KEY FEATURES**

- Test parameter LC/C/D/Z/ESR
- Test 8 electrolytic capacitors
- Constant current for test leakage current
- Special test clip fix DUT
- Testing specification from program management
- Test report auto generate
- Statistic analysis
- Software interface easy to operate

The system is a aluminum electrolytic capacitor with high capacitance designed for measuring LC and C/D/Z/ESR. It provides the best test solution to high capacity electrolytic capacitor with data record function. The general users spend longer time to wait LC test in testing high capacitance electrolytic capacitor. The system can install 8 electrolytic capacitors maximum at a time to enhance 8 times of productivity. It will sound an alarm after the test is completed. The operating personnel process other operations to increase the time efficiency in testing.

The screen consists of DUT model number and lot number information. The software will automatically bring out DUT test specifications which includes LC test voltage, Dwell time, current limit and C/D/Z/ESR value. Count Pass/Fail ratio at the lowermost of main program for analysis convenience of production line engineer.







#### **ORDERING INFORMATION**

1911 : High Capacitance Electrolytic Capacitor ATS

#### SPECIFICATIONS

| Accurate and | highly re | liable hai | rdware | devices : |  |
|--------------|-----------|------------|--------|-----------|--|
|--------------|-----------|------------|--------|-----------|--|

| Capacitor Leakage Current/ IR Meter |        |   |  |
|-------------------------------------|--------|---|--|
| Model                               |        | 11200 (650V)  |  |
| Main Function                       |        | Capacitor Leakage Current / IR Meter                            |  |
| Test Parameter                      |        | LC, IR  |  |
| <b>Test Signals Information</b>     | n      |   |  |
| Voltage                             |        | 1.0 V~100 V, step 0.1 V; 101V~650 V, step 1V;<br>±(0.5% + 0.2V) |  |
|                                     |        | V ≤ 100V: 0.5mA~500mA   |  |
| Charge Current Limit                |        | V > 100V: 0.5mA~150mA, 97.5W max.                               |  |
|                                     |        | step 0.5mA; ±( 3% + 0.05mA)                                     |  |
| Measurement Display Rar             | nge    | LC : 0.001 $\mu$ A~20.00mA                                      |  |
| Basic Measurement Accur             | acy *1 | LC Reading : $\pm$ (0.3% + 0.005 $\mu$ A)                       |  |
| Measurement speed                   | Fast   | 77 ms   |  |
| (Ext. Trigger, Hold Range,          | Medium | 143 ms  |  |
| Line Frequency 60Hz)                | Slow   | 420 ms  |  |
| Function                            |        |   |  |
| Correction                          |        | Null zeroing  |  |
| Test Voltage Monitor                |        | Vm: 0.0 V~660.0V;   |  |
| Test Voltage Monitor                |        | $\pm$ (0.2% of reading + 0.1V)                                  |  |
| Charge Timer                        |        | 0~999 Sec.  |  |
| Dwell Timer                         |        | 0.2~999 Sec   |  |
| Scanner                             |        |   |  |

| ell Timer    | 0.2~999 Sec               |
|--------------|---------------------------|
|              |                           |
| nner         |                           |
| lel          | 19200                     |
| th Module *1 |                           |
| nnels        | 8ports, 4HV relays        |
| tion Voltage | max up to DC 6KV / AC 5KV |
| Current      | 40A                       |
| Module *2    |                           |
| nnels        | 4 Channels Driver & Sense |
| Current      | 40A                       |

| LCR Meter                  |                                     |  |  |  |
|----------------------------|-------------------------------------|--|--|--|
| Model                      | 11022                               |  |  |  |
| Test Parameter             | L,C, R, Ζ , Q, D, ESR, X, θ         |  |  |  |
| Test Signals               |                                     |  |  |  |
| Level                      | 10 mV~1V, step 10 mV; ±(10% + 3 mV) |  |  |  |
|                            | 50Hz, 60Hz, 100Hz, 120Hz,           |  |  |  |
| Frequency                  | 1kHz, 10kHz, 20kHz, 40kHz,          |  |  |  |
|                            | 50kHz, 100kHz ; $\pm$ 0.01%         |  |  |  |
| <b>Measurement Display</b> | Range                               |  |  |  |
| C (Capacitance)            | 0.001pF~1.9999F                     |  |  |  |
| L, M, L2 (Inductance)      | 0.001 <i>µ</i> H∼99.99kH            |  |  |  |
| Z (Impedance), ESR         | 0.01m~99.99MΩ                       |  |  |  |
| Q (Quality Factor)         | 0.0001 .0000                        |  |  |  |
| D (Distortion Factor)      | 0.0001~9999                         |  |  |  |
| $\theta$ (Phase Angle)     | -180.00°~ +180.00°                  |  |  |  |

**Note\*1 :** Swith module for leakage current measure **Note\*2 :** GB module for C/D/Z/ESR measure

Mod Switt Chan Isolat Max Chan Max

#### FIXTURES AND ACCESSORIES /ideo & 19056 19055 19071 19053 Description 19020 19032 19032-P 19035 19036 19052 19057 19305-10 No. 19572 19054 19073 19057-20 Flat Panel Display \* A190301 8HV Scanning box (5KV max) (9030A) \* A190313 500VA Isolation Transformer \* A190314 1000VA Isolation Transformer • \* A190316 Dummy Load (3KV/25A) • • • • A190321 GPIB Interface \* A190334 Ground Bond 40A \* A190336 8HV/8GB Scanning Box (9030AG) \* A190337 Ground Bond 60A A190338 19001 EST Software • A190343 19" Rack Mounting Kit for 19032 \* A190344 10kV HV Gun Automation A190346 RS-232 Cable for Impulse Winding Tester Connection A190347 GPIB & Handler Interface A190348 RS-232 Interface for 19035 • \* A190349 Universal Corded Product Adapter \* A190351 8ch-16ch HV box for 19035 A190355 19" Rack Mounting Kit A190356 GPIB Interface for 19032-P • Inspection A190359 16 channel HV External Scanning Box (H, L, X) \* A190362 16 channel 4 wire HV External Scanning Box (H, L, X) A190506 RS422 Interface A190508 GPIB Interface • • \* A190512 Auto Transformer Scan Box (3002B) A190517 19" Rack Mounting Kit \* A190701 Remote Control Box \* A190702 40KV HV Probe • \* A190704 Start Switch A190706 19" Rack Mounting Kit \* A190708 ARC Verification Fixture

## **Options of Electrical Safety Test Instruments**

(\*) see pictures below



/ Test &

# Semiconductor/IC Test Solution

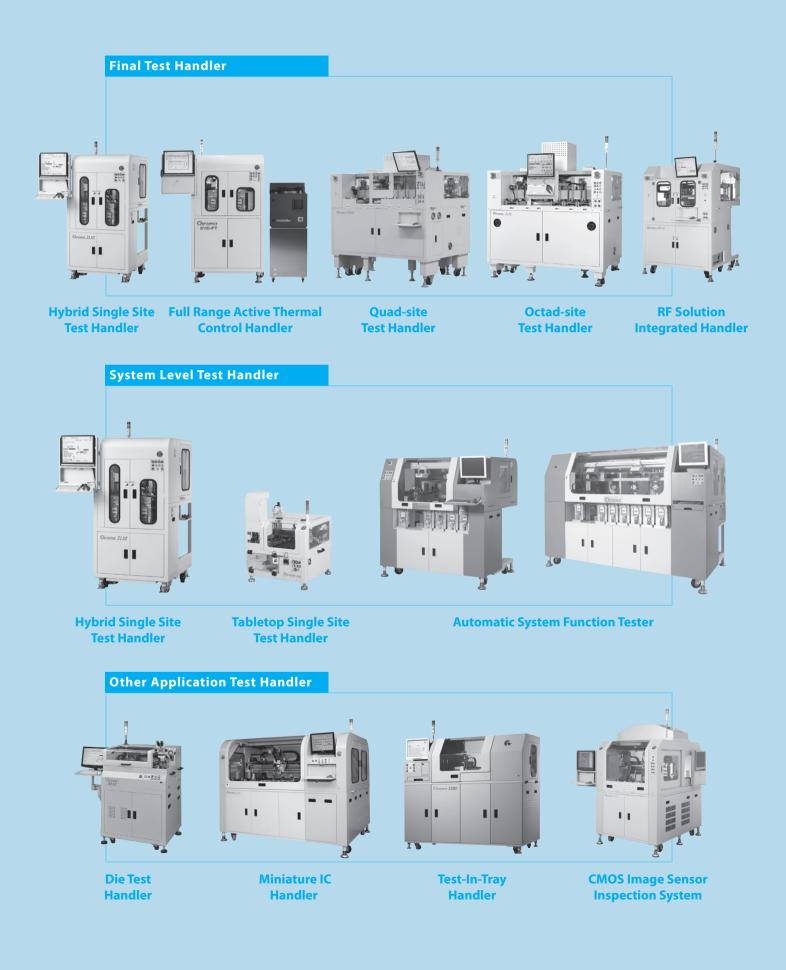
| Selection Guide                     | 14-1  |
|-------------------------------------|-------|
| VLSI Test System                    | 14-3  |
| SoC/Analog Test System              | 14-8  |
| Programmable Pin Electronics Module | 14-14 |
| Four-quadrant DUT Power Supply      | 14-15 |
| Final Test Handler                  | 14-16 |
| System Level Test Handler           | 14-20 |
| Other Application Test Handler      | 14-24 |







Programmable Pin Electronics Module Four-quadrant DUT Power Supply



# **Selection Guides**

| Selection Guide - VLSI Test System 3360 Series |             |              |              |             |             |             |      |
|--|-------------|--------------|--------------|-------------|-------------|-------------|------|
|  | STDPS       | STPMU        | LXUVI        | LFUVI       | HVREF       | HVREF-48    | PAGE |
| V Range  | $\pm$ 10 V  | $\pm$ 48 V   | $\pm$ 10 V   | 24 V        | $\pm$ 60 V  | $\pm$ 48 V  |      |
| l Range  | ± 2 A       | $\pm$ 100 mA | $\pm$ 500 mA | ± 1.5A      | ± 2 A       | $\pm$ 500mA |      |
| Channel  | 8 /board    | 8 /board     | 16 /board    | 4 /board    | 8 /board    | 8 /board    |      |
| Slot   | DPS slot    | PMU slot     | I/O slot     | I/O slot    | I/O slot    | I/O slot    |      |
| EPB Module                                     | None        | None         | None         | None        | Yes         | None        |      |
| Accuracy                                       | $\pm$ 1.5mV | $\pm$ 1.25mV | $\pm$ 1.0mV  | $\pm$ 0.5mV | $\pm$ 1.5mV | $\pm$ 1.5mV |      |
| 3360-D   |             |              | 0            |             |             |             | 14-1 |
| 3360-P   | S           | S            | 0            | 0           | 0           | 0           | 14-2 |

| Selection Guide - VLSI Test System 3380 Series |   |   |  |   |   |  |  |
|--|---|---|--|---|---|--|--|
| MXDPS  | MXUVI   | MXREF   | MLDPS  | MLDPS-16  | Remark  | PAGE   |  |
| $\pm$ 16 V                                     | $\pm$ 12 V  | $\pm$ 48 V  | $12 V/\pm 6 V$   | $12 V/\pm 6 V$  |   |  |  |
| ± 2 A  | ± 1 A   | $\pm$ 250 mA  | $\pm$ 1 A ( $\pm$ 6V)  | $\pm$ 1 A ( $\pm$ 6V)   |   |  |  |
| 8 /board                                       | 16 /board   | 16 /board   | 32 /board  | 16 /board   |   |  |  |
| S slot   | S / IO slot   | S / IO slot   | S / IO slot  | S / IO slot   |   |  |  |
| Yes  | Yes   | Yes   | Yes  | Yes   | 1 -S/2CH  |  |  |
| None   | Yes (4A)  | Yes (1A)  | Yes (8A)   | Yes (8A)  |   |  |  |
| 0  | 0   | 0   | 0  | S   |   | 14-3   |  |
| 0  | S   | 0   | 0  | 0   |   | 14-4   |  |
| 0  | 0   | 0   | 0  | 0   | Flexible  | 14-5   |  |
|  | MXDPS<br>± 16 V<br>± 2 A<br>8 /board<br>S slot<br>Yes<br>None<br>O<br>O | MXDPS         MXUVI           ± 16 V         ± 12 V           ± 2 A         ± 1 A           8 /board         16 /board           S slot         S / IO slot           Yes         Yes           None         Yes (4A)           O         O           O         S | MXDPS         MXUVI         MXREF           ± 16 V         ± 12 V         ± 48 V           ± 2 A         ± 1 A         ± 250 mA           8 /board         16 /board         16 /board           S slot         S / IO slot         S / IO slot           Yes         Yes         Yes           None         Yes (4A)         Yes (1A)           O         O         O           O         S         O | MXDPS         MXUVI         MXREF         MLDPS $\pm$ 16V $\pm$ 12V $\pm$ 48V         12V/ $\pm$ 6V $\pm$ 2A $\pm$ 1A $\pm$ 250 mA $\pm$ 1A ( $\pm$ 6V)           8 /board         16 /board         16 /board         32 /board           S slot         S / IO slot         S / IO slot         S / IO slot           Yes         Yes         Yes         Yes           None         Yes (4A)         Yes (1A)         Yes (8A)           O         O         O         O           O         S         O         O | MXDPS         MXUVI         MXREF         MLDPS         MLDPS-16 $\pm$ 16 V $\pm$ 12 V $\pm$ 48 V         12 V/ $\pm$ 6 V         12 V/ $\pm$ 6 V $\pm$ 2 A $\pm$ 1 A $\pm$ 250 mA $\pm$ 1 A ( $\pm$ 6V) $\pm$ 1 A ( $\pm$ 6V)           8 /board         16 /board         16 /board         32 /board         16 /board           S slot         S / 10 slot         S / 10 slot         S / 10 slot         S / 10 slot           Yes         Yes         Yes         Yes         Yes         Yes           None         Yes (4A)         Yes (1A)         Yes (8A)         Yes (8A)           O         O         O         S         O         O           O         S         O         O         O         O | MXDPS         MXUVI         MXREF         MLDPS         MLDPS-16         Remark $\pm 16V$ $\pm 12V$ $\pm 48V$ $12V/\pm 6V$ $12V/\pm 6V$ $$ $\pm 2A$ $\pm 1A$ $\pm 250 \text{ mA}$ $\pm 1A(\pm 6V)$ $\pm 1A(\pm 6V)$ $$ $8/board$ $16/board$ $16/board$ $32/board$ $16/board$ $$ $8/board$ $5/l0$ slot $5/l0$ slot $5/l0$ slot $$ $$ $8/board$ $16/board$ $16/board$ $32/board$ $16/board$ $$ $8/board$ $5/l0$ slot $5/l0$ slot $5/l0$ slot $$ $$ $Yes$ Yes         Yes         Yes         Yes $$ $$ Yes         Yes         Yes         Yes         Yes $$ $$ Yes         Yes (4A)         Yes (1A)         Yes (8A)         Yes (8A) $$ O         O         O         S         O $$ $$ O         S         O         O         O $$ |  |

S : Standard O: Option --:None

| Selection Guide - SoC/Analog Test System |       |       |       |          |                         |       |
|--|-------|-------|-------|----------|-------------------------|-------|
|  | DPS   | HDDPS | PMU   | VI45     | PVI100                  | PAGE  |
| V Range                                  | ±16V  | ±12V  | ±16V  | ±45V     | $\pm$ 100V ( $\pm$ 50V) |       |
| l Range                                  | 800mA | 1A    | 250mA | 100mA    | 2A (4A)                 |       |
| Channels                                 | 16    | 48    | 2     | 32       | 8                       |       |
| Slot                                     | DPS   | DPS   | None  | I/O slot | I/O slot                |       |
| 3650-CX                                  | 0     |       | 0     | 0        | 0                       | 14-8  |
| 3650                                     | 0     |       | 0     | 0        | 0                       | 14-10 |
| 3650-EX                                  | Х     | 0     | 0     | 0        | 0                       | 14-12 |

| Selection Guide - SoC/Analog Test System |        |          |       |  |  |
|--|--------|----------|-------|--|--|
|  | ADDA   | HDADDA   | PAGE  |  |  |
| Fs Max                                   | 500KHz | 500KHz   |       |  |  |
| Resolution                               | 16 Bit | 16 Bit   |       |  |  |
| Channels                                 | 1      | 32       |       |  |  |
| Slot                                     | None   | I/O slot |       |  |  |
| 3650-CX                                  | 0      |          | 14-8  |  |  |
| 3650                                     | 0      | 0        | 14-10 |  |  |
| 3650-EX                                  |        | 0        | 14-12 |  |  |

S : Standard O : Option -- : None

| Selection ( | Selection Guide - Final Test Handler               |                 |       |            |            |       |        |  |
|-------------|--|-----------------|-------|------------|------------|-------|--------|--|
| Tempertu    | Temperture condition                               |                 |       | Final Test |            |       |        |  |
|             |  |                 | 3110  | 3110-FT    | 3160/3160A | 3180  | 3240-Q |  |
|             | Ambient  | Ambient         | 0     | 0          | 0          | 0     | 0      |  |
| Hot         | High Temperature                                   | ~150°C±3°C      | 0     |            | 0          | 0     |        |  |
|             | (General Heater)                                   | ~125°C±3°C      | 0     |            | 0          | 0     | 0      |  |
|             | Tri-Temperature<br>(TEC Control)                   | -40°C~125°C±2°C | 0     | 0          |            |       |        |  |
|             |  | -40°C~150°C±2°C | 0     |            |            |       |        |  |
| ATC         | (TEC CONTION)                                      | ~-55°C          | 0     |            |            |       |        |  |
|             | High Temperature<br>(ATC : Active Thermal Control) | ~135°C±2°C      | 0     |            |            |       |        |  |
| РТС         | Passive cooling<br>(PTC : Passive Thermal Control) | <300W, <85°C    | 0     |            |            |       |        |  |
| PAGE        |  |                 | 14-20 | 14-16      | 14-17      | 14-18 | 14-19  |  |

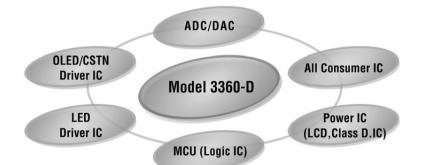
| Selection 0 | Selection Guide - System Level Test Handler        |                 |       |                   |       |       |  |
|-------------|--|-----------------|-------|-------------------|-------|-------|--|
| Tempertu    | re condition                                       |                 |       | System Level Test |       |       |  |
|             |  |                 | 3110  | 3111              | 3240  | 3260  |  |
|             | Ambient  | Ambient         | 0     | 0                 | 0     | 0     |  |
| Hot         | High Temperature                                   | ~150°C±3°C      | 0     |                   |       | 0     |  |
|             | (General Heater)                                   | ~125°C±3°C      | 0     | 0                 | 0     | 0     |  |
|             | ATC Tri-Temperature (TEC Control)                  | -40°C~125°C±2°C | 0     |                   |       | 0     |  |
|             |  | -40°C~150°C±2°C |       |                   |       |       |  |
| ATC         |  | ~-55°C          | 0     |                   |       | 0     |  |
|             | High Temperature<br>(ATC : Active Thermal Control) | ~135°C±2°C      | 0     |                   |       | 0     |  |
| РТС         | Passive cooling<br>(PTC : Passive Thermal Control) | <300W, <85°C    | 0     |                   |       | 0     |  |
| PAGE        |  |                 | 14-20 | 14-21             | 14-22 | 14-23 |  |

O : Option -- : None

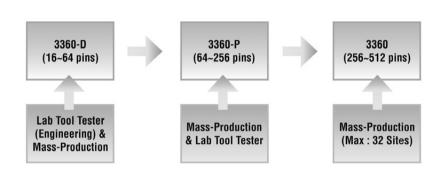
# Model 3360D

#### The Full Application Functions – Logic, ADDA, LCD, LED, Power, ALPG, Match…etc





#### 3360-D Bridge Test Development to Mass-Production



| SPECIFICATIONS                     |                                    |  |  |
|------------------------------------|------------------------------------|--|--|
| Model                              | 3360D (I/O)                        |  |  |
| Test Rate                          | 25/50MHz                           |  |  |
| Pin Channels                       | 32/64 Pins                         |  |  |
| Pattern Memory                     | 8M (16M Option)                    |  |  |
| Parallel Testing Capability        | Max 8 DUTs                         |  |  |
| Edge Placement Accuracy            | ± 625ps                            |  |  |
| Resource Per Pin Architecture      | Yes                                |  |  |
| DPS ( $\pm$ 16V, $\pm$ 400 mA)     | 8                                  |  |  |
| PMU (±16V, ±100 mA)                | 8                                  |  |  |
| PPMU (-2V ~ +7V, $\pm$ 25 $\mu$ A) | Per Pin                            |  |  |
| Programmable Load (Active Load)    | Per Pin ( $\pm$ 35 mA)             |  |  |
| Windows Environment                | Windows <sup>®</sup> XP            |  |  |
| Programming Language               | C\C++                              |  |  |
| Test Option                        |                                    |  |  |
| LCD Channel ( $\pm$ 80V)           | Max 32 LCD Output Pins             |  |  |
| AD / DA Converter Test Option      | 4 AWG / DGT (16 Bits AWI board)    |  |  |
| STPHI/GPIB                         | TTL (Handler) / GPIB (Prober)      |  |  |
| SCAN Option                        | 512M / IO board                    |  |  |
| ALPG Memory Test Option            | 16X, 16Y, 16D                      |  |  |
| System and Dimension               |                                    |  |  |
| Power consumption                  | Max. 1KVA (90~240 Vac - 1phase 3W) |  |  |
| Only Test Head                     | W330 x D560 x H390 mm (Max. 35 Kg) |  |  |

#### **KEY FEATURES**

50/100 MHz clock rate

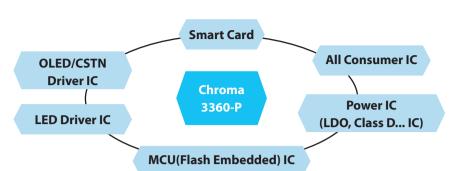
- 50/100 Mbps data rate
- 256 I/O digital I/O pins
- Up to 256 sites parallel testing
- 32/64/128M pattern memory
- Various VI source
- Flexible HW-architecture (Interchangeable I/O, VI, ADDA,)
- Real parallel trim/match function
- Time & Frequency Measurement Unit (TFMU)
- AD/DA test (16/24bits option)
- SCAN test option (max 1G M/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, S50, E320, SC312, V7, TRI-6020)
- User friendly Windows 7 environment
- CRAFT C/C++ programming language
- SW (Software) same as 3360 & 3360P
- D-M Probe-card compatible with 3360P DM probe-card
- C-M DUT-card compatible with 3360D/3360P C-M DUT-card (FT/CP)

# Model 3360P



# 9

#### The Full Functions - Logic, LCD, LED, ADDA, Power, ALPG, SCAN, Match... etc.



Engineering Board Available for Test Development on-the-spot & Ready for Direct-mount Solution



3360P FT Direct-mount Solution



3360P CP Direct-mount Solution

| Model                                   | 3360P (I/O)                        |  |  |
|---|------------------------------------|--|--|
| Test Rate                               | 25/50MHz                           |  |  |
| Data Rate                               | 25/50Mbps                          |  |  |
| Logic I/O Channels                      | Max. 256 Pins                      |  |  |
| Pattern Memory                          | 8M (16 M option)                   |  |  |
| Parallel Testing Capability             | Max. 32 DUTs                       |  |  |
| EPA                                     | ± 625ps                            |  |  |
| Resource Per Pin Architecture           | Yes                                |  |  |
| DPS (± 10V, ± 2 A)                      | 8                                  |  |  |
| PMU (± 48V, ±100mA)                     | 16                                 |  |  |
| PPMU (± 0.5V ~ 6.5V, ± 35mA)            | Per Pin                            |  |  |
| TFMU function (Max 400Mhz)              | Per Pin                            |  |  |
| Programmable Active Load<br>(±35mA)     | Per Pin                            |  |  |
| Windows Environment                     | Windows XP                         |  |  |
| Programming Language                    | C\C++                              |  |  |
| Test Option                             |                                    |  |  |
| Hi-V (LCD- 80V) Channel                 | Max. 224 LCD pins                  |  |  |
| AD / DA Converter Test Option           | 4 AWG / 4 DGT (16 Bits)            |  |  |
| Mixed-Signal Test Option (PXI)          | 24bits / 200 MS/s(14bits)          |  |  |
| LXUVI ( DPS $\pm$ 10V, $\pm$ 500 mA )   | 16 CH / board                      |  |  |
| LXREF( DPS $\pm$ 48V, $\pm$ 250 mA )    | 16 CH / board                      |  |  |
| HVREF-48( DPS $\pm$ 48V, $\pm$ 500 mA ) | 8 CH / board                       |  |  |
| HV100(-6V ~+100V, ± 250 mA)             | 8 CH / board (with EPB option)     |  |  |
| HVREF ( DPS $\pm$ 60V, $\pm$ 1A )       | 8 CH / board (with EPB option)     |  |  |
| SCAN Option                             | 512M / board                       |  |  |
| ALPG Memory Test Option                 | 16X, 16Y, 16D                      |  |  |
| System And Dimension                    |                                    |  |  |
| Power Consumption                       | Max. 3KVA                          |  |  |
| Only Test Head                          | W640 x D470 x H639 mm (Max. 90 Kg) |  |  |

#### **KEY FEATURES**

- 25/50 MHz clock rate
- 25/50 Mbps data rate
- 256 I/O channels
- 8/16 M pattern memory
- Flexible HW configuration
- (Interchangeable I/O, VI, ADDA, and LCD) Max 32 DUTs parallel testing
- Real parallel trim/Match function
- Time & Frequency Measurement Unit(TFMU)
- Test program/pattern converter (V7, TRI6020, V50, E320, SC312, D10, J750, ITS9K, TS670)
- AD/DA test option
- SCAN test option (max 512M/chain)
- ALPG test option for embedded memory
- STDF tools support
- User friendly Windows XP environment
- CRAFT C/C++ programming language

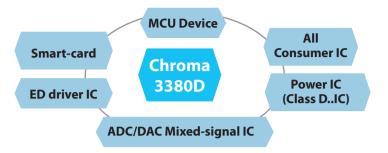


# Model 3380D



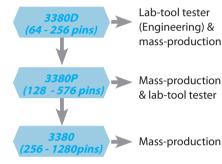
#### **The Full Application Functions**

Logic, ADDA, LCD, LED, Power, ALPG, Match, and etc.



#### 3380D Linking for mass-production

C-M Kits : Compatible with 3360D/3360P C-M FT/CP & D-M Kits : Compatible 3360P D-M probe card



(Engineering) & mass-production Mass-production



3380D Cable-Mount FT /CP solution



3380D Direct-mount **CP** solution

|     | / == | ATL | JRES |
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#### 100 MHz clock rate

- 50/100 MHz data rate
- 256 I/O digital I/O pins
- Up to 256 sites Parallel testing
- 32/64/128M Pattern Memory
- Various VI source
- Flexible HW-architecture
- (Interchangeable I/O, VI, ADDA,)
- Real parallel Trim/Match function
- Time & Frequency Measurement Unit (TFMU)
- AD/DA test (16/24bits option)
- SCAN test option (max 1G M/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, S50, E320, SC312, V7, TRI-6020)
- User friendly Windows 7 environment
- CRAFT C/C++ programming language
- SW (Software) Same as 3360 & 3360P
- D-M Probe-card compatible with 3360P DM Probe-card
- C-M DUT-card compatible with 3360D/3360P C-M DUT-card(FT/CP)
- Direct mount fixture can be compatible with 3360P probe-Card
- Cable mount fixture can be compatible with 3360D & 3360P

| SPECIFICATIONS   |   |
|--|---|
| Standard Specification   | 3380D   |
| Clock Rate   | 50/100 Mhz  |
| Data Rate  | 50/100 Mbps   |
| Pin Channels   | 256 Pins  |
| Pattern Memory   | 32M(S) / 64 & 128M (option)   |
| Parallel Testing Capability  | 256 DUTs  |
| EPA  | ± 500ps   |
| Resource Per Pin Architecture  | Yes   |
| VI source  | 8CH : MXDPS,<br>16CH : MLDPS-16(S) / MXUVI / MXREF,<br>32CH : MLDPS |
| PMU(± 48V, ± 100 mA)   | 16 Channels /board  |
| HV-Pins driver ( +5.9V to +13.5V )                                     | 4 channels /board   |
| PPMU (-2V~+ 6V, ± 32 mA )  | Per Pin (FIMV/FVMI)   |
| Programmable Active Load ( $\pm$ 12 mA)                                | Per Pin   |
| TFMU (Time/Freq Measure unit:Max 400Mhz)                               | Per Pin   |
| Free-run Clock ( Max: 200Mhz )   | Per Pin   |
| Windows Environment  | Windows 7   |
| Programming Language   | C/C++   |
| 3380D Test Option Specification  |   |
| AD/DA Converter Test Option (MXAWI/MXAWI2)                             | 4 AWG/ 4 DIG ( 16/24bits)   |
| Mixed- Signal test option ( PXI )                                      | 24bits, 200MS/s   |
| MXUVI ( DPS $\pm$ 12V, $\pm$ 1A, CG $\pm$ 4A )                         | 16 Channels /board  |
| MXDPS ( DPS $\pm$ 16V, $\pm$ 2A )                                      | 8 Channels /board   |
| MXREF ( DPS $\pm$ 48V, $\pm$ 250mA, CG $\pm$ 1A )                      | 16 Channels /board  |
| MLDPS (DPS + 12V/ $\pm$ 500mA, $\pm$ 6V/ $\pm$ 1A , CG max $\pm$ 8 A ) | 32 Channels /board  |
| SCAN Option  | 1G bits/ chain  |
| ALPG Memory Test Option  | 16X, 16Y, 16D /board  |
| 3380D System And Dimension   |   |
| Power consumption Max  | 2KVA (VI Option to Max. 3KVA)                                       |
| Test Head  | W365 x D586 x H412 mm ( Max:45Kg)                                   |
| Power Box  | W220 x D372 x H187 mm ( Max:15Kg)                                   |

Note 1: "Cable-Mount" as standard, "Direct-Mount" as option.

# Model 3380P

Chroma

3380-P

Smart-card/RFID

All Consumer IC

**Power IC** 

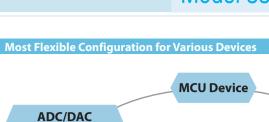
(LDO, Class D... IC)



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Measurement PXI Test &

Test &



# LED Driver IC **CP/FT Direct/Cable Mount Solutions** CP/FT Direct/Cable Mount Solutions available from engineering to Production; Maintain Compatibility to 3360 & 3360P

#### **KEY FEATURES**

- 50/100 Mhz clock rate
- 50/100 Mbps data rate
- 512 digtial I/O pins (Max 576 digtial I/O pins)
- Up to 512 sites parallel testing
- 16/32M pattern memory
- Various VI source
- Flexible HW-architecture
- (Interchangeable I/O, VI, ADDA) Real parallel trim/Match function
- Time & Frequency Measurement Unit (TFMU)
- AD/DA test option
- SCAN test option (max 1G/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, V50, E320, SC312, V7, TRI-6020, ITS9K)
- User friendly Windows 7 environment
- CRAFT C/C++ programming language
- Software same as 3360 & 3360-P



3380-P FT Direct-mount

**Mixed-signal IC** 

| Model  | 3380P  |
|--|--|
| Clock Rate   | 50 / 100Mhz                                      |
| Data Rate  | 50 / 100Mbps                                     |
| I/O Channels   | 512 Pins (Max:576Pins)                           |
| Pattern Memory   | 16M / 32M(Option) 2X: 32M / 64M(option)          |
| Parallel Testing Capability  | 512 DUTs   |
| EPA  | ± 500ps  |
| Resource Per Pin Architecture  | Yes  |
| VI source  | 8CH: MXDPS,<br>16CH: MXUVI/MXREF,<br>32CH: MLDPS |
| PMU( $\pm$ 48V, $\pm$ 100 mA)  | 16 Channels /board                               |
| HV-Pins driver ( +5.9V to +13.5V )                                     | 4 channels /board                                |
| PPMU (-2V~+ 6V, ± 32 mA )  | Per Pin (FIMV/FVMI)                              |
| Programmable Active Load ( $\pm$ 12 mA)                                | Per Pin  |
| TFMU (Time/Freq Measure unit:Max 400Mhz)                               | Per Pin  |
| Free-run Clock ( Max: 200Mhz )   | Per Pin  |
| Windows Environment  | Window 7   |
| Programming Language   | C\C++  |
| Test Option  | Specification                                    |
| AD/DA Converter Test Option  | 4 AWG / 4 DIG (16 bits)                          |
| Mixed- Signal test option ( PXI )                                      | 24bits, 200MS/s                                  |
| MXUVI (DPS $\pm$ 12V, $\pm$ 1A, CG max : $\pm$ 4A)                     | 16 Channels /board                               |
| MXDPS (DPS -8V~+16V, ±2A)  | 8 Channels /board                                |
| MXREF (DPS $\pm$ 48V, $\pm$ 250mA, CG max : $\pm$ 1A)                  | 16 Channels /board                               |
| MLDPS (DPS +12V/ $\pm$ 500mA, $\pm$ 5V/ $\pm$ 1A, CG max : $\pm$ 4/8A) | 32 Channels /board                               |
| SCAN Option  | 1G bits/ chain                                   |
| ALPG Memory Test Option  | 16X, 16Y, 16D /board                             |
| System And Dimension   |  |
| Power Consumption  | Max : 3KVA                                       |
| Only Test Head   | W640xD470XH639 mm ( Max:100Kg)                   |

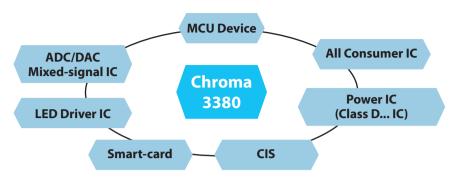
3380-P CP Direct-mount

\* Note 1: "Direct-Mount" as Standard, "Cable-Mount" as Option

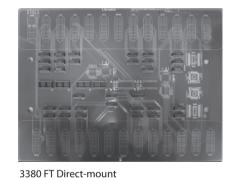
# Model 3380

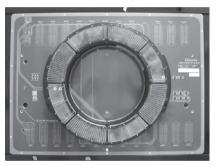


# Rich Functions and Wide Coverage : Logic, MCU, ADDA (Mixed-signal); Power, LED driver, Class D; CIS, SCAN, ALPG, Match..etc



CP/FT Direct mount solutions available from engineering to production; CP maintain compatibility to J750





3380 CP Direct-mount (compatibility with J750)

| SPECIFICATIONS   |   |
|--|---|
| Model  | 3380  |
| Clock Rate   | 50 / 100Mhz   |
| Data Rate  | 50 / 100Mbps  |
| I/O Channels   | 1024 Pins ( Max:1280 Pins)                          |
| Pattern Memory   | 16M / 32M (Option)2X: 32M / 64M (option)            |
| Parallel Testing Capability  | 1024 DUTs   |
| EPA  | ± 500ps   |
| Resource Per Pin Architecture  | Yes   |
| VI source  | 8CH : MXDPS,<br>16CH : MXUVI/MXREF,<br>32CH : MLDPS |
| PMU ( $\pm$ 48V, $\pm$ 100 mA )  | 32 Channels   |
| HV-Pins driver ( +5.9V to +13.5V )                                     | 4 channels /board                                   |
| PPMU (-2V~+ 6V, ± 32 mA)   | Per Pin (FIMV/FVMI)                                 |
| Programmable Active Load ( $\pm$ 12 mA)                                | Per Pin   |
| TFMU (Time/Freq Measure unit:Max 400Mhz)                               | Per Pin   |
| Free-run Clock (Max: 200Mhz)   | Per Pin   |
| Windows Environment  | Window 7  |
| Programming Language   | C\C++   |
| 3380 Test Option   | Specification                                       |
| AD/DA Converter Test Option  | 4 AWG / 4 DIG (16 bits)                             |
| Mixed- Signal test option ( PXI )                                      | 24bits, 200MS/s                                     |
| MXUVI (DPS $\pm$ 12V, $\pm$ 1A, CG max : $\pm$ 4A)                     | 16 Channels /board                                  |
| MXDPS (DPS -8V~+16V, $\pm$ 2A )  | 8 Channels /board                                   |
| MXREF (DPS $\pm$ 48V, $\pm$ 250mA, CG max : $\pm$ 1A)                  | 16 Channels /board                                  |
| MLDPS (DPS +12V/ $\pm$ 500mA, $\pm$ 5V/ $\pm$ 1A, CG max : $\pm$ 4/8A) | 32 Channels /board                                  |
| SCAN Option  | 1G bits/ chain                                      |
| ALPG Memory Test Option  | 16X, 16Y, 16D /board                                |
| System And Dimension   |   |
| Power Consumption  | Max : 8KVA  |
| <b>T</b> (1) 1   | W714 x D717 x H458 mm ( Max : 165Kg)                |
| Test Head  | W/14 X D/17 X 11430 11111 ( Wax . 105Kg)            |

\* Note \*1: "Direct-Mount" as Standard

- 50/100 MHz clock rate
- 50/100 Mbps data rate
- 1024 I/O pins (Max :1280 I/O pins)
- Up to 1024 sites Parallel testing
- 32/64 M pattern memory
- Various VI source
- Flexible HW-architecture (Interchangeable I/O, VI, ADDA,)
- Real parallel trim/match function
- Time & frequency measurement unit (TFMU)
- High-speed time measurement unit (HSTMU)
- AD/DA test option
- SCAN test option (max 1G M/chain)
- ALPG test option for embedded memory
- STDF tools support
- Test program/pattern converter (J750, D10, V50, E320, SC312, V7, TRI-6020, ITS9K)
- User friendly windows 7 environment
- CRAFT C/C++ programming language
- SW (Software) same as 3380P & 3360P

# Model 3650-CX



#### **KEY FEATURES**

- 50 / 100MHz; 200Mhz (MUX) Clock Rate
- 50 / 100Mbps; 200 Mbps (MUX) Data Rate
- Up to 256 digital I/O pins
- 16/32 (option) MW vector memory
- 16/32 (option) MW pattern instruction memory
- Per-pin timing/PPMU/frequency measurement
- Up to 4-32 16-bit ADDA channels option SW configurable scan chains in 1024M
- depth or up to 32 scan chains/board
- ALPG option for memory test
- Up to 16 high-voltage pins
- 16 high-performance DPS channels
- Overall timing accuracy < ±550ps
- 8 ~ 32-CH / board for VI45 analog option
- 2 ~ 8-CH / board for PVI100 analog option
- Microsoft Windows® XP OS
- C++ and GUI programming interface
- CRISP, full suite of intuitive software tools
- Air-cooled, All-in-one design and space-saving footprint
- Cable mount / Direct mount

#### **APPIICATIONS**

- MCU/MCU + Embedded Memory
- NAND Flash Controller
- PC I/O
- Switch ICs
- Smart Power Management
- Devices Mixed Signal, Digital and
- Analog ICs ADC/DAC/CODEC ICs
- Consumer ICs
- Engineering, Wafer Sort and **Final Test**
- Power ICs
- LED Driver ICs



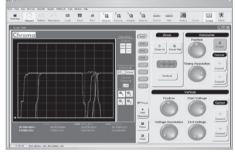
#### Chroma 3650-CX brings you the low cost and high performance test solution

3650-CX adopts the all-in-one design to provide a compact size ATE with very low cost, high accuracy and high throughput for customers to save the cost and raise the profit. With the versatile test capabilities and powerful software tools, 3650-CX is designed for MCU, NAND flash controllers, the peripheral devices of PC, switch devices, LED driver ICs, power ICs and consumer SoC devices.

#### CRISP, the powerful system software for 3650-CX

The 3650-CX features powerful suite of software tools using Chroma Integrated Software Platform, CRISP. It not only provides the rapid test developing functions, CRISP also covers all needs for test debugging, production and data analysis. Base on the Microsoft Windows XP® operation system and C++ programming language, CRISP provides powerful, easy-to-use, intuitive and fast-runtime GUI tools for users. The CRISP includes test plan debugger, pattern editor, waveform tool, scope tool, pin margin, Shmoo, wafer map, histogram, STDF tool, datalog and etc.

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#### All-in-one design and compact size to save the floor space

With the air-cooled and zero footprint testerin-a-test-head design, 3650-CX delivers high throughput in a highly integrated package for minimum floor space. With an optional manipulator, 3650-CX can be used in both package and wafer sort test.

#### Peripheral

The 3650-CX provides multiple drivers for communications with handler and prober by GPIB and TTL interface. The supported handlers or probers include SEIKO-EPSON, SHIBASOKU, MULTITEST, ASECO, DAYMARC, TEL, TSK and OPUS II, and so forth.

Flat Panel Display

Photovoltaic Test & Automation

Optical

Electronics

Test &

Passive

Component

/ Test &

| SPECIFICATIONS                        |  |
|---------------------------------------|--|
| Model 3650-CX                         |  |
| Clock Rate                            | 50 / 100Mhz; 200Mhz (MUX mode)                       |
| Data Rate                             | 50 / 100Mbps; 200Mbps (MUX mode)                     |
| Pattern Memory Size                   | 16 / 32M (Option)                                    |
| Overall Timing Accuracy               | ±550ps (Window), ±450ps (Edge)                       |
| Software / Programming Language / OS  | CRISP/ C++ / Windows XP                              |
| Pin Electronics Board                 | LPC  |
| IO Channels                           | 64-pin / Board X 4 Boards / System                   |
| Vector Depth                          | 16 / 32M per pin                                     |
| Drive VIL / VIH                       | -2 ~ +6V / -1.9 ~ +7V                                |
| Maximum Driver Current                | 50mA (static) / 100mA (dynamic)                      |
| Comparator VOL / VOH                  | -2 ~ +7V   |
| Compare Modes                         | Edge, Window   |
| EPA (Drive / IO / Compare)            | ±300ps / ±300ps / ±300ps                             |
| Dynamic Load Current                  | ±35mA  |
| Timing Sets                           | 32 sets per pin                                      |
| Timing Edges                          | 6 (2 Drive, 2 Drive & IO, 2 Compare)                 |
| Rate / Edge Resolution                | 125 / 62.5ps   |
| Waveform Sets                         | 32 sets per pin                                      |
| Waveform Format                       | 4096 Timing-Waveform Combination Changes on-the-fly  |
| Utility Pin Relay Control             | 64 (8 / Board), 128 bit relay board option available |
| PPMU/Frequency Measurement Unit (OSC) | per pin  |
| DUT Power Supply                      | DPS  |
| Channels                              | 16-CH / Board X 1 Boards / System                    |
| Voltage Range                         | ±8V, ±16V  |
| Maximum Output Current                | 0.8A / 1-CH  |
| Current Gang Channels                 | 8  |
| Precision Measurement Unit            | PMU  |
| Channels                              | 2-CH / Board X 4 Boards / System                     |
| Voltage Range                         | $\pm 2.5V, \pm 8V, \pm 16V$                          |
| Current Range                         | ±800nA ~ ±250mA                                      |
| Options                               |  |
| ADDA/HD-ADDA                          |  |
| Channels                              | 1 ADDA CH / LPC or 32 CH HD-ADDA / board             |
| AWG / Digitizer                       | per channel  |
| Resolution / Max. Conversion Rate     | ADDA: 16-bit / 500KHz ; HD-ADDA: 16 Bit 500KHz       |
| Voltage Range                         | ±2.5V/±4.5V/±9V                                      |
| Algorithm Pattern Generator (ALPG)    | X = 16, Y = 16 / D = 16                              |
| Scan                                  | 1 / 2 / 4 / 8 / 16 / 32 scan chains, Max 1024M depth |
| VI45                                  |  |
| Channels                              | 8 ~ 32-CH / Board                                    |
| Voltage / Current Range               | ±45V/±100mA  |
| Current Ganged Channels               | 4 buses for 8 channels, x2 – x8, 800mA max           |
| TMU                                   | per channel  |
| PVI100                                |  |
| Channels                              | 2 ~ 8-CH / Board                                     |
| Voltage / Current Range               | ± 100V / ±2A , ±50V / ±4A                            |
| Current Ganged Channels               | x2 - x8, 32A max                                     |
| TMU                                   | per channel  |
| System and Dimension                  |  |
| Power Consumption                     | 3.5KW Max  |
| Cooling System                        | Forced Air Cooling                                   |
| Frame Size                            | L 643 x W369 x H 760 mm                              |
|                                       |  |

# Model 3650



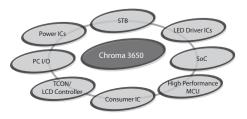
#### 50/100 MHz

#### **KEY FEATURES**

- 50 / 100MHz; 200Mhz (MUX) Clock Rate
- 50 / 100Mbps; 200Mbps (MUX) Data Rate
- Up to 512 digital I/O pins
- 16/32 (option) MW vector memory
- 16/32 (option) MW pattern instruction memory
- Per-pin timing/PPMU/frequency measurement
- Up to 8-32 16-bit ADDA channels option
- SW configurable scan chains in 1024M depth or up to 32 scan chains/board ALPG option for memory test
- Up to 32 high-voltage pins
- 32 high-performance DPS channels
- Overall timing accuracy  $< \pm 550$  ps
- 8 ~ 32-CH / board for VI45 analog option
- 2 ~ 8-CH / board for PVI100 analog option MRX option for 3rd party PXI instruments
- Microsoft Windows<sup>®</sup> XP OS
- C++ and GUI programming interface
- CRISP, full suite of intuitive software tools
- Test program and pattern converters for other platforms
- Accept DIB and probe card of other testers directly
- Support STDF data output
- Air-cooled, small footprint tester-in-a-test-head desian

#### Chroma 3650 brings you the most cost-effective SoC tester

Chroma 3650 is an SoC tester with high throughput and high parallel test capabilities to provide the most cost-effective solution for fabless, IDM and testing houses. With the full functions of test, high accuracy, powerful software tools and excellent reliability, 3650 has the versatile test capabilities for high-performance microcontroller, analog IC, consumer SoC devices, and wafer sort applications.



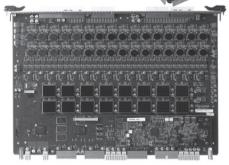
#### High performance in a low-cost production system

The 3650 achieves lower test cost not only by reducing the cost of tester system but also by testing more devices faster and the high parallel test capability. With the Chroma PINF IC and the sophisticated calibration system, 3650 has the excellent overall timing accuracy within  $\pm$  550ps. The pattern generator of 3650 has up to 32M pattern instruction memory. By having the same depth as the vector memory, Chroma 3650 allows to add pattern instruction for each vector. Moreover, the powerful sequential pattern generator provides the variety of pattern commands to meet the demands of complex test vectors. The true test-per-pin architecture and the flexible site mapping with no slot boundaries are designed for multi-site test with high throughput. Up to 512 digital pins, 32 device power supplies, per-pin PMU and the analog test capability, 3650 delivers a combination of high test performance and throughput with cost-effective test solution.

#### **High parallel test capability**

The powerful, versatile parallel pin electronics resources of 3650 can simultaneously perform identical parametric tests on multiple pins. The 3650 integrates 64 digital pins onto one single LPC board. In each LPC board, it contains 16 high performance Chroma PINF ICs which supports 4 4 channels timing generator. The integration of local controller circuitry manages resources setup and result readout, and therefore cuts the overhead time of the system controller. With the any-pin-to-any-site mapping design, 3650 provides up to 32 sites high throughput parallel testing

capabilities to enlarge the mass production performance with more flexible and easy layout.



64 channel Digital Pin Card

#### Flexibility

The semiconductor industry is a fast moving one, and capital equipment

must be built to outlive several device generations and applications. With varieties of available options, such as AD/DA converter test, ALPG for memory test, high voltage PE, multiple scan chain test, VI45 & PVI100 analog options, Chroma 3650 makes sure that it will serve you for years to come.

Moreover, Chroma 3650 platform architecture allows development of focused instruments by third-party suppliers that can be easily added for specific applications. It can stretch the boundaries of test by covering a broader range of devices than ever before possible in a low-cost production test system.



CP Docking Solution for other Tester Platform

#### Powerful suite of software tools – CRISP

The 3650 features the powerful suite of software tools using Chroma Integrated Software Platform, CRISP. Not only provides the rapid test development function, CRISP covers all needs for test debugging, production and data analysis. The CRISP integrates the software functions of test development, test execution control, data analysis and tester management together. Based on the Microsoft Windows XP® operation system and C++ programming language, CRISP provides the powerful, easy-to-use, intuitive, and fast-runtime GUI tools for users. In the Project IDE tool, test developer can easily shift between standard template, user-defined template and C++ code-based editor to create their test program quickly and automatically scale to multi-site for parallel test. Besides, CRISP also provides the test program and test pattern converters to facilitate the test conversion from other tester platforms to 3650.

Photovoltaic Test

Power

Test &

Passive

PXI Test &

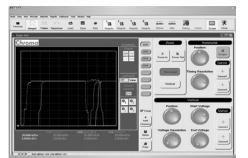
For the test program execution controller, user can select the System Control tool or Plan Debugger tool for normal mode or debugging mode. In the Plan Debugger tool, user can control the execution of test program by setting break point, step, step-into, step-over, resume execution, variable-watch and variable-modify, etc. For the test debugging and data analyzing purposes, 3650 provides abundant software utility tools. Datalog, Waveform and Scope tools are designed to support the measured data and digital waveform display. To find the parametric margin, SHMOO and Pin Margin tools can easily accomplish debug

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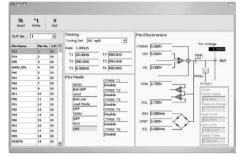
System Control







#### Scope Tool



#### Channel Debugger

by auto-mode or manual-mode execution. Besides, the Wafer Map, Summary, Histogram and STDF tools are very helpful and powerful for collecting the test results and analyzing the parametric characterization. As for the Test Condition Monitor and Pattern Editor tools, they provide the superior functions for run-time debugging to change the test conditions or pattern data without breaking the test or modifying the source files. Besides, CRISP also prepares the ADDA tool and Bit Map tool for the analog and ALPG option. Using the ADDA tool, user can not only see the AD/DA test result by graphic tool, user can also create the ADC pattern easily.The full suite of powerful GUI tools will definitely meet the various purposes for test debugging and test report.

The OCI tool is the solution of CRISP for mass production.Easy-and-correct operation is the most important request for production run. Programmer can customize the setup of OCI tool by the Production Setup tool to meet the production environment requirement in advance. Then, what an operator has to do is just to select the planned process to start the mass production.

#### Peripheral

The 3650 provides multiple drivers for communications with handler and prober by GPIB and TTL interface. The supported handlers or probers include SEIKO-EPSON, SHIBASOKU, MULTITEST, ASECO, DAYMARC, TEL, TSK and OPUS II, and so forth. In addition to provide the convenient converter tools for test platform migration, 3650 provides the adaptor board solution for existed tester platform to save the cost of users. Through theadaptor board solution, Chroma 3650 can accept the DIB and probe card of other testers directly to save the cost for making the new load boards and probe cards.

#### **Small footprint**

With the air-cooled and small footprint tester-in-atest-head design, 3650 delivers high throughput in a highly integrated package for minimum floor space. A mainframe cabinet contains the power distribution units and the space for third-party instruments. With an optional manipulator, 3650 can be used in both package and wafer test.

#### Application support

Chroma offers the application support solutions to its new and established customers to accurately meet user needs. On request Chroma can provide customized support designed around your specific needs. Whether you need ramp up production, want to capitalize on emerging market opportunities, enhance productivity, lower testing costs with innovative strategies, Chroma worldwide customer support staff is committed to generate timely and efficient solution for you.

| SPECIFICATIONS   |   |
|--|---|
| Model  | 3650  |
| Clock Rate   | 50 / 100Mhz; 200Mhz (MUX mode)  |
| Data Rate  | 50 / 100Mbps; 200Mbps (MUX mode)  |
| Pattern Memory Size  | 16 / 32M (Option)   |
| Overall Timing Accuracy  | $\pm 550$ ps (Window), $\pm 450$ ps (Edge)  |
| Software /Programming Language / OS  |   |
| Pin Electronics Board  | LPC   |
| IO Channels  |   |
|  | 64-pin / Board X 8 Boards / System  |
| Vector Depth   | 16 / 32M per pin  |
| Drive VIL / VIH  | -2 ~ +6V / -1.9 ~ +7V   |
| Maximum Driver Current   | 50mA (static) / 100mA (dynamic)   |
| Comparator VOL / VOH   | -2 ~ +7V  |
| Compare Modes  | Edge, Window  |
| EPA (Drive / IO / Compare)   | ±300ps / ±300ps / ±300ps  |
| Dynamic Load Current   | ±35mA   |
| Timing Sets  | 32 sets per pin   |
| Timing Edges   | 6 (2 Drive, 2 Drive & IO, 2 Compare)  |
| Rate / Edge Resolution   | 125 / 62.5ps  |
| Waveform Sets  | 32 sets per pin   |
| Waveform Format  | 4096 Timing-Waveform Combination Changes on-the-fly   |
| Utility Pin Relay Control  | 64 (8 / Board), 128 bit relay board option available  |
| PPMU/Frequency Measurement Unit  |   |
| (OSC)  | per pin   |
| DUT Power Supply   | DPS   |
| Channels   | 16-CH / Board X 2 Boards / System   |
| Voltage Range  | ±8V, ±16V   |
| Maximum Output Current   | 0.8A / 1-CH   |
| Current Gang Channels  | 8   |
| Precision Measurement Unit   | PMU   |
| Channels   | 2-CH / Board X 8 Boards / System  |
| Voltage Range  | $\pm 2.5V, \pm 8V, \pm 16V$   |
|  |   |
|  |   |
| Current Range  | ±250, ±0, ±10<br>±800nA ~ ±250mA  |
| Current Range Options  |   |
| Current Range Options ADDA   | ±800nA ~ ±250mA   |
| Current Range<br>Options<br>ADDA<br>Channels   | ±800nA ~ ±250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer  | ±800nA ~ ±250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate   | ± 800nA ~ ± 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz ; HD-ADDA: 16 Bit 500KHz  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz ; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz ; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz ; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A, $\pm$ 50V / $\pm$ 4A  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A, $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max  |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU  | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A, $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max<br>per channel   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>MRX   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A, $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max<br>per channel<br>Mixed Resource BoX   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>MRX<br>No of slots<br>Instruments   | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A, $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max<br>per channel<br>Mixed Resource BoX<br>10 slots per chassis (max 2 chassis)   |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Schannels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>MRX<br>No of slots<br>Instruments<br>System and Dimension                     | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A , $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max<br>per channel<br>Mixed Resource BoX<br>10 slots per chassis (max 2 chassis)<br>PXI-based instruments                               |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>MRX<br>No of slots<br>Instruments<br>System and Dimension<br>Power Consumption | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A , $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max<br>per channel<br>Mixed Resource BoX<br>10 slots per chassis (max 2 chassis)<br>PXI-based instruments<br>5.5KW / forced air cooling |
| Current Range<br>Options<br>ADDA<br>Channels<br>AWG / Digitizer<br>Resolution / Max. Conversion Rate<br>Voltage Range<br>Algorithm Pattern Generator (ALPG)<br>Scan<br>VI45<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>PVI100<br>Schannels<br>Voltage / Current Range<br>Current Ganged Channels<br>TMU<br>MRX<br>No of slots<br>Instruments<br>System and Dimension                     | $\pm$ 800nA ~ $\pm$ 250mA<br>1 ADDA CH / LPC or 32 CH HD-ADDA / board<br>per channel<br>ADDA: 16-bit / 500KHz; HD-ADDA: 16 Bit 500KHz<br>$\pm$ 2.5V / $\pm$ 4.5V / $\pm$ 9V<br>X = 16, Y = 16 / D = 16<br>1 / 2 / 4 / 8 / 16 / 32 scan chains / LPC maximum 1024 /<br>2048M scan depth<br>8 ~ 32-CH / Board<br>$\pm$ 45V / $\pm$ 100mA<br>4 buses for 8 channels, x2 – x8, 800mA max<br>per channel<br>2 ~ 8-CH / Board<br>$\pm$ 100V / $\pm$ 2A , $\pm$ 50V / $\pm$ 4A<br>x2 – x8, 32A max<br>per channel<br>Mixed Resource BoX<br>10 slots per chassis (max 2 chassis)<br>PXI-based instruments                               |

#### 14-11

All specifications are subject to change without notice.

## Model 3650

# Model 3650-EX



#### **KEY FEATURES**

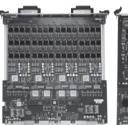
- 10 interchangeable slots for digital, analog and mixed-signal applications
- 50/100 MHz clock rate, 100/200 Mbps data rate
- Up to 512 sites parallel test
- Up to 1024 digital I/O pins
- 32/64 MW vector memory
- Up to 32 CH PMU for high precision measurement
- Per-pin timing/ PPMU/ frequency measurement
- Scan features to 4G depth / 32 scan chains
- ALPG option for memory test
- Switching timing accuracy ±300ps
- Up to 64 CH high-voltage pins
- 96 CH high density DPS
- 32 CH HDADDA mixed-signal option
- 8~32 CH VI45 analog option
- 2~8 CH PVI100 analog option
- MRX option for 3rd party PXI/PXIe applications
- Microsoft Windows® 7 OS
- C++ and GUI programming interface
- CRISP, full suite of intuitive software tools
- Test program and pattern converters for other platforms
- Accept DIB and probe card of other testers directly
- Support STDF data output
- Air-cooled, small footprint tester-in-a-test-head design

#### **High parallel test capability**

The powerful, versatile parallel pin electronics resources of 3650-EX can simultaneously perform identical parametric tests on multiple pins. 3650-EX integrates 128 digital pins into one slot. In each LPC board, it contains high performance Chroma PINF ICs which supports timing generation. The integration of local controller circuitry manages resources setup and result readout, and therefore cuts the overhead time of the system controller. With the any-pin-to-anysite mapping design, 3650-EX provides up to 512 sites high throughput parallel testing capabilities to enlarge the mass production performance with more flexible and easy layout.

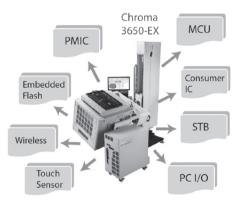
#### **Flexibility**

Semiconductor manufacturing is a fast moving industry; more and more devices are highly integrated with various functions. Capital equipment must be built to outlive several device generations and applications. With varieties of available options, such as AD/DA converter test, ALPG for memory test, high voltage PE, multiple scan chain test, VI45 & PVI100 analog test options and HDADDA mixed-signal test options, Chroma 3650-EX can provide a wide coverage for customer to test different kind of devices with flexible configurations. Moreover, Chroma 3650-EX platform architecture allows development of focused instruments by thirdparty suppliers that can be easily added for specific applications. It can stretch the boundaries of test by covering a broader range of devices than ever before possible in a low-cost production test system.





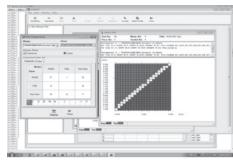
128-Channel Logic Pin Card 48-Channel High Density **Device Power Supply** 



#### Powerful suite of software tools - CRISP

3650-EX features the powerful suite of software tools using Chroma Integrated Software Platform(CRISP). Not only provides the rapid test development function, CRISP covers various tools for test debugging, production and data analysis. CRISP integrates software functions of test program development, test execution control, data analysis and tester management together. Based on the Microsoft Windows 7® operation system and C++ programming language, CRISP

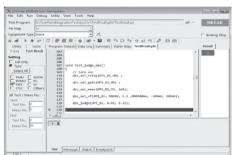
provides the powerful, easy-to-use, intuitive, and fast-runtime GUI tools for users. In the Project IDE tool, test developer can easily shift between standard template, user-defined template and C++ code-based editor to create their test program guickly and automatically scale to multi-site for parallel test. Besides, CRISP also provides the test program and test pattern converters to facilitate the test conversion from other tester platforms to 3650-EX.



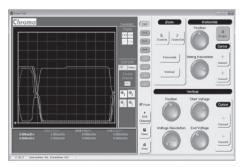
#### Shmoo tool

| Test Condition | on option Help  |                |            |          |              |               |                     | - |
|----------------|-----------------|----------------|------------|----------|--------------|---------------|---------------------|---|
| Timing         |                 | vaveform 🖉 Mod |            |          | L + +···     | 100           |                     |   |
| trining        | En Level   En 1 | waveform S Mod | E ST PPMU  | 26 0PS   | V PVM        | LINER CHIDING | att User Helay      |   |
| E& Beng File   | dRead DW        | lite           |            |          |              |               |                     |   |
| Ste#: 1        | v               | Timing         |            |          | Pin Electron | iics          |                     |   |
| Pin Name       | Pof             | Timing Set 00  | TMO        | *        | _            |               | Pin Voltage         |   |
| PINE           | - 0.0           | Rate 96.000+5  |            |          | VTERM 0.00   | 9V            | STRATION.           |   |
| PINE           | 2               | T1 0.000 5     | T4 0.000 S | _        | VBI 0.00     | r ve          | PNR                 |   |
| PINS           | 3               |                |            |          |              | La            |                     |   |
| PINE           | 4               | T2 0.000 S     | TS 0.000 S |          |              |               |                     |   |
| P2N6           | 5               | T3 0.000 S     | T6 0.000 S | _        | V2 0.00      | 5V _          |                     |   |
| PINE           | 6               |                |            |          |              |               | PEMU                |   |
| PIN7           | 7               | Pin Mode       |            |          | _            |               |                     |   |
| PINE           | 8               | DRON           | DTMSK T    |          | VOH 0.00     |               | PPMU                | _ |
| PTO            | 9               | Dittol         |            |          |              |               | VEM                 |   |
| P2NE0          | 30              | LEVEL          | DTM5K T    | <u> </u> |              |               | Force Range         |   |
| PINL1          | 11              | Cisable        | DTM5K T    |          | VOL 0.00     | ov            | Force Value 0.000 V | - |
| P2N22          | 12              | LOAD           | DTMSK T:   | _        |              |               | Meas Range ICuA     | - |
| PINEJ          | 13              | CIFF           | DTMEK T    |          | 10L 0.00     | DA            |                     | _ |
| P2NL4          | 34              | TEEM           | Cisable    | _        | VREF 0.00    | - ×           | Limit Low D.000 A   |   |
| PINEs          | 41              | CFF            | CTMSK TT   |          |              | *             | Junit High D.000 A  |   |
| PIN2s          | 42              | MUX            | Cisable    | _        | IOH 0.00     | DA A          | Clamp Low -         | - |
| P2N0s          | 43              | OFF            | CTMSK TO   |          |              |               |                     |   |
| PINAs          | 44              |                | Cintal     | _        |              |               | Clamp High          |   |
|                |                 |                | 1          |          |              |               | Strobe Time 0.000 S |   |

#### TCM tool



#### System Control



Scope Tool

CDECIEICATIO

# Model 3650-EX

## Chroma 3650-EX brings you the most cost-effective SoC tester

Chroma 3650-EX is specifically designed for high-throughput and high parallel test capabilities to provide the most cost-effective solution for fabless, IDM and testing houses. With the full functions of test capability, high accuracy, powerful software tools and excellent reliability, 3650-EX is ideal for testing consumer devices, high-performance microcontrollers, analog devices and SoC devices.

#### From design to production

Chroma 3650-EX build-in MRX solution can support PXI instrumentation which can provide users wider coverage to different kind of applications. For those users use PXI instrumentation for their design validation and verification, they can move PXI instrumentation directly to 3650-EX for production. There will be less uncorrelated issues happened on design stage and production by using the same PXI instrumentation. Chroma 3650-EX had successfully integrated several PXI solutions like Audio, Video and RF applications not only on hardware integration, also for build-in libraries and tools in software to help users control PXI instrumentation more easily and enable accelerated test program development, reducing product time to market.

| SPECIFICATIONS  |  |
|---|--|
| Model   | 3650-EX  |
| Digital IO Channels   | 1024 Channels  |
| Test Speed  | 50/100MHz (2/4 Edges), 200MHz (Mux)  |
| Multi-site Test Capability  | Maximum 512 sites  |
| Software / Programming language/  |  |
| Operating System  | CRISP / C++ / WINDOWS 7  |
| Logic Pin Card  | HDLPC  |
| IO Channels   | 64 / 128 CH per board  |
| Pattern Memory  | 32 / 64M vector Depth  |
| Drive VIL / VIH   | -1.5 ~ +6.4V/-1.4 ~ +6.5V  |
| Maximum Drive Current   | 50mA (static) / 100mA (dynamic)  |
| Comparator VOL / VOH  | -1.5 ~ +6.5V   |
| Comparator Modes  | Edge, Window   |
| EPA (Drive / IO / Compare)  | ±300ps / ±300ps / ±300ps   |
| Dynamic Load Current  | ±25mA  |
|   | 4 channels per 64 IO / 0V ~ 15V, maximum 64 CH per   |
| High Voltage Driver   | system   |
| Timing Edges  | 6 (2 Drive, 2 Drive & IO, 2 Compare)   |
| Rate / Edge resolution  | 125ps / 62.5ps   |
| Utility Pin Control   | 8 utility bits per 64 IO, maximum 128 bits per system  |
| SCAN  | 1/2/4/8/16/32 scan chains, maximum 4G depth  |
| Algorithm Pattern Generator (ALPG)  | X = 16, Y = 16 / D = 16  |
| Precision Measurement Unit  | PMU  |
| Number of channels  | 2 CH per 64 IO / maximum 32 CH per system  |
| Voltage Range   | ±2.5V, ±8V, ±16V   |
| Current Range   | ±800nA ~ ±250mA  |
| Current hange   |  |
| Device Power Supply   | AUUH   |
| Device Power Supply   | HDDPS  |
| Number of channels  | 48 CH per board / maximum 96 CH per system   |
| Number of channels<br>Voltage Range   | 48 CH per board / maximum 96 CH per system<br>±6V, ±12V  |
| Number of channels<br>Voltage Range<br>Maximum Output Current   | 48 CH per board / maximum 96 CH per system           ±6V, ±12V           1A / 6V, 500mA / 12V  |
| Number of channels<br>Voltage Range<br>Maximum Output Current<br>Current Gang Channels  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A  |
| Number of channels<br>Voltage Range<br>Maximum Output Current<br>Current Gang Channels<br><b>Mixed-signal options</b>   | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA   |
| Number of channels<br>Voltage Range<br>Maximum Output Current<br>Current Gang Channels<br><b>Mixed-signal options</b><br>Number of channels   | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system  |
| Number of channels<br>Voltage Range<br>Maximum Output Current<br>Current Gang Channels<br><b>Mixed-signal options</b><br>Number of channels<br>Sampling Rate  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz  |
| Number of channels<br>Voltage Range<br>Maximum Output Current<br>Current Gang Channels<br><b>Mixed-signal options</b><br>Number of channels<br>Sampling Rate<br>Resolution  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options   | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Voltage / Current Range  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Current Range         Current Ganged Channels  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options   | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Voltage / Current Range  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PV1100         2~8 CH per board         ±100V / ±2A, ±50V / ±4A   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / Current Range         Current Ganged Channels  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board         ±100V / ±2A , ±50V / ±4A         x2 ~ x8, 32A maximum   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / DVM / TMU         Analog Options         Number of channels         Voltage / DVM / TMU         Analog Options         Number of channels         Voltage / DVM / TMU                              | <ul> <li>48 CH per board / maximum 96 CH per system</li> <li>±6V, ±12V</li> <li>1A / 6V, 500mA / 12V</li> <li>x2 ~ x6, Maximum 6A</li> <li>HDADDA</li> <li>32 CH per board / maximum 64 CH per system</li> <li>500 KHz</li> <li>16 Bit</li> <li>±2.5V / ±4.5V / ±9V</li> <li>V145</li> <li>8~32 CH per board</li> <li>±45V / ±100mA</li> <li>x2 ~ x8, 800mA maximum</li> <li>1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU</li> <li>PV1100</li> <li>2~8 CH per board</li> <li>±100V / ±2A , ±50V / ±4A</li> <li>x2 ~ x8, 32A maximum</li> <li>2~8 CH AWG / 2~8 CH DIG / 2~8 CH DVM / 2~8 CH TMU</li> </ul>   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / Current Range         Current Ganged Channels         Voltage / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / DIG / DVM / TMU         Mixed-signal and RF Box              | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board         ±100V / ±2A , ±50V / ±4A         x2 ~ x8, 32A maximum         2~8 CH AWG / 2~8 CH DVM / 2~8 CH TMU  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / DVM / TMU         Analog Options         Number of channels         Voltage / DVM / TMU         Mixed-signal and RF Box         Number of slots  | <ul> <li>48 CH per board / maximum 96 CH per system</li> <li>±6V, ±12V</li> <li>1A / 6V, 500mA / 12V</li> <li>x2 ~ x6, Maximum 6A</li> <li>HDADDA</li> <li>32 CH per board / maximum 64 CH per system</li> <li>500 KHz</li> <li>16 Bit</li> <li>±2.5V / ±4.5V / ±9V</li> <li>V145</li> <li>8~32 CH per board</li> <li>±45V / ±100mA</li> <li>x2 ~ x8, 800mA maximum</li> <li>1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU</li> <li>PV1100</li> <li>2~8 CH per board</li> <li>±100V / ±2A , ±50V / ±4A</li> <li>x2 ~ x8, 32A maximum</li> <li>2~8 CH AWG / 2~8 CH DIG / 2~8 CH DVM / 2~8 CH TMU</li> </ul>   |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / Current Range         Current Ganged Channels         Voltage / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / DIG / DVM / TMU         Mixed-signal and RF Box              | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board         ±100V / ±2A , ±50V / ±4A         x2 ~ x8, 32A maximum         2~8 CH AWG / 2~8 CH DVM / 2~8 CH TMU  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / Current Range         Current Ganged Channels         Voltage / DVM / TMU         Mixed-signal and RF Box         Number of slots         System and Dimension         Power consumption / Cooling | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board         ±100V / ±2A , ±50V / ±4A         x2 ~ x8, 32A maximum         2~8 CH AWG / 2~8 CH DVM / 2~8 CH TMU  |
| Number of channels         Voltage Range         Maximum Output Current         Current Gang Channels         Mixed-signal options         Number of channels         Sampling Rate         Resolution         Voltage Range         Analog Options         Number of channels         Voltage Range         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         AWG / DVM / TMU         Analog Options         Number of channels         Voltage / Current Range         Current Ganged Channels         Voltage / Current Range         Current Ganged Channels         Voltage / DVM / TMU         Mixed-signal and RF Box         Number of slots         System and Dimension                                     | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board         ±100V / ±2A , ±50V / ±4A         x2 ~ x8, 32A maximum         2~8 CH AWG / 2~8 CH DIG / 2~8 CH DVM / 2~8 CH TMU         MRX         18 PXI / PXIe compatible slots         Maximum 10.8KW / Forced air cooling         800 x 744 x 806 mm |
| Number of channels<br>Voltage Range<br>Maximum Output Current<br>Current Gang Channels<br><b>Mixed-signal options</b><br>Number of channels<br>Sampling Rate<br>Resolution<br>Voltage Range<br><b>Analog Options</b><br>Number of channels<br>Voltage / Current Range<br>Current Ganged Channels<br>AWG / DVM / TMU<br><b>Analog Options</b><br>Number of channels<br>Voltage / Current Range<br>Current Ganged Channels<br>Voltage / Current Range<br>Current Ganged Channels<br>AWG / DIG / DVM / TMU<br><b>Mixed-signal and RF Box</b><br>Number of slots<br><b>System and Dimension</b><br>Power consumption / Cooling  | 48 CH per board / maximum 96 CH per system         ±6V, ±12V         1A / 6V, 500mA / 12V         x2 ~ x6, Maximum 6A         HDADDA         32 CH per board / maximum 64 CH per system         500 KHz         16 Bit         ±2.5V / ±4.5V / ±9V         VI45         8~32 CH per board         ±45V / ±100mA         x2 ~ x8, 800mA maximum         1~4 CH AWG / 1~4 CH DVM / 8~32 CH TMU         PVI100         2~8 CH per board         ±100V / ±2A , ±50V / ±4A         x2 ~ x8, 32A maximum         2~8 CH AWG / 2~8 CH DIG / 2~8 CH DVM / 2~8 CH TMU         MRX         18 PXI / PXIe compatible slots         Maximum 10.8KW / Forced air cooling                            |

## **Programmable Pin Electronics Module**

## Model 36010



### **KEY FEATURES**

- Standard PXI/PXIe-Hybrid compatible Bus type
- 100MHz maximum data rate
- 8 channels with per-pin, per-cycle
- bidirectional control
- Scalable architecture to provide up to 64-pin
- 32M sequence command memory
- More than 17 pattern sequence commands
- Per-pin architecture
- 32M vector memory per pin
- 32 sets of clock and waveform per pin
- Waveforms changes on-the-fly
- Programmable tri-level driver in 610uV resolution
- One high voltage driver per board
- Per-channel PMU
- Per-channel timing measurement unit
- Support scan pattern function
- Windows 2000/XP operating system
- Support LabView and LabWindows
- Proprietary software tools option

### **APPLICATIONS**

SPECIFICATIONS

**VOL/VOH Range** 

VOL/VOH Accuracy

Model

- Logic and mixed signal validation and test
- Digital pattern generator and vector capture
- Consumer IC and electronics test
- Logic test subsystem for DC and RF ATE

The 36010 is a 100MHz programmable pin electronic module designed for characterizing, validating and testing digital and mixed signal IC or electronics. Each module consists of a Sequence Pattern Generator and Logic Pin Electronics Card containing 8 channels. The 36010 module is expandable to provide up to 64 channels hardware resource for various purposes. Besides, based on the per-pin architecture, each channel is equipped with 32M vector memory, 32 sets of clocks, 32 sets of waveforms and one PMU channel. It provides fast and accurate testing, with same performance and features as other stand ATE equipment.

### **Sequence Pattern Generator**

The Sequence Pattern Generator of the 36010 module provides more than 17 sequence commands including "jump", "match", "loop", "repeat" and etc. to control the flow of pattern execution. It equips with 32M sequence command memory, which allows each vector to has its own sequence command to control the flow of pattern execution flexibly. Besides, each Sequence Pattern Generator can support up to 8 Logic Pin Electronics Cards, which means it can support up to 64 I/O channels and performs testing on 8 DUT simultaneously.

### **Logic Pin Electronics Card**

In each Logic Pin Electronics Card, it adopts Chroma® PINF ICs on it to achieve high timing accuracy and flexible waveform output functions. The per-pin timing generator provides 32 sets of clock containing 6 programmable edges. As for the per-pin waveform generator, it provides each digital I/O channel 32 sets of programmable waveform with the change-one-the-fly feature. In

the analog function, the Logic Pin Electronics card has the tri-level driver and comparator with 610uV programmable resolution. It also equips with active load, per-pin PMU and high voltage driver functions. Moreover, the 36010 supports scan pattern function for scan test.

### **Proprietary Software, CRISP**

In addition to support the LabView and LabWindows environments, Chroma® also provides the proprietary software option, CRISP. To cover the various requirements for the IC debugging, CRISP contains lots of software modules. Running on the Microsoft Windows XP® operation system and using C++ as the test program language, CRISP provides users the flexible, easy-to-use and fast-runtime GUI software to meet the various demands. The project IDE tool makes it easy to create the test program quickly. In the test program debugging stage, CRISP provides the suite of debugging software tools for user, which includes Plan Debugger, Datalog, Waveform, Scope, SHMOO, Pin Margin, Wafer Map, Summary, Histogram, STDF, Test Condition Monitor, Pattern Editor, and so on.

### **ORDERING INFORMATION**

36010: Programmable Pin Electronics Card A360100 : Sequence Pattern Generator A360101 : Load Board Test Fixture A360102 : 250W/48V DC Power Supply **Universal Load Board CRISP System Software** 

Universal Load Board

Load Board Test Fixture

Photovoltaic Test

Automated

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| Test Rate                             | 50/100MHz                   |  |
|---------------------------------------|-----------------------------|--|
| Channels Per Board                    | 8 (Scalable to 64 channels) |  |
| Vector Depth                          | 32M                         |  |
| Sequence Control Memory               | 32M                         |  |
| Number of Sequence Control<br>Command | 17                          |  |
| Parallel test capability              | 8                           |  |
| Timing Generator Per Pin              |                             |  |
| No. of Edgas                          | 6 edges / pin (2 Driver,    |  |
| No. of Edges                          | 2 Driver & I/O, 2 Strobe)   |  |
| No. of Timing Sets                    | 32 sets / pin               |  |
| Rate / Edge Setting Resolution        | 125ps / 62.5ps              |  |
| Rate Setting Range                    | 20nS → 1mS                  |  |
| Waveform Generator Per Pin            |                             |  |
| No. of Waveform Sets                  | 32 sets / pin               |  |
| Driver                                |                             |  |
| VIL/VIH Range                         | -1.5V~+5.9V/-1.4V~+6V       |  |
| VIL/VIH Accuracy                      | ±5mV@VIH ≧ VIL+200mV        |  |
| Output Current (Static/Dynamic)       | ±50mV/±100mA                |  |
| Output Impedance                      | 50±5Ω                       |  |
| Comparator                            |                             |  |
|                                       | 1                           |  |

36010

| Programmable Load      |                          |
|------------------------|--------------------------|
| IOL/IOH Range          | ±12mA                    |
| IOL/IOH Accuracy       | ±25uA                    |
| VREF Setting Range     | -1.5V ~ +6V              |
| VREF Accuracy          | ±50mV                    |
| High Voltage Driver    |                          |
| HV Channel             | 1 HV channels / board    |
| VIL/VIH Range          | 0V ~ +13.5V              |
| VIL/VIH Accuracy       | ±20mV                    |
| VIL/VIH Output Current | ±60mA                    |
| Scan Chain             |                          |
| Chain number / LPC     | 1/2/4                    |
| Size per chain         | 256M/128M/64M            |
| PPMU                   |                          |
| Channel Number         | 1 channel / 1 pin        |
| Voltage Force Range    | -1.5V ~ +6V              |
| Current Measured Range | 32mA/2mA/200µA/20µA/2µA  |
| Current Forced Range   | 32mA/2mA/200µA/20µA/2µA  |
| Voltage Measured Range | -1.5V ~ +6V              |
| Power and Dimensions   |                          |
| Power Consumption      | 25W per Slot             |
| Size                   | PXI 3U Standard Board    |
| JILC                   | (Extendable)             |
| Cooling System         | Standard PXI Chassis Fan |
| cooling system         | (Forced Air Cooling)     |

-1.5V ~ +6V

 $\pm 15 mV$ 

## Four-quadrant DUT Power Supply

## Model 36020



### **KEY FEATURES**

- 4 channels in a PXI/PXIe-Hybrid compatible Bus type
- +5V/-2V and +10V/-2V force ranges
- 16-bit voltage force resolution
- 18-bit current measurement resolution
- 6 selectable ranges from 5uA to 250mA for current measurement
- Programmable current clamp function
- Ganged function available for larger current
- Board-to-board isolation
- Windows 2000/XP operating system
- Support LabView and LabWindows
- Proprietary software tools for data analysis

#### **APPLICATIONS**

- Logic and mixed signal validation and test
- Consumer IC and electronics test
- DUT Power Supply

The 36020 is a four-quadrant programmable DUT power supply in a single-slot 3U PXI module. Each 36020 features 4 channels with the ability to source voltage and measure current. There are two selectable voltage ranges, +5V/-2V and +10V/-2V, with 16-bit resolution for programming the voltage output. In order to provide better accuracy, 36020 provides six selectable current ranges including  $\pm 5 \,\mu$  A,  $\pm 25 \,\mu$  A,  $\pm 250 \,\mu$  A,  $\pm$  2.5mA,  $\pm$  25mA and  $\pm$  250mA with 18-bit resolution for the current measurement functionality. Moreover, the board-to-board isolation design makes it possible to source the larger voltage than 10V by the series connection with multiple 36020 modules. The versatile supply rails and high accuracy make 36020 an excellent general-purpose, four-guadrant power supply for design validation and manufacturing test application. Especially, the extraordinary accuracy in the small current measurement makes the 36020 very suitable for semiconductor IC test.

### Power Supply with Precision Source and Measurement Capability

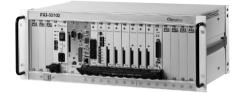
The 36020 uses a combination of switching and linear regulation to provide the excellent voltage source and accuracy. It has the ability to source voltage from each of its four outputs. It can be programmed in 113  $\mu$  V steps on the +5V/-2V range and 189  $\mu$  V steps on the +10V/-2V channels. As a current measure unit, it can measure in minimum 47.6pA resolution on each channel in the  $\pm 5 \mu$  A current range. You can use this impressive level of current resolution in many power supply applications.

### **Proprietary Software, CRISP**

In addition to support the LabView and LabWindows environment, Chroma<sup>®</sup> provides the front panel tool of the 36020 for users to quickly troubleshoot or debug. Users can monitor or refer the setting of the 36020 through this front panel tool. Besides, Chroma® also provides the proprietary software option, CRISP, for the 36020 to meet the demands of users for various purposes. Based on Microsoft Windows XP<sup>®</sup> operation system and C++ programming language, CRISP provides the powerful, easy-to-use, intuitive, and fast-runtime GUI tools for users. For the test debugging and data analyzing purposes, CRISP provides users the abundant software modules for the 36020. including Datalog, SHMOO, Summary, Histogram, STDF and Test Condition Monitor.

### **ORDERING INFORMATION**

36020 : Four-quadrant DUT Power Supply CRISP System Software



| SPECIFICATIONS              |                 |  |
|-----------------------------|-----------------|--|
| Model                       |                 | 36020  |
| Input                       |                 | PXI Internal Power   |
| Channel Number              |                 | 4  |
| Voltage Source              |                 |  |
| Range                       |                 | VR1:+10v/-2v   |
| naliye                      |                 | VR2: +5v/-2v   |
| Resolution                  |                 | 16bits   |
| Accuracy                    |                 | ± 0.1%+4.64mV  |
| Noise                       |                 | 3mVrms   |
| <b>Current Measurem</b>     | ent             |  |
| Range                       |                 | $\pm$ 5µA, $\pm$ 25µA, $\pm$ 250µA, $\pm$ 2.5mA, $\pm$ 25mA, $\pm$ 250mA |
| Resolution                  |                 | 18bits   |
|                             | 250mA           | ± 0.2%+200μA   |
|                             | 25mA            | ± 0.15%+20μA   |
| Accuracy                    | 2.5mA           | ± 0.15%+2μA  |
| Accuracy                    | 250µA           | ± 0.15%+200nA+1nA/V  |
|                             | 25μΑ            | ± 0.15%+150nA+1nA/V  |
|                             | 5µA range       | ± 0.15%+50nA+1nA/V   |
| Slew Rate                   |                 | 5v/25µs  |
| Load Regulation             |                 | 2mV  |
| Load Transient              |                 |  |
| Time Response               |                 | 100µs  |
| Voltage Response            |                 | 50mv   |
| <b>Overshoot/Unders</b>     | hoot            | <3%  |
| Clamp Flag Response         |                 | 100µs  |
| Clamp Resolution            |                 | 10bits   |
| Protection Function         |                 | Short current limit  |
| Protection Function         | n / Alarin Flag | Clamp alarm flag   |
| Max Stable Load Capacitance |                 | 100µF  |

## Full Range Active Thermal Control Handler Model 3110-FT



#### **KEY FEATURES**

- Temperature Test from -40~125°C
- Final Test
- 3x3 mm~45x45 mm Package
- Contact Force Control 1~10 kg (Optional)
- Up to 4 Output Trays
- Remote Control Operation
- Yield Monitor
- Intelligent Auto Retest & Auto Retry
- Real-time Tray Status

Ideal for characterization and test development, the Chroma 3110-FT is an innovative pick & place system for IC testing in Final Test. The system is capable of handling a vast variety of device types and sizes ranging from 3x3 mm to 45x45 mm. To further increase productivity, the 3110-FT offers an optional remote control function allowing operation of the handler from any location with an internet connection. Equipped with 2 auto output tray stacks and 2 manual output trays, the 3110-FT will maximize the loading and unloading capacity to save cost and time all within a 1.4 m<sup>2</sup> floor space.

The 3110-FT can be configured to support virtually any industry standard communication interface and provide different docking options for various testers. It is also capable of supporting thermal test environments from -40°C to 125°C which will insure the durability of the devices. With a user-friendly graphic interface and quick device change setup, changeover is short and easy further increasing flexibility and productivity.

| SPECIFICATIONS     |  |
|--------------------|--|
| Model              | 3110-FT  |
| Dimensions (WxDxH) | 1000 mm x 1350 mm x 1900 mm (signal tower excluded)            |
| Weight             | 900 kg   |
|                    | Power : AC200V, Single Phase, 50/60Hz, 8.8 KVA Max.            |
| Facility           | Compressed Air : 0.5 MPa or higher (dray and clean air)        |
|                    | Flow Rate : 800 L/min, constant supply                         |
|                    | Type : QFP, SOP, TSSOP, QFN, BGA                               |
| Applicable Davice  | Package Size : 3x3 mm to 45x45 mm                              |
| Applicable Device  | Package Height : 0.5 mm to 5 mm                                |
|                    | Lead / Ball pitch : 0.5 mm / 0.4 mm and above                  |
| Category           | 4 categories (2 auto, 2 manual)                                |
| Contact Method     | Direct Contact / Drop and Press                                |
| Contract Former    | 50 kgf (standard)  |
| Contact Force      | 1 to 10 kgf, ±10% (optional)                                   |
| Tomporature Dange  | -40~125°C (contact head accuracy ±2°C,                         |
| Temperature Range  | Pre-soak and Post-recovery buffer accuracy $\pm 10^{\circ}$ C) |
| Rotator            | ±90°   |
| Interface          | Standard : RS-232,TCP/IP                                       |
|                    | Option : GPIB, TTL   |
| Index Time         | 6 sec. (Excluding tester communication time)                   |
| Jam Rate           | 1/3,000  |







Rotator



Pre-soak and Post-recovery

Binning

### **ORDERING INFORMATION**

3110-FT : Full Range Active Thermal Control Handler

Optical

/ Test &

### Quad-site FT Test Handler

## Model 3160/3160A



### **KEY FEATURES**

- 9Kpcs throughput
- Programmable pitch probes
- Side mount available
- Air damper buffer to reduce contact force impact
- Intelligent shuttle IC leftover check
- Yield monitor (individual contact head)
- Universal Change kits
- ESD enhanced
- In line 1x4 flexible DUT configuration (Model 3160)
- In line 1x4 & matrix 2x2 flexible DUT configuration (Model 3160A)
- Auto empty (option) (Model 3160A)
- Active thermal control cystem (cption) (Model 3160A)
- Motor arm Z (Model 3160A)
- Side knock cylinder (Model 3160A)

The Chroma 3160/3160-A Handler is productive pick & place system for high volume multi-site IC testing. Saving floor space, time and cost, the 3160/3160-A can increase production productivity and efficiency with its innovative design. The system is configurable for Single, Dual or Quad test sites and can be upgraded to provide an Active Thermal Control (ATC) System to test the DUT up to 150°C.

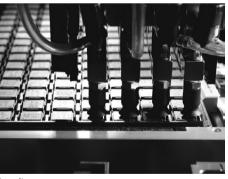
The Chroma 3160/3160-A is also capable of handling various package sizes and types then bins them according to customer specified test results. The system has a reliable handling mechanism, is compatible with standard Conversion Kits and has a streamlined automation sequence, which results in high throughput with low jam rate. Its precisely adjustable contact force, fine alignment positioning and various device sensors also reduces unexpected device damage and helps extend test socket lifetime while maintaining or increasing production yields.

| SPECIFICATIONS                |   |   |  |
|-------------------------------|---|---|--|
| Model                         | 3160  | 3160-A  |  |
| Dimension (WxDxH)             | 1700 mm x 1300 mm x 2000 mm   | 1800 mm x 1380 mm x 2050 mm   |  |
| Weight                        | Approx. 900 kg  | Approx. 1200 kg   |  |
| Facility                      | Power : AC220, 50 / 60Hz Single Phase, 10KVA Max.<br>Compressed Air : 0.5MPa or more (dry & clean air), Consumption 120I/min,                             |   |  |
|                               | constant supply   |   |  |
| Applicable Device             | Package Carried on Type : BGA, QFP, CSP,<br>Package Size : 3 mm x 3 mm to 50 mm x 5   |   |  |
| Contact Mode                  | Direct Contact / Drop and Press   |   |  |
| Interface                     | Standard TTL<br>Option GPIB, RS232  | Standard TTLx2 & GPIBx1<br>Option RS232, TCPIP  |  |
| Multiple Site                 | 4 sites (In line 1 x 4 pitch X =40mm)   | 4 sites : support both in-line type and<br>matrix type<br>In line 1 x 4 pitch X = 40mm / 57.15mm /<br>60mm<br>Matrix 2 x 2 pitch XY = 57.15 x 63.5mm /<br>80 x 60mm |  |
| Contact Area                  | Test Site : Single, Dual, Quad sites (in-Line)<br>Test Head Area : 550 mm (from socket center)<br>Height : 1000 mm (900/1, 100mm option)                  |   |  |
| Index Time                    | 0.4 sec (excluding tester communication time)   | 0.38 sec (excluding tester<br>communication time)   |  |
| Jam Rate                      | 1/8000  | 1/10000   |  |
| Applicable Tray               | JEDEC   |   |  |
| Category                      | 6 categories (3 auto, 3 manual)   |   |  |
| Binning 16 bin signal for TTL |   |   |  |
| Contact Force                 | 50 kgf (accuracy $\pm$ 1kgf)  | 80 kgf (accuracy $\pm$ 1kgf)  |  |
| Temperature                   | Operating Mode : Ambient  |   |  |
| High Temperature<br>(Option)  | Operating Mode : $40^{\circ}$ C ~ $150^{\circ}$ C (Heating Time : within 30 min.)<br>Accuracy : Contact Head $\pm$ 3°C, Pre-heater $\pm$ 5°C (90°C~130°C) |   |  |
| SOCKET CCD (Option)           |   | CCD checks socket and prevents double stack of parts in the socket  |  |

Note \*: Optional temperature up to 135°C/150°C

### ORDERING INFORMATION

**3160 :** Quad-site FT Test Handler **3160A :** Quad-site FT Test Handler



Loading



UnLoading



Test One Shut



### Octal-site FT Test Handler

## Model 3180



#### **KEY FEATURES**

- Up to x8 Parallel Test Sites
- Up to 9000 UPH
- Flexible Test Site Configuration
- Dampened Contact Force
- Contact Force Auto Learning
- 3x3 mm ~ 50x50 mm Packages
- Temperature Test from Ambient ~ 150 °C
- Intelligent Auto Retest & Auto Retry
- Yield Monitor

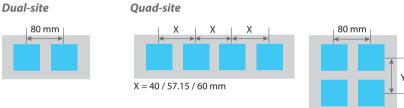
The Chroma 3180 Handler is a productive pick & place system for high volume multi-site IC testing. Saving floor space, time and cost, the 3180 can increase production productivity and efficiency with its innovative design. The system is configurable for single, dual, quad or octal test sites and can be upgraded to test the DUT up to 150  $^{\circ}$ C.

The Chroma 3180 is also capable of handling various package sizes and types then bins them according to customer specified test results. The system has a reliable handling mechanism, is compatible with standard Conversion Kits and has a streamlined automation sequence, which results in high throughput with low jam rate. Its precisely adjustable contact force, fine alignment positioning and various device sensors also reduces unexpected device damage and helps extend test socket lifetime while maintaining or increasing production yields.

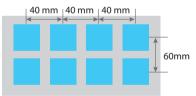
| SPECIFICATIONS            |  |  |
|---------------------------|--|--|
| Model                     | 3180   |  |
| Dimension (WxDxH)         | 1860 mm x 1380 mm x 2050 mm  |  |
| Weight                    | Approx. 1300 kg  |  |
| Facility                  | Power : AC220, 50/60 Hz Single-Phase, 10 KVA Max.<br>Compressed Air : 0.5 MPa or higher (dry and clean air)<br>Flow Rate : 120 L/min., constant supply |  |
| Applicable Device         | Type : BGA, QFP, CSP, QFN, Flip chip, TSOP, etc.<br>Package Size : 3 mm x 3 mm to 50 mm x 50 mm *  |  |
| Contact Mode              | Direct contact / Drop and Press  |  |
| Interface                 | Standard : TTL, GPIB<br>Option : RS232, TCPIP  |  |
| Multiple Site             | Octal Sites (4x2)<br>Matrix Quad Sites (2x2)<br>In-line Quad Sites (4x1)   |  |
| Contact Area              | Test Head Area : 600 mm (from socket center)<br>Docking Height : 1100 mm (1000/1200mm option)  |  |
| Index Time                | 0.4 sec (excluding tester communication time)  |  |
| Jam Rate                  | 1/10,000   |  |
| Category                  | 6 categories (3 auto, 3 manual)  |  |
| Contact Force             | Up to 120 kgf  |  |
| Mounting Type             | Direct mount / Side Mount  |  |
| Applicable Tray           | JEDEC  |  |
| Throughout (Max.)         | Up to 9000 UPH (Illustrated by BGA 4x6, 20x37 tray matrix)   |  |
| High Temperature (Option) | Operating Range : ~ 150 °C (Heating time < 30 min.)<br>Accuracy : Contact Head $\pm$ 3 °C, Pre-heater $\pm$ 5 °C                                       |  |

\* Maximum package size may vary due to test site pitch

### **TEST SITE CONFIGURATION**



### Octal-site



### KIT CONFIGURATION



Quick Fit Kit (standard)

### ORDERING INFORMATION

3180 : Octal-site FT Test Handler

Y = 60 / 36 / 63.5 mm

lat Panel

Photovoltaic Test & Automation

Automated Optical Inspection

Electronics

Battery Test &

Component

Passive

PXI Test & Measurement

### **RF** Solution Integrated Handler

## Model 3240-Q



### **KEY FEATURES**

- Cost-effective Integrated RF Solution
- Customized RF Isolation Chamber with Integrated Tester Docking
- Up to 120 mm Test Site Pitch
- Up to x8 Parallel Test Site
- 3x3 mm ~ 45x45 mm Package
- Precise Positioning
- Compatible with JEDEC and EIAJ tray

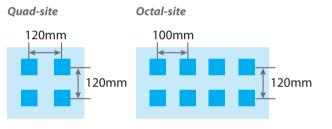
The Chroma 3240-Q is a unique and innovative handler with integration of RF/Wireless isolation chamber. The system is configured for up to octalsite with individual isolation for true parallel test. With a streamlined automation sequence, precise Pick & Place system, flexible test site configuration, high throughput and low jam rate, the 3240-Q is ideal for RF/Wireless production test.

The Chroma 3240-Q is also capable of handling various package sizes and types, accurately binning according to customer specified test results. With automatic Input/Output tray stacks, the 3240-Q can accommodate both JEDEC and EIAJ tray standards. Optional temperature control extends the test capability to provide high temperature testing up to 150°C.



| SPECIFICATIONS               |   |  |
|------------------------------|---|--|
| Model                        | 3240-Q  |  |
| Dimension (WxDxH)            | 1360 mm x 1390 mm x 1930 mm   |  |
| Weight                       | 900kg   |  |
| Facility                     | Power : AC200V, Single phase 50/60Hz, 10 KVA Max.<br>Compressed Air : 0.5 MPa or higher (dray and clean air)<br>Flow Rate : 150 L/min, constant supply                |  |
| Applicable Device            | Type : CSP, BGA, Gull Wing Package<br>Package Size : 3 mm x 3 mm to 40 mm x 40 mm<br>Package Height : 0.5 mm to 5 mm<br>Lead / Ball pitch : 0.5 mm / 0.4 mm and above |  |
| Category                     | 3 categories (1 auto, 2 manual)   |  |
| Applicable Tray              | JEDEC or EIAJ   |  |
| Index Time                   | 4 sec.  |  |
| Contact Method               | Direct Contact / Drop and Press   |  |
| Contact Force                | Up to $50 \pm 1$ kgf  |  |
| Test Site Configuration      | 4 sites, 2x2, Pitch X = 120 mm, Y = 120mm<br>8 sites, 4x2, Pitch X = 100 mm, Y = 120mm  |  |
| PCB Same Site Isolation      | -63dB   |  |
| PCB Different Site Isolation | -91.5dB   |  |
| Chamber Far Field Isolation  | 2.4GHz : -80dB @ Distance >250mm (=2*λ2.4GHz)   |  |
| Jam Rate                     | 1/5,000   |  |
| Interface                    | GPIB  |  |
| Hot Temperature (Option)     | Operating Range : Ambient ~ 125°C (Heating Time < within 30 min.)<br>Accuracy : Contact Head $\pm$ 3°C, Pre-heater $\pm$ 5°C  |  |

### **TEST SITE CONFIGURATION**

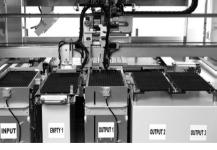


#### **RF CHAMBER ILLUSTRATIONS**





Bottom Cover



Loading



Pre-alignment

#### ORDERING INFORMATION

#### 3240-Q: RF Solution Integrated Handler

## Hybrid Single Site Test Handler

## Model 3110



### **KEY FEATURES**

- FT + SLT Handler Two In One
- Perfect for Device Engineering Characterization Gathering and Analysis
- Auto Tray Load/unload & Device Sorting capability
- Without socket damage issue
- Air damper for good contact balance
- Shuttle remain IC check function
- Camera for real time system monitoring
- Optional Tri-temp IC test function (-55°C ~ 150°C)
- High power cooling function (option)
- Diskless download function (option)

Chroma 3110 is a sigle site pick & place IC handler which supports various types of package such as QFP, QFN, TSOP, BGA,  $\mu$  BGA and CSP, etc. The handler uses P & P technology to pick up devices from JEDEC trays, move them to the test site. The 3110 consists system level tests that are designed to fully exercise programs as a whole and check all integrated elements function properly. It is capable to handle tri-temperature test environment since ambient to thermal or low temperature.

In addition to the capability of handling 3x3mm to 55x55mm devices, the machine is equipped with 1 auto stacks and 2 manual bin plates to maximize the loading and unloading capacity. It features a user-friendly graphic user interface based on Windows system and also provides interfaces for docking with various testers.

### **ORDERING INFORMATION**

3110: Hybrid Single Site Test Handler
3100-TT: Tri-temp Control (option)
3100-A: Active Thermal Control Module (option)
3100-P: Unity Passive Thermal Control (option)
3100-C: Cooling Pipe (option)

| Chroma<br>Thermal<br>Control<br>Solutions | Products | Capability                                      | Т      |
|---|----------|---|--------|
| Active                                    | 3100-TT  | -55°C ~ 150 °C ± 2°C                            | H      |
| Thermal<br>Control<br>Solution            | 3100-A   | Ambient ~ 135 $^{\circ}$ C $\pm$ 2 $^{\circ}$ C | V<br>C |
| Passive<br>Cooling<br>System              | 3100-P   | ~ 85°C<br>(< 300W Heat Dissipation)             | C      |
|   | 3100-C   | ~ 85°C<br>(<125W Heat Dissipation)              | C      |
| Solution<br>Passive<br>Cooling            | 3100-P   | ~ 85°C<br>(< 300W Heat Dissipation)<br>~ 85°C   |        |

| SPECIFICATIONS            |  |  |  |
|---------------------------|--|--|--|
| Model                     | 3110   |  |  |
| Dimensions (WxDxH)        | 900 mm x 1250 mm x 1800 mm (Signal Tower excluded)   |  |  |
| Weight                    | 75 0 kg  |  |  |
|                           | Power : AC 220V, 50/60 Hz Single-phase   |  |  |
| E. allin.                 | Maximum Power Consumption : 3.0KVA Max   |  |  |
| Facility                  | Controller Circuit: 1.0 KVA Max.   |  |  |
|                           | Heater Circuit : 2.0 KVA (Option)  |  |  |
| Compressed Air            | Dry Air of 5.0 kg/cm2 ( 0.49 Mpa ) or higher, constant supply  |  |  |
|                           | Type : BGA series, $\mu$ BGA, QFP series, QFN, Flip-Chip, TSOP   |  |  |
| Angelies ble Device       | Package Size : 3 mm x 3 mm to 55 mm x 55 mm  |  |  |
| Applicable Device         | Depth : 0.5 mm to 5 mm   |  |  |
|                           | Lead / Ball pitch : 0.4 mm / 0.5 mm and above  |  |  |
| Interface                 | Standard : RS-232,TCP/IP   |  |  |
| Interface                 | Option : GPIB and TTL  |  |  |
| Jam Rate                  | 1/3000   |  |  |
| Categories                | 4 Categories (128 bin signals for RS232)   |  |  |
| Contact Force             | 80 kgf (Accuracy $\pm$ 1kgf ), 125Kgf (Option)   |  |  |
| Temperature               | Operating Mode : Ambient   |  |  |
| Tri Temp Control (Option) | Temperature Range : $-40^{\circ}$ C ~ $135^{\circ}$ C $\pm 2^{\circ}$ C (-55 $^{\circ}$ C ~ 150 $^{\circ}$ C Option) |  |  |
| ATC Module (Option)       | Temperature Range : Ambient ~ $135^{\circ}C \pm 2^{\circ}C$ (150°C Option)   |  |  |
| Unity PTC (Option)        | Temperature Range : ~ 85 $^{\circ}$ C (up to 300W Heat Dissipation)  |  |  |
| Cooling Pipe (Option)     | Temperature Range : ~ 85 $^\circ$ C (up to 125W Heat Dissipation)  |  |  |
|                           | ECD function (Easy-edit communication define)  |  |  |
|                           | Single Movement Retest   |  |  |
| Advantage                 | Contact pick and place system  |  |  |
|                           | Yield control (Average yield of socket)  |  |  |
|                           | Continue Fail  |  |  |
|                           | Remote Control   |  |  |
| Ontion                    | Rotation ( $\pm$ 90 degree)  |  |  |
| Option                    | Auto Load / Unload : 1 input / 2 unload (with 2 manual unload)   |  |  |
|                           | Fixed Load / Unload : 1 input / 4 unload   |  |  |

### **Final Test Configuration**









3110 with tri-temp chamber & tester



3110 with module board

Configurations Standalone TEC Controller **Fest Plug Design** Dry Air Water Chamber Chiller Heat Exchanger+TEC (Peltier) Yes Yes Yes Yes Water Chiller Cooling+TEC (peltier) No Yes No Yes Closed-loop Liquid Cooling+TEC (peltier) No No No Yes Closed-loop Liquid Cooling No No No No Cooling Pipe No No No No

PXI Test & Gener easurement Purpos

/ Test &

External

Piping

Yes

Yes

No

No

No

### **Tabletop Single Site Test Handler**

## Model 3111



### **KEY FEATURES**

- 600 mm (W) x 565 mm (D) x 800 mm (H)
- JEDEC trays (2)
- IC packages: 5x5 mm to 45x45 mm
- Software configurable binning
- Air damper contact
- Optimizes IC force balance
- Maximize test socket lifetime
- Double stack protection
- Continuous automated re-test
- Real time system camera monitoring

The Chroma 3111 Tabletop Single Site Test Handler is an automated Pick & Place system ideal for engineering and test development of IC System Level Testing (SLT). The 3111 system is capable of handling a vast variety of device types and sizes ranging from 5x5mm to 45x45mm.

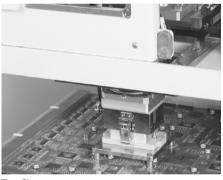
To maximize productivity, the 3111 offers a remote function allowing handler control from any distant location through an internet connection. Equipped with two software allocatable JEDEC trays, the 3111 maximizes the engineering test capability saving cost and time, all within a 60 cm<sup>2</sup> table space. A user-friendly graphic interface (Windows<sup>™</sup>) system provides a quick and easy device setup, change or changeover simplifying the process and increasing efficiency.



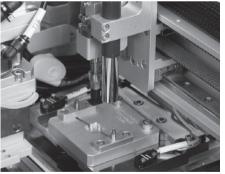
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| SPECIFICATIONS      |   |
|---------------------|---|
| Model               | 3111  |
| Dimension (WxDxH)   | 600 mm x 565mm x 800 mm (Signal Tower excluded)                         |
| Weight              | Net Weight 80 kg  |
| Facility            | Power : AC 220V-240V, 50Hz/60Hz, single-phase,2.3kva                    |
| Facility            | Dry Air of 5.0 kg/cm <sup>2</sup> (0.49 MPa) or higher, constant supply |
|                     | Type: BGA series, _BGA, QFP series, QFN, Flip-Chip, TSO                 |
| Device Type         | Package size : 5 mm x 5 mm to 45 mm x 45 mm                             |
| Device Type         | Thickness : 0.5 mm to 5 mm  |
|                     | Lead / Ball pitch : 0.4 mm / 0.5 mm and above                           |
| Test Site           | Single site   |
| Jam Rate            | 1/3000  |
| Tray Classification | 1 Category  |
| Tray                | JEDEC   |
| Binning             | 128 software bins   |
| Rotator             | $\pm$ 90 degree   |
| Contact Force       | 10 kgf - 50 kgf (±1kgf)   |
| Contact Mode        | Direct Contact / Drop and Press   |
| Tester Interface    | Standard : RS-232, TCP/IP   |
| rester intenace     | Option : GPIB   |
| Socket CCD (Option) | CCD checks socket to prevent double stack of parts in the socket        |

Note 1: 3111 alarm mail function is available by e-mail server setting



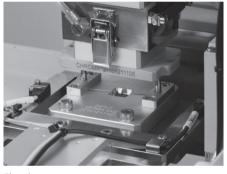




Positioning

### **ORDERING INFORMATION**

3111 : Tabletop Single Site Test Handler



Shuttle



Category

### Automatic System Function Tester

Model 3240



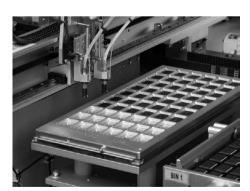
### **KEY FEATURES**

- Reliable high-speed pick & place handler
- Auto contact-force learning
- Gull wing package capability
- No socket damage
- Air damper for contact balance
- IC-in-socket protection
- NS-5000/6000 change kits compatible

Chroma 3240 is an innovative handler for high volume/multi-site IC testing at system level. It is capable of handling packages of various types including QFP, TQFP, BGA, PGA, etc. The handler uses pick and place technology to pick up devices from JEDEC trays, move them to the test site, then move them to the appropriate bin after test. It features a 90-degree device rotation which is required for various pin one orientations.

Chroma 3240 can test up to 4 devices in parallel at high temperature with ATC (Auto Temperature Cooling) ranging from  $50^{\circ}$ C to  $125^{\circ}$ C.

| SPECIFICATIONS          |   |  |  |
|-------------------------|---|--|--|
| Model                   | 3240  |  |  |
| Dimension (WxDxH)       | 1640 mm x 1190 mm x 1774 mm (Excluding Signal Tower)                            |  |  |
| Weight                  | Net Weight 800kg  |  |  |
| Facility                | Power : AC 220V , 50/60 Hz Single-phase   |  |  |
|                         | Maximum Power Consumption : 3.0 KVA Max   |  |  |
|                         | Controller Circuit : 3.0 KVA Max.   |  |  |
|                         | Heater Circuit : 1.0 KVAMax.  |  |  |
| Compressed Air          | Dry Air of 5.0 kg/cm <sup>2</sup> (0.49 Mpa) or higher constant supply          |  |  |
| Vacuum Source           | Built-Diaphragm Vacuum Pump : Pumping Volume 100 L/min                          |  |  |
| vacuum source           | Ultimate Pressure : 100 Torr Max.   |  |  |
|                         | Package Type :  |  |  |
|                         | BGA series , µGA, PGA, QFP series, CSP, BCC, QFN , Flip-Chip , TSOP             |  |  |
| Applicable Dovice       | Package size : 7 mm x 7 mm to 40 mm x 40 mm                                     |  |  |
| Applicable Device       | Depth : 0.9mm to 5mm  |  |  |
|                         | Lead / Ball pitch : 0.4mm / 0.5mm and above                                     |  |  |
|                         | Weight : 0.2g to 20g  |  |  |
| Multiple Testing Layout | 4 sites (Pitch 400 mm)  |  |  |
| Index Time              | 2.1 sec (Excluding test communication time) / One site cycle time : 3.2 Sec.    |  |  |
| Jam Rate                | 1/3000 pcs  |  |  |
|                         | Type :  |  |  |
|                         | Input / Empty Tray : 130 mm ~ 143 mm (D) by 310 mm ~ 330 mm (W)                 |  |  |
| Applicable Tray         | Output Tray : 135 mm ~ 150 mm (D) by 290 mm ~ 330 mm (W)                        |  |  |
| Applicable may          | Capacity :  |  |  |
|                         | Input / Empty Tray : Elevator with 210 mm stroke (JEDEC)                        |  |  |
|                         | Output Tray 1, 2, 3 : Elevator with 210 mm stroke (JEDEC)                       |  |  |
| Categories              | 3 Categories (Max. 128 bin signals with RS-232)                                 |  |  |
| Contact Area            | Test Site Pitch : 400mm   |  |  |
|                         | Test Module Dimensions : 400 mm x 400 mm  |  |  |
| Contact Force           | Max. 50 kgf ( Accuracy $\pm$ 1kgf )   |  |  |
| High Temperature        | Operating Mode : Room Temperature / High Temperature                            |  |  |
| (Option)                | Temperature Range : ~125°C (Heat-up time : Within 30 min)                       |  |  |
| ()                      | Accuracy : Pre-heater Buffer $\pm 5^{\circ}$ C , Contact Area $\pm 3^{\circ}$ C |  |  |
| Tester Interface        | Standard : TTL  |  |  |
|                         | Option : RS-232, GPIB   |  |  |
|                         | Tray map fit for producion analysis   |  |  |
|                         | Universal kit design  |  |  |
|                         | Change over time within 15 min.   |  |  |
|                         | ECD function (Easy -edit Communication Define) for various equipment            |  |  |
| Special Function        | Two Tray (Color tray) mode available  |  |  |
|                         | Continue Fail Alarm<br>Auto Z function  |  |  |
|                         | Yield Control (Average yield of socket)   |  |  |
|                         | Yield Monitor (Per contact head plug)   |  |  |
|                         | ATC (Auto Temperature Cooling) High Temperature Function                        |  |  |
|                         | Are (Auto remperature cooling) riigh remperature runction                       |  |  |



ORDERING INFORMATION

3240 : Automatic System Function Tester



acturing Turnkey Test &

## Automatic System Function Tester

SPECIFICATI Model Dimension (Weight



### **KEY FEATURES**

- Reliable high-speed pick & place handler
- Auto contact-force learning
- Gull wing package capability
- No socket damage
- Air damper for contact balance
- IC-in-socket protection
- Invention patent 190373, 190377, 1227324 & 125307
- Thermal Control Configurations
  - Tri Temp Control
  - Close-Loop Active Thermal Control
  - (ATC) Module
  - Unity PTC (Passive Thermal Control)

Chroma 3260 is an innovative handler for high volume/multi-site IC testing at system level. It is capable of handling packages for various types including QFP, TQFP, BGA, PGA, etc. The handler uses pick and place technology to pick up devices from JEDEC trays, move them to the test site, then move them to the appropriate bin after test.

Chroma 3260 can test up to 6 devices in parallel at high temperature with ATC (Auto Temperature Cooling) ranging from -40 $^\circ$ C to 125 $^\circ$ C.



| SPECIFICATIONS                   |   |  |  |  |  |
|----------------------------------|---|--|--|--|--|
| Model                            | 3260  |  |  |  |  |
| Dimension (WxDxH)                | 2570 mm x 1360  | mm x 1780 mm   |  |  |  |
| Weight                           | 1300 kg   |  |  |  |  |
| Facility                         | Power : AC 220, 50/60 Hz Single-Phase<br>Maximum Power Consumption : 6.0 KVA Max<br>Controller Circuit : 3.0 KVA Max<br>Heater Circuit : 3.0 KVA (Option)   |  |  |  |  |
| Compressed Air                   |   | cm <sup>2</sup> (0.49 Mpa) or higher, constant supply  |  |  |  |
| Vacuum Source                    | Build-in Diaphrag   | m Vacuum Pump: Pumping Volume : 100 L/min<br>2 : 100 Torr (-13.3 Kpa) Max.   |  |  |  |
| Applicable Device                | Outer dimension   | . $\mu$ BGA, Pga, QFP series, CSP, BCC, QFN, Flip-Chip, TSOP s: 4 mm x 4 mm to 45 mm x 45 mm 0.4 mm / 0.5 mm and above |  |  |  |
| Multiple Testing Layout          | 6 sites (Pitch 400  | mm)  |  |  |  |
| Index Time                       | 3.0 sec (excluding  | g test communication time)/ One site cycle time : 3.5 Sec  |  |  |  |
| Ram Rate                         | 1/5000 pcs  |  |  |  |  |
| Applicable Tray                  | JEDEC and EIAJ  |  |  |  |  |
| Categories                       | 4 categories (6 ca  | tegories for option)   |  |  |  |
| Contact Force                    | Max. 60 Kgf (accu   | rracy $\pm$ 1kgf) by servo motor (80 Kgf for Option)   |  |  |  |
| Soak Hot Temperature<br>(Option) | Operating Mode : Room Temperature / High Temperature<br>Temperature Range : 50°C to 150°C (Heat-up time: Within 30 min)<br>Accuracy : Pre-heater Buffer $\pm$ 5°C, Contact Area $\pm$ 3°C<br>Cooling Head : 10°C + 5°C  |  |  |  |  |
| Temperature<br>Control           | Operating Mode : Room Temperature / Cold TemperatureTemperature Range : room temperature ~ -55°CAccuracy : Contact Area $\pm$ 3°CTri Temp ControlTemperature Range : -40°C ~ 125°C $\pm$ 2°C (150°C Option)   |  |  |  |  |
| (Option)                         | (Option)<br>ATC Module<br>(Option)  | or -55 °C ~ 135 °C $\pm$ 2 °C (150 °C Option)<br>Temperature Range : Ambient ~ 135 °C $\pm$ 2 °C<br>(150 °C Option)    |  |  |  |
|                                  | Unity PTC<br>(Option)   | Temperature Range : ~ 85 °C<br>(up to 300W Heat Dissipation)   |  |  |  |
| Tester Interface                 | Standard : RS-232<br>Option : GPIB, US  |  |  |  |  |
| Features                         | Universal kit design<br>ECD function (Easy-edit communication define)<br>Two tray (Color tray) mode available<br>Continuous fail retest function<br>Real pick and place system<br>Yield control (Average yield of socket)<br>Yield monitor (Per contact head plug)<br>System Invention Patent No.: 190373<br>Process Invention Patent No.: 190377 |  |  |  |  |
| Option                           |   |  |  |  |  |

Model 3260

#### ORDERING INFORMATION

3260 : Automatic System Function Tester



### **Die Test Handler**

# Model 3112



0 0.888

### **KEY FEATURES**

- Reliable Pick&Place bare die test handler
- Multi-plate input and automated test sorting capability
- Omni-directional adjustable probe stage  $(X/Y/Z/\,\theta$  )
- Stage remain die check function
- x12 output tray and programmable output binning
- Real time yield control monitor (Per Dut)
- Real time probing status monitoring

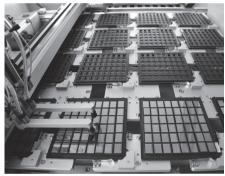
Chroma 3112 is a productive pick and place handler for high volume single or multi-site bare die testing. It is capable to handle various of bare die. The handler 3112 uses P&P technology to pick up bare die from chip tray, move them to the test stage and bin them upon sorting result. High throughput with low jam rate is the consequence result from the reliable handling mechanism and functionality outfit. The remain die check function reduce unexpected damages occurred.

The automation of testing and sorting techniques that applied to the bare die testing, not only in the production efficiently, reducing human resources and ensuring the test quality, but also reducing the testing defect rate.



3112 tabletop handler

| SPECIFICATIONS                         |  |  |  |
|--|--|--|--|
| Model                                  | 3112   |  |  |
| Dimension (WxDxH)                      | 1020 mm x 870mm x 1300 mm  |  |  |
| Weight                                 | Net Weight < 250 kg  |  |  |
| Facility                               | Power : Single-phase, AC 220V, 60 Hz / 2.4KVA  |  |  |
|  | Compressed Air : Dry Air of 5.0 kg/cm <sup>2</sup> (0.5 Mpa ) or higher, constant supply |  |  |
| Application Die Size                   | 5 x 5 mm to 15 x 15 mm   |  |  |
| Test Site Number                       | Single site ; Dual site  |  |  |
| Input Loader                           | 4 manual tray  |  |  |
| Number of sorting catagories           | 12 manual output tray (128 bin software bins)  |  |  |
| Probe Card Outside                     | 4470 x 5620 mil (113.5 x 142.7 mm)   |  |  |
| Dimension                              | * Probe card provide by customer   |  |  |
| Carrier Tray Outside<br>Dimension      | Standard size : 101.4 x 101.4 mm   |  |  |
| Contact Force                          | Max. 10 kgf  |  |  |
| Probe Alignment $(X / Y / Z / \theta)$ | Manual alignment by probing stage  |  |  |
| Interface                              | Standard : RS 232  |  |  |
|  | Optional : GPIB  |  |  |
|  | > 360 (Test Time : 7 sec.)   |  |  |
| UPH                                    | Cycle Time : 4.5 sec.  |  |  |
|  | Index Time : 5 sec.  |  |  |
| Jam Rate                               | 1/2000 (exclude any sticky residue)  |  |  |
| Change Over Time                       | < 10 min.  |  |  |



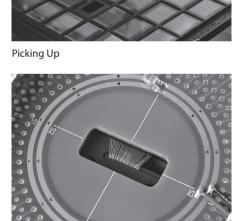
Loading



Positioning

### **ORDERING INFORMATION**

3112 : Die Test Handler



Testing

### **Miniature IC Handler**

## Model 3270



### **KEY FEATURES**

- High throughput for CIS Testing
- Reliable high-speed pick & place handler
- 3x3 mm miniature device handling capability
- Air damper for contact balance
- Socket damage free

Chroma 3270 is an innovative handler for high volume/multisite miniature IC testing, especially for CIS Testing (CMOS Image Sensor), at system level. It is capable of handling devices of a large variety of package types including QFP, TQFP, 3270: Miniature IC Handler BGA, PGA, etc. The handler uses pick and place technology to pick up devices from JEDEC trays, move them to the test site, then move them to the appropriate bin after test.

Chroma 3270 can handle 16 devices for parallel test at ambient temperature to high temperature 50°C



| SPECIFICATIONS      |  |  |  |  |  |
|---------------------|--|--|--|--|--|
| Model               | 3270   |  |  |  |  |
| Dimension (WxDxH)   | 2100 mm x 1540 mm x 1720 mm  |  |  |  |  |
| Weight              | Net Weight 1300 kg   |  |  |  |  |
|                     | Power : AC220V ± 10%, 50/60 Hz 3-Phase   |  |  |  |  |
| Facility            | Maximum power consumption : 12KVA, 20A   |  |  |  |  |
|                     | Compressed Air : Dry air of 5.0 kg/cm <sup>2</sup> (0.49 Mpa) or higher, constant supply |  |  |  |  |
|                     | Type : BGA series, µBGA, PGA, QFP series, CSP, WCSP, PLCC, QFN, TSOP                     |  |  |  |  |
| Applicable Device   | Outer dimensions : 3 mm x 3 mm to 14 mm x 14 mm  |  |  |  |  |
|                     | Lead / Ball pitch : 0.4 mm / 0.5 mm above  |  |  |  |  |
| Multiple Test Sites | 16 sites   |  |  |  |  |
| Index Time          | 5 sec (Exclude power and communication time)   |  |  |  |  |
| Cycle Time          | One site cycle time 6 sec (4 site simultaneously, tray pitch fixed)                      |  |  |  |  |
| Jam Rate            | 1/2000 pcs   |  |  |  |  |
| Applicable Trav     | Standard tray size : JEDEC 135.9 mm(W) x 315 mm(L)                                       |  |  |  |  |
| Applicable Tray     | Tray thickness : 7.62 mm   |  |  |  |  |
| Categories          | 5 Categories, 1 Auto, 4 Fixed (accepts 128 bin signals for RS-232)                       |  |  |  |  |
| Contact Force       | Max. 50 kgf (Accuracy force $\pm$ 1kgf)  |  |  |  |  |
| High Temperature    | Operating mode : room temperature / high temperature                                     |  |  |  |  |
| (Optional)          | Temperature setting range : Ambient to 50°C  |  |  |  |  |
| Tester Interface    | Standard : RS-232  |  |  |  |  |

### **ORDERING INFORMATION**



### **Test-In-Tray Handler**

## Model 3280



#### **KEY FEATURES**

- Tester & Handler Integration
- Test 120pcs micro SD in parallel
- Test-in-Tray, no pick & place arm before sorting
- UPH = 5400 with 70 sec test time
- SD Protocol Aware Tester
- DC Measurements
- 32MB Buffer Memory per site
- Microsoft Windows XP OS
- Software provides tray map and binning information
- Compact Size: 164cm X 79cm X 180cm
   Options:
- 3rd party test tools
- Change Kits for mini SD, SD and MMC
- Loading Content

The Chroma 3280 is an innovative integration system for testing and handling SD cards in parallel without picking any part before sorting. SD Protocol Aware and Focused DC tests in the 3280 brings a revolutionary test methodology to all SD cards (include MMC). The benefit to customers is lower manufacturing cost from the high throughput of the 3280. The compact size of 3280 also saves floor space in the manufacturing facility.

The cost sensitivity involved with consumer products challenges traditional final test methodology. To reduce the cost to consumers, manufacturers must recognize the fact that SD cards are built upon Known Good Die (KGD). This recognition will narrow the tester's focus to assembly related defects rather than retesting KGD. A new focused tester that tests for assembly will be smaller and less expensive than traditional solutions. That smaller size then allows for more parts to be tested in parallel in a reduced area, further reducing the unit of test cost. Additionally, the high yield of SD cards using KGD leads to a small footprint Test-in-Tray mechanism. This integrated combination of tester and handler with a reduced footprint facilitates low cost solution of the Chroma 3280.

### Chroma 3280 provides a high throughput solution to SD cards manufacturers

**Test-In-Tray** provides the most efficient method to move DUTs from input site to test site without the use of a pick-and-place arm. The average index time from input stack to test hive about 10 seconds for 120pcs micro SD cards.

**High Parallel Test** A Test Hive is integrated into Chroma 3280 which provides the capability to test 120pcs micro SD cards simultaneously. Typically, it takes 70 seconds test time for 120pcs 1GB micro SD card.

**Pick Up Reject SD card Only** By using the Test-In-Tray and high yield SD cards, the Chroma 3280 only picks up defective devices from the sorting tray to the reject tray and replaces the good devices from the buffer tray to the sorting tray. Assuming a 98% yield rate only need to be removed 2~3 devices from the sorting tray. Therefore, the average sorting time is less than the average testing time. That also enables the testing and sorting to be concurrent, so sorting will be completed before testing.



Test-in-Tray

#### Firecracker II

The design circuit of the Firecracker II is identical to a single test circuit (Fire Channel) in the test hive of the Chroma 3280. The Firecracker II provides a very convenient tool for generating a test program off line. Users can plug in micro SD, mini SD, SD and MMC devices on the left side of the cartridge. USB connector is located at the right side of the Firecracker II which can be connected with a USB cable to communicate with a portable device such as a notebook computer.



### Test Coverage

- SD Protocol Aware Tests
- Check CID RegCheck CSD Reg
- Check OCR Reg
- Check SCR Reg
- Check SD Status
- Functional Test

### **DC** Measurements

- Open/Shorts
- ESD Diodes
- Power Up Idd
- Leakage

#### **Software Functions**

- Password control system for user privileges management
- Provide safety detecting alarm system
- Auto alarm for binning time-out error
- Visual display for error jam area
- Provide off-line mode for dummy running
- Real-time testing result display
- Individual DUT enable and disable control
- Yield display for each output tray
- Real-time UPH display
- Multiple yield stop monitor functions
- Loading device counter control
- Door-opened interrupt protecting function
- Emergency stop controlKeep alarm log for over 30 days

| iort | ing | Stat | us  |    |    |    |    |        |      |    |    |    |    |    |   |                 |
|------|-----|------|-----|----|----|----|----|--------|------|----|----|----|----|----|---|-----------------|
|      |     |      |     |    |    |    | Bu | fer 1  | ray  |    |    |    |    |    |   |                 |
|      | 113 | 105  | 97  | 89 | 81 | 73 | 6S | 57     | 49   | 41 | 33 | 25 | 17 | 9  | 1 |                 |
|      | 114 | 106  | 98  | 90 | 82 | 74 | 66 | 58     | 50   | 42 | 34 | 26 | 18 | 10 | 2 |                 |
|      | 115 | 107  | 99  | 91 | 83 | 75 | 67 | 59     | 51   | 43 | 35 | 27 | 19 | 11 | 3 |                 |
|      | 116 | 108  | 100 | 92 | 84 | 76 | 68 | 60     | 52   | 44 | 36 | 28 | 20 | 12 | 4 |                 |
|      | 117 | 109  | 101 | 93 | 85 | 77 | 69 | 61     | 53   | 45 | 37 | 29 | 21 | 13 | 5 |                 |
|      | 118 | 110  | 102 | 94 | 86 | 78 | 70 | 62     | 54   | 46 | 38 | 30 | 22 | 14 | 6 |                 |
|      | 119 | 111  | 103 | 95 | 87 | 79 | 71 | 63     | 55   | 47 | 39 | 31 | 23 | 15 | 7 |                 |
|      | 120 | 112  | 104 | 96 | 88 | 80 | 72 | 64     | 56   | 48 | 40 | 32 | 24 | 16 | 8 |                 |
|      |     |      |     |    |    |    | _  |        |      | _  |    |    | _  |    | _ |                 |
| 1    |     |      |     |    | (  |    | _  | rt Tra |      | _  |    |    |    |    |   |                 |
|      | 113 | 105  | 97  | 89 | 81 | 73 | 65 | 57     | 49   | 41 | 33 | 25 | 17 | 9  | 1 |                 |
| 1    | 114 | 106  | 98  | 90 | 82 | 74 | 66 | 58     | 50   | 42 | 34 | 26 | 18 | 10 | 2 |                 |
| 1    | 115 | 107  | 99  | 91 | 83 | 75 | 67 | 59     | 51   | 43 | 35 | 27 | 19 | 11 | 3 | DUT_Status      |
| 1    | 116 | 108  | 100 | 92 | 84 | 76 | 68 | 60     | 52   | 44 | 36 | 28 | 20 | 12 | 4 | Pass            |
| 1    | 117 | 109  | 101 | 93 | 85 | 77 | 69 | 61     | 53   | 45 | 37 | 29 | 21 | 13 | 5 | Fail No Contact |
|      | 118 | 110  | 102 | 94 | 86 | 78 | 70 | 62     | 54   | 46 | 38 | 30 | 22 | 14 | 6 | Not Present     |
| ļ    | 119 | 111  | 103 | 95 | 87 | 79 | 71 | 63     | 55   | 47 | 39 | 31 | 23 | 15 | 7 |                 |
| J    | 120 | 112  | 104 | 96 | 88 | 80 | 72 | 64     | 56   | 48 | 40 | 32 | 24 | 16 | 8 |                 |
|      |     |      |     |    |    |    | Re | ject ' | Tray |    |    |    |    |    |   |                 |
|      | 113 | 105  | 97  | 89 | 81 | 73 | 65 | 57     | 49   | 41 | 33 | 25 | 17 | 9  | 1 |                 |
|      | 114 | 106  | 98  | 90 | 82 | 74 | 66 | 58     | 50   | 42 | 34 | 26 | 18 | 10 | 2 |                 |
|      | 115 | 107  | 99  | 91 | 83 | 75 | 67 | 59     | 51   | 43 | 35 | 27 | 19 | 11 | 3 |                 |
|      | 116 | 108  | 100 | 92 | 84 | 76 | 68 | 60     | 52   | 44 | 36 | 28 | 20 | 12 | 4 |                 |
|      | 117 | 109  | 101 | 93 | 85 | 77 | 69 | 61     | 53   | 45 | 37 | 29 | 21 | 13 | 5 |                 |
|      | 118 | 110  | 102 | 94 | 86 | 78 | 70 | 62     | 54   | 46 | 38 | 30 | 22 | 14 | 6 |                 |
|      | 119 | 111  | 103 | 95 | 87 | 79 | 71 | 63     | 55   | 47 | 39 | 31 | 23 | 15 | 7 |                 |
|      | 120 | 112  | 104 | 96 | 88 | 80 | 72 | 64     | 56   | 48 | 40 | 32 | 24 | 16 | 8 | Done            |
| -    |     |      |     |    |    |    |    |        |      |    |    |    |    |    |   |                 |

**Sorting Status** 

Photovoltaic Test & Automation

Automated

Electronics

/ Test &

## Test-In-Tray Handler

Model 3280

| SPECIFICATIONS                 |   |  |  |  |
|--------------------------------|---|--|--|--|
| Model                          | 3280  |  |  |  |
| System                         | Test-In-Tray Handler  |  |  |  |
|                                | Temperature Control Range : Ambient   |  |  |  |
|                                | Tray Input: 1 Auto Stack. Output Tray : 1 Auto Stack  |  |  |  |
| <b>Basic Specification</b>     | Test hive interfaced with Tester  |  |  |  |
|                                | Tester integrated into Handler  |  |  |  |
|                                | One Pick & Place arm, one buffer tray and one reject tray   |  |  |  |
|                                | Chroma TnT Production Test Tool   |  |  |  |
| Tester                         | Skymedi Production Test Tool  |  |  |  |
|                                | By Customer Request: Phison, Silicon Motion & InCOMM  |  |  |  |
| Change Kit                     | One micro SD change kit per handler   |  |  |  |
| Change Kit                     | SD, Mini SD and MMC (optional)  |  |  |  |
|                                | Power : 220VAC $\pm$ 10%, 50/60 Hz, single phase, less than 4KW   |  |  |  |
| Facility                       | Compressed Air : 0.5MPa   |  |  |  |
| Applicable Package             | micro SD  |  |  |  |
|                                | mini SD, SD and MMC (Optional)  |  |  |  |
| A                              | Standard tray size: JEDEC 135.9mm(W)x 315mm(L)  |  |  |  |
| Applicable Tray                | Applicable tray thickness: 7.62mm   |  |  |  |
| Dimensions and<br>Weight Limit | 1640 mm (W) x 790 mm(D) x 1800 mm(H); WEIGHT: 650KG   |  |  |  |
| Index Time and                 | Max. UPH = 42,000, when test time is 0  |  |  |  |
| Throughput                     | UPH = 5400, when test time is 70 sec with DUTs better than 97% yield                                    |  |  |  |
|                                | X Arm Max. Speed: 2.9 M.P.S.  |  |  |  |
|                                | Y Arm Max. Speed: 3.75 M.P.S.   |  |  |  |
| Pick & Place Arm               | Regular Sorting Speed: 6 sec per failed DUT   |  |  |  |
|                                | Sorting concurrently occurs with testing  |  |  |  |
|                                | 960 Pogo Pins each insertion  |  |  |  |
| Device                         | 7.1 Newton per DUT  |  |  |  |
| Contact method                 | 8 Pogo pins per DUT   |  |  |  |
|                                | Current Motor Max. Force: 320KG F   |  |  |  |
| Test Interface                 | Standard : RS-232, USB  |  |  |  |
| lest interface                 | Option : Ethernet   |  |  |  |
| Loader and                     | er and Input Tray Stacker : 1 Automatic with 30 JEDEC Trays   |  |  |  |
| Un-loader Capacity             | oader Capacity Output Tray Stacker : 1 Automatic with 30 JEDEC Trays                                    |  |  |  |
| System Jam Rate                | Less than 1/5000 devices  |  |  |  |
|                                | Less than 5 min. for SD products  |  |  |  |
| Kit conversion time            | Change Kit Setting File is saved in handler. Any necessary software and hardware adjust within 1 minute |  |  |  |

### **ORDERING INFORMATION**

3280: Test-In-Tray Handler

## CMOS Image Sensor Inspection System Model 7970



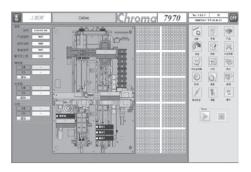
### **KEY FEATURES**

- High speed tray-based CMOS image sensor inspection system
- Complete chip appearance inspection including glass and ball side of the chip
- On-fly acquisition can get clear images and reduce processing time.
- Multi-nozzles pick & place technology (patented) to improve throughput
- Advance and flexible illumination modules are suitable for specific defect mode
- Adjustable inspection criteria can be set for different type of the chip

Chroma 7970 CMOS Image (CIS) Sensor Inspection System is an automatic inspection system for tray-based CMOS image sensor. There are five main stations in Chroma 7970: loader, ball side inspector, optical side inspector, sorter and unloader. Each station can operate simultaneously to increase inspection time.

The appearance feature of image sensor and defects on it can be clearly conspicuous by using advanced illumination technology. Illumination condition can be adjusted depended on the type of image sensor. Applied with high speed camera and software algorithms, the throughput can reach UPH 6600 for 4mmX4mm chip size.

In addition, Chroma 7970 owns a friendly user interface to reduce user's learning time. All of inspection information, like tray map, station condition, is visualized for easy reading.



lat Panel

Photovoltaic Test & Automation

Test &

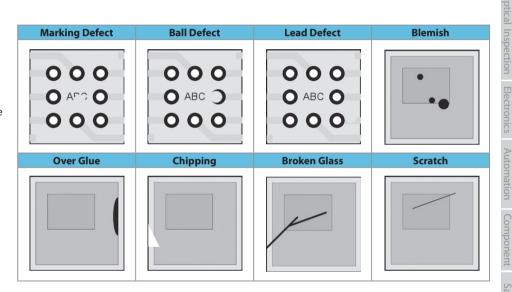
Passive

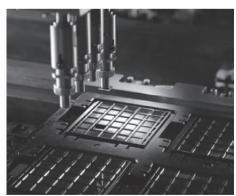
PXI Test &

General

### **ORDERING INFORMATION**

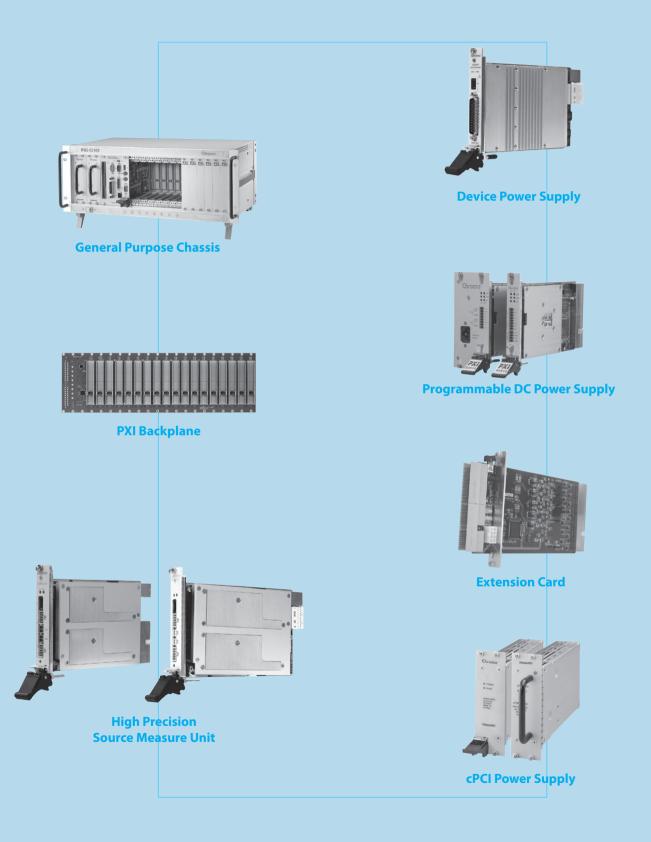
7970 : CMOS Image Sensor Inspection System





| SPECIFICATIONS               |  |  |  |  |  |
|------------------------------|--|--|--|--|--|
| Suitable IC and Package Type | Suitable IC and Package Type                                       |  |  |  |  |
| Applicable Package           | Jedec tray, chips need to be carried in chip tray                  |  |  |  |  |
| Chip Size                    | 2.5mm x 2.5mm to 10mm x 10mm                                       |  |  |  |  |
| Package Type                 | CSP  |  |  |  |  |
| Inspector Spec               |  |  |  |  |  |
| Inspection Section           | Ball side inspector unit X 1, optical side inspector unit X 2      |  |  |  |  |
| Resolution                   | Ball side inspector: 12um, optical side inspector: 6um             |  |  |  |  |
| Throughput                   | Throughput UPH Over 6600, base on 4mmX4mm chip size, 90% yield     |  |  |  |  |
| Loader/ Unloader and Sorting |  |  |  |  |  |
| Tray Stacker                 | Input and output, motor control, elevator stroke >= 200mm          |  |  |  |  |
| Sorting Buffer               | 8 chip trays for good chip, 16 chip trays for fail chip categories |  |  |  |  |
| Facility Requirement         |  |  |  |  |  |
| Power Input                  | 220VAC $\pm$ 10%, 50/60 Hz, 3 phase 5 line, 5 KW                   |  |  |  |  |
| Compressed Air               | 300 Liter/min @ 5 KG/cm2 (0.49Mpa)                                 |  |  |  |  |
| General Spec                 |  |  |  |  |  |
| Dimension (W x D x H)        | 1200 mm x 1600 mm x 2100 mm  |  |  |  |  |
| Weight                       | 800 kg   |  |  |  |  |

| General-purpose Chassis & Backplane | 15-1 |
|-------------------------------------|------|
| High Precision Source Measure Unit  | 15-2 |
| Device Power Supply                 | 15-5 |
| Programmable DC Power Supply        | 15-6 |
| Extension Card                      | 15-7 |
| CompactPCI Power Supply             | 15-8 |



## PXI General Purpose Chassis & Backplanes Model 52100 Series



#### **KEY FEATURES-** CHASSIS

- High-capacity 8-slot/14-slot/18-slot PXI/cPCI backplane
- Low-profile 4U rugged design
- Easily convertible for rack or bench used
- **51** CFM for 3/4/6 high pressure tube-axial fans
- 175W/ea plug-in power supply
- Removable fans and air filter
- Optional DC (24V) input configuration available
- Comprehensive EMC shielding

#### **KEY FEATURES**- BACKPLANES

- Compliant With PXI Specification R2.0
- Accepts Both PXI and CompactPCI (PICMG 2.0 R3.0) 3U Modules
- Standard 3U Form Factor
- Two ATX Sockets and Screw Terminals for +3.3V, +5V, +12V & -12V DC Output Connection
- 64-Bit PCI BUS On P1 & P2, Supports N-1 BUS- Mastering I/O Slots. (N : Slots)
- System Controller Slot Is Located In Slot 1
- Trigger Controller Slot Is Located In Slot 2, Providing Individual Triggers To All Other Peripherals
- Dimension :
  - 8-slot / 227.3mm x 128.7 mm x 3.2 mm
  - 14-slot / 337.5mm x 128.7mm x 3.2mm
  - 18-slot / 420.6mm x 128.7mm x 3.2mm

#### Chassis

The PXI-52100 platform features the industrystandard, 8-slot/14-slot/18-slot PXI/ CompactPCI backplane integrated into a 3U Eurorack enclosure with a bay for removable power supplies.

With hot pluggable power supplies and optional battery packs, 52100 offers the widest application range of all chassis on the market.

Mounting attachment locations allow the PXI-52100 to be mounted against a wall or bulkhead, with the card cage extended in front for easy access to adapter card. The rear of the card cage is enclosed to protect the backplane from contamination as well as provide shielding for RFI/ EMI.



### **Power Supplies**

The PXI-52100 chassis accepts removable power supply modules of the cPWR series. The power connector is a PCI 47M 400A1 connector, compliant with PICMG 2.11 Power Interface Specification standard, a mechanically and electrically roBust connector.

### Backplanes

PXI (PCI eXtensions for Instrumentation) defines a rugged PC platform for measurement and instrumentation. PXI products are compatible with the CompactPCI industrial computer standard but offer additional features, such as environmental specifications, software requirements, and built-in timing and triggering. Moreover, PXI backplane provides configuration control and longer product lifetimes than typical desktop design.

PXI backplane is designed for instrumentation computer. Its architecture makes rapid repair by board substitution possible and system upgrades and changes are greatly simplified, with minimum resulting system downtime.

| SPECIFICATIONS          | 52404  | 52402   |   |  |  |  |  |
|-------------------------|--|---|---|--|--|--|--|
| Chassis                 | 52101 52102 52105  |   |   |  |  |  |  |
| Backplane               | • 3U-sized; PXI backplane<br>• Compliant with PXI Specification R2.0<br>• PXI and CompactPCI (PICMG 2.0 R3.0) 3U modules |   |   |  |  |  |  |
| Accessible Slots        | 8 slots 14 slots 18 slot   |   |   |  |  |  |  |
| Power Supply            | Output: 175W   | / max. x 2 sets   | Output:<br>175W max. x 4 sets                     |  |  |  |  |
| rowei Suppiy            |  | • AC Input: 90V to 264V<br>• DC Input: 18V to 36V       |   |  |  |  |  |
| BUS Width               |  | 64-bit  |   |  |  |  |  |
| Rack Mounting           | 4U, 19" EIA format   |   |   |  |  |  |  |
| Cooling Capacity        | Slot coolir  | ng capacity in worst-case s                             | slot is 50W                                       |  |  |  |  |
| Module Cooling          | Forced air circulation Forced air circulation ( positive pressurization) ( positive pressurization)                      |   | Forced air circulation ( positive pressurization) |  |  |  |  |
|                         | via 51 cfm (x3)  | via 51 cfm (x4)   | via 51 cfm (x6)                                   |  |  |  |  |
| Slot Airflow Direction  | P1 to P2,  | bottom of module to top                                 | of module   |  |  |  |  |
| Module Cooling Fan MTBF |  | 75,000+hr   |   |  |  |  |  |
| Weight                  | 8.5kg  | 9.5kg   | 13.5kg  |  |  |  |  |
| Dimensions (WxDxH) mm   | • Desktop: 442.2   | • Desktop:<br>442.2 x 481.2 x 192.1                     |   |  |  |  |  |
|                         | • Rack-mount: 482  | • Rack-mount:<br>482.6 x 481.2 x 177.0                  |   |  |  |  |  |
| Operating Temp.         | 0°C ~ 55°C   |   |   |  |  |  |  |
| Storage Temp.           | -20°C ~ 70°C   |   |   |  |  |  |  |
| Humidity                | 10 ~ 95% @ 40°C, non-condensing  |   |   |  |  |  |  |
| Packaged Vibration      | 5 ~ 100Hz: 0.015G2/Hz; 100 ~ 200Hz: -6 dB/Oct; 200 Hz: 0.0038 G2/Hz  |   |   |  |  |  |  |
| Unpackaged Vibration    | 5 ~ 55 ~ 5Hz 0.38mm Peak to Peak   |   |   |  |  |  |  |
| Drop Test               | Falling Height: 76 cm; Falling: 1 corner/3 edges/6 faces   |   |   |  |  |  |  |
| Shock Test (Operating)  |  | Pulse width: 11ms; Pulse s<br>shock: 3 shocks for botto | 1   |  |  |  |  |

| ORDERING INFORMATION |                                  |                                    |
|----------------------|----------------------------------|------------------------------------|
|                      | Chassis (w/Backplane)            | AC Power Supply (Input 110/220Vac) |
| 52101-1/52102-1      | 1                                | 2                                  |
| 52105-1              | 1                                | 4                                  |
| 52101-A              | 8-Slot, 3U 64-Bit PXI Backplane  |                                    |
| 52102-A              | 14-Slot, 3U 64-Bit PXI Backplane |                                    |
| 52105-A              | 18-Slot, 3U 64-Bit PXI Backplane |                                    |



52101-A : 8-slot backplane

-----



52102-A: 14-slot backplane

52105-A : 18-slot backplane

## High Precision Source Measure Unit

## Model 52400e/52400 Series



### **KEY FEATURES & FUNCTIONS**

- PXI Express Peripheral Module
- (X1 PCI Express Link) (Model 52400e Series)
- Four quadrant operation
- 18-bit source/measure resolution (multiple selectable ranges)
- Low output noise
- High measurement speed (100k s/S)
- High output slew rate
- Optional measurement log
- DIO/Trigger bits
- Output profiling by hardware sequencer
- Programmable output resistance
- Floating & Guarding output
- 16 Control Bandwidth Selection
- Master / Slave operation
- Driver with LabView/LabWindows & C/C# API
   Softpanel GUI

### **APPLICATIONS**

- Semiconductor Test
- LED / Laser Diode Test
- Battery Test
- Transistor Test
- Solar Cell Test
- Electric Vehicle Test
- Avionics Test
- Power Electronics Test
- Sensor Test

The Chroma 52400e is a series of 3U PXI Express module that can host 2 programmable source/ measure channels, while 52400 is a series of 3U PXI module hosting 2 programmable source/ measure channels. They are designed for highly accurate source or load simulation with precision voltage with precision voltage and current measurement.

The SMU combines four-quadrant operation with precision and high speed measurement. This makes the SMU an ideal instrument in many parametric test applications ranging from ICs, two-leaded components such as sensors, LEDs, laser diodes, transistors, to solar cells, batteries and many other electronic devices.



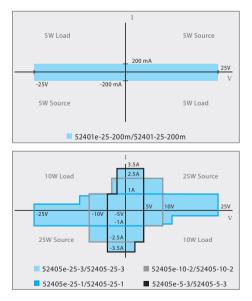


The 52400e/52400 series feature: 16 selectable control bandwidths to ensure high speed output and stable operation; multiple source/measure ranges with an 18-bit DAC/ADC to provide the best resolution and accuracy available with a sampling rate up to 100K s/S; programmable internal series resistance for battery simulation;  $\pm$ force,  $\pm$ sense and  $\pm$ guards lines to avoid leakage current and reduce settling time -- especially useful for low current test applications.

The 52400e/52400 series have patented hardware sequence engine that uses deterministic timing to control each SMU. The sequencer's on-board memory can store up to 65535 sequencer commands and 32k measurement samples per channel, allowing cross module/card synchronization and latency free output control and measurement. No PC communication is required during execution of the hardware sequencer test process.C, C#, LabView, LabWindows APIs and versatile soft front panels come standard with each SMU. The back connectors are compatible with both PXIe and hybrid chassis. All of these features enable easy integration to PXIe or PXI-hybrid systems designed for a wide range of applications.

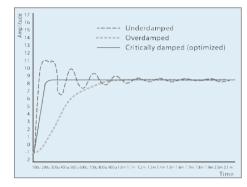
### Four Quadrant Operation

All 52400e/52400 series SMUs support four quadrant operation for applications that require a reverse voltage/current source or load. During a load operation, the module is limited by the PXI chassis' standard of 20W heat dissipation per slot. Shown below are the quadrant diagrams with the operating regions of the Chroma PXIe/PXI SMUs.



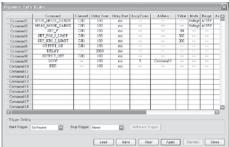
#### **Control Bandwidth Selection**

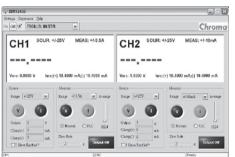
To reduce test times, Chroma's SMUs are designed for fast response providing high speed output voltage and current. The impedance of the DUT, fixture, or cabling may cause loop instability under voltage or current source mode. An unstable loop can cause saturation, oscillation, or even damage the DUT. To prevent system instability, the 52400e/52400 series SMUs provide 16 user selectable control bandwidths, eliminating the need for external capacitors or inductors placed near the DUT. This results in faster output rise time, reduced voltage ripple and noise, and reduced transient response. The control bandwidth can be modified via software to maximize test flexibility and minimize downtime when changing DUTs.



#### **Unique Hardware Sequencer**

The Chroma Hardware Sequencer is a powerful tool that can predefine commands as instrument executable steps. This allows latency free control and measurement since no PC interaction is required during execution. Once the instrument receives the start trigger, it will execute step commands in the sequencer table line by line or as defined by the trigger. Shown below are the soft panels for the SMU in hardware sequencer mode (left) and direct operation mode (right).





/ Test &

PXI Test 8

Flat Panel Display

Optical

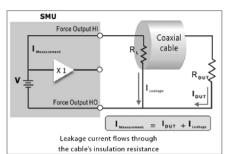
## **High Precision Source Measure Unit**

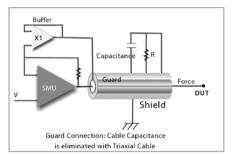
### Model 52400e/52400 Series

### Versatile Soft Front Panel Guarding for Low Current Application

Guarding is an important technique for very-low current measurements. Guarding reduces leakage current error and decreases settling time. This is achieved by keeping the potential of the guard connector at the same potential as the force conductor, so current does not flow between the force and guard conductors. Guarding also eliminates the cable capacitance between the SMU and DUT.

The Chroma 52400e series features two  $\pm$ guard wires per channel, resulting in faster and more accurate measurements.





### Master/Slave Operation

For maximum flexibility, the 52400e/52400 series SMUs support Master/Slave operation when higher current under FVMI (Force Voltage Measure Current) mode is required. To ensure accurate current sharing between modules and maximum performance, Master/Slave operation is only allowed between SMUs of the same model number.

Current sharing is achieved by one channel operating as the Master under FVMI mode while the Slaves operate in FIMV mode. The Master channel is programmed in voltage mode while the Slaves are set to current mode. The Slaves will follow the Master's set voltage. The wiring diagram for current sharing in master/slave control is shown to the right.

| SPECIFICATIONS                 | PECIFICATIONS   |  |  |   |  |  |  |
|--------------------------------|---|--|--|---|--|--|--|
| Model Name                     | 52401e-6-1<br>52401-6-1   | 52401e-25-200m<br>52401-25-200m  | 52405e-5-3 *1<br>52405-5-3 *1  | 52405e-10-2 *1<br>52405-10-2 *1   | 52405e-25-1 *1<br>52405-25-1 *1                                    | 52405e-25-3 *1<br>52405-25-3 *1  |  |
| Slots                          |   |  |  |   | 1  |  |  |
| Output Channels                | 4   |  |  |   | 2  |  |  |
| Source                         | 3W x 4  | 5W x 2   |  | 25V   | V x 2  |  |  |
| Load                           | 1.8W × 4  | 5W x 2   |  | 10V   | V x 2  |  |  |
| Input Voltage                  | Backplane Power   |  |  | External 48VDC s  | ource required *2  |  |  |
| Input Current                  | 2.5A Max  | 0.7A Max   |  | 2.2A  | Max  |  |  |
| Output Isolation               | Isolated but share<br>common LO   | Isolated   |  | Isolated by Exter   | nal Power Supply   |  |  |
| Bit Resolution                 | 16 Bits   |  |  | 18  | bits   |  |  |
| Programmable<br>Loop Bandwidth | 8 steps   |  |  | 16 s  | teps   |  |  |
| Settling Time                  |   |  |  | <30µSec   | , typically  |  |  |
| Force Voltage<br>anges         | ±6V   | ±25V, ±10V, ±5V,<br>±2.5V, ±1V, ±500mV   | ±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV                          | ±10V, ±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV   | ±25V, ±12.5V, ±10V,<br>±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV | ±25V, ±12.5V, ±10V,<br>±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV                 |  |
| Force Current<br>Ranges        | $\pm$ 1A, $\pm$ 100mA,<br>$\pm$ 10mA, $\pm$ 1mA,<br>$\pm$ 100uA, $\pm$ 10uA | ±200mA, ±20mA,<br>±2mA, ±200uA,<br>±20uA, ±2uA,<br>±200nA                                  | ±3.5A, ±2.5A, ±1A,<br>±100mA, ±10mA,<br>±1mA, ±100uA,<br>±10uA, ±1uA | $\pm 2.5A, \pm 1A, \pm 100$ mA,<br>$\pm 10$ mA, $\pm 1$ mA,<br>$\pm 100$ uA, $\pm 10$ uA,<br>$\pm 1$ uA | ±1A, ±100mA, ±10mA,<br>±1mA, ±100uA,<br>±10uA, ±1uA                | ±3.5A(≤5V),<br>±2.5A(≤10V), ±1A,<br>±100mA, ±10mA,<br>±1mA, ±100uA,<br>±10uA, ±1uA |  |
| Measure Voltage<br>Ranges      | ±6V   | ±25V, ±10V, ±5V,<br>±2.5V, ±1V, ±500mV,<br>±250mV, ±100mV,<br>±50mV, ±25mV,<br>±10mV, ±4mV | ±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV                          | ±10V, ±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV   | ±25V, ±12.5V, ±10V,<br>±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV | ±25V, ±12.5V, ±10V,<br>±5V, ±2V, ±1V,<br>±500mV, ±200mV,<br>±100mV                 |  |
| Measure Current<br>Ranges      | $\pm$ 1A, $\pm$ 100mA,<br>$\pm$ 10mA, $\pm$ 100uA,<br>$\pm$ 10uA            | ±200mA, ±20mA,<br>±2mA, ±200uA,<br>±20uA, ±2uA,<br>±200nA                                  | ±3.5A, ±2.5A, ±1A,<br>±100mA, ±10mA,<br>±1mA, ±100uA,<br>±10uA, ±1uA | ±2.5A, ±1A, ±100mA,<br>±10mA, ±1mA,<br>±100uA, ±10uA,<br>±1uA   | ±1A, ±100mA,<br>±10mA, ±1mA,<br>±100uA, ±10uA,<br>±1uA             | ±3.5A(≤5V),<br>±2.5A(≤10V), ±1A,<br>±100mA, ±10mA,<br>±1mA, ±100uA,<br>±10uA, ±1uA |  |

### **High Precision Source Measure Unit**

### Model 52400e/52400 Series

|                                   |   |   |   |   |                |                       | Video &<br>Color                          |
|-----------------------------------|---|---|---|---|----------------|-----------------------|---|
| Model Name                        | 52401e-6-1  | 52401e-25-200m  | 52405e-5-3 *1   | 52405e-10-2 *1  | 52405e-25-1 *1 | 52405e-25-3 *1        | or &                                      |
| Force Voltage<br>Accuracy         | 0.02% reading +<br>0.01% F.S.   | 0.05% reading +<br>0.0076% F.S.<br>(≥500mV Range)<br>0.02% reading + 25uV<br>(<500mV Range) | 0.05% reading + 0.008% F.S. (≥500mV Range)<br>0.05% reading + 25uV (<500mV Range) |   |                | Flat Panel<br>Display |   |
| Force Current<br>Accuracy         | 0.1% reading + 0.1% F.S.<br>(1A Range)<br>0.05% reading + 0.05%   | 6 F.S. 0.05% reading +<br>0.05% F.S. 0.1% reading + 0.1% F.S. (>1A Range)                   |   |   |                | LED/<br>Lighting      |   |
|                                   | F.S. (<1A Range)  | (<2uA Range)  |   |   |                |                       | Optical<br>Devices                        |
| Measure Voltage<br>Accuracy       | 0.02% reading +<br>0.01% F.S.   | 0.05% reading +<br>0.0076% F.S.<br>(≥500mV Range)<br>0.05% reading + 25uV<br>(<500mV Range) |   | 0.05% reading + 0.008% F.S. (≥500mV Range)<br>0.05% reading + 25uV (<500mV Range) |                |                       | ical PhotovoltaicTest<br>ces & Automation |
| Measure Current<br>Accuracy       | 0.1% reading + 0.1% F.S.         0.05% reading +           (1A Range)         0.05% F.S.           0.05% reading + 0.05%         0.1% reading + 0.12% F.S. (>1A Range)           0.05% reading + 0.05% reading + 200pA         0.05% reading + 0.05% F.S. (≤1A Range) |   |   |   |                |                       |   |
|                                   | F.S. (<1A Range)  | (<2uA Range)  |   |   |                | ptic                  |   |
| Wideband Source<br>Noise          |   |   |   | < 30 mV pp 20M  | /hz BW No Load |                       | utoma<br>al Ins                           |
| Measurement<br>Sampling Rate      | 600K Samples/s  |   |   | 100K Sa   | mples/s        |                       | Automated<br>Optical Inspection           |
| Output Connection                 | 5 Wires ( $\pm$ Force,  |   |   |   | /ires          |                       |   |
|                                   | $\pm$ Sense, +Guard)  |   | (±Force, ±Sense, ±Guard)  |   |                |                       |   |
| Measurement Log                   |   |   |   |   | oles/channel   |                       | Power<br>Electronics                      |
| Output Profiling                  |   |   |   | 65535   | Steps          |                       | ics                                       |
| Trigger Input                     | Programmable 4 Ch   | 1 Ch  |   | Programm  | nable 8 Ch     |                       | A Ba                                      |
| Trigger Output<br>Floating Output | No  |   |   | Channa  | Isolated       |                       | tter                                      |
| Master/Slave Mode                 |   | Yes No Yes  |   |   | y T            |                       |   |
| Programmable                      |   |   |   |   |                |                       | Battery Test &<br>Automation              |
| Resistance                        | Yes   | Yes No Yes  |   |   |                |                       |   |
| Regulatory<br>Compliance          |   |   |   | CE/   | FCC            |                       | Passiv<br>Compor                          |

Note \*1: If chassis has less than 38.2W/slot, then the below output limitations apply.

2.5Amp range = 50% on duty cycle, 500mSec maximum continuous on time

3.5Amp range = 40% on duty cycle, 500mSec maximum continuous on time (1250mSec off during maximum on time case)

If the PXI-SMU card is over temperature, it will automatically disconnect output to protect the unit.

**Note** \*2: Required Voltage Range  $48V \pm 5\%$ ; Required Voltage Noise  $\leq 100$  mVpp

All specifications are subject to change without notice.

#### **ORDERING INFORMATION**

52401e-6-1: High Precision Source Measurement Unit, 6V/1A 52401e-25-200m : High Precision Source Measurement Unit, 25V/200mA 52405e-5-3: High Precision Source Measurement Unit, 5V/3.5A 52405e-10-2: High Precision Source Measurement Unit, 10V/2.5A 52405e-25-1: High Precision Source Measurement Unit, 25V/1A 52405e-25-3: High Precision Source Measurement Unit, 25V/3.5A A524006 : External AC-DC Power Adapter (drives up to 3x 52401e or 1x 52405e SMUs) A524011 : High Power External AC-DC Adapter (drives up to 3x 52405e SMUs) A524009: 52405e Output Triaxial Cable

15-4

Furnkey Test & Automation

PXI Test &

## **Device Power Supply**

## Model 52310e Series



### **KEY FEATURES**

- 4 Isolated channels of  $\pm$  6V, 1 A (max)
- 20-bit measurement resolution
- Low output noise
- Maximum sampling rate of 600 KS/s
- Deterministic output by hardware sequencer
- Programmable output resistance
- 8 selectable control bandwidths
- Master/Slave operation
- Drivers with LabVIEW/ LabWindows & C/C# API
- Soft panel GUI
- PXI Express Peripheral Module (X1 PCI Express Link)

### **APPLICATIONS**

- Semiconductor
- Components Manufacturing



Chroma 52310e series is a programmable PXI-Express DPS (Device Power Supply) Card designed for high-accuracy and reliable output power for device test applications. Its compact size, easy level of integration, and high flexibility make the 52310e series ideal for multi-channel power supplies.

Chroma 52310e series features 8 selectable control bandwidths to ensure high speed output and stable operation; multiple current measurement ranges with a 20-bit DAC/ADC provide the highest resolution and accuracy with a sampling rate up to 600K S/sec; programmable internal series resistance for battery simulation.

Chroma 52310e DPS series has a patented hardware sequence engine that has deterministic timing to control each DPS channel. The sequencer's on-board memory can store up to 1024 sequencer commands and 32k measurement samples per channel.

Each 52310e DPS card can be configured to load-share by connecting channels in parallel. This enables users to achieve higher output currents on the same card.

A versatile soft front panel and C / C# / LabVIEW / LabWindows APIs are provided for rapid test development and deployment. The back connector is compatible with both PXIe and hybrid chassis slots. All of these features enable easy integration to PXIe or PXI-hybrid systems designed for a wide range of applications.

Chroma 52310e series programmable device power supplies are designed specifically for test applications that demand precision output voltage/current and tightly coupled measurement capabilities. It provides a cost-effective solution ideal for a broad range of design and production applications such as semiconductor and components manufacturing.

### **ORDERING INFORMATION**

52314e-6-1 : Device Power Supply

| SPECIFICATIONS                |  |  |  |  |
|-------------------------------|--|--|--|--|
| Model                         | 52314e-6-1   |  |  |  |
| Slot                          | 1  |  |  |  |
| Output Channels               | 4  |  |  |  |
| Source Power                  | 6W peak (3W continuous) x 4  |  |  |  |
| Max. Current                  | 1A Max (Surge capability)  |  |  |  |
| Input Voltage                 | PXI-Express backplane power  |  |  |  |
| Output Isolation              | Isolated, but share a common LO  |  |  |  |
| Bits Resolution               | 20 bits for measurement; 16 bits for programming; 16 bits for current clamping |  |  |  |
| Programmable Loop Bandwidth   | 8  |  |  |  |
| Force Voltage Ranges          | ±6V  |  |  |  |
| Measure Voltage Ranges        | ±6V  |  |  |  |
| Measure Current Ranges        | 1A, 100mA, 10mA, 1mA, 100uA, 10uA  |  |  |  |
| Force Voltage Accuracy        | 0.02% reading + 0.01% F.S.   |  |  |  |
| Measure Voltage )Accuracy     | 0.02% reading + 0.01% F.S.   |  |  |  |
| Measure Current Accuracy      | 0.1% reading + 0.1% F.S. (1A)  |  |  |  |
|                               | 0.05% reading + 0.05% F.S. (<1A)   |  |  |  |
| Output Voltage Ripple & Noise | <50mV pp 20MHz BW Full Load  |  |  |  |
| Measurement Sampling Rate     | 600K Samples/second for both V & I   |  |  |  |
| Programming Output Resistance | Up to 1 ohm (1A range); Up to 10 ohm (100mA range)                             |  |  |  |
| Output Ganging                | Channels must be on the same DPS card (1A range only)                          |  |  |  |
| Output Connection             | 4-Wire (±Force / ±Sense)   |  |  |  |
| Measurement Log               | 32K Samples per channel  |  |  |  |
| Output Profiling              | 1024 Steps per channel   |  |  |  |
| Digital In                    | Programmable 4 CH  |  |  |  |
| Digital out                   |  |  |  |  |
| Master/Slave Mode             | Yes  |  |  |  |
| Programmable Resistance       | Yes  |  |  |  |
| Control Interface             | PXI-Express  |  |  |  |
| Regulatory Compliance         | CE/ FCC  |  |  |  |

\* Unless otherwise noted, specifications are only valid under the following conditions:

Ambient temperature 23 °C ± 5 °C; After 30 minutes warm-up period; Self-calibration performed within the last 24 hours.

## Programmable DC Power Supply

## Model 52912/52914

(DC Input)

(AC Input)

**ORDERING INFORMATION** 

52912 : PXI/cPCI Programmable DC Power Supply

52914 : PXI/cPCI Programmable DC Power Supply

A529102 : AC/DC Adapter (for Model 52912)



### 0~48VDC/2AMP/60W

### **KEY FEATURES**

- Dual Isolated outputs; 0-48VDC/ 2A MAX./ 60W, programmable
- Direct Universal AC input via front panel (Model 52914)
- External Trigger function
- Programmable current limit
- Over voltage, over current and short circuit protection
- Remote Voltage Sense
- 16 Bit read back voltage and current at output
- Supplies can be connected in series

Chroma 52912/52914 programmable DC power supplies are designed specifically for test applications that demand precise output voltage/current and tightly coupled measurement capabilities. Chroma 52912/52914 provides you a good return on investment. The versatile design and world-class performance of Chroma 52912/52914 make them ideal for a broad range of design and production applications in markets as diverse as communications, semiconductor, and components manufacturing.

#### **Measurement Function**

In operation, the measurement capabilities include quickly sourcing I/V and then measuring I/V automatically without processor intervention. The 52912/52914 has built-in hardware sequence list that can execute command and store data in FIFO without processor action. With the tight integration of a Chroma 52912/52914, you'll get high speeds for high throughput and high measurement accuracy and repeatability for yield integrity.

#### **Power Levels**

The 52912/52914 Programmable power supplies provide two independent and isolated 60W (MAX) power supplies, and each channel is programmable from 0-48VDC to a maximum of 2.0 Amps. The 52912/52914 include programmable current limit to protect critical UUT's from excessive current, output will automatically switch into constant current mode when limit is reached. For greater power or voltage applications, channels can be connected in series.

#### **Input Power**

To avoid excess power draw from the PXI backplane, the 52912 draws input power (+56VDC) via front panel connections. This approach not only minimizes power required



from the backplane but also maintains complete isolation between backplane logic and power conversion circuitry for noise immunity. For applications where +56VDC is not available, Chroma 52912 provides an optional AC-DC adapter which allows the instrument to be operate from 100~240VAC mains. Chroma 52914 incorporates the AC-DC converter circuit on board. Universal power (100~240VAC) is applied to the front panel directly in order to produce the dual isolated programmable outputs.

### **Compliant to PXI and cPCI Standards**

The 52912/52914 Programmable power supplies comply with the latest PXI Revision 2.0 specifications of the PXI System Alliance (PXISA) as well as the CompactPCI specifications as defined by the PCI Industrial Computer Manufacturing Group (PICMG). Thus, the 52912/52914 may be used in either PXI or CompactPCI mainframes.



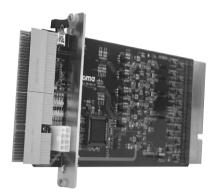
A529102

| CompactPCI mainframes.       |  |  |  |  |  |  |  |
|------------------------------|--|--|--|--|--|--|--|
| SPECIFICATIONS               |  |  |  |  |  |  |  |
| Model                        | 52912 (CE)                                       | 52914  |  |  |  |  |  |
| Dimensions                   | 1-Slot, 10x16cm                                  | 3-Slot, 10x16cm                                |  |  |  |  |  |
| Output                       |  |  |  |  |  |  |  |
| Voltage/Current/Power        | Channel #1:0 ~ 48VDC, 2A MAX, 60W                |  |  |  |  |  |  |
|                              | Channel #2 : 0 ~ 48VDC, 2A MAX, 60W              |  |  |  |  |  |  |
| Voltage Accuracy             |  | ned value $\pm$ 50mV                           |  |  |  |  |  |
| Voltage setting resolution   |  | Bits   |  |  |  |  |  |
| Line Regulation              |  | 1%   |  |  |  |  |  |
| Load Regulation              | 1  | 0% load change)                                |  |  |  |  |  |
| Transient Response           |  | d return to within 5% less than 2ms            |  |  |  |  |  |
| (20MHz)                      |  | ndition: 24V@1.44A~1.8A, 48V@0.8A~             |  |  |  |  |  |
|                              | ,  | t 25°C   |  |  |  |  |  |
| Current Limit Accuracy       |  | 2 Bits Resolution)                             |  |  |  |  |  |
| Read back                    | 5  | f Reading + 60mV                               |  |  |  |  |  |
|                              |  | f Reading + 10mA                               |  |  |  |  |  |
| Rise Time                    |  | 0%~90%)  |  |  |  |  |  |
| Efficiency                   | 84% typical                                      |  |  |  |  |  |  |
| Measurement Function         |  |  |  |  |  |  |  |
| Maximum sampling rate        | 5K S/s of each channel                           |  |  |  |  |  |  |
| Input Impedance              | 5kΩ  |  |  |  |  |  |  |
| Trigger sources              | Software, external                               |  |  |  |  |  |  |
| Buffer size                  | 2K samples per channel                           |  |  |  |  |  |  |
| Data transfers               | Polling  |  |  |  |  |  |  |
| Sequence Function            |  |  |  |  |  |  |  |
| Trigger sources              | Software   | , external                                     |  |  |  |  |  |
| Input Impedance              | 3.78   | 3kΩ  |  |  |  |  |  |
| Buffer size                  | 256 command w                                    | ords per channel                               |  |  |  |  |  |
| Input                        |  |  |  |  |  |  |  |
| DC Input                     | Isolated + 56VDC (dual)                          |  |  |  |  |  |  |
| AC Input                     | 100V ~ 240VAC, 50 or 60 Hz<br>(Optional A529102) | 100 ~ 240VAC, 50 or 60 Hz                      |  |  |  |  |  |
| Software API                 | •  | Instrument's VISA 2.5 or above<br>ws DLL's API |  |  |  |  |  |
| PCI Data BUS                 | PCI V2.2 compliant, 33MHz, 32 Bits               |  |  |  |  |  |  |
| <b>Operating Temperature</b> | 0°C ~ 55°C                                       |  |  |  |  |  |  |
| Operating Humidity           | 10% ~ 90 % relative                              |  |  |  |  |  |  |
| Storage Temperature          | -30°C ~ 70°C                                     |  |  |  |  |  |  |
| Isolation                    |  |  |  |  |  |  |  |
| Channel to Channel           | 50   | 0V   |  |  |  |  |  |
| Channel to Chassis           | 50   | 0V   |  |  |  |  |  |
| Chan davda                   | • PXISA  | PXI 2.0  |  |  |  |  |  |
| Standards                    | PICMG 2.0 R3.0 CompactPCI                        |  |  |  |  |  |  |

/ Test &

### **Extension Card**

## Model 52906



### **KEY FEATURES**

Extend PXI backplane signals

- 3U 64-bit PXI extension card available for hot swapping PXI card
- Extend PXI BUS to outside of chassis, easy for inspection
- Able to use voltage meter to measure the power consumption of +5V, +3.3V, +12V,-12V and VIO
- Use Jumper to control the cutoff current
- Power is controlled by mechanical switches
- Provide external power device
- Provide short circuit protection



The function of PXI extension card is to extend the PXI backplane signal outside of the chassis. Inserting the PXI card to extension card can easily check or measure the PXI card's signal under power on condition, which resolves the problems of inconvenient inspection due to the PXI card inside the chassis for RD or maintenance personnel. PXI extension card is able to isolate the voltage and signals sent to the PXI card for hot swap when the system is powered on. Every time the extension card activates it can supply the power required for PXI initialization. It eliminates the need for rebooting PC when users read and re-write the configuration files.

PXI extension card allows users to measure the voltage consumption power of PXI standard 5 sets voltage easily using the voltage meter. The extension card has over current protection circuit that can prevent the system backplane and other related components from damage once the PXI card malfunctions. Jumpers on the extension card are available for users to define the current range for protection; in addition an outward power connector is attached to supply the power externally instead of using the backplane power.

### **ORDERING INFORMATION**

52906 : Extension Card



**Test Board** 

| SPECIFICATIONS         |  |  |  |  |  |
|------------------------|--|--|--|--|--|
| Model                  | 52906  |  |  |  |  |
| BUS                    | PXI / Compact PCI 32 or 64 bit                                       |  |  |  |  |
| Input Requirement      | 5V at 250 mA, 12V at 100 mA, -12V at 100 mA                          |  |  |  |  |
| Input for UUT          | From chassis or the external power, configurable by jumpers for each |  |  |  |  |
|                        | power source   |  |  |  |  |
|                        | 5V, up to 5 Amps, 3 limitations jumper selectable                    |  |  |  |  |
| Output Current Limit   | 3.3V, up to 3 Amps, 3 limitations jumper selectable                  |  |  |  |  |
| Protection             | VIO, up to 2 Amps, 3 limitations jumper selectable                   |  |  |  |  |
| rotection              | 12V, up to 1.25 Amps, 3 limitations jumper selectable                |  |  |  |  |
|                        | -12V, up to 1 Amp, 3 limitations jumper selectable                   |  |  |  |  |
|                        | 0.07 volts drop for every 1 Amp drawn for 5V, 3.3V;                  |  |  |  |  |
| Output Voltage Drop    | 0.1 volts drop for every 1 Amp drawn for VIO;                        |  |  |  |  |
| Output voltage Drop    | 0.25 volts drop for every 1 Amp drawn for 12V;                       |  |  |  |  |
|                        | 0.15 volts drop for every 1 Amp drawn for -12V                       |  |  |  |  |
| Propagation Delay      | Less than 500 pico-seconds from the PC BUS to the UUT.               |  |  |  |  |
| Propagation Delay      | (Switch propagation delay is rated at 250 Pico-seconds)              |  |  |  |  |
| UUT ON-OFF Controls    | Via SPDT switch on-board   |  |  |  |  |
|                        | Current draw by the UUT can be measured at connector J5              |  |  |  |  |
| Outputs                | for 5V, 3.3V, 12V, -12V and VIO.                                     |  |  |  |  |
|                        | Each volt represents 1 Amp.  |  |  |  |  |
| Current Sense Accuracy | Typical below 10% for 5V, 3.3V, 12V, and VIO; below 15% for -12V     |  |  |  |  |
| Mechanical Dimensions  | 100 x 220 mm (3U high)   |  |  |  |  |

## 3U cPCI Hot Swap Power Supply

# Model cPWR-59100 Series



### 175W

### **KEY FEATURES**

- Eurorack-compatible module design
- Input: 100V ~ 240Vac, 18V ~ 36Vdc
- Hot-swappable
- N+1 redundant
- Remote sense on main output (+5V, +3.3V)
- Efficiency 73%
- Build-in EMI protection
- EMI Meets EN55022/FCC Class A
- Overvoltage protectionShort circuit protection on all outputs
- Over temperature output
- Compliant with PICMG 2.11 (47-pin)Status LEDs indicate power OK or fault
- Current sharing on main output
- (+5V and +3.3V)
- Worldwide Safety Approval including UL, CSA, CE Marking

### 

The cPWR-59100 series features models of hot swappable, front access power supplies for 3U CompactPCI platform. It utilizes switching technology and high power density design as well to achieve its small size and large power output. Optionally, two or more power supplies can be used to implement current sharing, N+1 redundancy, and fault-tolerance systems.

### **ORDERING INFORMATION**

**cPWR-59102 :** 3U cPCI Power Supply, AC 110/220V input, 175W **cPWR-59104 :** 3U cPCI Power Supply, DC 24V input, 175W

| SPECIFICATIONS        |   |                                   |  |  |  |
|-----------------------|---|-----------------------------------|--|--|--|
| Model                 | 59102   | 59104                             |  |  |  |
| Power Capacity        | 175W  | 175W                              |  |  |  |
| Input Range           |   |                                   |  |  |  |
| Voltage               | 100 ~ 240 Vac   | 18 ~ 36 Vdc                       |  |  |  |
| Frequency             | 50 ~ 60 Hz  |                                   |  |  |  |
| Max. Inrush Current   | 20A (110Vac)  | 20A                               |  |  |  |
| P.F.C.                | 20.97   |                                   |  |  |  |
| Protections           | Over Voltage, Lo  | Over Voltage, Low Voltage, Surge  |  |  |  |
| Output Range          |   |                                   |  |  |  |
| Efficiency            | 73% (t  | ypical)                           |  |  |  |
| Voltage               |   | /V3(+12V)/V4(-12V)                |  |  |  |
| Max. Current          |   | A/3A/1A                           |  |  |  |
| Hold-up Time          | 20 ms   | 5 ms                              |  |  |  |
| Voltage Regulation    | ±1% (V1, V2),   | ±3% (V3, V4)                      |  |  |  |
| Line Regulation       |   | .3%                               |  |  |  |
| Current Sharing       | ±   | 5%                                |  |  |  |
| Noise and Ripple      |   | V whichever is greater            |  |  |  |
| Over Load Capacity    |   | down when over current occur      |  |  |  |
|                       |   | 200mV and returns to              |  |  |  |
| Transient Response    |   | s than 300 $\mu$ S                |  |  |  |
| ·                     | following 25% load change (V1, V2, V3)                        |                                   |  |  |  |
|                       | Total voltage compensation for ca                             | able losses with 150mV respect to |  |  |  |
| Remote Sense          | output.   |                                   |  |  |  |
| Voltage Drop          | <5% @ Hot-swap (V1, V2, V3), Load > 20%                       |                                   |  |  |  |
| Ducto ati a na        | Over Voltage(V1, V2), Low Voltage, Over Current, Over Tempera |                                   |  |  |  |
| Protections           | Hot-swap, Short   |                                   |  |  |  |
| Minimum Load          | V1 (2A), V2 (1A)  |                                   |  |  |  |
| I/O Interface         |   |                                   |  |  |  |
| Display and Status    | Normal Indication (Green LE                                   | D) / Fault Indication (Red LED)   |  |  |  |
| Power Connector       | 47 pins: Positronic PC147M400A1 or PCIH47M400A1               |                                   |  |  |  |
| Safety and EMS        |   |                                   |  |  |  |
| Safety                | UL 1950 / cUL 1   | 950 / EN 60950                    |  |  |  |
| EMI                   | EN 55022 ClassA   |                                   |  |  |  |
|                       | EN5502  | 24: 1998                          |  |  |  |
|                       | IEC 61000-4   | -2: 1995 ESP                      |  |  |  |
|                       |   | 1-3: 1995 RS                      |  |  |  |
| EMS                   |   | 4: 1995 EFT/B                     |  |  |  |
|                       |   | 5: 1995 Surge                     |  |  |  |
|                       |   | : 1995 1996 CS                    |  |  |  |
|                       |   | Frequency Magnetic Field          |  |  |  |
|                       | IEC 61000-4-11: 1994 Volge and Interruption Measurement       |                                   |  |  |  |
| CE Mark               | Y   | 25                                |  |  |  |
| Others                |   |                                   |  |  |  |
| Operating Temperature | 0°C ~ 40°C (Full-load)  |                                   |  |  |  |
| Storage Temperature   |   | ~ 85°C                            |  |  |  |
| Operating Humidity    |   | -condensing)                      |  |  |  |
| Cooling               |   | air flow is required              |  |  |  |
| Audible Noise         | < 40 dBA  |                                   |  |  |  |
| Dimensions            | i   | ) x D (172.8 mm)                  |  |  |  |
| Weight                | 0.85 Kg   |                                   |  |  |  |

| Thermal/Multi-function Data Logger | 16-1  |
|------------------------------------|-------|
| TEC Controller                     | 16-4  |
| 6½ Digital Multimeter              | 16-7  |
| GNSS Signal Simulator              | 16-9  |
| GPS Simulator                      | 16-10 |
| Wireless Test Station              | 16-11 |
| RF Recorder/Player                 | 16-12 |
| Wireless Communication Test System | 16-13 |



### **Overview**





## Thermal/Multi-function Data Logger

## Model 51101/51101C Series



### 8/64 channels

#### **KEY FEATURES**

- Models with 8 and 64 channels on-line data recording. Multi-sets linked to a PC for hundreds of channels are doable
- Support B, E, J, K, N, R, S, and T type thermal couples with ITS-90 defined temperature range
   Individual channel cold junction compensation
- Individual channel cold junction compensation with <±0.3°C accuracy</p>
- Temperature resolution up to 0.01°C, error down to ±(0.01% of reading+0.3°C)
- VA-480 voltage adaptor : Voltage range ±480VDC ; Resolution 1mV ; Accuracy 0.1% of reading+1mV
- VA-10 voltage adaptor : Voltage range ± 10VDC ; Resolution 100uV ; Accuracy 0.05% of reading+500uV
- 1000VDC channel to channel isolation, full protection for testing points with charge and guarantee for accurate measurements
- Thermal couple open circuit detection
- PC-based operation with powerful software for recording and analyzing data
- 8 channel model is USB powered. No battery or external power supply is required

It is a general requirement to record temperatures, voltages, currents, and many physics quantities during research, product development, productions, and quality assurance processes. The number of record channels can be a simple one to several complicated set of hundreds. Thermal/ multi-function data loggers are prefect solutions to serve for these measurement and tracking needs.

There are several measurement products in the market to perform such a large-scale and extensive time varying recording. Some are expensive, some are limited in accuracy or resolution, and some have low immunity to interference. Chroma thermal/multi-function data loggers are by far the most cost-effective solutions for versatility, accuracy, stability, and interference immunity among this category.

Chroma thermal/multi-function data loggers measure temperatures, voltages, and currents with high accuracy and resolutions. For



8 channels

example, they support 8 types of thermal couples measurement with ITS-90 defined temperature range at 0.5°C accuracy and 0.01°C resolution\*, while most data loggers in the market are at 1 °C accuracy and 0.1°C resolution\*. Chroma loggers are with 1000VDC channel to channel isolation, which means they can attach thermal couples to objects with high electricity, such as batteries, solar cells, working PCB, etc., and still get correct data. Many competitors are just malfunctioned or even damaged in those cases. Data retrieve in Chroma loggers are in a parallel architecture, while most of competitors use a sequential multiplexing method. This means data rate per channel is quick and constant for Chroma loggers, while others become much slower when number of channels is bigger.

Using Chroma thermal/multi-function data loggers, customers get confidence in measured data and high Performance/Cost ratio. Most of all, we can help in certain cases that our competitors fail, and only Chroma succeeds.

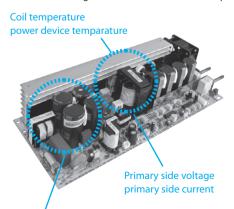
\* Thermocouple error excluded. Please see specification list for detail.

### 1000VDC channel to channel isolation

In developing or qualifying some electronic devices, tracking records of temperatures/ voltages/currents are required. Many cases there can be high voltage difference between measured points. A switching power supply, for example, is required to measure the primary side voltage/ current, secondary side voltage/current, and key component temperatures. Unfortunately, many data loggers including some leading brands are incapable to handle such a high voltage difference between both sides. Few hundred voltage difference can mess up their measurement totally, or even kills their loggers.

Chroma thermal/multifunction data loggers are perfect for the measurements in a situation with charge and high voltage difference. The feature of 1000VDC channel to channel isolation makes them immune to voltage difference between any two channels. One just attaches thermal couples or wires on the device or conducting pads and gets accurate data.

Another case can be battery system tests. One needs to know the voltage and temperature of each cell. For other data loggers, often the voltages cannot be measured properly in the cascade configuration. The thermal couple



Secondary side voltage Secondary side current Multi-channel Data Logger



attachment is another issue needing special care. All these problems are easily solved using Chroma thermal/multi-function data loggers for the high channel to channel isolation.

### 0.5°C accuracy and 0.01°C resolution

For the same or even lower prices, Chroma thermal/multi-function data logger offers higher accuracy and better resolution than our competitors do. While most of data loggers are at 1°C accuracy and 0.1°C resolution, Chroma data loggers are 1 order better than theirs. It is always true the more accurate and seeing more details, the better for measurements.

In order to achieve such high accuracy and resolution, Chroma implements individual CJC for each channel. High bit-count A-to-D converters and advanced noise suppression circuit makes outstanding performance for these data loggers. The best of all is that customers can enjoy better specifications without paying more.

Precise temperatures can be critical in thermal conductivity measurements, chemical processes, and biologic experiments. Testing a heat pipe, for example, often requires resolving <1°C temperature difference between evaporation and condensing zones. Some liquid crystals can change their properties drastically with a very small temperature variation at critical temperatures.

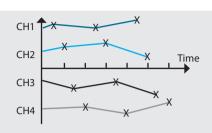
#### Constant data rate per channel

Most of data loggers in the market use a multiplexing circuit structure. All channels share a bandwidth which means the more active channels, the slower data rate per channel will be. Chroma data loggers use a parallel data retrieving circuit structure. No matter how many channels are active, the data rate can be as fast as 5 samples per second per channel.

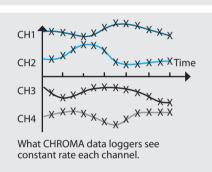
## Thermal/Multi-function Data Logger

# Model 51101/51101C Series

The benefit of constant data rate can be profound for recording large number of channels. For tens of channels, total data bandwidth of Chroma data logger can be several times larger than that of other data loggers. Some other data loggers can become too slow and lose details. They can miss recording critical changes happen in a short time. Chroma data loggers greatly reduce this possibility.



What other data loggers see, more channels, slower rate each channel bandwidth



Sample rate per channel = constant

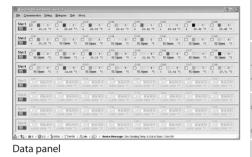
### Powerful data recording and analyzing through a PC

Personal computers and Notebooks are powerful for their fast calculation and data processing capability, friendly graphic user interface, and huge hard disk storage. While operation of many other data loggers are limited by their small display and memory, Chroma data loggers link to PCs or Notebooks for direct display, analyses, and storage.

Using the PC software, one can see the detail of all the curves, change drawing time and range scales, create marks, zoom in selected sections, and perform difference calculations, all in few simple steps. The PC RAM is used as buffer to store every data since the logger is powered on, making data tracking back possible without opening the record file. Size of data recording is determined by hard disk free space, which is almost unlimited.

| Slot 1 | 0-41<br>                               | CHG<br>                | C163<br># 1999,9999 *c | CH4<br>  | CH5<br>   | C165<br>                 <br>+1995,9999 *C | C167<br>                                 | CHG<br>              |
|--------|--|------------------------|------------------------|--|---|--|--|----------------------|
| Stot 2 | CH1<br>10 10 10 10 10<br>+1935.9933 *2 | CH2<br>                | The last of the        | 2944<br>1919   19   19   10<br>10   1919 - 1919 - 10 | IN IN IN IN IN                                  | COLUMN THE REAL                            | Martin .                                 | C Halth              |
| Stor 3 | CHI<br>also, sypp *c                   | CNQ<br>1999.9999 *0    | CHG<br>#1009,0009 *c   | C104   | CHS<br>= [] [] [] [] [] [] [] [] [] [] [] [] [] | CHG<br>41399,9999 *c                       | CH2<br>+1999,9999 *c                     |                      |
| Stor 4 | 2011<br>3 10 10 10<br>1000, 35550 W    | CHQ<br>                | 010<br>                | CH4<br>  | 2HS<br>1990,9999 *C                             | CHE<br>1995,9995 *C                        | (2)47<br>                                |                      |
| Stor 5 | CHI<br>H Is Is R<br>+1999-9999 *C      |                        | CHG<br>+1999,9999 *c   | CB44<br>   | CIHS<br>-1999.9999 *C                           | CPUE<br>+1999,9999 *C                      | C107<br>                                 | CH3<br>+1999.9999 *C |
| Slee 6 | COLUMN REPORT                          | CHC<br>                | C Report               | COLUMN A REAL  | COLUMN A REAL                                   | COLUMN A STATE OF                          | THE R R R R                              | COLUMN AND A         |
| let 7  | 1939-3999 *C                           |                        | CHG<br>                | CB44<br>   | CHS<br>   | CPG<br>                                    | CHU<br>Manit<br>+1999.9999 *1            | CHG                  |
| SLet B | CHI<br>1 19 16 12 14                   | CH2<br>8 1000, 9900 *2 | ())()<br>              |  | CHS   |  | CH2-<br>N   a   2   2<br>41 995, 9993 *c | (CHI)<br>            |

Main panel



/ideo &

Photovoltaic Test & Automation

Electronics

Test &

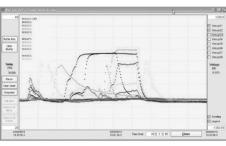
Passive

PXI Test &

Manufacturing xecution System

/ Test &

Component



Data Histogram

#### **Applications**

- Automotive & Aircraft
- Electrical & Electonics
- Solar Energy
- Power
- Machinery
- Iron & Steel
- Metals & Mining
- Oil & Gas
- Water & Waste
- Chemical
- Pharmaceutical & Food
- Others

| SPECIFICATIONS               |                |   |                          |  |  |  |
|------------------------------|----------------|---|--------------------------|--|--|--|
| Model                        |                | 51101-8<br>51101C-8   | 51101-64<br>51101C-64    |  |  |  |
| Thermocouple                 |                |   |                          |  |  |  |
| Thermocouple T-type          | -200 to 400°C  | _   |                          |  |  |  |
| Thermocouple K-type          | -200 to 1372°C |   |                          |  |  |  |
| Thermocouple B-type          | 250 to 1820°C  |   |                          |  |  |  |
| Thermocouple E-type          | -200 to 1000°C | 51101 Series : ±(0.019  | % of reading +0.3) °C *1 |  |  |  |
| Thermocouple J-type          | -210 to 1200°C | 51101C Series : ± (0.01   | % of reading +0.8) °C *1 |  |  |  |
| Thermocouple N-type          | -200 to 1300°C |   |                          |  |  |  |
| Thermocouple S-type          | -50 to 1760°C  |   |                          |  |  |  |
| Thermocouple R-type          | -50 to 1760°C  | -   |                          |  |  |  |
| Thermocouple Jacks           |                | B, E, J, K, N, R, S, or T mini-type   |                          |  |  |  |
| Thermocouple Connector       |                | B, E, J, K, N, R, S, or T mini-type   |                          |  |  |  |
| Temperature Reading          |                |   |                          |  |  |  |
| Number of Inputs             |                | 8   | 64                       |  |  |  |
| Temperature Sensor Type      |                | Thermocouple : B, E, J, K, N, R, S, T   |                          |  |  |  |
| Temperature Scale            |                | ITS-90  |                          |  |  |  |
| Temperature Resolution       |                | ±0.01 °C  |                          |  |  |  |
| Temperature Accuracy *1*2    |                | 51101 Series : ±(0.01% of reading +0.3) °C<br>51101C Series : ±(0.01% of reading +0.8) °C |                          |  |  |  |
| CJC Error                    |                | 51101 Series : ± 0.3°C<br>51101C Series : ± 0.8°C   |                          |  |  |  |
| Maximum Sample Rate          |                | 5 sample/sec.   |                          |  |  |  |
| Channel to Channel Isolation |                | 1000VDC/750 Vrms  |                          |  |  |  |
| Input Resistance             |                | 5ΜΩ   |                          |  |  |  |
| Thermocouple break detection | current        | 100 nA  |                          |  |  |  |

## Thermal/Multi-Function Data Logger

## Model 51101/51101C Series

| Model   | 51101-8<br>51101C-8                                  | 51101-64<br>51101C-64                                |  |  |  |
|---|--|--|--|--|--|
| Digital I/O                                   | 511010-0   | 511012-04  |  |  |  |
| Number of Digital I/O                         |  | 4 differential digital inputs<br>and outputs         |  |  |  |
| Digital Input                                 |  | 1 trigger input(Dl0) and<br>3 general purpose inputs |  |  |  |
| Digital Input- High Input Voltage             |  | 3 ~ 30 V   |  |  |  |
| Digital Input- Low Input Voltage              |  | < 0.8 V  |  |  |  |
| Digital Input-High Input Current              |  | 0.8 ~ 13.1 mA  |  |  |  |
| Digital Input- Low Input Current              |  | <10 µ A  |  |  |  |
| Digital Input-Terminal Resistor               |  | 2.2ΚΩ  |  |  |  |
| Digital Output Configuration                  |  | transistor switch                                    |  |  |  |
| Digital Output- External Supply Voltage       |  | <30 V  |  |  |  |
| Digital Output- ON-state Voltage              |  | <1.5 V   |  |  |  |
| Digital Output- ON-state Current              |  | <400 mA  |  |  |  |
| Digital Output- OFF-state Current             |  | <2.1 µ A   |  |  |  |
| Digital Output- Power Dissipation per Output  |  | <0.6 W   |  |  |  |
| solation Voltage                              | Ē  | ±250 V   |  |  |  |
| Communication                                 |  |  |  |  |  |
| RS-232  |  | Half Duplex, DB-9 female connector                   |  |  |  |
| USB   | USB2.0 (full speed device) ;<br>USB B-type connector |  |  |  |  |
| LAN   |  | 10/100 Mbps  |  |  |  |
| Power Specifications                          |  |  |  |  |  |
| Power Requirement                             | 4.5~5.5 V  | 11.4~12.6 V  |  |  |  |
| Maximum Power Consumption                     | 1.2W   | 18 W   |  |  |  |
| Physical Specifications                       |  |  |  |  |  |
| Dimensions (WxDxH)                            | 135.3 x 186 x 51.7 mm                                | 277 x 200.7 x 233 mm                                 |  |  |  |
| Weight for Main Frame                         | 1.2 Kg   | 2.4 Kg   |  |  |  |
| Weight per Sensor Card                        |  | 0.15 Kg  |  |  |  |
| Weight (Main Frame + 8 Sensor Card)           |  | 3.6 Kg   |  |  |  |
| Environmental specifications                  |  |  |  |  |  |
| Operating Temperature *1*2                    | 0  | 0~50°C   |  |  |  |
| Humidity                                      | <  | 80 %RH   |  |  |  |
| Power Adaptor Input Voltage                   |  | 90 to 260 VAC  |  |  |  |
| Power Adaptor Input Frequency                 |  | 47 to 63 Hz  |  |  |  |
| Main Frame DC Input                           |  | 12.6 V/1.5 A   |  |  |  |
| Thermocouple Differential Input Voltage Limit | ±1.2 V   | ± 1.2 V  |  |  |  |
| Operating Temperature                         | 0  | )~50°C   |  |  |  |
| Storage Temperature                           | -20~60°C   |  |  |  |  |
| Storage Humidity                              | 80 %RH   |  |  |  |  |

| Voltage Reading        |                                 |                                    |  |  |  |  |  |
|------------------------|---------------------------------|------------------------------------|--|--|--|--|--|
| Voltage Input Type     | VA-480 Voltage Adaptor          | VA-10 Voltage Adaptor              |  |  |  |  |  |
| Voltage Resolution     | 1mV                             | 100uV                              |  |  |  |  |  |
| Voltage Input Range    | ±480VDC                         | ±10VDC                             |  |  |  |  |  |
| Voltage Input Accuracy | $\pm$ (0.1% of reading + 1mV)*3 | $\pm$ (0.05% of reading + 500uV)*3 |  |  |  |  |  |
| Input Resistance       | 1MΩ                             | <b>300</b> KΩ                      |  |  |  |  |  |
|                        |                                 |                                    |  |  |  |  |  |

| Current Reading        |                             |  |  |  |  |
|------------------------|-----------------------------|--|--|--|--|
| Current Input Type     | IA-3 Current Adaptor        |  |  |  |  |
| Current Resolution     | 1mA                         |  |  |  |  |
| Current Input Range    | ±3A                         |  |  |  |  |
| Current Input Accuracy | $\pm$ (1% of reading + 1mA) |  |  |  |  |



Voltage/Current Adaptor Thermocouple

**Note \*1 :** Measure after heat equilibrium is reached and the uncertainty of thermocouple itself is excluded. Operating temperature within 20°C to 30°C range. **Note \*2 :** For operating temperature out of range from 20°C to 30°C, additional error  $\pm$ [(0.01% of reading + 0.03°C) x (T-25°C)] will be added. T is the ambient temperature.

Note \*3 : Under MV\_8 filtering mode

Note \*4: Model 51101-64/51101C-64 with LAN module

### **ORDERING INFORMATION**

51101-8 : Thermal/Multi-Function Data Logger - 8 channel 51101C-8 : Thermal/Multi-Function Data Logger - 8 channel 51101-64 : Thermal/Multi-Function Data Logger - 64 channel 51101C-64 : Thermal/Multi-Function Data Logger - 64 channel A511000 : VA-480 Voltage Adaptor (option) A511001 : IA-3 Current Adaptor (option) A511002 : VA-10 Voltage Adaptor (option) A511003 : 8-port sensor card with package A511004 : C8-port sensor card with package



### 150W/300W/800W

### **KEY FEATURES**

- Bidirectional driving with 150W (24V/8A), 300W (27V/12A), or 800W (40V/20A) output
- Filtered PWM output with >90% driving power efficiency while maintaining linear driving with current ripples<20 mA
- Temperature reading and setting range -70 to 250°Cwith 0.01°Cresolution and 0.3°C absolute accuracy
- Short term stability (1 hour) ±0.01°C and long term stability ±0.05°C with optimal PID control
- Feature true TEC large signal PID auto tune for best control performance
- 2 T-type thermal couple inputs, one for control feedback and the other for monitor and offset, providing versatile control modes
- RS232 serial communication port for PC remote operation and thermal data recording
- Powerful and user-friendly PC program available
- Perfect matching all Chroma designed temperature controlled platforms

A thermoelectric cooler (TEC) module is a solid state device which can control heat flux using current. First discovered in the 19th century and called the Peltier effect, TEC's operate by electrical current flow between two dissimilar conductors. Depending on the direction of the flow heat will be either absorbed or released. This technology is very useful for small scale temperature control; providing fast temperature response and ultra-high temperature stability. TEC temperature control equipment is also very compact and energy efficient in comparison to conventional thermal chambers. TECs have the added advantage of control case temperatures directly and have mechanical moving parts.

Chroma's Model 54100 series of advanced TEC Controllers provide an excellent temperature monitoring engine via two thermal couple inputs. The cold junction of the engine is internally stabilized to 0.001°C, providing 0.01°C temperature resolution. The TEC driver circuit within the 54100 uses a filtered PWM architecture which provides much higher drive currents over ordinary PWM drivers and provides smooth current modulation which is critical for electromagnetic sensitive measurements.

Another important feature of Chroma's 54100 TEC Controllers is its true auto tune function providing for optimum control and temperature response. Stability down to the temperature resolution of  $0.01^{\circ}$ C is regularly achieved regardless of the size and geometry of thermal platforms.

High TEC driving capability is another merit of Chroma's 54100 controllers. Currently two modles

All specifications are subject to change without notice.

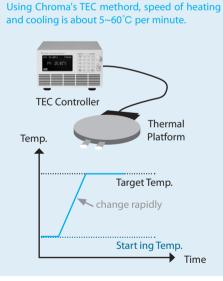
are available (150W and 300W) with 800W under development. More TEC driving power means wider temperature range, faster temperature response, and larger platform applications. For comparable accuracy and stability, Chroma offers one of the best TEC driving power-to-price ratio in the market.

\* Operation temperature range of platform is independent with TEC controller range, and proper platform design should be considered to obtain certain temperature.

### Excellent Thermal response, temperature precision, and control stability

TEC module is a bi-directional heat pump controlled by current. So a temperature control system with TEC modules can reach temperatures higher or lower than ambient. Compared with traditional temperature control methods, the 54100 provides a compact, fast responding, solution to thermal control applications.

Chroma's Advanced TEC Controller is specially designed for optimal performance. Changing temperature from one value to another rapidly without overshoot are primary benefits of the 54100 series. Effects of thermal perturbations by the unit-under-test can even be minimized up to 100W on/off, by the 54100 and often reduces temperature variation to less than 1°C within few seconds. If temperature stability is concerned, Chroma's Advanced TEC Controllers offer 0.01°C stability in almost most applications.

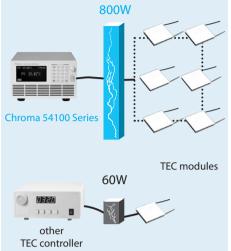


### **High Driving Capability**

There were many low output power TEC controllers on the market mainly for small devices and small scale lab tests. As technologies grow, higher TEC driving power is required in many modern applications. For example, testing solar cells larger than 4 inch square from -20°C to 85°C requires more than 100W driving power and thermal loads of sunlight can add 30W or more. Designers of high power LEDs must have great concern about their thermal properties. 30 W-LED module testing from -20°C to 150°C also demands high driving power.

### Model 54100 Series

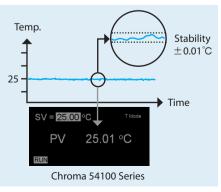
Chroma's Advanced TEC Controllers can deliver 150W, 300W, 800W driving power, satisfying needs of both small to large platforms. Another benefit of high driving power is that in many applications several units can be driven from a single TEC controller reducing costs and test times.



### High temperature accuracy and resolution

TEC controllers using thermal couples currently on the market usually have accuracy of only about 1°C and poor resolution (0.1°C). This is inadequate for many modern applications. For example, rating solar cell power efficiency requires temperature accuracy much better than 1°C since phase changes of some solar materials can occur within 0.1°C or less. Some biochemical process can be very sensitive to temperature variations as well. Thermal resistance measurements of heat pipes often results in a temperature deviation much less than 1°C. Some high resolution TEC controllers are using different types of temperature sensors, such as RTD, temperature IC, or thermistors. Unfortunately, these temperature control methods often cannot provide direct case temperate control/contact and can be too bulky for measuring at the point of interest.

Chroma's Advanced TEC Controllers are thermal couple based and with temperature accuracy\* 0.3°C and resolution down to 0.01°C. Users can take advantage of a wide range of thermal couple for easy measurement setup, while maintaining high accuracy and resolution. This means users can achieve test results with high repeatability, high accuracy, and therefore high confidence.

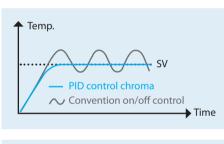


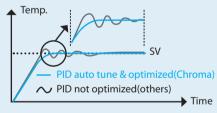
Test &

### True large-signal PID / auto tune for TEC control

PID control is an important feature for a good controller. The PID parameters basically describe the dynamic response of a system and can be very different from one to another. A guarantee of successful control cannot be achieved without setting proper PID parameters and setting PID parameters manually is very time consuming. Chroma 54100 provides an advanced PID auto tune feature making PID setting fast, repeatable and easy.

Many other TEC controllers use a small signal and one-directional temperature transient to find PID parameters. This auto tune method is OK for heater only temperature control, but is not always successful for TEC control. In order to truly match the thermal response of a TEC control system, Chroma's Advanced TEC Controllers use a largesignal and bi-directional driving method for PID auto tune. This proprietary method results in the superb temperature control behavior which is fast, precise, and very stable. While some other TEC controllers require a set of PID parameters for every 20°C interval, Chroma's Advanced TEC Controllers need only a set of optimal PID parameters (usually auto tuned at 40~50°C) to cover all operation from -40 to 150°C.

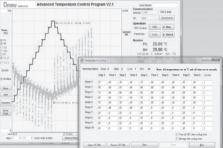


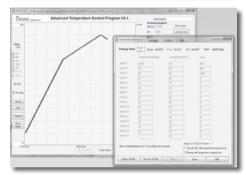


### Soft Panel

Available for Chroma's Advanced TEC Controller are graphical softpanels which allow for intuitive control and measurements. Viewing TEC current and temperature vs. time curves, recording data to a file, and running temperature cycling, ramping sub-programs, etc., are all provided. PID parameters, current limit, and other important settings can also be read and set from a pop-up setup windows.







### **High Efficiency Standard Platforms**

There are numerous TEC platforms be developed by Chroma for sue with the 54100 TEC Controllers. Such platforms include LEDs, solar cells, e-paper, burn-in, and many others. As shown below each are designs to provide a wide temperature range with typical temperature stability of 0.01°C.



### **TEC Platform Architecture**





## Model 54100 Series





General Platform

## Model 54100 Series

| Model                                    |            | 54115-24-8                                     | 54130-27-12             | 54180-40-20                                   |  |  |
|--|------------|--|-------------------------|---|--|--|
| TEC Output Voltage                       |            | 24VDC  | 40VDC                   |   |  |  |
| TEC Output Current                       |            | 8A   | 12A                     | 20A   |  |  |
| TEC Driving Output Power                 |            | 150W   | 300W                    | 800W  |  |  |
| Temperature Control                      |            |  |                         |   |  |  |
| Setting Temperature Range                |            | -49 to   | 149°C                   | - 70 to 250°C *1                              |  |  |
| Setting Temperature Resolution           | 1          |  | 0.01°C                  |   |  |  |
| Temperature Control Stability            | Short Term |  | ≦0.01°C                 |   |  |  |
| Temperature Control Stability            | Long Term  |  | ≦0.05°C                 |   |  |  |
| Temperature Monitoring                   |            |  |                         |   |  |  |
| Monitoring Temperature Range             | 2          | -49 to   | 149°C                   | - 70 to 250°C *1                              |  |  |
| Temperature Sensor Type                  |            | T-type the                                     | rmocouple               | Standard : T-type thermocouple                |  |  |
|  |            | Optional : K-type thermocouple                 |                         |   |  |  |
| Monitoring Temperature Resolution        |            | 0.01°C   |                         |   |  |  |
| Monitoring Temperature Relative Accuracy |            | <±0.3°C  |                         |   |  |  |
| Monitoring Temperature Absolute Accuracy |            | < ±(0.3+0.002 ×  T-25 ) °C                     |                         |   |  |  |
| Environmental                            |            |  |                         |   |  |  |
| Working Temperature                      |            | 5~45°C   |                         |   |  |  |
| Humidity                                 |            |  | < 80 % RH               |   |  |  |
| Power Requirement                        |            |  | 90 to 240 VAC, 50/60 Hz |   |  |  |
| Maximum Power Consumption                |            | 330W   | 550W                    | 1400W   |  |  |
| Fuse                                     |            | 3A/250V  | 5A/250V                 | 12A/250V                                      |  |  |
| PC Communication Port                    |            | RS-232 Half Duplex (USB2.0)<br>LAN 10/100Mbps  |                         |   |  |  |
| Storage Temperature                      |            | -20~60°C                                       |                         |   |  |  |
| Storage Humidity                         |            |  | 80%R H                  |   |  |  |
| Dimensions (WidthxDepthxHeight)          |            | 367 x 286 x 131 2 mm / 14 3 x 11 3 x 5 17 inch |                         | 241 x 441 x 135 mm /<br>9.5 x 17.4 x 5.3 inch |  |  |
| Weight                                   |            | 6.3 kg / 13.9 lbs                              | 6.6 kg / 14.6 lbs       | 9.5 kg / 20.9 lbs                             |  |  |

**Note \*1 :** Platform temperature range is highly relating to the structure and design and will need to apply external elements to reach extreme conditions. To reach below -30 degree, it will need extra coolant. To reach beyond 150 degree, other heating material will need to be considered.

Note \*2 : The temperature control stability depends on not only the controller but also platform and environment. The PID parameters must be optimized for the platform. Avoid any liquid or air turbulence around the platform. Attach the temperature feedback thermocouple firmly with good thermal conductivity. Shield for electromagnetic interference if necessary. Extremely high control temperature stability can be achieved with all these issue taken care. Note \*3: Monitoring Temperature Relative Accuracy is defined as the temperature difference between the two thermocouples reading the same thermal

point. It is the working ambient temperature, which must be thermal balance within 20~30 °C, and exclude thermocouples error for controller specifications to be guaranteed. If the operation temperature is out of 20~30 °C, the specification will be modified to  $< \pm (0.3+0.002 \times |T-25|)$ , where T here is the working ambient temperature.

### ORDERING INFORMATION

54115-24-8 : TEC Controller 150W 54130-27-12 : TEC Controller 300W 54180-40-20 : TEC Controller 800W A541151 : TEC Thermal Platform for LED integrated sphere A541152 : TEC Thermal Platform for LED burn-in A541153 : TEC Thermal Platform for LED wafer A541154 : TEC Thermal Platform for e-paper A541155 : TEC Thermal Platform for solar cell



54115-24-8 / 54130-27-12

Manufacturing Execution System

**Jrnkey Test &** 

## 61/2 Digital Multimeter

## Model 12061



### **KEY FEATURES**

6½ digits resolution

- 11 types of measurement characteristics
  - DC voltage/current (1000V/3A max)
  - AC voltage/current (750V/3A max)
  - Resistance 2 or 4-wire ohms
  - measurement
  - Period & frequency
  - Diode & continuity
  - Temperature (RTD)
- Various math functions
  - NULL
  - Max/Min/Avg
  - High/Low limit
  - Percentage/Ratio/ MX+B
  - dB/dBm
- DC voltage accuracy : 0.0015%
- AC voltage accuracy : 0.04%
- Optional Multi-point TC Scanner Card (10ch), multi-point scanner card (10/20ch)
- Measurement and data transmission up to 2000 readings/sec (4½)
- Up to 2000 readings memory storage
- Standard SCPI control
- Standard USB & GPIB interface, support USBTMC
- Software control support
  - Chroma 12061 software
  - LabView® Driver

### Fast & High Performance

The 12061 6<sup>1</sup>/<sub>2</sub> Digital Multimeter has assorted settings of resolution, integration time and ranges that allow users to optimize the configuration of measurement speed, resolution and accuracy when in individual measurement test mode.

The 12061 has built-in a high speed, low interference A/D converter with a maximum speed of 2000 rdgs/s it is the best solution for high speed measurement.

### **Individual Application**

Chroma 12061 equipped with 11 types of measurement functions containing DC voltage/ current, AC voltage/current, resistance 2/4-wire ohms, period, frequency, diode, continuity and temperature as well as diverse math functions of NULL, Max/Min/Avg, High/Low limit, High/Low limit, Percentage/Ratio/MX+B, dB/dBm and etc. Along with trigger and memory function, Chroma 12061 is the right tool for you to perform the basic measurement.



### **Test System Application**

For user's convenience Chroma supports various software and hardware for different control platforms.

- **Chroma 12061 TOOL :** It is a real-time display interface for value monitoring. It can log data and output in CSV format for analysis.

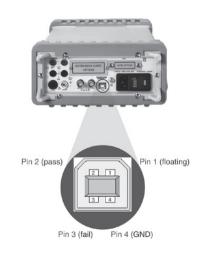
- **Chroma 12061 LINK**: It can send the data to PC directly in real time and save it to EXCEL or WORD format file as well as create the data pattern. Test engineers can use ActiveX components to control the 12061 using SCPI commands.

|    | A          | B          | C    | D            | E                   | F              |
|----|------------|------------|------|--------------|---------------------|----------------|
| 1  | Time       | OHM        |      |              | Start Time          | 2008/7/9 11:58 |
| 2  | 11:58:22.0 | 22.894424  |      |              | Interval            | 00:00:01.0     |
| 3  | 11:58:23.0 | 26.6830752 | 10   |              |                     |                |
| 4  | 11:58:24.0 | 2345.61888 |      |              | Samples Completed   | 20             |
| 5  | 11:58:25.0 | 772.210048 |      |              |                     |                |
| 6  | 11:58:26.0 | 105.287576 |      |              | Last Point on Chart | 20             |
| 7  | 11:58:27.0 | 954,219584 |      |              |                     |                |
| 8  | 11:58:28.0 | 1381.71068 |      |              | OHM                 |                |
| 9  | 11:58:29.0 | 1884.20928 |      |              | onn                 |                |
| 10 | 11:58:30.0 | 2363.31904 | 7000 |              |                     |                |
| 11 | 11:58:31.0 | 2935.32544 |      |              | <u> </u>            |                |
| 12 | 11:58:32.0 | 3608.2752  | 6000 |              |                     |                |
| 13 | 11:58:33.0 | 4240.964   | 5000 |              | 1                   | -              |
| 14 | 11:58:34.0 | 4853.53824 | 4000 | 1            |                     | ~              |
| 15 | 11:58:35.0 | 5344.7104  | 3000 |              |                     |                |
| 16 | 11:58:36.0 | 5866.3264  |      |              |                     |                |
| 17 | 11:58:37.0 | 6450.1664  | 2000 |              |                     |                |
| 18 | 11:58:38.0 | 5761.55456 | 1000 |              |                     |                |
| 19 | 11:58:39.0 | 5054.24032 | 0    |              |                     |                |
| 20 | 11:58:40.0 | 4506.42048 |      |              |                     |                |
| 21 | 11:58:41.0 | 3830.20928 |      |              |                     |                |
| 22 |            |            |      |              |                     |                |
| 23 |            |            |      | MA 12061 CB  |                     | * x            |
| 24 |            |            | Ab   | out 12061 CB | R-Link 🛃 🛬 쬉 백 백 🕨  | H              |
| 25 |            |            |      |              |                     |                |

Application Softpanel - CHROMA 12061 LINK

### **PASS/FAIL signal output**

Chroma 12061 can provide PASS/FAIL signal to system by USB port (either communication or PASS/FAIL signal) with high/low limit set. USB type B female connect to system with signal (1 floating/ 2 PSS/ 3 FAIL/ 4 GND) in 2ms low and please disable USB interface. If result over the high/low limit, the beeper will alarm and signal output. (Beeper can be off)

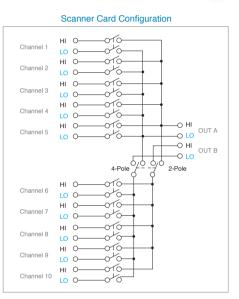


### Multi-Point Scanner Card (10CH/20CH)

Chroma 6½ Digital Multimeter supports Multi-point Scanner Card which is a scanning measurement tool not supported by most of the 6½ Digital Multimeters in the field.

Multi-point Scanner Card offers multiplexing ten two poles (ACV, ACI, DCV, DCI, Resistance, Period, Frequency) that can be installed to the extension card option directly on the rear panel.





### Multi-Point TC Scanner Card (10ch)

The multi-point temperature scanning card has multiple functions including 2-wire/4-wire resistance, AC/DC voltage/current, frequency, period and temperature measurements. As cold junction compensation is equipped for temperature measurement, it increases the measurement accuracy greatly. In addition, it can scan the temperature of 10 different channels that can be applied extensively to electronic devices and industrial studies for temperature measurement

#### **ORDERING INFORMATION**

12061 : 6½ Digital Multimeter A120000 : Multi-point Scanner Card (10ch) A120001 : Thermal-measurement Adapter A120002 : Multi-point Scanner Card (20ch) A120003 : HV Probe (1000:1) A120004 : Multi-point TC Scanner Card (10ch)

## 61/2 Digital Multimeter

## Model 12061

|   | Color                 | Video      |
|---|-----------------------|------------|
|   |                       | o & Flat   |
|   | Display Li            | Panel      |
|   | Lighting              | LED/       |
|   | Devices               | Optical    |
|   | & Auton               | Photovolt  |
|   | mation                | Itaic Test |
|   | <b>Optical Inspec</b> | Automated  |
|   | tion                  |            |
|   | Electronics           | Power      |
|   | Autor                 | Battery T  |
| _ | nation                | ry Test &  |
|   | Componer              | Passive    |
|   | ent                   |            |
|   | Safety                | Electrica  |
|   |                       | l Sem      |

conductor/ PXI Test & IC Measuremen

Automatio

| Model                    |               | 12061                |   |  |  |  |  |  |  |
|--------------------------|---------------|----------------------|---|--|--|--|--|--|--|
| DC Voltage               |               |                      |   |  |  |  |  |  |  |
| Range                    | Resolution    | Input Resistance     | 1 year accuracy<br>$\pm$ (reading%+rang<br>(23°C $\pm$ 5°C)   |  |  |  |  |  |  |
| 100.000mV                | 0.1µV         |                      | 0.0050 + 0.003  |  |  |  |  |  |  |
| 1.00000V                 | 1.0 µV        | >10G Ω               | 0.0040 + 0.000  |  |  |  |  |  |  |
| 10.0000V                 | 10 µV         |                      |   |  |  |  |  |  |  |
| 100.0000V                | 100 µV        | 10M Ω                |   |  |  |  |  |  |  |
| 1000.000V DC Current     | 1mV           |                      | 0.0045 + 0.001  |  |  |  |  |  |  |
| DC Current               |               |                      | 1 year accuracy   |  |  |  |  |  |  |
| Range                    | Resolution    | Shunt<br>Resistance  |   |  |  |  |  |  |  |
| 10.0000mA                | 10nA          | 5.1Ω                 | 0.050 + 0.020   |  |  |  |  |  |  |
| 100.0000mA               | 100nA         | 5.1 32               | 0.050 + 0.005   |  |  |  |  |  |  |
| 1.000000A                | 1μA           | 0.1Ω                 | 0.100 + 0.010   |  |  |  |  |  |  |
| 3.00000A                 | 10µA          | 01132                | 0.120 + 0.020   |  |  |  |  |  |  |
| AC RMS Voltag            | e             |                      |   |  |  |  |  |  |  |
| Range                    | Resolution    | Frequency<br>(Hz)    |   |  |  |  |  |  |  |
|                          |               | 3 ~ 5                | 1.00 + 0.04   |  |  |  |  |  |  |
|                          |               | 5 ~ 10               | 0.35 + 0.04   |  |  |  |  |  |  |
| 100.0000mV               | 0.1µV         | 10 ~ 20K             | 0.06 + 0.04   |  |  |  |  |  |  |
|                          |               | 20K ~ 50K            |   |  |  |  |  |  |  |
|                          |               | 50K ~ 100K           |   |  |  |  |  |  |  |
|                          |               | 100K ~ 300K<br>3 ~ 5 |   |  |  |  |  |  |  |
|                          |               | 5~10                 |   |  |  |  |  |  |  |
| 1.000000V ~<br>750.000V  |               | 10 ~ 20K             |   |  |  |  |  |  |  |
|                          | 1.0μV ~ 1mV   | 20K ~ 50K            |   |  |  |  |  |  |  |
|                          |               | 50K ~ 100K           | 0.60 + 0.08   |  |  |  |  |  |  |
|                          |               | 100K ~ 300K          | 4.00 + 0.50   |  |  |  |  |  |  |
| AC RMS Curren            | t             |                      |   |  |  |  |  |  |  |
| Range                    | Resolution    | Frequency<br>(Hz)    | 1 year accuracy<br>$\pm$ (reading%+rang<br>(23°C $\pm$ 5°C)   |  |  |  |  |  |  |
|                          |               | 3 ~ 5                | 1.00 + 0.04   |  |  |  |  |  |  |
| 1.000000A                | 1µA           | 5 ~ 10               | $\begin{array}{c} 0.0035 \pm 0.0005\\ 0.0045 \pm 0.0006\\ 0.0045 \pm 0.0010\\ \hline\\ \\ 1 \ year \ accuracy\\ \pm (reading\%+range\\ (23^{\circ} \pm 5^{\circ} C)\\ 0.050 \pm 0.020\\ 0.050 \pm 0.020\\ \hline\\ 0.050 \pm 0.020\\ \hline\\ 0.100 \pm 0.020\\ \hline\\ \\ 1 \ year \ accuracy\\ \pm (reading\%+range\\ (23^{\circ} \pm 5^{\circ} C)\\ 1.00 \pm 0.04\\ \hline\\ 0.35 \pm 0.04\\ \hline\\ 0.06 \pm 0.04\\ \hline\\ 0.12 \pm 0.05\\ \hline\\ 0.60 \pm 0.08\\ \hline\\ 4.00 \pm 0.50\\ \hline\\ 1.00 \pm 0.03\\ \hline\\ 0.12 \pm 0.05\\ \hline\\ 0.60 \pm 0.03\\ \hline\\ 1 \ year \ accuracy\\ \pm (reading\%+range\\ (23^{\circ} \pm 5^{\circ} C)\\ \hline\\ 1 \ year \ accuracy\\ \pm (reading\%+range\\ (23^{\circ} \pm 5^{\circ} C)\\ \hline\\ 0.010 \pm 0.004\\ \hline\\ 0.010 \pm 0.004\\ \hline\\ 0.010 \pm 0.001\\ \hline\end{array}$ |  |  |  |  |  |  |
|                          |               | 10 ~ 5K              |   |  |  |  |  |  |  |
|                          |               | 3~5                  |   |  |  |  |  |  |  |
| 3.000000A                | 1.0µA         | 5~10                 |   |  |  |  |  |  |  |
| Desister of (A)          |               | 10 ~ 5K              | 0.15 + 0.06   |  |  |  |  |  |  |
| Resistance (4W           | Measurement)  |                      | 1 year accuracy   |  |  |  |  |  |  |
| Range                    | Resolution    | Test Current         | $\pm$ (reading%+rang  |  |  |  |  |  |  |
| 100.0000Ω                | 100μΩ         | 1mA                  | 0.010 + 0.004   |  |  |  |  |  |  |
| 1.000000kΩ               | 1mΩ           | 1mA                  |   |  |  |  |  |  |  |
| 10.0000kΩ                | 10m Ω         | 100 µ A              | 0.010 + 0.001   |  |  |  |  |  |  |
| 100.0000kΩ               | 100mΩ         | 10 µ A               | 0.010 + 0.001   |  |  |  |  |  |  |
| 1.000000MΩ               | 1Ω            | 5 µ A                | 0.010 + 0.001   |  |  |  |  |  |  |
| 10.00000MΩ<br>100.0000MΩ | 10 Ω<br>100 Ω | 500nA<br>500nA       | 0.040 + 0.001<br>0.800 + 0.010  |  |  |  |  |  |  |
| Diode Test               | 100 12        | JUUIA                | 0.000 + 0.010   |  |  |  |  |  |  |
| Dioue lest               |               |                      | 1 year accuracy   |  |  |  |  |  |  |
| Range                    | Resolution    | Test Current         | ±(reading%+rang<br>(23°C±5°C)   |  |  |  |  |  |  |
| 1.00000V                 | 10 $\mu$ V    | 1mA                  | 0.010 + 0.020   |  |  |  |  |  |  |

| <b>Continuity Test</b>                              |  |  |  |  |  |  |  |  |  |  |  |  |  |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|
| Range   | Resolution   | Shunt<br>Resistance  | 1 year accuracy<br>±(reading%+range%)<br>(23°C±5°C)  |  |  |  |  |  |  |  |  |  |  |
| 1000.00Ω  | <b>100m</b> Ω  | 1mA  | 0.010 + 0.030  |  |  |  |  |  |  |  |  |  |  |
| Frequency and P                                     | eriod  |  |  |  |  |  |  |  |  |  |  |  |  |
| Range   | Freque   | ncy (Hz)   | 1 year accuracy<br>± (reading%+range%)<br>(23°C±5°C) |  |  |  |  |  |  |  |  |  |  |
|   | 3  | ~ 5  | 0.1  |  |  |  |  |  |  |  |  |  |  |
| 100mV ~ 750V  | 5 ~  | ~ 10   | 0.05   |  |  |  |  |  |  |  |  |  |  |
| 1001110 - 7500                                      |  | ~ 40   | 0.03   |  |  |  |  |  |  |  |  |  |  |
|   |  | 300K   | 0.01   |  |  |  |  |  |  |  |  |  |  |
| Measurement Ch                                      |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Math Functions                                      |  | nin / max / averag<br>O, %, limit test (w  | ge, dBm, dB, MX+B,<br>/ith TTL output)               |  |  |  |  |  |  |  |  |  |  |
| Measurement<br>Noise Rejection<br>60Hz(50Hz)        |  | DC CMRR : 140 dB:<br>AC CMRR : 70 dB   |  |  |  |  |  |  |  |  |  |  |  |
| Integration Time<br>& Normal Mode<br>Rejection NMRR |  | 10 plc/167 ms (200 ms) : 60 dB<br>1 plc/16.7 ms (20 ms) : 60 dB  |  |  |  |  |  |  |  |  |  |  |  |
| DC Voltage  | In   | put bias current :<br>Input protectio  | •  |  |  |  |  |  |  |  |  |  |  |
| DC Current  | Input  | protection: Exteri   | nal 3 A 250V fuse                                    |  |  |  |  |  |  |  |  |  |  |
| AC Voltage  |  | pedance: $1 M \Omega$  <br>It protection: 750  | parallel with 100 pF<br>Vrms all ranges              |  |  |  |  |  |  |  |  |  |  |
| AC Current  | Input  | Input protection: External 3 A 250V fuse   |  |  |  |  |  |  |  |  |  |  |  |
| Resistance  | 10% of ra<br>1k  | Maximum lead resistance (4-wire):<br>10% of range per lead for 100Ω and 1kΩ ranges<br>1kΩ per lead on all other ranges.<br>Input protection: 1000 V all ranges |  |  |  |  |  |  |  |  |  |  |  |
| Continuity/Diode                                    | With audible tone Continuity threshold: Selectable from1 $\Omega$ to 1000 $\Omega$ |  |  |  |  |  |  |  |  |  |  |  |  |
| Temperature   |  | vire, 3-wire and 4<br>Temperature Co<br>EC751, Callendar   |  |  |  |  |  |  |  |  |  |  |  |
| External Control                                    |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Samples/Trigger                                     |  | 1 ~ 50,0   | 00   |  |  |  |  |  |  |  |  |  |  |
| Trigger Delay                                       |  | 0~3600   | sec.   |  |  |  |  |  |  |  |  |  |  |
| Memory  |  | 2000 read  | ings   |  |  |  |  |  |  |  |  |  |  |
| Standard  | S  | CPI (IEEE-488.2), A  | ailent 34401   |  |  |  |  |  |  |  |  |  |  |
| Complier  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Interface   |  | USB, GP  | IB   |  |  |  |  |  |  |  |  |  |  |
| General   | 1  |  |  |  |  |  |  |  |  |  |  |  |  |
| Power<br>Consumption                                |  | 25VA ma  | ах.  |  |  |  |  |  |  |  |  |  |  |
| Power<br>Requirements                               | 100 V/120 V/220 V/240 V, 45 Hz ~ 440 Hz  |  |  |  |  |  |  |  |  |  |  |  |  |
| Dimensions<br>(HxWxD)                               | 88.6 x 213.6 x 346.9 mm  |  |  |  |  |  |  |  |  |  |  |  |  |
| Operating<br>Temperature                            |  | 0°C to 50°C  |  |  |  |  |  |  |  |  |  |  |  |
| Weight  | Approx. 4.36 kgs   |  |  |  |  |  |  |  |  |  |  |  |  |
| Multi-point TC Sc                                   | anner Card A12   | 0004   |  |  |  |  |  |  |  |  |  |  |  |
| Maximum<br>AC Voltage                               | 1  |  | 1A switched, 30VA                                    |  |  |  |  |  |  |  |  |  |  |
| Maximum<br>DC Voltage                               | 110V, 1A switch  | ned, 30VA (resistiv  | ve load)   |  |  |  |  |  |  |  |  |  |  |
| Connector Type                                      | Screw terminal   | , #22 AWG wire si  | ze   |  |  |  |  |  |  |  |  |  |  |
| Common Mode<br>Voltage                              | 200V peak btw  | any terminal and   | earth  |  |  |  |  |  |  |  |  |  |  |
| Max. Voltage btw<br>Any Two Terminals               | 160V peak  |  |  |  |  |  |  |  |  |  |  |  |  |
| Thermocouple  | K type (-200°C /   | ~ 1372°) $\pm$ 1.5°<br>er to the detailed  |  |  |  |  |  |  |  |  |  |  |  |
|   |  |  | •  |  |  |  |  |  |  |  |  |  |  |

## **GNSS Signal Simulator**

## Model 49003



#### **KEY FEATURES**

- Selectable GPS/GLONASS Satellite Vehicle and Navigation Data
- Adjustable RF levels from -85dBm to -145dBm in 0.1dB steps
- Provided calibration output level from -25dBm to -85dBm
- Embedded OCXO for accurate clock
- Embedded Doppler function
- Industry-leading stability, quality and reliability Verify operational integrity of GPS/GLONASS
- receivers auickly Small size, easy to operation

### **APPLICATIONS**

- Evaluation of GPS products quality / accuracy
- Evaluation of GPS receiver sensitivity
- Mobile phone GPS function test
- Performance evaluation of receiver and module desian
- Verify operational integrity of GPS receivers and module

Chroma 49003 Satellite Signal Simulator is a new generation of test instruments, the advantages of combining traditional instruments and new architecture designed in full compliance with the standards of the GPS and GLONASS testing will subvert the traditional concept of the test system.

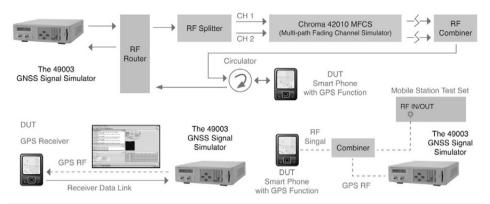
The Chroma 49003 power output with high accuracy (resolution 0.1dB), built-in high-stability 10.22MHz OCXO (GLONASS) and 10.23 MHz OCXO (GPS) to provide the best signal quality, on-demand single channel type satellite navigation data output and humanized operation interface, in full compliance with the testing requirements of the production line. The light volume and scalable satellite series design concept, with the contact and non-contact fixtures can be a variety of test environments, such as miniaturized test system, portable test system, as well as a small amount of diverse testing requirements, it can meet your any testing requirements.

The Chroma 49003 retains the advantages of traditional instruments to facilitate the operation and the high stability of the system, multifunctional, high-quality and economical price, will be the best choice of the measurement works.

#### **ORDERING INFORMATION**

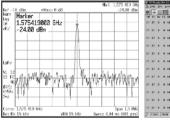
49003 : GNSS Signal Simulator Platform **Additional Options and Accessories** A490030 : GPS Flat Antenna A490031: RF Coaxial Cable A490032 : GPS / GLONASS Dual Mode Flat Antenna A490033: 50 ohm Terminator (N Type) A490034 : GPS Signal Module A490035 : GLONASS Signal Module

**Application-Configuration Proposed for Multi-mode Handset Measurement** 



### **SPECIFICATIONS**

| Model  | 49003  |
|--|--|
| RF Signal  |  |
| Output Center Frequency                            | GPS Signal Module : 1575.42MHz (L1 band), optional                   |
| output center riequency                            | GLONASS Signal Module : 1598.0625MHz-1605.375MHz (L1 band), optional |
| RF output level                                    | -85 to -145dBm   |
| Calibration RF output level                        | -25 to -85dBm  |
| Resolution   | 0.1dB  |
| Power Accuracy                                     | ±1dB   |
| RF Output impedance                                | 50 Ω   |
| Spurious   | Less than -30dBc   |
| (in GPS/GLONASS band)                              |  |
| Carrier phase noise                                | 0.1 rad RMS@10 to 10KHz  |
| Baseband Signal                                    |  |
| Modulation method                                  | BPSK   |
| Oven crystal oscillator                            | Less than 5X10 <sup>-10</sup> per day                                |
| frequency accuracy                                 |  |
| OCXO Stability                                     | Less than 5X10 <sup>-9</sup> -20 to +70°C                            |
| C/A Code   | GPS Signal Module : 1.023 MHz (1023 bit gold code), optional         |
|  | GLONASS Signal Module : 0.511MHz (3135.029354 cycles/chip), optional |
| Channels   | GPS Signal Module : SV1~SV32, optional                               |
|  | GLONASS Signal Module : SV1~SV24, optional                           |
| Navigation Data                                    | 50BPS  |
| RF Output Connectors                               | N-Type female RF out & Cal. out                                      |
| Other signals available                            | LCD keypad RS-232  |
| General  |  |
|  | AC Input Voltage: 90V to 265V, 47 to 63 Hz                           |
| Power supply                                       | Input line Current: 0.2A Max.  |
|  | Max. Output Rating: 250W   |
| Weight   | 5.5 Kg   |
| Dimensions   | 318mm (W) x 320mm (D) x 100mm (H)                                    |
| Operating Temperature                              | 0 to 45°C  |
| Operating Humidity                                 | 20 to 90%  |
| Mari 1.575 419<br>Ref -18 dBn #Rtten 6 dB -24,89 d |  |
| Ref -18 dBn #Rten 8 dB -24.88 c                    |  |





| 0   | 0    | 00  | [E  | 비율           | B    | 19  | 14  | 10      | 긔  | D  | 16 | a] i | $\overline{n}$ | G | Þ  | E.  | 01 |    |    |     |    |   |    |     |    | e  |
|-----|------|-----|-----|--------------|------|-----|-----|---------|----|----|----|------|----------------|---|----|-----|----|----|----|-----|----|---|----|-----|----|----|
| 58  | 32   | 82  | 0   | 6240         | -    |     |     |         | -5 |    |    |      | •              |   |    |     | -3 |    |    |     | -7 |   |    |     | -1 |    |
| 21  | 37   | .0  |     | 10.1         | Ш    | Ш   | Ш   | 11      |    | 11 | 11 | 11   | 1              |   | 11 | 111 | 11 | 11 | 11 | 111 | 1  | Ш | 11 | 111 | 1  | 11 |
| 15  | **   |     |     | <b>u</b> , e | C    |     |     |         | Ι  |    |    |      | L              |   |    |     |    |    |    |     | Ι  |   |    |     |    |    |
| 9   | 88   | 0   |     | 0.0          | Г    |     |     |         | Τ  |    |    |      | Г              |   |    |     | Т  |    |    |     | Τ  |   |    |     | Т  |    |
| 13. | 24   | 0   |     | 0.0          | Г    |     |     |         | Τ  |    |    |      | Γ              |   |    |     | Τ  |    |    |     | T  |   |    |     |    |    |
| 22  |      | 0   | ٠   | 0.0          | Г    |     |     |         | Τ  |    |    |      | Г              |   |    |     | Ι  |    |    |     | Τ  |   |    |     | Т  |    |
| 15  |      |     |     | 0.E          | Г    |     |     |         | Т  |    |    |      | Г              |   |    |     | Т  |    |    |     | T  |   |    |     | Т  |    |
| 1   |      |     |     | 9.0          | Γ    |     |     |         | Τ  |    |    |      | Γ              |   |    |     | Τ  |    |    |     | T  |   |    |     |    |    |
| 77  |      |     |     | а.е          | Г    |     |     |         | Τ  |    |    |      | Г              |   |    |     | Τ  |    |    |     | T  |   |    |     | Т  |    |
| 17  | 14   | 0   |     | 0.0          |      |     |     |         | T  |    |    |      | Γ              |   |    |     | T  |    |    |     | T  |   |    |     |    |    |
| 2.0 |      |     |     | 0.0          | Г    |     |     |         | Τ  |    |    |      | Г              |   |    |     | Τ  |    |    |     | T  |   |    |     | T  |    |
| 29  |      |     |     | 9.E          | Γ    |     |     |         | T  |    |    |      | Γ              |   |    |     | T  |    |    |     | Ť  |   |    |     | T  |    |
|     |      |     |     | u. e         | Г    |     |     |         | Т  |    |    |      | Γ              |   |    |     | Т  |    |    |     | T  |   |    |     |    |    |
| 71  | 0.00 | a [ | 394 | 0.00         | 3700 | (54 | les | id albe | Ċ  |    |    |      |                |   |    |     |    |    |    |     |    |   |    |     |    |    |



A490031

**RF** Carrier

A490030/A490032

All specifications are subject to change without notice.

A490033

## **GPS Simulator**

# Model ADIVIC MP6220



### **KEY FEATURES**

### Frequency Characteristics

- Frequency Range : 1575.42MHz
- Warm-up time (typical) : 30 minutes
- Frequency Accuracy : +/-100ppb maximum
- Temperature stability : +/-100ppb maximum
- Aging (Per year) : +/-100ppb maximum, (Per day) : +/-1 ppb maximum
- Channels
  - Number : 1CH, 8CH
  - Navigation data : GPS C/A @1.023MHz with 50bps
  - Modulation : BPSK
- Spectral purity
  - Phase Noise@1KHz offset : Harmonic : RF Output Characteristics
  - High power normal output level : -55dBm ~ -90dBm
  - Low power normal output level : -90dBm ~ -160dBm
  - Channel Attenuation range (refer normal output level : -31.5dB ~ 0dB)

% Power level ranged from -55 dBm to -145 dBm in 1 dB step, -145 dBm to -160dBm in 0.5 dB step.

| SPECIFICATIONS                   |                            |  |  |  |  |
|----------------------------------|----------------------------|--|--|--|--|
| Model                            | ADIVIC MP6220              |  |  |  |  |
| Amplitude Resolution             | 1dB step                   |  |  |  |  |
| Amplitude Accuracy               | Output Impedance : 50 ohms |  |  |  |  |
| Doppler Shift                    | $\pm$ 30KHz (1CH option)   |  |  |  |  |
| Voltage Standing Wave Ratio      | 1575.42MHz                 |  |  |  |  |
| Overload protection on RF output |                            |  |  |  |  |
| Maximum reverse RF power         | 1W maximum                 |  |  |  |  |
| Maximum DC input                 | ± 50 VDC                   |  |  |  |  |
| Environmental                    |                            |  |  |  |  |
| Operating temperature            | 0 to 50 °C                 |  |  |  |  |
| Relative Humidity                | 10% to 90%                 |  |  |  |  |
| Storage temperature              | -20 to 70 °C               |  |  |  |  |
| Relative Humidity                | 5% to 95%                  |  |  |  |  |

### **ORDERING INFORMATION**

ADIVIC MP6220 : GPS Simulator



furnkey Test &

## Wireless Test Station

## Model ADIVIC MP5000



MP5000

### **KEY FEATURES**

- Support testing on 802.11ac, 802.11/a/b/g/n standards
- Support 120MHz VSA measurement B/W (16-bit 160MSPS ADC)
- Support automated mass-production turnkey software
- Easy-to-use GUI application for RD/QA purpose
- PC open system architecture with VSA/VSG all-in-one-box
- Signal measurement engine resides at the tester side
- Capable of customer generated I/Q waveform file transmission

The MP5000 wireless test station is designed to test WLAN products for both R&D/QA and manufacturing purpose. The MP5000 supports 802.11ac, and 802.11a/b/g/n standards. It equips the high performance processor architecture as well as the optimized algorithm to speed up the testing time, in addition, the MP5000 equips high quality VSA (Vector Signal Analyzer) and VSG (Vector Signal Generator) for signal measurement and signal generating. The MP5000 wireless test station provides a user friendly GUI program which allows the user to easily measure the incoming WLAN signal with only a few mouse clicks. The supported measurement items include EVM, power, frequency error, phase error, IQ imbalance and etc. The MP5000 contains a rich set of pre-generated 802.11a/b/g/n/ac waveform files to provide high quality WLAN test signals to the DUT.

Moreover, a built-in waveform generator allows the user to generate arbitrary 802.11a/b/g/n/ ac test signals as well. The MP5000 also supports automated mass-production turnkey software by customer request.

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|  | 56                 |      | 13           | Capture Length | 1.04         | •       |         |         |           |          |            | emote S  |         |   |
| Freq Band  | 153                |      |              | Average        | 1            |         |         |         |           | 1.0      |            | aveGen I | Jtliky. |   |
| Channel  |                    |      |              |                | Auto         |         |         |         |           |          | sadProfile |          |         |   |
|  | \$365              | 4    | 1012         |                |              |         |         |         |           |          |            |          | 478     |   |
| Charael<br>Prequency<br>Sampling Rate                    |                    |      | 944          | Packet Detect  | 0            |         |         |         |           |          |            |          |         | 2 |
| Chaneel<br>Frequency<br>Sampling Rate<br>Raference level | \$765              |      |              | DC Offset      | 0            | 1       |         |         |           |          | iave huffe |          |         |   |
| Channel<br>Prequency<br>Sampling Rate                    | \$765<br>100       | .*   | 994          |                | 0            | 1 100   |         |         |           |          | iave huffe |          |         |   |

Graphic User Interface

| CRECIFICATIONS  |   |
|---|---|
| SPECIFICATIONS  |   |
| RF Analyzer (Note *1)   |   |
| Input Frequency Range   | 2150~2600 MHz, 4900~6000 MHz  |
| RF Port number  | 2 Ports   |
| IF bandwidth  | 120 MHz   |
| Max input power   | +30 dBm peak, +20 dBm average   |
| Input power accuracy  | ±0.75 dB (±0.5 dB Typ)  |
| @(+20 to -75 dBm)   | ±1.0 dB@ 0 °C ~ 50 °C   |
| Phase Noise   | < -100dBc: 1 KHz offset @2.4 GHz<br>< -9 5dBc: 1 KHz offset @5.8 GHz  |
| LO Leakage (after self-c alibration)  | <-50 dBc  |
| sideband image (IQ-imbalance)   | <-50dBc @ 2.4GHz, -10dBm  |
| @after self-calibration   | <-50dBc @ 5.8GHz, -10dBm  |
| Third order input inter-modulation distortion(IMD3)   | < -70dBc@-10 dBm  |
| Input Return loss   | > 10 dB 2150~2600 MH z<br>> 12 dB 4900~6000 MH z  |
| ADC resolution  | 16 Bits   |
| Sample rate   | 160 MS/s  |
| Sample fale   | $\pm 50 \text{ ppb maximum (OCXO)}@25 °C,$  |
| Initial achievable accuracy   | after 60 minutes warm up  |
| Temperature atability   |   |
| Temperature stability   | ±20 ppb maximum(OCXO) @0 °C ~ 50 °C   |
| Aging   | ±1 ppb / day maximum (OCXO)   |
|   | $\pm 100 \text{ ppb / yr maximum (OCXO)}$   |
| Operating Temperature   | 0 °C to 50 °C   |
| Operating Voltage   | 100 V to 240 V  |
| Warm - up time  | > 30 minute   |
|   |   |
| RF Generator (Note *1)  |   |
| Output Frequency Range  | 4900~6000 MHz , 2150~2600 MHz   |
|   | 120 MHz   |
| Output Frequency Range  |   |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz  |
| Output Frequency Range<br>IF bandwidth  | 120 MHz<br>+10 dBm @ 2150~2600 MHz  |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz  |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz   |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)   | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m  |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@after self-calibration  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m   |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@after self-calibration<br>sideband image (IQ-imbalance)   | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 2.4 GHz, -10 dB m  |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@after self-calibration<br>sideband image (IQ-imbalance)<br>@after self-calibration  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m   |
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| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@after self-calibration<br>sideband image (IQ-imbalance)<br>@after self-calibration<br>Third order inter -modulation   | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m  |
| Output Frequency Range<br>IF bandwidth<br>Max Output power @ CW<br>Power Accuracy @ (0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@ after self-calibration<br>sideband image (IQ-imbalance)<br>@ after self-calibration<br>Third order inter -modulation<br>distortion(IMD3)  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -60dBc@-10dBm(two -13dBm Tone)<br>> 10 dB 2150 ~ 2600 M Hz                        |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@ after self-calibration<br>sideband image (IQ-imbalance)<br>@ after self-calibration<br>Third order inter -modulation<br>distortion(IMD3)<br>Return loss<br>DAC resolution  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -60dBc @ -10dBm(two -13dBm Tone)<br>> 10 dB 2150 ~ 2600 M Hz<br>> 12 dB 4900 ~ 6000 M Hz<br>16 Bits                                |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@ after self-calibration<br>sideband image (IQ-imbalance)<br>@ after self-calibration<br>Third order inter -modulation<br>distortion(IMD3)<br>Return loss<br>DAC resolution<br>Sample rate   | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -60 dBc @ -10 dBm(two -13 dBm Tone)<br>> 10 dB 2150 ~ 2600 M Hz<br>> 12 dB 4900 ~ 6000 M Hz<br>16 Bits<br>960 MS/s |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@ after self-calibration<br>sideband image (IQ-imbalance)<br>@ after self-calibration<br>Third order inter -modulation<br>distortion(IMD3)<br>Return loss<br>DAC resolution<br>Sample rate<br>Initial achievable accuracy  | 120 MHz<br>+10 dBm @ 2150~2600 MHz<br>+7 dBm @ 4900 ~ 6000 MHz<br>±0.75 dB (± 0.5 dB Typ )<br>±1.0 dB @ 0 °C ~ 50 °C<br>Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz<br>Phase noise < -95 dBc: 1 KHz offset @ 5.8 GHz<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 2.4 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -50 dBc @ 5.8 GHz, -10 dB m<br>< -60dBc @ -10dBm(two -13dBm Tone)<br>> 10 dB 2150 ~ 2600 M Hz<br>> 12 dB 4900 ~ 6000 M Hz<br>16 Bits                                |
| Output Frequency Range<br>IF bandwidth<br>Max Output power@ CW<br>Power Accuracy@(0 to -95 dBm)<br>Phase Noise<br>LO leakage(DC offset)<br>@ after self-calibration<br>sideband image (IQ-imbalance)<br>@ after self-calibration<br>Third order inter -modulation<br>distortion(IMD3)<br>Return loss<br>DAC resolution<br>Sample rate   | 120 MHz         +10 dBm @ 2150~2600 MHz         +7 dBm @ 4900 ~ 6000 MHz $\pm 0.75$ dB ( $\pm 0.5$ dB Typ ) $\pm 1.0$ dB @ 0 °C ~ 50 °C         Phase noise < -100 dBc: 1 KHz offset @ 2.4 GHz  |
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**Note \*1 :** Test condition Temperature :  $15 \degree C \sim 35\degree C$ , Voltage : 100 V to 240 V

### **ORDERING INFORMATION**

ADIVIC MP5000 : Wireless Test Station

## RF Recorder / Player

# Model ADIVIC MP7 Series



### **Benefits**

- Shorten design-in schedule because of evitable time-wasting virtual field testing
- Flexible bandwidth extension with the availability of interconnection between instruments
- Passive and active input ports enable receiving different power signals
- Recording fluctuated spectrum is feasible via MAGC function
- High spectrum sensitivity performance because of low noise floor (< -165 dBm/Hz)</li>

- Precise measurement in accordance with excellent spurious response.
- High resolution in order to avoiding unnecessary distortion as recording and playback
- Diminish space limitation during recording via remote control with 10 MHz sync. port
- Swapable SSD enables prolonged recording
   In support of various worldwide communication standards
- Instinctive control by user-friendly GUI

### **KEY FEATURES**

- Adjustable bandwidth from 1 MHz to 100 MHz
- Frequency coverage from 300 KHz to 6.0 GHz
- 250 MSPS ADC sampling rate
- 16-Bit ADC, DAC resolution
- 1PPS, IRIG-B support (Optional)
- Additional traces for maximum/ minimum holds
- 20+ makers for easy signal identification
- Data formats compatible to MATLAB
   Software utility support including I/ Q data extractor and File segment
- Matrix System supports 7 units sync (Optional)
   4 X 2.5" SSD internal drive bays
- (4 X 480 GB by default, 4 X 1 TB upgradable )

### **ADIVIC RF Recorder/Player Overview**

MP7 series is a specific RF measurement instrument which is able to capture signals in the air and faithfully playback. To carry out field testing and performance testing, MP7 series are excellent assistance with fast signal analysis for all existing communication standards and modulation schemes regardless digital and analogue. In addition, it also allows users to precisely record and investigate the wanted signals, adjacent channel signals, noise/ fading signals and any other distortion signals accordingly by means of excellent performance against spurious signals.

MP7200 is basic version for spectrum analysis within 25 MHz bandwidth. MP7300 is specialized for the requirement of simultaneous two-channel recording/playback. MP7600 is the most powerful version with wider bandwidth and compact housing for contemporary wireless communication standards.

| SPECIFICATIONS        |                             |                                     |                                     |                                     |
|-----------------------|-----------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Model                 | ADIVIC MP9000<br>RF Player  | ADIVIC MP7200<br>RF Recorder/Player | ADIVIC MP7300<br>RF Recorder/Player | ADIVIC MP7600<br>RF Recorder/Player |
| TFT Touch Screen      | Resistive                   | Capacity                            | Capacity                            |                                     |
| Frequency             | 25MHz~2.7GHz                | 25MHz~2.7GHz                        | 300KHz~3.0GHz                       | 300KHz~6GHz                         |
| Bandwidth             | 25MHz                       | 25MHz (20MHz<br>Guaranty BW)        | 45MHz                               | 100MHz                              |
| Sample Rate           | 100MS/s                     | 100MS/s                             | 250MS/s                             | 250MS/s                             |
| Resolution RX/TX      | 14 bit                      | 14/14 bit                           | 16/14 bit                           | 16 bit                              |
| Recorder Channel      | -                           | 1                                   | 1/2                                 | 1                                   |
| Playback Channel      | 1                           | 1                                   | 1/2                                 | 1                                   |
| Diversity function    | No                          | No                                  | Yes<br>(Diversity option)           | No                                  |
| Trigger function      | No                          | Yes                                 | Yes                                 | Yes                                 |
| 10MHz Clock<br>In/Out | No                          | No                                  | Yes                                 | Yes                                 |
| SWAP Hard Disk        | Yes                         | Yes                                 | Yes                                 | Yes                                 |
| SSD                   | Option                      | Standard                            | Standard                            | Standard                            |
| Power                 | AC 100~250V                 | AC 100~250V                         | AC 100~250V                         | 12V                                 |
| Size                  | L:36 x W :34 x<br>H : 20 cm | L : 36 x W : 34 x<br>H : 22.9 cm    | L : 45 x W : 44 x<br>H : 26.4 cm    | 35.6 x 30.2 x<br>10.2 cm            |
| Weight                | 17 kg                       | 14.3 kg                             | depends on configuration            | 9 kg                                |

### **ORDERING INFORMATION**

ADIVIC MP7200 : RF Recorder/Player 25MHz~2.7GHz ADIVIC MP7300 : RF Recorder/Player 25MHz~3.0GHz ADIVIC MP7600 : RF Recorder/Player 300KHz~6.0GHz

/ Test &

## Wireless Communication Test System

## Model ADIVIC MP9000



MP9000

### **APPLICATIONS**

### Multi-Standards RF Communication Testing GPS

- 6CH, 8CH GPS Model
- RF Level -55dBm to -160 dBm
- Global City Library
- Location editor
- Almanac upgradeable
- 1 Channel GPS Model
- RF Level -55dBm to -160dBm
- Almanac data
- Doppler Control  $\pm$  30KHz
- RF Player
  - Perfect solution for DTV, GPS, Radio and many RF communications
  - Field testing signal source
  - Performance testing signal source
  - Supports Frequency ranged from 300K-2.7GHz
  - Adjustable bandwidth 25MHz

### DTV

- DVB-T/H
- ATSC
- DTMB
- ISDB-T
- RF level +10dBm to -110dBm
- Noise Generator
- FM RDS
  - FM 76 to 108MHz
  - RF level -10 to -120dBm
  - FM Mono
  - FM Stereo
  - RDS - RBDS
  - RDS TMC / RBDS TMC
  - RDS Feature Alternative Frequency / Enhance
  - Other Network / Radio Text Plus
- Audio Analyzer
  - RX :

AC Level, Noise, Distortion, S/N, Frequency response, Total Harmonic Distortion THD+N, SINAD

- TX :
- CW mode, Multi Tone, 20Hz-20KHz Sweepmode

### Introduction

ADIVIC proudly introduces the new model -MP9000 RF Station. MP9000 provides a platform that adopts different wireless communication modules into variety of combinations for different purposes & standard require-ments of tests including GPS, FM RDS/TMC, DTV, Audio Analyzer and all one way communication standard.

The MP9000 allows the users to implement single or multiple standards testing, such as concurrent paral-lel testing and sequence-based testing. MP9000 is sophisticated for R&D applications, and the user friendly GUI also makes it ideal for production line applications. By bringing in the concept of one does all, MP9000 would greatly benefit the customers with dramatic time saving and high-level of cost-effectiveness.

### Operation

An easy-to use GUI and an integrated 10.2" Touch panel fully conform with one of its designations to provide an user-friendly environment which allows the users to easily control the MP9000 functionalities. Speaking of compatibility, the USB and Ethernet ports are implemented to allow the users to easily integrate the MP9000 into the production-line ATE for production test purpose covering the semi-product (PCBA) and end product test.

### **RF Player Option**

ADIVIC RF PLAYER is an exquisite RF- engineering tool for both field testing and performance testing. It has the capability of replacing many expensive instruments from one RF communication to another. It is by far the only instrument which crosses over RF communication standards from the past, the present and the future. RF PLAYER is meant for all existing RF communications, for all modulation schemes, for analogue and digital.MP9000 plays the streams recorded from the ADIVIC's RF Recorders.



| SPECIFICATIONS                          |                                 |
|---|---------------------------------|
| Model                                   | ADIVIC MP9000                   |
| System                                  |                                 |
| Processor                               | Intel Core 2 Duo Series         |
| Memory                                  | DDRII 667 2GB                   |
| System storage                          | SATAII 320G HDD or above        |
| Power supply                            | AC 100 to 240V, 50/60Hz         |
| Operating temperature                   | 0 to 50°C                       |
| Operating humidity                      | 0% to 95% RH (Non Condensation) |
| Storage temperature                     | -20 to +80°C                    |
| Dimensions                              | 360(L) x 340(W) x 200(H) mm     |
| Weight                                  | Approx.17Kgw                    |
| OS system                               |                                 |
| Windows XP Professional User interface  |                                 |
| 10.2 inch TFT color LCD                 |                                 |
| Touch Screen                            |                                 |
| External Interface                      |                                 |
| USB 2.0 Port x 4                        |                                 |
| eSATA x 1                               |                                 |
| Ethernet LAN Port (10BASE-T / 100BASE-T | X / 1000BASE-T) x 1             |

### **ORDERING INFORMATION**

ADIVIC MP9000 : Wireless Communication Test System

|  | Video &<br>Color                  |
|--|-----------------------------------|
|  | Flat Panel<br>Display             |
|  | el LED/<br>Lighting               |
|  | Optical<br>Devices                |
|  |                                   |
|  | Photovoltaic Test<br>& Automation |
|  |                                   |
|  | Automated<br>Optical Inspection   |
|  | Power<br>Electronics              |
|  | er Batte<br>nics Aut              |
|  | Battery Test &<br>Automation      |
|  | Passive<br>Component              |
|  | Electrical<br>Safety              |
|  |                                   |
|  | Semiconductor/<br>IC              |
|  | PXI Test &<br>Measurement         |
|  | t & Ge<br>ment Pu                 |
|  | General I<br>Purpose E            |
|  | Manufacturing<br>Execution System |
|  | ing Turnk<br>stem Auto            |
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| Manufacturing Execution System (MES)  | 17-1 |
|---------------------------------------|------|
| Hemodialysis Management System (HDMS) | 17-3 |
| Fast Easy Player                      | 17-4 |



Fast Easy Player

### **Industry 4.0**



### **KEY FEATURES**

- Complete Production Process Trace Traceability
- Full Production Information Monitoring - WIP Control
- Equipment /PLC Automatic Connectivity
   Computer Integrated Manufacturing: CIM
   Equipment Automation Program: EAP
- Professional Quality Control System
  - Statistical Process Control: SPC
  - Corrective Action Report: CAR
  - Out of Control Action Plan: OCAP
- Manufacturing Equipment Management - Equipment Management System: EMS
- Overall Equipment Effectiveness: OEE
- Real-time Report
  - Yield Rate Report
  - WIP Report

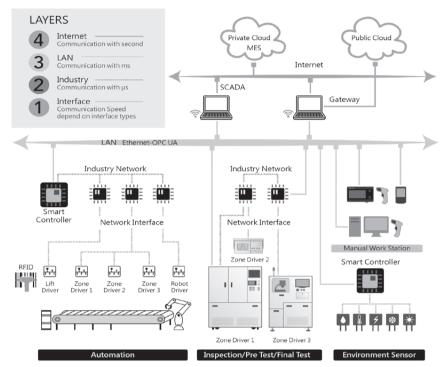
### The New Generation of MES - The Core System of Automated Factories

As the key of smart factory, Manufacturing Execution System (MES) plays an important role of integrating automation. The trend of modern factory is heading toward automated production. Traditional MES, which focuses on only collecting data and report analysis, cannot meet the requirements of automation era. New generation of MES is the core system of automated factories that not only retains the original scope but also covers the functions of CIM, EAP, equipment connectively, and integrating robotic arms to meet the objectives of factory automation by gaining massive data analysis in real time to improve product quality and customer satisfaction, at the same time, reducing the production cost and maximize the benefits of enterprise.



### Sajet MES - The Best Choice of Smart Factory System

Chroma, not only the professional MES system provider but also the world-class test & measurement equipment and automated production line manufacturer, has abundant technology and experiences in MES and automated equipment integration that can provide you the best manufacturing execution system solution of new generation.



### Complete Production Process Trace -Traceability

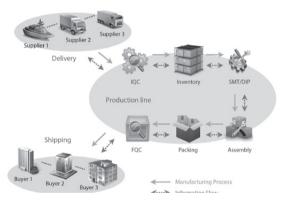
The manufacturing process information contained in Sajet MES can assist the factory to process work orders, monitor workstations, track and manage inventory as well as to conduct quality inspection and exception conditions management. The precision allows users to find out the lot number, delivery date and quantity of passive components used in a product from the supplier. It can also use the lot number to trace back the shipped products for locations and quantities to reduce the loss caused by defect components. The traceability feature can solve the problems rapidly is the best helper for factory management.

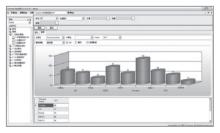
### Full Production Information Monitoring-WIP Control

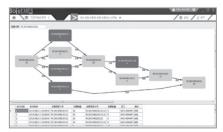
Sajet MES provides flexible routing management that allows users to plan different routes based on the products, control the quantity of yield and defective goods, manage reworked products and calculate the pass-through rate. The complete traceability data collection and production line information are fully controlled by Sajet MES to increase the production efficiency and reduce production costs.

### Flexible Routing Management - LOT Control

Sajet MES also provides the function of flexible routing control. Users can do different route management according to different products, at the same time support different demands of controlling products, work orders, and lots as the management objectives. Also, users can easily structure production types on diverse operation interfaces of different industries, providing prediction and abnormality handling system, so as to control abnormality efficiently.



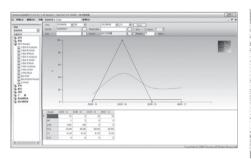


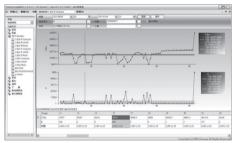


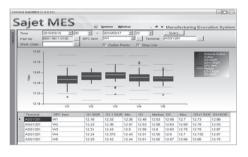
All specifications are subject to change without notice.

### **Professional Quality Control System -**SPC, CAR, OCAP

Sajet MES is not just a professional factory manufacturing management solution but also has specialized quality control system and on-line SPC control that allow users to check the data collected on-line. It can perform measurements, control chart analysis (ex: CPK, X-R, X-S Chart etc.), defect analysis and exception handling by setting up the channel for error notification via Email to supervisors and sending alerts in voice or chart colors to improve the quality of production as well as reduce the risks.





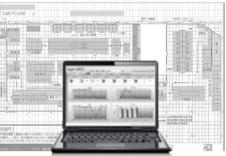


### Manufacturing Equipment Management -**EMS, OEE**

Sajet MES is capable of collecting the workstation status to give the supervisor and on-site personnel to monitor the workstation status in real time, log its maintenance status and query the information of device, including:

- Device failure analysis
- Device utilization rate
- Failure frequency analysis
- Device maintenance time analysis...etc.

Users can use PCs or display board to manage the processing workstation easily.



### **Real-time Report** - Yield Rate Report, WIP Report

Sajet MES has powerful MES database technology in the industry that can be online in real time to administer every work item precisely. The report generator developed by Chroma is applicable for complete report query and real time report generation. Various mobile devices like smart phone, PDA and Pad can be used to query the report and get the factory status immediately. It can integrate into BI (Business Intelligence) in the enterprise so that the manager can view the report of production line thoroughly.



### **Complete Hardware Integrated Solution Satisfies Various Needs**

- Integration of Various Devices - Various test equipment of Chroma
  - Manufacturing database online control program development and implementation
- Barcode Printing Device and Sensor Switch - Long/short range optical switching system - Various industrial barcode printer
- Mobile Application Management Device - PDA, Tablet Computer (iOS/Windows/Android)
  - Wireless Scanner, wireless terminal, and etc.
- Other Electromechanics and Factory Devices - Temperature controller, electronic scale
  - PLC, connectable device (Scanner), and etc.

### Optical Scanning

- Various handheld 1 & 2 dimension gun type barcode scanner
- RFID Reader, fixed barcode scanner system
- Industrial Network Peripherals
  - Data collector, IPC
  - TCP/IP, RS232, USB signal converter, and etc.
- Display Device Management - Various production efficiency kanban
  - Factory notice kanban, Pick To Ligh, and etc.

### Automatic Equipment

- Automatic labeling machine, laser engraving machine, and etc.
- Fully automatic test equipment solution

### **ORDERING INFORMATION**

| List of Systems and Function | al Modules                       |                                       |  |
|------------------------------|----------------------------------|---------------------------------------|--|
| Basic Modules                | Other Systems                    | Smary Factory Modules                 | Optional Modules                       |
| Data Center                  | Real-time SPC                    | App Report                            | ERP/MES Interface                      |
| Work Order Manager           | Work Hour System                 | Computer Integrated Manufacturing,    | Automated Test Eqiipment (ATE)         |
| Barcode Center               | Global RMA System                | PLC Handshaking Centre (CIM/PHC)      | Incoming Quality Control (IQC)         |
| TGS Server (Data Collection) | Computer Numerical Control (CNC) | Equipment Automation Program (EAP)    | Tooling Manager                        |
| Repair                       | Warehouse Management System      | Equipment Management System (EMS/OEE) | Alarm System                           |
| Rework                       | Material and Pull System (MMPS)  | Formation Measurement System (FMS)    | SMT Feeding System                     |
| Quality Control              | ANDON System                     | Fast Easy Player (FEP)                | Shipping                               |
| Packing                      | Note : Independent modules       | Recipe Management System (RMS)        | Material Warehouse                     |
| Run Card Manager (R/C)       | ·                                | Note : Independent modules            | Return Merchandise Authorization (RMA) |
| WIP IN/OUT Tracking          |                                  |                                       | e-Kanban (Real-time Display Board)     |
| Report                       |                                  |                                       | Nete Cubridiarias of basis modulas     |

Note : Subsidiaries of basic modules

PXI Test &

## Hemodialysis Management System

# Model Sajet HDMS Series





- Digital Sickbed Arrangement Management
- e-Hemodialysis Record
- Accurate Weight Scale Management
- HOPE Auto-Uploading Management
- Digitalize Medical Records Management
- HD Visualized Data Analysis

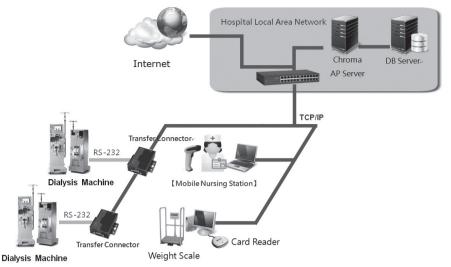
### **Chroma HDMS is Your Best Choice**

HemoDialysis Management system integrates related software and hardware, saving medical personnels' time on organizing all the paper work. Also, it helps to decrease the possible error that might be happened during the process of hand-writing document. Through the automatic process on the system, we can get more completed data, at the same time, enhancing medical and nursing data integration.

### **HD Visualized Data Analysis**

The system can also produce short, medium, and long term related hemodialysis data and reports, so as to be the analysis of medical and nursing research, providing a basis to improve medical quality.





### **Digital Sickbed Arrangement Management**

Through digital sickbed arrangement, it's easier to manage all the sickbed arrangement. The user interface is clear and useful for the administrator to control the entire situation, without spending lots of time on complicated paper work.

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### e-Hemodialysis Record

All the data on dialysis machine will be automatically uploaded to the Chroma AP Server. The system will automatically help to fill in related reports. Not only nursing staffs can save lots of time doing complicated hand-writing document but also keep the complete data for the future references and inquiry.

### **Accurate Weight Scale Management**

In order to decrease inconvenience and possible error of hand-writing process, the number of weight scale can be automatically uploaded to the system, which reaches the goal of "PAPERLESS".

### **HOPE Auto-Uploading Management**

So as to reduce repeatedly key-in data, users can conduct the doctors' orders and upload it to HOPE on HDMS. Any computers that connect to the hospital local area network can inquire the medical records and conduct doctors' orders through the authorized permission.

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### **Digitalize Medical Records Management**

Digital medical records gradually replace the traditional paper medical records, including eyesight, hearing, and past medical history. It becomes more convenient to inquire patients' medical records.

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### Lists of Systems and Functional Modules

### Basic Modules

- Data Center
- Medical Records
- Dialysis Machine
- HemoDialysis
- Sickbed Arrangement
- Report

### **Optional Modules**

- Weight Scale
- HOPE Uploading
- HIS Connection
- Doctor Patrol
- Peritoneal Dialysis
- NIS Connection
- PACS Management

### Complete Hardware Integrated Solution Satisfies Various Needs

- HemoDialysis Device
- Dialysis Machine Connection NPort
- Various Handheld 1&2 Dimension Gun-Type Barcode Scanner
- Mobile Application Management Device: PDA, Tablet Computer, and etc.

## Fast Easy Player

# Model FEP Series



### **KEY FEATURES**

- Broadcast through Wi-Fi
- Log in on web browser
- Modularize interface setting / Flexibly adjust layout
- Integrate multiple ways to connect external database
- Voluntarily define the chart and diagram
- Platform controls the area and setting of each screen

### **APPLICATIONS**

- Real-time information broadcast through Wi-Fi in hospitals, retail stores, and public environments
- Real-time broadcast of factory production efficiency kanban through Wi-Fi
- Real-time broadcast of factory eSOP through Wi-Fi
- Real-time broadcast of above messages on mobiles and tablets through Wi-Fi

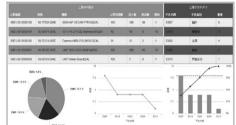
### Setting Up & Installment

- Connect the display devices through HDMI
- Internal Android platform on AP
- Fast hardware setup
- Setup can be finished under environment with Wi-Fi Connect to SQL server easily



### **User Interface**

- With function of display of dashboard, scrolling text, bulletin board, pictures rotator, date, time, weather, embedded web page and etc
- Voluntarily adjust the layout according to actual needs
- Multiple templates can be set at the same time, and display on different monitors



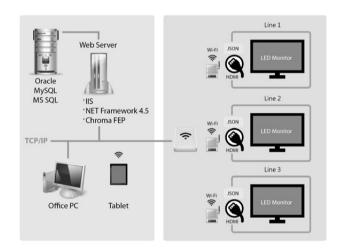
### **Picture Files Maintenance**

- User can easily upload pictures by dragging
- Create a group upon existed folders
- Support different formats of pictures
- Set pictures display order and time interval



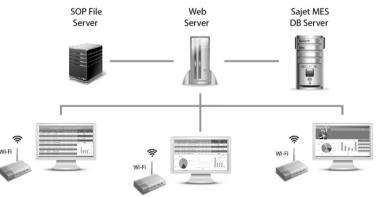
### System Architecture- Establish eKanban through Wi-Fi

The new generation of Chroma eKanban solution integrates HDMI interface and different kinds of digital display monitors under Android platform. It helps to deliver real-time information to display monitors through Wi-Fi in factories. Moreover, it is easy to set up the layout configuration on Web interface so as to upload and broadcast real-time kanban information to factories, hospitals, retail stores, and public environments, providing the best choice of visual management solution.



### Factory Layout- One platform can manage all the kanbans

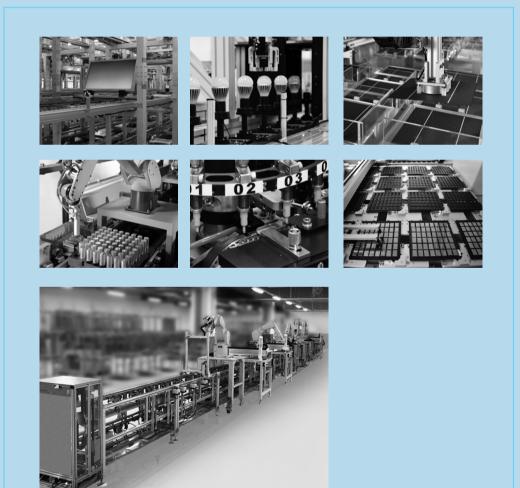
Chroma FEP can establish new kanban according to different area configurations, setting up template through one single managing platform. Each functional module can be configured by dragging. The configurable functions include picture files, weather information, clock, scrolling text, dashboard, chart and diagram, bulletin board, table, and embedded web page, providing managers integrated kanban information.



/ Test &

| Assembly & Test Automation Solutions | 18-1 |
|--------------------------------------|------|
| Smart Conveyor                       | 18-2 |

| Selection Guide                           |   |       |
|---|---|-------|
| Assembly & Test Automation                | Applications  | Page  |
| Flat Panel Display Burn-in & Testing      | LCM, LCD & other flat panel displays  | 5-11  |
| Packaged LED Test Sorter & Tapper         | Packaged LEDs   | 6-5   |
| LED Lighting Automatic Assembly & Testing | LED light bulbs & tubes   | 6-11  |
| Photovoltaic Automatic Testing & Sorting  | Solar wafers & cells  | 8-3   |
| Battery Cell Formation & Assembly         | Lithium Ion & lithium polymer secondary batteries   | 11-1  |
| Passive Component Test & Packing          | Inductors   | 12-25 |
| IC Automatic Testing & Sorting            | especially for CIS Testing (CMOS Image Sensor), capable of handling devices of a large variety of package types including QFP, TQFP, BGA, PGA, etc. | 14-25 |
| Smart Conveyor                            | Manufacturing transportation  | 18-2  |



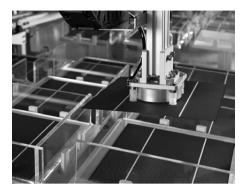
## Assembly & Test Automation Solutions

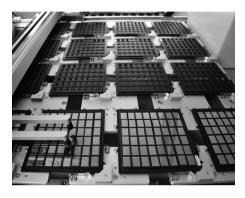












### **APPLICATIONS**

- Flat Panel Display Burn-in & Testing
- LED Lighting Automatic Assembly & Testing
- Photovoltaic Automatic Testing & Sorting
- Battery Cell Formation & Assembly
- Passive Component Testing & Packing
- IC Automatic Testing & Sorting3C Device Automatic Assembly

Chroma is a world leading supplier of precision Test and Measurement instrumentation.

Utilizing in-house automated handling and manufacturing execution system (MES) expertise, Chroma specializes in integrated and fully automated turn-key electronic test and manufacturing solutions for technologies including FPD (Flat Panel Display), video and color, LED/lighting, photovoltaic, Li-battery, passive components, semiconductor/IC, etc. **ORDERING INFORMATION** 

\* Call for customized availability



Inquire Now !

## **Smart Conveyor**

# Model 5703



### **KEY FEATURES**

- Modular architecture
- Hybrid Operating mode
- Reconfigurable line layout
- Intelligent lifter
- High speed pick and placeAutonomous material routing
- To fulfill the need of complete test solutions from the market, Chroma not only provides test and measurement instruments, but also integrates with automated systems and manufacturing execution systems as turnkey solutions, which bring more value and service to customers and help customers in terms of time saving, cost saving, and one-stop full service.

### **ORDERING INFORMATION**

5703 : Smart Conveyor

\* Call for customized availability



Inquire Now !



Barcode binding



Lift up and lift down



Pick and place



Sorting

Test &

### **Customer Support & Service**



Chroma offers total solutions in selling the highest quality instrumentation available and service. That begins with the first call to Chroma and continues after the sale through long-term product support. Our sales and service personnel work closely to help you make the best selections for your applications. Then we help you maximize your investment by ensuring optimum equipment performance. All this is accomplished through customer support programs ranging from training to product installations

### WARRANTY SERVICE

CHROMA ATE INC. warrants its instruments against all defects in workmanship and material. If you should experience a problem with your instrument, our technicians are available to help you over the phone, or find the nearest service support for timely repair.

### **CALIBRATION AND REPAIR SERVICE**

Whatever your test and measurement hardware support needs, Chroma can provide a reliable, cost-effective support selection that you can trust to reduce downtime and get you back to Business swiftly.



HALT & HASS System

### Instrument Calibration

Keep your equipment operating with maximum precision: Chroma's calibration services are all traceable to national and international standards.

- On-site Calibration for All Major Instrument Brands
- Service Center Instrument Calibration

### Instrument Repair

Chroma offers a variety of flexible choices to maximize instrument uptime, with just the coverage you need for repair.

- Instrument Repair Agreements
- Instrument Standard Repair

### Test System Calibration and Repair

Maximize test system uptime. Chroma has flexible, custom-configurable service and support package, available on select solutions for your specific needs.

- On-site System Calibration
- On-site System Repair



**Radiation Test** 



**Conduction Test** 



ESD Test



**Optical Laboratory** 



Programmable Temperature & Humidity Chamber

### Service Warranty

Chroma's service is unconditionally warranted for 90 days, except for disposables such as batteries and lamps, abuse and damage. All calibrations are traceable to National Standards like CNLA.

### CUSTOMER-SITE INSTALLATIONS

Chroma provides on-site installations for most Chroma-configured systems. Your Chroma service person will set up your product to meet all operating specifications. Contact your local sales and service office or sales agency for more information.

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|                                  | a instrument drivers can be unclose   |                               |                         |              |            |     |
| Most Macingo                     | sh-instrument drivers require the use | of Dotes.                     |                         |              |            |     |
| UND users all                    | used download the Windows version     | and then use the UNIX utility | ly social to entract th | e thes.      |            |     |
|                                  | Model                                 | Description                   | Environment             | Type         |            |     |
| 1                                |                                       | AC Power Source               | Lallview                | Traditional  |            |     |
| 2                                |                                       | AC Power source               | Laliview                | N8           |            |     |
| 3                                |                                       | AC Power source               | LaWindows               | D.E.         |            |     |
| 4                                |                                       | <b>DC Electronic Load</b>     | Latiview                | Traditional  |            |     |
| 6                                |                                       | <b>DC Electronic Load</b>     | LalVew5.0               | Traditional  |            |     |
| 7                                |                                       | DC Electronic Load            | LalV/ew/5.0             | Traditional  |            |     |
|                                  |                                       | <b>DC Electronic Load</b>     | LaWindows               | Traditional  |            |     |
| 9                                |                                       | <b>DC Electronic Lood</b>     | LaWrew                  | M            |            |     |
|                                  |                                       | DC Electronic Lond            | LatWindows              | PH .         |            |     |
| 11                               |                                       | DC Electronic Load            | Lallview                | P4           |            |     |
| 12                               |                                       | DC Electronic Load            | LaWindows               | NE .         |            |     |
|                                  |                                       | AC Power Source               | LaWview                 | Traditional  |            |     |
|                                  |                                       | AC Power Deute                | LaWindows               | Teditional   |            |     |
| 15                               |                                       | AC Power Source               | Latiview                | Traditional  |            |     |
| 16                               |                                       | AC Power Source               | LaWindows               | Teditional   |            |     |
|                                  |                                       | AC Power Source               | Lallvlew                | Teditional   |            |     |
| 10                               |                                       | AC Power Source               | LaWindows               | Traditional  |            |     |
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| 20                               |                                       | AC Power Source               | LaWindows               | Traditional  |            |     |
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|                                  |                                       |                               |                         |              | No PECKS   | _   |
|                                  |                                       |                               |                         |              |            |     |

### PRODUCT UPGRADE

Older instruments may be upgraded in order to extend the life of the product on your bench or in your system. Upgrades include adding options or new functions, and/or updating firmware.

### **REPLACEMENT PARTS**

Reduce your inventory and free up your technical staff by taking advantage of our repair exchange modules and board assemblies. Simply call or FAX in your purchase order and Chroma will send you a replacement part.

### TRAINING

Chroma provides formal training courses to help you get up to speed and make the most of our products.





### **TECHNICAL SUPPORT**

Chroma provides high quality technical support on applications, operation, measurement specification, hardware, and software, by expert Application engineers. Contact us for more information.

### LONG TERM PRODUCT SUPPORT

Chroma supports its instruments for a period of five to ten years beyond the end of production (depending upon the instrument), and wherever possible, we make an effort to support our instruments for much longer time.

### **CUSTOMIZED SERVICES**

In addition to Taiwan headquarters, we not only distribute oversea branch offices but also supply customized serviecs to meet various customs and cultures. In Europe, our customers can inspect instruments' demonstrations easily on the CBC (Chroma Business Coach) which works as a dynamic show-room instead of taking long Business trips. If you are interested in this service, please contact our Europe branch office directly.







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