Aluminum Capacitors
Power Economic Screw Terminals

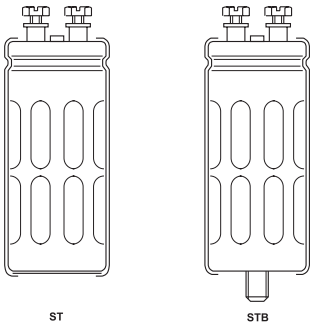
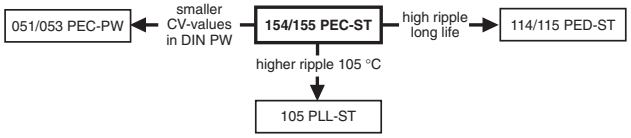


Fig.1 Component outlines.



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, minimized dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Also available in bolt version (154/155 PEC-STB)
- Pressure relief in the sealing
- Charge and discharge proof
- Long useful life: 12000 hours at 85 °C
- High ripple current capability
- High resistance to shock and vibration achieved by longitudinal rills and special internal construction.

APPLICATIONS

- General purpose, computer and industrial systems
- Smoothing and filtering
- Standard and switched mode power supplies
- Energy storage in pulse systems.

MARKING

The capacitors are marked with the following information:

- Rated capacitance (in μF).
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (M for 20%).
- Rated voltage (in V).
- Date code (YYMM).
- Name of manufacturer.
- Code for factory of origin.
- Code number.
- Climatic category in accordance with IEC 60068.
- "LL" for long life grade.

QUICK REFERENCE DATA		
DESCRIPTION	VALUE	
	154	155
Nominal case sizes (∅D × L in mm)	35 × 60 to 76 × 144	
Rated capacitance range (E6 series), C_R	220 to 680000 μF	
Tolerance on C_R	±20%	
Rated voltage range, U_R	10 to 100 V	200 to 450 V
Category temperature range	–40 to +85 °C	
Endurance test at 85 °C	5000 hours (400/450 V: 2000 hours)	
Useful life at 85 °C	12000 hours (400/450 V: 5000 hours)	
Useful life at 40 °C, 1.4 × I_R applied	200000 hours (400/450 V: 90000 hours)	
Shelf life at 0 V, 85 °C	500 hours	
Based on sectional specification	IEC 60384-4/EN130300	
Climatic category IEC 60068	40/085/56	

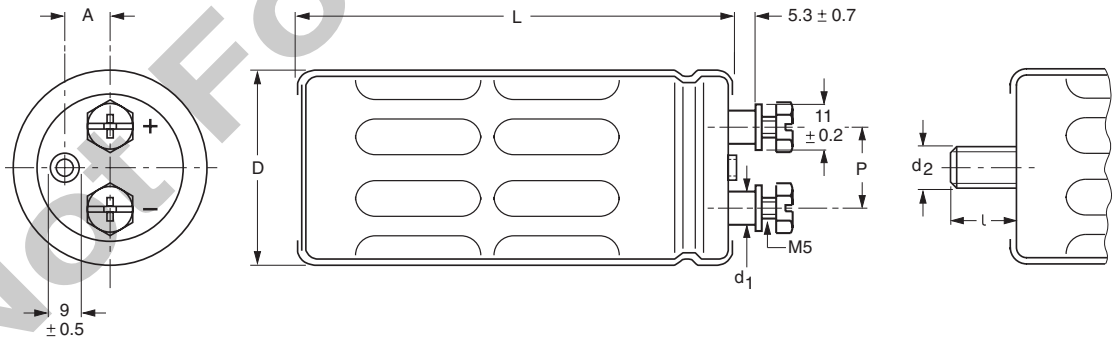
SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (∅D × L in mm) for 154 PEC-ST series

C_R (μF)	U_R (V)					
	10	16	25	40	63	100
3300	–	–	–	–	–	35 × 60
4700	–	–	–	–	–	35 × 80
6800	–	–	–	–	35 × 60	35 × 105
10000	–	–	–	–	35 × 80	50 × 80
15000	–	–	–	35 × 60	35 × 105	50 × 105

SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (∅D × L in mm) for 154 PEC-ST series						
C_R (µF)	U_R (V)					
	10	**16**	**25**	**40**	**63**	**100**
22000	–	–	35 × 60	35 × 80	50 × 80	65 × 105
33000	–	35 × 60	35 × 80	50 × 80	50 × 105	75 × 105
47000	35 × 60	35 × 80	35 × 105	50 × 80	65 × 105	76 × 144
68000	35 × 80	35 × 105	50 × 80	50 × 105	75 × 105	–
100000	35 × 105	50 × 80	50 × 105	65 × 105	76 × 144	–
150000	50 × 80	50 × 105	65 × 105	75 × 105	–	–
220000	50 × 105	65 × 105	75 × 105	76 × 144	–	–
330000	65 × 105	75 × 105	76 × 144	–	–	–
470000	75 × 105	76 × 144	–	–	–	–
680000	76 × 144	–	–	–	–	–

SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (∅D × L in mm) for 155 PEC-ST series						
C_R (µF)	U_R (V)					
	200	**250**	**350**	**385**	**400**	**450**
220	–	–	–	35 × 60	35 × 60	35 × 60
330	–	–	35 × 60	35 × 80	35 × 80	35 × 80
470	35 × 60	35 × 60	35 × 80	35 × 80	35 × 80	35 × 105
680	35 × 60	35 × 80	35 × 105	35 × 105	35 × 105	50 × 80
1000	35 × 80	35 × 105	50 × 80	50 × 80	50 × 80	50 × 105
1500	50 × 80	50 × 80	50 × 105	50 × 105	50 × 105	65 × 105
2200	50 × 80	50 × 105	65 × 105	65 × 105	65 × 105	75 × 105
3300	50 × 105	65 × 105	65 × 105	75 × 105	75 × 105	76 × 144
4700	65 × 105	65 × 105	75 × 105	–	76 × 144	76 × 144
6800	65 × 105	75 × 105	76 × 144	–	76 × 144	–
10000	75 × 105	76 × 144	–	–	–	–

DIMENSIONS in millimeters **AND AVAILABLE FORMS**



Maximum permissible torque which may be applied to the termination screws: 2 Nm.
For accessories refer to datasheet *"Mounting Accessories"*.
The capacitors are delivered with screws and washers.

Fig.2 Screw terminal **(ST);** screw terminal bolt **(STB).**

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES									
NOMINAL CASE SIZE ∅D × L	∅D_{max}	L_{max}	P ±0.1	A	d_1 ±0.2	d_2 × l	MASS (g)	PACKAGING QUANTITIES (per box)	CARDBOARD BOX DIMENSIONS L × W × H
35 × 60	36.5	63	13.0	8.4	8.0	M8 × 12	≈55	25	196 × 192 × 110
35 × 80	36.5	83	13.0	8.4	8.0	M8 × 12	≈80	25	196 × 192 × 115
35 × 105	36.5	108	13.0	8.4	8.0	M8 × 12	≈110	25	196 × 192 × 140
50 × 80	51.5	83	22.0	14.3	8.0	M12 × 16	≈160	25	293 × 273 × 115
50 × 105	51.5	108	22.0	14.3	8.0	M12 × 16	≈210	25	293 × 273 × 140
65 × 105	66.5	108	28.5	19.0	9.6	M12 × 16	≈370	10	368 × 151 × 140
75 × 105	76.5	108	32.0	21.0	9.6	M12 × 16	≈535	10	418 × 173 × 140
76 × 144	77.5	145	32.0	21.0	8.0	M12 × 16	≈900	10	418 × 173 × 180

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz
I_R	rated RMS ripple current at 100 Hz, 85 °C
I_{L5}	max. leakage current after 5 minutes at U_R
ESR	typical equivalent series resistance at 100 Hz
Tan δ	max. dissipation factor at 100 Hz
Z	impedance at 20 kHz

Note

1. Unless otherwise specified, all electrical values in Tables 2 and 3 apply at T_{amb} = 20 °C, P = 86 to 106 kPa, RH = 45 to 75%.

ORDERING EXAMPLE

Electrolytic capacitor 154 PEC-ST series 10000 μF/63 V; ±20%

Nominal case size: ∅35 × 80 mm; ST version

Catalog number: 2222 154 18103.

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION FOR 154 PEC-ST SERIES									
U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	I_R 100 Hz 85 °C (A)	I_{L5} 5 min (mA)	ESR TYP. 100 Hz (mΩ)	Tan Δ MAX. 100 Hz	Z TYP. 20 kHz (mΩ)	Z MAX. 20 kHz (mΩ)	CATALOG NUMBER (note 1) 2222 ... .
10	47000	35 × 60	8.4	0.94	14	0.48	11	16.5	154 14473
	68000	35 × 80	8.7	1.36	11	0.88	9	13.5	154 14683
	100000	35 × 105	10.7	2.00	10.5	0.92	8	12	154 14104
	150000	50 × 80	13.2	3.00	8	1.03	8	12	154 14154
	220000	50 × 105	16.5	4.40	6.5	1.26	7	10.5	154 14224
	330000	65 × 105	20.8	6.60	5.5	1.59	7	10.5	154 14334
	470000	75 × 105	22.6	9.40	5.5	2.21	7	10.5	154 14474
	680000	76 × 144	29	13.60	4	2.8	6	10	note 2
16	33000	35 × 60	8.4	1.06	14	0.32	10	15	154 15333
	47000	35 × 80	8.7	1.51	11	0.32	9	13.5	154 15473
	68000	35 × 105	12.2	2.18	8	0.45	8	12	154 15683
	100000	50 × 80	13.2	3.20	8	0.70	8	12	154 15104
	150000	50 × 105	14.9	4.80	8	0.88	7	10.5	154 15154
	220000	65 × 105	20.8	7.04	5.5	1.07	7	10.5	154 15224
	330000	75 × 105	22.6	10.60	5.5	1.58	7	10.5	154 15334
	470000	76 × 144	28	15.1	4.5	2.7	6	10	note 2
25	22000	35 × 60	8.1	1.10	12	0.23	10	15	154 16223
	33000	35 × 80	9.6	1.65	10	0.28	9	13.5	154 16333
	47000	35 × 105	12.2	2.35	8	0.33	8	12	154 16473
	68000	50 × 80	13.2	3.40	8	0.49	8	12	154 16683
	100000	50 × 105	15.9	5.00	7	0.60	8	12	154 16104
	150000	65 × 105	19.7	7.50	7	0.93	8	12	154 16154
	220000	75 × 105	22.6	11.00	5.5	1.07	7	10.5	154 16224
	330000	76 × 144	28	16	4	1.5	6	10	note 2

ELECTRICAL DATA AND ORDERING INFORMATION FOR 154 PEC-ST SERIES

U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	I_R 100 Hz 85 °C (A)	I_{L5} 5 min (mA)	ESR TYP. 100 Hz (mΩ)	Tan Δ MAX. 100 Hz	Z TYP. 20 kHz (mΩ)	Z MAX. 20 kHz (mΩ)	CATALOG NUMBER (note 1) 2222 ... .
40	15000	35 × 60	7.7	1.20	13	0.17	10	15	154 17153
	22000	35 × 80	9.8	1.76	11	0.20	9	13.5	154 17223
	33000	50 × 80	11.8	2.64	10	0.29	9	13.5	154 17333
	47000	50 × 80	11.8	3.76	10	0.42	9	13.5	154 17473
	68000	50 × 105	14.1	5.44	9	0.45	8	12	154 17683
	100000	65 × 105	17.3	8.00	9	0.80	8	12	154 17104
	150000	75 × 105	20.8	12.00	6.5	0.83	7	10.5	154 17154
	220000	76 × 144	26	17	6	0.95	6.5	10.5	note 2
63	4700	35 × 60	6.2	0.59	19	0.10	15	25	154 18472
	6800	35 × 60	6.6	0.86	17	0.10	13	19	154 18682
	10000	35 × 80	8.6	1.26	12.5	0.11	10	15	154 18103
	15000	35 × 105	10.9	1.89	10	0.13	9	13.5	154 18153
	22000	50 × 80	11.8	2.77	10	0.20	9	13.5	154 18223
	33000	50 × 105	14.1	4.16	9	0.24	8	12	154 18333
	47000	65 × 105	17.3	5.92	9	0.36	8	12	154 18473
	68000	75 × 105	17.7	8.57	9	0.58	8	12	154 18683
	100000	76 × 144	25.5	11.5	7	0.78	7	11	note 2
100	3300	35 × 60	3.8	0.66	50	0.13	35	55	154 19332
	4700	35 × 80	5.3	0.94	35	0.13	25	40	154 19472
	6800	35 × 105	7.1	1.36	25	0.14	18	28	154 19682
	10000	50 × 80	8.9	2.00	18	0.14	13	20	154 19103
	15000	50 × 105	11.5	3.00	14	0.16	10	16	154 19153
	22000	65 × 105	18.2	4.40	7.5	0.13	6	9	154 19223
	33000	75 × 105	24.1	6.60	5	0.13	4	6	154 19333
	47000	76 × 144	25	9.4	5	0.15	4	6	note 2

Notes

1. Catalog number applies to the ST version; for STB version (not preferred) replace 8th digit by '5' (2222 154/155 5....).
2. Types in development, for actual status please check our website: www.vishay.com

Table 3

ELECTRICAL DATA AND ORDERING INFORMATION FOR 155 PEC-ST SERIES

U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	I_R 100 Hz 85 °C (A)	I_{L5} 5 min (mA)	ESR TYP. 100 Hz (mΩ)	Tan Δ MAX. 100 Hz	Z TYP. 20 kHz (mΩ)	Z MAX. 20 kHz (mΩ)	CATALOG NUMBER (note 1) 2222 ... .
200	470	35 × 60	1.9	0.20	367	0.17	302	453	155 12471
	680	35 × 60	2.2	0.28	256	0.17	212	318	155 12681
	1000	35 × 80	2.9	0.40	175	0.17	145	217	155 12102
	1500	50 × 80	3.9	0.60	119	0.18	100	149	155 12152
	2200	50 × 80	4.5	0.88	85	0.18	72	108	155 12222
	3300	50 × 105	6.3	1.32	58	0.19	50	75	155 12332
	4700	65 × 105	9.0	1.88	38	0.18	32	48	155 12472
	6800	65 × 105	10.5	2.72	27	0.18	23	35	155 12682
	10000	75 × 105	14.0	4.0	19	0.18	16	23	155 12103
250	470	35 × 60	1.6	0.24	360	0.16	300	450	155 13471
	680	35 × 80	2.2	0.34	250	0.16	216	325	155 13681
	1000	35 × 105	2.9	0.50	175	0.16	140	210	155 13102
	1500	50 × 80	3.9	0.75	115	0.16	100	150	155 13152
	2200	50 × 105	5.3	1.10	80	0.17	70	105	155 13222
	3300	65 × 105	7.7	1.65	50	0.17	43	65	155 13332
	4700	65 × 105	8.2	2.35	44	0.19	40	60	155 13472
	6800	75 × 105	10	3.40	35	0.22	33	50	155 13682
	10000	76 × 144	15	5	30	0.22	25	50	note 2
350	330	35 × 60	1.5	0.23	370	0.12	313	470	155 15331
	470	35 × 80	2.1	0.33	260	0.12	223	335	155 15471
	680	35 × 105	2.9	0.48	180	0.12	146	220	155 15681
	1000	50 × 80	3.7	0.70	125	0.12	113	170	155 15102
	1500	50 × 105	4.3	1.05	120	0.18	106	160	155 15152
	2200	65 × 105	6.5	1.54	70	0.18	63	95	155 15222
	3300	65 × 105	7.1	2.31	60	0.19	63	95	155 15332
	4700	75 × 105	8	3	50	0.2	52	95	note 2
	6800	76 × 144	11	4	45	0.2	45	85	note 2

ELECTRICAL DATA AND ORDERING INFORMATION FOR 155 PEC-ST SERIES

U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	I_R 100 Hz 85 °C (A)	I_{L5} 5 min (mA)	ESR TYP. 100 Hz (mΩ)	Tan δ MAX. 100 Hz	Z TYP. 20 kHz (mΩ)	Z MAX. 20 kHz (mΩ)	CATALOG NUMBER (note 1) 2222 ... .
385	220	35 × 60	1.0	0.17	650	0.15	475	955	155 18221
	330	35 × 80	1.5	0.25	430	0.15	326	635	155 18331
	470	35 × 80	1.8	0.36	300	0.15	220	445	155 18471
	680	35 × 105	2.4	0.52	210	0.15	150	310	155 18681
	1000	50 × 80	3.4	0.77	125	0.15	90	210	155 18102
	1500	50 × 105	4.7	1.15	85	0.15	60	140	155 18152
	2200	65 × 105	6.5	1.69	58	0.15	40	95	155 18222
	3300	75 × 105	7.6	2.54	50	0.15	35	70	155 18332
400	220	35 × 60	1.0	0.18	650	0.15	475	955	155 16221
	330	35 × 80	1.5	0.27	430	0.15	320	635	155 16331
	470	35 × 80	1.8	0.38	300	0.15	220	445	155 16471
	680	35 × 105	2.4	0.54	210	0.15	150	310	155 16681
	1000	50 × 80	3.4	0.80	125	0.15	90	210	155 16102
	1500	50 × 105	4.7	1.20	85	0.15	60	140	155 16152
	2200	65 × 105	6.5	1.76	58	0.15	40	95	155 16222
	3300	75 × 105	7.6	2.64	50	0.15	35	70	155 16332
	4700	76 × 144	10	4	40	0.17	30	60	note 2
	6800	76 × 144	12	4	35	0.17	28	55	note 2
450	220	35 × 60	2.4	0.20	501	0.7	284	483	note 2
	330	35 × 80	3.4	0.30	330	0.7	191	325	note 2
	470	35 × 105	4.4	0.42	200	0.7	132	224	note 2
	680	50 × 80	5.4	0.60	165	0.7	96	163	note 2
	1000	50 × 105	7.2	1.00	103	0.7	67	114	note 2
	1500	65 × 105	10.5	1.35	80	0.7	43	73	note 2
	2200	75 × 105	13.4	1.98	70	0.8	29	49	note 2
	3300	76 × 144	17.7	2.97	40	0.8	18	31	note 2
	4700	76 × 144	18.5	4.30	36	0.9	16	27	note 2

Notes

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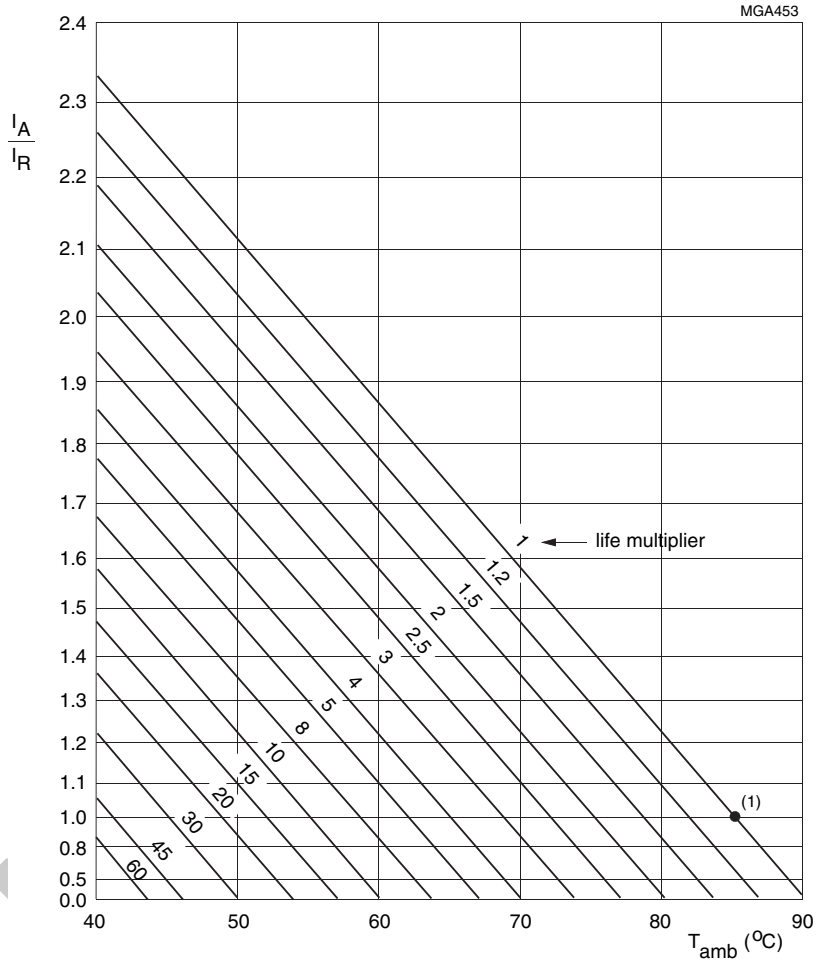
ADDITIONAL ELECTRICAL DATA

PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage	≤250 V versions	$U_s = 1.15 \times U_R$
	≥350 V versions	$U_s = 1.1 \times U_R$
Reverse voltage		$U_{rev} \leq 1$ V
Current		
Leakage current	after 1 minute at U_R	$I_{L1} \leq 0.006\ C_R \times U_R + 4\ \mu A$
	after 5 minutes at U_R	$I_{L5} \leq 0.002\ C_R \times\ U_R + 4\ \mu A$
Inductance		
Equivalent series inductance (ESL)	case ∅D = 35 mm	typ. 18 nH
	case ∅D = 50 mm	typ. 25 nH
	case ∅D = 65 mm	typ. 27 nH
	case ∅D = 75/76 mm	typ. 29 nH

RIPPLE CURRENT AND USEFUL LIFE



I_A = actual ripple current at 100 Hz and 85 °C.
I_R = rated ripple current at 100 Hz and 85 °C.
With an absolute maximum of 50 A at 85 °C.
(1) Useful life at 85 °C and I_R applied: 12000 hours; (5000 hours for 400/450 V types).

Fig.3 Multiplier of useful life as a function of ambient temperature and ripple current load.

Table 4

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY	
FREQUENCY (HZ)	**I_R MULTIPLIER**
50	0.83
100	1.00
200	1.10
400	1.15
1000	1.19
≥2000	1.20

Table 5

TEST PROCEDURES AND REQUIREMENTS			
TEST		**PROCEDURE (quick reference)**	**REQUIREMENTS**
NAME OF TEST	**REFERENCE**		
Endurance	IEC 60384-4/ EN130300 subclause 4.13	T_{amb} = 85 °C; U_R applied; 5000 hours (400/450 V types: 2000 hours)	$U_R \leq 100$ V; $\Delta C/C$: ±15% $U_R > 100$ V; $\Delta C/C$: ±10% tan $\delta \leq 1.3 \times$ spec. limit $Z \leq 2 \times$ spec. limit $I_{L5} \leq$ spec. limit
Useful life	CECC 30301 subclause 1.8.1	T_{amb} = 85 °C; U_R and I_R applied; 12000 hours (400/450 V types: 5000 hours)	$U_R \leq 100$ V; $\Delta C/C$: ±45% $U_R > 100$ V; $\Delta C/C$: ±30% tan $\delta \leq 3 \times$ spec. limit $Z \leq 3 \times$ spec. limit $I_{L5} \leq$ spec. limit no short or open circuit, no visible damage total failure percentage: $U_R \leq 100$ V: ≤ 1%; $U_R > 100$ V: ≤ 3%
Shelf life (storage at high temperature)	IEC 60384-4/ EN130300 subclause 4.17	T_{amb} = 85 °C; no voltage applied; 500 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C$: ±10% tan $\delta \leq 1.2 \times$ spec. limit $I_{L5} \leq 2 \times$ spec. limit