

CONIS COMPANY Ltd.

CAPACITORS

EMI and RFI FILTERS

MKP CAPACITORS FOR LIGHTING APPLICATION



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MKP CAPACITORS FOR LIGHTING APPLICATIONS

GENERAL INFORMATION

ELECTRICAL SPECIFICATIONS AND DEFINITIONS

- Dielectric:
bi-axially oriented polypropylene
- Plates:
self-healing metal layer Zn or Al deposited by evaporation under vacuum

Rated voltage U_R

The rms value of the sinusoidal AC voltage which can be applied to the capacitor in normal working conditions. From 250 to 500 V (see each series)

Rated current I_R

The value of the current flowing through the capacitor of rated capacitance at the rated voltage and frequency.

Duty frequency range

The capacitors can be used at a frequency range of 50-60 Hz. Use at higher frequencies is possible provided the voltage, current, temperature and power limits are complied with.

Operating temperature class

Minimum temperature - 25 °C.

Maximum temperature +70 °C or +85 °C.

In accordance with the reference standards, these temperatures are those measured on the surface of the capacitor.

Storage temperature -10 °C ... +85 °C

Capacitance tolerance

Rated tolerance $\pm 5\%$; $\pm 10\%$

Different tolerance values are available on request.

Dissipation factor ($\text{tg } \delta$)

The value of the tangent of the loss factor measured at 50 Hz, 20 °C at the rated voltage is:

$$\text{tg } \delta \leq 20 \times 10^{-4}$$

Maximum permissible overloads

The capacitors can operate in the following overload conditions throughout the temperature class range:

$$I_{\text{max}} = 1.3 I_R$$

$$U_{\text{max}} = 1.1 U_R$$

The overload deriving from the simultaneous presence of voltage and current above the rated values, even if within the stated limits, must be such that the apparent power P_a ($I_{\text{rms}} \times V_{\text{rms}}$) absorbed by the capacitor is:

$$P_a \leq 1.35 \times 2\pi f \times C \times U_R^2$$

Pulsed stress

The capacitors are capable of withstanding steep wavefronts with a maximum voltage variation speed of 20 V/ μs .

Insulation resistance between terminals and case

Measured at 500 VDC, 20 °C after 30 seconds.

$$R_i > 1000 \text{ Mohm}$$

Direct current operation

These capacitors can be used with a DC voltage not exceeding the peak value of the rated voltage

$$\text{VDC} \leq \checkmark 2 V_n$$

MECHANICAL SPECIFICATIONS

Mounting:

The capacitors may be provided with stud M8 for mounting:

The maximum torque is 5 Nm

Vibrations:

In accordance with IEC 68-2-6 standards, the capacitors pass the test with a frequency range from 10 to 55 Hz, acceleration amplitude 10 g and duration 6 h.

Operating classes (DIN 40040)

According to DIN 40040, operating classes are identified by 5 letters which are defined consecutively: Lower temperature, upper temperature, relative humidity, expected life, failure rate.

1st code letter	2nd code letter	3rd code letter	4th code letter	5th code letter			
Lower Temper. limit	Upper Temper. limit (1)	Relative Humidity limit %	Number of failures per 10^9 comp/hour	Expected life (4)			
	°C	°C	Ave. Max.	Pcs Hours			
G	-40	S	70	(2) (3) M	1000 S	30000	
H	-25	R	75	F ≤ 75 ≤ 95	N	3000 T	10000
J	-10	P	85		P	10000 U	3000
K	0	M	100		Q	30000 V	1000

(1) Measured on the surface of the capacitor

(2) Average yearly value

(3) Maximum value for no longer than 30 days in an year; for the remaining days it is occasionally permitted a value of no more than 85 °C.

(4) Expected life at the rated voltage and maximum temperature with a failure rate stated by the 4th letter.

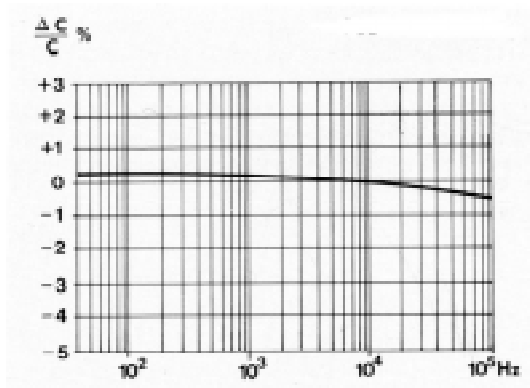
(Ex.: MS = expected life 30000 hours and failure rate $\leq 3\%$)

Markings

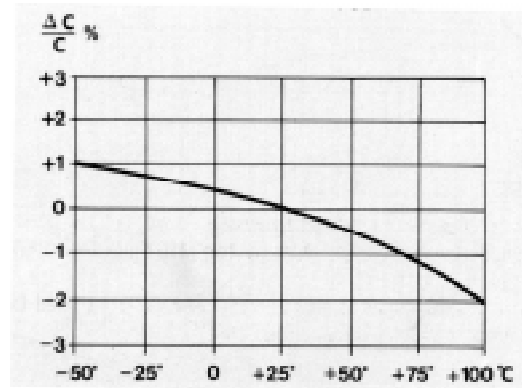
Black colour. Data shown: CONIS trade mark, Series number, Capacitance in microfarad, Tolerance in %, Rated A.C. Voltage, Operating temperature range in degrees Centigrade, Coded climatic class and reliability data according to DIN 40040, Self-Healing property SH, Year and month of production.

MKP CAPACITORS FOR LIGHTING APPLICATIONS

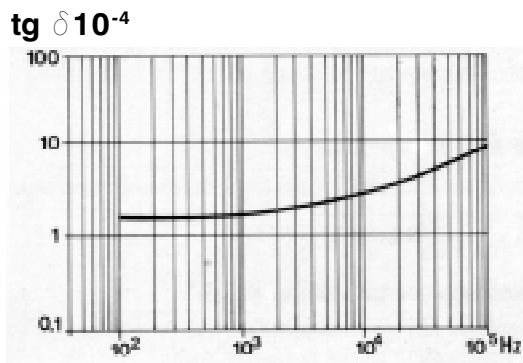
CHARACTERISTIC CURVES



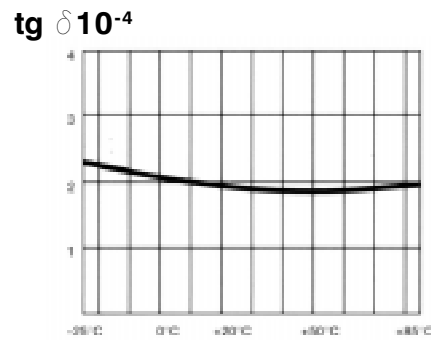
Capacitance vs. frequency



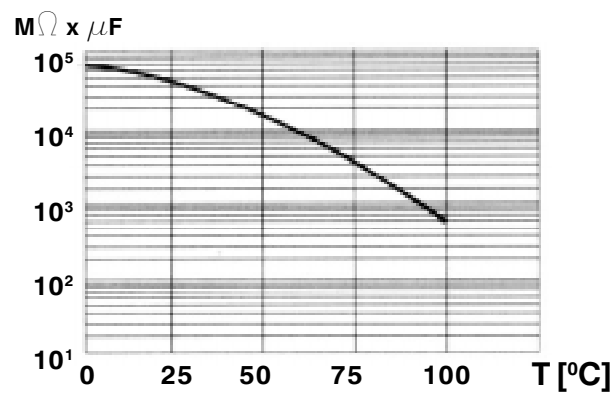
Capacitance vs. temperature at 1 kHz



Dissipation factor vs. frequency



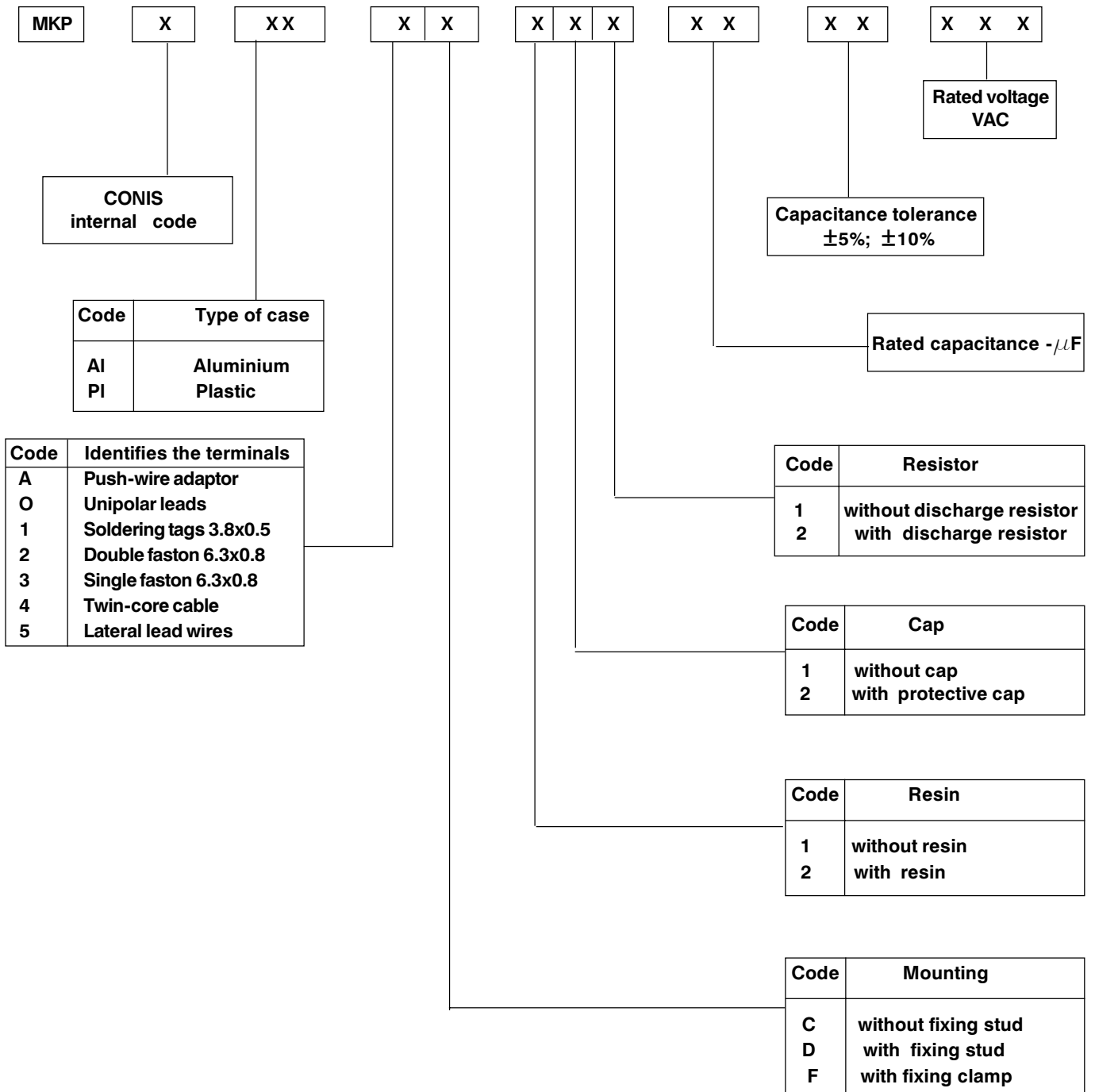
Dissipation factor vs. temperature at 1 kHz



Time constant vs. temperature

MKP CAPACITORS FOR LIGHTING APPLICATIONS

ORDERING CODE



Example of following code: MKP-Z-Al-1D-222 - 4 μ F \pm 10% 250VAC describes a MKP-Z capacitor, aluminium case, soldering tags, fixing stud, discharge resistor, protective cap and resin, 4 μ F \pm 10% 250VAC

MKP CAPACITORS FOR LIGHTING APPLICATIONS

Discharge lamps (fluorescent lamps, halogen-metal vapour lamps, mercury vapour lamps and sodium vapour lamps) require suitable chokes or leakage reactance transformers for ignition and also for current limitation during discharge.

Due to their inductance, the power factor is, depending on the type, between 0.5 and 0.7. Electricity Boards, therefore, require that the wattless power from the chokes or transformers be suitably corrected to $\cos \varphi = 0.9$. To improve the power factor, capacitors, which are designed for the widest range of operating, climatic and thermal conditions, should be used. Capacitors can be for single lamps or group correction (parallel types), as well as for series use (where the choke and capacitor are in series).

Parallel and series capacitors are dimensioned for the following rated voltages and temperature ranges:

Parallel capacitors:
250 V ~ / -40°C to 85°C

Series capacitors:
450V ~ / -25°C to 85°C

Because of light fitting capacitors can retain their charge for a considerable time after they have been disconnected, EN 61048 stipulate the use of special discharge resistors, to ensure that 1 minute after disconnecting the voltage across the capacitor is reduced to less than 50 V.

The capacitors are to be discharged by a discharge resistor which is normally included in the spring connector. Spring connectors are available mounted or unmounted against surplus.

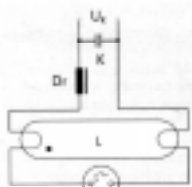


Fig. 1

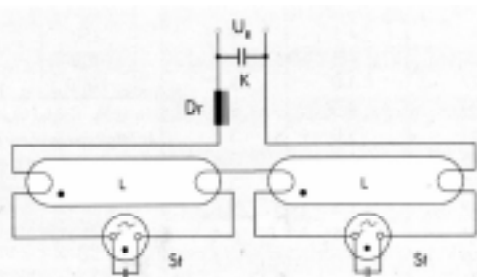


Fig. 2

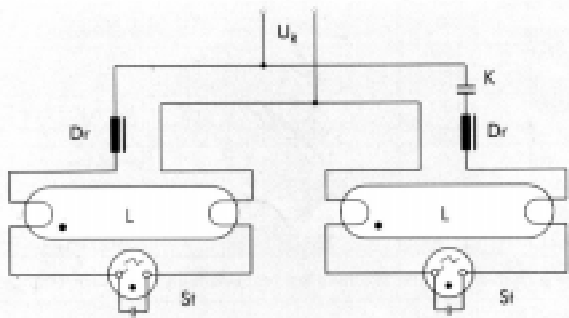


Fig. 3

POWER FACTOR CORRECTION OF FLUORESCENT LAMPS

Single-lamp and group correction by means of parallel capacitors.

Each separate lamp (single-lamp correction) or a group of lamps controlled by a common switch (group correction) can be power factor corrected by shunting a capacitor K across the line (see fig. 1 and 2).

If group correction is employed, then the correction capacitor must have a value equal to the sum of the capacitance values that would be required to correct individual lamps.

Power factor correction using series capacitors

With this type of power factor correction one choke is „over-corrected“ so that the wattless power handled by the capacitor is sufficient to compensate for the wattless power of two chokes. A second non-corrected lamp is therefore connected in parallel with the first one (dual circuit, see Fig. 3.).

Due to the series-connection of choke and power factor correction capacitor the voltage developed across the capacitor while the lamp is energized exceeds the line voltage. The series capacitor must be rated for an appropriately higher voltage.

This dual circuit has the additional advantage that the combined light produced by the two lamps is almost completely free of flicker since the current through one lamp is always a maximum whilst that through the other is zero. Also, this type of power factor correction is more economic than parallel correction and is the only one permissible if the supply carries an audio-frequency signal used for central control purposes.

For the correction of series power factor the capacitance is critical and is suggested by the manufacturer of ballast. In this application the capacitance tolerance must be close ($\pm 4\%$).

- D Balast
- D₁ Tapped balast
- K Compensating capacitor
- K₁ Compensating and ignition capacitor 5 μ F
- K+S Short time switch and cut-out
- L Lamp
- U_N Mains voltage 220V~
(For 2000 W and 3500 W = 380 V~)
- Z Ignition device
- Z_K Ignition device with ignition capacitor
- ZL High frequency ignition line
- St Starter

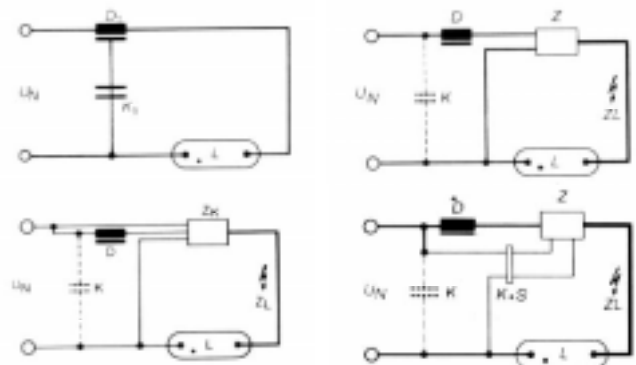


Fig. 4

MKP CAPACITORS FOR LIGHTING APPLICATIONS

POWER FACTOR CORRECTION OF DISCHARGE LAMPS

Power factor correction for high pressure mercury vapour lamps, sodium vapour lamps, halogen metal vapour lamps is achieved by parallel connection of capacitors. /Fig. 4/

The power factor of these discharge lamps depends on the operating equipment, and amounts to 0.5 to 0.7 if reactance chokes are used, and to approx. 0.3 in the case of leakage-reactance transformers.

The differing characteristics of various types of discharge lamps require an individual approach to the selection of proper capacitors for power factor correction:

Fluorescent lamps

Lamp power W	Lamp power with ballast W	Parallel capacitor 250V~ μF	Series capacitor 450V~ μF
4	10	2.0	-
6	12	2.0	-
8	14	2.0	-
10	14	2.0	-
13	19	2.0	-
15	25	4.5	-
16	21	2.5	-
18	27	4.5	2.9*
18	23 ⁽¹⁾	4.5	-
20	30	4.5	2.9*
20	25 ⁽¹⁾	4.5	-
22	27	5.0	3.2*
30	39	4.5	3.0
32	42	5.0	3.6
36	45	4.5	3.6
38	48	4.5	3.6
40	49	4.5	3.6
40	54	4.5	4.4
58	69	7.0	5.7
65	76	7.0	5.7
65	76	7.0	5.7
65	80	9.0	6.8*
115	135	18.0	12.2*
140	160	18.0	12.7*

⁽¹⁾ 2 Lamps in series 220 V

Low-pressure sodium vapour lamps

Lamp power W	Lamp power with ballast W	Parallel capacitor 230V~ μF
18	25	5
50	62	10
70	83	12
90	113	25
100	115	12
135	175	45
150	170	20
180	220	40
210	232	18
250	275	36
350	445	25
400	450	45
1000	1090	100

High-pressure sodium lamps

Lamp power W	Parallel capacitor 230V~ mF
50	10
70	12
150	20
250	36
400	50*
400	45*
1000	100*
1000	120*

* depending on lamp type

High-pressure Mercury vapour lamps

Lamp power W	Lamp power with ballast W	Parallel capacitor 230V~ mF
50	59	7
80	89	8
125	137	10
150	170	20
250	266	18
250	275	32
400	425	25
400	385	35
700	735	40
1000	1045	60
2000	2070	-

Halogen - Metal vapour lamps

Lamp power W	Lamp power with ballast W	Parallel capacitor 230V~ / 380V~ mF
35	48	6
70	88	12
150	170	20
250	275	32
400	385	35
400	440	45
1000	1050	85
2000	2070	37*
2000	2080	50*
3500	3650	100*

The above values have been specified by leading lamp manufacturers. We take no responsibility for future changes or variations in these specifications.

MKP CAPACITORS FOR LIGHTING APPLICATIONS

TECHNICAL DATA

SERIES	MKP-AL	MKP-PL	
Reference standards	IEC566; EN 61048; EN 61049; VDE 0560-6		
Storage temperature	- 10 +85 °C		
Rated AC Voltage U_R	250VAC	400 VAC	450VAC
Rated DC Voltage $\checkmark 2U_R$	350VDC	560VDC	630VDC
Voltage rise/fall time (dv/dt) max	15V/ μ s	20V/ μ s	20V/ μ s
Test voltage between terminals	$2 U_R$ for 2 sec		
Test voltage terminals to case	2 000 VAC for 2 sec	2500 VAC - for 2 sec	
Terminals	Faston 6.35x0.8 single or double; soldering tags 3.8x0.5; Unipolar leads. push-in adaptor		
Creepage distances	≥ 7 mm		
Clearance in air	≥ 5 mm		
Self discharge time $R_i(M\Omega) \times C(mF)$	$R \times C \geq 3000$ sec.		
Dissipation factor (tg δ)	$\leq 20 \times 10^{-4}$ at $U=U_R$ 20 °C and 50 Hz		
Vibration strength	According to Test Fc of IEC 68-2-6 Test duration - 6h. Frequency range 10 to 55 Hz Amplitude -0.75 mm; Acceleration max - 10 g		
Max fixing torque	M8 bolt: 5 Nm		
Degree of protection (ref. EN 60529)	IP00 with faston; IP55 with protective cap		
Capacitance tolerance	$\pm 5\%$ or $\pm 10\%$ (different tolerance available upon request)		
Maximum permissible voltage (RMS)	$1.1 \times U_R$		
Maximum permissible current (RMS)	$1.3 \times I_R$		
Maximum permissible reactive output	$1.35 \times Q_R$		
Rated frequency	50 Hz (60 Hz on request)		
Expected life and operating classes DIN 40040	30 000 h HPFMS	10 000 h HPFNT	Failure rate $\leq 3\%$
Temperature range and climatic category	-25 °C +85 °C 25/85/21		
Safety class	P0; P2 (FPU) for MKP-AL on request		

MKP CAPACITORS FOR LIGHTING APPLICATION IN PLASTIC CASE

DESIGN

DIELECTRIC: Low losses polypropylene film metallized with Zn or Al SELF HEALING.
WINDING: Non-inductive type
CASE: Plastic materials self-extinguishing grade V2 according to UL 94 standard.
RESIN: Non polluting filling compound made of vegetable oil (non PCB) improving the protection of the winding and the functioning of the capacitor.
DECK: Plastic materials self-extinguishing, grade V1 or V0 according to UL 94 standard.

TERMINALS:

- Faston-tinned brass 6.35 x 0.8 single or double only for $D \geq 30$ mm
- Unipolar leads: stiff wires or flexible wires copper - 0.5 mm^2 ; 0.75 mm^2 length - min 80 mm, max 250 mm stripping - $5 \text{ mm} \pm 1 \text{ mm}$
- Push-wire adaptor

DISCHARGE RESISTOR:

Included on request
 Included in push-wire adaptor.

CLASS OF SAFETY PROTECTION: P0

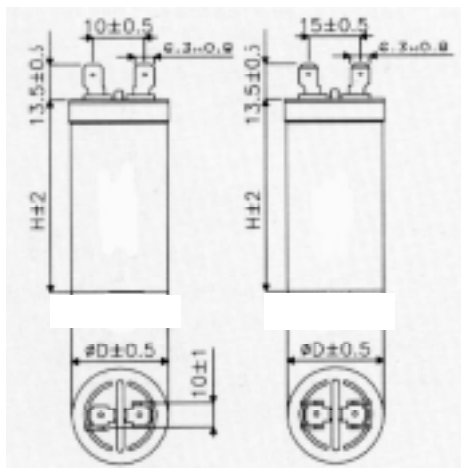
REFERENCE STANDARDS:

EN 61048; EN 61049 - for lighting applications capacitors

APPLICATION

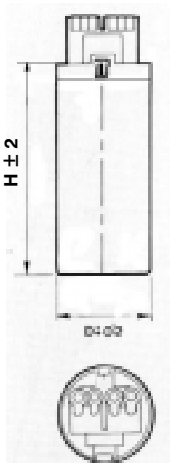
Lighting application

AVAILABLE EXECUTIONS

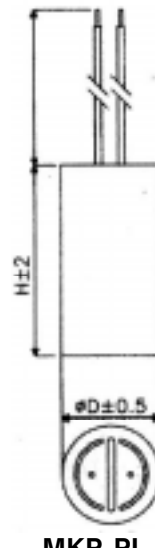


MKP-PL-3C
single faston

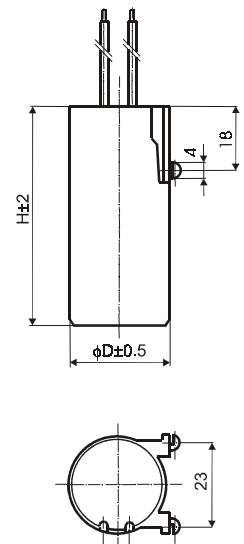
MKP-PL-2C
double faston



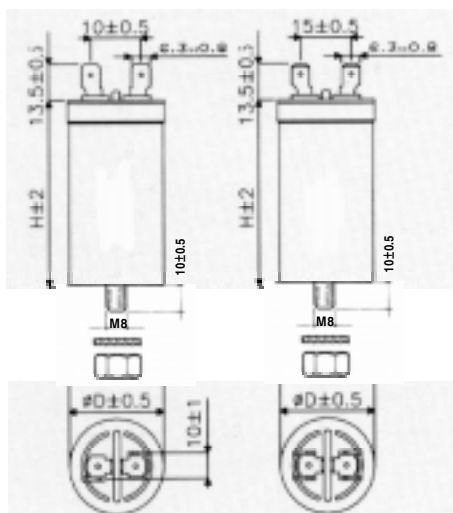
MKP-PL-AC
push-wire adaptor



MKP-PL-OC
unipolar leads

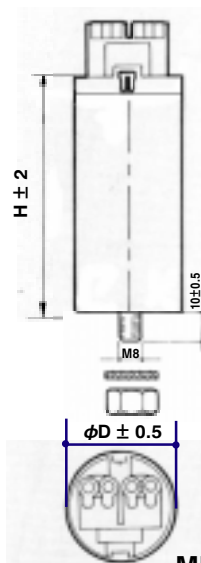


MKP-PL-0F
with fixing clamp

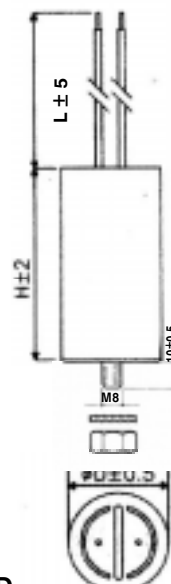


MKP-PL-3D
single faston

MKP-PL-2D
double faston



MKP-PL-AD
push-wire adaptor



MKP-PL-OD
unipolar leads

MKP CAPACITORS FOR LIGHTING APPLICATION IN PLASTIC CASE

SERIES Life	MKP-PL		MKPZ-PL		MKP-PL	
30 000 h HPF	250 VAC		400 VAC		-	
10 000 h HPF	320 VAC		450VAC		400 VAC	
3 000 h HPF			500VAC		450 VAC	
1000 h HPF	-				500 VAC	
C / μ F/	D	H	D	H	D	H
	mm		mm		mm	
1.5	25	55	25	55	25	55
2.0	25	55	25	55	25	55
2.5	25	55	25	55	25	55
3.0	25	55	25	55	30	55
3.5	25	55	25	55	30	55
3.75	25	55	30	55	30	55
4.0	25	55	30	55	30	55
4.5	30	55	30	55	30	55
5.0	30	55	30	55	35	55
6.0	30	55	35	55	35	55
7.0	35	55	35	55	35	73
8.0	35	55	35	55	35	73
9.0	35	55	35	55	35	73
10.0	35	55	35	73	40	73
11.0	35	55	35	73	40	73
12.0	35	55	35	73	40	73
13.0	35	73	40	73	45	73
14.0	35	73	40	73	45	73
15.0	35	73	40	73	45	73
16.0	40	73	40	73	45	73
18.0	40	73	40	73	40	93
20.0	40	73	45	73	40	93
22.0	45	73	45	73	40	93
25.0	45	73	45	93	45	93
30.0	45	73	45	93	45	128
35.0	45	93	45	93	45	128
40.0	45	93	45	128		
45.0	45	128	45	128		
50.0	45	128	45	128		
55.0	45	128				
60.0	45	128				

Other dimensions and capacitance values on request

MKP CAPACITORS FOR LIGHTING APPLICATION IN ALUMINIUM CASE

DESIGN

DIELECTRIC: Low losses polypropylene metallized with Zn or Al **SELF HEILING.**

WINDING: Non-inductive type

CASE: Aluminium with/without fixing stud M8 x 10
Locking strength - 5 Nm

RESIN: Non polluting filling compound made of vegetable oil (non PCB) improving the protection of the winding and the functioning of the capacitor.

DECK: Plastic materials self-extinguishing, grade V1 or V0 according to UL 94 standard.

TERMINALS:

- Faston-tinned brass 6.35 x 0.8 single or double only dor $D \geq 30$ mm
- Soldering tags - tinned steel 3.8 x 0.5
- Unipolar leads: stiff wires or flexible wires
copper - 0.5 mm^2 ; 0.75 mm^2
length - min 80 mm, max 250 mm
stripping - $5 \text{ mm} \pm 1 \text{ mm}$

PROTECTIVE CAP: Plastic materials self-extinguishing, grade V2 according to UL 94 standard.

DISCHARGE RESISTOR:
Included on request.

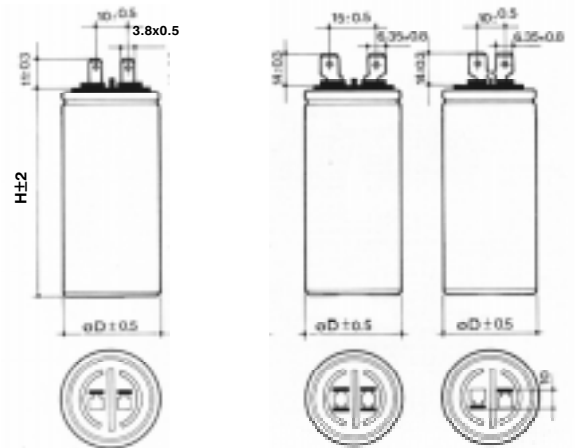
CLASS OF SAFETY PROTECTION: P0 or P2 (FPU) for $D=45$ mm on request.

ACCESSORIES: Protective cap
Crimp M8 and hexagonal nut M8

REFERENCE STANDARDS:
EN 61048; EN 61049 - for lighting applications capacitors

APPLICATION
Lighting application

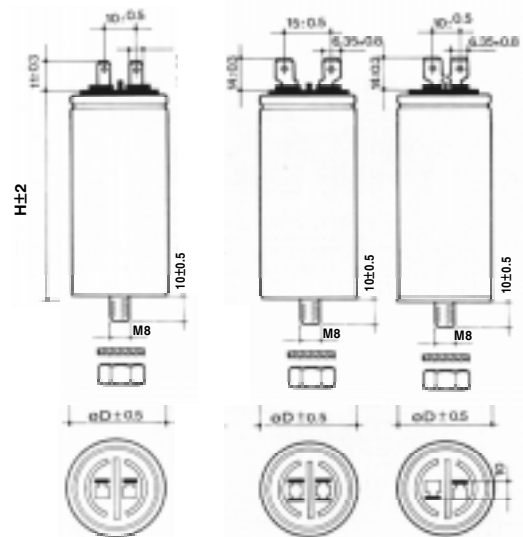
AVAILABLE EXECUTIONS



MKP-AL-1C
soldering tags

MKP-AL-2C
double faston

MKP-AL-3C
single faston

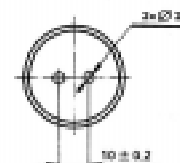
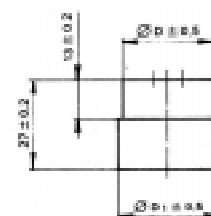


MKP-AL-1D
soldering tags

MKP-AL-2D
double faston

MKP-AL-3D
single faston

ACCESSORIES



MKP CAPACITORS FOR LIGHTING APPLICATION IN ALUMINIUM CASE

SERIES Life	MKP-AL		MKPZ-AL		MKP-AL	
	D	H	D	H	D	H
C / μ F/	mm		mm		mm	
30 000 h HPF	250 VAC		400 VAC		-	
10 000 h HPF	320 VAC		450VAC		400 VAC	
3 000 h HPF	400 VAC		500VAC		450 VAC	
1000 h HPF	-				500 VAC	
	D	H	D	H	D	H
	mm		mm		mm	
1.5	25	60	25	60	25	60
2.0	25	60	25	60	25	60
2.5	25	60	25	60	25	60
3.0	25	60	25	60	30	60
3.5	25	60	25	60	30	60
3.75	25	60	25	60	30	60
4.0	25	60	30	60	30	60
4.5	30	60	30	60	30	60
5.0	30	60	30	60	35	60
6.0	30	60	35	60	35	60
7.0	35	60	35	60	35	78
8.0	35	60	35	60	35	78
9.0	35	60	35	78	35	78
10.0	35	60	35	78	40	78
11.0	35	78	35	78	40	78
12.0	35	78	35	78	40	78
13.0	35	78	40	78	45	78
14.0	35	78	40	78	45	78
15.0	35	78	40	78	45	78
16.0	40	78	40	78	40	98
18.0	40	78	40	78	40	98
20.0	40	78	40	98	40	98
22.0	45	78	40	98	40	98
25.0	45	78	45	98	45	98
30.0	45	78	45	98	45	132
35.0	45	98	45	98	50	132
40.0	45	98	40	132	50	132
45.0	40	132	45	132	50	132
50.0	45	132	50	132	55	132
55.0	45	132	55	132	55	132
60.0	45	132	55	132		

*D \geq 50 mm only for design with unipolar leads.

Other capacitance values and other dimensions on request