



## Low Voltage Power Factor Correction Capacitors

### KEY BENEFITS

- Compact design with high outputs up to 37 kVAR (higher ratings on request)
- Very low losses and small diameters for excellent heat dissipation
- Stacked assembled winding elements design to reduce the risk of device breakdown
- Highest overcurrent capability of up to 3 times
- Highest inrush current capability of 300 times rated current, substantiated by type test report
- Life expectancy of more than 150,000 operating hours
- Two versions available: oil and dry types
- Available with KEMA, UL type test report

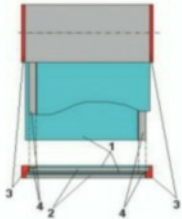
The World's only Manufacturer  
to offer a complete range of Power Capacitors

## General Technical Information

### MKP- Technology

Capacitors are used in many diverse applications, and many different capacitor technologies are available. In low voltage applications, MKP-type capacitors which are metallized polypropylene technology have proved to be most appropriate and also the most cost effective. Dependent on the nominal voltage of the capacitor, the thickness of the polypropylene film will be different.

### MKP-TYPE CAPACITOR (Metallized polypropylene film)

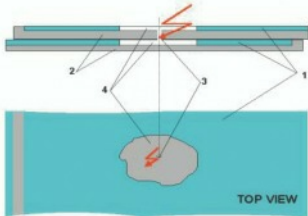


Design of a MKP-type capacitor

1. Electrodes ( Metallized)
2. Polypropylene film
3. Electric contact (schooping)
4. Non-metallized edge

### SELF-HEALING

At the end of service life, or due to inadmissible electrical or thermal overload, an insulation breakdown may occur. A breakdown causes a small arc which evaporates the metal layer around the point of breakdown and re-establishes the insulation at the place of perforation. After electric breakdown, the capacitor can still be used. The decrease of capacitance caused by a self-healing process is less than 100pF. The self-healing process lasts for a few microseconds only and the energy necessary for healing can be measured only by means of sensitive instruments.



Self-healing breakdown

1. Electrodes (Metallized)
2. Polypropylene film
3. Point of breakdown
4. Non-conductive insulating area

For self-healing dielectric, impregnation is basically not required. However, our MKP capacitors are impregnated to eliminate environmental influences and to guarantee reliable, long-term operation. Vacuum impregnation eliminates air and moisture, improves "Self healing" and reduces thermal resistance.

### FILLING AGENT

#### ESTAprop-PhMKP

ESTAprop MKP-type capacitors are filled with a natural oil. The highly fire-resisting insulation oil on vegetable base (flash point 285°C, ignition point 315°C) is fully biodegradable and non-toxic. There are no legal regulations regarding its destruction so it can be safely disposed of along with ordinary refuse.

After an extended drying period, the filling of the capacitor casing with oil is carried out under high vacuum for removal of moisture. Following this process, the capacitor will be hermetically sealed. This process ensures excellent heat dissipation and constant capacitance over full service life.

#### ESTAdry – ACMKP

ESTAdry ACMKP type capacitors are "dry". It is an environmentally friendly inert gas-filling type to avoid corrosion of the winding elements and inner electric contacts. For larger dry capacitors such as the D-type capacitors or DW filter capacitors, the filling agent is a resin.

Both versions of oil type - PhMKP and dry type - ACMKP comply with the highest temperature class D, specified by the standards. The Oil-impregnated version has more safety margin by design.

We recommend the use of our oil-impregnated standard tubular can type whenever possible. Especially for filter applications, as its thermal resistance is very low and it therefore provides excellent heat dissipation, which helps to overcome very high loading.

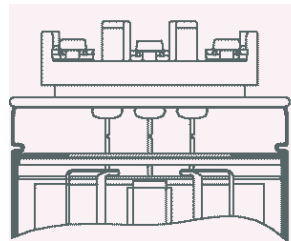
### PROVIDING THE WINDING ELEMENT WITH ELECTRIC CONTACTS

For ESTAprop and ESTAdry MKP-type capacitors, metallized electrodes are used. A winding element consists of two displaced polypropylene films, wound together. The front surface of the winding elements is joined by means of a metal spray process. This process is called Schooping. Due to the displacement of the two polypropylene films, only one film will be electrically connected on one side of the element. The terminal leads can be soldered onto this sprayed metal surface.

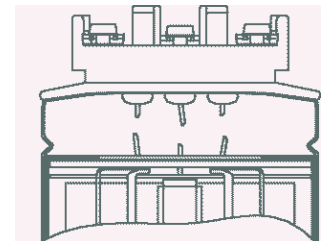
### ALL PHASE OVERPRESSURE TEAR-OFF FUSE

At the end of service life, due to inadmissible electrical or thermal overload, an overpressure builds up and causes an expansion of the cover. Expansion over a certain limit causes the tear-off of the internal fuses. The active capacitor elements are thus cut off from the source of supply. The pressure within the casing separates the breaking point so rapidly that no harmful arc can occur.

#### Operating Condition



#### Torn-off condition



### CE-MARKING

ESTAprop  
ESTAdry

73/23 EEC

Low voltage capacitors conform with the regulations of the following European directives:  
Low Voltage Directive

All ESTAprop and ESTAdry low voltage power factor correction Capacitors are supplied with CE-marking.

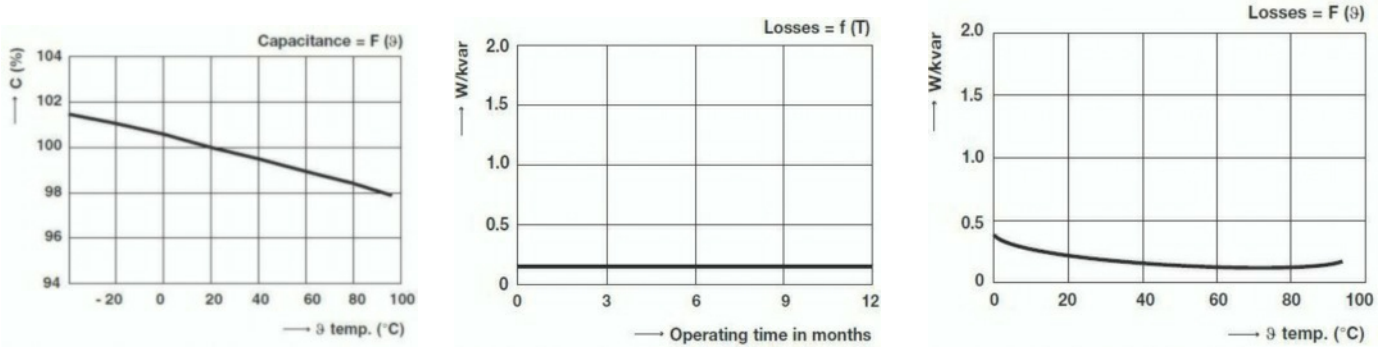
### UL – AND ULc - MARKING

ESTAprop and ESTAdry cylindrical type capacitors have been tested and approved by independent laboratories such as Underwriters Laboratories Inc. (UL). ESTAprop and ESTAdry low voltage capacitors conform with UL standard 810 and Canadian standard C 22.2. UL and ULc marks are included in standard component marking.

# ESTAprop / ESTAdry - LOW VOLTAGE

## CHARACTERISTICS OF DIELECTRIC

### MKP-POLYPROPYLENE, METALLIZED



## CAPACITORS IN CYLINDRICAL ALUMINIUM CASING

### TECHNICAL DATA

STANDARDS	IEC 60831-1+2, EN 60831-1+2, UL810 LATEST EDITIONS, UL/ULC - FILE E97723, VDE 0560-46+47
Overvoltages: (in accordance with the above standards)	U <sub>cn</sub> + 10% (up to 8 hours daily) U <sub>cn</sub> + 15% (up to 30 minutes daily) U <sub>cn</sub> + 20% (up to 5 minutes, only 200 times in the life of the capacitor) U <sub>cn</sub> + 30% (up to 1 minute, only 200 times in the life of the capacitor)
Overcurrent: (in accordance with the above standards)	1.3 x I <sub>n</sub> , 1.5 x I <sub>n</sub> with 10% overvoltages, 15% over capacitance and Harmonics included, continuous operation
Tolerance on capacitance:	-5/ +10% in accordance with the standards; ± 5% as MH VISHAY ESTA standard
Test voltage, terminal / casing:	2.15 x U <sub>cn</sub> , VAC, 2 s (routine test)
Test voltage, terminal/casing:	4800 VAC, 2 s (routine test)
Inrush current:	300 times rated current I <sub>n</sub> (type test report available on request)
Losses:	≤0.25 W/kvar to 0.45 W/kvar ( without discharge resistors)
Statistical life expectancy:	>150 000 operating hours (ESTAprop) >130 000 operating hours (ESTAdry)
Degree of protection:	IP 20 clamp terminal with mounted discharge resistor unit or IP 00 (terminal cover for higher protection class upon request), indoor mounting
Ambient temperature category:	- 25/D (max. 55°C) ESTAprop, - 40/D (max. 55 °C) ESTAdry
Permitted casing temperature:	Max. 65 °C(measured on top of the can)
Cooling:	Naturally air-cooled
Permissible relative humidity:	Maximum 95%
Maximum allowed altitude:	2000 m above sea level
Mounting position:	Vertical and horizontal
Mounting and grounding:	Threaded M12 stud at the bottom of the container
Safety features:	ALL-PHASE overpressure tear-off fuse, self-healing
Casing:	Deep-drawn Aluminium can
Dielectric:	Polypropylene film, self-healing
Filling agent:	Natural oil, non -PCB, biodegradable (ESTAprop) or dry/ gas -filled (ESTAdry)
Terminals per casing ø: (Cross-head screws)	<b>Ø 64mm</b> <b>IP 20</b> M4 terminal block <b>A</b> (D-351), <b>3.0Nm, max. 16mm<sup>2</sup></b> Drawing 1 Max. Current, depending on ambient conditions: 34 A (1 - phase) / 25 A (3 - phase)
	<b>Ø 84mm</b> <b>IP 00</b> M5 screw terminals (D-203), <b>2.0 Nm, max. 25mm<sup>2</sup></b> Drawing 2, feed through Max. Current, depending on ambient conditions: 57 A (1 - phase) / 52 A (3 - phase)
	<b>IP 20</b> M4 terminal block <b>A</b> (D-351), <b>3.0 Nm, max. 16mm<sup>2</sup></b> Drawing 3 Max. Current, depending on ambient conditions: 57 A (1-phase) / 52 A (3 - phase)

# GE POWER FACTOR CORRECTION CAPACITORS

MH Vishay ESTA

## Three Phase Capacitors in Cylindrical Aluminium Casing

Rated voltage 230 V, 50 Hz, 3-phase, delta connection

Type	Article No. <sup>(1)</sup>	Output kVAr	Capacity $\mu$ F	Current A	Dimensions $\varnothing$ *H (mm)	Weight kg	Drawing No
PhMKP 230.3.02,50 - A64-MH	5341- 48300 - xx	2.5	3 x 50.1	6.3	64 x 190	0.8	1
PhMKP 230.3.05,00- A64-MH	5341- 48301- xx	5	3 x 100.3	12.6	64 x 265	1.0	1
PhMKP 230.3.10,00 - A84-MH	5341- 48600 - xx	10	3 x 200.6	25.1	84.4 x 265	1.7	3
PhMKP 230.3.12,50 - A84-MH	5341- 48601 - xx	12.5	3 x 250.7	31.4	84.4 x 340	2.0	3
PhMKP230.3.15,00 - A84-MH	5341- 48602 - xx	15	3 x 300.9	37.7	84.4 x 340	2.1	3

Rated voltage 400 V, 50Hz, 3-phase, delta connection

CAN BE USED ALSO FOR 415V, FULL OVER VOLTAGE RANGE

Type	Article No. <sup>(1)</sup>	OUTPUT KVAR 400V	OUTPUT KVAR 415V	Capacity $\mu$ F	Current A 400V/ 415V	Dimensions $\varnothing$ *H (mm)	Weight kg	Drawing No.
PhMKP 400.3.10,00 - 84-MH	5341- 44403 - xx	10	10.8	3 x 66.3	14.4/15.0	84.4 x 190	1.3	2
PhMKP 400.3.12,50 - 84-MH	5341- 44404 - xx	12.5	13.5	3 x 82.9	18.0/18.7	84.4 x 190	1.3	2
PhMKP 400.3.15,00 - 84-MH	5341- 44405 - xx	15	16.1	3 x 99.5	21.6/22.4	84.4 x 190	1.3	2
PhMKP 400.3.16,70 - 84-MH	5341- 44406 - xx	16.7	18.0	3 x 110.7	24.1/25.0	84.4 x 265	1.7	2
PhMKP 400.3.20,00 - 84-MH	5341- 44407 - xx	20	21.5	3 x 132.6	28.8/30.0	84.4 x 265	1.7	2
PhMKP 400.3.25,00 - 84-MH	5341- 44408 - xx	25	26.9	3 x 165.8	36.1/37.4	84.4 x 265	1.7	2

Rated voltage 440 V, 50 Hz, 3-phase, delta connection

CAN BE USED ALSO FOR 415V

Type	Article No. <sup>(1)</sup>	OUTPUT KVAR 440V	OUTPUT KVAR 415V	Capacity $\mu$ F	Current A 440V/ 415V	Dimensions $\varnothing$ *H (mm)	Weight kg	Drawing No.
PhMKP 440.3.12,50 - 84-MH	5341- 44409 - xx	12.5	11.1	3 x 68.5	16.4/ 15.5	84.4 x 190	1.3	2
PhMKP 440.3.14,10 - 84-MH	5341- 44410 - xx	14.1	12.5	3 x 77.0	18.5/17.5	84.4 x 190	1.3	2
PhMKP 440.3.15,00 - 84-MH	5341- 44411 - xx	15	13.3	3 x 82.2	19.7/ 18.6	84.4 x 190	1.3	2
PhMKP 440.3.16,90 - 84-MH	5341- 44412 - xx	16.9	15	3 x 92.6	22.2/ 20.9	84.4 x 190	1.3	2
PhMKP 440.3.18,80 - 84-MH	5341- 44413 - xx	18.8	16.7	3 x 103.0	24.7/23.3	84.4 x 265	1.7	2
PhMKP 440.3.20,00 - 84-MH	5341- 44414 - xx	20	17.8	3 x 109.6	26.2/24.8	84.4 x 265	1.7	2
PhMKP 440.3.22,50 - 84-MH	5341- 44415 - xx	22.5	20	3 x 123.3	29.5/27.8	84.4 x 265	1.7	2
PhMKP 440.3.25,00 - 84-MH	5341- 44416 - xx	25	22.2	3 x 137.0	32.8/30.9	84.4 x 265	1.7	2
PhMKP 440.3.28,10 - 84-MH	5341- 44417 - xx	28.1	25	3 x 154.0	36.9/34.8	84.4 x 265	1.7	2
PhMKP 440.3.30,00 - 84-MH	5341- 44418 - xx	30	26.7	3 x 164.4	39.4/37.1	84.4 x 340	2.1	2

Rated voltage 525 V, 50 Hz, 3-phase, delta connection

CAN BE USED ALSO FOR 480V

Type	Article No. <sup>(1)</sup>	OUTPUT KVAR 525V	OUTPUT KVAR 480V	Capacity $\mu$ F	Current A 525V/ 480V	Dimensions $\varnothing$ *H (mm)	Weight kg	Drawing No.
PhMKP 525.3.10,00 - 84-MH	5341- 44419 - xx	10	8.33	3 x 38.5	11.0/10.1	84.4 x 190	1.3	2
PhMKP 525.3.12,50 - 84-MH	5341- 44420 - xx	12.5	10.4	3 x 48.1	13.7/12.6	84.4 x 190	1.3	2
PhMKP 525.3.13,80 - 84-MH	5341- 44421 - xx	13.8	11.5	3 x 53.1	15.2/13.8	84.4 x 190	1.3	2
PhMKP 525.3.15,00 - 84-MH	5341- 44422 - xx	15	12.5	3 x 57.7	16.5/15.0	84.4 x 190	1.3	2
PhMKP 525.3.20,00 - 84-MH	5341- 44423 - xx	20	16.7	3 x 77.0	22.0/20.1	84.4 x 265	1.7	2
PhMKP 525.3.25,00 - 84-MH	5341- 44424 - xx	25	20	3 x 96.2	27.5/24.6	84.4 x 265	1.7	2

### Notes:

- Other voltage ratings, outputs and frequencies upon request. All PhMKP-type capacitors may be also applied in 60Hz networks, output and current will, however, be 20% higher in these cases (i.e. additional thermal load and therefore, a lower class of temperature must be taken into account.)

(1) Version no. xx may differ as it respects small changes, e.g. on the label

Rated voltage 660 V, 50 Hz, 3-phase, delta connection

CAN BE USED ALSO FOR 690 V, FULL OVER VOLTAGE RANGE

Type	Article No. <sup>(1)</sup>	OUTPUT KVAR 660V	OUTPUT KVAR 690V	Capacity $\mu$ F	Current A 660V/690V	Dimensions $\varnothing$ *H (mm)	Weight kg	Drawing No.
PhMKP 660.3.08,33-84-MH	5341-44425-xx	8.33	9.1	3 x20.3	7.3/7.6	84.4 x 190	1.4	2
PhMKP 660.3.10,00-84-MH	5341-44426-xx	10	10.9	3 x24.4	8.7/9.1	84.4 x 190	1.9	2
PhMKP 660.3.12,50-84-MH	5341-44427-xx	12.5	13.7	3 x30.4	10.9/11.5	84.4 x 265	1.9	2
PhMKP 660.3.15,00-84-MH	5341-44428-xx	15	16.4	3 x36.5	13.1/13.7	84.4 x 265	2.0	2
PhMKP 660.3.16,70-84-MH	5341-44429-xx	16.7	18.3	3 x40.7	14.6/15.3	84.4 x 265	2.0	2
PhMKP 660.3.20,00-84-MH	5341-44430-xx	20	21.9	3 x48.7	17.5/18.3	84.4 x 340	2.4	2
PhMKP 660.3.22,90-84-MH	5341-44431-xx	22.9	25.0	3 x55.8	20.0/20.9	84.4 x 340	2.4	2

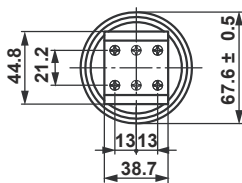
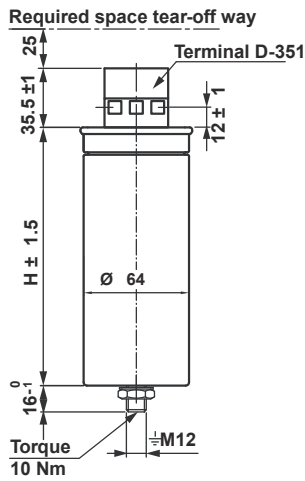
Rated voltage 690 V, 50 Hz, 3-phase, delta connection

CAN BE USED ALSO FOR 660 V

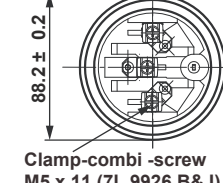
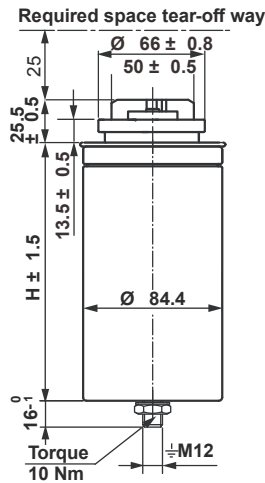
Type	Article No. <sup>(1)</sup>	OUTPUT KVAR 660V	OUTPUT KVAR 690V	Capacity $\mu$ F	Current A 660V/690V	Dimensions $\varnothing$ *H (mm)	Weight kg	Drawing No.
PhMKP 690.3.12,50-84-MH	5341-44432-xx	11.4	12.5	3 x 27.9	10.5/ 10.00	84.4 x265	1.9	2
PhMKP 690.3.15,00-84-MH	5341-44433-xx	13.7	15	3 x 33.4	12.6/ 12.0	84.4 x265	1.9	2
PhMKP 690.3.20,00-84-MH	5341-44434-xx	18.3	20	3 x 44.6	16.7/ 16.0	84.4 x 340	2.4	2
PhMKP 690.3.25,00-84-MH	5341-44435-xx	22.9	25	3 x 55.8	20.9/ 20.0	84.4 x 340	2.4	2

Rated voltages >660<1000V / 50/60Hz upon request.

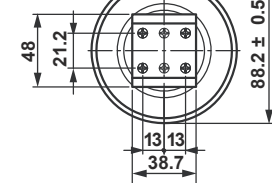
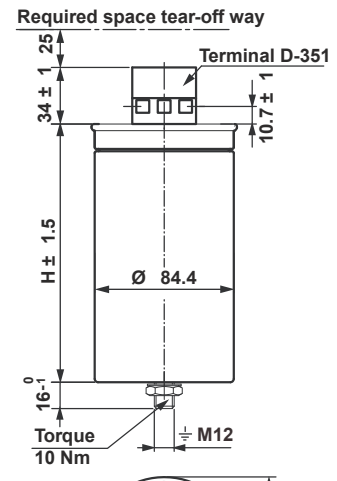
DIMENSIONS



Drawing 1



Drawing 2



Drawing 3

### PRODUCTS

Low Voltage Capacitors  
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