

TECHNICAL

INFORMATION



ESTAprop® / ESTAdry®

POWER FACTOR CORRECTION CAPACITORS LOW VOLTAGE

Capacitors in Cylindrical Aluminium Casing
General Technical Information,
Terms, Definitions, Standards,

Separate brochures available:

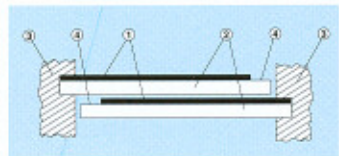
- High Voltage Capacitors
- Power Electronic Capacitors
- Microprocessor based Controllers

General Technical Information

MKP – Technology

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

MKP – (metallized polypropylene film)

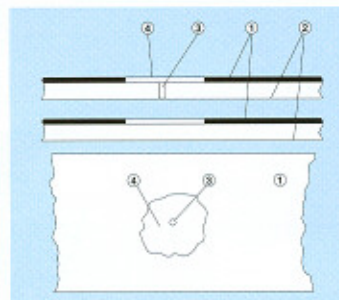


Design of a MKP capacitor

- 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 100 pF. 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.

Impregnating agent

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

Impregnation (ESTAprop) – PhMKP

After an extended drying period the impregnation (filling 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.

Filling agent (ESTAdry) – PhMKPg

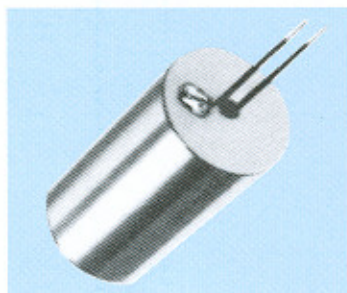
ESTAdry MKP-type capacitors are "dry". That is, after the extended drying period and before the hermetic sealing of the casing, an unliquid filling agent is used instead of natural oil. In case of tubular cans, it is an environmental friendly inert gas-filling to avoid corrosion of the winding elements and inner electric contacts. Filling agent resin is used in DW-Type Filter Capacitors.

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.

Both versions comply with the highest temperature class D, specified by the standards. The oil-impregnated version has more safety margin by design.

Providing the winding element with electric contacts

For ESTAprop 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.



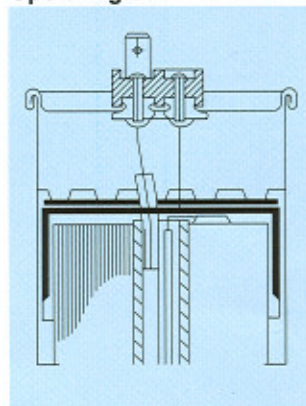
Winding element with schooping and soldered connecting wires

Overpressure tear-off fuse

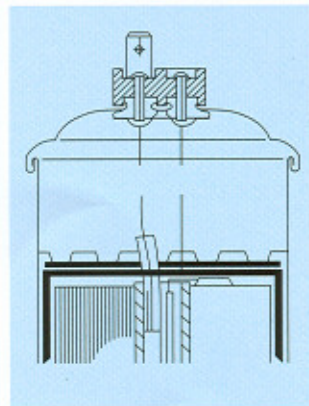
If at the end of service life, due to inadmissible electrical or thermal overload an overpressure builds up and causes an expansion of the cover. Expansion over a certain limit causes the tear-off of the internal fuses.

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® low voltage
ESTAdry®

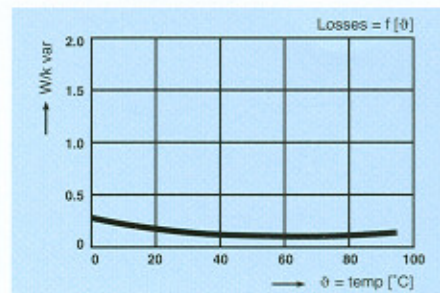
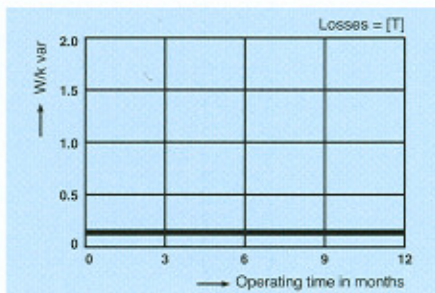
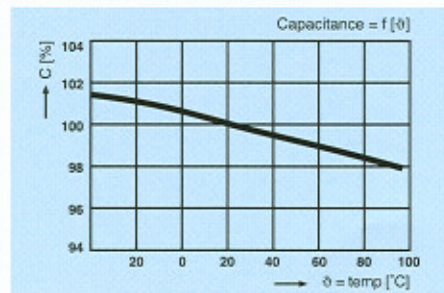
89/336/EWG
92/31 /EWG
93/68 /EWG

capacitors are conformed with the regulations of the following European directives :
Electromagnetic compatibility
Electromagnetic compatibility
Directive to change the directives
...89/336/EWG

All ESTAprop® and ESTAdry® Low Voltage Power Factor Correction Capacitors are supplied with CE – marking.

ESTAprop[®] / ESTAdry[®] - POWER FACTOR

Characteristics of dielectric MKP-Polypropylene, metallized



UL and ULc-marking

ESTAprop[®] cylindrical type capacitors have been tested and approved by independent laboratories such as Underwriters Laboratories Inc. (UL). ESTAprop[®] low voltage capacitors are conformed with UL-standard 810 and Canadian standard C 22.2. UL and ULc mark are included in standard component marking.

Capacitors in Cylindrical Aluminium Casing

TECHNICAL DATA	Standards:	IEC 60831-1+2, EN 60831-1+2, VDE 0560-46+47
	Overvoltages: (according above standards)	U _{cn} + 10% (up to 8 hours daily) U _{cn} + 15% (up to 30 minutes daily) U _{cn} + 20% (up to 5 minutes) U _{cn} + 30% (up to 1 minute)
	Overcurrent: (according above standards)	1.3* I _n , 1.5* I _n with 10% overvoltage, 15% overcapacitance and harmonics included, continuous operation
	Tolerances on capacitance:	-5 / +10% according to standards, normally ± 5% as ESTA standard
	Test voltage, terminal / terminal:	2.15* U _{cn} , AC, 2 seconds
	Test voltage, terminal / casing:	4800 VAC, 2 seconds
	Inrush current:	300 times rated current I _n
	Losses:	app. 0.25 W / kVAr (without discharge resistors) app. 0.35 W / kVAr (inclusive discharge resistors)
	Life expectancy:	> 150 000 operating hours (ESTAprop) > 130 000 operating hours (ESTAdry)
	Degree of protection:	IP00 (terminal cover for higher protection class, for instance IP54 upon request), indoor mounting
	Ambient temperature category:	-25 / D (max. 55°C), (-40 / D on request)
	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:	threaded M 12 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
Impregnant:	natural oil, NON-PCB, biodegradable (ESTAprop) or dry / gas – filled (ESTAdry)	
Terminals:	casing Ø 84 mm: M5 screw-on terminals casing Ø < 84mm: push-on (6.3* 0.8mm) connectors	

POWER CORRECTION CAPACITORS – LOW VOLTAGE

Three Phase Capacitors in Cylindrical Aluminium Casing

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

Type	Article No.	Output kVAr	Capacity μ F	Current A	Dimensions \varnothing *H (mm)	Weight kg	Drawing No.
PhMKP230.3.02,5	33476	2.5	3* 50.1	6.3	64 * 190	0.8	1
PhMKP230.3.05	30998	5	3*100.3	12.6	64 * 265	1.1	1
PhMKP230.3.10	33486	10	3* 200.6	25.1	84 * 265	1.9	2
PhMKP230.3.12,5	33303	12.5	3* 250.7	31.4	84 * 340	2.4	2
PhMKP230.3.15	35457	15	3* 300.9	37.7	84 * 340	2.4	2

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

Type	Article No.	Output kVAr	Capacity μ F	Current A	Dimensions \varnothing *H (mm)	Weight kg	Drawing No.
PhMKP400.3.02,5	26199	2.5	3* 16.6	3.6	64 * 190	0.8	1
PhMKP400.3.05	31116	5	3* 33.2	7.2	64 * 190	0.8	1
PhMKP400.3.06,67	33305	6.67	3* 44.2	9.6	64 * 190	0.8	1
PhMKP400.3.08,33	33477	8.33	3* 55.2	12	64 * 265	1.1	1
PhMKP400.3.10	31916	10	3* 66.3	14.4	64 * 265	1.1	1
PhMKP400.3.12,5	31414	12.5	3* 82.9	18	64 * 340	1.3	1
PhMKP401.3.10	35459	10	3* 66.3	14.4	84 * 190	1.4	2
PhMKP401.3.12,5	35460	12.5	3* 82.9	18	84 * 190	1.4	2
PhMKP400.3.15	35461	15	3* 99.5	21.6	84 * 265	1.9	2
PhMKP400.3.16,7	35462	16.7	3* 110.7	24.1	84 * 265	1.9	2
PhMKP400.3.20	33483	20	3* 132.6	28.8	84 * 265	1.9	2
PhMKP400.3.25	35463	25	3* 165.8	36.1	84 * 340	2.4	2

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

can be used also for 415 V

Type	Article No.	Output kVAr 440 V	Output kVAr 415 V	Capacity μ F	Current A 415/440 V	Dimensions \varnothing *H (mm)	Weight kg	Drawing No.
PhMKP440.3.05	33989	5	4.4	3* 27.4	6.1/6.6	64 * 190	0.8	1
PhMKP440.3.08,33	35919	8.33	7.4	3* 45.7	10.3/10.9	64 * 265	1.0	1
PhMKP440.3.10	36130	10	8.9	3* 54.8	12.4/13.1	64 * 265	1.1	1
PhMKP440.3.11,2	33307	11.2	10	3* 61.4	13.9/14.7	64 * 265	1.1	1
PhMKP440.3.14,0	33308	14.05	12.5	3* 76.7	17.4/18.4	64 * 340	1.3	1
PhMKP440.3.14,0	35465	14.05	12.5	3* 76.7	17.4/18.4	84 * 190	1.4	2
PhMKP440.3.15	35598	15	13.3	3* 82.2	18.5/19.7	84 * 265	1.8	2
PhMKP440.3.16,9	35466	16.9	15	3* 92.6	20.9/22.2	84 * 265	1.9	2
PhMKP440.3.18,8	35467	18.8	16.67	3* 103.0	23.2/24.7	84 * 265	1.9	2
PhMKP440.3.20	35599	20	17.8	3* 109.6	24.8/26.2	84 * 265	2.3	2
PhMKP440.3.22,5	35468	22.5	20	3* 123.3	27.8/29.5	84 * 340	2.4	2
PhMKP440.3.25	35545	25	22.2	3* 137.0	30.9/32.8	84 * 340	2.4	2
PhMKP440.3.28,1	35469	28.1	25	3* 154	34.7/36.9	84 * 340	2.4	2
PhMKP440.3.30	35470	30	26.7	3* 164.4	37.1/39.4	84 * 340	2.5	2

Other voltage ratings, outputs and frequencies upon request. All PhMKP-type capacitors may be used for 60 Hz, the output will be 1.2 times higher.

VDE PRÜF- UND ZERTIFIZIERUNGSIKITUT
VDE Verband Deutscher Elektrotechniker e.V.

CERTIFICATE

Registration-Number: 2556/QM03 94 (AG, AJ)

This is to certify that the company

VISHAY ELECTRONIC GMBH
Geschäftsbereich ROEDERSTEIN/VESTA
D-84034 LANDSHUT

In the following locations

Tuchwalkerstraße, D-84034 Landshut (AG)
Hofmark-Aich-Straße 36, D-84030 Landshut (AJ)

has implemented and maintains a
Quality-Management System for the following scope:

Heavy Current Capacitors

This QM-System complies with the requirements of:

DIN EN ISO 9001:1994
Quality systems
Model for quality assurance in design/development,
Production, installation and servicing

This certificate is valid until 2000-03-19

VDE Testing and Certification Institute
Department for Certification



D-63069 Offenbach/Main, Merianstraße 28
Date: 1997-05-20
2556-0110-0004

The VDE Testing and Certification Institute is accredited by DIN according to DIN 69023



Exclusive Agent:

MUN HEAN SINGAPORE PTE LTD

51 Kim Keat Road, Unit 05-02 Mun Hean Industrial Building,
Singapore 328821

Tel: (65) 6250 0522 Fax: (65) 6253 6885 / (65) 6253 5879

E-mail: munheansing@munhean.com.sg

Website: <http://www.munheansingapore.com>

MUN HEAN (MALAYSIA) SDN BHD

15, Jalan SS26/6, Taman Mayang Jaya,
47301 Petaling Jaya,

Selangor Darul Ehsan, Malaysia.

Tel: (03) 7804 2288 Fax: (03) 7803 1185

E-mail: mhmsb@pc.jaring.my

Website: <http://www.munheanmalaysia.com>

MUN HEAN ELECTRICAL ENGINEERING (HK) CO LTD

Room 1701, 17/F Kodak House II,

321 Java Road, North Point, Hong Kong.

Tel: (852) 2873 1711 Fax: (852) 2518 7013

E-mail: munhean@netvigator.com

Website: <http://www.munheanhongkong.com>

MH POLY-ELECTROMECHS, INC.

No. 31 Mayon St., Unit G Villa Maria

Brgy. Malamig, Mandaluyong City, Philippines.

Tel: (632) 531 5865 / (632) 531 5775 Fax: (632) 531 9086

Email: polyelec@pacific.net.ph

All printed details are legally binding after written confirmation only especially
with respect to the provisions of §§ 463 and 480 II
of the German Code of Civil Law.

The data indicated herein describes the type of component
and shall not be considered as guaranteed characteristics.

© Copyright 1999 VISHAY ELECTRONIC GMBH

® Registered Trademark of VISHAY INTERTECHNOLOGY, INC.
All rights reserved. Specifications subject to change without notice.