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VISHAY INTERTECHNOLOGY, INC.

DATA BOOK



Power Electronic Capacitors

General Technical Information

DC-Capacitors

AC-Filter Capacitors

GTO-Capacitors

Commutation and Damping Capacitors

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E 03-02 E/04

VISHAY INTERTECHNOLOGY, INC.

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Power Electronic Capacitors Vishay ESTA

Vishay Electronic GmbH
Division ESTA
Hofmark-Aich-Strasse 36
D-84030 Landshut
Germany
Phone: + 49 871 86-0
Fax: + 49 871 862519
www.vishay.com

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Power Electronic Capacitors

MKP DIELECTRIC

A metallic layer is vacuum-metallized on one side of the corresponding polypropylene base film by means of a special process.

The thickness of the metallic layer varies over the distance of the film width.

At the connection area, the metallic layer is thicker to reduce losses occurring at this point due to high current densities.

Self-healing characteristics and series resistance are optimized by the metallization arrangement. This metallization arrangement principle is shown in Fig. 1. The actual arrangement however is adapted to the corresponding capacitor demands.

MKP = METALLIZED POLYPROPYLENE

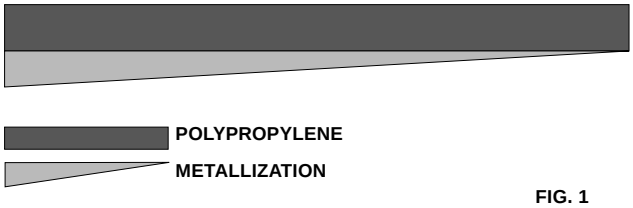


FIG. 1

SELF-HEALING

As a result of the self-healing effect, the capacitor is fully operational after an electrical breakdown. A breakdown generates a small electric arc which evaporates the metallization around the area of the breakdown in only a few microseconds.

The localized increase in gas pressure caused by the high temperature, blows off the gaseous metallization away from the breakdown point. By means of this process, a metallic free non-conductive isolation crescent is formed which enables continuous full operation of the capacitor.

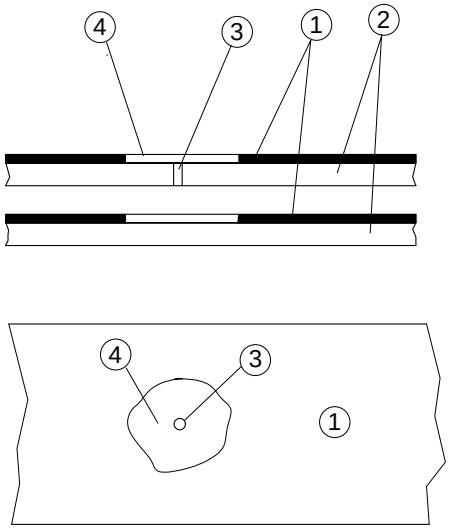


FIG. 2

Self healing breakdown on an MKP capacitor
1 metallized electrode
2 polypropylene film
3 point of breakdown
4 non-conductive insulating crescent

PROTECTION OF SELF-HEALING CAPACITORS

Since no low resistance short circuit occurs on failure of self healing capacitors, line-side fuses cannot offer any protection against bursting of the case.

Therefore, in addition to segmentation (exclusively for DC capacitors) there is also a fuse for MKP capacitors which reacts to overpressure.

A capacitor failure generally occurs due to a weak point in the dielectric, an overload or degradation. If it is not taken off line, over-heating of the dielectric occurs at the defect point. This over-heating leads to the formation of gas and a quick increase in pressure on the inside of the capacitor case. In cylindrical cases, this takes the form of an elongation causing a crowning of the cover or stretching of the expansion bead.

SEGMENTATION

Self-healing DC capacitors without tear-off fuses can be manufactured with a segmented metallized polypropylene film. Various segmental designs are available which are applied in accordance with the mode of application and the specification. All segmented metallizations being applied are produced in accordance with the Vishay specification.

MODE OF FUNCTIONING

If a non-self-healing breakdown occurs in the dielectric, the segment affected by this error will be disconnected.

Due to the high number of segments per capacitor element, the disconnection of a partial segment causes a practically non-measurable change of capacitance. The application of this technology essentially allows the dielectric's field strength to increase and, consequently, reduce to a minimum the capacitor volume and capacitor weight.

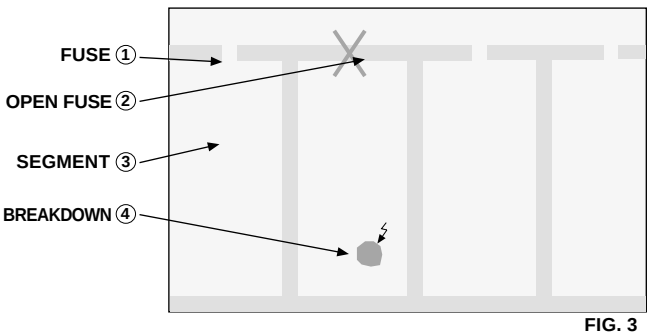
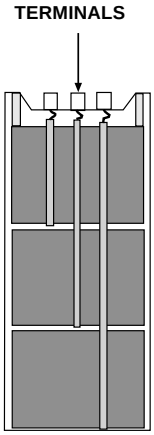


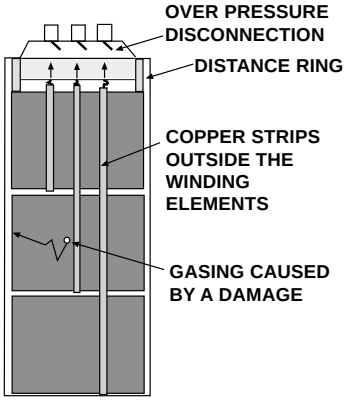
FIG. 3

Power Electronic Capacitors

OVERPRESSURE TEAR-OFF FUSE

On over-running or on reaching the limits of the expected capacitor lifetime, punctures can occur, causing localized bridging and the formation of gas. An overpressure tear-off fuse disconnects the capacitors element from the line side thereby preventing bursting.





OVERPRESSURE SENSOR

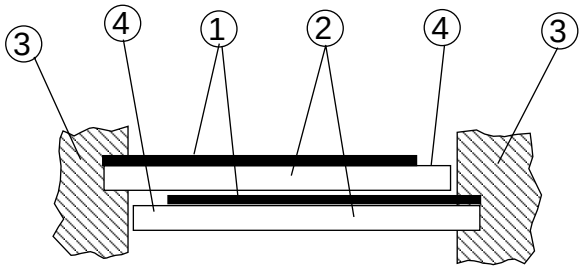
For capacitors in rectangular cans, pressure sensors are available which can activate a line-side switch via a signal contact.

CONTACTING OF THE WINDING ELEMENT

For capacitors with metallized film winding elements (MKP-technology), the contacting of the windings is accomplishedby a special metal spray method (“schooping”).

The vacuum-metallized layers stretch to the edge of the dielectric on the contacting side.

For contacting purposes a solderable lead-free metal base layer is sprayed onto the front side of the winding. One designates this process as “schooping”. The leads are then soldered onto the schoopened surface.



1 metallized electrodes
2 polypropylene film
3 electric contact (schooping)
4 non-metallized edge



SCHOPPED METALLIZED FILM (MKP) WINDING ELEMENT

The connection of the winding is accomplished by means of a highly flexible conductive material with low inductive characteristics.

In this way the capacitors are able to fulfill the highest demands for current carrying capabilities, low inductive characteristics and vibration protection.

Power Electronic Capacitors

FILLERS

There are various fillers for the capacitors listed in the catalog.

DRY CASTING

Almost all self-healing capacitors in rectangular cases and a number of capacitors in cylindrical cans can be constructed as dry capacitors.

A casting compound developed by VISHAY is utilized which remains elastic throughout the entire life of the capacitor.

This elastic casting compound offers outstanding vibration protection for the internal structure and long-lasting protection against the penetration of moisture into the electrical components of the capacitor.

A very good heat conductivity (see table 1) of the casting compound enables maximum capacitor loads under high temperature stress conditions.

The casting compound can be disposed of as normal refuse.

OIL

For capacitors equipped with tear-off protection, preference is given to impregnation using a specially produced and stabilized vegetable oil.

The highly non-flammable insulating oil is fully biodegradable and non-toxic.
There are no disposal requirement regulations and the oil can therefore be disposed off as normal refuse.

INERT GAS

For various applications, the utilization of oil for capacitors with tear-off protection is permitted. Such capacitors can also be supplied as dry capacitors.

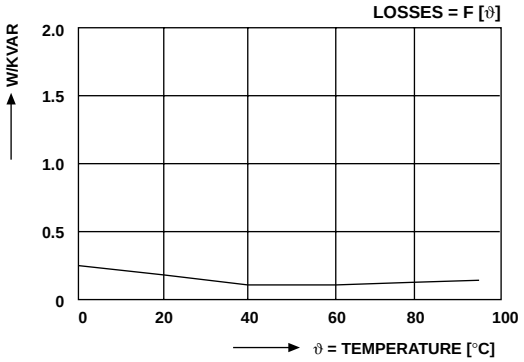
Instead of oil, the capacitors are filled with an inert gas.

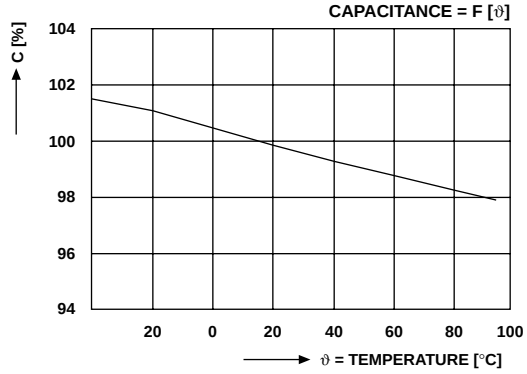
AIR/GAS	0.015 - 0.020W/mK
POLYPROPYLENE	0.22W/mK
VERMICULITE	0.061W/mK
CASTOR OIL	0.15W/mK
POLYURETHANE	0.015 - 0.2W/mK

TABLE 1

CHARACTERISTICS OF THE DIELECTRIC

"MKP" Metallized film, Polypropylene





Power Electronic Capacitors

CAPACITOR LOSSES

In order to prove reliable functioning and the life expectancy of a capacitor at maximum ambient temperature, the maximum surface temperature of the casing has to be ascertained.

In general, the capacitors are designed for a maximum casing temperature of 80°C at short time operation and 65°C at continuous operation. In case of higher calculated casing temperature, please contact our offices for a special design according to your specifications.

The surface temperature of the capacitor can be ascertained by means of the data concerning the temperature loading, the series resistance, and the loss factor.

EXEMPLARY CALCULATION

OPERATING DATA

U_n = 1900VDC

U_{ripple} = 20Vrms

F = 500Hz

T_{max} = 70°C (10% of operating time)

T_{min} = - 40°C

CAPACITOR DATA

U_n = 1900VDC

C_n = 4000µF

I_n = 300A

R_s = 0.5mΩ

tanδdiel = $< 2 \times 10^{-4}$

$< 5 \times 10^{-4}$ (1kHz)

tanδtotal $< 3 \times 10^{-4}$ (50Hz)

capacitor dimensions = 340 x 175 x 520mm (l x w x h)

CALCULATION OF OVERTEMPERATURE BASED ON OPERATING DATA

I = U x 2π x f x C

I = 20V x 2π x 500Hz x 4000 x 10^{-6}F

I = 251A

Q = I x Uripple

Q = 251A x 20V

Q = 5000var

$\Delta\vartheta$ = Pvtotal / 0.1 x A

$\Delta\vartheta$ = 32.5W/((0.1W x 65.5dm^2)/(K x dm^2))

$\Delta\vartheta$ = 4.96K

Maximum casing temperature:

surface of casing A = 65.5dm^2

heat dissipation factor

of casing surface 0.1W/(K x dm^2)

Pvtotal = Pv + Pv diel.

Pvtotal = I^2 x Rs + Q x tanδtotal

Pvtotal = 251A^2 x 0.5 x 10^{-3} + 5000 x 2 x 10^{-4}

Pvtotal = 32.5W

Tcmax = Tamb max + $\Delta\vartheta$

Tcmax = 70°C + 5K

Tcmax = 75°C

RESULT

A calculated maximum case temperature of 75°C (based on operating data) allows unrestricted operation of the capacitor for above specified short time operation.

APPLICATION CLASSES

Capacitors are divided into application classes according to their permissible exposure to climatic conditions and physical wear and tear. The application classes are defined in DIN 40040. DIN 40040 also defines the criteria determining the reliability of capacitors.

CLIMATIC EXPOSURE

Permissible exposure to temperature and humidity depends on the particular model and is designated as follows according to DIN 40040.

1st letter	**I**	**H**	**G**	**F**
minimum temperature	- 10°C	- 25°C	- 40°C	- 55°C

2nd letter	**V**	**U**	**S**	**P**
maximum temperature	+ 55°C	+ 60°C	+ 70°C	+ 85°C

3rd letter	**F**	**E**	**C**	
mean annual humidity	≤ 75%	≤ 75%	≤ 95%	
30 days max. per year continuous	95%	95%	-	
occasionally on the other days	85%	85%	100%	
dew	none	seldom	present	

FAILURE RATE

The failure rate is the number of permissible failures per 10^9 component hours.

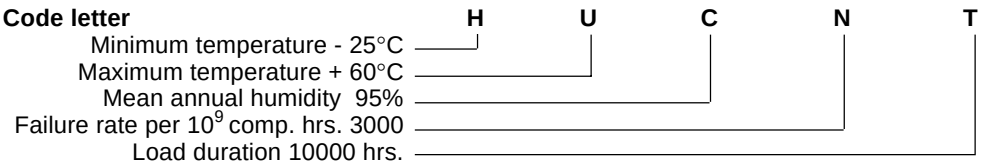
4th letter	**K**	**L**	**M**	**N**	**P**	**Q**
failure rate (failure per 10^9 comp. hrs)	100	300	1000	3000	10000	30000

LOAD DURATION

The duration of exposure is the actual total time subjected to nominal voltage.

5th letter	**R**	**S**	**T**	**U**	**V**
Load duration (h)	100000	30000	10000	3000	1000

EXAMPLE OF HOW AN APPLICATION CLASS IS SPECIFIED:

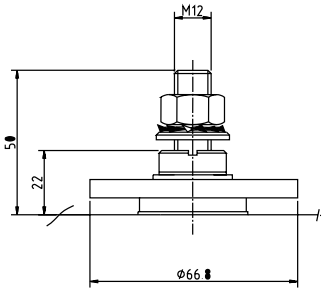


Power Electronic Capacitors

BUSHINGS

Ceramic and plastic types of construction material are offered. Both materials have been selected to conform with Standard CTI 600.

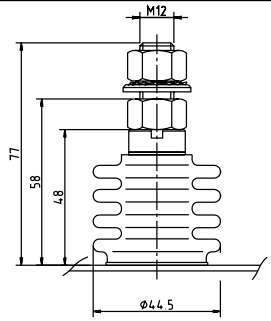
CERAMIC TYPE



FLASHOVER DISTANCE 35mm
CREEPAGE DISTANCE 50mm

D 195

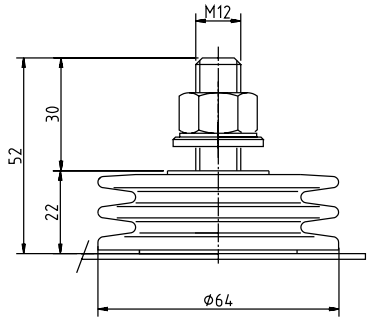
CERAMIC TYPE



FLASHOVER DISTANCE 47mm
CREEPAGE DISTANCE 90mm

D 197

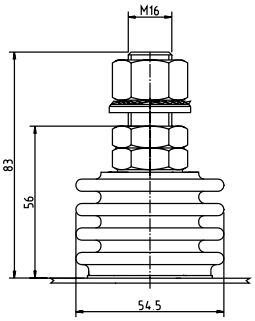
PLASTIC TYPE



FLASHOVER DISTANCE 38mm
CREEPAGE DISTANCE 61mm

D 216

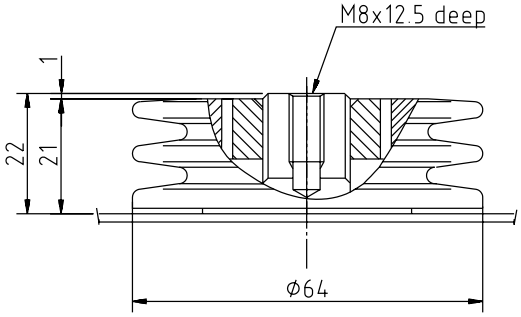
CERAMIC TYPE



FLASHOVER DISTANCE 47mm
CREEPAGE DISTANCE 93mm

D 229

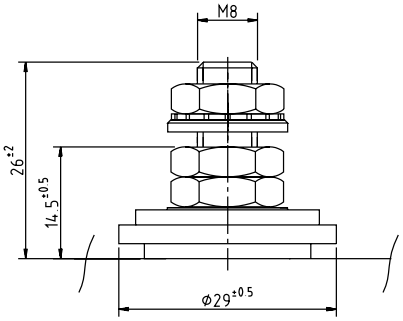
PLASTIC TYPE



FLASHOVER DISTANCE 38mm
CREEPAGE DISTANCE 61mm

D 242

CERAMIC TYPE



FLASHOVER DISTANCE 11mm
CREEPAGE DISTANCE 18mm

D 214

Power Electronic Capacitors

RULES, REGULATIONS AND DEFINITIONS

The type of capacitors listed in this catalog are subject to the relevant rules:
General specifications for capacitors:
VDE 0560 Part 1/12.69

DC-capacitors:	EN 61071-1
Commutation capacitors:	VDE 0560 part 12
	EN 61071-1

TERMS:

Rated capacitance (C_N)
of a capacitor is the capacitance by which it is designated. The term is related to 20°C capacitor temperature, 50Hz and rated voltage.

Tolerance on capacitance
is the capacitance range within which the actual capacitance may differ from rated capacitance (C_N).

Rated Voltage (U_N)
is the maximum of mixed voltages or the peak of AC voltages for which the dielectric of capacitors is designed, adhering to the characteristics and other rated values specified. Rated voltage is **not** the rms value but the maximum or peak capacitor voltage.

Rated voltage (U_N) DC-capacitors
is the maximum operating peak voltage of either polarity but of a non-reversing type waveform, for which the capacitors have been designed, for continuous operation.

Periodic peak voltage (U_S)
is the periodically permissible peak voltage. The characteristic and permissible duration of exposure are given.

Peak voltage (U_{smax})
is the maximum voltage which may be allowed to occur across the capacitor sporadically and for a brief period, e.g. in the event of a fault. The characteristic and permissible load duration are given in most cases.

Ratio of voltage reversal (D)
is the ratio between the second voltage peak and the first voltage peak for dampened dying-out surge discharge, expressed as a percentage.

Rated insulation voltage (U_i)
is the rms AC voltage for which the insulation of the capacitor is designed and designed with terminal connected to case.

Rated current (I_N)
is the current by which the capacitor is designated and in particular for which its current paths are designed. Rated current is the maximum rms level of steady-state current.

Peak surge current (I_S)
is the maximum level of current which may be allowed to occur across the capacitor sporadically for a short period e.g. in the event of a fault. The characteristic and permissible duration are given.

Dielectric loss factor (tan δ_o)
is the loss factor of the dielectric which is assumed to be constant for the normal dielectrics and their operating frequency range.

DEFINITIONS:

Minimum temperature
The lowest temperature at the surface of the capacitor case (ready for operation) at which the capacitor may be switched on. Lower temperatures are usually permissible for transport and and storage.

Maximum temperature
The highest temperature which the hottest point of the capacitor case may reach during operation, including self-heating.

Reliability
The operating reliability of the capacitor is determined by the number of failures within an adequately large batch expected to occur after a specified time (life expectancy).
DIN 40040 has replaced the previous term “operating reliability” by the new term “reference reliability”.

Reference reliability
Reference reliability is expressed in terms of failure quota and respective load duration (not including storage times).

Reference reliability is the reliability for defined load (reference load). The reference exposure figure quoted relates to operation under nominal conditions and the application class given in the data lists.

Failure ratio
The failure ratio is the relationship between the number of failed capacitors and the total number of capacitors used.
It applies to a particular capacitor only and the load duration cited (life expectancy). The figure quoted in the data lists is an average which is generally not exceeded if examining an adequately large number of capacitors.

FIT
FIT = **f**ailures **i**n **t**ime
The failure rate in FIT indicates the maximum failed components within 1 x 10^9 component operation hours.

Request for Quotation DC-Filter-Capacitors

		VALUE		CONDITION/TIME
1	**CAPACITANCE**		µF	-
	Tolerance on capacitance		%	-
	Tolerance after expected life time		%	-
2	**VOLTAGE**			
	Rated AC-voltage		V	
	Rated DC-voltage		V	
	Superimposed ripple voltage		V	
	Frequency of ripple voltage		Hz	
	Maximum recurrent peak voltage		V	
	Maximum recurrent surge voltage		V	
	Maximum surge voltage		V	
	Voltage raise (repetitive)		V µS	-
3	**CURRENT**			
	Rated rms-current		A	
	Maximum rms-current		A	
	Maximum peak surge current		A	
4	**MAXIMUM PERMISSIBLE INDUCTANCE**		nH	-
5	**CLIMATIC CONDITIONS**			
	Capacitor ambient temperature min/max		°C	-
	Temperature distribution over the year	temperature days		
	Forced cooling		m/s	-
	Natural cooling			-
6	**EXPECTED LIFE TIME**		hours	-
7	**INSTALLATION**			
	Traction			-
	Fixed installation			-
8	**MECHANICAL REQUIREMENTS**			
	Maximum dimensions			
	Mounting position			
	Flash over distance of bushings			
	Creepage distance of bushings			
9	**FURTHER REQUIREMENTS**			
	Delivery (quantity)			
	Start of Delivery:			
	Specialities			

Your address:

Please copy, complete and return to:

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E-mail to : meesta@vishay.com

MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

VOLTAGE RANGE: UP TO 10kV

CAPACITANCE RANGE: UP TO 20mF

MAIN CHARACTERISTICS

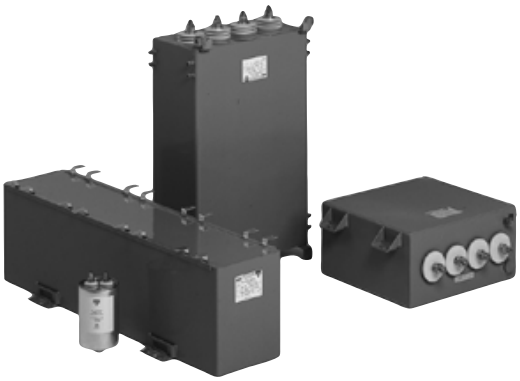
- High energy density and minimum dimensions
- High rms currents and peak currents
- Absolutely vibration proof
- Flexible mechanical designs

APPLICATION

These capacitors have been developed mainly for applications in DC-link filters and in resonant filter circuits. Other applications, such as energy storage capacitors, are also possible.

The low-inductive and impulse current resistant capacitors are offered specifically for applications with IGBT- type thyristors in all voltage ranges.

The MKP-type capacitors described in this catalog are suitable for rated voltages up to 10kV. For applications requiring capacitor voltages above 10kV, oil-impregnated film capacitors should be used. This technology and the respective capacitors are described in detail in a separate Vishay ESTA catalog (No: E 03-03E/01).



DESIGN

Models in welded rectangular casings, or in aluminum round casing, and in plastic casings, (terminal distance 37.5mm), are available.

The specific mechanical design of the different versions is described in detail on the following pages.

In principle, however, the capacitors are manufactured for individual types of application in accordance with the customer's specification.

To specify your requirements please see the request for quotation form.

TECHNOLOGY

Metallized and segmented polypropylene film (MKP) is used for the dielectric (see general information, document number 13017). This dielectric is particularly characterized by a low loss factor and by a very high voltage loading capacity.

Highest current loading capacity for all capacitors is guaranteed by both specific procedures at the production of the film and the optimized internal construction of the capacitor.

All capacitors for this type of application are manufactured in accordance with the dry technology and have a firm filling. This design guarantees vibration-proof construction of the capacitor especially when used in traction applications. In addition, the firm filling ensures absolute safety against leaking and, consequently, a constant lifetime in case of eventual leakage of the casing.

Using this technology, the maximum energy density with minimum dimensions is achieved. Continuous development in our production department results in permanent improvements in our range of capacitors.

MKP-DC-Filter Capacitors, Dry, Self-Healing, Segmented

RECTANGULAR CASE CAPACITORS



GENERAL

The capacitors are mounted into welded stainless steel cases. The standard dimensions for the cases are 340mm x 175mm, or 340mm x 135mm. The maximum case height is 1200mm. Deviations from these dimensions are available on request, and the capacitors can be adapted to different mounting conditions specified by the customer.

Fastening brackets may also be attached to the casing in accordance with the customer's request, taking into account that the capacitor's narrow faces are preferred for the fastening.

Various types of screw type terminals can be attached for the electrical connection. Depending on the type of application, either plastic or ceramic terminals can be mounted.

See appropriate datasheets for specific styles/options.

NOMINAL RATINGS

Capacitance / tolerance	CN	up to 20mF
Rated DC voltage	UN	up to 10kVDC
Nominal current	IN	up to 600A
Peak current	Is	up to 500kA
Self inductance	Ls	> = 30nH
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

OVERVOLTAGES ACCORDING TO IEC 61071-1

1.15 x Un	(30min/day)	U1
1.2 x Un	(5min/day)	U2
1.3 x Un	(1min/day)	U3
1.5 x Un	(100ms/day)	U4

ROUTINE TESTS

Test voltage Term./Term:	UT/T	1.5 * UN, DC, 10s
Test voltage Term./Casing:	UT/C	min. 2 * Ui + 1000V 50Hz, 10s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature: Tmin up to - 40°C

Maximum ambient temperature: Tmax up to + 70°C

STORAGE TEMPERATURE

Minimum temperature:	Tmin	- 40°C
Maximum temperature:	Tmax	+ 85°C

TECHNOLOGY

Dielectric:	Polypropylene, self-healing **segmented**
Filling material:	Resin, polyurethane **dry**

DESIGN DATA

Material of casing:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting positions:	All

LIFE EXPECTANCY:	> 100000h
FAILURE RATE:	300 FIT
SPECIFICATIONS:	IEC 1071-1 EN 61071-1 customer specification

MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 0.9/12.0mF/X**
ART. NO.	**39864**

NOMINAL RATINGS

Capacitance/Tolerance	CN	12000uF ± 5%
Rated voltage	UN	900VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	990V (30% of the working time)
1.15 x Un	U2	1035V (30min/day)
1.2 x Un	U3	1090V (5min/day)
1.3 x Un	U4	1170V (1min/day)
1.5 x Un	U4	1350V (100ms/day)

Voltage rate of rise	du/dt	35V/us
Nominal current	IN	300A
Short time current		700A
Peak current	Is	420kA
Self Inductance	Ls	< 40nH

Series resistance	RESR	< 0.8mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	1350V, DC, 10s
Test voltage Terminal/Casing	UT/C	6000V, 50Hz, 60s

Measurement of capacitance	320V/50Hz
Measurement of loss factor	320V/50Hz

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

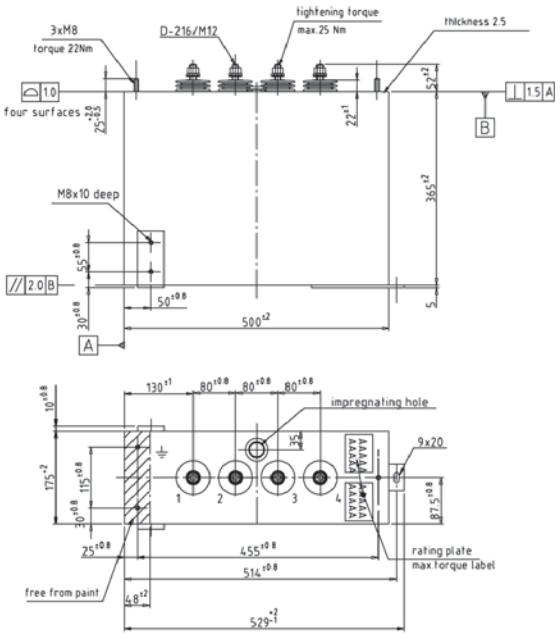
Type	D-216
Flash over distance	38mm
Creepage distance	61mm
Connection	M 12
Max. torque	25Nm

DESIGN DATA

Dimensions:	500 x 175 x 365mm
Drawing:	07-B-778
Weight:	45kg
Material of casing:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting position:	All

LIFE EXPECTANCY:	200000h/65°C
FAILURE RATE:	300 FIT
SPECIFICATION:	IEC 61071-1 customer specification

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO. **GMKPg 1.0/9.0mF/X**
ART. NO. **43390**

NOMINAL RATING

Capacitance/Tolerance	CN	9000uF ± 10%
Rated voltage	UN	1000VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	1100V (30% of the working time)
1.15 x Un	U2	1150V (30min/day)
1.2 x Un	U3	1200V (5min/day)
1.3 x Un	U4	1300V (1min/day)
Surge voltage	Us	1500V (100ms/day)

Voltage rate of rise	du/dt	50V/µs
Rated current	In	300A
Peak current	Is	450000A

Self Inductance	Ls	< 40nH
Series resistance	RESR	< 0.5mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TEST

Test voltage Terminal/Terminal	UT/T	1500V, DC, 10s
Test voltage Terminal/Casing	UT/C	6000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 60°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Type	D-242
Flash over distance	38mm
Creepage distance	61mm
Terminal	M 8 Internal thread
Max. torque	10.0Nm

DESIGN DATA

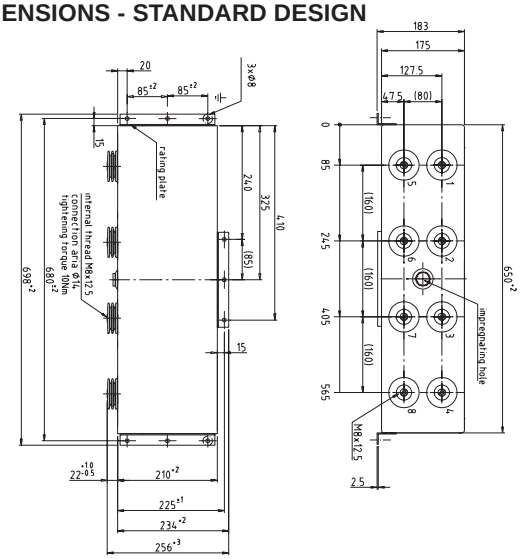
Dimensions:	650*175*210mm
Drawing:	07-B-824
Weight:	34kg
Casing material:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting positions:	ALL

LIFE EXPECTANCY: > 100000h at 50°C

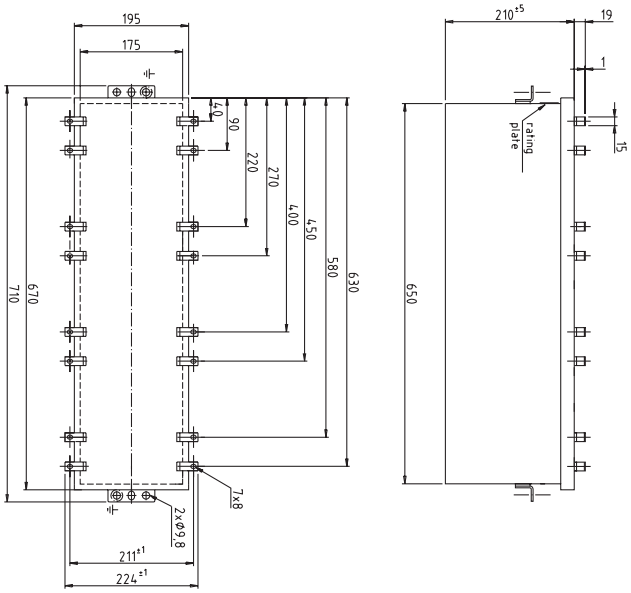
FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 61071-1
IEC 60077
customer specification

DIMENSIONS - STANDARD DESIGN



DIMENSIONS - ALTERNATIVE DESIGN



MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 1.9/4.0mF/X**
ART. NO.	**35133**

NOMINAL RATINGS

Capacitance/Tolerance	CN	4000uF ± 5%
Rated voltage	UN	1900VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	2090V (30% of the working time)
1.15 x Un	U2	2185V (30min/day)
1.2 x Un	U3	2280V (5min/day)
1.3 x Un	U4	2470V (1min/day)
1.5 x Un	U4	2850V (100ms/day)

Voltage rate of rise	du/dt	100V/us
Nominal current	IN	500A
Peak current	Is	400kA
Self Inductance	Ls	< 50nH

Series resistance	RESR	< 0.5mΩ
Loss factor 50Hz	tan	< 2x10^ - 4
Loss factor diel. 50Hz	tan	< 2x10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	2850V, DC, 10s
Test voltage Terminal/Casing	UT/C	6000V, 50Hz, 60s

Measurement of capacitance	320V/50Hz
Measurement of loss factor	320V/50Hz

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling Material	Resin, polyurethane **dry**

BUSHING

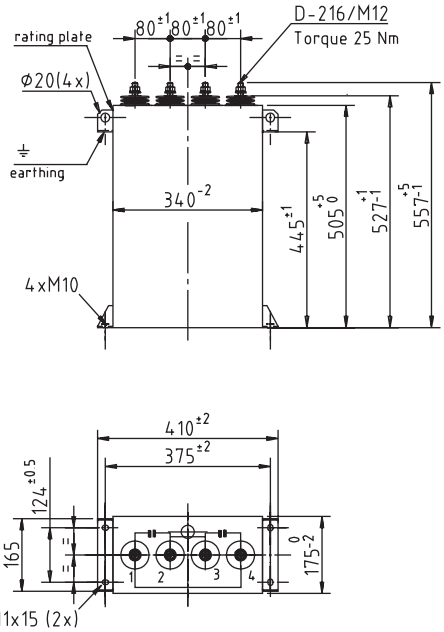
Type	D-216
Flash over distance	38mm
Creepage Distance	61mm
Connection	M 12
Max. Torque	25Nm

DESIGN DATA:

Dimension:	340*175*510mm
Drawing:	07-B-649
Weight:	39kg
Material of casing:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting position:	All

LIFE EXPECTANCY:	150000 hours/at 60°C
FAILURE RATE:	200 FIT
SPECIFICATIONS:	IEC 61071-1
	customer specification

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 2.6/4400uF**
ART. NO.	**33219**

NOMINAL RATINGS

Capacitance/Tolerance	CN	4400uF ± 5%
Rated voltage	UN	2600VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	2860V (30% of the working time)
1.15 x Un	U2	2990V (30min/day)
1.2 x Un	U3	3120V (5min/day)
1.3 x Un	U4	3380V (1min/day)
Surge voltage	Us	3900V (100ms/day)
Voltage rate of rise	du/dt	40V/μs
Rated current	In	600A
Peak current	Is	180kA
Self inductance	Ls	< 150nH
Series resistance	RESR	< 0.5mΩ
Loss factor 50Hz	tan	< 10x10^ - 4
Loss factor diel. 50Hz	tan	< 2x10^ - 4
Overtemperature casing at 600A		18K

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	3900V, DC, 10s
Test voltage Terminal/Casing	UT/C	10000V, 50Hz, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 65°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing, **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Type	D-195
Flash over distance	35mm
Creepage Distance	50mm
Terminal	M 12
Max. torque	20.0Nm

DESIGN DATA:

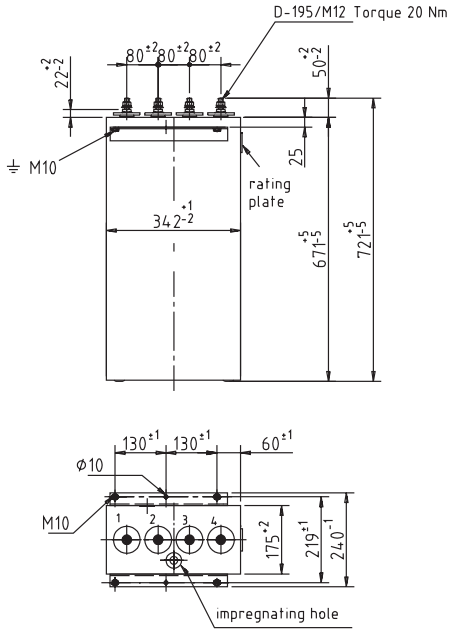
Dimensions:	340 x 175 x 980mm
Drawing:	07-B-687
Weight:	72kg
Casing material:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting position:	All

LIFE EXPECTANCY: > 100000h at 60°C

FAILURE RATE: 100 FIT

SPECIFICATIONS: IEC 61071-1
IEC 60077
customer specification

DIMENSIONS



GMKPg 3.6/1114uF

Vishay ESTA

MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 3.6/1114uF**
ART. NO.	**38200**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	1114uF - 2 + 8%
Rated voltage	Un	3600VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	3960V (30% of the working time)
1.15 x Un	U2	4140V (30min/day)
1.2 x Un	U3	4320V (5min/day)
1.3 x Un	U4	4680V (1min/day)
Surge voltage	Us	5400V (100ms/day)
Voltage rate of rise	du/dt	50V/µs
Rated current	In	160A
Peak current	Is	55.7kA
Self Inductance	Ls	< 150nH
Series resistance	RESR	< 2.0mΩ
Loss factor 50Hz	tan	< 10 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	5400V, DC, 10s
Test voltage Terminal/Casing	UT/C	10000V, 50Hz, 60s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 60°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Type	D-229
Flash over distance	47mm
Creepage Distance	90mm
Terminal	M 16
Max. torque	25.0Nm

DESIGN DATA

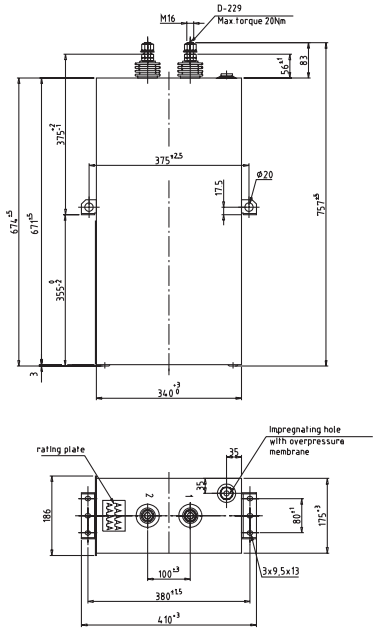
Dimensions:	340 x 175 x 671mm
Drawing:	07-B-779
Weight:	55kg
Casing material:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting position:	All

LIFE EXPECTANCY: > 100000h at 60°C

FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 61071-1
IEC 60077
customer specification

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 4.05/1000uF**
ART. NO.	**31817**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	1000uF ± 5%
Rated voltage	Un	4050VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	4455V (30% of the working time)
1.15 x Un	U2	4658V (30min/day)
1.2 x Un	U3	4860V (5min/day)
1.3 x Un	U4	5265V (1min/day)
Surge voltage	Us	6075V (100ms/day)
Voltage rate of rise	du/dt	80V/µs
Rated current	In	240A
Peak current	Is	80kA
Self Inductance	Ls	< 50nH
Series resistance	RESR	< 1.0mΩ
Loss factor 50Hz	tan	< 10 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	6075V, DC, 10s
Test voltage Terminal/Casing	UT/C	10000V, 50Hz, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 50°C
Maximum ambient temperature	Tmax	+ 75°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Type	D-195
Flash over distance	35mm
Creepage Distance	50mm
Terminal	M 12
Max. torque	20.0Nm

DESIGN DATA

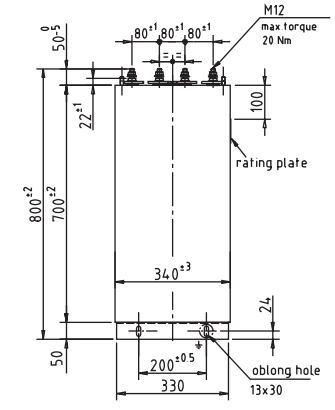
Dimensions:	340 x 175 x 700mm
Drawing:	07-B-706
Weight:	54kg
Casing material:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting positions:	All

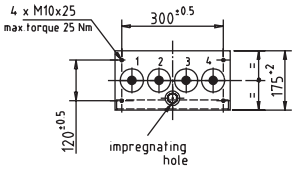
LIFE EXPECTANCY: > 100000h

FAILURE RATE: 100 FIT

SPECIFICATIONS: IEC 61071-1
IEC 60077
customer specification

DIMENSIONS





MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 10.0/128.6uF**
ART. NO.	**31760**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	128.6uF ± 10%
Rated voltage	Un	10000VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	11000V (30% of the working time)
1.15 x Un	U2	11500V (30min/day)
1.2 x Un	U3	12000V (5min/day)
1.3 x Un	U4	13000V (1min/day)
Surge voltage	Us	15000V (100ms/day)

Voltage rate of rise	du/dt	150V/µs
Rated current	In	100A
Peak current	Is	19.3kA

Self Inductance	Ls	< 400nH
Series resistance	RESR	< 5.0mΩ
Loss factor 50Hz	tan	< 10 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	17500V, DC, 10s
Test voltage Terminal/Casing	UT/C	28000V, 50Hz, 60s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 25°C
Maximum ambient temperature	Tmax	+ 50°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

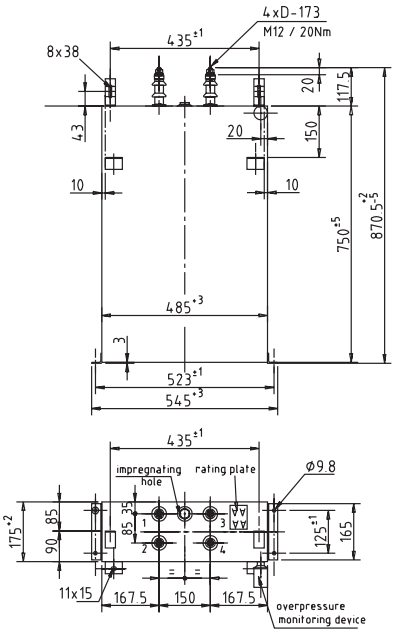
Type	D-173
Flash over distance	81mm
Creepage Distance	98mm
Terminal	M 12
Max. torque	15.5Nm

DESIGN DATA

Dimensions:	485 x 175 x 750mm
Drawing:	07-B-719
Weight:	80kg
Casing material:	Stainless steel, antimagnetic
Paint:	RAL 7033
Mounting positions:	All

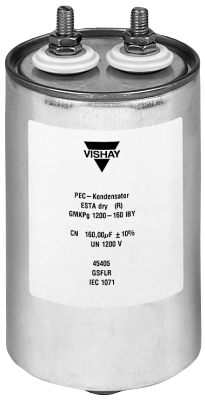
LIFE EXPECTANCY:	> 200000h at 50°C
FAILURE RATE:	300 FIT
SPECIFICATIONS:	IEC 61071-1 IEC 60077 customer specification

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-Healing, Segmented

TUBULAR CASE



GENERAL

The capacitors are mounted in deep-drawn aluminum round cases. A multiplicity of sizes, up to a maximum diameter of 84mm, are available.

In the connection area, covers made of brass or aluminum and screwed or soldered-on terminals are fitted.

For special types of application, capacitors in plastic cases can be offered.

Please see appropriate datasheets for different styles.

NOMINAL RATINGS

Capacitance / tolerance	CN	up to 1mF
Rated DC voltage	UN	up to 5kVDC
Nominal current	IN	up to 80A
Peak current	Is	up to 20kA
Self inductance	Ls	> = 30nH
Loss factor diel. 50Hz	tan	< 2x10^ - 4

OVERVOLTAGES ACCORDING IEC 61071-1

1.15 x Un	(30min/day)	U1
1.2 x Un	(5min/day)	U2
1.3 x Un	(1min/day)	U3
1.5 x Un	(100ms/day)	U4

ROUTINE TESTS

Test voltage Term./Term	UT/T	1.5*UN, DC, 10s
Test voltage Term./Casing	UT/C	min. 2*Ui + 1000V, 50Hz, 10s
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	up to - 40°C
Maximum ambient temperature	Tmax	up to + 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

DESIGN DATA

Case Material:	Aluminum
Mounting positions:	All

LIFE EXPECTANCY: > 100000h

FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 1071-1
EN 61071-1
customer specification

GMKPg 900-500 IBY

Vishay ESTA

MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 900-500 IBY**
ART. NO.	**44374**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	500uF ± 5%
Rated voltage	Un	900VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	990V (30% of the working time)
1.15 x Un	U2	1035V (30min/day)
1.2 x Un	U3	1080V (5min/day)
1.3 x Un	U4	1170V (1min/day)
1.5 x Un	U4	1350V (100ms/day)

Voltage rate of rise	du/dt	30V/µs
Nominal current	In	55A
Peak current	Is	15kA
Self Inductance	Ls	< 40nH

Series resistance	RESR	< 2.5mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	1350V, DC, 10s
Test voltage Terminal/Casing	UT/C	4000V, 50Hz, 60s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 80°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Type	D-214
Flash over distance	11mm
Creepage Distance	16mm
Connection	bolt M 8
Max. torque	8Nm

DESIGN DATA

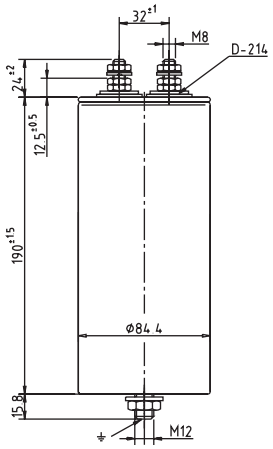
Dimensions:	84.4 x 190mm
Drawing:	20-B-068
Weight:	1.00kg
Casing Material:	Aluminum
Mounting positions:	All

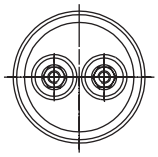
LIFE EXPECTANCY: > 200000h at 60°C

FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 61071-1

DIMENSIONS





MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 1100-220 IBY**
ART. NO.	**30496**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	200uF - 2 + 3%
Rated voltage	Un	1100VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	1210V (30% of the working time)
1.15 x Un	U2	1265V (30min/day)
1.2 x Un	U3	1320V (5min/day)
1.3 x Un	U4	1430V (1min/day)
1.5 x Un	U4	1650V (100ms/day)

Voltage rate of rise	du/dt	25V/µs
Nominal current	In	40A
Peak current	Is	5.5kA
Self Inductance	Ls	< 45nH
Series resistance	RESR	< 3.0mΩ
Loss factor 50Hz	tan	< 3 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	1650V, DC, 10s
Test voltage Terminal/Casing	UT/C	4000V, 50Hz, 60s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 80°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

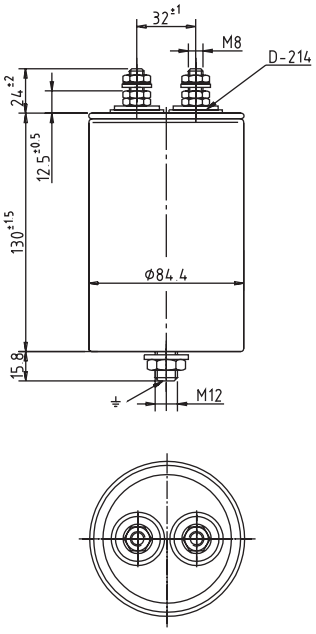
BUSHING

Type	D-214
Flash over distance	11mm
Creepage Distance	16mm
Connection	bolt M 8
Max. torque	8Nm

DESIGN DATA

Dimensions:	84.4 x 130mm
Drawing:	20-B-068
Weight:	0.72kg
Casing Material:	Aluminum
Mounting positionS:	All
LIFE EXPECTANCY:	> 200000h at 50°C
FAILURE RATE:	200 FIT
SPECIFICATIONS:	IEC 61071-1

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 1200-300 IBY**
ART. NO.	**30489**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	300uF ± 5%
Rated voltage	Un	1200VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	1320V (30% of the working time)
1.15 x Un	U2	1385V (30min/day)
1.2 x Un	U3	1440V (5min/day)
1.3 x Un	U4	1560V (1min/day)
1.5 x Un	U4	1800V (100ms/day)

Voltage rate of rise	du/dt	25V/µs
Nominal current	In	50A
Peak current	Is	7.5kA
Self Inductance	Ls	< 40nH

Series resistance	RESR	< 3.0mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	1800V, DC, 10s
Test voltage Terminal/Casing	UT/C	4000V, 50Hz, 60s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 80°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Type	D-214
Flash over distance	11mm
Creepage Distance	16mm
Connection	bolt M 8
Max. torque	8Nm

DESIGN DATA

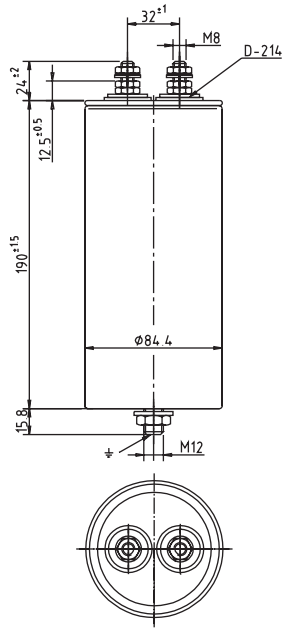
Dimensions:	84.4 x 190mm
Drawing:	20-B-068
Weight:	1.00kg
Case Material:	Aluminum
Mounting position:	All

LIFE EXPECTANCY: > 200000h at 50°C

FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 61071-1

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-Healing, Segmented

RECTANGULAR CASE:
SPACE BETWEEN TERMINALS 37.5MM



GENERAL

These capacitors were developed for mounting on printed circuit boards. Their outstanding features are a compact structural shape and high mechanical stability.

This series of capacitors is available in a plastic case only and the standard dimensions of the casing is 42 x 28 x 40mm. Upon request, casings of other dimensions can be supplied.

The pin connections have a wire diameter of 1.2mm and their raster dimension is 37.5mm. The 2-pin version is the standard, however, a 4-pin version can also be provided upon request.

Please see appropriate Data sheets showing examples of possible capacitor designs.

GENERAL TECHNICAL DATA

NOMINAL RATINGS

Capacitance / tolerance	CN	up to 18uF ± 10%
Rated DC voltage	UN	up to 1200VDC
Nominal current	IN	up to 4A
Peak current	Is	up to 10kA
Self inductance	Ls	> = 30nH
Loss factor diel. 50Hz	tan	< 2x10^ - 4

OVERVOLTAGES ACCORDING IEC 61071-1

1.15 x Un	(30min/day)	U1
1.2 x Un	(5min/day)	U2
1.3 x Un	(1min/day)	U3
1.5 x Un	(100ms/day)	U4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	1.5*UN, DC, 10s
Test voltage Terminal/Casing	UT/C	-
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin up to - 40°C
Maximum ambient temperature	Tmax up to + 75°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

DESIGN DATA

Case Material:	Plastic (ABS) blank
Mounting position:	All

LIFE EXPECTANCY > 100000h

FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 61071-1
EN 61071-1
customer specification

MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 450/18/37.5**	
ART. NO.	**38410**	
NOMINAL RATINGS		
Capacitance/Tolerance	Cn	18uF ± 10%
Rated voltage	Un	450VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	495V (30% of the working time)
1.15 x Un	U2	518V (30min/day)
1.2 x Un	U3	540V (5min/day)
1.3 x Un	U4	585V (1min/day)
1.5 x Un	U4	675V (100ms/day)

Voltage rate of rise	du/dt	55V/µs
Nominal current	In	4.0A
Peak current	Is	10kA
Self Inductance	Ls	< 30nH

Series resistance	RESR	< 5.0mΩ
Loss factor 50Hz	tan	< 3 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	675V, DC, 10s
Test voltage Terminal/Casing	UT/C	-
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Number of pins	2
pin distance	37.5 ± 0.4mm
length of pins	4.0 ± 0.5mm
diameter of pins	1.2 ± 0.05mm

DESIGN DATA

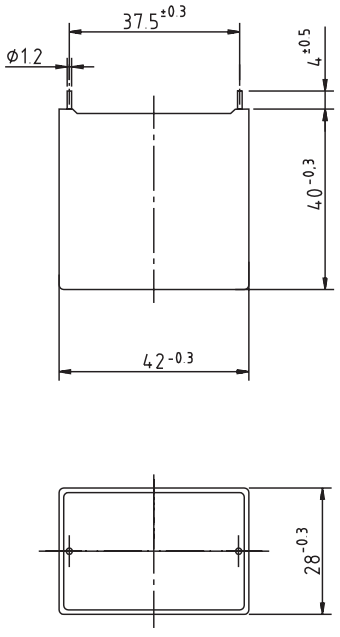
Dimensions:	42 x 28 x 40mm
Drawing:	20-B-084
Weight:	0.1kg
Case Material:	Plastic (ABS)
Mounting position:	All

LIFE EXPECTANCY: > 100000h at 70°C

FAILURE RATE: 300 FIT

SPECIFICATION: IEC 61071-1

DIMENSIONS



MKP-DC-Filter Capacitors, Dry, Self-healing, Segmented

PART NO.	**GMKPg 1200/6.8/37.5**
ART. NO.	**44725**

NOMINAL RATINGS

Capacitance/Tolerance	Cn	6.8uF ± 10%
Rated voltage	Un	1200VDC

OVER VOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	1320V (30% of the working time)
1.15 x Un	U2	1380V (30min/day)
1.2 x Un	U3	1440V (5min/day)
1.3 x Un	U4	1560V (1min/day)
1.5 x Un	U4	1800V (100ms/day)

Voltage rate of rise	du/dt	55V/µs
Nominal current	In	2.0A
Peak current	Is	10kA
Self Inductance	Ls	< 30nH

Series resistance	RESR	< 5.0mΩ
Loss factor 50Hz	tan	< 3 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage Terminal/Terminal	UT/T	1800V, DC, 10s
Test voltage Terminal/Casing	-	

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	Resin, polyurethane **dry**

BUSHING

Number of pins	2
pin distance	37.5 ± 0.4mm
length of pins	4.0 ± 0.5mm
diameter of pins	1.2 ± 0.05mm

DESIGN DATA

Dimensions:	42 x 28 x 40mm
Drawing:	20-B-084
Weight:	0.1kg
Case Material	Plastic (ABS)

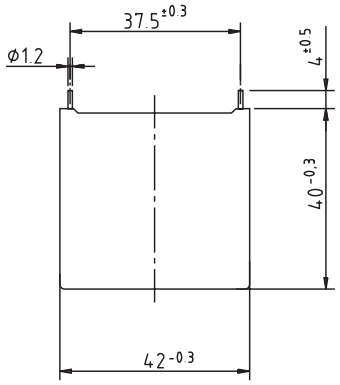
Mounting position: All

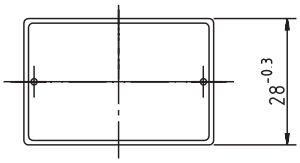
LIFE EXPECTANCY > 100000h at 70°C

FAILURE RATE: 300 FIT

SPECIFICATIONS: IEC 61071-1

DIMENSIONS



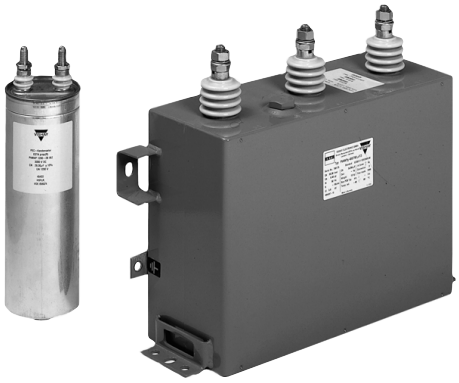


MKP-AC-Filter Capacitors, Self-healing, Dry

VOLTAGE RANGE: **UP TO 1.4kV**
CAPACITANCE RANGE: **UP TO 5mF**

MAIN CHARACTERISTICS

- 1-phase-, delta- and star connected
- Lowest volume at maximum power
- Flexible mechanical design



APPLICATIONS

These capacitors are mainly used as harmonic filters in frequency converters however, they are also suitable for a variety of power factor correction applications in general drive and system technology products.

The MKP-type capacitors described in this catalogue are suitable for rated voltages up to 1.4kV. For applications requiring capacitor voltages above 1.4kV, oil-impregnated film capacitors should be used. The capacitors manufactured by Vishay ESTA which use this technology are described in detail in a separate catalogue which can be provided on request.

DESIGN

The range comprises both single-phase and three-phase capacitors with delta and star connections. Also available are versions in a soldered rectangular or in round aluminum cases.

The specific mechanical design of the different versions is described in detail in the appropriate datasheets, in principle, however, the capacitors are custom manufactured for individual applications in accordance with the customer's requirements.

Please see the request for quotation form

In addition to the capacitors listed in this catalogue, there exists a standard product line for power factor correction capacitors in the voltage range 230V to 690V, also in single-phase and three-phase design. This catalogue can be sent on request.

TECHNOLOGY

Metallized polypropylene film (MKP) is used for the dielectric. (for explanations, refer to general information document number 13017). This dielectric is particularly characterized by a low loss factor and by a very high voltage loading capacity. Highest current loading capacity for all capacitors is guaranteed by both specific procedures at the production of the film and the optimized internal construction of the capacitor.

The capacitors in the rectangular casing contain a firm filler (for full description see general information document number 13017). A pressure switch is incorporated for the capacitors' protection. In case of an inadmissible increase of pressure due to a defect or at the end of service life, the signal given by the pressure switch should be understood as indication that the capacitor has to be disconnected from the network.

The capacitors in a round aluminum case contain oil or a gaseous filler. An overpressure tear-off fuse (for explanations, refer to general information) will disconnect the capacitor from the network in case of a defect.

The capacitors in a round aluminum case containing resin-filler are not tear-off fused. Safety of these capacitors is determined only by the self-healing performance of the metallized polypropylene film.

MKP-AC-Filter Capacitors, Self-healing, Dry



GENERAL

These capacitors are mounted into welded stainless steel cases. The standard dimensions for the cases are 340mm x 175mm, or 340mm x 135mm. The maximum case height is 1200mm. Deviations from these dimensions are available by special order and the capacitors can also be adapted to most different mounting conditions required by the customer.

Fastening brackets may be attached to the casing in accordance with the customer's request, taking into account that the capacitor's narrow faces are to be given preference for the fastening.

Various types of screw type terminals are available for the electrical connection. Depending on the type of application, either plastic terminals or ceramic terminals are used.

Please see appropriate data sheets giving examples of possible capacitor designs.

GENERAL TECHNICAL DATA

RATINGS

Capacitance/Tolerance	Cn	4000uF ± 10%
Rated power	Qn	up to 400kvar
Rated voltage	Un	up to 1400Vrms

OVERVOLTAGES ACCORDING IEC 608711 / 60831-1

1.1 x Un	U1	(12 Std/day)
1.15 x Un	U2	(30min/day)
1.2 x Un	U3	(5min/day)
1.3 x Un	U4	(1min/day)

Rated frequency	fn	50/60Hz
Rated current	In	up to 350A
Peak current	Is	up to 10000A
Series resistance	RESR	< 1.0MΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Dielectric loss factor 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	2.15*UN V, AC, 10s
Test voltage terminal/casing	Ut/c	Ui V, AC, 60s

Measurement of capacitance

Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin up to - 40°C
Maximum ambient temperature	Tmax up to + 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	resin, polyurethane **dry**
Safety system	overpressure monitoring device

CASING

Case material:	stainless steel, antimagnetic
Paint:	RAL 7033
Mounting positions:	vertical, horizontal
Life time failure rate	> 200000h at 60°C 300 FIT

SPECIFICATIONS:	IEC 60831-1, IEC 60871-1
	customer specification

PhMKPg 440-1248uF/3

Vishay ESTA

MKP-AC-Filter Capacitors, Self-healing, Dry

PART NO.	**PhMKPg 440-1248uF/3**	
ART. NO.	**44534**	
RATINGS		
Capacitance/Tolerance	Cn	3 * 416uF ± 5%
Rated power	Qn	76kvar
Rated voltage	Un	440Vrms

OVERVOLTAGES ACCORDING IEC 60871-1 60831-1

1.1 x Un	U1	484V (12 Std/Tag)
1.15 x Un	U2	506V (30min/Tag)
1.2 x Un	U3	528V (5min/Tag)
1.3 x Un	U4	572V (1min/Tag)

Rated frequency	fn	50Hz
Rated current	In	3* 123A
Peak current	Is	3* 6000A
Capacitance terminal / casing		10nF
Self inductance	Ls	app. 0.5uH
Series resistance	RESR	< 2.0mΩ
Loss factor 50 Hz	tan	< 5 x 10^ - 4
Dielectric loss factor 50 Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/	946V, AC, 10s
Test voltage terminal/casing	UT/c	6000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	resin, polyurethane **dry**
Safety system	overpressure monitoring device

BUSHING

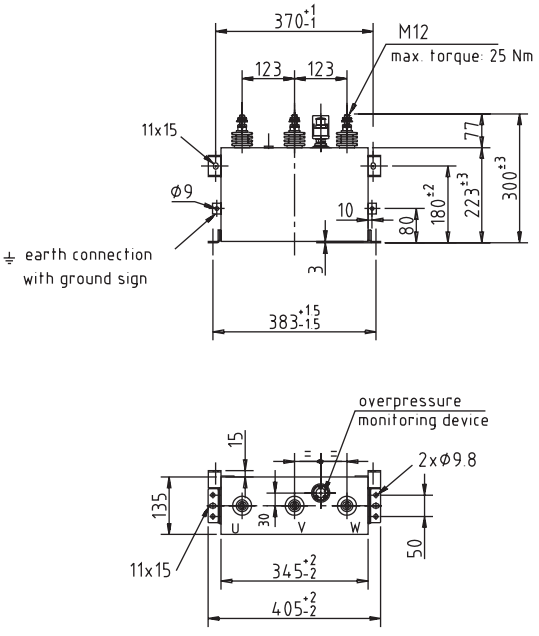
Type	D-197
Flash over distance	47mm
Creepage distance	90mm
Connection	M 12
Max. torque	20.0Nm

CASING

Dimensions:	345 x 135 x 220mm
Drawing:	07-B-849
Weight:	15kg
Case material:	stainless steel, antimagnetic
Paint:	RAL 7033
Mounting position:	All

LIFE TIME FAILURE RATE	> 200000h at 60°C 300 FIT
SPECIFICATION:	IEC 60831-1

DIMENSIONS



MKP-AC-Filter Capacitors, Self-healing, Dry

PART NO.	**PhMKPg 690-1600uF**
ART. NO.	**44503**

RATINGS

Capacitance/Tolerance	Cn	1600uF ± 5%
Rated power	Qn	404kvar
Rated voltage	Un	690Vrms

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	759V (12 Std/day)
1.15 x Un	U2	794V (30min/day)
1.2 x Un	U3	828V (5min/day)
1.3 x Un	U4	897V (1min/day)

Rated frequency	fn	50Hz
Rated current	In	350A
Peak current	Is	25kA
Capacitance terminal / casing		10nF
Self inductance	Ls	app. 0.5uH
Series resistance	RESR	< 2.0mΩ
Loss factor 50 Hz	tan	< 5 x 10^ - 4
Dielectric loss factor 50 Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/	1484V, AC, 10s
Test voltage terminal/casing	UT/c	6000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 60°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	resin, polyurethane **dry**
Safety system	overpressure monitoring device

BUSHING

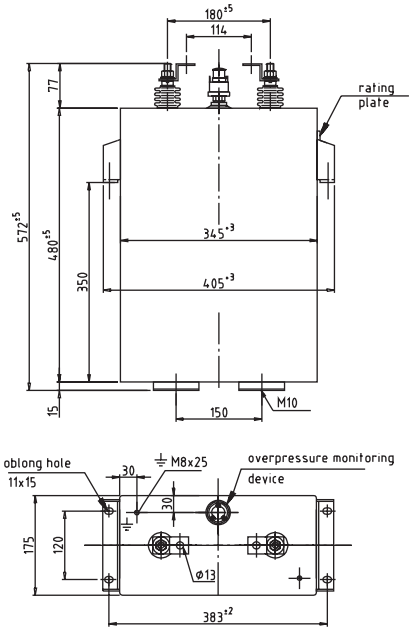
Type	D-197
Flash over distance	47mm
Creepage distance	90mm
Connection	M 12
Max. torque	20.0Nm

CASING

Dimensions	345*175*480mm
Drawing	07-B-556
Weight	38kg
Casing material	stainless steel, antimagnetic
Colour	RAL 7033
Mounting position	every position

LIFE TIME FAILURE RATE	> 200000h at 60°C 300 FIT
RECOMMENDATION	IEC 60831-1

DIMENSIONS



MKP-AC-Filter Capacitors, Dry, Self-healing, With Fuse

TUBULAR CASINGS

GENERAL

The capacitors are mounted in deep-drawn aluminum round case. A multiplicity of dimensions, up to a maximum diameter of 84mm, are available.

At the connection area, covers made of brass or aluminum and screwed-on or soldered-on terminals are fitted.

See appropriate data sheets giving examples of possible capacitor designs.



GENERAL TECHNICAL DATA

RATINGS

Capacitance/Tolerance	Cn	up to 900 uF ± 10%
Rated power	Qn	up to 30kvar
Rated voltage	Un	up to 1400Vrms

OVERVOLTAGES ACCORDING IEC 60871-1 / 60831-1

1.1 x Un	U1	(12 Std/day)
1.15 x Un	U2	(30min/day)
1.2 x Un	U3	(5min/day)
1.3 x Un	U4	(1min/day)

Rated frequency	fn	50/60Hz
Rated current	In	up to 80A
Peak current	Is	up to 1000A

Series resistance	RESR	< 3.0mΩ
Loss factor 50 Hz	tan	< 5 x 10^ - 4
Dielectric loss factor 50 Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	2.15* Un	V, AC, 10s
Test voltage terminal/casing	UT/c	Ui*)	V, AC, 60 s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	up to - 40°C
Maximum ambient temperature	Tmax	up to + 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	inert gas
Safety system	tear off fuse

CASING

Casing material	aluminum
Mounting position	vertical, horizontal

LIFE TIME FAILURE RATE	> 200000h at 60°C 300 FIT
RECOMMENDATION	IEC 60871-1/60831-1, customer specification

*) according IEC and VDE standard

MKP-AC-Filter Capacitors, Dry, Self-healing, With Fuse

PART NO.	**PhMKPg 1400-33IB**	
ART. NO.	**45445**	

RATINGS

Capacitance/Tolerance	Cn	33uF ± 10%
Rated power	Qn	20kvar
Rated voltage	Un	1400Vrms

OVERVOLTAGES ACCORDING IEC 60871-1

1.1 x Un	U1	1540V (12 Std/day)
1.15 x Un	U2	1610V (30min/day)
1.2 x Un	U3	1680V (5min/day)
1.3 x Un	U4	1820V (1min/day)

Rated frequency	fn	50Hz
Rated current	In	55A
Peak current	Is	300A

Series resistance	RESR	< 6.0mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Dielectric loss factor 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	3010V, AC, 10s
Test voltage terminal/casing	UT/c	6000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 60°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	inert gas
Safety system	tear off fuse

BUSHING

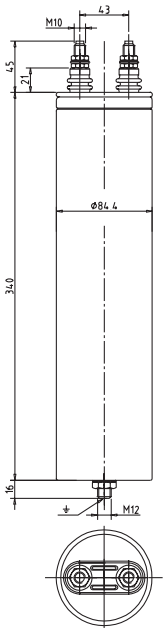
Type	D-138
Flash over distance	16mm
Creepage distance	23mm
Connection	M 10
Max. torque	10.0Nm

CASING

Dimension	84,4 * 340mm
Drawing	20-B-010
Weight	2.5kg
Casing material	aluminum
Mounting position	vertical, horizontal

LIFE TIME FAILURE RATE	> 200000h at 60°C 300 FIT
RECOMMENDATION	IEC 60871-1 customer specification

DIMENSIONS



MKP-AC-Filter Capacitors, Dry, Self-healing, With Fuse

PART NO.	**PhMKPg 440.3.30**	
ART. NO.	**35470**	

RATINGS

Capacitance/Tolerance	Cn	3 x 164.4uF ± 10%
Connection	3 phase, delta	
Rated power	Qn	30kvar
Rated voltage	Un	440Vrms

OVERVOLTAGES ACCORDING IEC 60871-1 60831-1

1.1 x Un	U1	484V (12 Std/day)
1.15 x Un	U2	506V (30min/day)
1.2 x Un	U3	528V (5min/day)
1.3 x Un	U4	572V (1min/day)

Rated frequency	fn	50Hz
Rated current	In	3* 40A
Peak current	Is	3*300A

Series resistance	RESR	< 7.5mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Dielectric loss factor 50Hz	tan	< 2 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	946V, AC, 10s
Test voltage terminal/casing	Ut/c	6000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 60°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	inert gas
Safety system	tear off fuse

BUSHING

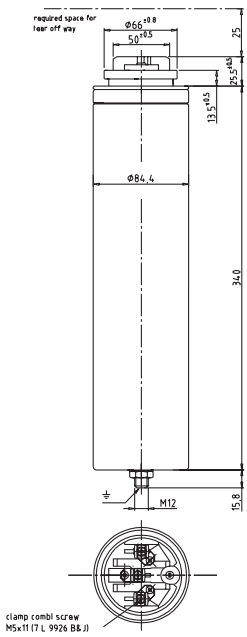
Type	D-203
Flash over distance	24mm
Creepage distance	28mm
Connection	M 5
Max. torque	2.0Nm

CASING

Dimension	84.4 * 340mm
Drawing	ME 131-400-007
Weight	2.5kg
Casing material	aluminum
Mounting position	vertical, horizontal

LIFE TIME FAILURE RATE	> 200000h at 60°C 300 FIT
RECOMMENDATION	IEC 60831 customer specification

DIMENSIONS



MKP-AC-Filter Capacitors, Dry, Self-healing, Without Fuse

TUBULAR CASINGS

GENERAL

The capacitors are produced in deep-drawn aluminum round casings. A variety of different dimensions, up to a maximum diameter of 84mm and a length of 240mm, is available. In the range of the capacitor's connection, no metal cover will be mounted. The filling material used tightens the capacitor connections hermetically against external influences.

Threaded studs M5, M6, and M8 are available for the electrical connection.

Please see appropriate data sheets showing examples of possible capacitor designs..



GENERAL TECHNICAL DATA

NOMINAL RATINGS

Capacitance/Tolerance	CN	up to 600uF
Rated power	QN	up to 15kvar
Rated voltage	UN	up to 400Vrms

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	(12 Std/day)
1.15 x Un	U2	(30min/day)
1.2 x Un	U3	(5min/day)
1.3 x Un	U4	(1min/day)

Rated frequency	fn	50/60Hz
Rated current	In	up to 50A
Peak current	Is	up to 6000A

Series resistance	RESR	< 3.0mΩ
Loss factor 50Hz	tand	< 3*10^ - 4
Dielectric loss factor 50Hz	tand	< 2*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	2,15* Un VAC, 10s
Test voltage terminal/casing	UT/C	Ui*)VAC, 2s
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 25°C
Maximum ambient temperature	Tmax	+ 75 C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing
Filling material	resin, polyurethane **dry**

DESIGN DATA

Case material	aluminum
Mounting position	every position

LIFE EXPECTANCY > 100000 Std

FAILURE RATE 300 FIT

RECOMMENDATION IEC 60831-1
VDE 0560/46

*) according IEC and VDE standard

MKP-AC-Filter Capacitors, Dry, Self-healing, Without Fuse

RECTANGULAR CASE:
SPACING BETWEEN TERMINALS 37.5MM

GENERAL

The capacitors are mounted into welded stainless steel casings. The standard dimensions for the cases are 340mm x 175mm, or 340mm x 135mm. The maximum standard case height is 1200mm. Deviating from these dimensions, the capacitors can also be adapted to many different mounting configurations as required by the customer.

Fastening brackets may be attached to the casing in accordance with the customer's request, taking into account that the capacitor's narrow faces are preferred for the fastening.

Various types of screw-type terminals are available for the electrical connection. Depending on the type of application, either plastic terminals or ceramic terminals can be mounted.

Please see the appropriate Vishay ESTA data sheets giving examples of possible capacitor designs.



GENERAL TECHNICAL DATA

NOMINAL RATINGS

Capacitance / tolerance	Cn	up to 18uF ± 10%
Rated power	Qn	up to 0.5kvar
Rated voltage	Un	up to 400V/AC

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	(12 Std/Tag)
1.15 x Un	U2	(30min/Tag)
1.2 x Un	U3	(5min/Tag)
1.3 x Un	U4	(1min/Tag)

Rated frequency	fn	50/60Hz
Rated current	In	up to 4A
Peak current	Is	up to 1kA

Series resistance	RESR	< 5MΩ
Loss factor 50Hz	tan	< 3*10^ - 4
Dielectric loss factor	tan	< 2*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	2.15*UN, AC, 10s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	up to - 40°C
Maximum ambient temperature	Tmax	up to + 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	up to - 40°C
Maximum temperature	Tmax	up to + 85°C

INTERNAL DESIGN

Dielectric	Polypropylene, self-healing
Filling material	resin, polyurethane **dry**

DESIGN DATA

Case material	plastic (ABS), black
Mounting position	every position

LIFE EXPECTANCY > 100000h

FAILURE RATE 300 FIT

MKP-AC-Filter Capacitors, Dry, Self-healing, Without Fuse

PART NO.	**PhMKP 250-200 IBR/X**	
ART. NO.	**44546**	

RATINGS

Capacitance / tolerance	Cn	200uF ± 10%
Rated power	Qn	4kvar
Rated voltage	Un	250Vrms

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	275V (12 Std/day)
1.15 x Un	U2	288V (30min/day)
1.2 x Un	U3	300V (5min/day)
1.3 x Un	U4	325V (1min/day)

Rated frequency	fn	50Hz
Rated current	In	16A
Peak current	Is	2kA

Series resistance	RESR	< 3.0mΩ
Loss factor 50Hz	tan	< 3*10^ - 4
Dielectric loss factor 50Hz	tan	< 2*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	946V, AC, 10s
Test voltage terminal/casing	UT/c	6000V, AC, 2s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 25°C
Maximum ambient temperature	Tmax	+ 75°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 80°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	resin, polyurethane
	dry

BUSHING

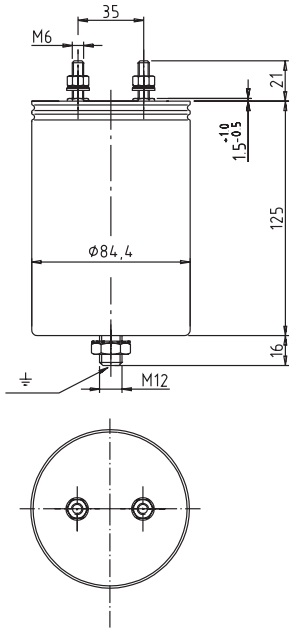
Flash over distance	13mm
Creepage distance	13mm
Connection	M 6
Max. torque	5Nm

DESIGN DATA

Diameter	64mm
Height	125mm
Drawing	20-B-053
Weight	0.7kg
Casing material	aluminum
Mounting position	every position

LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 60831-1/VDE 0560/46

DIMENSIONS



MKP-AC-Filter Capacitors, Dry, Self-healing, Without Fuse

PART NO.	**PhMKP 250-600 IBR**	
ART. NO.	**33385**	

RATINGS

Capacitance/Tolerance	Cn	600uF ± 10%
Rated power	Qn	11.8kvar
Rated voltage	Un	250Vrms

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	275V (12 Std/day)
1.15 x Un	U2	288V (30min/day)
1.2 x Un	U3	300V (5min/day)
1.3 x Un	U4	325V (1min/day)

Voltage rate of rise	du/dt	50V/us
Rated current	In	48A
Peak current	Is	6kA
Series resistance	RESR	< 3mΩ
Loss factor 50Hz	tan	< 3*10^ - 4
Dielectric loss factor	tan	< 2*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	538V, AC, 10s
Test voltage terminal/casing	UT/c	3600V, AC, 2s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 25°C
Maximum ambient temperature	Tmax	+ 75°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 80°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing
Filling material	resin, polyurethane **dry**

BUSHING

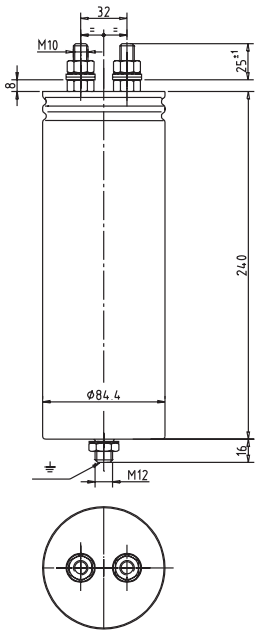
Flash over distance	19mm
Creepage distance	19mm
Connection	M 10
Max. torque	8Nm

DESIGN DATA

Diameter	84.4mm
Height	240mm
Drawing	20-B-076
Weight	1.9kg
Casing material	aluminum
Mounting position	every position

LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 60831-1/VDE 0560/46

DIMENSIONS



MKP-AC-Filter Capacitors, Dry, Self-healing, Without Fuse

PART NO.	**PhMKPg 250/14/37.5**
ART. NO.	**44276**

RATINGS

Capacitance / tolerance	Cn	14uF ± 10%
Rated power	Qn	0.3kvar
Rated voltage	Un	250Vrms

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	275V (12 Std/day)
1.15 x Un	U2	288V (30min/day)
1.2 x Un	U3	300V (5min/day)
1.3 x Un	U4	325V (1min/day)

Rated frequency	fn	50Hz
Rated current	In	3.5A
Peak current	Is	1kA

Series resistance	RESR	< 3mΩ
Loss factor 50Hz	tan	< 2 x 10^ - 4
Dielectric loss factor	tan	< 2*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	538V, AC, 10s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 75°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 80°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing,
Filling material	resin, polyurethane **dry**

BUSHING

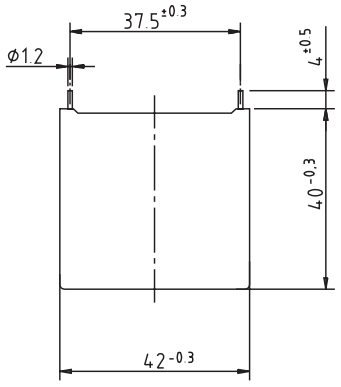
Number of pins	2
pin distance	37.5 ± 0.4mm
length of pins	4.0 ± 0.5mm
diameter of pins	1.2 ± 0.05mm

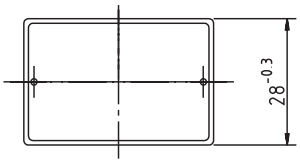
DESIGN DATA

Dimension	42 * 28 * 40mm
Drawing	20-B-084
Weight	0.1kg
Casing Material	plastic (ABS)
Mounting position	every position

LIFE EXPECTANCY	> 100000h at 70°C
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 60831-1

DIMENSIONS





MKP-AC-Filter Capacitors, Dry, Self-healing, Without Fuse

PART NO.	**PhMKPg 400/6/37.5**
ART. NO.	**44727**

RATINGS

Capacitance/Tolerance	Cn	6uF ± 10%
Rated power	Qn	0.3kvar
Rated voltage	Un	400Vrms

OVERVOLTAGES ACCORDING IEC 60831-1

1.1 x Un	U1	440V (12 Std/day)
1.15 x Un	U2	460V (30min/day)
1.2 x Un	U3	480V (5min/day)
1.3 x Un	U4	520V (1min/day)

Rated frequency	fn	50/60Hz
Rated current	In	2A
Peak current	Is	0.5kA

Series resistance	RESR	< 3mΩ
Loss factor 50 Hz	tan	< 2*10^ - 4
Dielectric loss factor	tan	< 2*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	Ut/t	860V, AC, 10s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 25°C
Maximum ambient temperature	Tmax	+ 75°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 40°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing,
Filling material	resin, polyurethane **dry**

BUSHING

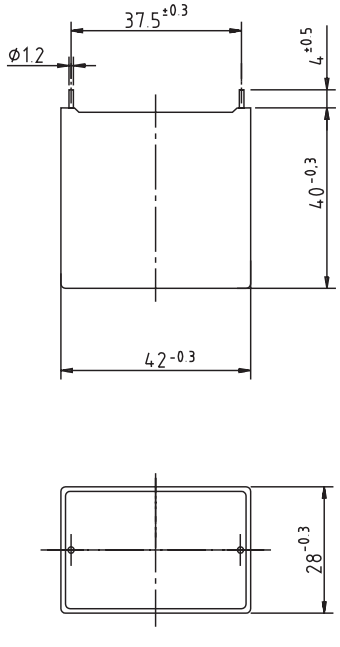
Number of pins	2
pin distance	37.5 ± 0.4mm
length of pins	4.0 ± 0.5mm
diameter of pins	1.2 ± 0.05mm

DESIGN DATA

Dimension	42 * 28 * 40mm
Drawing	20-B-084
Weight	0.1 kg
Casing Material	plastic (ABS)
Mounting position	every position

LIFE EXPECTANCY	> 100000h at 70°C
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 60831-1

DIMENSIONS



MKP-HC, High Current Capacitors, Dry, Self-healing

VOLTAGE RANGE: UP TO 3000V
CAPACITANCE RANGE: UP TO 280µF

MAIN CHARACTERISTICS

- High rms current and peak current
- Maximum capacitance at minimum dimensions
- Radial terminals

APPLICATIONS

Capacitors of this design have been developed for all snubber applications in the power electronics, which require both a high current carrying capacity and a high capacitance.

DESIGN

The capacitors are produced in a case made of a combination of plastic and aluminum. This type of casing guarantees optimum heat dissipation. The plastic material used is fire resistant according to UL-94-VO.

The case diameter is preferably 84mm with a height varying from 55mm to 130mm. The customer's specific requirements can also be met, when manufacturing these capacitors.

For the electrical connection, preferably four screw-type bolts are use; upon request, the capacitor can also be supplied with two connection bolts only.

Data sheets giving examples of possible capacitor designs are available and an RFQ form can be used to outline your requirements.

TECHNOLOGY

Metallized and segmented polypropylene film (MKP) is used for the dielectric. The segmentation guarantees an absolutely uncritical failure performance at the end of service life. (For explanations, refer to - general information).

For this type of application, the metallization has been optimized to the highest possible current carrying capacity at low losses. As a consequence, maximum capacitor currents up to 120A per unit are possible.

All capacitors of this design are produced in accordance with dry-type technology and are sealed with a resin filling.



The filling ensures the capacitor is absolutely leakproof and thus guarantees a consistent life expectancy in case of eventual case leakage.

GENERAL TECHNICAL DATA

NOMINAL RATINGS		
Capacitance/Tolerance	CN	up to 280uF
Rated DC voltage	UN	up to 3kVDC
Rated AC voltage	UN	up to 1.5kVAC
Nominal current	IN	up to 120A
Peak current	Is	up to 50kA
Self inductance	Ls	< = 30nH
Loss factor diel. 50Hz	tan	< 2x10^ - 4
OVER VOLTAGES ACCORDING IEC 61071-1		
1.15x Un (30min/day)	U1	
1.2 x Un (5min/day)	U2	
1.3 x Un (1min/day)	U3	
1.5 x Un (100ms/day)	U4	
ROUTINE TESTS		
Test voltage Terminal/Terminal	UT/T	1.5 * UN, DC, 10s
Test voltage Terminal/Casing	UT/C	10000V, AC, 10s
Measurement of capacitance		
Measurement of loss factor		
THERMAL RESISTANCE	Rth	3.3k/W
OPERATING TEMPERATURE		
Minimum ambient temperature	Tmin	up to - 40°C
Maximum ambient temperature	Tmax	up to + 70°C
STORAGE TEMPERATURE		
Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY	
Dielectric	Polypropylene, self-healing, **segmented**
Filling material	resin, polyurethane **dry**
DESIGN DATA	
Case material	plastic according to UL-94-V0 and aluminum
Mounting position	every position
LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 61071-1 EN 61071-1 customer specification

MKP-High-Current Capacitors, Dry, Selfhealing, Segmented

PART NO.	**GMKPg 1000-42uF**	
ART. NO.	**33747**	

NOMINAL RATINGS

Capacitance/Tolerance	Cn	42uF ± 5%
Rated voltage	Un	1000VDC
		500Vrms

OVERVOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	1100V (30% of the working time)
1.15 x Un	U2	1150V (30min/day)
1.2 x Un	U3	1200V (5min/day)
1.3 x Un	U4	1300V (1min/day)
Surge voltage	Us	1500V (100ms/day)

Voltage rate of raise	du/dt	200V/µs
Rated current	In	100A
Peak current periodical	I	8400A
Peak current non periodical	Is	20kA
Self inductance	Ls	< 16nH
Series resistance	RESR	< 0.6mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4
Thermal resistance		3.3k/W

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	1500V, DC, 10s
Test voltage terminal/casing	UT/C	10000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing, **segmented**
Filling material	resin, polyurethane **dry**

BUSHING

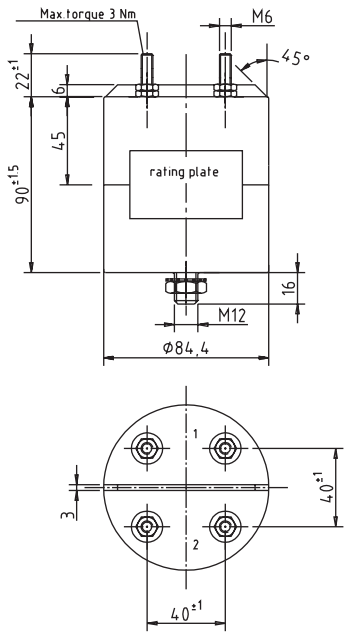
Flash over distance	28mm
Creepage distance	40mm
Terminal	M 6
Max. torque	3.0Nm

DESIGN DATA

Dimensions	dia. 84.4 * 90mm
Drawing	20-B-078
Weight	0.6kg
Casing material	plastic according to UL-94-V0
	aluminum
Mounting position	every position

LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 61071-1 IEC 60077

DIMENSIONS



MKP-High-Current Capacitors, Dry, Selfhealing, Segmented

PART NO.	**GMKPg 3000-9uF**	
ART. NO.	**44701**	

NOMINAL RATINGS

Capacitance/Tolerance	Cn	9uF ± 5%
Rated voltage	Un	3000VDC
		1500Vrms

OVERVOLTAGES ACCORDING IEC 61071-1

1.1 x Un	U1	3300V (30% of the working time)
1.15 x Un	U2	3450V (30min/day)
1.2 x Un	U3	3600V (5min/day)
1.3 x Un	U4	3900V (1min/day)
Surge voltage	Us	4500V (100ms/day)

Voltage rate of raise	du/dt	200V/µs
Rated current	In	40A
Peak current periodical	I	1800A
Peak current non periodical	Is	10kA
Self inductance	Ls	< 30nH
Series resistance	RESR	< 0.8mΩ
Loss factor 50Hz	tan	< 5 x 10^ - 4
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4
Thermal resistance		3.3k/W

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	4500V, DC, 10s
Test voltage terminal/casing	UT/C	10000V, AC, 60s

Measurement of capacitance
Measurement of loss factor

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	- 40°C
Maximum ambient temperature	Tmax	+ 65°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene, self-healing **segmented**
Filling material	resin, polyurethane **dry**

BUSHING

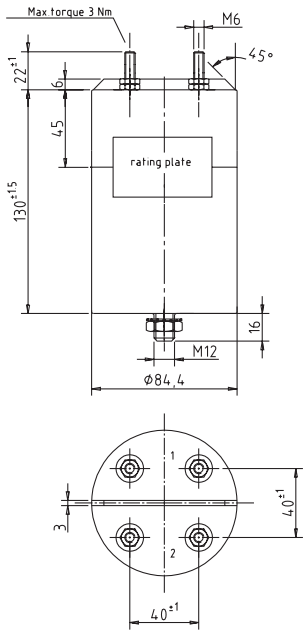
Flash over distance	28mm
Creepage distance	40mm
Terminal	M 6
Max. torque	3.0Nm

DESIGN DATA

Dimensions	dia. 84.4 * 130mm
Drawing	20-B-078
Weight	0.9kg
Casing material	plastic according to UL-94-V0
	aluminum
Mounting position	every position

LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT
RECOMMENDATION	IEC 61071-1 IEC 60077

DIMENSIONS



GTO Snubber Capacitors, Oil Impregnated

VOLTAGE RANGE: 4500V / 6000V
CAPACITANCE RANGE: 0.125μF - 7μF

MAIN CHARACTERISTICS

- High rms current and peak current
- High current at small capacitances
- Lowest inductance
- Axial terminals

APPLICATION

These capacitors are mainly used for protecting **G**ate **T**urn **O**ff Thyristors. They are also suitable for other fields of application, for which the specific features of these capacitors are required.

DESIGN

The capacitors are produced in a case made of plastic. The plastic material used according to Norme Francaise, NF F 16-101 offers highest protection against inflammability.

The case diameter is preferably 92mm with a height varying from 91mm to 181mm. Customers specific requirements can also be accommodated.

For the electrical connection, an internal M8 thread is used on each side. This internal thread can be used for mounting purposes too.

Data sheets giving examples of feasible capacitor designs are available and the Request for Quotation form can be used to outline your requirements.

TECHNOLOGY

The applied All-film dielectric is made of TUS or multiple-layer polypropylene film. The film is hazed by means of a specific surface treatment. This allows an even and thorough impregnation. Aluminum foil is used for the electrodes so these capacitors are not self-healing. All-film capacitors excel in very low dielectric losses and low series resistance. Due to the low losses, they are also suitable for very high current loads, even at low capacity.



GENERAL TECHNICAL DATA

NOMINAL RATINGS

Capacitance/Tolerance	CN	0.125uF to 7uF/± 5%	
Rated voltage	UN	4500V	6000V
Rated DC voltage	UDC	3300VDC	4400VDC
Rated rms voltage	Urms	1400VAC	1880VAC
peak voltage period.	Us	4500V	6000V
peak voltage non period.	Usmax	4900V	6550V
Voltage raise	du/dt	1200V/us	
Nominal current	IN	120A	
Peak current	Is	up to 10kA	
Self inductance	Ls	< = 15nH	
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4	
Loss factor 50Hz	tan	< 2 x 10^ - 4	
Loss factor 1kHz	tan	< 4 x 10^ - 4	

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	1/62 * UN, DC, 10s
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	up to - 25°C
Maximum ambient temperature	Tmax	up to + 60°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 45°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film non self-healing
Impregnation	oil, NON PCB

BUSHINGS

Internal thread	M8, depth 15mm
Max. torque	8.5Nm

DESIGN DATA

Casing material	Lathene
Drawing	20-B-043
Mounting position	every position

LIFE EXPECTANCY > 100000h

FAILURE RATE 300 FIT

GTO Snubber Capacitors, Oil Impregnated

PART NO. **GTO 4500-6.0P**
ART. NO. **10726**

NOMINAL RATINGS

Capacitance/Tolerance	CN	6uF ± 5%
Rated voltage	UN	4500V
Rated DC voltage	Udc	3300VDC
Rated RMS voltage	Urms	1400VAC
Peak voltage period.	Us	4500VDC
Peak voltage not period.	Usmax	4900VDC
Voltage raise	du/dt	1200V/us
Rated current	In	160A
Peak current	Is	7200A
Inductance	Ls	< 15nH
Loss factor diel.	tanδ	< 2.0*10^ - 4
Loss factor 50Hz	tanδ	< 2.0*10^ - 4
1kHz	tanδ	< 4.0*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	7300VDC, 10s

OPERATING TEMPERATURE

Minimum ambient temperature	Ta min	- 25°C
Maximum ambient temperature	Ta max	60°C
Minimum casing temperature	Tc min	- 25°C
Maximum casing temperature	Tc max	70°C

The list below contains our standard program for GTO capacitors with a rated voltage of 4500V. All parameters not mentioned below are in accordance with this data sheet.

Type	C µF	I_s A	Dimensions Ø d x h (mm)	Weight kg
GTO 4500 - 0.25 P	0.25	300	92 x 91	0.59
GTO 4500 - 0.50 P	0.50	600	92 x 91	0.59
GTO 4500 - 1.00 P	1.00	1200	92 x 91	0.59
GTO 4500 - 2.00 P	2.00	2400	92 x 91	0.59
GTO 4500 - 3.00 P	3.00	3600	92 x 141	0.92
GTO 4500 - 4.00 P	4.00	4800	92 x 141	0.92
GTO 4500 - 5.00 P	5.00	6000	92 x 141	0.92
GTO 4500 - 6.00 P	6.00	7200	92 x 161	1.05
GTO 4500 - 7.00 P	7.00	8400	92 x 181	1.18

- Other values upon request.
- Above capacitors types are usually available ex stock.
- All other types have to be manufactured in accordance with specific orders, however certain minimum order quantities may be requested depending on the capacitor type.
- The dimensions may be changed due to technical advances without notice.

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film non self-healing
Impregnation	oil, NON PCB

BUSHING

Internal thread	M8 depth 15mm
Air distance	217mm
Creepage distance	217mm

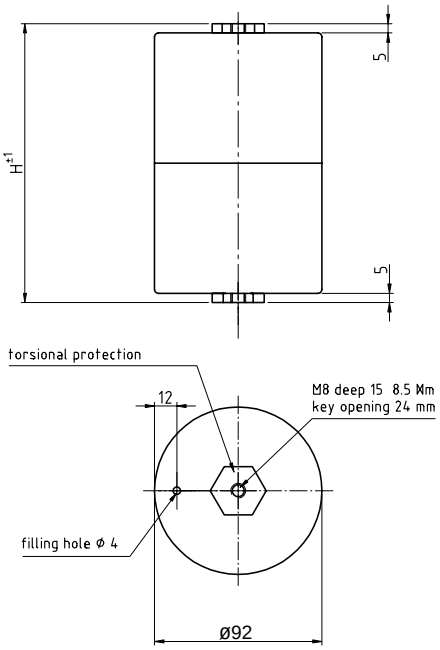
DESIGN DATA

Diameter	91mm
Height	161mm
Drawing	20-B-043
Weight	1.2kg
Casing material	Lathene
Mounting	every position

LIFE EXPECTANCY > 100000 Std

FAILURE RATE 300 FIT

DIMENSIONS



GTO 6000-0.65P

Vishay ESTA

GTO Snubber Capacitors, Oil Impregnated

PART NO. **GTO 6000-0.65 P**
ART. NO. **44855**

NOMINAL RATINGS

Capacitance/Tolerance	CN	0.65uF ± 5%
Rated voltage	UN	6000V
Rated DC voltage	Udc	4400VDC
Rated RMS voltage	Urms	1880VAC
Peak voltage period.	Us	6000VDC
Peak voltage not period.	Usmax	6550VDC
Voltage raise	du/dt	1200V/us
Rated current	In	70A
Peak current	Is	780A
Inductance	Ls	< 20nH
Loss factor diel.	tanδ	< 2.0*10^ - 4
Loss factor 50Hz	tanδ	< 2.0*10^ - 4
1kHz	tanδ	< 6.0*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	9720VDC, 10s

OPERATING TEMPERATURE

Minimum ambient temperature	Ta min	- 25°C
Maximum ambient temperature	Ta max	60°C
Minimum casing temperature	Tc min	- 25°C
Maximum casing temperature	Tc max	70°C

STORAGE TEMPERATURE

Minimum temperature	T min	- 50°C
Maximum temperature	T max	85°C

TECHNOLOGY

Dielectric	Polypropylene film, non self-healing
Impregnation	oil, NON PCB

BUSHING

Internal thread	M8 depth 15mm
Air distance	207mm
Creepage distance	207mm

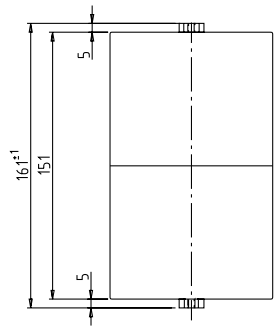
DESIGN DATA

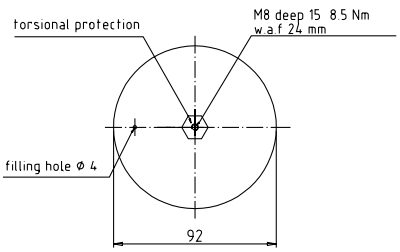
Diameter	92mm
Height	151mm
Drawing	20-B-043
Weight	1.2kg
Case material	Lathene
Mounting	every position

LIFE EXPECTANCY > 100000 Std

FAILURE RATE 300 FIT

DIMENSIONS





GTO Snubber Capacitors, Dry, Self-healing

VOLTAGE RANGE: **1200V / 4000V**
CAPACITANCE RANGE: **0.1μF - 6.0μF**

MAIN CHARACTERISTICS

- Wide voltage range
- Lowest inductance
- Axial terminals

APPLICATIONS

These capacitors are mainly used for protecting **G**ate **T**urn **O**ff Thyristors (GTO).

This application requires capacitors with a very low inductance and a high current carrying capability. The capacitors are also suitable for other applications, which require these features.

DESIGN

The capacitors are produced in a case made of plastic. The case diameter varies between 40mm and 88mm with a height varying from 49mm to 61mm.

For this series of capacitors, the customer's specific requirements can also be met.

For the electrical connection, internal M6 and M8 threads are used; these internal threads can also be used for mounting purposes.

Data sheets giving examples of feasible capacitor designs are available and the Request for Quotation form can be used to outline your customomized requirements.

TECHNOLOGY

Metallized polypropylene film (MKP) is used for the dielectric. For this type of application, the metallization has been optimized to the highest possible current carrying capacity at low losses. Consequently, maximum capacitor currents up to 80A per unit are possible. (For an explanation of these terms, please see General Information document).

All capacitors of this design are produced in accordance with the dry-type technology and are sealed with a firm filling. This design guarantees a vibration resistant capacitor. In addition, the fixed filling, ensures the capacitor is absolutely leakproof and thus guarantees a consistent life expectancy. These features are vital characteristics in traction applications.



GENERAL TECHNICAL DATA

NOMINAL RATINGS

Capacitance/ Tolerance	CN	0.1uF to 6uF/± 5%
Rated voltage	UN	1200V to 4000V
Rated DC voltage	UDC	up to 3000V DC
Rated rms voltage	Urms	up to 1400V AC
peak voltage period.	Us	up to 4000V
peak voltage non period.	Usmax	up to 4600V
Nominal current	IN	up to 80A
Peak current	Is	up to 10kA
Self inductance	Ls	< = 10nH
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4
Loss factor 50Hz	tan	< 2 x 10^ - 4
Loss factor 1kHz	tan	< 10 x 10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	2 * UN, DC, 10s
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	up to - 40°C
Maximum ambient temperature	Tmax	up to + 70°C
Storage temperature		
Minimum temperature	Tmin	- 45°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film metallized, self-healing
Filling material	resin, polyurethane **dry**

TERMINALS

Internal thread	M6, depth 6mm, 6Nm M8, depth 8mm, 8Nm

DESIGN DATA

Casing material	Plastic
Mounting position	every position

LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT

GTO 1200-2R

Vishay ESTA

GTO Snubber Capacitors, Dry Self-healing

PART NO.	**GTO 1200-2R**
ART. NO.	**15915**

NOMINAL RATINGS

Capacitance/Tolerance	CN	2 uF ± 5%
Rated voltage	UN	1200V
Rated DC voltage	Udc	800VDC
Rated RMS voltage	Urms	500VAC
Peak voltage period.	Us	1200VDC
Peak voltage not period.	Usmax	1700VDC
Voltage raise	du/dt	2000V/us
Rated current	In	32A
Peak current	Is	4000A
Inductance	Ls	< 10nH
Loss factor diel.	tanδ	< 2*10^ - 4
Loss factor 50 Hz	tanδ	< 2*10^ - 4
Loss factor 1 kHz	tanδ	< 10.0*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	1600V, DC, 10s

OPERATING TEMPERATURE

Minimum ambient temperature	Ta min	- 40°C
Maximum ambient temperature	Ta max	60°C
Minimum casing temperature	Tc min	- 40°C
Maximum casing temperature	Tc max	70°C
Storage temperature		
Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	85°C

TECHNOLOGY

Dielectric	Polypropylene film metallized, self-healing
Filling material	resin, polyurethane **dry**

BUSHING

Internal thread	M6 depth 8mm
Max. torque	6Nm
Air distance	76mm
Creepage distance	76mm

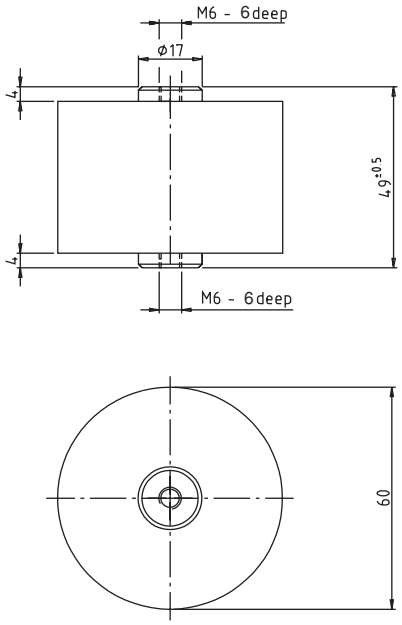
DESIGN DATA

Diameter	60mm
Height	49mm
Drawing	20-B-050
Weight	0.1kg
Case material	plastic
Mounting	every position

LIFE EXPECTANCY > 100000 Std

FAILURE RATE 300 FIT

DIMENSIONS



GTO Snubber Capacitors, Dry Self-healing

PART NO.	**GTO 4000-0.12 R**	
ART. NO.	**42844**	

NOMINAL RATINGS

Capacitance/Tolerance	CN	0.12uF ± 5%
Rated voltage	UN	4000V
Rated DC voltage	Udc	3000VDC
Rated RMS voltage	Urms	1400VAC
Peak voltage period.	Us	4000VDC
Peak voltage not period.	Usmax	4600VDC
Voltage raise	du/dt	4000V/us
Rated current	In	20A
Peak current	Is	480A
Inductance	Ls	< 10nH
Loss factor diel.	tand	< 2*10^ - 4
Loss factor 50Hz	tand	< 2*10^ - 4
Loss factor 1kHz	tand	< 10.0*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	6000V, DC, 10s

OPERATING TEMPERATURE

Minimum ambient temperature	Ta min	- 40°C
Maximum ambient temperature	Ta max	70°C
Minimum casing temperature	Tc min	- 40°C
Maximum casing temperature	Tc max	75°C
Storage temperature		
Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	85°C

TECHNOLOGY

Dielectric	Polypropylene film metallized, self-healing
Filling material	resin, polyurethane **dry**

BUSHING

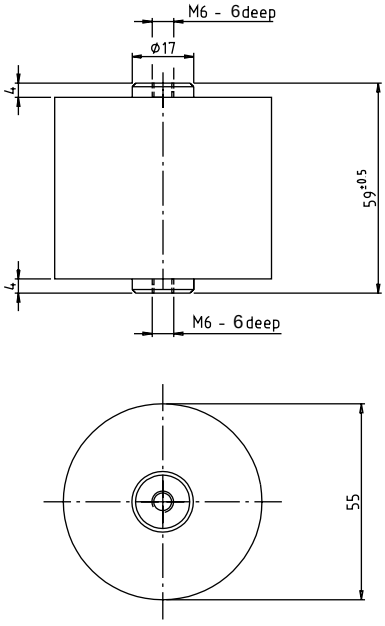
Internal thread	M6 depth 8mm
Max. torque	6Nm
Air distance	79mm
Creepage distance	79mm

DESIGN DATA

Diameter	55mm
Height	59mm
Drawing	20-B-050
Weight	0.1kg
Casing material	plastic
Mounting position	every position

LIFE EXPECTANCY	> 100000 Std
FAILURE RATE	300 FIT

DIMENSIONS



GTO Clamping Capacitors, Self-healing, Segmented

VOLTAGE RANGE: **1200V4000V**

CAPACITANCE RANGE: **5µF - 80µF**

MAIN CHARACTERISTICS

- High capacitance and small dimensions
- Lowest inductance
- Axial terminals



APPLICATION

GTO - Clamping capacitors are mainly used as energy storage capacitors in applications with Gate Turn Off Thyristors (GTO).

This application requires capacitors with a very low inductance and a high current carrying capability.

These capacitors are also suitable for other fields of application where these features are desirable

DESIGN

The capacitors are enclosed in a casing made of a plastic material according to Norme Francaise, NF F 16-101 which offers the highest level of resistance against inflammability.

The casing diameter of the standard product is 92mm with a height varying from 111mm to 161mm. Custom sizes can also be produced.

For the electrical connection internal M8 threads are used and the internal threads can be used for customer mounting purposes.

Data sheets giving examples of feasible capacitor designs are available and the Request for Quotation form can be used to outline your customized requirements.

TECHNOLOGY

Metallized and segmented polypropylene film (MKP) is used for the dielectric. This metallization is especially designed to offer best results during use. The segmentation guarantees an absolutely uncritical failure performance at the end of service life. (For an explanation, refer to General Information).

All capacitors of this design are manufactured with the dry-type technology and are sealed with a firm filling. The design ensures, particularly in traction applications, a vibration resistant capacitor. In addition, the fixed filling ensures the capacitor is absolutely leakproof and thus guarantees a consistent life expectancy.

GENERAL TECHNICAL DATA

NOMINAL RATINGS

Capacitance/Tolerance	CN	5uF to 80uF/± 5%
Rated voltage	UN	1200V to 4000V
Rated DC voltage	UDC	up to 4000VDC
peak voltage period.	Us	up to 4800V
peak voltage non period.	Usmax	up to 5200V
Nominal current	IN	up to 80A
Peak current	Is	up to 5kA
Self inductance	Ls	< = 20nH
Loss factor diel. 50Hz	tan	< 2 x 10^ - 4
Loss factor 50Hz	tan	< 2 x 10^ - 4
Loss factor 1kHz	tan	< 10 x 10^ - 4

ROUTINE TESTS

Test voltage Term./Term.	UT/T	2 * UN, DC, 10s
Measurement of capacitance		
Measurement of loss factor		

OPERATING TEMPERATURE

Minimum ambient temperature	Tmin	up to - 40°C
Maximum ambient temperature	Tmax	up to + 70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 45°C
Maximum temperature	Tmax	+ 85°C

TECHNOLOGY

Dielectric	Polypropylene film metallized, self-healing **segmented**
Filling material	resin, polyurethane **dry**
Terminals	
Internal thread	M8, depth 15mm
Max. Torque	8.5Nm

DESIGN DATA

Casing material:	Lathene
Mounting position:	All
LIFE EXPECTANCY	> 100000h
FAILURE RATE	300 FIT

GTO Clamping Capacitors, Self-healing, Segmented

PART NO.	**GTO 2940-12RP**
ART. NO.	**20914**

NOMINAL RATINGS

Capacitance/Tolerance	CN	12uF ± 5%
Rated voltage	UN	2940V
Rated DC voltage	Udc	2940VDC
Peak voltage period.	Us	3600VDC
Peak voltage not period.	Usmax	4100VDC
Voltage raise	du/dt	200V/us
Rated current	In	50A
Peak current	Is	2400A
Inductance	Ls	< 20nH
Loss factor diel.	tanδ	< 2*10^ - 4
Loss factor 50Hz	tanδ	< 2*10^ - 4
Loss factor 1kHz	tanδ	< 10.0*10^ - 4

ROUTINE TESTS

Test voltage terminal/terminal	UT/T	5880V, DC, 10s

OPERATING TEMPERATURE

Minimum ambient temperature	Tamin	- 40°C
Maximum ambient temperature	Tamax	70°C
Minimum casing temperature	Tcmin	- 40°C
Maximum casing temperature	Tcmax	70°C

STORAGE TEMPERATURE

Minimum temperature	Tmin	- 50°C
Maximum temperature	Tmax	85°C

TECHNOLOGY

Dielectric	Polypropylene film, metallized, self-healing **segmented**
Filling material	resin, polyurethane **dry**

BUSHING

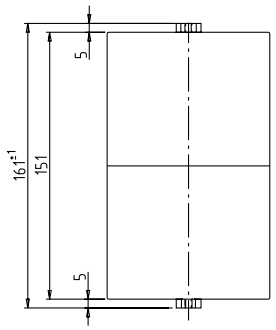
Internal thread	M8 depth 15mm
Max. torque	8.5Nm
Air distance	217mm
Creepage distance	217mm

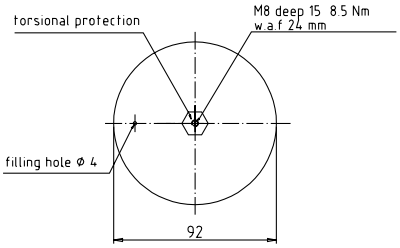
DESIGN DATA

Diameter	91mm
Height	161mm
Drawing	20-B-043
Weight	1.2kg
Casing material	Lathene
Mounting	All

LIFE EXPECTANCY	> 100000 Std
FAILURE RATE	300 FIT

DIMENSIONS





Standard Capacitors In Cylindrical Casing, Oil Impregnated, Self-healing, With Fuse

DESIGN

These capacitors are housed in aluminum casings of cylindrical deep-drawn shape.

A gasproof lid is flanged onto the casing. The electrical terminals may be either rubber-seal ceramic bushings with fast-on contacts 6.3 x 0.8mm, or solder-sealed ceramic bushings with screw-type terminals. The electrical connection must be made only by means of flexible conductors in order to avoid horizontal mechanical stresses on the bushings, and to allow a variation of the axial length of the aluminum casing by approximately + 20mm. This adjustment of length is necessary for the reliable functioning of the internal tear-off fuse. For the purpose of mechanical mounting, the capacitors are provided with a threaded bolt at the bottom of the casing. This bolt, marked according to DIN 40011, can be used as an earth connection.



TECHNOLOGY

The dielectric is a metallized polypropylene film using self-healing technology (for explanations refer to general information).

These self-healing capacitors are provided with an overpressure tear-off fuse which will guarantee both safe disconnection and tightness of the capacitor in case of an internal short-circuit (for explanations refer to general information).

Power Electronic, Standard AC Capacitors

STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELF-HEALING, WITH FUSE

AC-CAPACITORS, COMMUTATION AND DAMPING CAPACITORS

Series KMKP/KA 900 V - 3500 V, higher voltages upon request.
Capacitance range from 0.1 to 100µF, in relation to rated voltage and dimension. Other capacitance values, upon request.

GENERAL
Vishay ESTA Commutation capacitors are used in static frequency changers. They act, for example, as quenching capacitors taking over for a short time the current of the main thyristor thus making sure that the latter will safely block when the voltage returns.

The current load is very high on commutation and damping capacitors. Owing to the non-sinusoidal characteristic of the voltage path, high pulse-shaped recharge currents occur. With regard to ohmic and dielectric losses, the commutation capacitors have to be of a particularly high quality. Since modern low-loss dielectrics are applied and also the current paths are generously dimensioned, Vishay ESTA commutation capacitors are ideal for such extreme loads.

TECHNICAL DATA
OPERATING MODE
continuous operation

CLASS OF APPLICATION
HSF (refer to general information

IMPREGNATION
Oil (NON-PCB, refer general information)

PERMISSIBLE TEMPERATURE RANGE
Min./max. casing temperature: - 25 °/70 °C
Min./max. storage temperature: - 40 °/85 °C

SELF-DISCHARGE TIME CONSTANT
> 10.000 s

PERMISSIBLE RELATIVE AIR HUMIDITY
95 %

LIFE EXPECTANCY WITH 3% FAILURE RATE
100000h

CONNECTIONS
AMP plugs 6.3 x 0.8
Threaded bolts M10

MOUNTING POSITION
Vertical/Horizontal
Upside down position, upon request only

PROTECTION
Overpressure tear-off fuse, refer to general information

LOSS FACTOR
(50 Hz) 1.5×10^{-4}
(10k Hz) 5.0×10^{-4}

CAPACITANCE TOLERANCE
± 10 %

TEST VOLTAGE
terminal/ terminal 2.15 x Un/ $\sqrt{2}$ AC/10 s.
terminal/casing 2 x Un/ $\sqrt{2}$ + 1000 VAC/60 s
min. 3.000VAC/10 sec.

PEAK CURRENT (periodical) du/dt x C [A]

STANDARD
VDE 0560/12 IEC 61071-1 EN 61071-1

DIELECTRIC
metallized polypropylene film, refer to general information

STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELF-HEALING, WITH FUSE

AC-CAPACITORS, COMMUTATION AND DAMPING
CAPACITORS SERIES KMKP/KA 900 V - 3500 V

RATED VOLTAGE U_n 900 V
RMS voltage U_{rms} 640 V
Peak voltage (periodical) U_s 1344 V
Surge peak voltage (not periodical) U_{smax} 2688 V
DC voltage U_{DC} 1800 V

MODEL	C µF	I A	du / dt V / µs	DIMENSIONS Ø d x h (mm)	WEIGHT kg	FIGURE*
KMKP 900 - 0.10 IA	0.10	12.0	750	30 x 52	0.04	1
KMKP 900 - 0.22 IA	0.22	12.0	750	30 x 52	0.04	1
KMKP 900 - 0.33 IA	0.33	12.0	600	30 x 52	0.04	1
KMKP 900 - 0.47 IA	0.47	12.0	500	30 x 52	0.04	1
KMKP 900 - 0.68 IA	0.68	15.0	500	30 x 52	0.04	1
KMKP 900 - 1.0 IA	1.0	16.0	500	35 x 52	0.05	1
KMKP 900 - 2.2 IA	2.2	16.0	500	35 x 72	0.07	1
KMKP 900 - 3.3 IA	3.3	16.0	500	35 x 82	0.08	1
KMKP 900 - 4.7 IA	4.7	18.0	300	40 x 97	0.12	1
KMKP 900 - 6.8 IA	6.8	18.0	300	50 x 92	0.18	4
KMKP 900 - 10 IA	10.0	18.0	300	60 x 97	0.27	4
KMKP 900 - 15 IA	15.0	18.0	300	60 x 127	0.31	4
KMKP 900 - 15 IB	15.0	40.0	300	64 x 109	0.31	6 I
KMKP 900 - 22 IB	22.0	80.0	300	64 x 140	0.45	6 I
KMKP 900 - 33 IB	33.0	80.0	300	64 x 240	0.68	6 I
KMKP 900 - 47 IB	47.0	80.0	300	64 x 240	1.06	6 I
KMKP 900 - 68 IB	68.0	80.0	300	84 x 240	1.33	6 I
KMKP 900 - 100 IB	100.0	80.0	300	84 x 340	1.42	6 I

*See dimensional drawings document number :13104

Other values available upon request. Standard capacitors types usually, available ex stock. Non-standard and custom styles to be manufactured in accordance with specific orders. Minimum order quantities are applicable depending on the various capacitor types. Vishay reserve the right to change any dimensions without notice.

STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELF-HEALING, WITH FUSE

AC-CAPACITORS, COMMUTATION AND DAMPING
CAPACITORS SERIES KMKP/KA 900 V - 3500 V

RATED VOLTAGE	**U_n**	**1400 V**
RMS voltage	U_{rms}	1000 V
Peak voltage (periodical)	U_s	2100 V
Surge peak voltage (not periodical)	U_{smax}	4200 V
DC voltage	U_{DC}	3000 V

MODEL	C µF	I A	du / dt V / µs	DIMENSIONS Ø d x h (mm)	WEIGHT kg	FIGURE*
KMKP 1400 - 0.10 SA	0.10	10.0	900	40 x 52	0.07	3
KMKP 1400 - 0.22 SA	0.22	10.0	900	40 x 52	0.07	3
KMKP 1400 - 0.33 SA	0.33	10.0	900	40 x 52	0.07	3
KMKP 1400 - 0.47 SA	0.47	10.0	750	40 x 52	0.07	3
KMKP 1400 - 0.68 IA	0.68	18.0	500	50 x 72	0.16	4
KMKP 1400 - 1.0 IA	1.0	18.0	500	50 x 72	0.16	4
KMKP 1400 - 2.2 IA	2.2	18.0	500	50 x 97	0.19	4
KMKP 1400 - 3.3 IA	3.3	18.0	450	50 x 127	0.25	4
KMKP 1400 - 4.7 IB	4.7	40.0	450	64 x 140	0.45	6 I
KMKP 1400 - 6.8 IB	6.8	60.0	450	64 x 190	0.61	6 I
KMKP 1400 - 6.8 IBK	6.8	80.0	450	84 x 140	0.78	6 I
KMKP 1400 - 10 IB	10.0	60.0	250	64 x 190	0.61	6 I
KMKP 1400 - 15 IB	15.0	80.0	250	84 x 190	1.05	6 I
KMKP 1400 - 22 IB	22.0	80.0	250	84 x 190	1.16	6 I
KMKP 1400 - 30 IB	30.0	80.0	250	84 x 240	1.33	6 I
KMKP 1400 - 0.10 IAX	0.10	10.0	900	35 x 52	0.05	2
KMKP 1400 - 0.22 IAX	0.22	10.0	900	35 x 52	0.05	2
KMKP 1400 - 0.33 IAX	0.33	10.0	900	40 x 52	0.07	2
KMKP 1400 - 0.47 IAX	0.47	10.0	750	40 x 52	0.07	2
KMKP 1400 - 1.0 IAX	1.0	10.0	500	40 x 75	0.09	2

RATED VOLTAGE	**U_n**	**3500 V**
RMS voltage	U_{rms}	2480 V
Peak voltage (periodical)	U_s	5208 V
Surge peak voltage (not periodical)	U_{smax}	10416 V
DC voltage	U_{DC}	7200 V

MODEL	C µF	I A	du / dt V / µs	DIMENSIONS Ø d x h (mm)	WEIGHT kg	FIGURE*
KMKP 3500 - 0.10 SA	0.10	12.0	1900	40 x 97	0.16	3
KMKP 3500 - 0.22 SA	0.22	12.0	1900	40 x 127	0.16	3
KMKP 3500 - 0.33 SA	0.33	12.0	900	50 x 127	0.25	3
KMKP 3500 - 0.47 SA	0.47	15.0	750	50 x 127	0.25	3
KA 3500 - 0.68 SA	0.68	15.0	750	60 x 127	0.36	3
KA 3500 - 1.0 SB	1.0	30.0	500	64 x 190	0.61	7 II
KA 3500 - 1.5 SB	1.5	60.0	400	84 x 190	1.05	7 II
KA 3500 - 2.0 SB	2.0	80.0	400	84 x 190	1.05	7 II
KA 3500 - 3.0 SB	3.0	80.0	400	84 x 210	1.16	7 II

*See dimensional drawings document number :13104

Other values available upon request. Standard capacitors types usually, available ex stock. Non-standard and custom styles to be manufactured in accordance with specific orders. Minimum order quantities are applicable depending on the various capacitor types. Vishay reserve the right to change any dimensions without notice.

Power Electronic, DC Capacitors

STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELF-HEALING, WITH FUSE

DC CAPACITORS

Series GMKP 1000 V - 3000 V, higher voltages upon request.

Capacitance range 1-400 µF, in relation to rated voltage and dimension. Other capacitance values upon request.

GENERAL
VISHAY ESTA DC-capacitors may be loaded with a comparatively high component of alternating voltage or alternating current due to the low ohmic and low dielectric losses. Thus the capacitors can equally be employed for all DC applications.

The capacitors can also be applied as AC capacitors at a rated frequency of 50 Hz for the quoted root-mean-square voltages.

TECHNICAL DATA
OPERATING MODE
continuous operation

CLASS OF APPLICATION
HSF (refer to general information)

IMPREGNATING AGENT
Oil (NON-PCB, refer to general information)

PERMISSIBLE TEMPERATURE RANGE
Min./max. casing temperature:- 25 °/70 °C
Min./max. storage temperature:- 40 °/85 °C

SELF-DISCHARGE TIME CONSTANT
> 10.000 s

PERMISSIBLE RELATIVE AIR HUMIDITY
95 %

LIFE EXPECTANCY WITH 3% FAILURE RATE
100.000 h

NUMBER OF DISCHARGES
upon request

TIME INTERVAL BETWEEN 2 DISCHARGES
With a periodic discharge: 2 sec.
With oscillating discharge: upon request

TERMINALS
AMP plugs 6.3 x 0.8 or
Threaded bolts M10

MOUNTING POSITION
vertical/horizontal
upside down position, upon request only

PROTECTION
Overpressure tear-off fuse, refer to general information

LOSS FACTOR

(50 Hz)	1.5×10^{-4}
(14 kHz)	2.0×10^{-4}

CAPACITANCE TOLERANCE
± 10 %

OVERVOLTAGES

1.1 x Un	1.15 x Un	
30% operation	30 min./day	
1.2 x Un	1.3 x Un	1.5 x Un
5min./day	1 min./day	100 ms/day

TEST VOLTAGE
terminal/ terminal 1.5 x Un DC/10 sec.
terminal/casing 2.0 x Un/ $\sqrt{2}$ + 1000 VAC/10 s
(min. 2000 VAC/10 s)

PEAK CURRENT (periodical) du/dt x C [A]

STANDARD
IEC 61071-1 EN 61071

DIELECTRIC
metallized polypropylene film (refer to general information)

DC CAPACITORS
SERIES GMKP 1000 V - 3000 V
Rated voltage 1000 VDC

U_{rms} = 470 V

MODEL	C µF	I A	du / dt V / µs	L nH	DIMENSIONS Ø d x h (mm)	WEIGHT kg	FIGURE*
GMKP 1000 - 2 IA	2.0	12.0	500	< 150	30 x 52	0.04	1
GMKP 1000 - 4 IA	4.0	12.0	500	< 150	30 x 52	0.05	1
GMKP 1000 - 8 IA	8.0	12.0	500	< 150	40 x 72	0.09	1
GMKP 1000 - 10 IA	10.0	15.0	500	< 150	50 x 72	0.09	1
GMKP 1000 - 16 IA	16.0	15.0	500	< 150	50 x 72	0.14	4
GMKP 1000 - 20 IA	20.0	15.0	300	< 150	50 x 97	0.18	4
GMKP 1000 - 32 IA	32.0	18.0	200	< 150	50 x 127	0.25	4
GMKP 1000 - 40 IA	40.0	18.0	200	< 150	50 x 127	0.25	4
GMKP 1000 - 64 IA	64.0	20.0	200	< 150	64 x 140	0.45	4
GMKP 1000 - 80 IA	80.0	20.0	200	< 200	64 x 190	0.61	6 I
GMKP 1000 - 100 IA	100.0	20.0	150	< 200	84 x 140	0.78	4
GMKP 1000 - 200 IA	200.0	35.0	70	< 220	84 x 240	1.34	5
GMKP 1000 - 400 IA	400.0	35.0	50	< 250	84 x 340	1.88	5

Rated voltage 1800VDC

U_{rms} = 640 V

MODEL	C µF	I A	du / dt V / µs	L nH	DIMENSIONS Ø d x h (mm)	WEIGHT kg	FIGURE*
GMKP 1800 - 4 IA	4.0	12.0	500	< 150	50 x 72	0.14	4
GMKP 1800 - 8 IA	8.0	12.0	500	< 150	50 x 127	0.25	4
GMKP 1800 - 10 IA	10.0	15.0	500	< 150	50 x 127	0.25	4
GMKP 1800 - 16 IA	16.0	15.0	500	< 150	60 x 127	0.36	4
GMKP 1800 - 20 IA	20.0	18.0	300	< 150	64 x 140	0.41	4
GMKP 1800 - 32 IB	32.0	20.0	200	< 200	84 x 140	0.78	6 I
GMKP 1800 - 40 IB	40.0	25.0	200	< 120	84 x 190	1.05	6 I

Rated voltage 3000VDC

MODEL	C µF	I A	du / dt V / µs	L nH	DIMENSIONS Ø d x h (mm)	WEIGHT kg	FIGURE*
GMKP 3000 - 2 IA	2.0	15.0	500	< 150	50 x 97	0.18	4
GMKP 3000 - 4 IA	4.0	15.0	500	< 150	50 x 127	0.25	4
GMKP 3000 - 8 IA	8.0	15.0	500	< 150	64 x 140	0.41	4
GMKP 3000 - 8 IB	8.0	15.0	500	< 150	64 x 140	0.41	6
GMKP 3000 - 10 IA	10.0	18.0	400	< 200	64 x 190	0.61	4
GMKP 3000 - 16 IB	16.0	25.0	300	< 200	64 x 240	1.05	6 II
GMKP 3000 - 20 IB	20.0	35.0	300	< 200	84 x 190	1.05	6 II
GMKP 3000 - 28 IB	28.0	35.0	200	< 250	84 x 240	1.33	6 II

*See dimensional drawings document number :13105

Other values available upon request. Standard capacitors types usually, available ex stock. Non-standard and custom styles to be manufactured in accordance with specific orders. Minimum order quantities are applicable depending on the various capacitor types. Vishay reserve the right to change any dimensions without notice.

Power Electronic Capacitors

STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELFHEALING, WITH FUSE

DIMENSIONAL DRAWINGS

Dimensional drawings of the bushings on last page of this datasheet,

Design IA

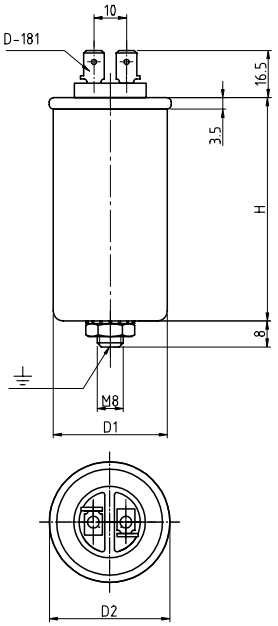


FIGURE 1

Design IAX

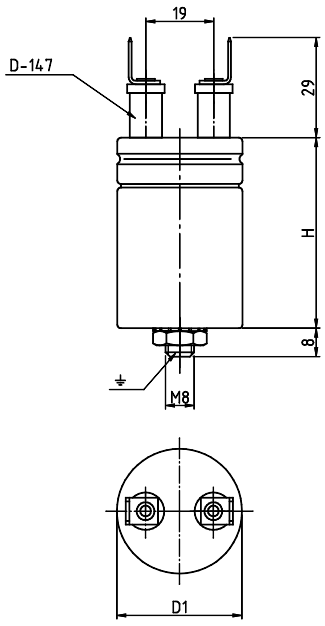


FIGURE 2

Design SA

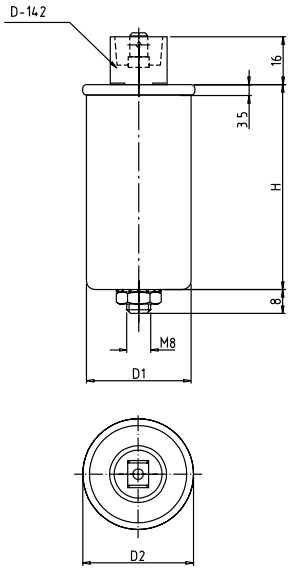


FIGURE 3

Design IA

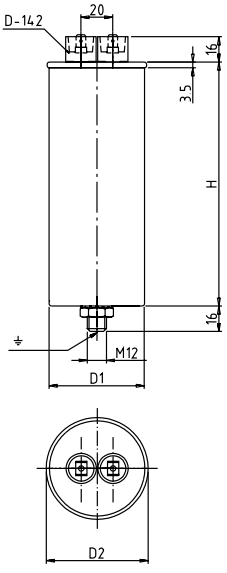


FIGURE 4

STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELFHEALING, WITH FUSE

DIMENSIONAL DRAWINGS

Dimensional drawings of the bushings on last page of this datasheet,

Design IS

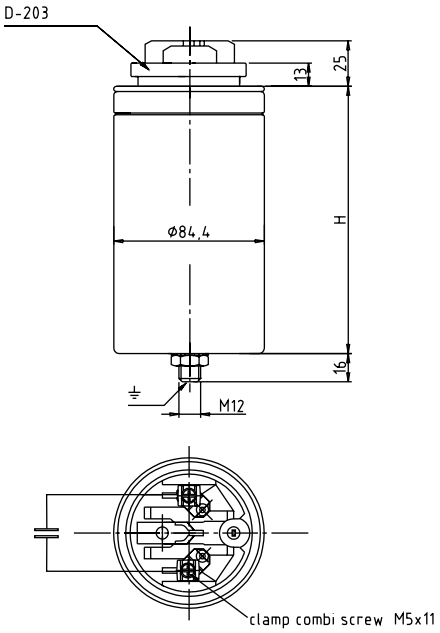


FIGURE 5

Design IB

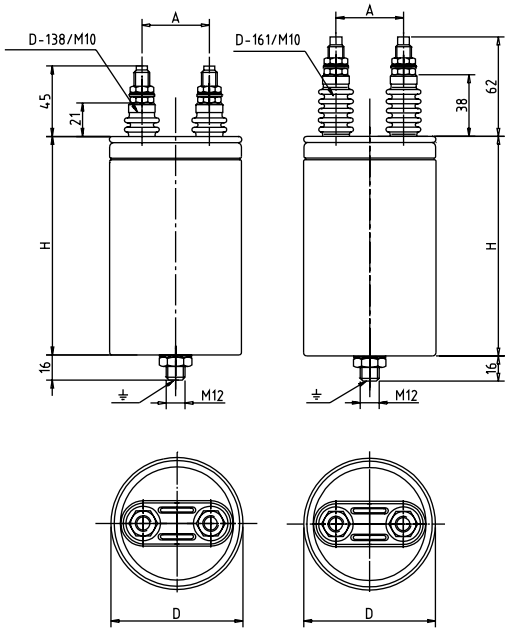
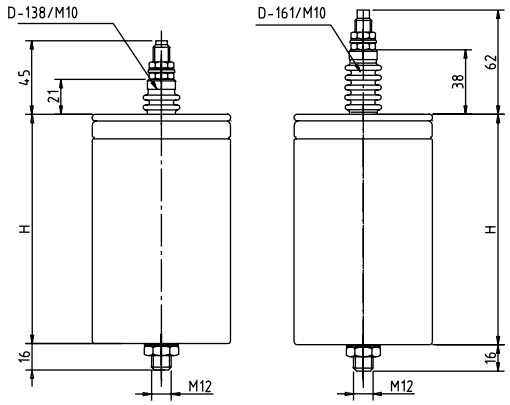


FIGURE 6 I

FIGURE 6 II

Design SB



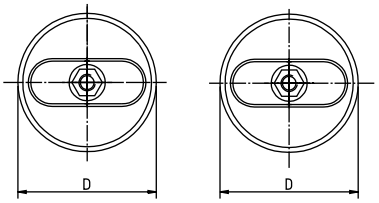


FIGURE 7 I

FIGURE 7 II

Fastening bolt

Diameter of cylindrical case
< 50mm
≥ 50mm

Fastening bolt
M 8/8mm
M 12/12mm

Permissible tightening torque
4Nm
10Nm

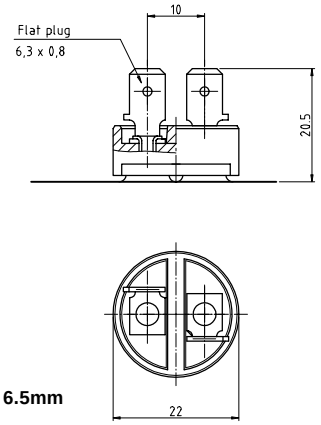
STANDARD CAPACITORS IN CYLINDRICAL CASING, OIL IMPREGNATED, SELFHEALING, WITH FUSE

DIMENSIONAL DRAWINGS

BUSHINGS

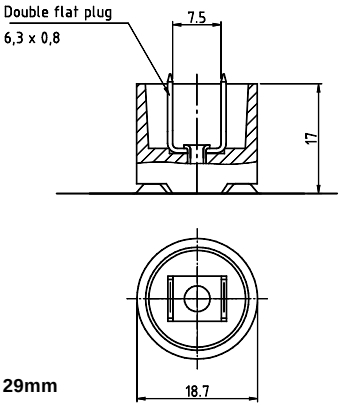
The voltage limit of the bushings for the types of capacitor listed in this catalogue is based on the “Rules for Proprotioning Clearance and Creepage Distances in Electrical Equipment”, VDE 0110.

D-181



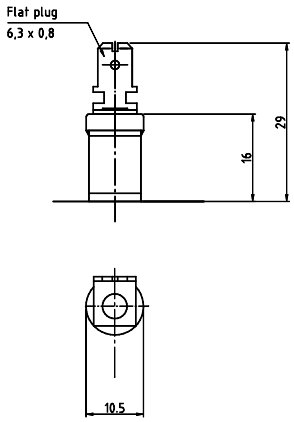
AIR DISTANCE 6mm
CREEPAGE DISTANCE 6.5mm

D-142



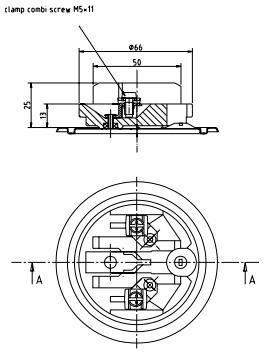
AIR DISTANCE 20mm
CREEPAGE DISTANCE 29mm

D-147



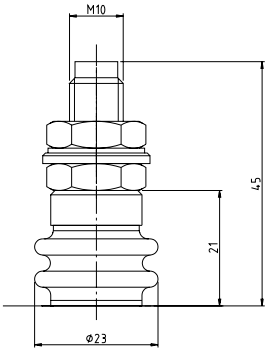
AIR DISTANCE 10mm
CREEPAGE DISTANCE 10mm

D-203



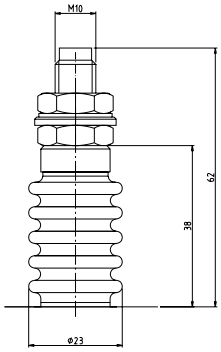
AIR DISTANCE 24mm
CREEPAGE DISTANCE 28mm

D-138



AIR DISTANCE 16mm
CREEPAGE DISTANCE 23mm
MAX. TORQUE 10Nm

D-161



AIR DISTANCE 32mm
CREEPAGE DISTANCE 54mm
MAX. TORQUE 10Nm

VDE Prüf- und Zertifizierungsinstitut

VDE VERBAND DER ELEKTROTECHNIK
ELEKTRONIK INFORMATIONSTECHNIK e.V.

CERTIFICATE

Registration-Number: 2556/QM/03.94

This is to certify that the company

VISHAY

VISHAY ELECTRONIC GmbH
Division ESTA

at the following locations

Riegrova 1231, CZ-38801 Blatna
Pasticka 1243, CZ-38801 Blatna
Hofmark-Aich-Straße 36, D-84030 Landshut

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

Heavy Current Capacitors
High Voltage Units

This QM-System complies with the requirements of:

DIN EN ISO 9001:2000

This Certificate is valid until 19.03.2006

VDE Testing and Certification Institute
Certification

D-63069 Offenbach/Main, Merianstraße 28
Date: 02.04.2003
2556-9110-0004/27625

The VDE Testing and Certification Institute is accredited by DAR Accreditation Bodies according to DIN EN 45012 and notified in the EU under ID. No. 0366.

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FLUORESCENT LAMP/MOTOR CAPACITORS



POWER-FACTOR CONTROLLER



FURNANCE CAPACITORS



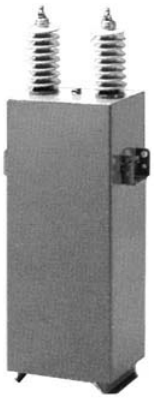
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ASIA

VISHAY INTERTECHNOLOGY ASIA PTE LTD.
25 TAMPINES STREET 92
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SINGAPORE 528877
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JAPAN

VISHAY JAPAN CO., LTD.
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JAPAN
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EUROPE

VISHAY ELECTRONIC GMBH
GESCHÄFTSBEREICH ROEDERSTEIN
ESTA UND HYBRIDE
HOFMARK-AICH-STRASSE 36
84030 LANDSHUT
GERMANY
PH: +49-871-86-0
FAX: +49-871-77-01-52

VISHAY S.A.
4, RUE DE SALONIQUE
95101 ARGENTEUIL
FRANCE
PH: +33-1-39-98-22-00
FAX: +33-1-39-98-22-05

VISHAY LTD.
PALLION INDUSTRIAL ESTATE
SUNDERLAND, SR4 6SU
GREAT BRITAIN
PH: +44-191-514-4155
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