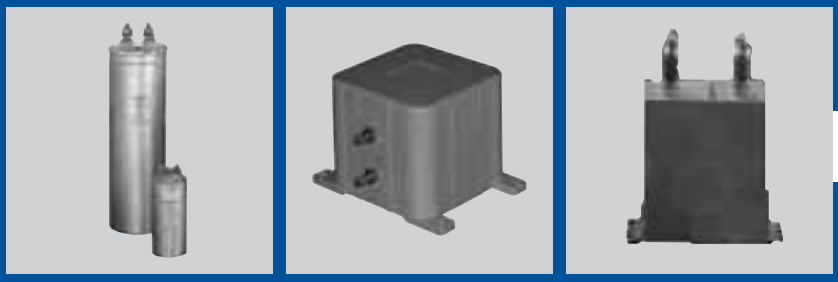
DUCATI energia

POWER ELECTRONIC CAPACITORS



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POWER ELECTRONICS CAPACITORS

MAIN TYPES OF CAPACITORS:

CAPACITOR TYPE	*SERIE*	*APPLICATIONS*
GENERAL PURPOSE	**GP 42** 416.42	switching, high performance lighting, UPS filter, AC-link, resonant circuit, PFC with high harmonics, DC-link, filter
	GP 84 416.84	
DEDICATED DC APPLICATIONS	**DC 85** 416.85	filtering and storage
	POWER STORAGE 415.45	traction and engine filtering, welding
DEDICATED AC APPLICATION	**WIND TURBINE** 416.37	3-phase filter/PFC for wind generator
	HIGH VOLTAGE 416.75	high Vac for resonant circuit
	GTO SNUBBER 416.75	high peak current lowest inductance

CONTENTS:

INTRODUCTION:

Ducati was founded in 1926 and was the first company in Italy, and among the first in the world, to introduce capacitors for the radiobroadcasting equipment produced by Guglielmo Marconi.
Building upon this tradition, which has always seen Ducati in the forefront of capacitor technology, the company has eveloped the **innovative PPMh (AC applications) and PPMd films (DC applications)**.
Superior performance and reduced dimensions compared to the by now obsolete paper and oil and gas solutions make these capacitors the new standard of reference for industrial power electronics systems.
However, the present range also includes traditional PPM versions for applications where the capacitor is not subjected to severe working conditions.
All the capacitors manufactured by Ducati Energia feature a protection device conforming to standards IEC 61071-1/2. This protection has been achieved by means of a special engineering technology: if a fault occurs the connections will be broken due to overpressure, leaving the insulation of the case intact and preventing the capacitor from exploding or burning.
The device has been designed and dimensioned to ensure more efficient, prompt operation with both low and high short circuit currents (up to 10,000 A).

TECHNOLOGIES

PPM / MKP TECHNOLOGY
Metallized polypropylene technology (PPM – MKP) utilizes a vacuum evaporation technique to deposit an extremely thin
layer of metal on one side of the polypropylene film.
The capacitor elements built using this technology are obtained by winding two polypropylene films. The capacitor plates consist in the metallized surface of the two films and the dielectric is the propylene film itself.
The main advantage of capacitors with metallized plates is their self-healing capacity. This means that they are capable
of restoring their electrical properties following the occurrence of a short circuit between the plates.
Due to the reduced thickness of the plates, the short circuit current generated in the area of a fault is capable of vaporizing the metal coating; the short circuit is thereby automatically extinguished without an appreciable reduction in capacitance or expenditure of energy.

- STANDARD LIFE (SL) SERIES - PPM capacitors
In these capacitors the impregnating agent is a special type of resin. Ducati Energia has developed an ecofriendly resin composition displaying high dielectric stability, which completely eliminates every possible risk of air and water molecules being present inside the capacitor. This category includes the capacitors belonging to the families:

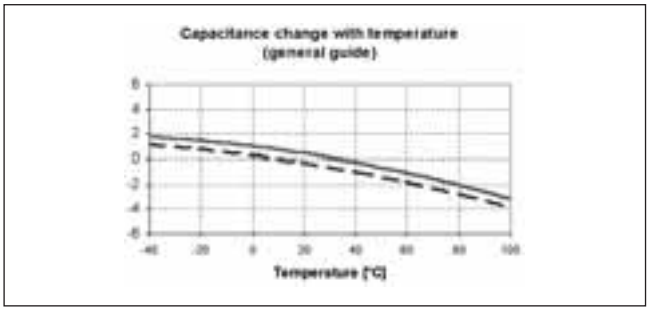
- SEGMENTATION
Self-healing DC capacitors without tear-off fuses can be manufactured with a segmented metallized polypropylene film. Various segmental designs are available which are applied in accordance with the mode of application and the specification. All segmented metallizations being applied are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

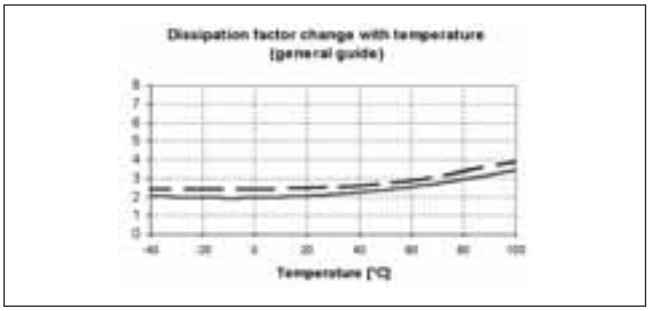
TECHNOLOGY PPMh/MKPh and PPMd/MKPd
The continuous research conducted in Ducati Energia laboratories has led to the development of a polypropylene film with a special metallization, whose purpose is to increase gradient of voltage without decreasing lifetime.
Thanks to this innovative metallization treatment, the capacitor has a significantly dimension reduction and maintains its dielectric properties and performance in terms of both current and voltage.
- PPMh is film designed for AC voltage, can support also DC applications, agree with technical data.
- PPMd is designed for DC voltage, with high superimposed ripple

TERMS AND DEFINITIONS

(In according to IEC 61071)

Rated capacitance (Cn)
Capacitance value rated at ambient temperature (20 ±5°C) and at the rated voltage. For capacitors made with metallized polypropylene dielectric film, the capacitance and dissipation factor change versus temperature. Typical graphs of these deviations are shown in the below diagrams.





Tollerance on capacitance
The maximum admitted devistion from the rated value of capacitrance, measured at ambient temperature (20 ±5°C) and at the rated voltage.

Rated AC Voltage (Un AC)
The maximum operating peak recurrent voltage of either polarity of a reversing type wave form, for which the capacitor has been designed.

Rated DC Voltage (Un DC)
The maximum operating peak voltage of either polarity but of a non- reversing type wave form, for which the capacitor has been designed.

Rated Rms voltage (Urms)
Root mean square of the maximum permissible value of A.C. voltage, in continuous operation. In case of sinusoidal wave form voltage, the following relationship could be considered:

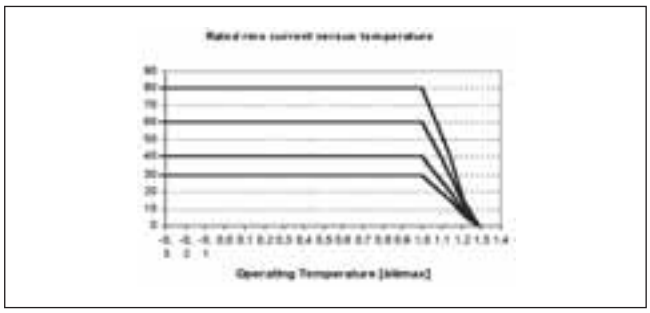
$$U_{Un} = U_{rms}\sqrt{2}$$

Non-recurrent surge voltage (Us)
A peak voltage inducted by switching or any other faults or disturbance of the system, which is allowed for a maximum of 500 times and for a durations shorter than 100 msec.

Ripple voltage (Ur)
The peak-to-peak alternating component of the unidirectional voltage.

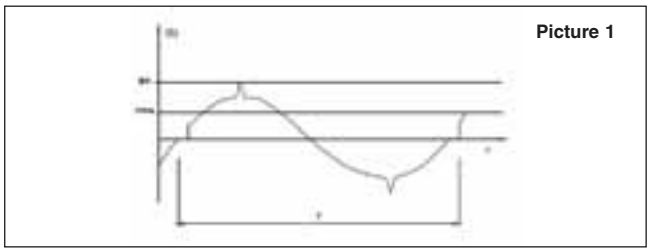
Maximum current (Imax)
The maximum rms value of permissible current in continuous operation. This value are related to the maximum power dissipation at the highest permitted

temperature of the case (Θ_{max}) at which the capacitor may be operated.
Operating at the maximum r.m.s current (IMAX), the capacitor produces a case temperature rise of about 10 – 15 °C over the ambient, according to the capacitor type (please see RTHC for each models) and the application.
To avoid thermal instability on the capacitor the case temperature of the capacitor must not exceed the maximum operating temperature (Θ_{max}), so it could be necessary to reduce the ambient temperature with a cooling air system or to reduce the Imax current according to the following diagram:



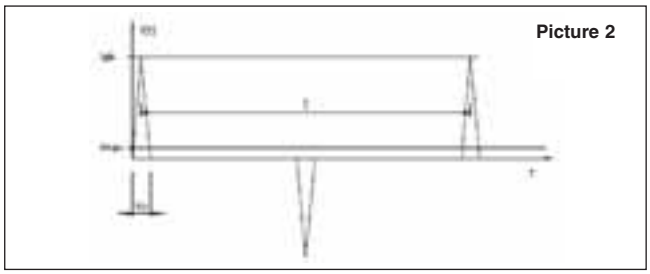
Maximum peak current (Ipk)
The maximum current amplitude which occurs istantaneously during continuos operation. For some capacitors series and according to the typical application (high or low distorsion), it's possible to describe two different maximum peak current:

Ipk Cw (continuos waveform): for linear or low distorsion current waveform - picture 1



Picture 1

Ipk Iw (Impulsive waveform): for high distorsion current waveform, typical when the $t_0/T < 0,1\%$ - picture 2



Picture 2

Rate of voltage rise (du/dt)
Maximum permitted repetitive rate of voltage rise of the operational voltage

Peak surge current (Is)
The admissible peak current inducted by switching or any other faults or disturbance of the system, which is allowed for a maximum of 500 times and for a durations shorter than 100 msec.

Equivalent series resistance (RESR)
An effective resistance which, if connected in series with an ideal capacitor with the same value capacitance,would have a power loss equal to the active power dissipated in the capacitor under specified operating conditions. Normally, for frequency lower than the resonanting one, the following relationship could be considered:

$$R_{ESR} = R_S + \left(\frac{\tan\delta_0}{2\pi fC}\right)$$

Series resistance (Rs)
It is the resistance produced by the current heat losses ($I^2_{RMS} \cdot R_S$) in the capacitor.

Equivalent series inductance (LESR)
The value of equivalent inductance that the capacitors has due to the internal connections, terminals, winding characteristics and phisical dimensions.

Thermal resistance (RTHC)
It is the thermal resistance (°C/W) between the hottest point on the case of the capacitor in thermal equilibrium and the natural cooling enviroment, with the temperature measured approximately at 0,1 meter away from the capacitor container and at two-third of the height from its base. The following relationship could be considered:

$$P_{max} = R_{THC} \cdot (\theta_c - \theta_{max})$$

Maximum dissipation factor (tanδ max)
Maximum tangent of the loss angle, expressed as the ratio between the equivalent series resistance and the capacitive reactance of the capacitor at 50Hz sinusoidal frequency. The nominal value (tanδ) is calculeted as follows:

$$\tan\delta = 2\pi fCR_{ESR} = \tan\delta_0 + 2\pi fCR_S$$

Safety area
The following charts shown the maximum permissible voltage or current in case of an overload operation. The amplitude of overvoltages or overcurrents may be tolerated without significant reduction in the life time of capacitor, if the case temperature of the capacitor is within the operating temperature.

Voltage test between terminals (Utt)
Routine test of all capacitors conducted at room temperature, prior to delivery. The capacitor shall be subjected for 10 s to a test voltage applied between the terminals. During the test, neither puncture nor flashover shall occur, self-healing breakdowns are permitted. For more details regarding the value of test voltage, please see the data sheet for each single capacitor model.

Voltage test between terminals and case (Utc)
Routine test of all capacitors conducted at room temperature, prior to delivery. The capacitor having all terminals insulated from the container shall be subjected for 10 s to a AC test voltage applied between terminals (joined together) and the container. During the test, neither puncture nor flashover shall occur. For more details regarding the value of test voltage, please see the data sheet for each single capacitor model.

Lowest operating temperature (Θmin)
Lowest permissible case temperature, in thermal equilibrium, at which the capacitor may be used.
Maximum operating temperature (Θmax)
Highest permissible case temperature, in thermal equilibrium, at which the capacitor may be used.

Climatic categories
F class:
- maximum relative humidity 75% - annual means,
- permitted maximum 95% for 30 days/year,
- condensation not permitted

SAFETY

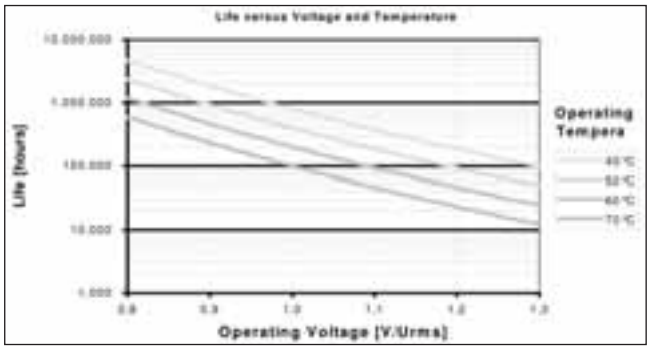
Capacitor Protection:

- Against accidental contact
In accordance with IEC 61071, all capacitors are checked by 100% routine test (voltage test between terminations and case). Accessible capacitors must be earthed at the bottom stud or with an additional earthing clamp.

- Overload and failure at the end of service life
All described capacitors are "self-healing": in the event of a voltage breakdown the metal layers around the breakdown channel are evaporated by the temperature of the electric arc between the electrodes, and create small overpressure. An insulation area is formed which is reliably resistive and voltage proof for all operating requirements of the capacitor. The capacitor remains fully functional during and after the breakdown.
In the event of overvoltage or at the end capacitor service life, an increasing number of selfhealing breakdowns may cause rising pressure inside the capacitor and brake the can. To prevent it, the capacitor is fitted with an obligatory "overpressure mechanism".
This safety mechanism is based on an attenuated spot at one of the connecting wires inside the capacitor.
When the rising pressure, the casing begins to expand, and disconnects the attenuated spot wire and the current path is interrupted irreversibly. It has to be noted that this safety system can act properly only within the permitted limits of loads and overloads.
The capacitors in rectangular case are provided with an overpressure switch that would signalize a rising pressure inside the case. A corresponding external safety circuit which disconnects the capacitor immediately in such event has to be provided by the user.

- Overvoltages and Short Circuits
As shown above, the capacitors are self-healing and regenerate themselves after breakdowns of the dielectric. For voltages within the permitted testing and operating maximum the capacitors are overvoltage-proof.
They are also proof against external short circuits as far as the resulting surge discharges do not exceed the specified current limits (IS).

Operating life
The capacitors have been designed for an average service life of 100,000 hrs (permitted failure rate 3%).
Above all, the operating life of the capacitors depends on the temperature inside during operation, and the field strength in its dielectric.
The following diagram demonstrates the correlation between service life, temperature, and operating voltage.



MOUNTING AND OPERATING INSTRUCTIONS

Connection
Connection at threaded studs have to be made between two nuts. During connection the lower nut shall be backed up to avoid any transmission of the torque at isolator. It is not recommended to solder cables to the terminals.
Permitted torque for screw connections.

M6: < 3 Nm
M10: < 7 Nm
M12: < 12 Nm
Screw terminal type M6: 3 - 4 Nm

Capacitors overpressure device:
All the AC capacitors with overpressure device shall be connected with sufficiently flexible leads to permit the functioning of the mechanism, and sufficient space for expansion of the capacitor case must be left above the terminals.
Depending on the specific dimensions of the capacitors the case could expand between 15 mm and 30 mm.

Mounting Location
As belong mentioned, the useful life of a capacitor may be reduced dramatically if exposed to excessive heat. To avoid overheating the capacitors must be allowed to emit their heat losses unhindered and shall be shielded from external heat sources. If attenuating circumstances give cause for doubt, special tests should be conducted to ensure that the permitted maximum temperature of the capacitor is not exceeded even under the most critical ambient circumstances. It should be noted that the internal heat balance of large capacitors is only reached after a couple of hours.

Mounting position
Capacitors with liquid or viscous filling shall be installed upright with terminals facing upwards. Please consult our technical department if different mounting position is required. Capacitors with hard resin filling can be mounted in any position without restrictions.

Earthing
Capacitors with a metal case must be earthed at the mounting stud or by means of a separate metal strap or clamp.

Discharge
If there is no discharge of the capacitors provided by external circuits, the capacitors should be provided with discharge resistors. In any event, the poles of the capacitors must be short-circuited before being touched.
Note that capacitors with nominal voltages above 750 V in particular may regenerate new voltage at their terminals after having been short-circuited just for short periods.
This condition results from the internal series connection of the capacitor elements and will be avoided by storing them permanently short-circuited.

DISPOSAL

Our capacitors do not contain PCB, solvents, or any other toxic or banned materials. The impregnants and filling materials contain vegetable oil or polyurethane mixtures. The capacitors are not rated as hazardous goods in transit and do not have to be marked under the Regulations for Hazardous Goods. They are rated WGK 0 (water risk category 0 "no general threat to water").
We recommend disposing of the capacitors through professional recycling centres for electric/electronic waste. The capacitors can be disposed of as follows:

- Capacitors: acc. to European Waste Catalogue (EWC) No. 160216 ("Components taken from discarded equipment")
- Liquid filling materials: acc. to EWC No. 080402 ("Waste adhesives and sealants free of halogenated solvents")
- Hardened filling materials: acc. to EWC No. 080404 ("Hardened adhesives and sealants").

Caution: When touching or wasting capacitors with activated break-action mechanism, please consider that even after days and weeks these capacitors may still be charged with high voltages !

Capacitors are hermetic sealing, to maintain a long operating life and for the correct functioning of the break action mechanism, please pay special attention not to damage any parts of the can, cover or isolators.

NOTE:

Capacitors of the DC series are not provided with an internal safety mechanism which would separate them in a controlled and reliable manner from the energy supply in case of malfunctioning.
These capacitors consist mainly of polypropylene (up to 90%), i.e. their energy content is comparably high. Capacitors may rupture and ignite as a result of internal faults or external overload (e.g. temperature, overvoltage, harmonic distortion). It must therefore be ensured by proper measures that they not perform any hazard for their environment in the event of failure.
Energy content in case of fire: approx. 40 MJ/kg.

GENERAL PURPOSE CAPACITORS

GP 42 and GP 84 SERIES

Metallized Polypropylene AC and DC capacitors for power electronics application with high current and harmonics distortion with long expected life.

FEATURES

- Cylindrical aluminum case
- Over pressure device
- Dry resin
- Double/single tags or screw type bolts terminals
- Self healing PPM/PPMh dielectric
- AC / DC voltage applications

TYPICAL APPLICATIONS

- Inverter
- Filtering
- Switching
- High power lighting

GENERAL CHARACTERISTICS	
RMS voltage	**250 - 930V (*)**
Rated Voltage DC	**420 - 2100V (*)**
Rate Capacitance	**0,1÷600 µF**
Test voltage between terminals	**1,5Un 10s**
Test voltage between terminals and case	**3kV 50Hz 10s**
Terminals	**Single or double tag 6.3 x 0.8 mm (GP 42 series)** **2 x M6 or 2 x M10 screw-type bolts (GP 84 series)**
Working temperature	**-40 / +70°C**
Storage temperature	**-40 / +85°C**
Protection degree	**IP 00**
Filling	**Dry polyurethane resin**
Dielectric	**Self-healing metallized polypropylene film**
Case	**Aluminum**
Protection	**Over pressure device**
Maximum altitude	**2000m a.s.l.**
Installation	**Vertical / horizontal**
Reference standard	**IEC 1071-1/2; UL 810**
Approvals	**UL-CSA**

(*) Standard values, other values on request

GENERAL PURPOSE CAPACITORS

GP 42 Series

Rated AC Voltage	250÷690V
Rated capacitance	0,1÷70 µF
Capacitance tollerance	±5% / ±10%
Max. rms current	10 A / 16 A
Thermal resistence natural cooling (R_{THc})	< 12 °C/W
Series resistance (R_S)	< 5 mΩ
Terminals	Single or double tag 6,3x0,8 mm.
Working temperature	-40 / + 70 °C
Storage temperature	-40 / + 85 °C
Test voltage	U_{tc}= 3 kVac / 6kVac @50Hz 10s U_{tt}= 1,5 x Un dc 10s
Filling	Dry polyurethane resin
Dielectric	Metallized PPM film
Cylindrical case	Aluminum
Life expectancy	80.000 h (*)
Failure quota	300/10E9
Reference standard	IEC 1071-1/2; UL 810
Integrated overpressure protection	
M8 Threaded fixing bolt	5 Nm
M12 Threaded fixing bolt	10 Nm

(*) Life Derating at operating voltage (according to the chart on page 4)

Life expectancy	4.16.42.1xxx Series	4.16.42.2xxx Series	4.16.42.3xxx Series	4.16.42.4xxx Series	4.16.42.6xxx Series	4.16.42.9xxx Series
80.000 h (rated)	*250 V*	*330 V*	*450 V*	*525 V*	*690 V*	*930*
40.000 h	275 V	360 V	500 V	575 V	760 V	1025 V
20.000 h	300 V	400 V	540 V	630 V	830 V	1120 V
10.000 h	330 V	450 V	600 V	690 V	930 V	1250 V

GENERAL PURPOSE CAPACITORS

GP 42 Series

Cn [µF]	I_{MAX} [A]	I_{PK} C_w [A]	I_S [kA]	dV/dT_{max} [V/µs]	R_T natural cooling [°C/W]	$Tan\delta_{MAX}$ @50Hz [10^{-4}]	Ø [mm]	H [mm]	Weight [g]	Part n. 416.42.	Pcs. X box	Box type
Urms = 250V					Un AC = 350V		Un DC = 420V			Us = 840V		
2	5,0	8	0,1	50	11,7	3,5	25	60	40	1.05.x	250	6
5	6,5	10	0,3	50	9,4	4,0	30	60	50	1.23.x	200	6
10	7,5	11	0,5	45	6,8	4,5	35	72	80	1.42.x	100	7
15	8,0	12	0,7	45	5,8	5,0	40	72	100	1.55.x	100	6
20	8,5	13	0,7	30	4,5	5,5	40	98	140	1.63.x	50	7
25	8,5	13	0,8	30	4,5	5,5	40	98	150	1.66.x	50	7
30	9,0	14	1,0	30	3,9	5,5	40	98	170	1.69.x	50	7
40	10,0	15	0,9	20	3,3	6,0	45	122	220	1.82.x	25	7
50	10,0	15	1,1	20	3,3	6,0	45	122	230	1.89.x	25	7
70	10,0	15	1,5	20	2,6	6,5	55	122	320	1.92.x	25	6
Urms = 330V					Un AC = 470V		Un DC = 560V			Us = 1120V		
1	5,0	8	0,1	50	11,7	3,5	25	60	40	2.03.x	250	6
2	6,0	9	0,2	70	10,4	3,5	30	53	50	2.12.x	200	7
5	7,0	11	0,3	50	7,8	4,5	35	60	80	2.39.x	125	6
10	8,0	12	0,5	45	5,8	5,0	40	72	100	2.49.x	100	6
15	8,5	13	0,5	30	4,5	5,5	40	98	140	2.58.x	50	7
20	9,0	14	0,7	30	3,9	5,5	45	98	180	2.68.x	50	6
25	10,0	15	0,6	20	3,3	6,0	45	122	220	2.75.x	25	7
35	10,0	15	0,8	20	2,9	6,5	50	122	270	2.88.x	25	7
50	10,0	15	0,8	15	2,4	6,5	55	132	350	2.94.x	25	6
60	10,0	15	1,0	15	2,1	7,0	60	137	430	2.98.x	25	6
Urms = 450V					Un AC = 640V		Un DC = 700V			Us = 1400V		
1	5,0	8	0,1	50	11,7	3,5	25	60	40	3.08.x	250	6
2	6,5	10	0,1	50	9,4	4,0	30	60	50	3.29.x	200	6
5	8,0	12	0,2	45	5,8	5,0	40	72	100	3.47.x	100	6
10	8,5	13	0,3	30	4,5	5,5	40	98	140	3.58.x	50	7
15	10,0	15	0,3	20	3,3	6,0	45	122	220	3.77.x	25	7
20	10,0	15	0,4	20	2,9	6,5	50	122	270	3.88.x	25	7
25	10,0	15	0,4	15	2,4	6,5	55	132	350	3.92.x	25	6
30	10,0	15	0,5	15	2,4	6,5	55	132	360	3.95.x	25	6
35	10,0	15	0,6	15	2,1	7,0	60	137	430	3.97.x	25	6
40	10,0	15	0,7	15	2,1	7,0	60	137	440	3.99.x	25	6

(Cn) standard values, other values on request.

Code "x" : according to the mechanical configuration, see figures at page 11.

Box TYPE	*Standard box dimensions*
6	mm 195 x 390 x 255
7	mm 195 x 390 x 200

STUD	*Capacitor diameter*
M8	Ø 25 - 30 - 40 - 45 - 50
M12	Ø 55 - 60

GENERAL PURPOSE CAPACITORS

GP 42 Series

Cn [µF]	I_{MAX} [A]	I_{PK} C_w [A]	I_S [kA]	dV/dT_{max} [V/µs]	RT natural cooling [°C/W]	$Tan\delta_{MAX}$ @50Hz [10^{-4}]	Ø [mm]	H [mm]	Weight [g]	Part. n. 416.42.	Pcs. X box	Box type
Urms = 525V					Un AC = 740V		Un DC = 840V			Us = 1680V		
1	7,0	11	0,1	60	6,3	3,0	30	98	70	4.10.x	125	6
2	7,0	11	0,1	60	5,2	3,0	30	98	80	4.15.x	125	6
5	8,5	13	0,3	60	4,5	3,5	40	98	140	4.33.x	50	7
10	9,5	14	0,7	60	3,5	4,0	50	98	220	4.58.x	25	7
15	10,0	15	0,7	40	2,4	4,5	55	135	360	4.63.x	25	6
20	10,0	15	0,9	40	2,4	4,5	55	135	370	4.68.x	25	6
25	10,0	15	1,1	40	2,1	5,0	60	135	420	4.78.x	25	6
35	10,0	15	1,0	25	1,7	5,5	60	181	560	4.88.x	25	6
Urms = 690V					Un AC = 980V		Un DC = 1120V			Us = 2240V		
0,68	7,0	11	0,1	60	6,3	3,0	30	98	80	6.12.x	125	6
1	7,0	11	0,1	60	6,3	3,0	30	98	90	6.15.x	125	6
2	8,0	12	0,1	60	5,2	3,0	35	98	110	6.23.x	50	7
5	9,5	14	0,3	60	3,5	4,0	50	98	220	6.51.x	25	7
8	10,0	15	0,4	40	2,4	4,5	55	135	360	6.62.x	25	6
10	10,0	15	0,4	40	2,4	4,5	55	135	370	6.68.x	25	6
15	10,0	15	0,7	40	2,1	5,0	60	135	420	6.78.x	25	6
20	10,0	15	0,6	25	1,7	5,5	60	181	560	6.88.x	25	6
Urms = 930V					Un AC = 1320V		Un DC = 1400V			Us = 2800V		
0,68	8,5	13	0,1	60	3,9	3,0	40	115	160	9.10.x	50	7
1	8,5	13	0,1	60	3,9	3,0	40	115	170	9.14.x	50	7
2	8,5	13	0,1	60	3,9	3,0	40	115	190	9.18.x	50	7
5	10,5	16	0,3	60	2,7	4,0	55	115	300	9.49.x	25	6
8	12,0	18	0,4	40	2,0	4,5	60	150	470	9.61.x	25	6
10	14,0	21	0,4	40	1,8	5,0	65	150	550	9.75.x	20	6
12	16,0	24	0,5	35	1,7	5,5	65	165	600	9.85.x	15	6
14	16,0	24	0,5	35	1,7	5,5	65	165	620	9.89.x	15	6

(Cn) standard values, other values on request.

Code "x" : according to the mechanical configuration, see figures at page 11.

Box TYPE	*Standard box dimensions*
6	mm 195 x 390 x 255
7	mm 195 x 390 x 200

STUD	*Capacitor diameter*
M8	Ø 25 - 30 - 40 - 45 - 50
M12	Ø 55 - 60

GP 42 Series

Mechanical Solutions

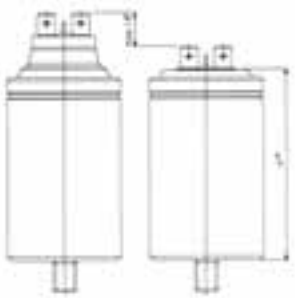
A solution
Urms ⩽690V

B solution
Urms = 930V

Over pressure safaty device

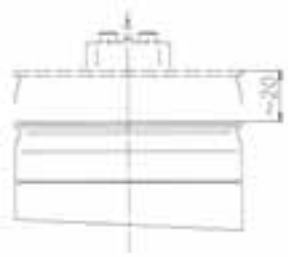
A solution

Overpressure safety device
In order to ensure proper device operation, when the capacitor is installed, e clearance of at least 10mm must be left above terminals.

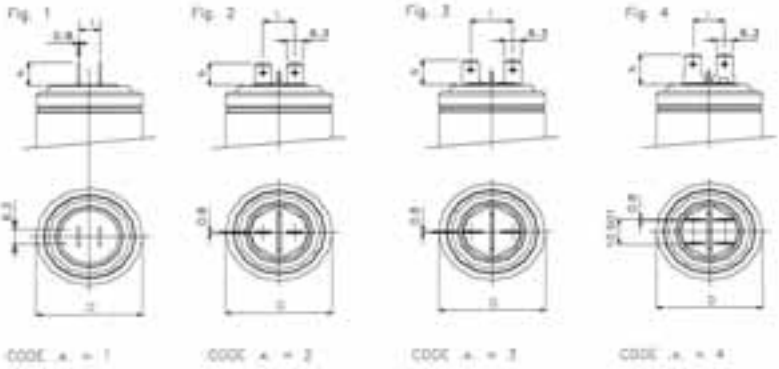


B solution

Overpressure safety device
In order to ensure proper device operation, when the capacitor is installed, e clearance of at least 20mm must be left above terminals.



Plastic cover configurations - only for A solutions



ØD Cap (mm)	Fig.1 h (mm)	Fig.1 l (mm)	Fig.2 h (mm)	Fig.2 l (mm)	Fig.3 h (mm)	Fig.3 l (mm)	Fig.4 h (mm)	Fig.4 l (mm)
25	10.9	8						
30	10.9	8	9	12				
35			9	12			12.2	12
40			9	12	10	16	12.2	12
45			9	12	10	16	12.2	12
50			9	12	10	16	12.2	12
55			9	12	10	16	12.2	12
60			8.9	15.5			12	20.5

GENERAL PURPOSE CAPACITORS

GP 84 Series

Rated AC Voltage	250÷930V
Range capacitance	10÷600 µF
Capacitance tollerance	±5% / ±10%
Max. rms current	80 A
Series resistance (R_s)	< 8 mΩ
Thermal resistence natural cooling (R_{THc})	< 3,0 °C/W
Max. voltage raise of rise (dV/dT)	⩽ 100 V/µs
Terminals	M6 or M10 screw-type bolts or double tag 6,3 x 0,8 mm.
Working temperature	-40 / + 70 °C
Storage temperature	-40 / + 85 °C
Test voltage	U_{tc}= 3 kVac / 6kVac @50Hz 10s U_{tt}= 1,5 x Un dc 10s
Filling	Dry polyurethane resin
Dielectric	Metallized PPMh film
Cylindrical case	Aluminum
Life expectancy	100.000h (*)
Failure quota	300/10E9
Reference standard	IEC 1071-1/2; UL 810
UL-CSA approved ( )	File n. E192559 (**)
Integrated overpressure protection	
M12 Theaded fixing bolt	10 Nm
Maxinum fixing torque for M6 terminals	3 Nm
Maxinum fixing torque for M10 terminals	6 Nm (***)

(*) Life Derating at operating voltage (according to the chart on page 4)

Life expectancy	4.16.84.2xxx Series	4.16.84.3xxx Series	4.16.84.4xxx Series	4.16.84.5xxx Series	4.16.84.6xxx Series	4.16.84.9xxx Series
100.000 h (rated)	*250 V*	*330 V*	*450 V*	*525 V*	*690 V*	*930*
50.000 h	275 V	360 V	500 V	575 V	760 V	1025 V
25.000 h	300 V	400 V	540 V	630 V	830 V	1120 V
12.500 h	330 V	450 V	600 V	690 V	930 V	1250 V

(**) UL Approved for A, B and C solution (excepted series 690V - 930V solution A).
(***) To avoid breaking, complete the tighten of the nuts using two wrenches.

GP 84 Series

Cn [µF]	I_{MAX}* [A]	I_{PK} C_W [A]	I_{PK} I_W [kA]	I_S [kA]	R_{TCH} [°C/W]	L_{ESR} [nH]	$Tan\delta_{MAX}$ @50Hz [10^{-4}]	Ø [mm]	H [mm]	Weight [g]	Mechanical solution	Part. n. 416.84.	Pcs. X box	Box type
Urms = 250V							Un ac = 350V			Un dc =490V		Us=950V		
60	22	33	1,7	9	2,7	130	5,0	55	115	300	A / C	2.1x.0	28	1
80	22	33	1,7	9	2,7	130	5,0	55	115	340	A / C	2.1x.0	28	1
100	25	38	1,9	11	2,2	160	5,0	55	150	370	A / C	2.2x.0	21	1
120	25	38	1,9	11	2,2	160	5,0	55	150	390	A / C	2.2x.0	21	1
150	32	48	2,4	13	2,0	160	5,5	60	150	450	A / C	2.3x.0	18	1
175	36	54	2,7	16	1,8	170	6,0	65	150	520	A / C	2.4x.0	16	1
200	38	57	2,9	12	1,7	180	6,5	65	165	580	A / C	2.5x.0	16	1
230	40	60	3,0	20	1,3	200	7,0	75	180	820	B	2.6x.0	6	2
250	40	60	3,0	20	1,3	200	7,0	75	180	830	B	2.6x.0	6	2
300	40	60	3,0	20	1,3	200	7,0	75	180	860	B	2.6x.1	6	2
350	45	68	3,4	20	1,1	210	7,5	85	180	980	B	2.7x.1	6	2
400	45	68	3,4	20	1,1	210	7,5	85	180	1050	B	2.7x.1	6	2
500	78	117	5,9	20	0,9	230	8,5	90	210	1400	B	2.9x.1	6	3
600	80	120	6,0	18	0,8	300	9,0	85	280	1700	B	2.9x.1	6	4
Urms = 330V							Un ac = 470V			Un dc =600V		Us=1150V		
50	22	33	1,7	7	2,7	160	5,0	55	115	320	A / C	3.1x.0	28	1
80	26	39	2,0	8	2,2	160	6,0	55	150	390	A / C	3.2x.0	21	1
100	26	39	2,0	8	2,2	160	6,0	55	150	400	A / C	3.2x.0	21	1
120	30	45	2,3	10	2,0	160	6,0	60	150	460	A / C	3.3x.0	18	1
150	34	51	2,6	13	1,8	170	6,5	65	150	540	A / C	3.4x.0	16	1
175	38	57	2,9	10	1,7	180	7,0	65	165	600	A / C	3.5x.0	16	1
200	40	60	3,0	14	1,3	200	7,5	75	180	860	B	3.6x.1	6	2
250	40	60	3,0	14	1,3	200	7,5	75	180	860	B	3.6x.1	6	2
300	45	68	3,4	18	1,1	210	7,5	85	180	1100	B	3.7x.1	6	2
350	70	105	5,3	16	1,0	230	8,0	85	210	1350	B	3.8x.1	6	3
400	75	113	5,6	18	0,9	230	8,5	90	210	1450	B	3.9x.1	6	3
450	80	120	6,0	13	0,8	300	9,0	85	280	1750	B	3.9x.1	6	4
Urms = 450V							Un ac = 630V			Un dc =825V		Us=1600V		
20	20	30	1,5	4	2,7	130	5,0	55	115	250	A / C	4.0x.0	28	1
30	20	30	1,5	4	2,7	130	5,0	55	115	300	A / C	4.0x.0	28	1
40	24	36	1,8	4,5	2,2	160	6,0	55	150	370	A / C	4.1x.0	21	1
50	24	36	1,8	4,5	2,2	160	6,0	55	150	400	A / C	4.1x.0	21	1
70	28	42	2,1	6,8	1,8	170	6,5	65	150	530	A / C	4.3x.0	16	1
80	28	42	2,1	6,8	1,8	170	6,5	65	150	550	A / C	4.3x.0	16	1
90	32	48	2,4	5,2	1,7	180	7,0	65	165	590	A / C	4.4x.0	16	1
100	38	57	2,9	7,4	1,3	200	7,5	75	180	860	B	4.5x.1	6	2
150	42	63	3,2	9,9	1,1	210	8,0	85	180	1100	B	4.6x.1	6	2
200	70	105	5,3	9,7	0,9	230	8,5	90	210	1450	B	4.8x.1	6	3
250	75	113	5,6	7,9	0,8	300	9,0	85	280	1710	B	4.9x.1	6	4
300	78	117	5,9	9,1	0,7	300	9,0	90	280	1920	B	4.9x.1	6	4

(Cn) standard values, other values on request.

Code "x": internal reference.

(*) The maximum rms current is referring to A or B solutions. Imax ⩽ 16A for C solution.

Box TYPE	*Standard box dimensions*
1	mm 250 x 386 x 190
2	mm 190 x 285 x 265
3	mm 190 x 285 x 325
4	mm 190 x 285 x 375
5	mm 335 x 220 x 375

GENERAL PURPOSE CAPACITORS

GP 84 Series

Cn [µF]	I_{MAX}* [A]	I_{PK} C_W [A]	I_{PK} I_W [kA]	I_S [kA]	R_{TCH} [°C/W]	L_{ESR} [nH]	Tanδ_{MAX} @50Hz [10^{-4}]	Ø [mm]	H [mm]	Weight [g]	Technical solution	Part. n. 416.84.	Pcs. X box	Box type
Urms = 525V							Un ac = 750V			Un dc =940V		Us=1800V		
20	18	27	1,4	2,9	2,7	130	5,0	55	115	300	A / C	5.0x.0	28	1
30	20	30	1,5	3,3	2,2	160	5,5	55	150	350	A / C	5.1x.0	21	1
40	20	30	1,5	3,3	2,2	160	5,5	55	150	390	A / C	5.1x.0	21	1
50	22	33	1,7	4,1	2,0	160	6,0	60	150	460	A / C	5.2x.0	18	1
70	26	39	2,0	3,9	1,7	180	7,0	65	165	590	A / C	5.4x.0	16	1
80	34	51	2,6	5,3	1,3	200	7,5	75	180	820	B	5.5x.1	6	2
100	38	57	2,9	7,2	1,1	210	8,0	85	180	950	B	5.6x.1	6	2
125	38	57	2,9	7,2	1,1	210	8,0	85	180	1050	B	5.6x.1	6	2
150	70	105	5,3	5,7	0,8	300	8,5	85	280	1550	B	5.8x.1	6	4
200	70	105	5,3	5,7	0,8	300	8,5	85	280	1700	B	5.8x.1	6	4
250	76	114	5,7	8,3	0,6	320	9,0	100	280	2100	B	5.9x.1	6	5
300	76	114	5,7	8,3	0,6	320	9,0	100	280	2400	B	5.9x.1	6	5
Urms = 690V							Un ac = 990V			Un dc =1350V		Us=2600V		
10	20	30	1,0	1,8	2,2	160	5,0	55	150	310	A / C	6.0x.0	21	1
15	20	30	1,0	1,8	2,2	160	5,0	55	150	350	A / C	6.0x.0	21	1
20	22	33	1,1	2,8	1,8	170	5,0	65	150	500	A / C	6.1x.0	16	1
30	26	39	1,3	2,9	1,7	180	5,0	65	165	560	A / C	6.2x.0	16	1
40	30	45	1,5	4,0	1,3	200	5,5	75	180	780	B	6.3x.1	6	2
50	30	45	1,5	4,0	1,3	200	5,5	75	180	850	B	6.3x.1	6	2
70	34	51	1,7	4,9	1,0	210	6,0	85	210	1150	B	6.5x.1	6	3
85	36	54	1,8	5,5	0,9	220	6,5	90	210	1400	B	6.6x.1	6	3
100	38	57	1,9	7,1	0,8	220	7,0	100	210	1680	B	6.7x.1	6	5
125	40	60	2,0	4,2	0,7	300	7,5	90	280	1860	B	6.8x.1	6	4
150	45	68	2,3	5,3	0,6	300	8,0	100	280	2150	B	6.9x.1	6	5
175	45	68	2,3	5,3	0,6	300	8,0	100	280	2360	B	6.9x.1	6	5
Urms = 930V							Un ac = 1300V			Un dc =1700V		Us=3250V		
10	18	27	0,9	1,2	2,2	160	4,5	55	150	360	A / C	9.0x.0	21	1
15	20	30	1,0	1,8	1,8	170	4,7	65	150	480	A / C	9.1x.0	16	1
20	22	33	1,1	1,8	1,7	180	5,0	65	165	550	A / C	9.2x.0	16	1
30	24	36	1,2	2,6	1,3	200	5,3	75	180	840	B	9.3x.1	6	2
35	28	42	1,4	2,3	1,1	210	5,5	75	210	980	B	9.4x.1	6	3
40	30	45	1,5	3,1	1,0	210	5,5	85	210	1150	B	9.5x.1	6	3
45	30	45	1,5	3,1	1,0	210	5,5	85	210	1220	B	9.5x.1	6	3
50	30	45	1,5	3,1	1,0	210	5,5	85	210	1280	B	9.5x.1	6	3
55	34	51	1,7	3,5	0,9	220	5,7	90	210	1380	B	9.6x.1	6	3
70	38	57	1,9	4,5	0,8	220	5,7	100	210	1720	B	9.7x.1	6	5
85	42	63	2,1	2,7	0,7	300	6,0	90	280	1840	B	9.8x.1	6	4
100	45	68	2,3	3,4	0,6	300	6,5	100	280	2250	B	9.9x.1	6	5

(Cn) standard values, other values on request.

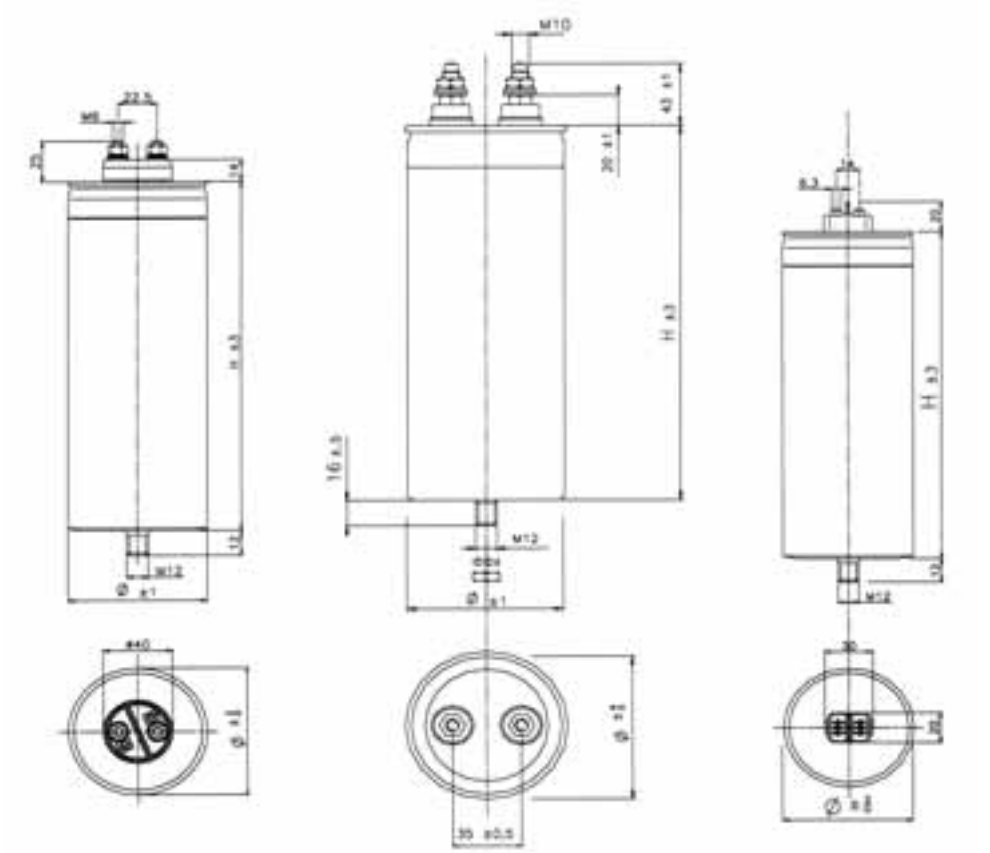
Code "x": internal reference.

(*) The maximum rms current is referring to A or B solutions. Imax ⩽ 16A for C solution.

Box TYPE	*Standard box dimensions*
1	mm 250 x 386 x 190
2	mm 190 x 285 x 265
3	mm 190 x 285 x 325
4	mm 190 x 285 x 375
5	mm 335 x 220 x 375

GP 84 Series

Mechanical Configurations



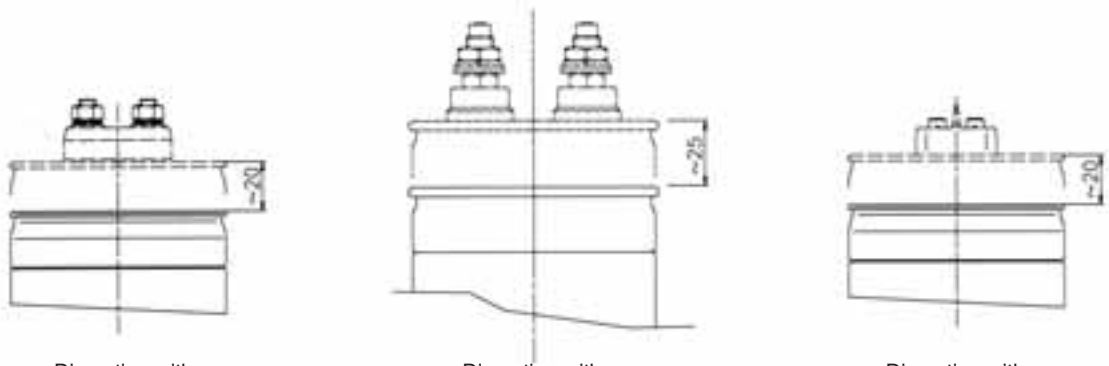
A solution
M6 Screw-type bolts

B solution
M10 Screw-type bolts

C solution
Double tag 6,3x0,8 mm

Overpressure safety device

In order to ensure proper device operation, when the capacitor is installed,
e clearance of at least the values given on drawing below must be left above terminals.



Dimention with overpressure device activated

Dimention with overpressure device activated

Dimention with overpressure device activated

DC 85 SERIES - *DC-link capacitor*

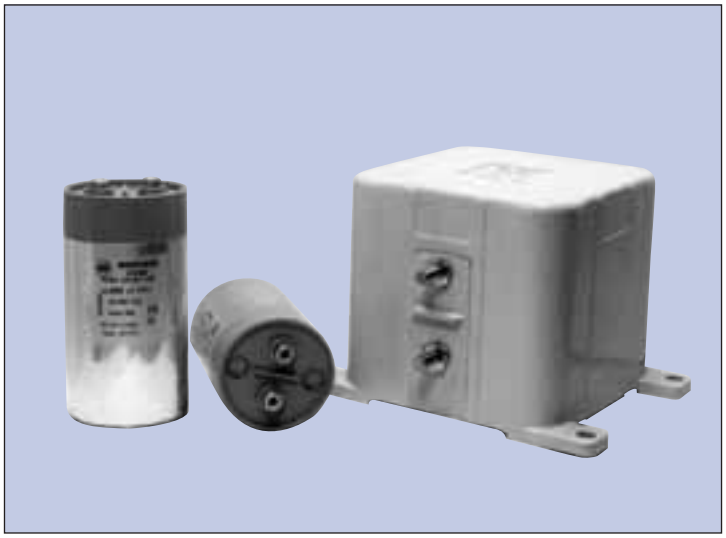
Capacitors for power inverter in railway, welding and special applications by energy storage and filtering.

FEATURES

- Plastic and steel case/can
- Dry type
- Internal thread or screw type bolts terminals
- DC voltage

TYPICAL APPLICATIONS

- Traction and railway filtering
- DC filtering
- Welding
- Special inverter



GENERAL CHARACTERISTICS	
Rated DC voltage	**DC 750÷4000V (*)**
Range capacitance	**60÷2250 µF (*)**
Capacitance tolerance	**+0% - 15%**
Test voltage between terminals	**2xUn 10s**
Test voltage between terminals and case	**3KVac 50Hz - 10s**
Terminals	**2 x M6 internal threads or 2 x M10 screw-type bolts**
Operating Temperature	**-25 / +75 °C**
Protection degree	**IP 00**
Filling	**Self-extinguishing (V0) polyurethane resin**
Dielectric	**Self healing MKP dielectric with high performances (PPMd)**
Case	**Cylindrical aluminum case or self-extinguishing (V0) plastic box**
Life expectancy	**100.000h**
Installation	**Vertical / horizontal**
Reference standard	**Standards IEC 1071-1/2; IEC 1881; UL 810**
Approvals	**UL-CSA**

(*) Standard values, other values on request

DC CAPACITORS

DC 85 C SERIES: Dc - Link Capacitors on cylindrical can

Maximum rated DC Voltage	1800 V
Maximum ripple voltage	1150 V
Maximum ripple current	100 A
Range capacitance	Up to 1750 µF
Capacitance Tollerance	+0 -15%
Series resistance (R_S)	< 4 mΩ
Maxinum Voltage raise of rise (dV/dT)	⩽ 40 V/µs
Terminals	M6 internal threads M8 screw types bolts
Voltage test	U_{tc}= 3 kVac @50Hz 10s U_{tt}= 2 x Un dc 10s
Climatic Ambient Temperature	-25 / + 45 °C
Operating temperature (θ_{MIN} – θ_{MAX})	-25 / + 75 °C
Storage temperature	-25 / + 85 °C
Filling	Dry polyurethane resin
Dielectric	Self healing PPMd film
Cylindrical case	Aluminum
Failure quota	300/10E9
Life expectancy	100.000h
Maximum altitude	2000m a.s.l.
Reference standard	IEC 1071-1/2 IEC 1881 UL 810
Approvals	UL-CSA
Driving tourque for M6 Internal thread terminals	3 Nm
Driving tourque for M8 screw type bolts terminals	6 Nm
Driving tourque for M12 fixing bolt	12 Nm

Safety system: This capacitors are designed with a particular type of polypropylene metalized film (PPMd film) that assure an open circuit at the end of life, if the service is within the specification.

DC 85 C Series

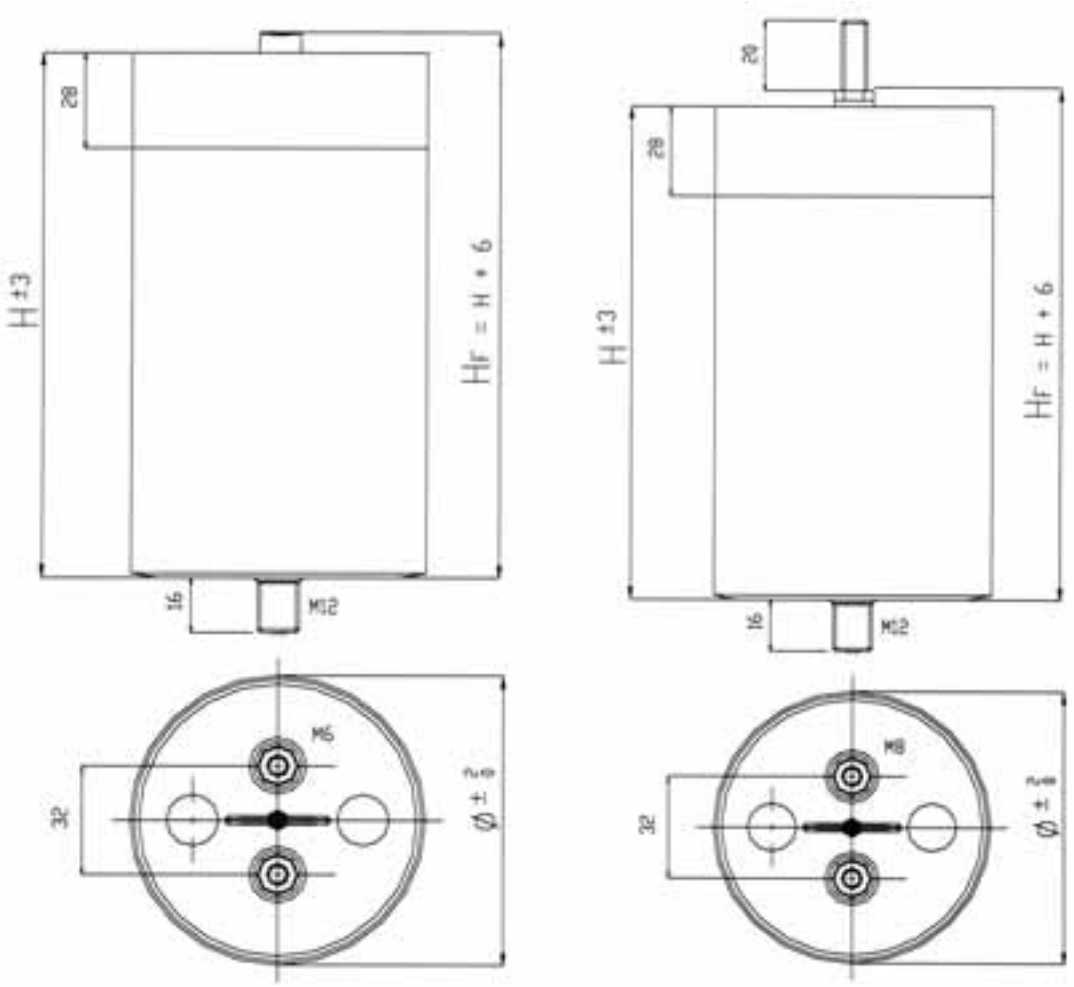
Cn [uF]	I_{MAX} [A]	I_{PK} C_W [A]	R_{THC} [°C/W]	L_{ESR} [nH]	$Tan\delta_{MAX}$ @50Hz [10^{-4}]	Ø [mm]	H [mm]	Weight [g]	Part. n. 416.85.	Pcs. X box	Box type
Un DC = 900 V						Ur = 550 V		Us = 1900 V			
160	35	53	2,5	50	5	75	105	510	110.x	12	8
250	35	53	2,5	50	6	75	105	510	115.x	12	8
400	40	60	2	60	8	75	140	680	130.x	6	9
500	40	60	1,7	65	9	85	140	870	140.x	6	9
600	40	60	1,6	65	11	85	155	970	160.x	6	9
1000	80	120	1,1	70	12	100	185	1590	170.x*	6	10
1500	80	120	0,9	80	15	100	255	2190	180.x*	6	11
1750	80	120	0,8	90	18	100	285	2450	190.x*	6	12
Un DC = 1100 V						Ur = 700 V		Us = 2300 V			
120	35	53	2,5	50	5	75	105	510	210.x	12	8
200	40	60	2	60	6	75	140	680	220.x	6	9
370	40	60	1,7	65	8	85	140	870	230.x	6	9
410	40	60	1,6	65	8	85	155	970	240.x	6	9
700	80	120	1,1	70	12	100	185	1590	260.x*	6	10
1000	80	120	0,9	80	13	100	255	2190	270.x*	6	11
1200	80	120	0,8	90	15	100	285	2450	280.x*	6	12
1600	100	150	0,6	100	17	100	365	3140	290.x*	6	13
Un DC = 1300 V						Ur = 850 V		Us = 2700 V			
100	35	53	2,5	50	4	75	105	510	310.x	12	8
180	40	60	2	60	5	75	140	680	320.x	6	9
250	40	60	1,7	65	6	85	140	870	330.x	6	9
300	40	60	1,6	65	7	85	155	970	340.x	6	9
470	80	120	1,1	70	9	100	185	1590	350.x*	6	10
700	80	120	0,9	80	12	100	255	2190	360.x*	6	11
820	80	120	0,8	90	13	100	285	2450	370.x*	6	12
1000	100	150	0,6	100	16	100	365	3140	399.x*	6	13
Un DC = 1550 V						Ur = 990 V		Us = 3250 V			
85	35	53	2,5	50	4	75	105	510	410.x	12	8
140	40	60	2	60	5	75	140	680	420.x	6	9
185	40	60	1,7	65	5	85	140	870	430.x	6	9
200	40	60	1,6	65	6	85	155	970	440.x	6	9
350	80	120	1,1	70	7	100	185	1590	450.x*	6	10
500	80	120	0,9	80	9	100	255	2190	460.x*	6	11
600	80	120	0,8	90	11	100	285	2450	480.x*	6	12
750	100	150	0,6	100	12	100	365	3140	499.x*	6	13
Un DC = 1800 V						Ur = 1150 V		Us = 3800 V			
60	35	53	2,5	50	4	75	105	510	510.x	12	8
100	40	60	2	60	4	75	140	680	520.x	6	9
135	40	60	1,7	65	5	85	140	870	530.x	6	9
150	40	60	1,6	65	5	85	155	970	540.x	6	9
240	80	120	1,1	70	6	100	185	1590	550.x*	6	10
360	80	120	0,9	80	8	100	255	2190	560.x*	6	11
420	80	120	0,8	90	8	100	285	2450	580.x*	6	12
550	100	150	0,6	100	10	100	365	3140	599.x*	6	13

(Cn) standard values, other values on request.
Code "x" according to the terminal type: x = 0 --> A SOLUTION - x = 1 --> B SOLUTION.
(*) Availability to be confirmed.

Box TYPE	*Standard box dimensions*
8	mm 190 x 285 x 280
9	mm 190 x 285 x 200
10	mm 220 x 335 x 265
11	mm 220 x 335 x 325
12	mm 220 x 335 x 375
13	mm 220 x 335 x 450

DC 85 C Series

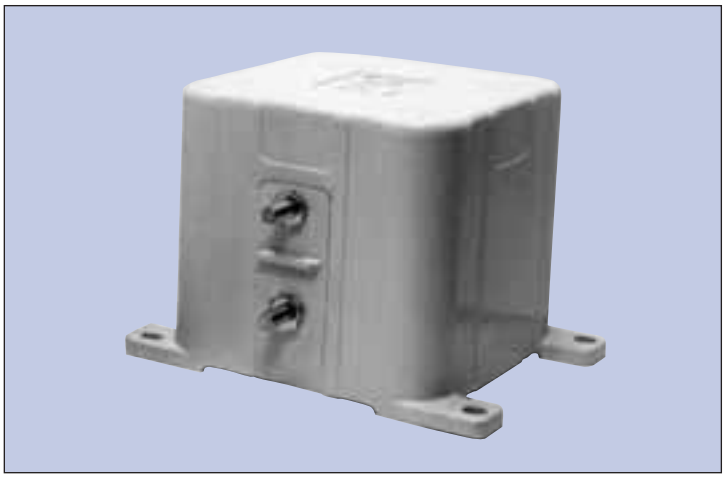
Mechanical Configurations



A solution
Internal Thread M6

B solution
M8 Screw-type bolts

DC CAPACITORS



DC 85 B SERIES: Dc - Link Capacitors on cubic box

Maximum rated DC Voltage	4000 V
Maximum ripple voltage	2500 V
Maximum ripple current	120 A
Range capacitance	Up to 2250 µF
Capacitance Tollerance	+0 -15%
Series resistance (RS)	< 5 mΩ
Thermal resistence natural cooling (R_{THc})	2,0 °C/W
Equivalent series inductance (L_{ESR})	< 35 nH
Terminals	M10 screw-type bolts
Voltage test	U_{tc}= 3 kVac @50Hz 10s U_{tt}= 2 x Un dc 10s
Climatic Ambient Temperature	-25 / + 45 °C
Operating temperature (θ_{MIN} – θ_{MAX})	-25 / + 75 °C
Storage temperature	-25 / + 85 °C
Filling	Self-extinguishing (UL94 V0) polyurethane resin
Dielectric	Self healing PPMd film
Container	Self-extinguishing (UL94 V0) plastic box
Failure quota	300/10E9
Life expectancy	100.000h
Maximum altitude	2000m a.s.l.
Reference standard	IEC 1071-1/2 IEC 1881 UL 810
Approvals	UL-CSA
Driving tourque for M10 screw-type bolts	6 Nm
Driving tourque for fixing bolt	15 Nm

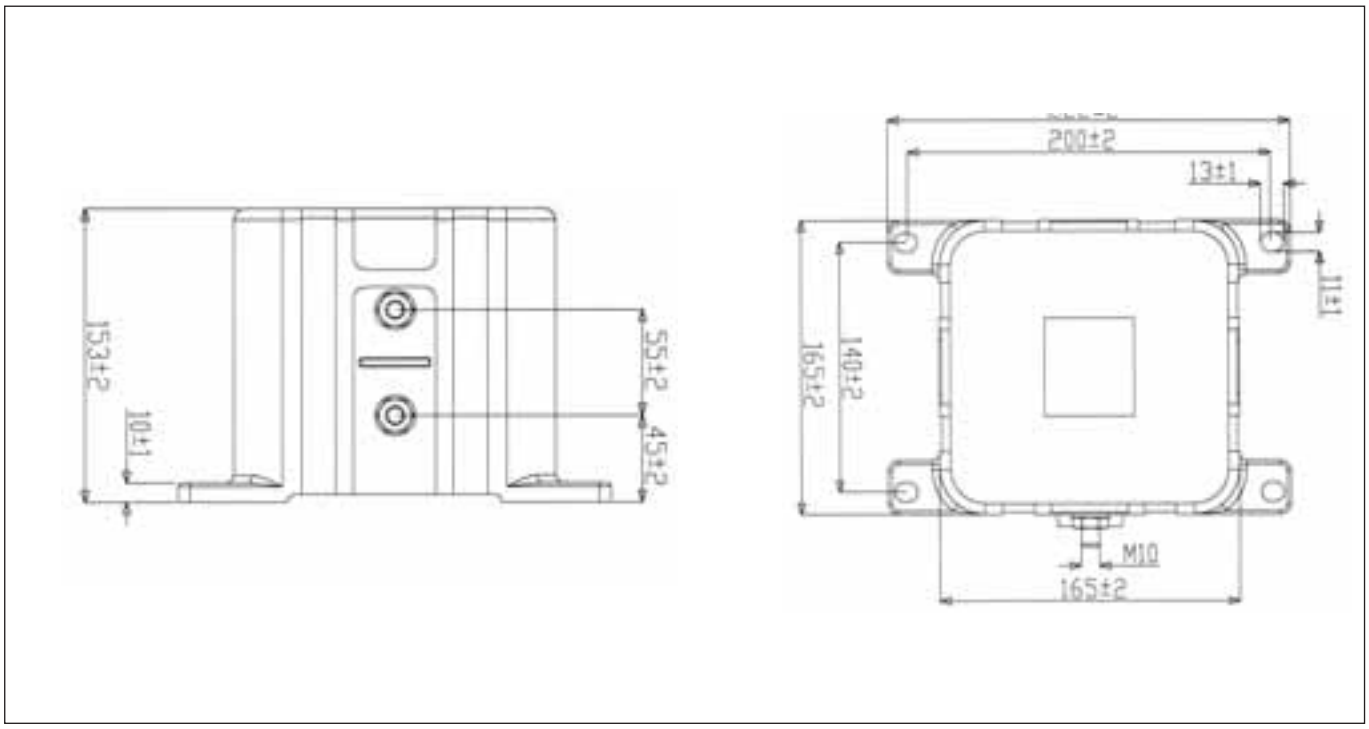
Safety system: This capacitors are designed with a particular type of polypropylene metalized film (PPMd film) that assure an open circuit at the end of life, if the service is within the specification.

DC 85 B Series

Cn [uF]	Un DC [V]	Ur [V[	I_{MAX} [A]	I_{PK} C_W [A]	U_S [V]	dV/dT [V/µs]	$Tan\delta_{MAX}$ @50Hz [10^{-4}]	Weight [kg]	Part. n. 416.85.
2000	750	500	120	180	1600	6	16	5,0	050.5
2250	750	500	120	180	1600	5	17	4,5	090.5
1300	900	550	120	180	1900	10	11	5,0	150.5
1500	900	550	120	180	1900	8	12	4,5	190.5
900	1100	700	120	180	2300	15	9	5,0	250.5
1200	1100	700	120	180	2300	10	11	4,5	290.5
650	1250	850	120	180	2600	20	9	5,0	350.5
1000	1250	850	120	180	2600	15	12	4,5	390.5
500	1450	950	120	180	3000	25	8	5,0	450.5
750	1450	950	120	180	3000	20	10	4,5	490.5
350	1800	1150	120	180	3800	35	7	5,0	550.5
420	1800	1150	120	180	3800	30	8	4,5	590.5
220	2200	1550	80	120	4600	60	6	5,0	650.5
280	2200	1550	80	120	4600	40	7	4,5	690.5
150	2800	1700	80	120	5300	80	5	5,0	750.5
180	2800	1700	80	120	5300	70	6	4,5	790.5
55	4000	2500	60	90	8500	220	5	5,0	850.5
80	4000	2500	60	90	8500	150	6	4,5	890.5

(Cn) standard values, other values on request.

Box TYPE	
Standard box dimensions	mm 450 x 470 x 220
No. pieces x box:	4



DC CAPACITORS

Power Storage Capacitors

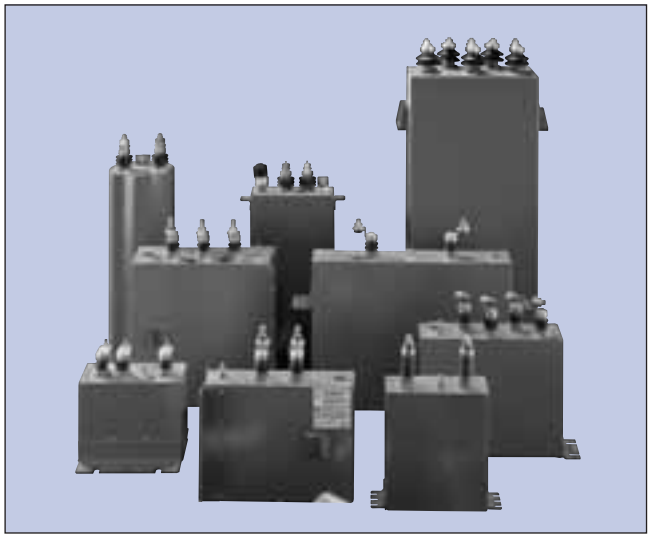
Capacitors for filtering in locomotive, traction applications and welding machine by capacitance discharge with high capacitance and high voltage

FEATURES

- Steel case
- Impregnated
- Screw type bolts
- DC voltage

TYPICAL APPLICATIONS

- Traction filtering
- Welding machines



GENERAL CHARACTERISTICS	
Rated voltage	**DC 800÷5000V (*)**
Range capacitance	**100÷5000 µF (*)**
Capacitance tolerance	**±5% ; ±10%**
Test voltage between terminals	**1,5Un 10s**
Test voltage between terminals and case	**2 Un 50Hz 60s**
Terminals	**Bushings**
Ambient operating temperature	**-25 / + 55 °C**
Protection degree	**IP 00**
Filling	**Castor oil**
Dielectric	**Mosaic metallized polypropylene**
Case	**Steel**
Life expectancy	**100.000h**
Installation	**Vertical / horizontal**
Reference standard	**IEC 1071-1/2; IEC 1881; UL 810**

(*) Standard values, other values can be on specific

Example of filter capacitor:

CHARACTERISTICS

Rated Capacitance	1000 µF
Capacitance Tolerance	±10 %
Rated Voltage Un(DC)	3500 V
Rated Current (In)	300 A
Serial Inductance	≤ 300 nH
Tanδ	≤ 25 10-4 (50Hz, 20°C)

MAXIMUM RATINGS

Max Voltage	3600 V
Max Peak Current	5 kA
(du/dt)max	5 V/µs
Max Duty Cycle	1 discharge/1sec

TEST DATA

AC Test voltage terminal to terminal	5 kVac (2 sec)
AC test voltage terminal to case	7 kVac (50Hz 60sec)

CLIMATIC CATEGORY

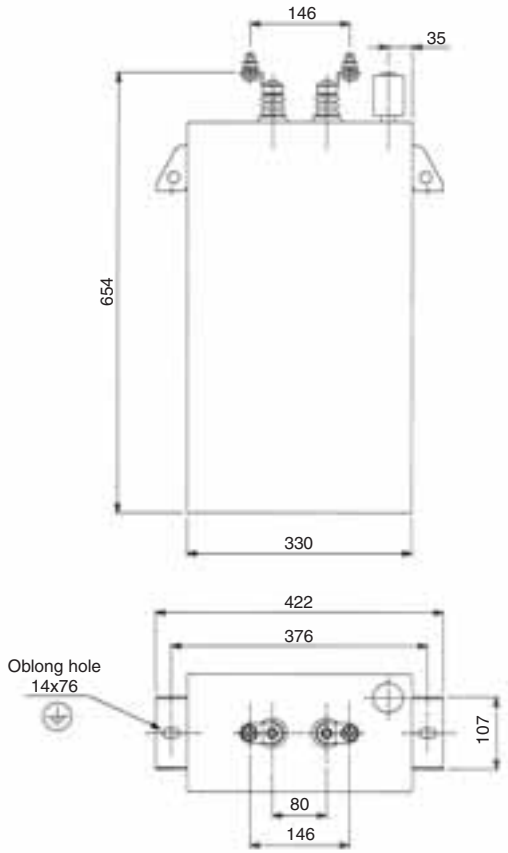
Operating Temperature	- 25 / + 55 °C

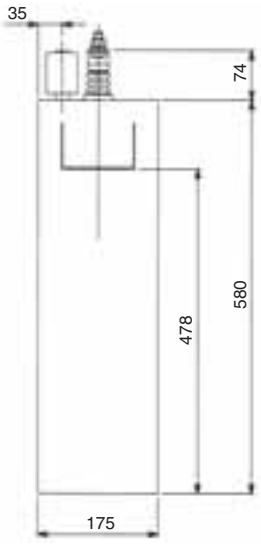
MECHANICAL CHARACTERISTICS

Dimensions	175x330x570 mm
Weight	<45 Kg
Case	Stainless steel
Painted case	
With Overpressure device	
Without discharge resistor	

TERMINALS AND INSULATION

Terminal	Z type
Material	Ceramic
Creepage distance	40 mm
Clearance	31 mm
Expected life	100000 h
Impregnation	Non polluting oil (NO PCB)





Example of filter capacitors:

CHARACTERISTICS

Rated Capacitance	3000 µF
Capacitance Tolerance	±5%
Rated Voltage Un(DC)	2200 V
Rated Current (In)	150 A
Serial Inductance	≤ 500 NH
Tanδ	≤ 20 10-4 (50Hz, 20°C)

MAXIMUM RATINGS

Max Voltage	2.9 KV
Max Peak Current	30 KA
(du/dt)max	10 V/µs

TEST DATA

AC Test voltage terminal to terminal	3.3 kVac (10 sec)
AC test voltage terminal to case	6 kVac (50Hz 60sec)

CLIMATIC CATEGORY

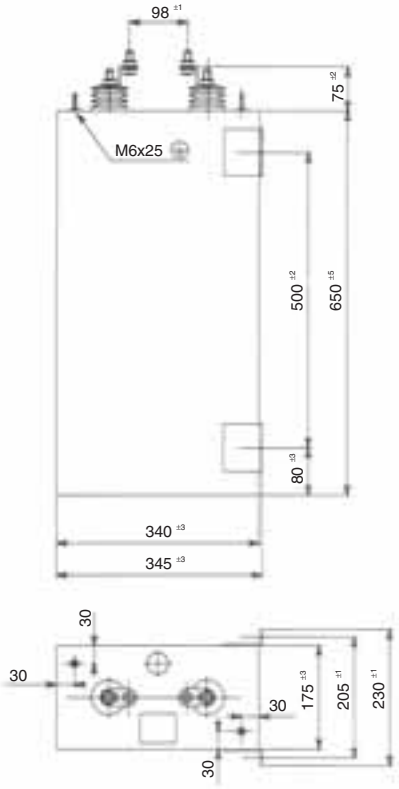
Operating Temperature	-25 / + 55 °C
Storage temperature	-55 / + 80 °C

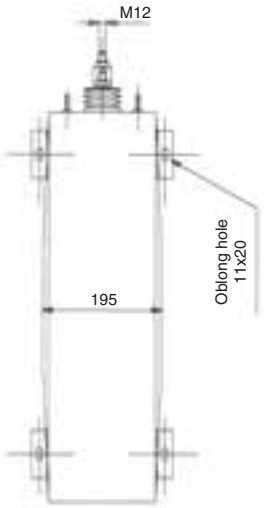
MECHANICAL CHARACTERISTICS

Dimensions	175x340x650 mm
Weight	<50 Kg
Case	Stainless steel
Painted case	
Without overpressure device	
Without discharge resistor	

TERMINALS AND INSULATION

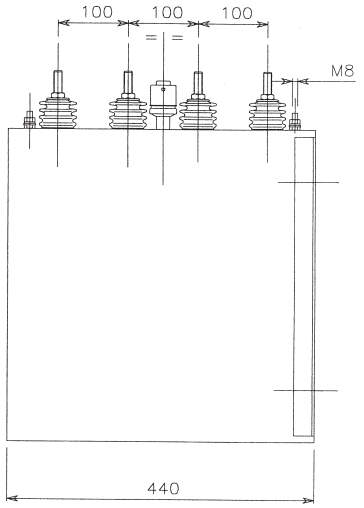
Terminal	Z type
Material	Ceramic
Creepage distance	85 mm
Clearance	50 mm
Expected life	100000 h
Impregnation	Non polluting oil (NO PCB)





DC APPLICATIONS

Example of filter capacitors:

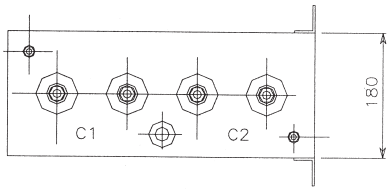


CHARACTERISTICS

Rated Capacitance	2 x 800 µF
Capacitance Tolerance	±4%
Rated DC Voltage (Un)	1000 V
Maximum Current (Imax)	2 x 210 A
Self-inductance	<300 nH
Typical tan d (10E-4)	<25 10-4 (Measure @ 50Hz)

MAXIMUM RATINGS

Over voltage	2300V
Maximum peak current	5 KA
Max. Voltage raise of rise (dV/dt)	10 V/µs
Maximum Duty Cycle	1 discharge/1 sec

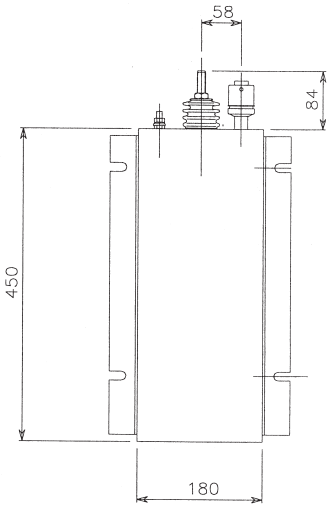


TEST DATA

DC Test voltage terminal to terminal	3500Vdc 60s
AC test voltage terminal to case	12Kvac 50Hz 60s

CLIMATIC CATEGORY

Min.operating temperature	-25 °C
Max. operating temperature	+70 °C
Storage temperature	-40 +85 °C

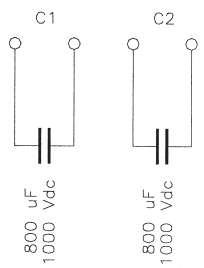


MECHANICAL CHARACTERISTICS

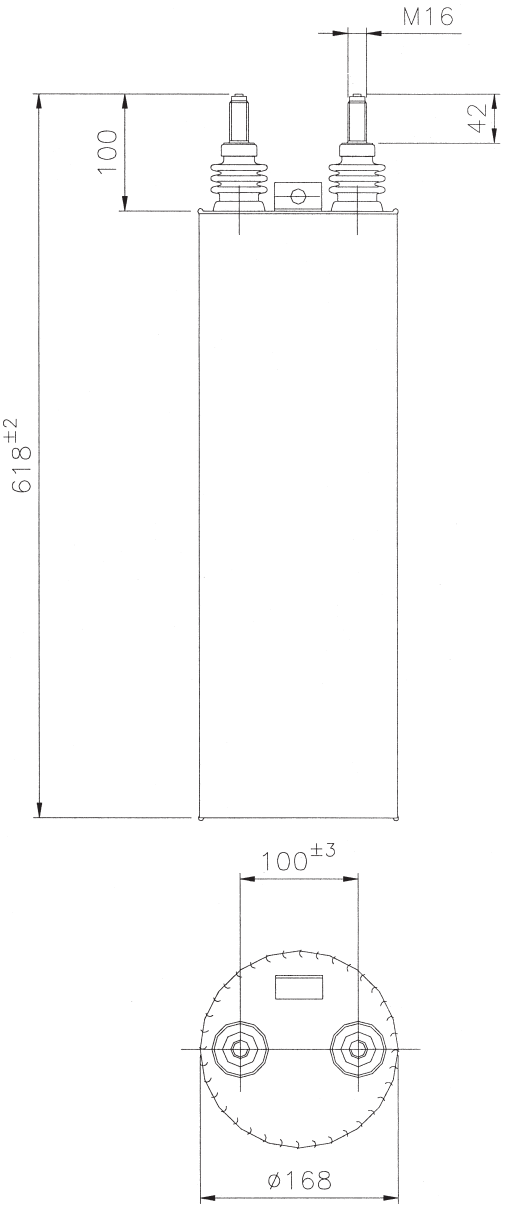
Dimensions	180 x 330 x 450
Weight	<46 Kg
Case	Stainless steel
With overpressure device	

TERMINALS AND INSULATION

Terminals	M12
Material	Ceramic
Expected life	100.000 h
Impregnation	Non polluting Oil (No PCB)



Example of filter capacitors:



CHARACTERISTICS

Rated Capacitance	3000 µF
Capacitance Tolerance	±10%
Rated DC Voltage (Un)	500 V
Maximum Current (Imax)	180 A
Self-inductance	<250 nH
Typical tan d (10E-4)	<15 10-4 (Measure @ 50Hz)

MAXIMUM RATINGS

Over voltage	1250V
Maximum peak current	6 KA
Max. Voltage raise of rise (dV/dt)	20 V/µs
Maximum Duty Cycle	2 discharge/1 sec

TEST DATA

DC Test voltage terminal to terminal	750Vdc 60s
AC test voltage terminal to case	9,5Kvac 50Hz 60s

CLIMATIC CATEGORY

Min.operating temperature	-25 °C
Max. operating temperature	+70 °C
Storage temperature	-40 +85 °C

MECHANICAL CHARACTERISTICS

Dimensions	168 x 618
Weight	<25 Kg
Case	Stainless steel

TERMINALS AND INSULATION

Terminals	M16
Material	Ceramic
Expected life	100.000 h
Impregnation	Non polluting Oil (No PCB)

Wind Turbine Capacitors

Metallized polypropylene three-phases capacitors for high voltage and high harmonics power factor correction applications.

FEATURES

- Aluminum case
- Dry resin
- Screw terminals
- AC voltage

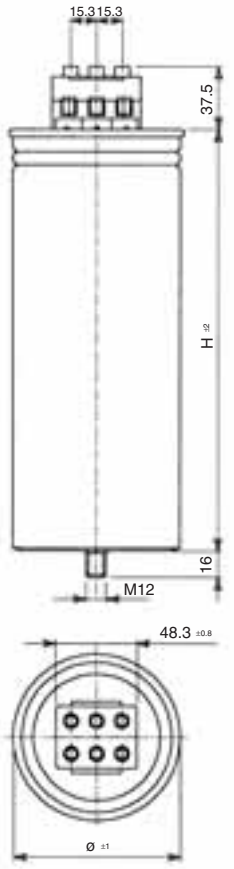
TYPICAL APPLICATIONS

- PFC with high voltage and high current harmonics

GENERAL CHARACTERISTICS	
Rated voltage	**AC 690÷880 V (*)**
Range power	**10÷30 kVAr (*)**
Capacitance tolerance	**±5% / ±10%**
Test voltage between terminals	**1,5Un 10s**
Test voltage between terminals and case	**6kV 10s**
Ambient operating temperature	**-25 / + 55°C**
Protection degree	**IP 20**
Filling	**Dry polyurethane resin**
Dielectric	**Metallized polypropylene film (HD)**
Case	**Aluminum**
Life expectancy	**100.000h**
Failure quota	**300/10E9**
Installation	**Vertical / horizontal**
Reference standard	**IEC 831-1/2; UL 810**
UL–CSA approved (**)**	**File n. E192559**

(*) Standard values, other values can be on specific

Example of wind turbine capacitor:



Fixing Stud: M12
Case materials: Aluminium

Ø (mm)	H (mm)
100 1	370 2

Maximum driving torque: 1,5 Nm

CHARACTERISTICS

Power	25,5 kVAr
Rated Capacitance	3x42.3 µF
Capacitance Tolerance	-5+10 %
Rated Voltage Un	800 V
Rated frequency	50 Hz
Rated Current (In)	18 A
Dielectric losses	⩽0.5 W/kVar
Connection	D
Insulating level	6/15 kV
Discharge resistor	none
Overpressure safety device	
Aluminum case	
Dry type	

MAXIMUM RATINGS

Overvoltage	1.1 Un 8 hours/day 1.15 Un 30 min/day 1.2 Un 5 min/200 times 1.3 Un 1 min/200 times
Overcurrent:	1.3 In
Inrush current:	100 In

TEST DATA

AC Test voltage terminal to terminal	1720 Vac (2 sec)
AC test voltage terminal to case	6000 Vac (10 sec)

CLIMATIC CATEGORY

Temperature class	-25/D (max 55°C)
Storage temperature	-40 +85°C
Failure quota	300/10E9
Expected life (Ln) (-25/C)	>100000h
Standards:	EN60831-1 EN60831-2
UL-CSA approval	File N° 192559
Degree of protection:	IP20 indoor mounting
Humidity category	in accord. with DIN 40040
Self-extinguishing	in accord. with UL 492
Vibration resistance	in accord. with EIA STAND. RS-186-7E

Total elongation is about 40 mm after the overpressure disconnector release.

AC CAPACITORS

High Voltage Capacitors

Paper and polypropylene for high AC voltage purpose capacitors for high voltage resonant applications.

FEATURES

- Aluminum case
- Impregnated
- Double faston or bolt terminals
- AC voltage

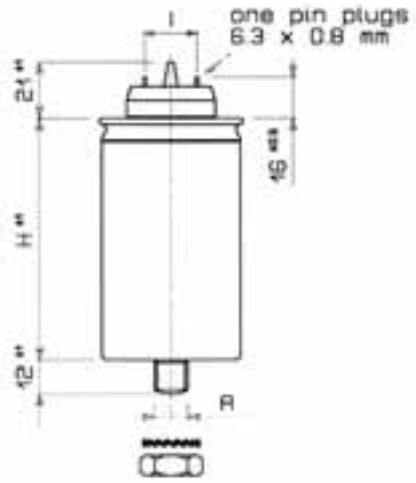
TYPICAL APPLICATIONS

- Microwave Oven
- High Voltage resonant circuit

GENERAL CHARACTERISTICS	
Rated voltage	**AC 1500 - 3000V (*)**
Range capacitance	**0,2÷10 µF (*)**
Capacitance tolerance	**±5% ; ±10%**
Test voltage between terminals	**1,5Un 10s**
Test voltage between terminals and case	**3kV 10s**
Terminals	**Double faston (6.3 x 0.8) or screws**
Ambient operating temperature	**-35 / + 70 °C**
Protection degree	**IP 00**
Filling	**Dielectric oil**
Dielectric	**Paper-film**
Case	**Aluminum**
Life expectancy	**30.000h**
Failure quota	**300/10E9**
Installation	**Vertical / horizontal**
Reference standard	**VDE 560-22**

*** Availability to be confirmed**

Example of High Voltage AC capacitor:



CHARACTERISTICS

Rated Capacitance (Cn)	0.22 µF
Capacitance Tolerance	± 10 %
Rated Voltage (Un)	2250 V
Rated AC Voltage (Ueff)	1500 V
Rated Current (Imax)	16 A
Series resistance (Rs)	17 mOhm
Self-inductance	< 150 nH
Dissipation Factor (tanδ x 10E-4)	< 20

MAXIMUM RATINGS

Peak voltage (periodic)	3300 V
Peak voltage (non periodic)	4500 V
Voltage rate of rise	900 V/ms

TEST DATA

AC Test voltage T-T (2 sec.)	3225 V
AC test voltage T-C (10 sec)	5000 V

CLIMATIC CATEGORY

Min.limit temperature (To min)	-35°C
Max limit temperature (To max)	+70°C
Storage temperature	-40 +85°C
Failure quota	300 / 10E9
Expected life (Ln)	100000 h
Humidity category	in accord. with DIN 40040 F
Self-extinguishing	in accord. with UL 492
Vibration resistance	in accord. with EIA STAND. RS-186-7E
Impregnant	non polluting oil (NON-PCB)

Fixing Stud: M5
Case materials: Aluminium

	H	I	A
40 ± 1	92 ± 5	20	M12

GTO Snubber Capacitors

High Peak Current and Low Inductance are the caratteristics of these special capacitors designed for GTO applications.

FEATURES

- Aluminum case
- Dry resin
- Bolt terminals
- AC voltage

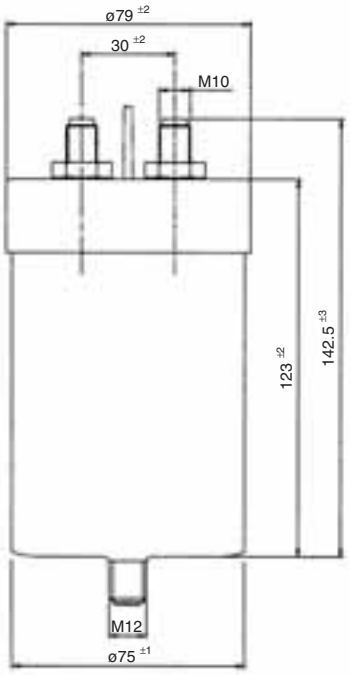
TYPICAL APPLICATIONS

- GTO Snubber

GENERAL CHARACTERISTICS	
Rated voltage	**AC 1500÷2100V**
Range capacitance	**0.5 ÷ 1 µF (*)**
Capacitance tolerance	**±5% ; ±10%**
Test voltage between terminals	**1,5Un 10s**
Test voltage between terminals and case	**10Kvac (50Hz 60s)**
Two terminals	**M10**
Ambient operating temperature	**-25 / + 70 °C**
Protection degree	**IP 00**
Filling	**Dry polyurethane resin**
Dielectric	**Metallized polypropylene**
Case	**Aluminum**
Life expectancy	**100.000h**
Failure quota	**300/10E9**
Installation	**Vertical / horizontal**
Reference standard	**IEC 1071-1/2; UL 810**

(*) Standard values, other values can be on specific

Example of GTO capacitor:



Ø (mm)	H (mm)
75 ± 1	123 ± 2

CHARACTERISTICS

Rated Capacitance	0.68 µF
Capacitance Tolerance	±10%
Rated Voltage Un(AC)	2100 V
Rated frequency	50 Hz
Rated Current (In)	80 A
Serial Inductance	≤30 nH
Discharge resistor	none
Aluminum case	

MAXIMUM RATINGS

Max Voltage	4000 V
Current	2 kA
Serial Current	4 kA
(du/dt)max	3 kV/µs
(du/dt)serie	6 kV/µs

TEST DATA

AC Test voltage terminal to terminal	4 kVac (2 sec)
AC test voltage terminal to case	10 kVac (50Hz 60sec)

CLIMATIC CATEGORY

Temperature class	-25 / +70 °C
Storage temperature	-40 + 85 °C
Failure quota	300/10E9
Expected life	100000h
Impregnation	Non polluting oil (NO PCB)
Technology	All film

Maximum driving torque for M10 screw type bolts: 6 Nm

Maximum driving torque for fixing bolt: 10 Nm

MECHANICAL CHARACTERISTICS

Dimensions	Ø75 x 123 mm
Weight	0.8 Kg
Painted case	

TERMINALS AND INSULATION

Terminal	M10
Torsion strength (terminals)	10 Nm
Max tightening torque (terminals)	7 Nm
Fixing stud	M12
Max tightening torque (fixing stud)	10 Nm
Creepage distance	52 mm
Clearance	24 mm

Power Electronics Capacitors

INQUIRY FORM

In case of custom design, or for any special request / quotation, please complete the following form.

Company Name _____

Contact Person _____

Phone / Fax / E-mail _____

Application _____

_____

Technical characteristics

	Value	Unit	Condition / Time / Note
CAPACITANCE			
Rated Capacitance		µF	
Capacitance Tolerance		%	
VOLTAGE			
Rated AC Voltage (Urms)		V	
Rated DC Voltage (Un)		V	
Superimposed ripple voltage (Ur)		Vpp	
Frequency of ripple voltage (fr)		Hz	
Maximum recurrent peak voltage		V	
Maximum surge voltage (Us)		V	
Voltage raise of rise (dV/dT)		V/µs	
CURRENT			
Rated rms current		A	
Maximum rms Current @ θ MAX (Imax)		A	
Maximum surge current (Is)		KA	
OPERATING DATA			
Maximum permissible inductance		nH	
Maximum series resistance (RS)		mΩ	
Maximum tan δ (10E-4) @ 50Hz			
Min.operating temperature (θ MIN)		°C	
Max. operating temperature (θ MAX)		°C	
Storage temperature MIN / MAX		°C	
Altitude maximum		m	
Forced cooling		m/s	
Type of installation (traction / fixed)			
Expected life time		hours	
MECHANICAL REQUIREMENTS			
Maximum dimensions (WxLxH)		mm	
Mounting position			
Flash over distance		mm	
Creepage distance		mm	
Terminals			
FURTHER REQUIREMENTS			
Quantity		pcs/year	
Start of delivery			

INQUIRY FORM

Circuit scherme																

Current and voltage waveforms																

PLEASE COPY, COMPLETE AND RETURN TO:

DUCATI energia

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www.ducatienergia.com - E-mail: commri@ducatienergia.com

NOTES

POWER ELECTRONIC CAPACITORS

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