

CRTE Power Capacitors



In its power factor correction systems, ICAR uses only capacitors entirely made within the facilities of its group. This way, ICAR guarantees the highest quality of the finished product.

The film used in the CRTE power capacitors comes directly from the ICAR experience in the high performance capacitors, in particular it is defined as "High density metalized polypropylene film".

High density metalized polypropylene film capacitors

The main difference in comparison to standard polypropylene capacitors is the way in which the dielectric film is metalized.

In standard polypropylene capacitors the thickness of the metal layer deposited on the film surface is constant; in 1995, instead, ICAR has developed a manufacturing process that enables obtaining a metal layer with properly modulated thickness and achieving extraordinary results in the capacitors field for direct current and energy accumulation applications.

Subsequently this technology has been extended to capacitors for alternating current applications, with same remarkable results in power factor correction of industrial facilities.

The modulation of the metallization thickness, considerably betters capacitors performances (and therefore those of the power factor corrector systems of which they are the basic component) in terms of:

- increased specific power (kvar/dm³) with resulting reduction of power factor corrector systems dimension;
- improvement of the strengthens to continuous and temporaries overvoltage for a better reliability even in plants with voltage peaks due to the network or manoeuvres on the plant; CRTE capacitors are in fact tested at three times the rated voltage (type test);
- better reaction to the internal short circuit thanks to the special metallization with variable thickness.

General description

CRTE is the ICAR last generation of metallized polypropylene film capacitors to be used for power factor correction and harmonic filtering in low voltage plants.

The main features are:

- Three phase windings delta connected in a cylindrical aluminum case;
- Rated power from 2,5kvar up to 50kvar;
- Rated voltage from 230V up to 800V;
- Rated frequency 50 / 60 Hz;
- IP20 terminal board;
- Reduced mounting cost thanks terminal lid connections;
- Up to 130.000 hours service life design;
- Dry, environment friendly construction;
- Suitable for any mounting position (vertical preferable for better cooling);
- Indoor installation;
- Made under Quality System in accordance with ISO 9001 standard.

Applications

- Individual fixed Power Factor Correction for motors, low voltage transformers, etc;
- Low voltage automatic Power Factor Correction Capacitor Banks;
- Low voltage detuned/tuned Capacitor Banks.

Damping of Inrush Current

Capacitors used for power factor correction have to withstand a lot of switching operations.

The switching of a capacitor in parallel with energized capacitor banks, produces extremely high inrush currents and voltage transients.

The connection of a low voltage power factor correction capacitor without damping to an AC power supply, could lead to a reduced lifetime.

For this reason, capacitors should be protected during the switching operation by means of suitable contactors equipped with damping resistors (AC6b).

Harmonics

Harmonics are sinusoidal voltages and currents with multiple frequencies of the 50 or 60 Hz line frequency.

In presence of harmonics the resonance phenomena can be avoided by connecting capacitors in series with reactors (detuned filters). Components for detuned filter must be carefully selected (see next chapter). Particular care has to be taken for capacitors because the voltage across them will be higher than the nominal voltage when they have a reactor in series.

Discharging

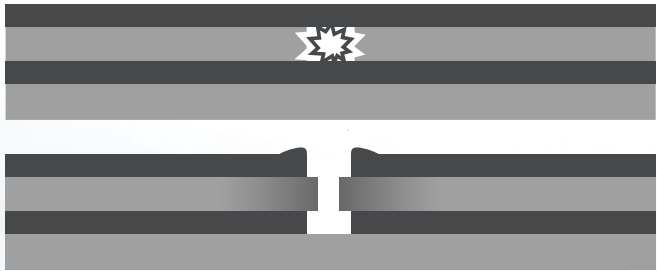
Capacitors must be discharged in 3 minutes to 75V or less. There shall be no switch, fuse or any other isolating device between the capacitor unit and the discharging device. ICAR supplies capacitor discharge resistors to all series.

Safety features

CRTE capacitors are equipped with the most modern and reliable safety features to keep capacitor working in proper conditions and to prevent heavy breakdowns.

Self-healing metallized polypropylene

This metallized polypropylene feature is widely used in Power Capacitors as a mean to keep capacitors working even when voltage breakdown between the metal layers occurs. In case of arc, the metallized surface around is evaporated but the breakdown is kept in limited area and it does not enlarge its effects.



Over pressure safety device

In the case or fault, due to over voltage, overload or normal ageing, the self-healing process may accelerate and so to create a increasing pressure within the case. In order to prevent the case from bursting, capacitor is fitted with an over pressure device that set out of service the capacitor from the supply; two of the supply leads have reduced section, and while the pressure increases leads are strained by the top lid till breaking of cables (see figure below).

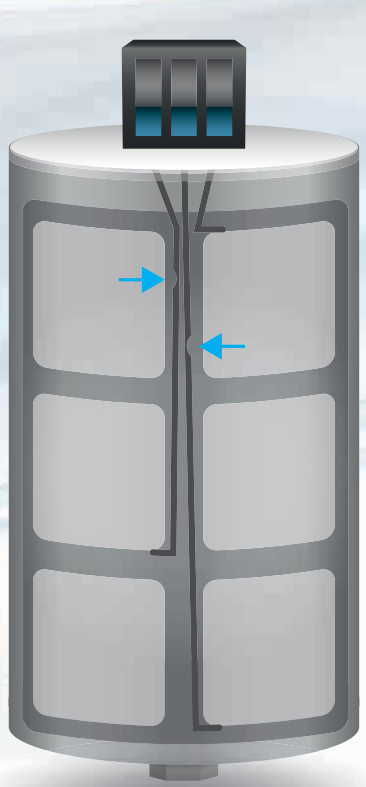
Dry technology

As CRTE capacitor is filled with resin, there is no risk of leaking oil or gas.

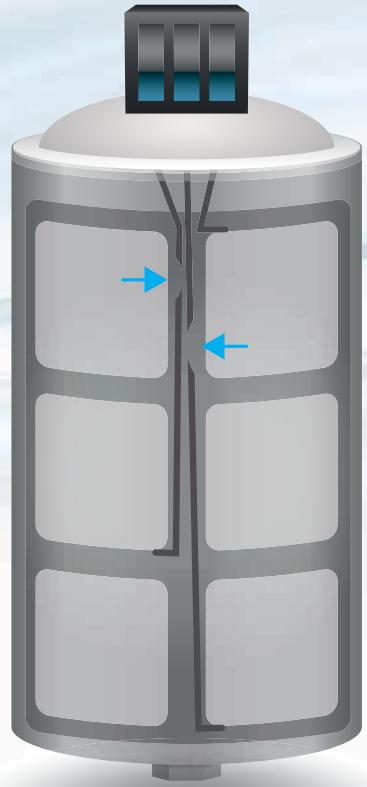
Touch proof terminals

CRTE is equipped with terminal board of IP20 protection degree (see product tables for specific feature application).

Overpressure safety device



CAPACITOR IN WORKING CONDITIONS



CAPACITOR WITH OPERATED MECHANISM

Inside layout



Metallized Polypropylene

ICAR has its own manufacturing of base polypropylene and relevant metallization: further it has developed a peculiar process that enables obtaining a metal layer with properly modulated thickness and achieving extraordinary performances in terms of voltage withstand and overall reliability.

The film is then cut and wound on high precision and fully automated winding machines, sprayed with abundant metal contact layer to reduce the contact resistance.



Wave cut film

CRTE capacitors are also fitted with wave cut film to reduce the stress between the polypropylene film layers and the contact layer. This enable capacitors to withstand higher inrush currents during the switching operations.



Environmentally friendly filler

Capacitors need filler around capacitive elements in order to protect metal layers from oxidation and to help heat dissipation.

Without this feature capacitors would cope with accelerated self healing and so a shorter service life.

ICAR filler are all PCB free.

Inside wiring

Power factor correction Capacitors for applications in nominal voltages networks of 600/660/690V (eg. Applications such as mining, highway tunnels and rail cargoes on board ship, port cranes, steel mills, paper mills and other "heavy" applications) can be realized in different ways described as follows.

Capacitors with star connection

A widely used mode embodiment, but risky, provides a capacitors star connection (fig 1): in this way capacitors are subjected to a voltage equal to the nominal plant divided by $\sqrt{3}$.

- Advantages: capacitors are smaller and cheaper, getting more compact and lightweight banks.
- Disadvantages: in case capacitor capacity degradations, the voltage across the capacitors of the star will no longer be balanced, but it will increase on the side with greater capacity degradation, till to reach values higher than the rated voltage of the capacitors themselves. In this situation, the risk of overvoltage with possible consequent capacitors explosion/fire increases dramatically.

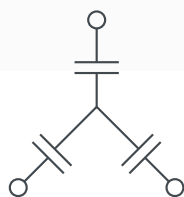


Fig 1: Capacitors star connection

Delta-connected Capacitors

This solution calls for the use of capacitor elements with a voltage rating at least equal to that of the network, as can be seen in Figure 2.

- Advantages: capacitor is electrically robust. Even in case of loss of capacity of a capacitor element, the others do not suffer any consequences: malfunctions risks and capacitors damages are reset.
- Disadvantages: capacitors bulkier and heavier, with higher costs.

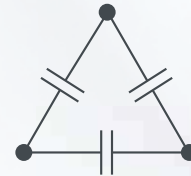


Fig 2: Capacitors delta connection

The ICAR way

CRTE for working voltages higher than 550V are made with delta connected capacitors, and so they have a nominal voltage equal or higher than the system network working voltage; this is the most sound and reliable solution.

Installation and maintenance

Handling and Storage

Capacitors shall have to be handled and stored with care in order to avoid any mechanical damage during transportation. Protection against environmental influences shall also be taken.

Installation

Capacitors are suitable for indoor installation and for any mounting position ($Q \leq 30$ kVar). Vertical is preferable for better cooling if $Q > 30$ kVar.

Capacitors must be installed in such a way that the specified limit temperature is not overcome.

Not being in compliance with the above instructions will result as a reduction of the expected service life.

Installation of capacitors shall have to be performed in such a way that any dangerous resonance phenomena due to harmonics is avoided.

Automatic power factor correction banks

The switching of a capacitor bank in parallel with energized capacitor(s), produces extremely high inrush currents and voltage transients. For this reason, it is extremely important to wait for the unit discharge before a new switching.

Assembly

Capacitors shall have to be assembled by means of the threaded M12 bottom stud. The maximum applicable tightening torque is 10Nm.

The catalogue specifies the recommended cross section of the supplying cables.

The recommended tightening torque is 3Nm.

With terminals screw design two antagonist spanners shall be used.

In order to ensure a proper operation of the internal overpressure safety device, an extra minimum 15mm

clearance distance between the upper part of capacitors and assembly enclosures shall have to be provided.

Capacitors shall be placed in such a way that there is an adequate dissipation by convection and radiation of the heat produced by the capacitor losses.

The ventilation of the operating room and the arrangement of the capacitor units shall provide good air circulation around each unit. A minimum 20mm distance between the units has to be maintained.

Maintenance

Periodical checks and inspections are required to ensure reliable operation of capacitors.

Monitoring and recording of the electrical service parameters are also recommended to become acquainted with progressive capacitors stress conditions.

Protections

Capacitors shall have to be protected against inrush peak currents during switching operations of automatic banks by means of suitable contactors equipped with pre-making resistors.

Safety Instructions

DO NOT MISAPPLY CAPACITORS FOR POWER FACTOR CORRECTION APPLICATIONS

Capacitors according to the Standards, are equipped with a suitable discharge device such as discharge resistors, permanently connected. They are able to reduce the residual voltage so that any dangerous resonance phenomena due to harmonics is avoided.

Automatic power factor correction banks

DO NOT TOUCH ANY CAPACITOR TERMINAL IF NOT SHORT CIRCUITED AND EARTHED IN ADVANCE To prevent damage to people and goods due to improper usage and/or application of capacitors, the "RECOMMENDATION FOR THE SAFE USE OF STATIC CAPACITORS, BANKS AND EQUIPMENT FOR POWERFACTOR CORRECTION" published by ANIE shall have to be strictly respected.

ICAR is not responsible for any kind of possible damages occurred to people or things, derived from the improper installation and application of Power Factor Correction capacitors.

Most common misapplication forms

- Current, voltage, harmonics and frequency above specification;
- Working or storage temperature beyond the specified limits;
- Unusual service conditions as mechanical shock and vibrations, corrosive or abrasive conductive parts in cooling air, oil or water vapour or corrosive substances, explosive gas or dust, radioactivity, excessive and fast variations of ambient conditions, service areas higher than 2000 m above sea level...

In case of doubt in choice or in performances of the capacitors ICAR technical service MUST be contacted.

Personal Safety

Electrical or mechanical misapplications of CRTE capacitors may become hazardous. Personal injury or property damage may result from disruption of the capacitor and consequent expulsion of melted material. Before using the capacitors in any application, please read carefully the technical information contained in this catalogue.

The energy stored in a capacitor may become lethal. The capacitor should be short circuited and earthed before handling to prevent any chance of shock.

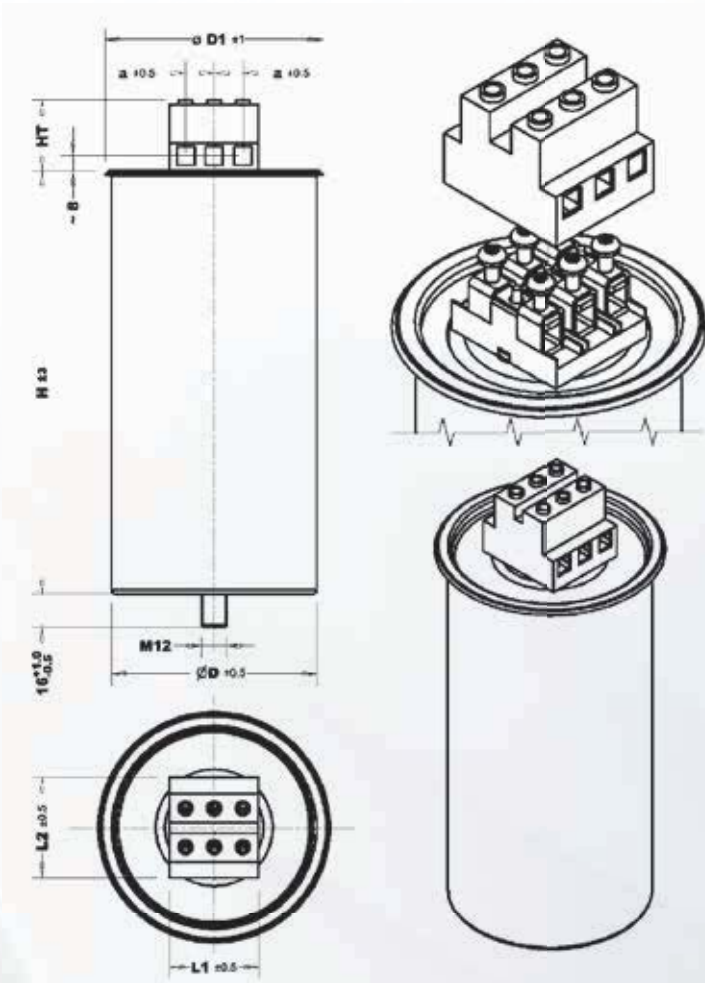
Special attention must be taken to make sure the capacitors are correctly used for each application and that warnings and instructions are strictly followed.

Capacitors are made with polypropylene that is a flammable material.

The risk of fire cannot be totally eliminated; therefore suitable precautions shall be taken. Reliability data have a statistical value (i.e. based on a large number of components), it is not possible to transfer automatically data from a limited quantity or even to a batch of capacitors.

This applies in particular to consequential damage caused by component failure.

Dimensions and connecting cable cross section



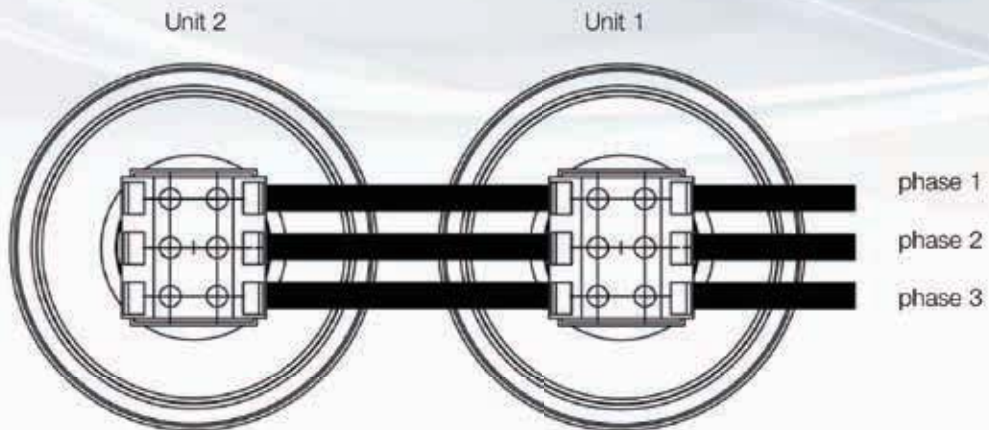
- Aluminium finishing: black painted for diameter ØD 100, ØD 116, ØD 136. naked for diameter ØD 75, ØD 85
- Terminals: 25mm² for ØD 85, ØD 100, ØD 116, ØD 136
16mm² for ØD 75
- Maximum continuative terminal current:
25mm² 60Arms
16mm² 35Arms
- Degree of protection: IP20
- Creepage 19mm
- Clearance 19mm
- Humidity class: F. Max relative humidity 75% annual on average, 95% 30 days per year, condensation not permitted.

ØD1	L1	L2	HT	a	
ØD 75.....	81	39,0	45,0	32±1	13
ØD 85.....	91	43,5	49,0	35±1	14
ØD 100.....	106	43,5	49,0	35Max	14
ØD 116.....	122	43,5	49,0	35Max	14
ØD 136.....	142	43,5	49,0	35Max	14

Max case elongation in case of over pressure disconnector activated < 12,7 mm. Below table is a guidelines for operation in normal conditions at ambient temperature up to 40°C (or 55°C capacitor surrounding air). Various parameter such us harmonics, temperature inside the cabinet, cable length have to be considered for proper selection.

Rated voltage 415V, 50 Hz	RATED POWER Qn [kvar]	In [A]	CROSS SECTION mm ² Cu
	2,5	3,5	2,5
5	7	2,5	
7,5	10,5	2,5	
10	13,9	4	
12,5	17,4	4	
15	20,9	6	
20	27,8	10	
25	34,8	16	
40	55,6	25	

Limits for parallel of crte capacitors



The maximum number of parallel connected units should not have a total output higher than 40kvar.

The cross section of cables in the Unit 1 (phase 1, 2, 3) have to be selected considering the total amount of the Unit 1 and Unit 2 output. **Leave enough space** to allow longitudinal expansion of the can for proper operation of the internal over pressure safety device (15 mm).

A minimum space of 20 mm between capacitors is necessary to ensure **proper cooling**.

CRT-E 230V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	230V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board / screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 230V - 50Hz  

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT233100156V00	CRT-56V-1-230 **	1	3 x 20	3 x 2,5	55	165	0,5	30	370x370x245	Internal
CRT233150156V00	CRT-56V-1,5-230 **	1,5	3 x 30,1	3 x 3,8	55	165	0,5	30	370x370x245	Internal
CRT233200166V00	CRT-66V-2-230 **	2	3 x 40,1	3 x 5	65	205	0,7	6	370x370x106	Internal
CRT233250166V00	CRT-66V-2,5-230 **	2,5	3 x 50,1	3 x 6,3	65	205	0,7	6	370x370x106	Internal
CRE501233M50322	CRTE08520805023	5	3 x 100	3 x 12,6	85	208	1,6	4	370x370x106	External
CRE751233M50323	CRTE10020807523	7,5	3 x 150	3 x 18,9	100	208	2	3	370x370x106	External
CRE102233M50315	CRTE10020810023	10	3 x 200	3 x 25,2	100	208	2	3	370x370x106	External
CRE1D2233M50324	CRTE11620812523	12,5	3 x 250	3 x 31,5	116	208	2,6	3	370x370x125	External
CRE152233M50325	CRTE13620815023	15	3 x 300	3 x 37,6	136	208	3,2	2	370x370x161	External

* File number E99479
** Not UL approved

CRT-E 400/415V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	400V/415V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board / screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 400V (415V) - 50Hz

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT403100156V00	CRT-56V-1-400 **	1	3 x 6,6	3 x 1,4	55	165	0,5	30	370x370x245	Internal
CRT403150156V00	CRT-56V-1,5-400 **	1,5	3 x 9,9	3 x 2,2	55	165	0,5	30	370x370x245	Internal
CRT403200156V00	CRT-56V-2-400 **	2	3 x 13,3	3 x 2,9	55	165	0,5	30	370x370x245	Internal
CRT403250156V00	CRT-56V-2,5-400 **	2,5	3 x 16,6	3 x 3,6	55	165	0,5	30	370x370x245	Internal
CRT403300166V00	CRT-66V-3-400 **	3	3 x 19,9	3 x 4,3	65	205	0,7	6	370x370x106	Internal
CRT403400166V00	CRT-66V-4-400 **	4	3 x 26,5	3 x 5,8	65	205	0,7	6	370x370x106	Internal
CRT403500166V00	CRT-66V-5-400 **	5	3 x 33,2	3 x 7,2	65	205	0,7	6	370x370x106	Internal
CRE501403M50028	CRTE07520805040	5	3 x 33,2	3 x 7,2	75	208	1,2	5	370x370x106	External
CRE751403M50033	CRTE07520807540	7,5	3 x 49,7	3 x 10,8	75	208	1,2	5	370x370x106	External
CRE102403M50053	CRTE08520810040	10	3 x 66,3	3 x 14,4	85	208	1,6	4	370x370x106	External
CRE1D2403M50036	CRTE08520812540	12,5	3 x 82,9	3 x 18	85	208	1,6	4	370x370x106	External
CRE152403M50054	CRTE10020815040	15	3 x 99,5	3 x 21,7	100	208	2	3	370x370x106	External
CRE202403M50001	CRTE10020820040	20	3 x 132,6	3 x 28,9	100	208	2	3	370x370x106	External
CRE252403M50002	CRTE11620825040	25	3 x 165,8	3 x 36,1	116	208	2,6	3	370x370x125	External
CRE302403M50003	CRTE11620830040	30	3 x 198,9	3 x 43,3	116	208	2,6	3	370x370x125	External
CRE402403M50108	CRTE13628340040 **	40	3 x 265,4	3 x 57,7	136	283	3,8	2	370x370x161	External
CRE502403M50416	CRTE13636050040 **	50	3 x 332	3 x 72,2	136	360	5,5	2	470x280x160	External

* File number E99479
** Not UL approved

CRT-E 450V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	450V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board / screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 450V - 50Hz  

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT453100156V00	CRT-56V-1-450 **	1	3 x 5,2	3 x 1,3	55	165	0,5	30	370x370x245	Internal
CRT453150156V00	CRT-56V-1,5-450 **	1,5	3 x 7,9	3 x 1,9	55	165	0,5	30	370x370x245	Internal
CRT453200156V00	CRT-56V-2-450 **	2	3 x 10,5	3 x 2,6	55	165	0,5	30	370x370x245	Internal
CRT453250156V00	CRT-56V-2,5-450 **	2,5	3 x 13,1	3 x 3,2	55	165	0,5	30	370x370x245	Internal
CRT453300166V00	CRT-66V-3-450 **	3	3 x 15,7	3 x 3,8	65	205	0,7	6	370x370x106	Internal
CRT453400166V00	CRT-66V-4-450 **	4	3 x 21	3 x 5,1	65	205	0,7	6	370x370x106	Internal
CRT453500166V00	CRT-66V-5-450 **	5	3 x 26,2	3 x 6,4	65	205	0,7	6	370x370x106	Internal
CRE501453M50015	CRTE07520805045	5	3 x 26,2	3 x 6,4	75	208	1,2	5	370x370x106	External
CRE751453M50034	CRTE07520807545	7,5	3 x 39,3	3 x 9,6	75	208	1,2	5	370x370x106	External
CRE102453M50055	CRTE08520810045	10	3 x 52,4	3 x 12,8	85	208	1,6	4	370x370x106	External
CRE1D2453M50037	CRTE08520812545	12,5	3 x 65,5	3 x 16	85	208	1,6	4	370x370x106	External
CRE152453M50056	CRTE10020815045	15	3 x 78,6	3 x 19,2	100	208	2	3	370x370x106	External
CRE202453M50010	CRTE10020820045	20	3 x 104,8	3 x 25,7	100	208	2	3	370x370x106	External
CRE252453M50004	CRTE11620825045	25	3 x 131	3 x 32,1	116	208	2,6	3	370x370x125	External
CRE302453M50009	CRTE11620830045	30	3 x 157,2	3 x 38,5	116	208	2,6	3	370x370x125	External
CRE402453M50162	CRTE13628340045 **	40	3 x 209,7	3 x 51,3	136	283	3,8	2	370x370x161	External

* File number E99479

** Not UL approved

CRT-E 525V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	525V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board / screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 525V - 50Hz



PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT523100156V00	CRT-56V-1-525 **	1	3 x 3,8	3 x 1,1	55	165	0,5	30	370x370x245	Internal
CRT523150156V00	CRT-56V-1,5-525 **	1,5	3 x 5,8	3 x 1,6	55	165	0,5	30	370x370x245	Internal
CRT523200156V00	CRT-56V-2-525 **	2	3 x 7,7	3 x 2,2	55	165	0,5	30	370x370x245	Internal
CRT523250156V00	CRT-56V-2,5-525 **	2,5	3 x 9,6	3 x 2,7	55	165	0,5	30	370x370x245	Internal
CRT523300166V00	CRT-66V-3-525 **	3	3 x 11,5	3 x 3,3	65	205	0,7	6	370x370x106	Internal
CRT523400166V00	CRT-66V-4-525 **	4	3 x 15,4	3 x 4,4	65	205	0,7	6	370x370x106	Internal
CRT523500166V00	CRT-66V-5-525 **	5	3 x 19,2	3 x 5,5	65	205	0,7	6	370x370x106	Internal
CRE501523M50016	CRTE07520805052	5	3 x 19,2	3 x 5,5	75	208	1,2	5	370x370x106	External
CRE751523M50035	CRTE07520807552	7,5	3 x 28,9	3 x 8,2	75	208	1,2	5	370x370x106	External
CRE102523M50057	CRTE08520810052	10	3 x 38,5	3 x 11	85	208	1,6	4	370x370x106	External
CRE1D2523M50038	CRTE08520812552	12,5	3 x 48,1	3 x 13,7	85	208	1,6	4	370x370x106	External
CRE152523M50058	CRTE10020815052	15	3 x 57,7	3 x 16,5	100	208	2	3	370x370x106	External
CRE202523M50021	CRTE10020820052	20	3 x 77	3 x 22	100	208	2	3	370x370x106	External
CRE252523M50022	CRTE11620825052	25	3 x 96,2	3 x 27,5	116	208	2,6	3	370x370x125	External
CRE302523M50023	CRTE11620830052	30	3 x 115,5	3 x 33	116	208	2,6	3	370x370x125	External
CRE402523M50079	CRTE13620840052	40	3 x 154	3 x 44	136	208	3,2	2	370x370x161	External
CRE502523M50428	CRTE13636050052 **	50	3 x 193	3 x 55	136	360	5,5	2	470x280x161	External

* File number E99479

** Not UL approved

CRT-E 690V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	690V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	6000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 690V - 50Hz 

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRE501693M50163	CRTE07520805069	5	3 x 11,1	3 x 4,2	75	208	1,2	5	370x370x106	External
CRE751693M50164	CRTE08520807569	7,5	3 x 16,7	3 x 6,3	85	208	1,6	4	370x370x106	External
CRE102693M50165	CRTE10020810069	10	3 x 22,3	3 x 8,4	100	208	2	3	370x370x106	External
CRE1D2693M50166	CRTE10020812569	12,5	3 x 27,9	3 x 10,5	100	208	2	3	370x370x106	External
CRE152693M50167	CRTE11620815069	15	3 x 33,4	3 x 12,5	116	208	2,6	3	370x370x125	External
CRE202693M50168	CRTE11620820069	20	3 x 44,6	3 x 16,7	116	208	2,6	3	370x370x125	External
CRE252693M50111	CRTE13620825069	25	3 x 55,7	3 x 20,9	136	208	3,2	2	370x370x161	External
CRE302693M50006	CRTE11628330069	30	3 x 66,9	3 x 25,1	116	283	3,2	3	370x370x125	External
CRE402693M50169	CRTE13628340069	40	3 x 89,2	3 x 33,5	136	283	3,8	2	370x370x161	External

CRT-E 750V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	750V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	6000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 750V - 50Hz



PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRE501753M50170	CRTE07520805075	5	3 x 9,4	3 x 3,8	75	208	1,2	5	370x370x106	External
CRE751753M50171	CRTE08520807575	7,5	3 x 14,1	3 x 5,8	85	208	1,6	4	370x370x106	External
CRE102753M50172	CRTE10020810075	10	3 x 18,9	3 x 7,7	100	208	2	3	370x370x106	External
CRE1D2753M50173	CRTE11620812575	12,5	3 x 23,6	3 x 9,6	116	208	2,6	3	370x370x125	External
CRE152753M50174	CRTE11620815075	15	3 x 28,3	3 x 11,5	116	208	2,6	3	370x370x125	External
CRE202753M50175	CRTE13620820075	20	3 x 37,7	3 x 15,4	136	208	3,2	2	370x370x161	External
CRE252753M50042	CRTE11628325075	25	3 x 47,2	3 x 19,2	116	283	3,2	3	370x370x125	External
CRE302753M50176	CRTE13628330075	30	3 x 56,6	3 x 23,1	136	283	3,8	2	370x370x161	External
CRE352753M50177	CRTE13628335075	35	3 x 66	3 x 26,9	136	283	3,8	2	370x370x161	External

CRT-E 800V - 50Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	800V
Rated Frequency	50 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	6000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 800V - 50Hz 

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRE501803M50178	CRTE08520805080	5	3 x 8,3	3 x 3,6	85	208	1,6	4	370x370x106	External
CRE751803M50044	CRTE10020807580	7,5	3 x 12,4	3 x 5,4	100	208	2	3	370x370x106	External
CRE102803M50179	CRTE10020810080	10	3 x 16,6	3 x 7,2	100	208	2,6	3	370x370x106	External
CRE1D2803M50180	CRTE11620812580	12,5	3 x 20,7	3 x 9	116	208	2,6	3	370x370x125	External
CRE152803M50181	CRTE13620815080	15	3 x 24,9	3 x 10,8	136	208	3,2	2	370x370x161	External
CRE202803M50182	CRTE13620820080	20	3 x 33,2	3 x 14,4	136	208	3,2	2	370x370x161	External
CRE252803M50183	CRTE13628325080	25	3 x 41,5	3 x 18	136	283	3,8	2	370x370x161	External
CRE302803M50184	CRTE13628330080	30	3 x 49,8	3 x 21,6	136	283	3,8	2	370x370x161	External

CRT-E 230V- 60Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	230V
Rated Frequency	60 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board / screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 230V - 60Hz

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT233120156V60	CRT-56V-1,2-230/60 **	1,2	3 x 20	3 x 3	55	165	0,5	30	370x370x245	Internal
CRT233180156V60	CRT-56V-1,8-230/60 **	1,8	3 x 30,1	3 x 4,5	55	165	0,5	30	370x370x245	Internal
CRT133240166V60	CRT-66V-2,4-230/60 **	2,4	3 x 40,1	3 x 6	65	205	0,7	6	370x370x106	Internal
CRT233300166V60	CRT-66V-3-230/60 **	3	3 x 50,1	3 x 7,5	65	205	0,7	6	370x370x106	Internal
CRE601233M60059	CRTE08520806023/60	6	3 x 100	3 x 15	85	208	1,6	4	370x370x106	External
CRE901233M60060	CRTE10020809023/60	9	3 x 150	3 x 22,6	100	208	2	3	370x370x106	External
CRE122233M60031	CRTE10020812023/60	12	3 x 200	3 x 30	100	208	2	3	370x370x106	External
CRE152233M60032	CRTE11620815023/60	15	3 x 250	3 x 37,6	116	208	2,6	3	370x370x125	External
CRE182233M60186	CRTE13620818023/60	18	3 x 300	3 x 45,2	136	208	3,2	2	370x370x161	External

* File number E99479
** Not UL approved

CRT-E 380V - 60Hz



TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	380V
Rated Frequency	60 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board / screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 380V - 60Hz 

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Heigh (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT383110156V60	CRT-56V-1,1-380/60 **	1,1	3 x 6,6	3 x 1,7	55	165	0,5	30	370x370x245	Internal
CRT383160156V60	CRT-56V-1,6-380/60 **	1,6	3 x 9,9	3 x 2,4	55	165	0,5	30	370x370x245	Internal
CRT383220156V60	CRT-56V-2,2-380/60 **	2,2	3 x 13,3	3 x 3,3	55	165	0,5	30	370x370x245	Internal
CRT383270156V60	CRT-56V-2,7-380/60 **	2,7	3 x 16,6	3 x 4,1	55	165	0,5	30	370x370x245	Internal
CRT383320166V60	CRT-66V-3,2-380/60 **	3,2	3 x 19,9	3 x 4,9	65	205	0,7	6	370x370x106	Internal
CRT383430166V60	CRT-66V-4,3-380/60 **	4,3	3 x 26,5	3 x 6,5	65	205	0,7	6	370x370x106	Internal
CRT383540166V60	CRT-66V-5,4-380/60 **	5,4	3 x 33,2	3 x 8,2	65	205	0,7	6	370x370x106	Internal
CRE541383M60326	CRTE07520805438/60	5,4	3 x 33,2	3 x 8,2	75	208	1,2	5	370x370x106	External
CRE811383M60327	CRTE07520808138/60	8,1	3 x 49,7	3 x 12,3	75	208	1,2	5	370x370x106	External
CRE1E2383M60328	CRTE08520810838/60	10,8	3 x 66,3	3 x 16,4	85	208	1,6	4	370x370x106	External
CRE1L2383M60329	CRTE08520813538/60	13,5	3 x 82,9	3 x 20,5	85	208	1,6	4	370x370x106	External
CRE1Q2383M60330	CRTE10020816238/60	16,2	3 x 99,5	3 x 24,6	100	208	2	3	370x370x106	External
CRE2F2383M60331	CRTE10020821738/60	21,7	3 x 132,6	3 x 33	100	208	2	3	370x370x106	External
CRE2G2383M60193	CRTE11620827138/60	27,1	3 x 165,8	3 x 41,2	116	208	2,6	3	370x370x125	External

* File number E99479

** Not UL approve

CRT-E 480V - 60Hz



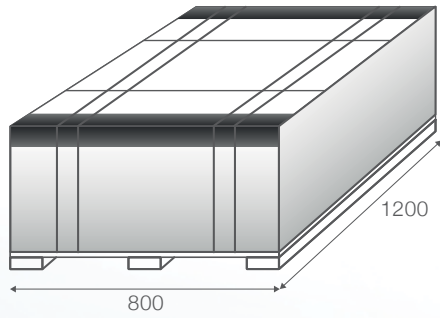
TECHNICAL CHARACTERISTICS	
Dielectric	polypropylene metallized film
Winding connection	delta
Safety device	Internal overpressure disconnecter
Capacitance tolerance	-5%, +10%
Rated Voltage	480V
Rated Frequency	60 Hz
Over voltages	According to IEC Un + 10% (up to 8 hours daily) Un + 15% (up to 30 minutes daily) Un + 20% (up to 5 minutes daily) Un + 30% (up to 1 minute daily)
Over current (not continuative)	2 In (including harmonics)
Maximum inrush current	200 In
Insulation level	3 / 15 kV
Voltage test between terminals	2,15 Un, 50Hz, 10 seconds (routine test)
Voltage test between terminals	3,00 Un, 50Hz, 60 seconds (type test)
Voltage test terminals/case	3000V, 50Hz, 10 seconds
Dielectric losses	< 0.2 W/kvar
Temperature class	-25/D
Cooling	Natural air or forced ventilation
Permissible humidity	95%
Service life	130.000 operating hours (hot spot 50°C)
Service life	100.000 operating hours (hot spot 55°C)
Altitude above sea level	2000 m
Impregnation	resin filled, PCB free
Terminals	Terminal board /screws (D ≤ 65mm)
Fixing and Ground	Threaded M12 stud on case bottom
Mounting position	vertical preferable for better cooling
Protection degree	IP20 (only D ≥ 85mm)
Installation	Indoor
Discharge resistors	Included
Discharge time	< 3 minutes to 75V or less
Applicable standards	IEC 60831-1/2

Vn = 480V - 60Hz

PART NUMBER	MODEL	Q POWER (KVar)	C Capacity (µF)	In Current (A)	D Diameter (mm)	H Height (mm)	Weight (Kg)	Pcs/box	Box dimensions	Discharge resistor
CRT483100156V60	CRT-56V-1-480/60 **	1	3 x 3,8	3 x 1,2	55	165	0,5	30	370x370x245	Internal
CRT483150156V60	CRT-56V-1,5-480/60 **	1,5	3 x 5,8	3 x 1,8	55	165	0,5	30	370x370x245	Internal
CRT483200156V60	CRT-56V-2-480/60 **	2	3 x 7,7	3 x 2,4	55	165	0,5	30	370x370x245	Internal
CRT483250156V60	CRT-56V-2,5-480/60 **	2,5	3 x 9,6	3 x 3	55	165	0,5	30	370x370x245	Internal
CRT483300166V60	CRT-66V-3-480/60 **	3	3 x 11,5	3 x 3,6	65	205	0,7	6	370x370x106	Internal
CRT483400166V60	CRT-66V-4-480/60 **	4	3 x 15,4	3 x 4,8	65	205	0,7	6	370x370x106	Internal
CRT483500166V60	CRT-66V-5-480/60 **	5	3 x 19,2	3 x 6	65	205	0,7	6	370x370x106	Internal
CRE501483M60085	CRTE07520805048/60	5	3 x 19,2	3 x 6	75	208	1,2	5	370x370x106	External
CRE751483M60086	CRTE07520807548/60	7,5	3 x 28,9	3 x 9	75	208	1,2	5	370x370x106	External
CRE102483M60087	CRTE08520810048/60	10	3 x 38,5	3 x 12	85	208	1,6	4	370x370x106	External
CRE1D2483M60088	CRTE08520812548/60	12,5	3 x 48,1	3 x 15	85	208	1,6	4	370x370x106	External
CRE152483M60089	CRTE10020815048/60	15	3 x 57,7	3 x 18	100	208	2	3	370x370x106	External
CRE202483M60090	CRTE10020820048/60	20	3 x 77	3 x 24,1	100	208	2	3	370x370x106	External
CRE252483M60091	CRTE11620825048/60	25	3 x 96,2	3 x 30,1	116	208	2,6	3	370x370x125	External
CRE302483M60092	CRTE11620830048/60	30	3 x 115,5	3 x 36,1	116	208	2,6	3	370x370x125	External
CRE402483M60198	CRTE13620840048/60	40	3 x 154	3 x 48,1	136	208	3,2	2	370x370x161	External
CRE502483M60429	CRTE13636040048/60	50	3 x 192	3 x 60,1	136	360	5,5	2	470x280x161	External

* File number E99479
** Not UL approved

Packing details: CRTE Capacitors



WOODEN FRAME ON STANDARD EURO-PALLET
(FUMIGATED IF REQUIRED)

CRTE Capacitor diameter (mm)	Number of Capacitors per box	Number of Capacitors per pallet/box	Package height H (mm)
75	5	180	900
85	4	144	900
100	3	108	900
116	3	108	1050
136	2	60	1050