

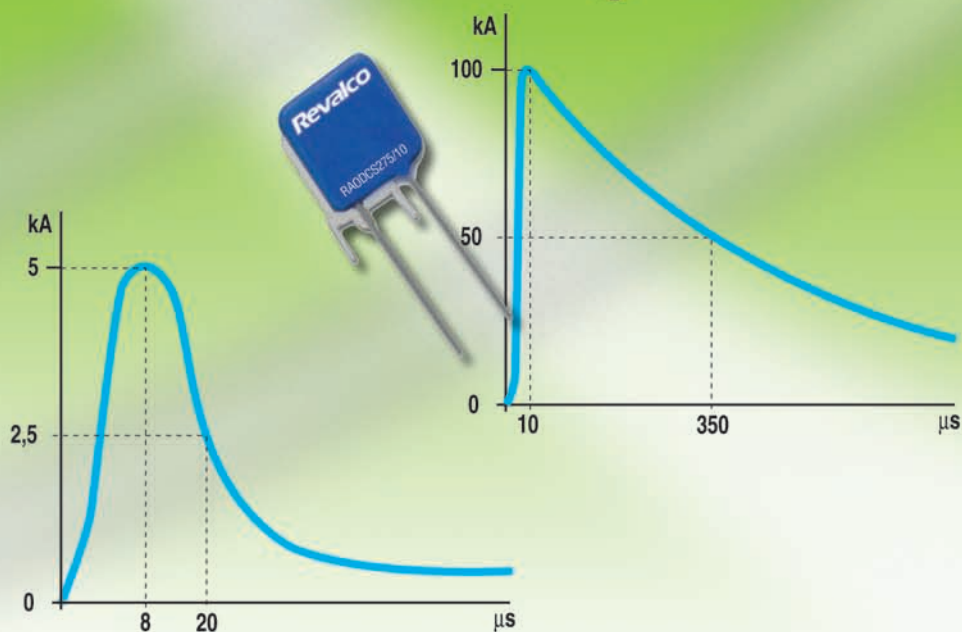
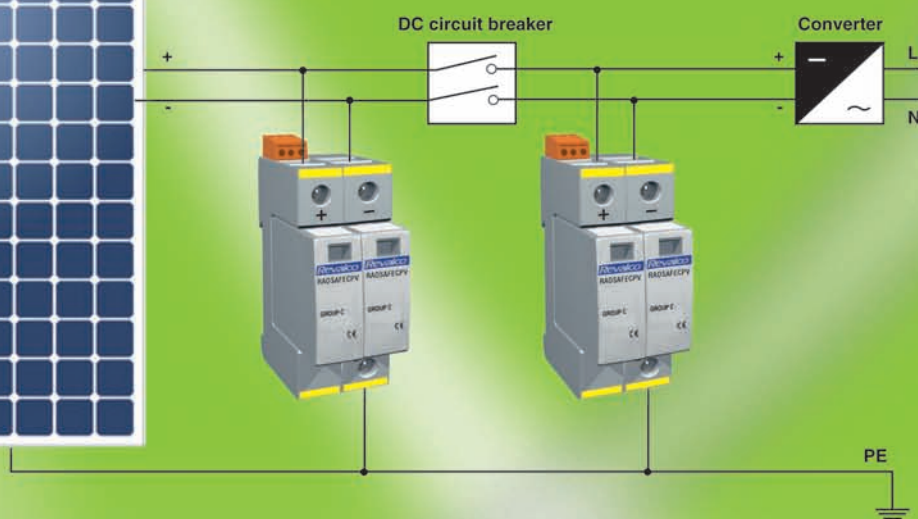
Revalco®

Made in Italy

surge arresters



PV PHOTOVOLTAIC MODULE

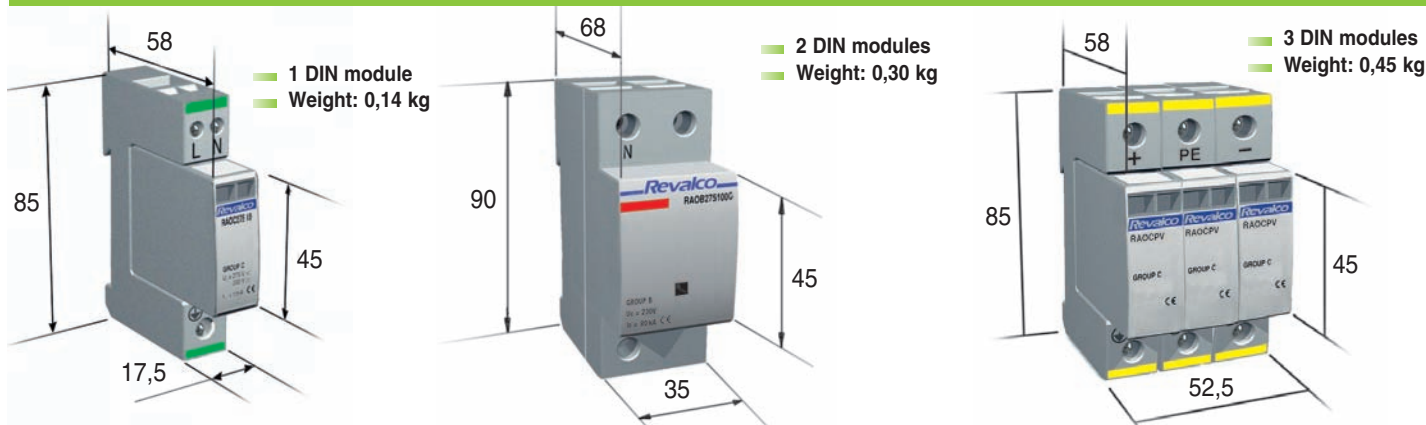


2011

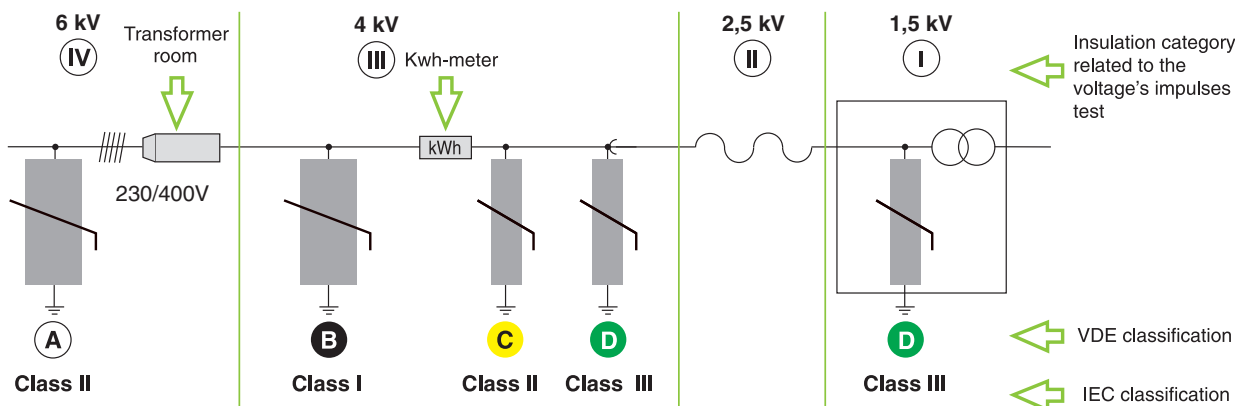
SURGE ARRESTERS

DIMENSIONS	184
CLASIFICATION	184
CONNECTION CABLES SECTION	184
OPTICAL FAULT SIGNAL	184
GENERAL DESCRIPTION	184
PRINCIPLE OF SURGE ARRESTERS OPERATION	185
CHARACTERISTICS OF CONNECTION	185
CHOISE OF THE SURGE ARRESTER FOR THE PROTECTION	186
SURGE ARRESTERS WITH VARISTOR FOR INTERNAL MOUNTING – GROUP B	186
SURGE ARRESTERS WITH GAS TUBE FOR INTERNAL MOUNTING – GROUP B	186
SURGE ARRESTERS WITH VARISTOR FOR INTERNAL MOUNTING – GROUP C	187
SURGE ARRESTERS WITH VARISTOR AND GAS TUBE FOR INTERNAL MOUNTING – GROUP C	188
SURGE ARRESTERS WITH GAS TUBE FOR INTERNAL MOUNTING – GROUP C	189
SURGE ARRESTERS WITH VARISTOR FOR INTERNAL MOUNTING – GROUP D	190
SURGE ARRESTERS FOR PHOTOVOLTAIC SYSTEM	191
SURGE PROTECTION DEVICE FOR POWER SUPPLY	192
SURGE PROTECTION DEVICE FOR PHOTOVOLTAIC SYSTEM	195

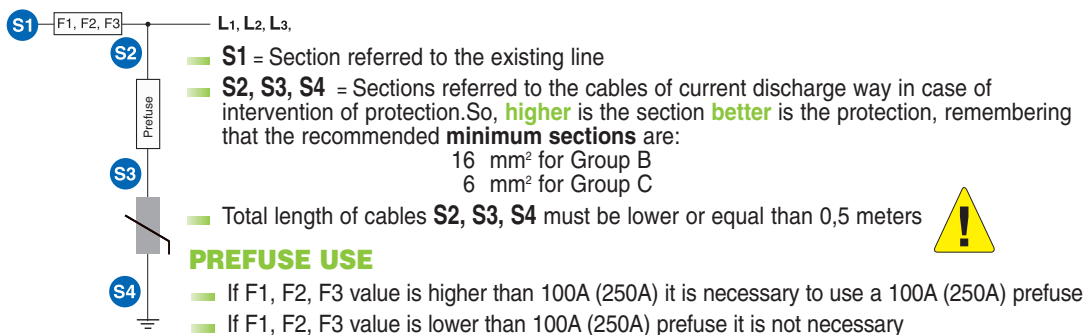
DIMENSIONS IN mm



CLASIFICATION OF SURGE ARRESTERS



CONNECTION CABLES SECTION



OPTICAL FAULT SIGNAL



GENERAL DESCRIPTION

Generally, the results caused by the atmospheric surge arresters are considered only as visual effects by the lightning current, without considering that these surge arresters, when they happen near to buildings at distances of 1,5 km from the lighting point, can also generate interferences in the magnetic fields that can create extensive damage. Infact, the lightning current can induce a cause of the electromagnetic effect, important values of current and as a consequence of overvoltage on the external conductors used for the electric energy transport (MT or BT) or for the transport of signals (television set lines, telephonic lines or data transmission etc..). The energy associated with these overvoltages is not bigger than the lightning energy, but in any case has sufficiently high values able to damage the connected devices (television, computer, Hi-Fi set etc..). As it is not possible to prevent these voltages, it is necessary to dissipate the energy by the use of specific devices developed for this aim.

By the use of the surge arresters, it is possible to create a protected zone against the lightning, inserting them on the power supply lines and distributing them correctly in a way that their coordinates action gives the protection required for the connected devices.

After the kWhmeter it is necessary to connect a discharger which is able to absorb the current constituted by an impulse with a wave form 10/350micros (figure 1). This discharger must enable the residual impulse that distributes itself through the line, to correspond to the energy that the surge arresters produce and is able to absorb but not to exceed the maximum values. The surge arresters used on the power supply lines of a single or three phase system are generally based on the utilization of the varistor technology characterised by a nominal discharge impulsive current from 5kA which represents the crest value of a impulsive current with wave form 8/20micros (figure 2.) The surge arresters must support at least 20 times the current without modifications of their characteristics and are characterised also by a protection level (crest value of the residual voltage before they intervene) in the majority of the cases this value is about 1000V.

The protection level determined in the utilised surge arresters of the power supply lines, the installation place following the overvoltage category(see classification of the dischargers).

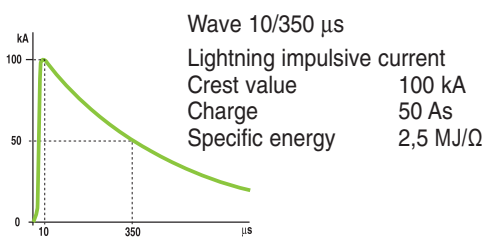


figure 1:
The wave needs 10 μs to arrive at the max level and 350 μs to abate to the medium value

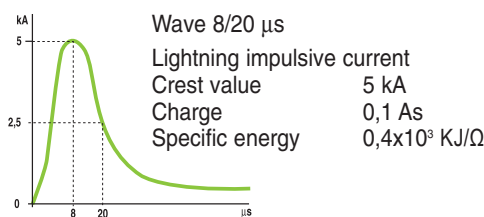


figure 2:
The wave needs 8 μs to arrive at the max level and 20 μs to abate to the medium value

PRINCIPLE OF SURGE ARRESTERS OPERATION

The protection can be realised by the use of:

Spinterometer surge arresters: These devices consist of two electrodes situated in opposite sides at a suitable distance from each other, between them there is a spacer of insulated material and also up to the electrodes a protection plate is placed. In overvoltage condition a superficial discharge primes itself over the insulation support. The residual arc obtained is expelled to the external and divided by cells extinguish-arc; it selfextinguishes when the current fall down of some tens of Ampere.

These devices are able to interrupt the residual current, have a very high discharge potential (up to 100kA) and a lower capacity between the electrodes that consent to use them also in teletansmission circuits.

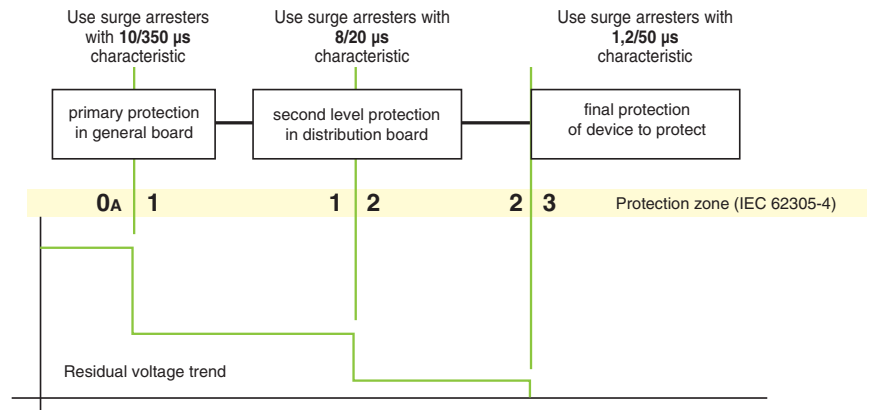
The prime voltage of the spinterometers increases with the ripidity of the overvoltage's wave. respect to the other protection surge arresters, these have bigger dimensions because it is necessary to contain the extinguish-arc cells. The performances of the spinterometers degrade progressively in function of the numbers of interventions effected and a cause of the high prime voltage.

Gas surge arresters: these devices consist of a ceramic or glass tube with electrodes connected to their extremity. Inside the tube; between the electrodes, there is a noble gas (neon or argon) and in cae of overvoltage the gas is ionised causing a quick lowering of the resistance; the prime voltage depend in this case by the overvoltage. Only used when necessary to avoid current to the ground being consumed.

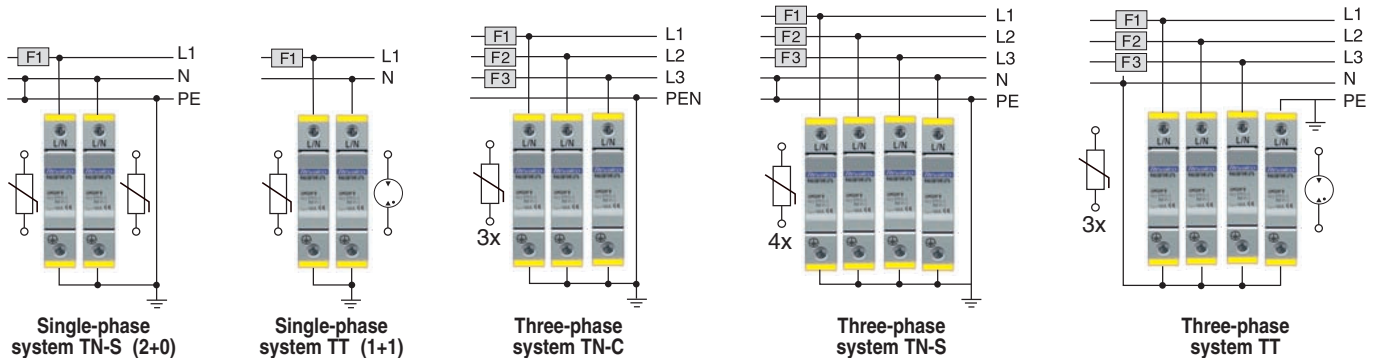
Varistor surge arresters: these devices consist of a disk of material (zinc oxide) with characteristics able to vary its own resistance in function of the applied voltage. At the nominal voltage, the resistance of the varistors is high, while in presence of an overvoltage decrises quickly permitting the discharge toward the ground. Considering their characteristic (voltage/current) these protection devices can have an high capacity of discharge and a low residual voltage. The varistor surge arresters have high discharger's power independent by the value of the prime voltage but lower respect to the spinterometer surge arresters. The minimum prime voltage is too high for an adequate protection of delicate electronic circuits.

Diode suppressors: These devices have the characteristic to intervene in a very quick time compared to the other overvoltage surge arresters. They consist of a diode that stops the current in condition of normal work, while over-voltages flow down to the break voltage (UB). The diode suppressors are manufactured in the way to support higher current rating than the common diodes. The discharger's power is limited so often them are already incorporated into the device to protect; The intervention time is very quick and the performances not effected by the numbers of discharges effected while the prime volta-ge's range is very wide.

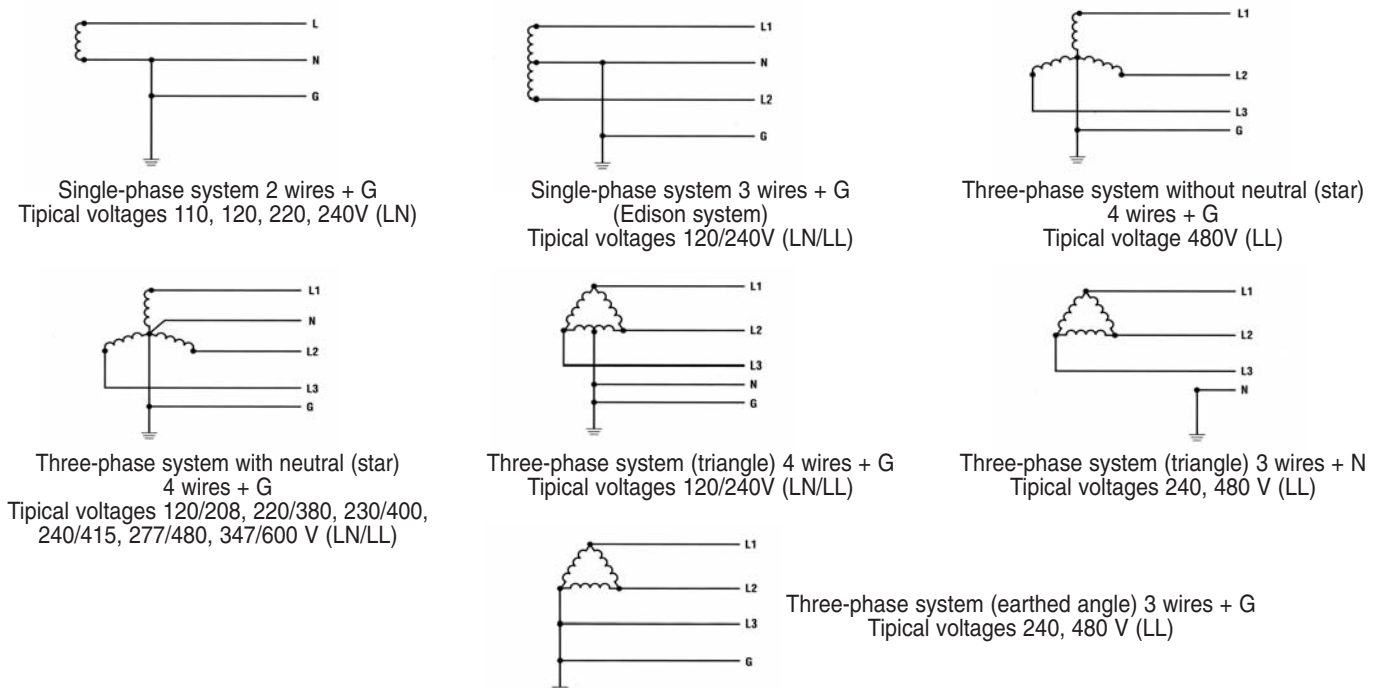
Example of protection in several levels:



CHARACTERISTICS CONNECTION (EUROPEAN COUNTRIES)



CHARACTERISTICS CONNECTION (ASIATIC, NORTH AMERICAN, LATIN AMERICAN COUNTRIES)



CHOICE OF THE SURGE ARRESTER FOR THE PROTECTION

When it is the moment to decide to protect a system against the overvoltages it is necessary to make initial considerations; firstly is the place of installation and the level of overvoltage's risk of the system. In this case we are helped by the actual standards (CEI 81-1 and CEI 81-4) that permit to identify and to know the average numbers of lightnings (Nt) in a certain geographic area. Identified the first coefficient of risk it is necessary to consider the economic value of the devices to protect. It is evident that more higher is the value to protect and the risk factor (Nt) and more is justified the utilisation of surge arresters. Becomes also fundamental to know the electrical characteristics of the system to protect and of the devices installed on it. The protection level (U_p) granted by the surge arresters must be compared with the various specific voltage values of the devices to protect. less is the difference between the maximum voltage protection (U_p) of the discharger and the voltage of the device to protect (U_p discharger ... U_p device), bigger will be the protection obtained. When it is necessary to protect sensible devices (TV, computers, HI-FI systems etc..) it is possible to protect them directly choosing dedicated protection devices (diode suppressors) with coordinated protection characteristics.

SURGE ARRESTERS WITH VARISTOR FOR INTERNAL MOUNTING - GROUP B

1RAOB / 1RAOB-T (with remote control)

Surge arresters with incorporated thermic protection. Suitable for installation in main distribution panels, for protection against direct or indirect lightning overvoltages. The protective element is a varistor so there are no residual currents. Suitable for protection in zones 0_A - 1. Case in polycarbonate material, V0 self-extinguishing. Optical signal of fault.

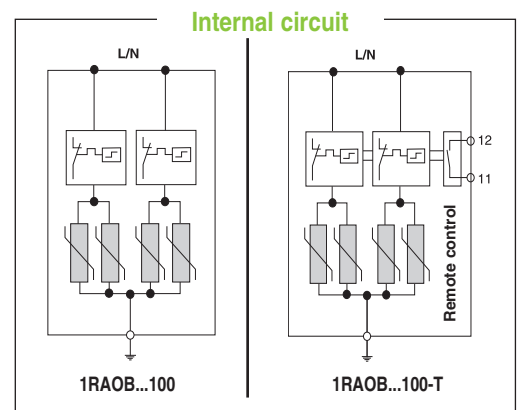
	1RAOB150/100	1RAOB275/100	1RAOB320/100	1RAOB440/100
MAX WORKING VOLTAGE U_c (AC/DC)	150/200V	275/350V	320/420V	440/580V
PROTECTION VOLTAGE U_p : AD I_n (8/20 μ s)	<0,7 kV	<1,3 kV	<1,3 kV	<2,0 kV
Ures a I_{imp} (10/350 μ s)	<0,7 kV	<1,2 kV	<1,2 kV	<1,8 kV
MAX CURRENT DISCHARGE I_{max} (8/20 μ s)	100 kA	100 kA	100 kA	100 kA
MAX CURRENT PEAK I_{imp} (10/350 μ s)	25 kA	25 kA	25 kA	25 kA
NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)			25 kA	
RESPONSE TIME t_A			< 25 ns	
RESIDUAL CURRENT I_{PE}			< 2,5 mA	
PRE-IN LINE FUSE (if main is > 250A)			250 AgL	
SHORT CIRCUIT			25 kA / 50 Hz	
WORKING TEMPERATURE			-40°C ÷ +80°C	
SECTION OF WIRES			35 mm ² (single wire) - 25 mm ² (multiple wire)	
REMOTE CONTROL			250 VCA / 0,5A Load 125 V / 3A	Section of wire 1,5 mm ² max
PROTECTION DEGREE				IP20 - IEC 61643/1
CLASS (IEC / VDE)			I - II / B-C	
DIMENSIONS / WEIGHT kg			2 DIN modules / 0,35	



1RAOB...100



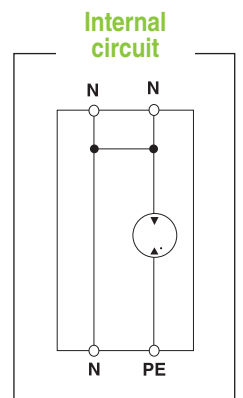
1RAOB...100-T



SURGE ARRESTERS WITH GAS TUBE FOR INTERNAL MOUNTING - GROUP B

1RAOB100G on which the protective element consists of a gas tube only. Used as galvanic separation between N-PE in a TT system. Suitable for protection against direct and indirect lightning overvoltages. Suitable for protection in zone 0_A - 1. Case in polycarbonate material, V0 self-extinguishing.

MAX WORKING VOLTAGE U_c (AC/DC)	255V
NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)	100 kA
MAX CURRENT DISCHARGE I_{max} (8/20 μ s)	100 kA
MAX CURRENT DISCHARGE I_{max} (10/350 μ s)	100 kA
VOLTAGE PROTECTION U_p : (1,2/50 μ s):	1,5 kV
RESPONSE TIME t_A	100 ns
RESIDUAL CURRENT ESTINTION AT I_f	>100 A _{rms}
WORKING TEMPERATURE	-40°C ÷ +80°C
SECTION OF WIRES	35 mm ² (single wire) - 25 mm ² (multiple wire)
PROTECTION DEGREE	IP20 - IEC 61643/1
CLASS (IEC / VDE)	I - II / B+C
DIMENSIONS	2 DIN modules



SURGE ARRESTERS WITH VARISTOR FOR INTERNAL MOUNTING - GROUP C

1RAOC / 1RAOC-T (with remote control)

Surge arresters with incorporated thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. The protective element is a varistor so there are no residual currents. Suitable for protection in zones 1-2. Case in polycarbonate material, V0 self-extinguishing. Optical signal of fault.

- MAX WORKING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p : I_n (8/20 μ s)
- MAX CURRENT DISCHARGE I_{max} (8/20 μ s)
- NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)
- RESPONSE TIME t_A
- RESIDUAL CURRENT U_c
- PRE-IN LINE FUSE (if main is > 100A)
- SHORT CIRCUIT
- WORKING TEMPERATURE
- SECTION OF WIRES
- REMOTE CONTROL
- PROTECTION DEGREE
- CLASS (IEC / VDE)
- DIMENSIONS / WEIGHT kg

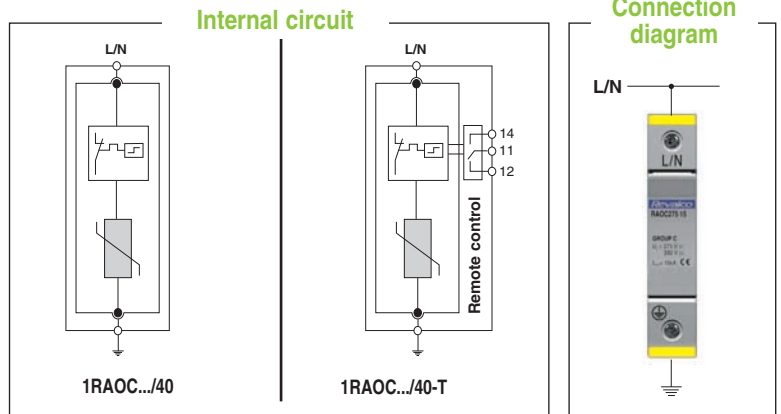
1RAOC75/40	1RAOC150/40	1RAOC275/40	1RAOC320/40	1RAOC440/40
75/100V	150/200V	275/350V	320/420V	440/580V
<0,6 kV	<0,85 kV	<1,25 kV	<1,45 kV	<2,1 kV
40 kA	40 kA	40 kA	40 kA	40 kA
20 kA	20 kA	20 kA	20 kA	20 kA
< 25 ns				
<1,5 mA				
100 AgL				
25 kA / 50 Hz				
-40°C ÷ +80°C				
35 mm ² (single wire) - 25 mm ² (multiple wire)				
250 VCA / 0,5A Load 125 V / 3A Section of wire 1,5 mm ² max				
IP20 - IEC 61643/1				
II / C				
1 DIN module / 0,14				



1RAOC...40



1RAOC...40-T



- MAX WORKING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p : $a I_n$
- NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)
- MAX CURRENT DISCHARGE I_{max} (8/20 μ s)
- RESPONSE TIME t_A
- PRE-IN LINE FUSE (if main is > 100A)
- SHORT CIRCUIT
- WORKING TEMPERATURE
- SECTION OF WIRES
- REMOTE CONTROL
- PROTECTION DEGREE
- CLASS (IEC / VDE)
- DIMENSIONS / WEIGHT kg

1RAOC275/10	1RAOC275/15	1RAOC275/30
<1 kV	<1,1 kV	<1,4 kV
10 kA	15 kA	30 kA
20 kA	40 kA	70 kA
< 25 ns		
100 AgL		
25 kA / 50 Hz		
-40°C ÷ +80°C		
35 mm ² (single wire) - 25 mm ² (multiple wire)		
250 VCA / 0,5A Load 125 V / 3A Section of wire 1,5 mm ² max		
IP20 - IEC 61643/1		
II / C		
1 DIN module / 0,14		

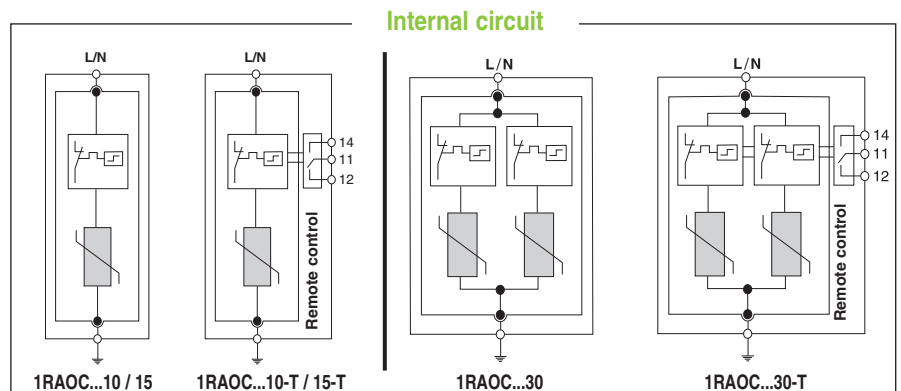
Connection diagram



1RAOC...10
1RAOC...15
1RAOC...30



1RAOC...10-T
1RAOC...15-T
1RAOC...30-T



1RAOC / 1RAOC-T (with remote control)

Surge arresters with incorporated thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. The protective element is a varistor so there are no residual currents. Suitable for protection in zones 1-2. Case in polycarbonate material, V0 self-extinguishing. Optical signal of fault. These devices have independent termination for L-PE and N-PE protection.

	1RAOC150/2x40	1RAOC275/2x40	1RAOC440/2x40
MAX WORKING VOLTAGE U_c (CA/CC)	150/200V	275/350V	440/580V
PROTECTION VOLTAGE U_p : $a I_n$	<0,9 kV / pole	<1,4 kV / pole	<2,2 kV / pole
NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)		15 kA / pole	
MAX CURRENT DISCHARGE I_{max} (8/20 μ s)		40 kA / pole	
RESPONSE TIME t_A		< 25 ns	
PRE-IN LINE FUSE (if main is > 100A)		100 AgL	
SHORT CIRCUIT		25 kA / 50 Hz	
WORKING TEMPERATURE		-40°C ÷ +80°C	
SECTION OF WIRES		25 mm ² (single wire) - 16 mm ² (multiple wire)	
"L" OR "N" CONNECTION WIRES SECTION		6 mm ² (single wire) - 4 mm ² (multiple wire)	
REMOTE CONTROL	250 VCA / 0,5A	Load 125 V / 3A	Section of wire 1,5 mm ² max
PROTECTION DEGREE		IP20 - IEC 61643/1	
CLASS (IEC / VDE)		II / C	
DIMENSIONS / WEIGHT kg		1 DIN module / 0,14	

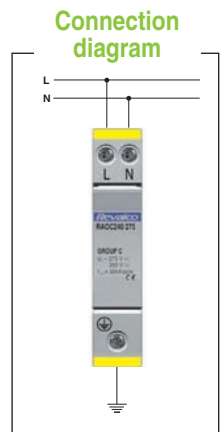
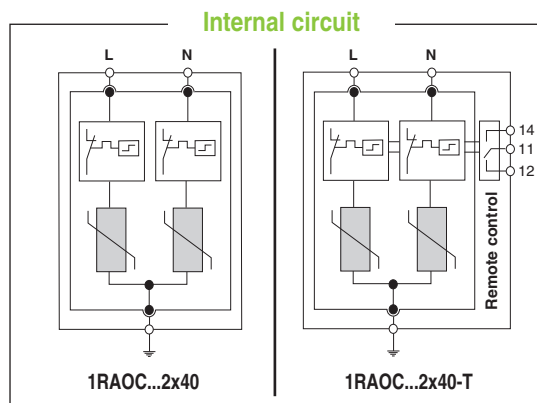
It is possible to substitute the fault varistor (1RAOC-F) without the disconnection of the auxiliary power supply



1RAOC...2x40



1RAOC...2x40-T



SURGE ARRESTERS WITH GAS TUBE FOR INTERNAL MOUNTING - GROUP C

1RAOC20G / 1RAOC20G-T (with remote control) on which the protective element consists of a varistor and a gas tube mounted in series.
1RAOC30G / 1RAOC30G-T (with remote control) on which the protective element consists of a varistor and a gas tube mounted in series.

Surge arresters with incorporated thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Suitable for protection in zones 1-2. Case in polycarbonate material, V0 self-extinguishing.

	1RAOC275/20G	1RAOC275/30G
MAX WORKING VOLTAGE U_c (CA/CC)	275/350V	275/350V
NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)	10 kA	15 kA
MAX CURRENT DISCHARGE I_{max} (8/20 μ s)	20 kA	30 kA
VOLTAGE PROTECTION $a I_n \leq$		<1,5 kV
RESPONSE TIME t_A		< 25 ns
PRE-IN LINE FUSE (if main is > 100A)		100 AgL
SHORT CIRCUIT		25 kA / 50 Hz
WORKING TEMPERATURE		-40°C ÷ +80°C
SECTION OF WIRES		35 mm ² (single wire) - 25 mm ² (multiple wire)
REMOTE CONTROL	250 VAC / 0,5A	Load 125 V / 3A
PROTECTION DEGREE		IP20 - IEC 61643/1 -
CLASS (IEC / VDE)		II / C
DIMENSIONS / WEIGHT kg		1 DIN module / 0,14

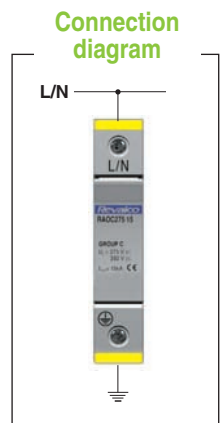
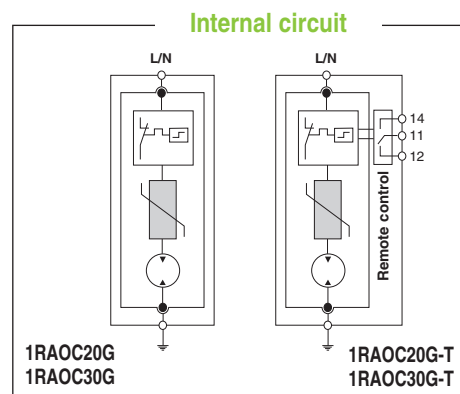
It is possible to substitute the fault varistor (1RAOCG-F) without the disconnection of the auxiliary power supply



1RAOC...20G
1RAOC...30G



1RAOC...20G-T
1RAOC...30G-T



1RAOC2x10G / 1RAOC2x10G-T (with remote control) 1RAOC2x20G / 1RAOC2x20G-T (with remote control)

On which the protective element consists of a varistor and a gas tube mounted in series. Surge arresters with incorporated thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Suitable for protection in zones 1-2. Case in polycarbonate material, V0 self-extinguishing. Optical signal of fault. These devices have independent termination for L-PE and N-PE protection.

- NOMINAL CURRENT DISCHARGE I_n (8/20 μ s)
- MAX CURRENT DISCHARGE I_{max} (8/20 μ s)
- PROTECTION VOLTAGE U_p :
- MAX WORKING VOLTAGE U_c (AC/DC)
- RESPONSE TIME t_A
- PRE-IN LINE FUSE (if main is > 100A)
- SHORT CIRCUIT
- WORKING TEMPERATURE
- SECTION OF WIRES
- "L" OR "N" SECTION OF WIRES
- REMOTE CONTROL 250 VCA / 0,5A
- PROTECTION DEGREE
- CLASS (IEC / VDE)
- DIMENSIONS / WEIGHT kg
- It is possible to substitute the fault varistor (1RAOCG-F) without the disconnection of the auxiliary power supply

1RAOC275/2x10G	1RAOC275/2x20G
5 kA / pole	10 kA / pole
10 kA / pole	20 kA / pole
<1,4 kV	<1,6 kV
275/350V	
< 25 ns	
100 AgL	
25 kA / 50 Hz	
-40°C ÷ +80°C	
25 mm ² (single wire) - 16 mm ² (multiple wire)	
6 mm ² (single wire) - 4 mm ² (multiple wire)	
Load 125 V / 3A	Section of wire 1,5 mm ² max
	IP20 - IEC 61643/1
II / C	
1 DIN module / 0,14	

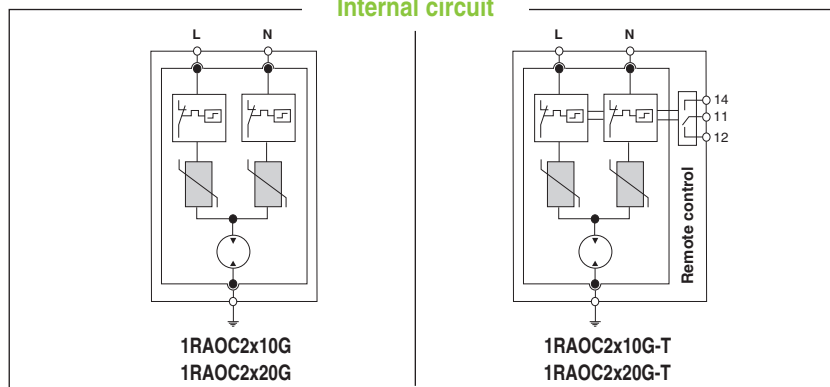
Connection diagram



1RAOC...2x10G
1RAOC...2x20G

1RAOC...2x10G-T
1RAOC...2x20G-T

Internal circuit



1RAOC2x10G
1RAOC2x20G

1RAOC2x10G-T
1RAOC2x20G-T

SURGE ARRESTERS WITH GAS TUBE FOR INTERNAL MOUNTING - GROUP C

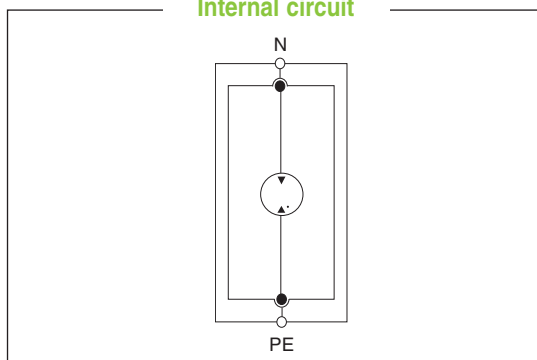
1RAOC40G on which the protective element consists of a gas tube only. Used as galvanic separation between N-PE in class II surge arresters.

Surge arresters with incorporated thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Suitable for protection in zones 0B - 1. Case in polycarbonate material, V0 self-extinguishing.

- MAX WORKING VOLTAGE U_c (AC/DC) 255V
- NOMINAL CURRENT DISCHARGE I_n (8/20 μ s) 20 kA
- MAX CURRENT DISCHARGE I_{max} (8/20 μ s) 40 kA
- PROTECTION VOLTAGE U_p : (1,2/50 μ s) 1,2 kV
- RESPONSE TIME t_A < 100 ns
- SHORT CIRCUIT 25 kA / 50 Hz
- WORKING TEMPERATURE -40°C ÷ +80°C
- SECTION OF WIRES 35 mm² (single wire) - 25 mm² (multiple wire)
- PROTECTION DEGREE IP20
- STANDARDS IEC 61643/1
- CLASS (IEC / VDE) II / C
- DIMENSIONS / WEIGHT kg 1 DIN module / 0,14
- It is possible to substitute the fault varistor (1RAOCG-F) without the disconnection of the auxiliary power supply



Internal circuit



Connection diagram



SURGE ARRESTERS WITH VARISTOR FOR INTERNAL MOUNTING - GROUP D

1RAOD / 1RAOD-T (with remote control)

Surge arresters with incorporated thermic protection. Suitable for installation close to the main device offering protection against indirect lighting overvoltages or overcurrents. The protective element is a varistor so there are no residual currents. Suitable for protection in zones 1-2. Case in polycarbonate material, V0 self-extinguishing. Optical signal of fault.

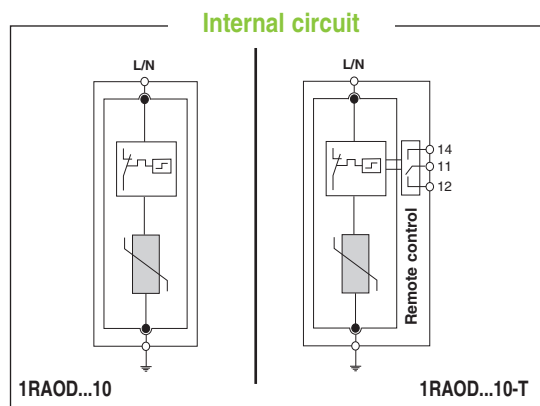
	1RAOD150/10	1RAOD275/10	1RAOD320/10	1RAOD440/10
MAX WORKING VOLTAGE U_c (AC/DC)	150/200V	275/350V	320/420V	440/580V
PROTECTION VOLTAGE U_p at U_{oc}/I_{sc}	<0,5 kV	<0,9 kV	<1 kV	<1,7 kV
MAX CURRENT DISCHARGE I_{max} (8/20 μ s)			10 kA	
COMBINED WAVE (1,2/50 μ s - 8/20 μ s) U_{oc}/I_{sc}			10 kV / 5 kA	
RESPONSE TIME t_A			< 25 ns	
PRE-IN LINE FUSE (if main is > 100A)			100 AgL	
SHORT CIRCUIT			10 kA / 50 Hz	
WORKING TEMPERATURE			-40°C ÷ +80°C	
SECTION OF WIRES		35 mm ² (single wire) - 25 mm ² (multiple wire)		
REMOTE CONTROL		Load 125 V / 3A	Section of wire 1,5 mm ² max	
PROTECTION DEGREE			IP20 - IEC 61643/1	
CLASS (IEC / VDE)			III / D	
DIMENSIONS / WEIGHT kg			1 DIN module / 0,14	
It is possible to substitute the fault varistor (1RAOD-F) without the disconnection of the auxiliary power supply				



1RAOD...10



1RAOD...10-T

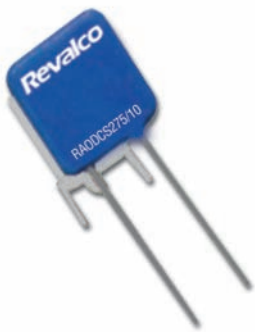


Connection diagram



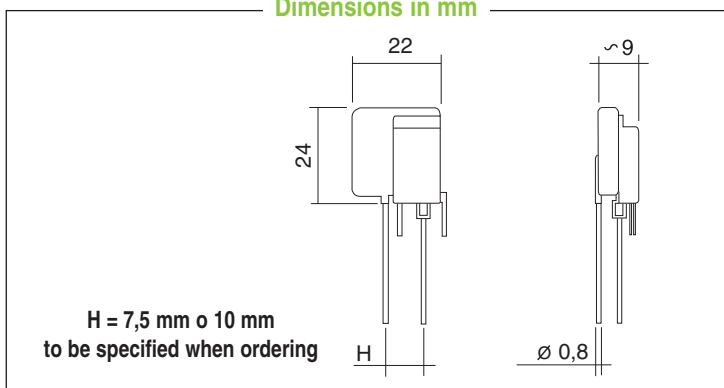
1RAODCS

Surge arresters with incorporated thermic protection. Suitable for installation in printed circuits against short circuits. Internal fuse 16A Signal of fault.

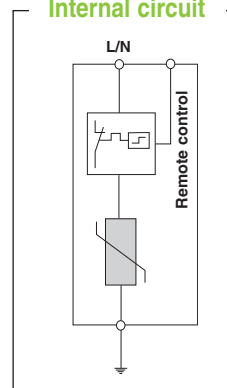


	1RAODCS150/10	1RAODCS275/10	1RAODCS320/10	1RAODCS440/10
MAX WORKING VOLTAGE U_c	150 VCA	275 VCA	320 VCA	440 VCA
PROTECTION VOLTAGE U_p at U_{oc}/I_{sc}	0,9 kV	1,4 kV	1,6 kV	1,8 kV
COMBINED WAVE (1,2/50 μ s - 8/20 μ s) U_{oc}/I_{sc}			10 kV / 5 kA	
MAX CURRENT DISCHARGE I_{max} (8/20 μ s)			10 kA	
RESPONSE TIME t_A			< 25 ns	
WORKING TEMPERATURE			-40°C ÷ +80°C	
REMOTE CONTROL			YES	
STANDARDS			IEC 61643/1	
CLASS (IEC / VDE)			III / D	

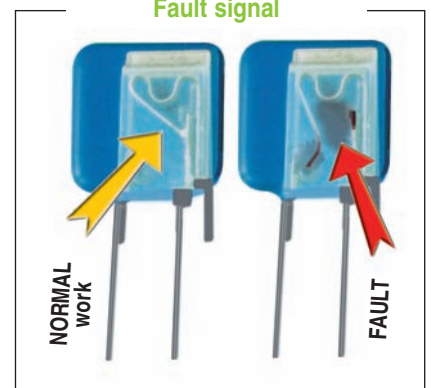
Dimensions in mm



Internal circuit



Fault signal



1RAOCPV / 1RAOCPV-T (with remote control)

Surge arresters with internal thermis protection. Suitable for photovoltaic systems protection against direct and indirect surge arresters for installation between the photovoltaic panels and AC/DC inverter. Protective element is a varistor, so residual currents will be not present. Suitable for zone 1-2 protection according to the IEC62305 standards. Polycarbonate, V0 self-extinguishing case. Optical signalling of fault. Connection can be effected with "T" system and "V" system.

- MAXIMUM CONTINUOUS VOLTAGE U_{cpv} (+ PE, - PE)
- MAXIMUM CONTINUOUS VOLTAGE U_{cpv} (+ -)
- PROTECTION VOLTAGE U_p
- MAX CURRENT DISCHARGE I_{max} (8/20 μ s)
- RESPONSE TIME t_A
- SHORT CIRCUIT
- WORKING TEMPERATURE
- SECTION OF WIRES
- REMOTE CONTROL
- PROTECTION DEGREE
- CLASS (IEC / EN / VDE)
- DIMENSIONS / WEIGHT kg
- It is possible to substitute the fault varistor (1RAOCPV-F) without the disconnection of the auxiliary power supply

1RAOCPV 40/100

100V
200V
<0,7 kV

1RAOCPV 40/550

550V
1100V
<2,1 kV
40 kA / polo
< 25 ns
25 kA
-40°C ÷ +80°C

1RAOCPV 40/1000

1000V
1000V
<4 kV

35 mm² (single wire) - 25 mm² (multiple wire)
AC: 250V / 0,5A ; 125V / 3A Section of wire 1,5 mm² max
IP20

2 DIN modules / 0,28

II / Type 2 / C
2 DIN modules / 0,31

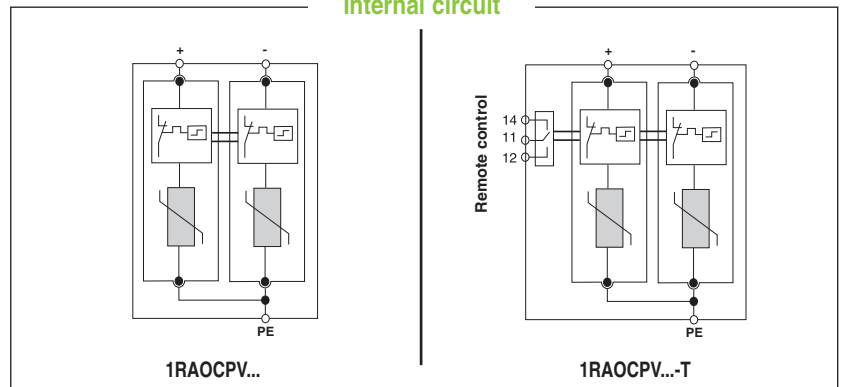
3 DIN modules / 0,40



1RAOCPV 40/100 (550)

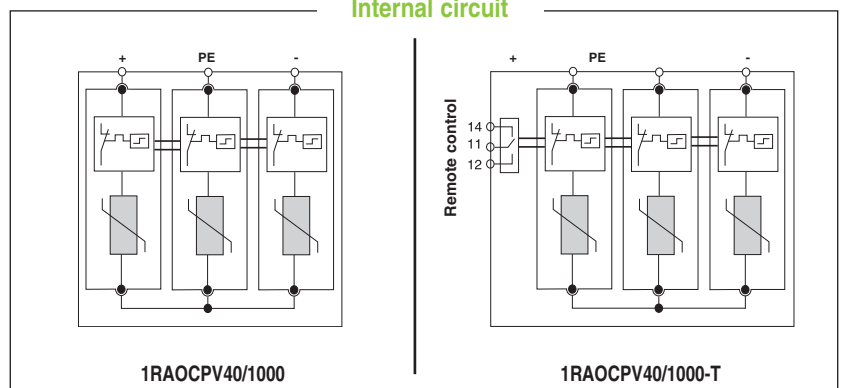
1RAOCPV 40/100-T (550-T)

Internal circuit



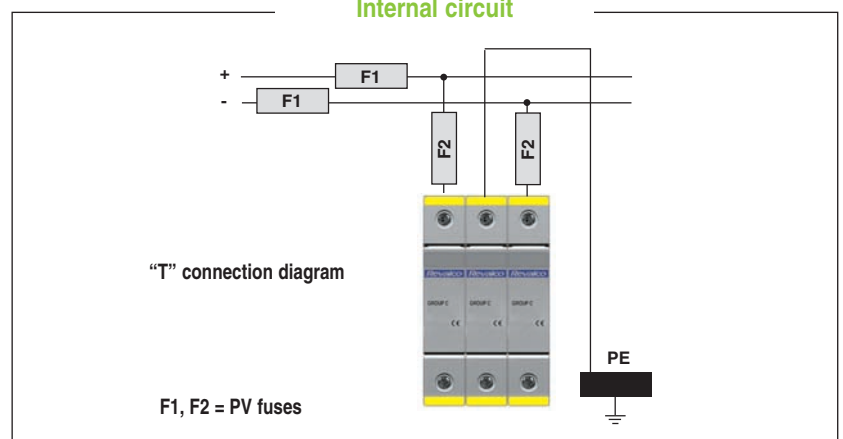
1RAOCPV 40/1000

Internal circuit



1RAOCPV 40/1000-T

Internal circuit

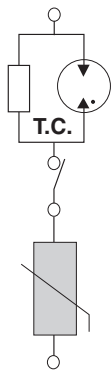


**NEW
GENERATION**

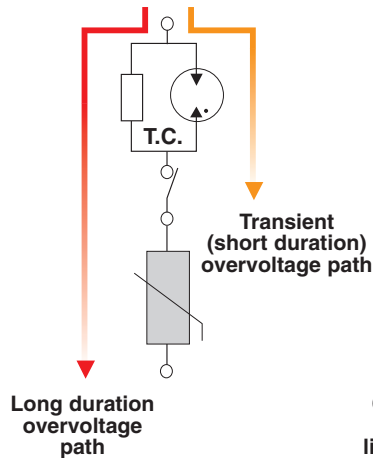
SURGE PROTECTION DEVICE FOR POWER SUPPLY

After years of experiences and tests, it was clear that the most important problem to solve in the Surge Arresters, was related to the risk of fire caused by the voltaic arc of thermal contact during commutation. As that the new standards in the world start to take into consideration this fact, Revalco developed a new generation of surge arresters adopting a new technology; **practically Thermal Disconnecter is soldered straight on MOV surface and if the current increases, the second stage protection reacts and switches off MOV from power supply.**

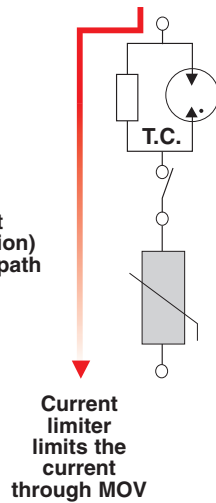
1. Normal Condition



2. How does it work



3. In case of long duration overvoltages



- In case of over-voltages up to 50% of U_c , because of current limitation (about 10mA) MOV is not degraded.
- In case of over-voltages up to 50% of U_c (if over-voltage level is higher), Current limit allows safe reaction of thermal disconnecter full stop
- Patented thermal disconnecter technology cuts the arc. Because of current limitation; energy through Surge Protection Device is lower ($I^2 \times T$)

MOV
Metal Oxide
Varistor

GDT
Gas
Discharge
Tube

Current
limiter

Thermal
Disconnecter

1RAOSAFE C...40 / 1RAOSAFE C-T...40 (with remote control)

On which the protective element consists of a varistor, a gas tube with thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing. Optical signal of fault. Protection modes L/N -PE. MOV protective element. High surge discharge rating $I_{max}=40kA$. Standards IEC-61643-1.

- MAX CONTINUOUS OPERATING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p
- NOMINAL DISCHARGE CURRENT (8/20 μs) I_n
- MAX DISCHARGE CURRENT (8/20 μs) I_{max}
- FOLLOW CURRENT I_f
- RESPONSE TIME t_A
- THERMAL PROTECTION
- TOV WITHSTAND FOR 5 SEC
- SHORT CIRCUIT WITHSTAND CURRENT
- TERMINAL SCREW TORQUE
- WORKING TEMPERATURE
- TERMINAL CROSS SECTION
- PROTECTION DEGREE
- DIMENSIONS / WEIGHT kg
- REMOTE CONTROL
- It is possible to substitute the fault module (1RAOSAFE C-F) without the disconnection of the auxiliary power supply

1RAOSAFE C150/40

150/200V
<1,0 kV

1RAOSAFE C275/40

275/350V
<1,6 kV

1RAOSAFE C440/40

440/580V
<2,2 kV

20kA

40 kA

NO

< 25 ns

YES

$1,32 \times U_{ref}$ (335V) - $\sqrt{3} \times U_{ref}$ (400V)

25 kA / 50 Hz

3,5Nm max

-40°C ÷ +80°C

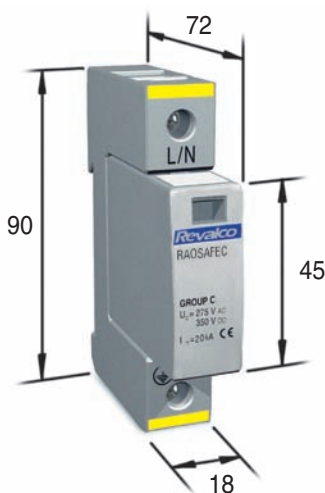
35 mm² (solid) - 25 mm² (stranded)

IP20

1 DIN module / 0,20

250 VAC / 0,5A Load 125 V / 3A

Section of wire 1,5 mm² max Terminal torque 0,25Nm

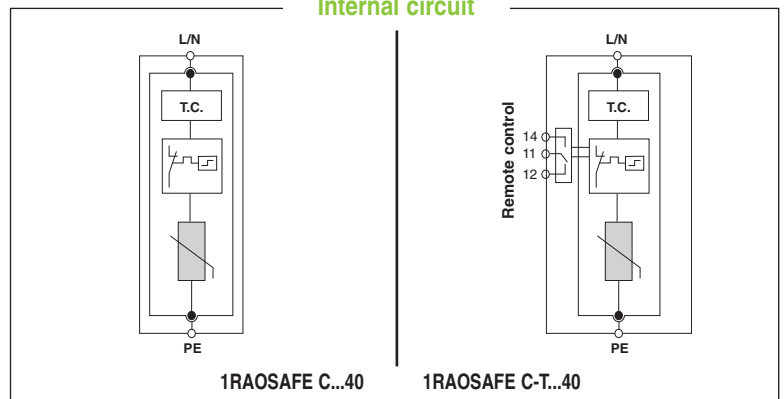


1RAOSAFE C...40



1RAOSAFE C-T...40

Internal circuit



1RAOSFC.../-80-1+1 / 1RAOSFC.../-80T1+1 (with remote control)

On which the protective element consists of a varistor, a gas tube with thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lightning overvoltages. Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing. Optical signal of fault. Connections TT. Protection modes L-N / N-PE. MOV and GDT protective element. High surge discharge rating $I_{max}=40kA$ per pole. Standards IEC-61643-1.

- MAX CONTINUOUS OPERATING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p (L-N) / U_p (N-PE)
- NOMINAL DISCHARGE CURRENT (8/20 μs) I_n (L-N/N-PE)
- MAX DISCHARGE CURRENT (8/20 μs) I_{max} (L-N/N-PE)
- FOLLOW CURRENT I_f (N-PE)
- RESPONSE TIME t_A (L-N/N-PE)
- THERMAL PROTECTION (L-N/N-PE)
- TOV WITHSTAND FOR 5 SEC
- SHORT CIRCUIT WITHSTAND CURRENT (L-N/N-PE)
- TERMINAL SCREW TORQUE
- WORKING TEMPERATURE
- TERMINAL CROSS SECTION
- PROTECTION DEGREE
- DIMENSIONS
- REMOTE CONTROL

It is possible to substitute the fault module (1RAOSFC...F1+1) without the disconnection of the auxiliary power supply

1RAOSFC 150/-80-1+1

150/200V
<1,0 kV / <2,0 kV

1RAOSFC 275/-80-1+1

275/350V
<1,6 kV / <2,0 kV

1RAOSFC 440/-80-1+1

440/580V
<2,2 kV / <2,0 kV

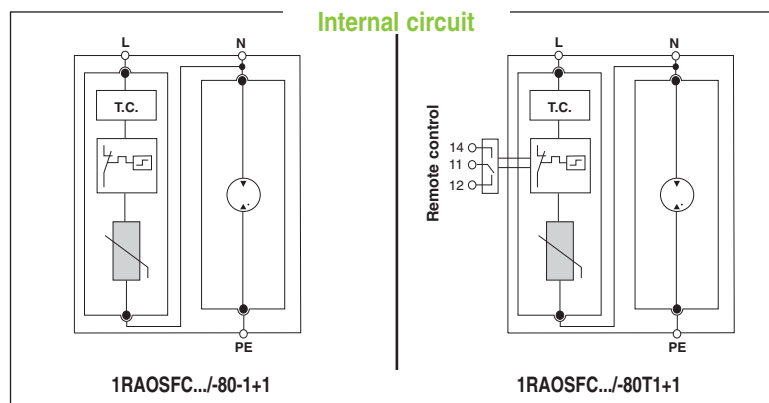
20kA per pole
40 kA per pole
>100A RMS
< 25 ns / 100 ns
YES
 $1,32 \times U_{ref}$ (335V) - $\sqrt{3} \times U_{ref}$ (400V)
25 kA / 50 Hz
3,5Nm max
-40°C ÷ +80°C
35 mm² (solid) - 25 mm² (stranded)
IP20
2 DIN modules

250 VAC / 0,5A Load 125 V / 3A Section of wire 1,5 mm² max Terminal torque 0,25Nm



1RAOSFC.../-80-1+1

1RAOSFC.../-80T1+1



1RAOSFC.../-80-2+0 / 1RAOSFC.../-80T2+0 (with remote control)

On which the protective element consists of a varistor, a gas tube with thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lightning overvoltages. Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing. Optical signal of fault. Connections TN-S. Protection modes LN-PE / L-PEN. MOV protective element. High surge discharge rating $I_{max}=40kA$ per pole. Standards IEC-61643-1.

- MAX CONTINUOUS OPERATING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p
- NOMINAL DISCHARGE CURRENT (8/20 μs) I_n
- MAX DISCHARGE CURRENT (8/20 μs) I_{max}
- FOLLOW CURRENT I_f
- RESPONSE TIME t_A
- THERMAL PROTECTION
- TOV WITHSTAND FOR 5 SEC
- SHORT CIRCUIT WITHSTAND CURRENT
- TERMINAL SCREW TORQUE
- WORKING TEMPERATURE
- TERMINAL CROSS SECTION
- PROTECTION DEGREE
- DIMENSIONS
- REMOTE CONTROL

It is possible to substitute the fault module (1RAOSFC...F2+0) without the disconnection of the auxiliary power supply

1RAOSFC 150/-80-2+0

150/200V
<1,0 kV

1RAOSFC 275/-80-2+0

275/350V
<1,6 kV

1RAOSFC 440/-80-2+0

440/580V
<2,2 kV

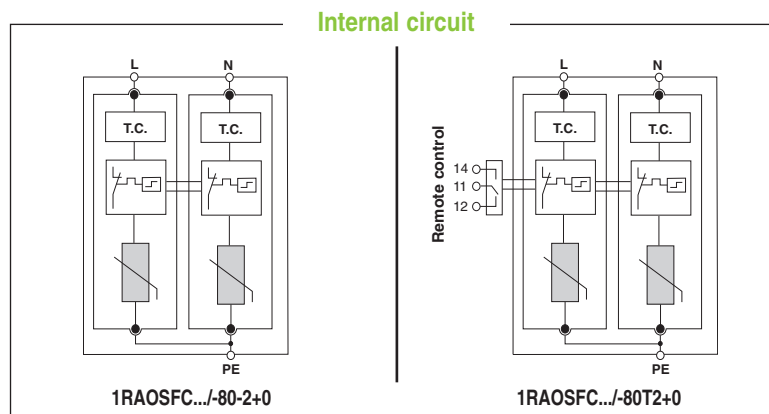
20kA per pole
40 kA per pole
NO
< 25 ns
YES
 $1,32 \times U_{ref}$ (335V) - $\sqrt{3} \times U_{ref}$ (400V)
25 kA / 50 Hz
3,5Nm max
-40°C ÷ +80°C
35 mm² (solid) - 25 mm² (stranded)
IP20
2 DIN modules

250 VAC / 0,5A Load 125 V / 3A Section of wire 1,5 mm² max Terminal torque 0,25Nm



1RAOSFC.../-80-2+0

1RAOSFC.../-80T2+0



1RAOSFC.../120-3+0 / 1RAOSFC.../120T3+0 (with remote control)

On which the protective element consists of a varistor, a gas tube with thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing. Optical signal of fault. Connections TN-C. Protection modes L-PEN. MOV protective element. High surge discharge rating $I_{max}=40kA$ per pole. Standards IEC-61643-1.

- MAX CONTINUOUS OPERATING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p
- NOMINAL (I_n) / MAX (I_{max}) DISCHARGE CURRENT (8/20 μs)
- FOLLOW CURRENT I_f / RESPONSE TIME t_A
- THERMAL PROTECTION
- TOV WITHSTAND FOR 5 SEC
- SHORT CIRCUIT WITHSTAND CURRENT
- TERMINAL SCREW TORQUE / TERMINAL CROSS SECTION
- WORKING TEMPERATURE
- PROTECTION DEGREE / DIMENSIONS
- REMOTE CONTROL
- It is possible to substitute the fault module (1RAOSFC...F3+0) without the disconnection of the auxiliary power supply

1RAOSFC 150/120-3+0

150/200V
<1,0 kV

1RAOSFC 275/120-3+0

275/350V
<1,6 kV
20kA per pole / 40 kA per pole
NO / < 25 ns

1RAOSFC 440/120-3+0

440/580V
<2,2 kV

1,32 x U_{ref} (335V) - $\sqrt{3}$ x U_{ref} (400V)

25 kA / 50 Hz

3,5Nm max / 35 mm² (solid) - 25 mm² (stranded)

-40°C ÷ +80°C

IP20 / 3 DIN modules

250 VAC / 0,5A Load 125 V / 3A

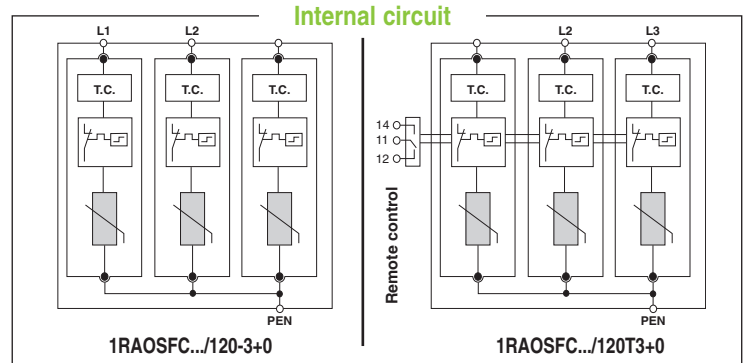
Section of wire 1,5 mm² max Terminal torque 0,25Nm



1RAOSFC.../120-3+0



1RAOSFC.../120T3+0



1RAOSFC.../160-3+1 / 1RAOSFC.../160T3+1 (with remote control)

On which the protective element consists of a varistor, a gas tube with thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing. Optical signal of fault. Connections TT. Protection modes L-N / N-PE. MOV and GDT protective element. High surge discharge rating $I_{max}=40kA$ per pole. Standards IEC-61643-1.

- MAX CONTINUOUS OPERATING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p (L-N) / U_p (N-PE)
- NOMINAL (I_n) / MAX (I_{max}) DISCHARGE CURRENT (8/20 μs L-N/N-PE)
- FOLLOW CURRENT I_f (N-PE) / RESPONSE TIME t_A (L-N/N-PE)
- THERMAL PROTECTION (L-N/N-PE)
- TOV WITHSTAND FOR 5 SEC
- SHORT CIRCUIT WITHSTAND CURRENT (L-N/N-PE)
- TERMINAL SCREW TORQUE / TERMINAL CROSS SECTION
- WORKING TEMPERATURE
- PROTECTION DEGREE / DIMENSIONS
- REMOTE CONTROL
- It is possible to substitute the fault module (1RAOSFC...F3+1) without the disconnection of the auxiliary power supply

1RAOSFC 150/160-3+1

150/200V
<1,0 kV / <2,0 kV

1RAOSFC 275/160-3+1

275/350V
<1,6 kV / <2,0 kV
20kA per pole / 40 kA per pole
>100A RMS - < 25ns / 100 ns

1RAOSFC 440/160-3+1

440/580V
<2,2 kV / <2,0 kV

1,32 x U_{ref} (335V) - $\sqrt{3}$ x U_{ref} (400V)

25 kA / 50 Hz

3,5Nm max / 35 mm² (solid) - 25 mm² (stranded)

-40°C ÷ +80°C

IP20 / 4 DIN modules

250 VAC / 0,5A Load 125 V / 3A

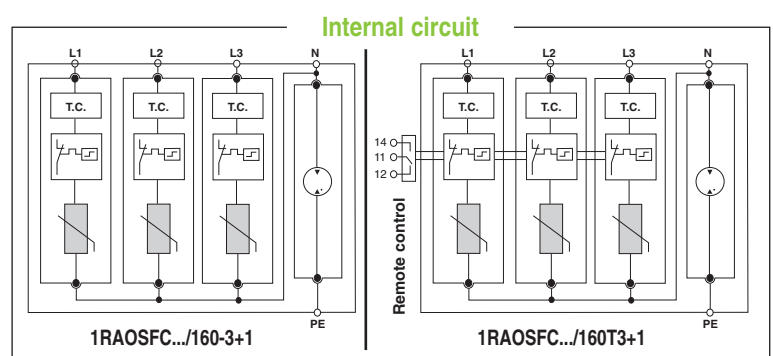
Section of wire 1,5 mm² max Terminal torque 0,25Nm



1RAOSFC.../160-3+1



1RAOSFC.../160T3+1



1RAOSFC.../160-4+0 / 1RAOSFC.../160T4+0 (with remote control)

On which the protective element consists of a varistor, a gas tube with thermic protection. Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages. Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing. Optical signal of fault. Connections TN-S, IT. Protection modes L/N-PE. MOV protective element. High surge discharge rating $I_{max}=40kA$ per pole. Standards IEC-61643-1.

- MAX CONTINUOUS OPERATING VOLTAGE U_c (AC/DC)
- PROTECTION VOLTAGE U_p
- NOMINAL (I_n) / MAX (I_{max}) DISCHARGE CURRENT (8/20 μs)
- FOLLOW CURRENT I_f / RESPONSE TIME t_A
- THERMAL PROTECTION
- TOV WITHSTAND FOR 5 SEC
- SHORT CIRCUIT WITHSTAND CURRENT

1RAOSFC 150/160-4+0

150/200V
<1,0 kV

1RAOSFC 275/160-4+0

275/350V
<1,6 kV
20kA per pole / 40 kA per pole
NO / < 25ns

1RAOSFC 440/160-4+0

440/580V
<2,2 kV

1,32 x U_{ref} (335V) - $\sqrt{3}$ x U_{ref} (400V)

25 kA / 50 Hz

- TERMINAL SCREW TORQUE / TERMINAL CROSS SECTION
- WORKING TEMPERATURE
- PROTECTION DEGREE / DIMENSIONS
- REMOTE CONTROL
- It is possible to substitute the fault module (1RAOSFC...F4+0) without the disconnection of the auxiliary power supply

1RAOSFC 150/160-4+0 | 1RAOSFC 275/160-4+0 | 1RAOSFC 440/160-4+0

3,5Nm max / 35 mm² (solid) - 25 mm² (stranded)

-40°C ÷ +80°C

IP20 / 4 DIN modules

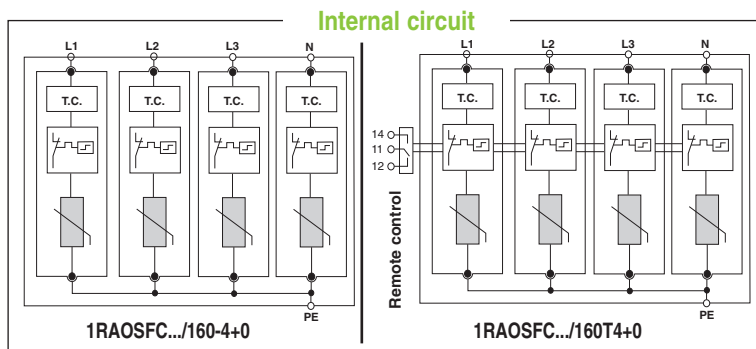
250 VAC / 0,5A Load 125 V / 3A Section of wire 1,5 mm² max Terminal torque 0,25Nm



1RAOSFC.../160-4+0



1RAOSFC.../160T4+0

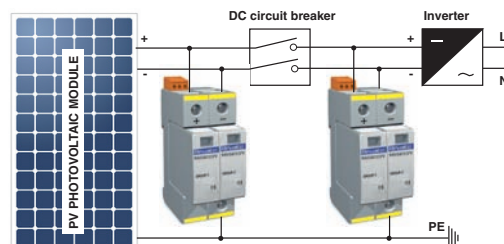


SURGE PROTECTION DEVICE

FOR PHOTOVOLTAIC SYSTEM

1RAOSAFE C...PV / 1RAOSAFE C-T...PV (with remote control)

- On which the protective element consists of a varistor, a gas tube with thermic protection.
- Suitable for installation in sub distribution panels or close to the main device offering protection against indirect lighting overvoltages.
- Category IEC/EN/VDE Class II - Type 2/C. Case in thermoplastic material, UL 94-V0 self-extinguishing.
- Optical signal of fault.
- Protection modes (+) + (-) - PE, (+) - PE / (-) - PE. MOV protective element.
- High surge discharge rating I_{max}=40kA.
- Standards IEC-61643-1; UTE 61740-51; EN 50539-11.
- Backup fuses are not necessary



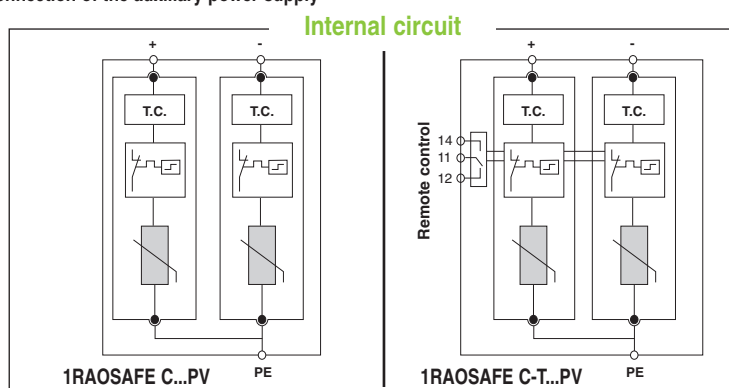
	1RAOSAFE C75PV	1RAOSAFE C300PV	1RAOSAFE C600PV	1RAOSAFE C1000PV	1RAOSAFE C1200PV
MAXIMUM CONTINUOUS VOLTAGE U _{cpv} (+ PE, - PE)	75V	300V	600V	1000V	1200V
U _{cpv} (+ -)	150V	600V	1200V	2000V	1200V
PROTECTION VOLTAGE U _p	<0,6 kV	<1,7 kV	<2,2 kV	<2,8 kV	<4,6 kV
NOMINAL DISCHARGE CURRENT (8/20μs) I _n (+) - PE / (-) - PE		20kA	20kA	12,5kA	20kA
I _n (+) + (-) - PE		40kA	25kA	25kA	20kA
MAX DISCHARGE CURRENT (8/20 μs) I _{max} (+) - PE / (-) - PE		40 kA	25kA	25kA	40kA
I _{max} (+) + (-) - PE		80 kA	50kA	50kA	40kA
MAX SHORT CIRCUIT WITHSTAND CURRENT I _{scwpv}			NO LIMIT		
FOLLOW CURRENT I _f / RESPONSE TIME t _A			NO / < 25 ns		
THERMAL PROTECTION / PROTECTION DEGREE			YES / IP20		
TERMINAL SCREW TORQUE / TERMINAL CROSS SECTION			3,5Nm max / 35 mm ² (solid) - 25 mm ² (stranded)		
WORKING TEMPERATURE			-40°C ÷ +80°C		
DIMENSIONS / WEIGHT kg			2 DIN modules / 0,40		3 DIN modules / 0,60
REMOTE CONTROL			250 VAC / 0,5A Load 125 V / 3A Section of wire 1,5 mm ² max Terminal torque 0,25Nm		
It is possible to substitute the fault module (1RAOSAFE CPV-F) without the disconnection of the auxiliary power supply					



1RAOSAFE C 75...1000PV



1RAOSAFE C-T 75...1000PV



1RAOSAFE C 1200PV



1RAOSAFE C-T 1200PV

