



PARS
Arrester

Electrical Transmission
Equipment Co.

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Arrester



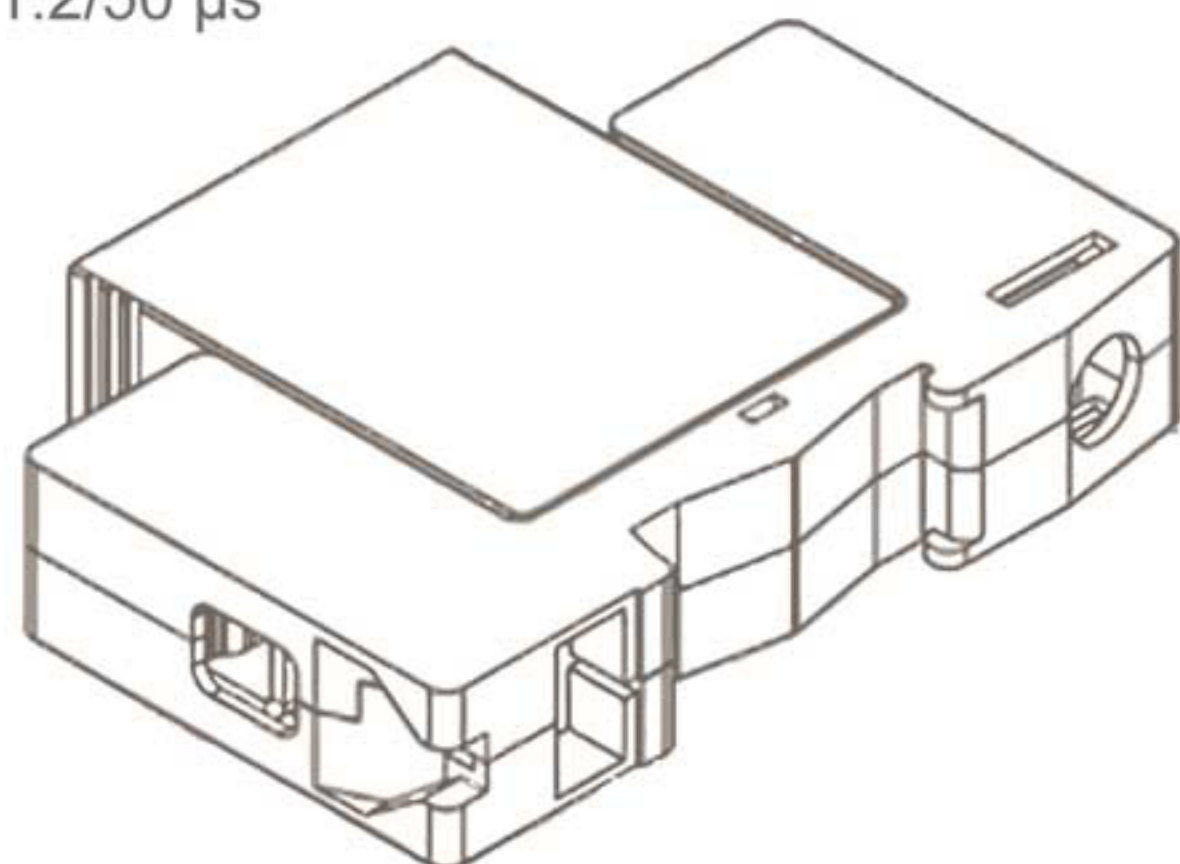


History of Pars Electrical Transmission Equipment Co.

- **1991:** Establishing the Pars Electrical Transmission Equipment Company
- **1992:** Producing medium voltage ceramic surge arrester (PAW/PAY models) under the license of Swiss ABB
- **1997:** Producing medium voltage polymeric surge arrester (PAP models) under the technical knowledge of Pars Electrical Transmission Equipment
- **1999:** Producing high voltage ceramic surge arrester under the licence of Simense in Germany
- **1999:** Obtaining International Certificate of ISO9002 from German DQS
- **2000:** Construction the high voltage laboratory
- **2001:** Producing Arrester Disconnecter under the technical knowledge of Pars Electrical Transmission Equipment
- **2001:** Producing low voltage surge arrester (PAL, PAM, PAS Series)
- **2003:** Producing Arrester Monitoring Device (AMD) machine in coproduction with NRI
- **2005:** Producing high voltage surge arrester under the technical knowledge of Pars Electrical Transmission Equipment
- **2007:** Producing direct injection polymeric surge arrester PAP2 under the technical knowledge of Pars Electrical Transmission Equipment
- **2011:** Producing surge counter under the technical knowledge of Pars Electrical Transmission Equipment
- **2011:** Promoting the quality management system ISO 9001-2008 through German DQS
- **2013:** Producing tube design polymeric surge arrester (PAQ models) under the technical knowledge of Pars Electrical Transmission Equipment

Laboratory Equipment

- Current Impulse Generator up to 100kA 8/20 μ s
- Current Impulse Generator up to 25kA 10/350 μ s
- Marx Generator up to 1200k V 1.2/50 μ s
- Weather Ageing Test
- Accelerated Ageing Test
- Power Frequency Test
- Sealing Test
- Temperature Cycle
- Disconnecter test
- Mechanical Test



Introduction

In energy transmission and distribution system, transient over-voltage caused by two kinds of major sources. First kinds are external resources that their most samples are thunderbolt. Internal factors also produce other kind of transient over-voltage like switching, load rejection...

Protecting the electrical equipments in front of these over-voltages, it's recommended to use kinds of surge arresters. There are different methods for limiting the over-voltages; Using lightning on the buildings, for example (or installing of the special switches for capacitor banks.)

In second stage, using kinds of surge arresters would presented as suitable solution to limit the surface of possible over voltages and protecting the equipments too. Finally, it's necessary also to design the network equipment with suitable dielectric strength.

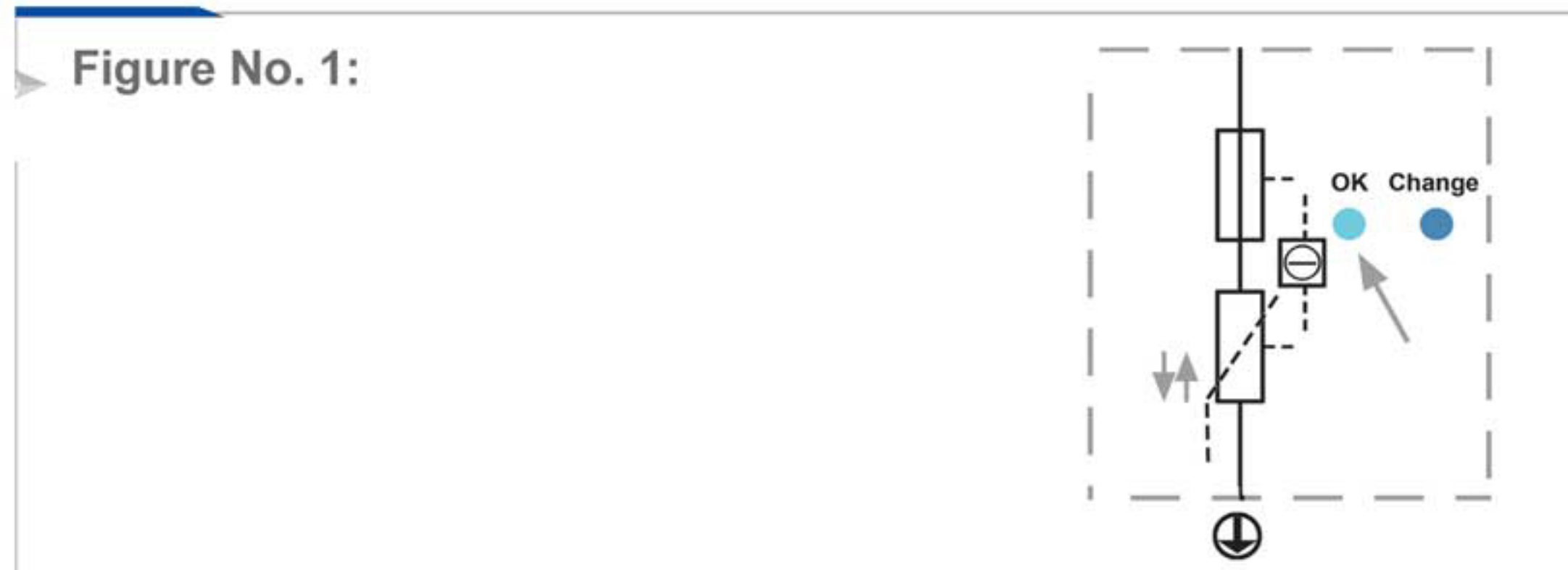
The Surge protective devices (SPD) are used to limit the surface of over-voltages in low voltage systems and in fact they are the same metal zinc oxide surge arresters with proper design for LV systems. Using these SPDs in LV systems in addition to avoid burning the system insulators in transient high amplitude waves, slow the aging of insulators by frequency of transient & low amplitude waves and increases the useful life of insulators.

Standard and Classifications of SPDs

SPDs are classified into three practical class based on their installation place, which named 1, 2, and 3 according to standard IEC61641-1 and EN61643-11 and are called B, C, and D in standard DIN VDE 0675-6. Here, we use standard IEC to produce the SPDs.

Structure and Function of SPDs

Principle and protective function of SPDs is base on non-linear voltage-current characteristic of their varistor. Figure No. 1 shows the internal structure of a SPD. According to this figure, you can see a heating fuse which is located in series with internal varistor, to disconnect the created short circuit in case of eventual varistor burning. The marker in SPD would discolor too and exchange from green to red.



Important Electrical Definitions

➤ **Class:**

Kind of SPD identifies the kind of its protective function in low voltage system.

➤ **Class1:** Some protection against lightning surge and switching, installable in main distribution frame.

➤ **Class2:** Some protection against lightning surge and switching, installable in substation distribution frame.

➤ **Class3:** Private protection of sensitive equipments.

➤ **Continuous Voltage (Uc):**

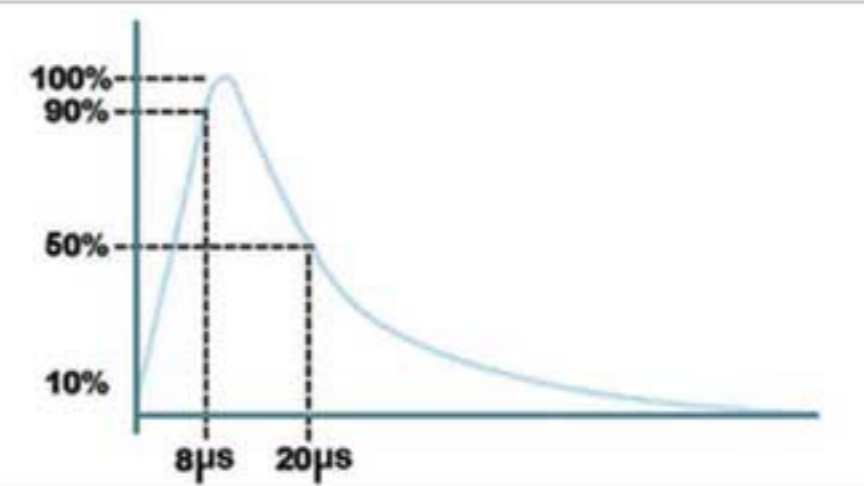
Maximum continuous Voltage is r.m.s or DC voltage that can be tolerated by SPD continuously. This amount also called rated voltage (Ur).

➤ **Nominal Discharge Current (In):**

It's the amount of current peak of SPD with 8/20 μ s wave form which are used in SPD type tests.

SPDs are classified into three practical class based on their installation place, which named 1, 2, and 3 according to standard IEC61641-1 and EN61643-11 and are called B, C, and D in standard DIN VDE 0675-6. Here, we use standard IEC to produce the SPDs. (figure No.2 shows In)

➤ **Figure No. 2:**



➤ **Current (Iimp):**

This is the special parameter of Class I surge arresters and determines by the value of current and also its load amount for doing the type test.

➤ **Protection Level (Up):**

This is the Voltage value which recognizes the application of SPD to limit the two sides of terminal voltage.

Selecting the Low voltage Surge Arrester

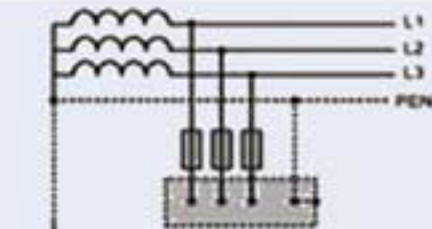
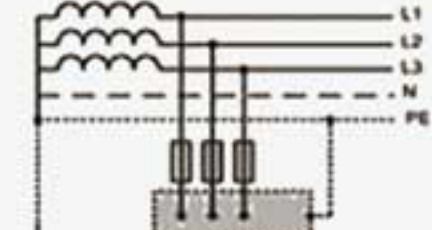
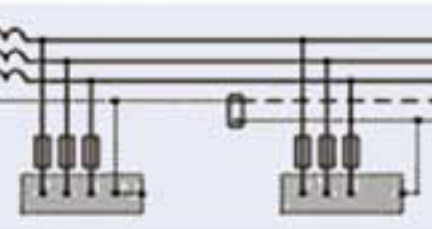
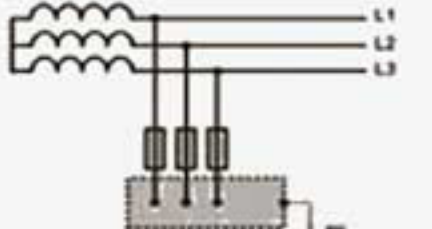
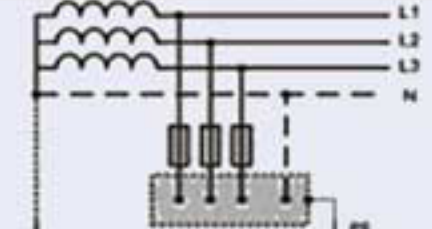
Selecting the SPD surge arresters and their installation depends on kind of earthing system.

Introducing the Earthing Systems:

- The names of applicable systems in installation are generally as follow: TN-S, TN-C-S, TT, IT
- The definition of applied words in this systems are according to standard DIN VDE 0100 part 300, which located also in below table:

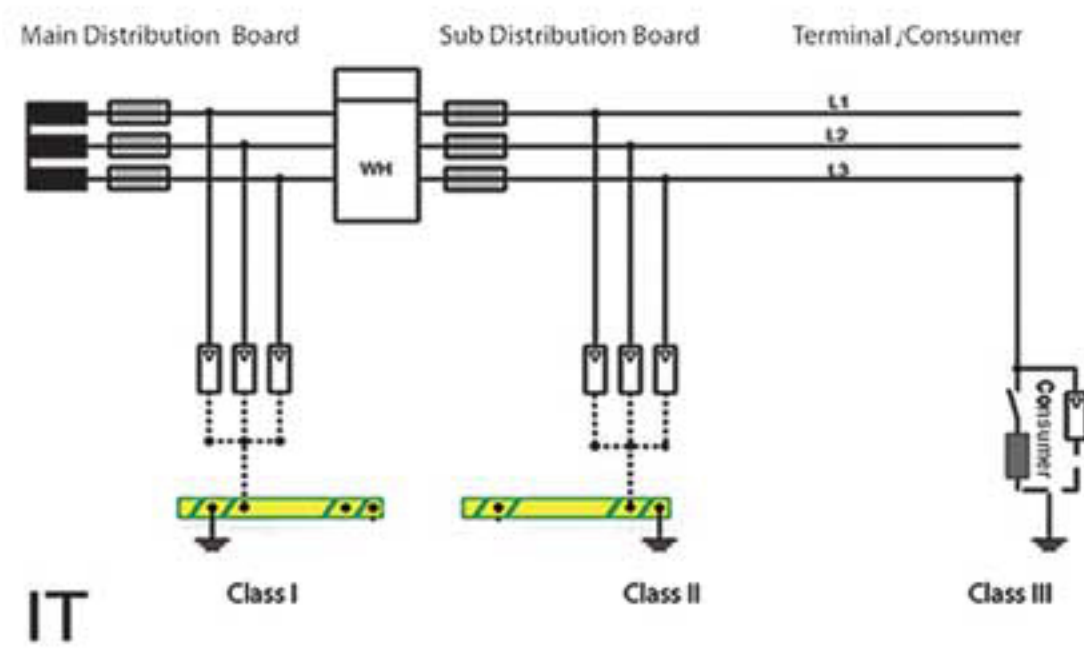
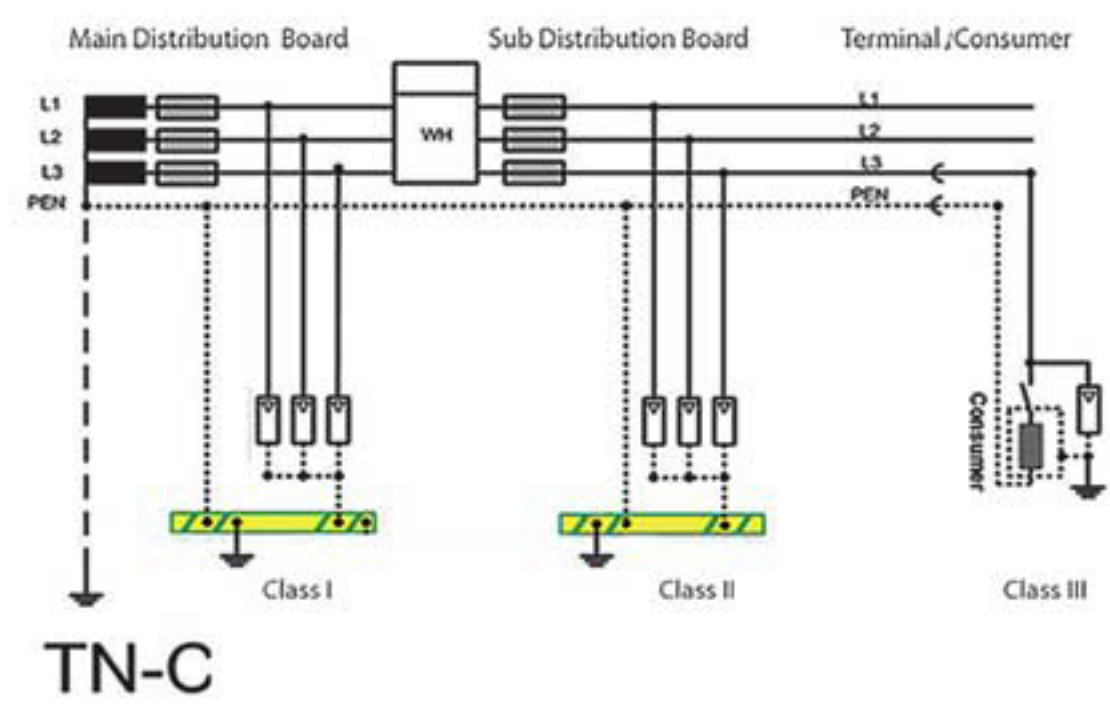
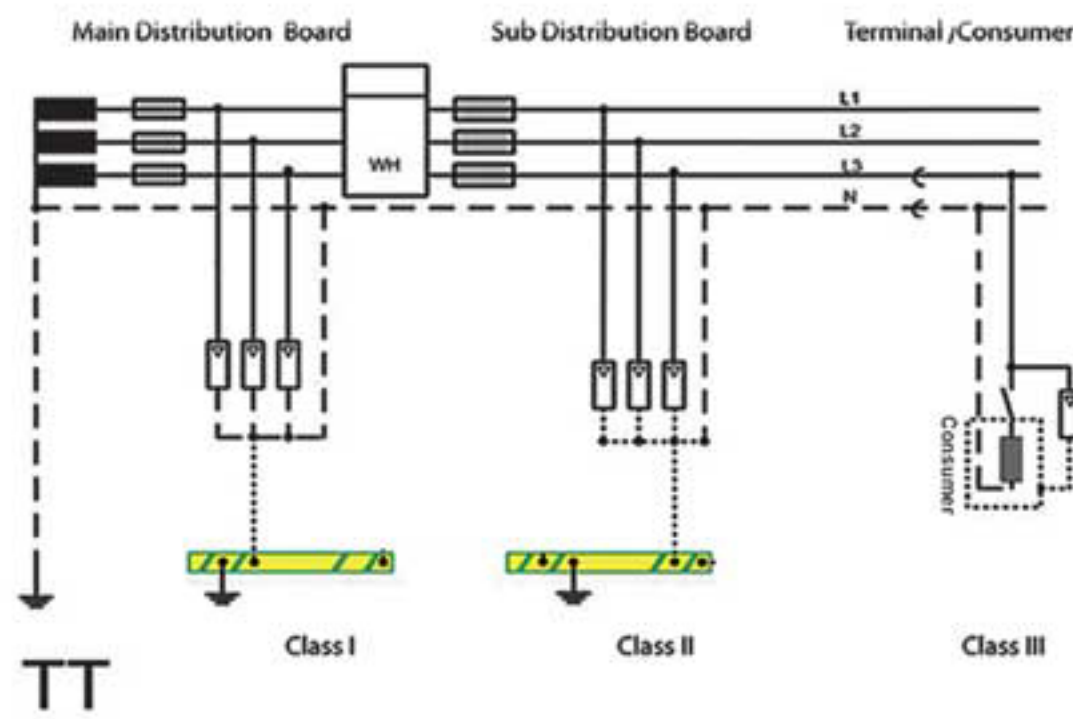
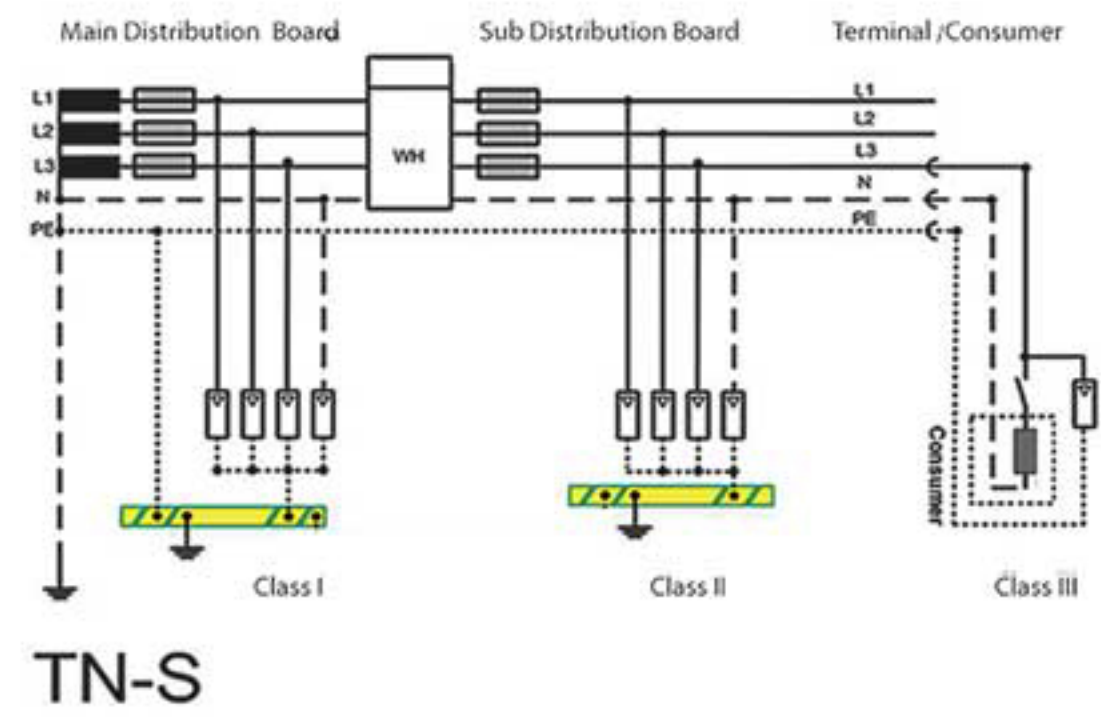
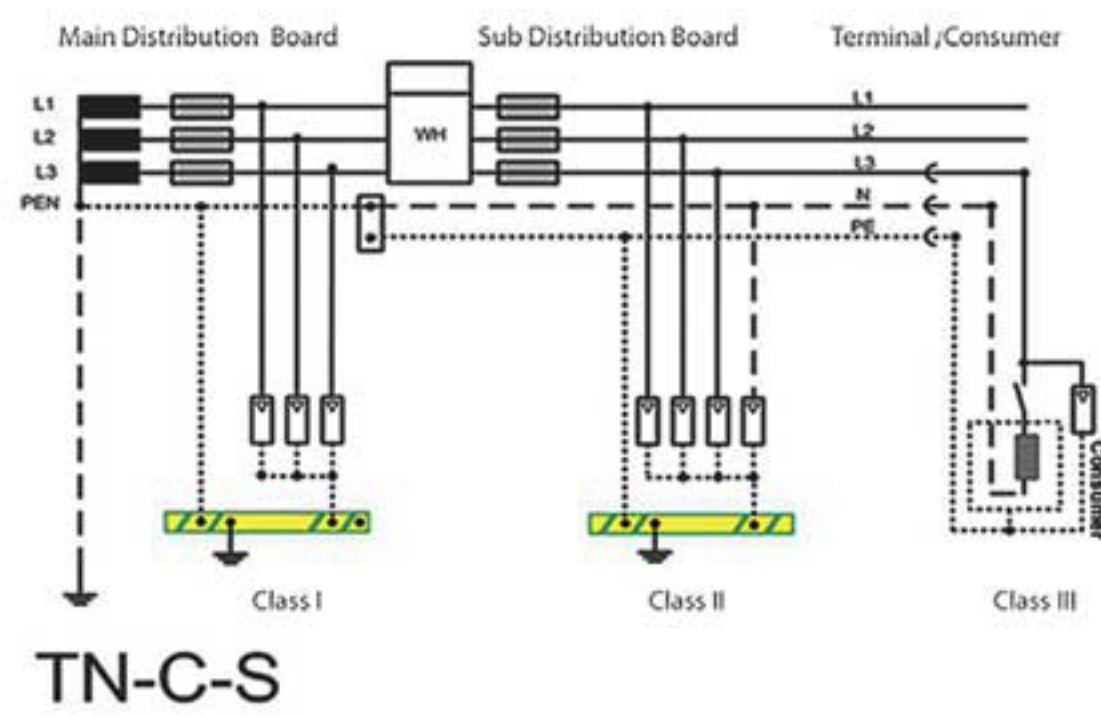
N-Earth connection	T	Term of system N with earth	First Word
N is earthing through impedance or is isolated toward earth	I		
The earth of metal structure equipment is independent of source earth connection	T	Term of installation conductor structure's connection with earth	Second Word
Direct connection of electrical device 's metal structure with a point of power supply network which connected to earth	N		
In whole system, metal structures are connected to protective wire and form PEN	C	Situation of protective wire (PE) and neutral wire N in TN wire	Third Word
In whole system, metal structures are connected to a neutral point in system source by a separate conductor (PE)	S		

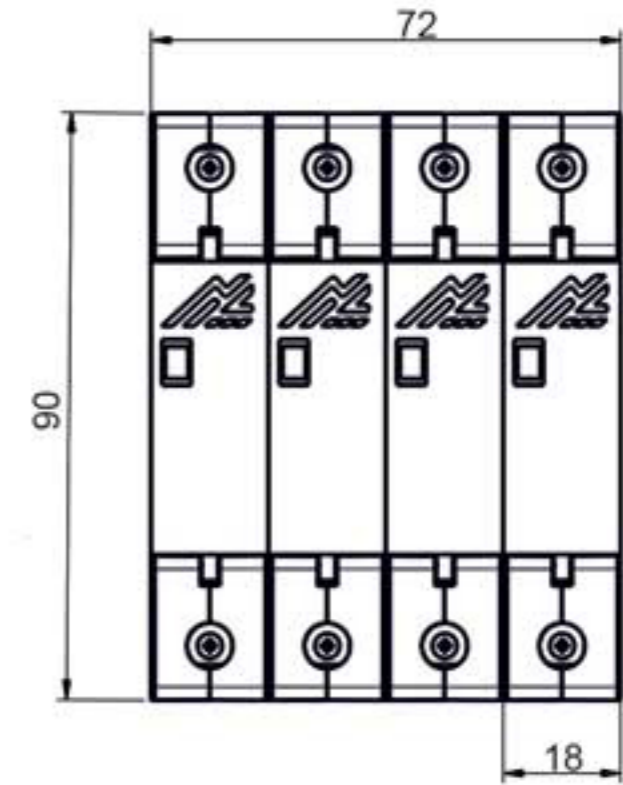
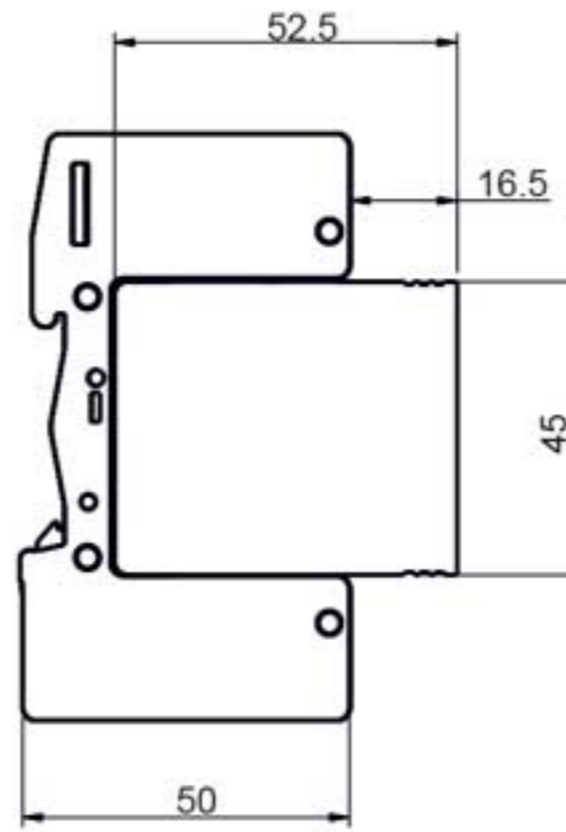
- Figure No. 3 is a brief of earthing systems

TN-C		Home & Office Installation
TN-S		Home & Office Lab, and Workshop Lnstallation
TN-C-S		Seperation of protective & neutral conductor can be done in specific parts of an installation
TT		For Agricultural & Gardening (with cuurent protective switch)
IT		Auxiliary Power supply Installation. e.g in Hospitals, surgery rooms, Glass furnace , Chemical Industries and Manufacturing units.



Introducing the Earthing Systems:

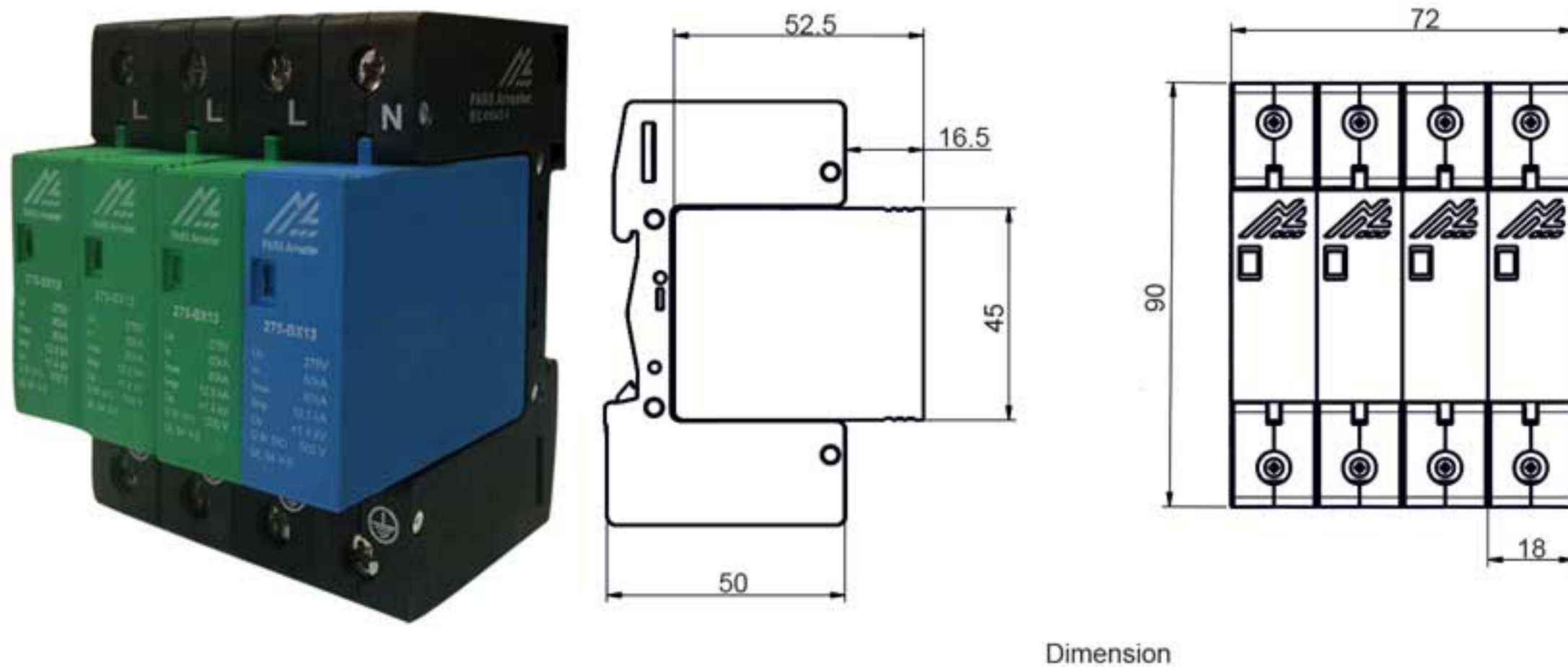




Dimension

- Surge arrester for low-voltage power supply system protection against surges at the boundaries from lightning protection zone 0 -2

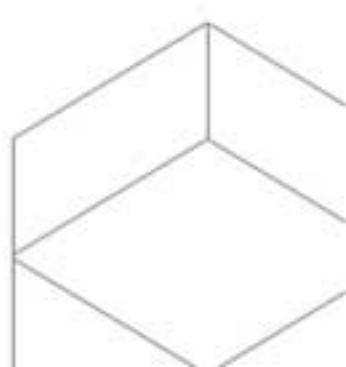
Type	PAM - *** - BX ** *p*	
	275	420
In accordance with	IEC61643-1	
Category IEC	B	
Max. continuous operating voltage V(AC/DC)	275 /350	420/560
Nominal discharge current(8/20) In	to 20kA (total 80kA)	
Max. discharge current(8/20) I _{max}	to 40kA (total 120kA)	
Lightning impulse current(10/350) I _{imp}	7kA (total 30kA)	
Voltage protection level @I _n	<1.4kV	<2.1kV
Response time (L-PE / N-PE)	< 5 ns / <100 ns	
Follow current	No	
Backup fuse(only required if not already provided in mains)	315A gL/gG	
Operating temperature range	- 40C° ~ + 80C°	
Cross-section of connection wire	Single-strand 35mm ² ; multi-strand 25mm ²	
Mounting	35mm DIN rail in accordance with EN 50022/DIN46277-3	
Max. Size of connecting wire	Max. 1.5mm ² (or # 16AWG)	
Enclosure material	thermoplastic; extinguishing degree UL94 V-0	
Degree of protection	IP20	
Installation width	4 modules, DIN 43880	

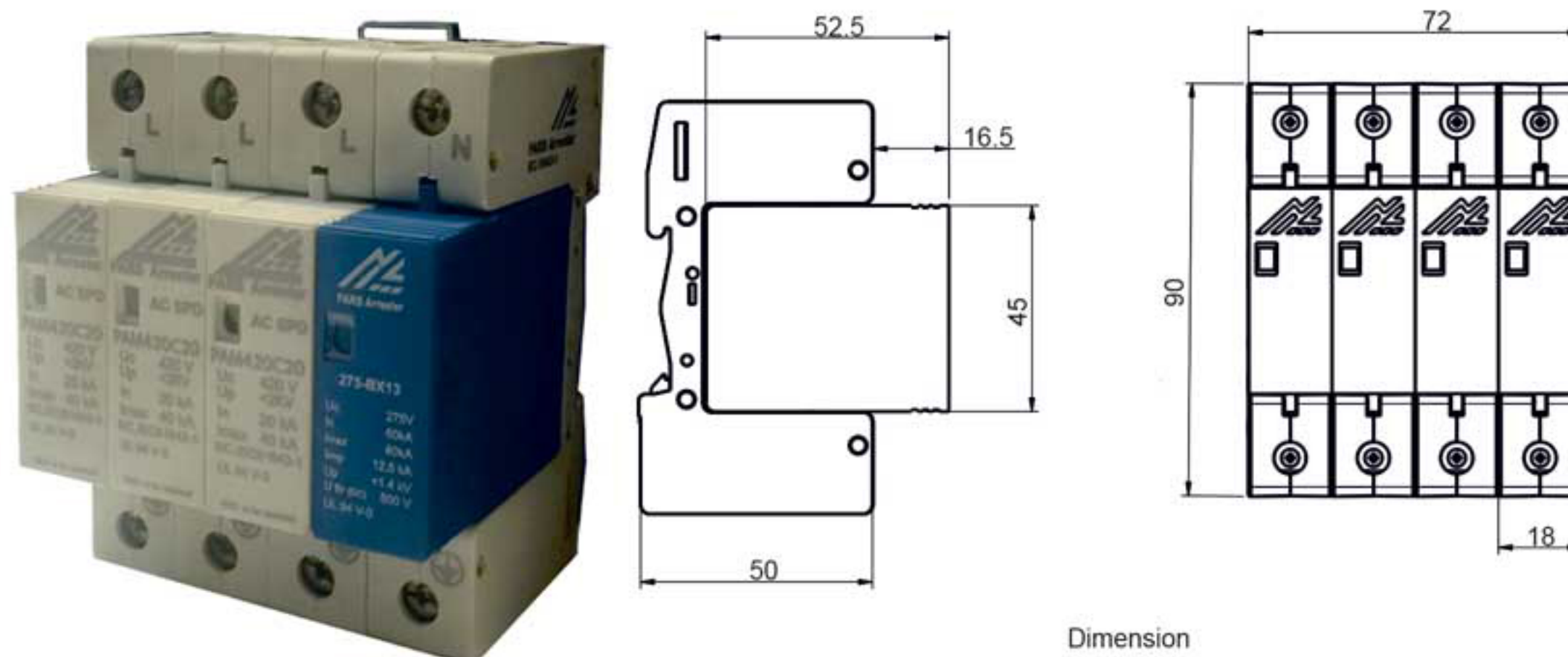


Dimension

- Surge arrester for low-voltage power supply system protection against surges at the boundaries from lightning protection zone 0 -2

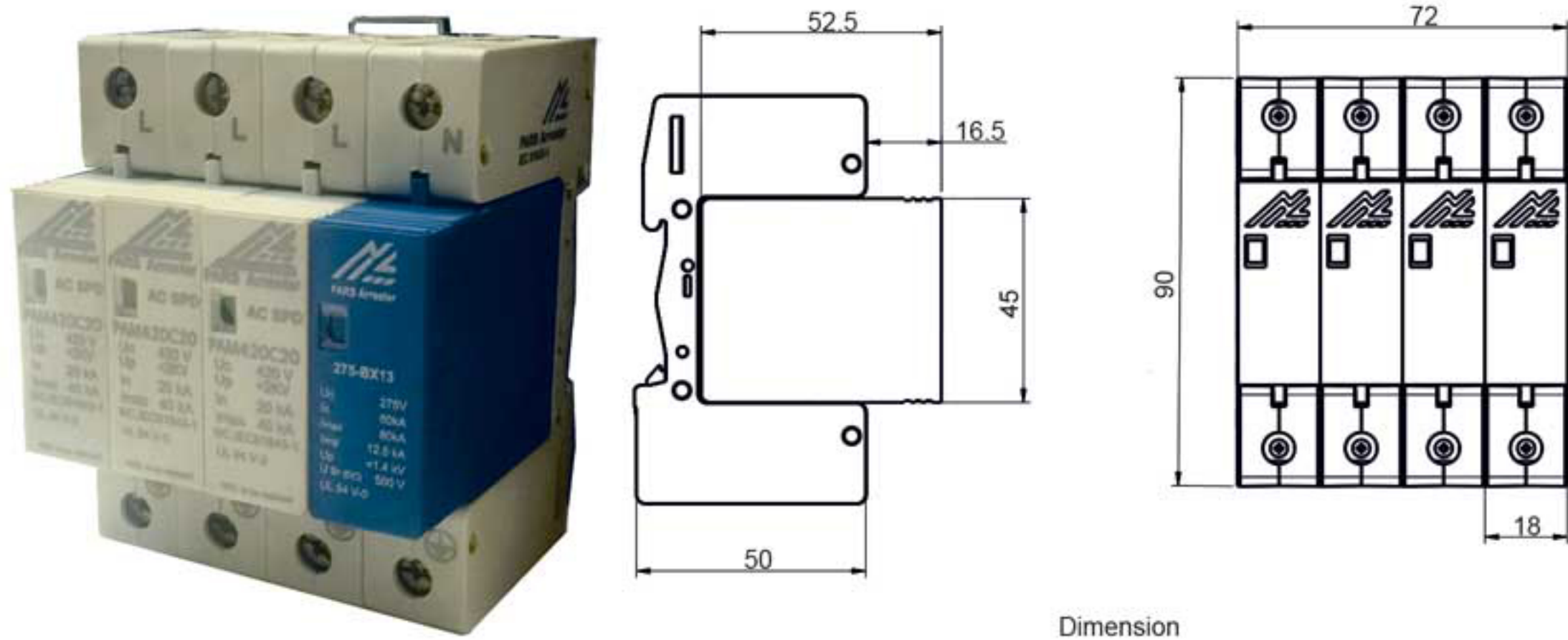
Type	PAM - *** - BX ** *p*	
	275	420
In accordance with	IEC61643-1	
Category IEC	B	
Max. continuous operating voltage V(AC/DC)	275 /350	420/560
Nominal discharge current(8/20) In	to 40kA (total 120kA)	
Max. discharge current(8/20) I _{max}	to 80kA (total 150kA)	
Lightning impulse current(10/350) I _{imp}	25kA (total 100kA)	
Voltage protection level @In	<1.4kV	<2.1kV
Response time (L-PE / N-PE)	<25 ns / <100 ns	
Follow current	No	
Backupfuse(only required if not already provided in mains)	315A gL/gG	
Operating temperature range	- 40C° ~ + 80C°	
Cross-section of connection wire	Single-strand 35mm ² ; multi-strand 25mm ²	
Mounting	35mm DIN-rail in accordance with EN 50022/DIN46277-3	
Max. Size of connecting wire	Max. 1.5mm ² (or # 16AWG)	
Enclosure material	thermoplastic; extinguishing degree UL94 V-0	
Degree of protection	IP20	
Installation width	4 modules, DIN 43880	





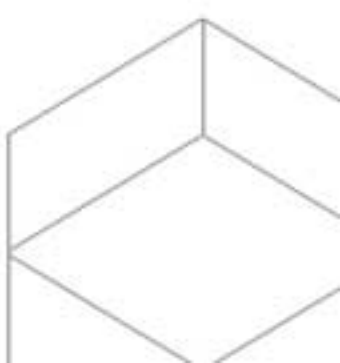
- Surge arrester for low-voltage power supply system protection against surges at the boundaries from lightning protection zone 0 -2

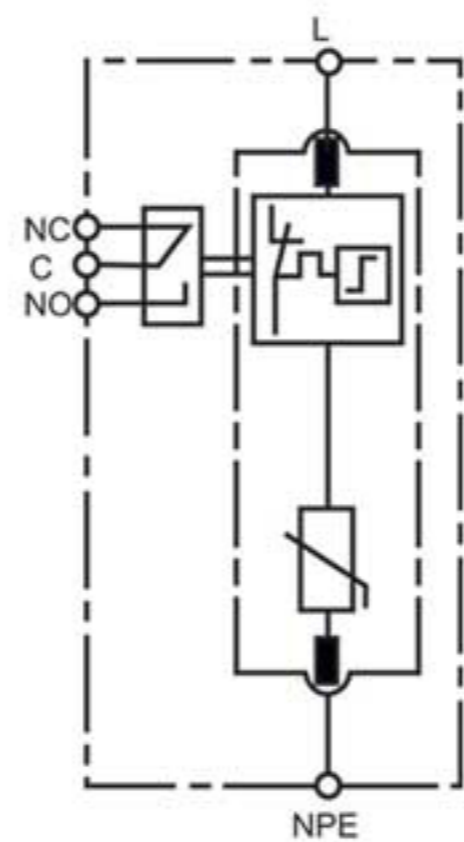
Type	PAM - *** - CX ** - *P*	
	275	420
In accordance with	IEC61643-1	
Category IEC	C	
Max. continuous operating voltage V(AC/DC)	275 /350	420/560
Nominal discharge current(8/20) In	to 20kA (total 80kA)	
Max. discharge current(8/20) Imax	to 40kA (total 150kA)	
@In	<1.2kV	<1.6kV
Voltage protection level @VPR	0.8 kV	
Response time (L-PE / N-PE)	<25 ns / <100 ns	
Follow current	No	
Backupfuse(only required if not already provided in mains)	125A gL/gG	
Operating temperature range	- 40C° ~ + 80C°	
Cross-section of connection wire	Single-strand 35mm ² ; multi-strand 25mm ²	
Mounting	35mm DIN-rail in accordance with EN 50022/DIN46277-3	
Max. Size of connecting wire	Max. 1.5mm ² (or # 16AWG)	
Enclosure material	thermoplastic; extinguishing degree UL94 V-0	
Degree of protection	IP20	
Installation width	4 modules, DIN 43880	
Thermal disconnecter	Internal red - failure	



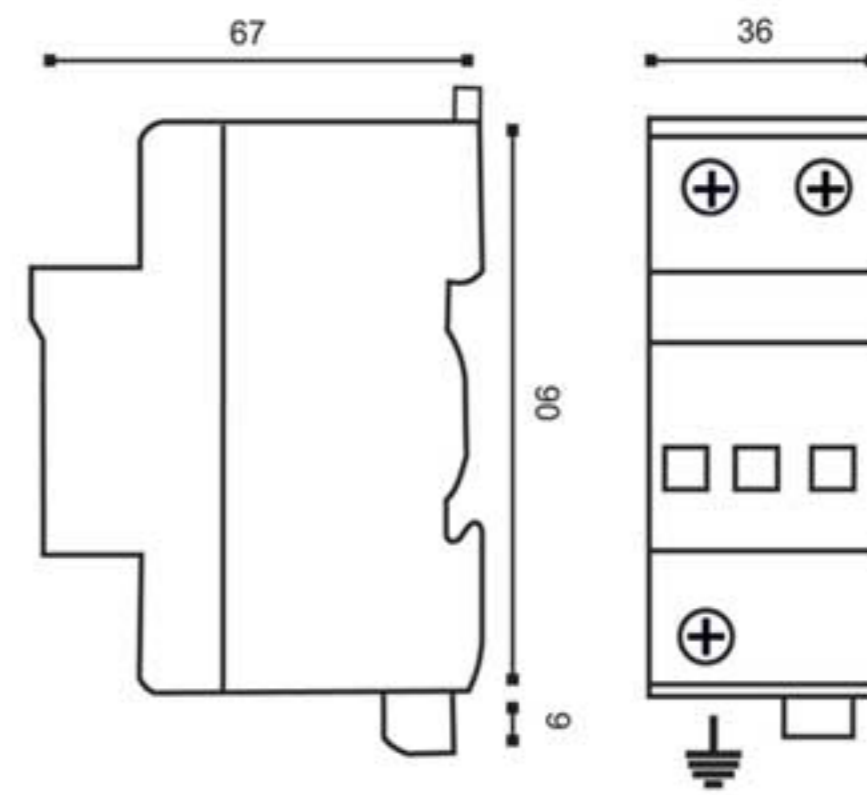
- Surge arrester for low-voltage power supply system protection against surges at the boundaries from lightning protection zone 0 -2

Type	PAM - *** - BC 07 - *P*	
	275	420
In accordance with	IEC61643-1	
Category IEC	B+C	
Max. continuous operating voltage V(AC/DC)	275 /350	420/560
Nominal discharge current(8/20) In	20kA	
Max. discharge current(8/20) I _{max}	40kA	
Lightning impulse current(10/350)	7kA	
Voltage protection level @In	<1.2kV	<1.6kV
Response time (L P / N-PE)	<25 ns / <100 ns	
Follow current	No	
Backupfuse(only required if not already provided in mains)	315A gL/gG	
Operating temperature range	- 40C° ~ + 80C°	
Cross-section of connection wire	Single-strand 35mm ² ; multi-strand 25mm ²	
Mounting	35mm DIN-rail in accordance with EN 50022/DIN46277-	
Max. Size of connecting wire	Max. 1.5mm ² (or # 16AWG)	
Enclosure material	thermoplastic; extinguishing degree UL94 V-0	
Degree of protection	IP20	
Installation width	4 modules, DIN 43880	
Thermal disconnecter	Internal red - failure	





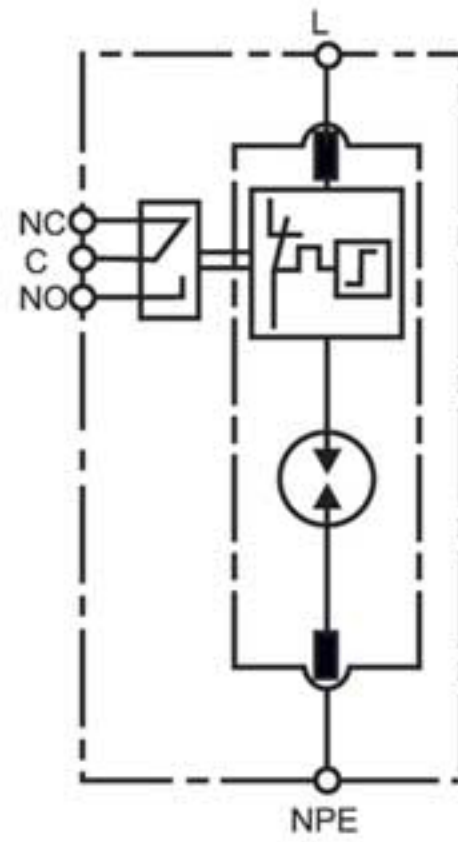
Basic Circuit Diagram



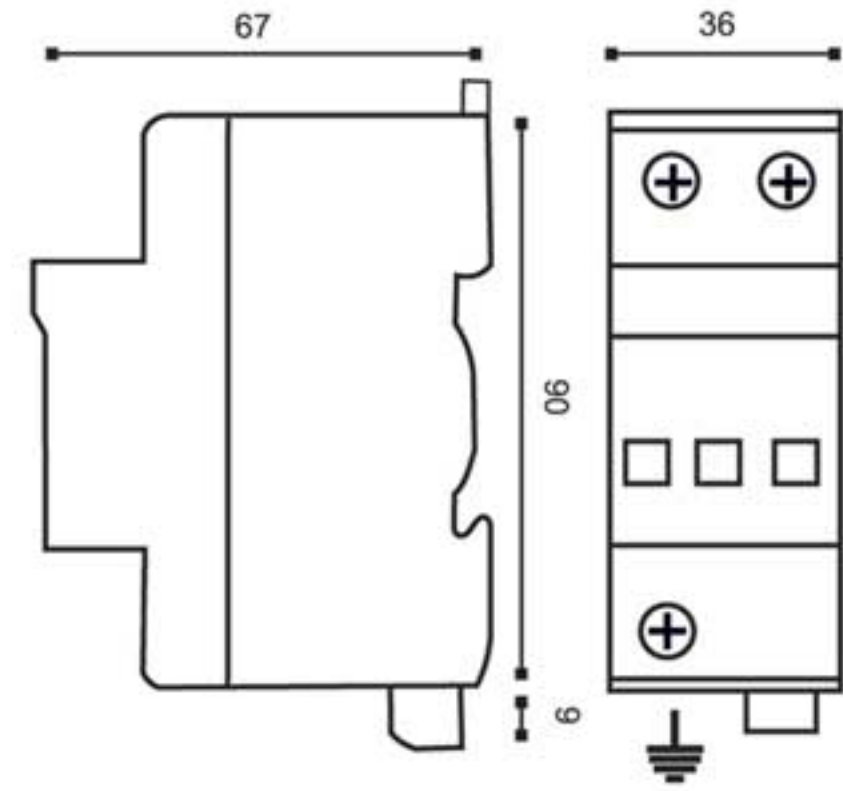
Dimension Drawing

- Surge arrester for low-voltage power supply system protection against surges at the boundaries from lightning protection zone 0 -2

Type	SPD – 275 – BC 25 – 1P 275
In accordance with	IEC61643-1
Category IEC	B+C
Max. continuous operating voltage V(AC/DC)	275 /350
Nominal discharge current(8/20) In	25kA
Max. discharge current(8/20) Imax	120kA
Lightning impulse current(10/350) Iimp	25kA
Voltage protection level @In	<1.2kV
@VPR	<0.8kV
Response time	<20 ns
Follow current	No
Backup fuse(only required if not already provided in mains)	315A gL/gG
Operating temperature range	- 40Ct ~ + 80Ct
Cross-section of connection wire	Single-strand 35mm ² ; multi-strand 25mm ²
Mounting	35mm DIN-rail in accordance with EN 50022/DIN46277-3
Max. Size of connecting wire	Max. 1.5mm ² (or # 16AWG)
Enclosure material	thermoplastic; extinguishing degree UL94 V-0
Degree of protection	IP20
Installation width	2 modules, DIN 43880
Thermal disconnect	Internal red - failure
Remote alarm contact	Optional
Remote alarm contact type	Isolated Form C



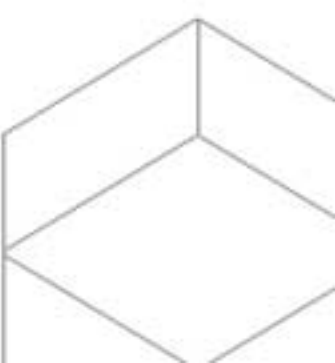
Basic Circuit Diagram

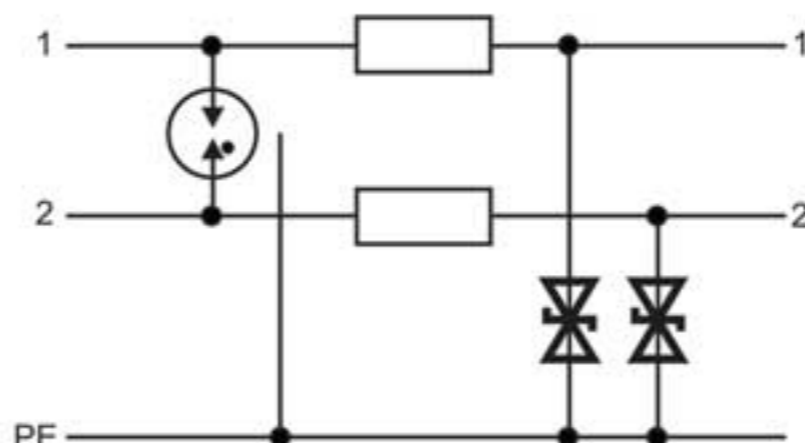


Dimension Drawing

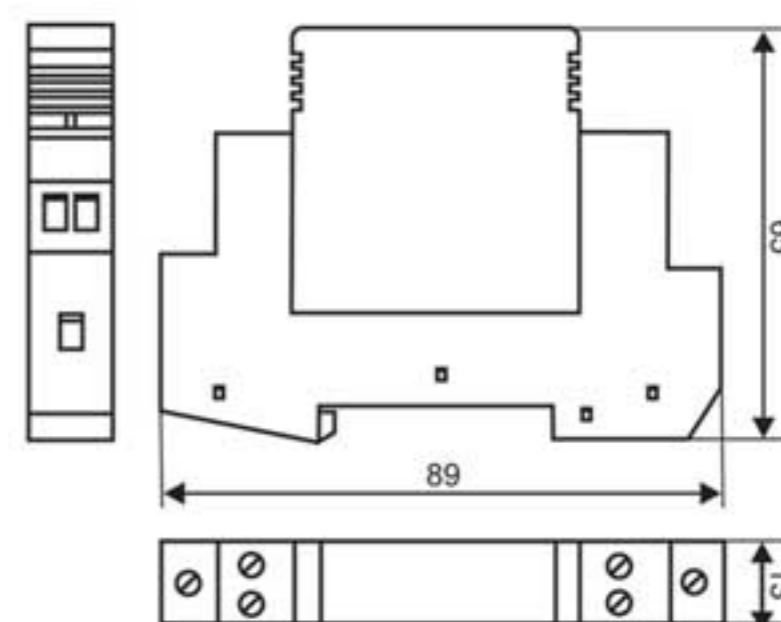
► **Surge arrester for low-voltage power supply system protection against surges at the boundaries from lightning protection zone 0 -2**

Type	SPD – *** – BC 25 – 1P	
	275	420
In accordance with	IEC61643-1	
Category IEC	B+C	
Max. continuous operating voltage V(AC/DC)	275 /350	420/560
Nominal discharge current(8/20) In	25kA	
Max. discharge current(8/20) Imax	100kA	
Lightning impulse current(10/350) Iimp	25kA	
Voltage protection level (1.2/50)	<1.5kV	<2.0kV
Response time	<100 ns	
short-circuit current rating (Iscrr)& follow current interrupt rating (Ifi)	Iscrr =10kArms ; Ifi≥10kArms@255Vac	
Backup fuse(only required if not already provided in mains)	250A gL/gG	
Operating temperature range	- 40C° ~ + 80C°	
Cross-section of connection wire	Single-strand 35mm ² ; multi-strand 25mm ²	
Mounting	35mm DIN-rail in accordance with EN 50022/DIN46277-3	
Max. Size of connecting wire	Max. 1.5mm ² (or # 16AWG)	
Enclosure material	thermoplastic; extinguishing degree UL94 V-0	
Degree of protection	IP20	
Installation width	2 modules, DIN 43880	
Thermal disconnect	Internal red - failure	
Remote alarm contact	Optional	
Remote alarm contact type	Isolated Form C	





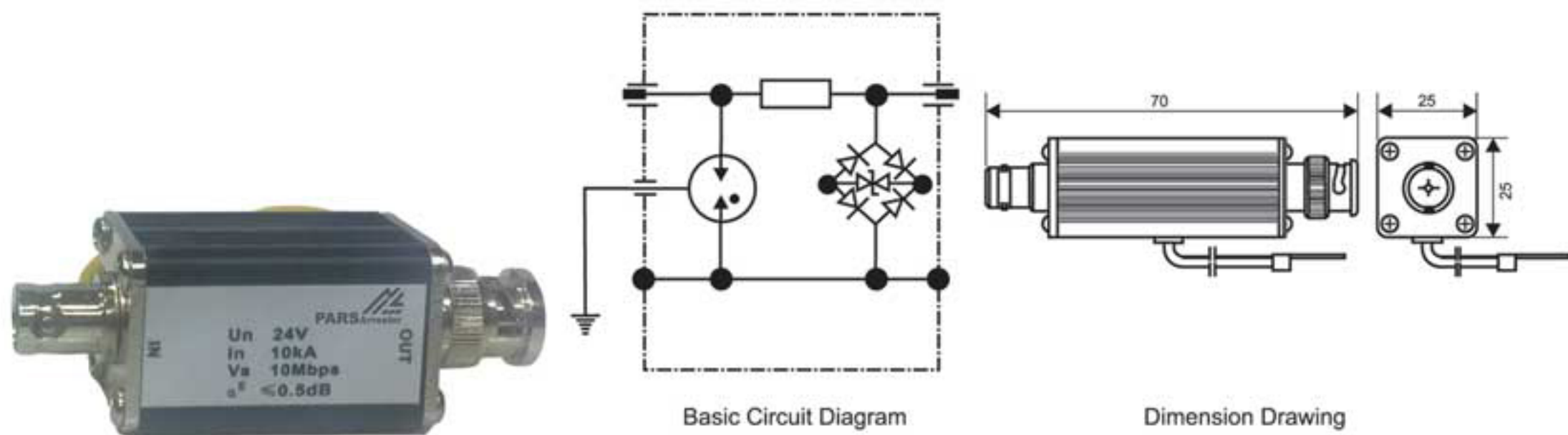
Basic Circuit Diagram



Dimension Drawing

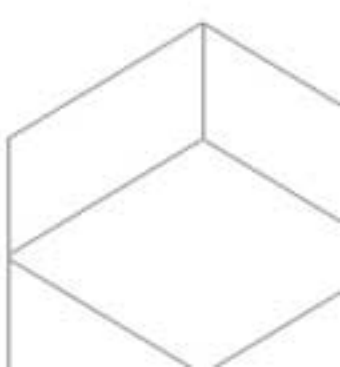
- Data network surge protective devices with plug-in protection modules for analogue telecommunication
- systems against surges at the boundaries from lightning protection zone 0 > 2

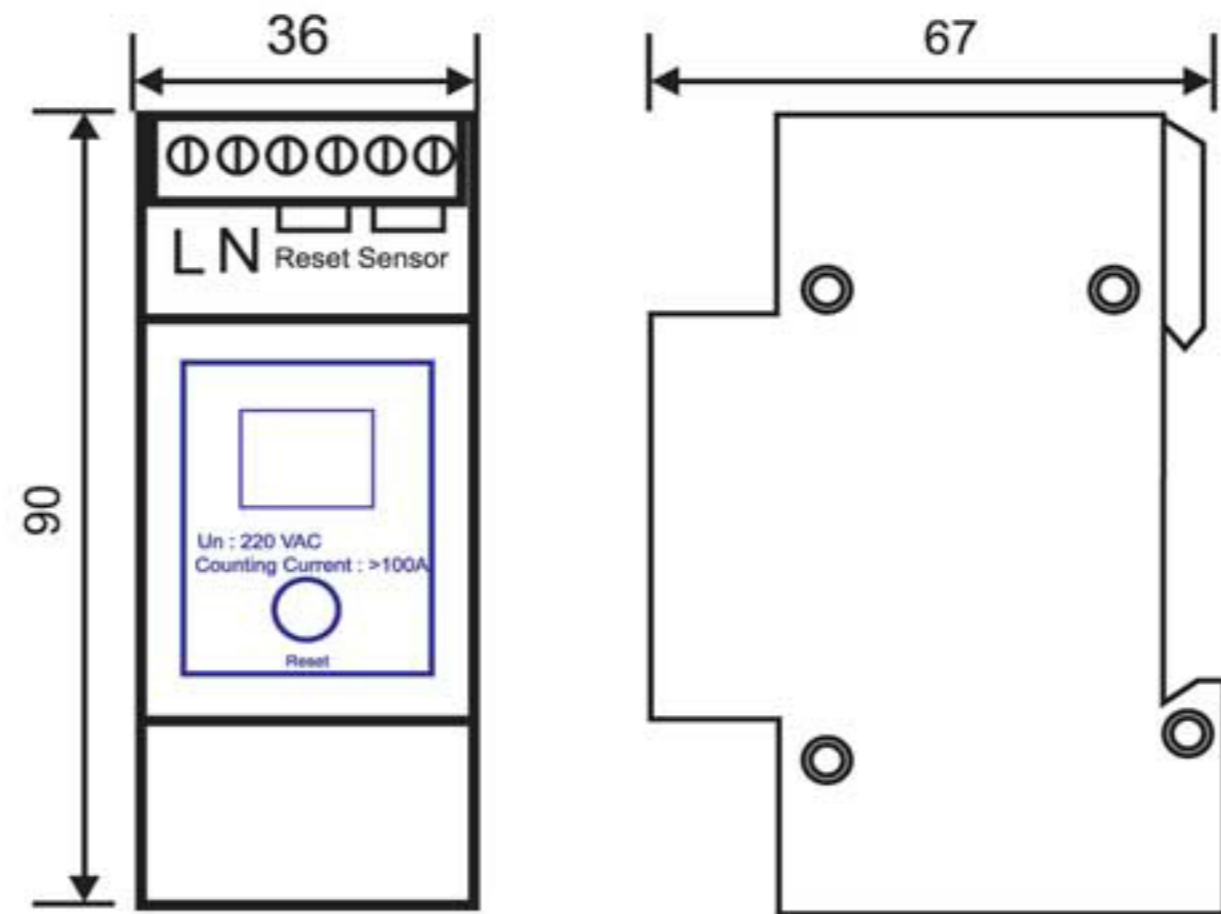
Type		DATA – 250 – DIN – 10
		250
In accordance with		IEC 61643-21:2005
Nominal voltage (Vdc)	Un	to 250
Max. continuous operating voltage (Vdc/ac)	Uc	280 / 190
C2 Nominal discharge current(8/20)	In	5kA
C2 Total nominal Discharge Current (8/20us)		10kA
Voltage protection level (V)	L-L@C2 (8/20μs)Up	<1000V
	L-G@C2 (8/20μs)Up	<750
	L-L@C3 (1KV/μs)Up	<900
	L-G@C3 (1KV/μs)Up	<450
Nominal Current (A)	IL	0.5A
Transmission Speed (bps)		2Mbps
Insertion loss (dB)		<0.5
Series impedance per line (Ohm)		2.2 Ohm
Protection line		One pair
Mounting		35mm DIN-rail in accordance with EN 50022/DIN46277-3
Type of Connection IN/OUT		screw/screw
Dimensions (mm)		89 X 13 X 59
Operating temperature range		- 40°C ~ + 80°C



- Data network surge protective devices with plug-in protection modules for analogue telecommunication systems against surges at the boundaries from lightning protection zone 0 > 2

Type		DATA – 24– BNC – 20 – FM
		24
In accordance with		IEC 61643-21:2005
Nominal voltage (Vdc)	Un	24
Max. continuous operating voltage (Vdc/ac)	Uc	28 / 24
C2 Nominal discharge current(8/20)	In	10kA
C2 Total nominal Discharge Current (8/20us)		20kA
Voltage protection level (V)	L-S@C2 (8/20ps)Up	<55
	S-G@C2 (8/20ps)Up	<500
	L-S@C3 (1KV/ps)Up	<48
	S-G@C3 (1KV/ps)Up	<700
Transmission Speed (bps)		10Mbps
Insertion loss at 10MHz (dB)		<0.5
Series impedance per line (Ohm)		2.2 Ohm
Pinning		Line/Shield/PG
Mounting		35mm DIN-rail in accordance with EN 50022/DIN46277-3
Type of Connection IN/OUT		BNC Female/ Male (75 Ohm)
Dimensions (mm)		70 X 25 X 25
Operating temperature range		- 25°C ~ + 70°C



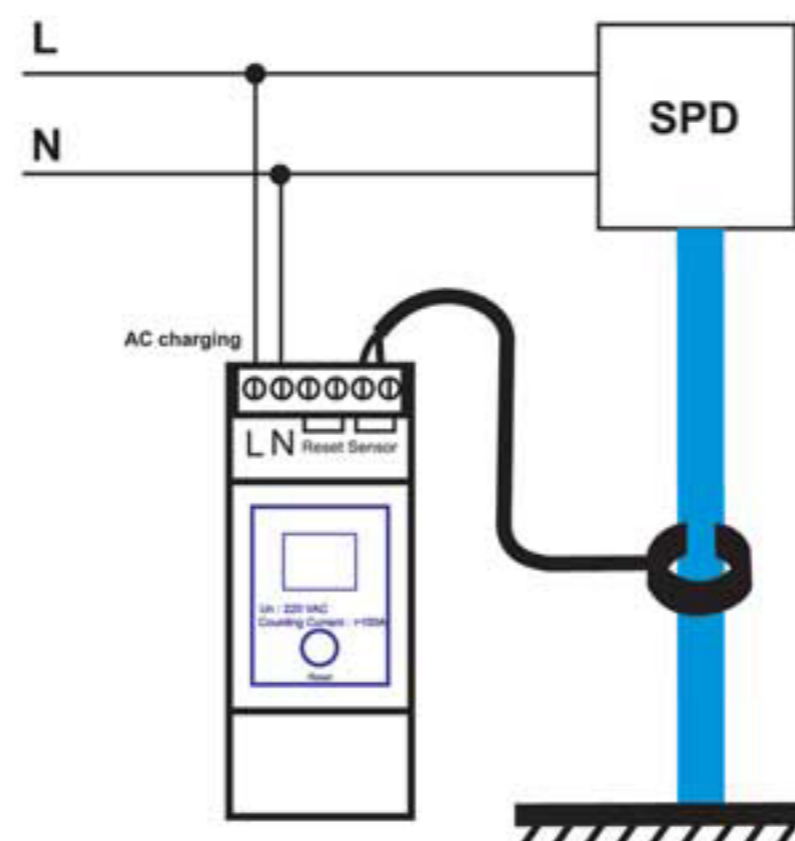


Dimension

► Lightning event counter is used for testing the lightning event in a certain area.

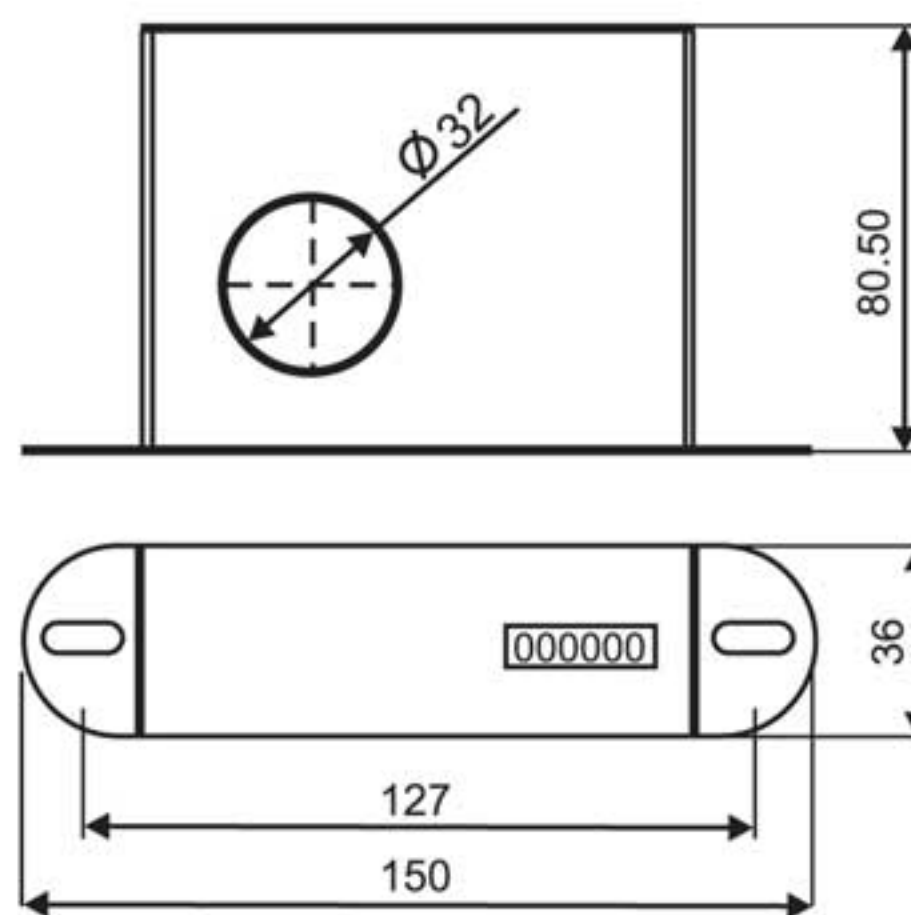
Type	SPD-C1-I1- DI
Nominal voltage	AC:110~240V
Counting Current (rise time > 8μs)	>100A
Display Model	LCD
Indicator	Lightning Event 0~99
Reset	short-circuit tow terminals of "RESET"
Current Sample Mode	Inductive Probe
Working mode	Battery service life> 3month without AC power
Operation temperature (°C)	-20~+60
Mounting on	35 mm DIN rail
Dimension of counter (mm)	150x80.5x36,2 modules, DIN 43880
Screw torque	0.2Nm
Enclosure material	thermoplastic; extinguishing degree UL94 V-0

► Install:



COUNTER

COUNTER

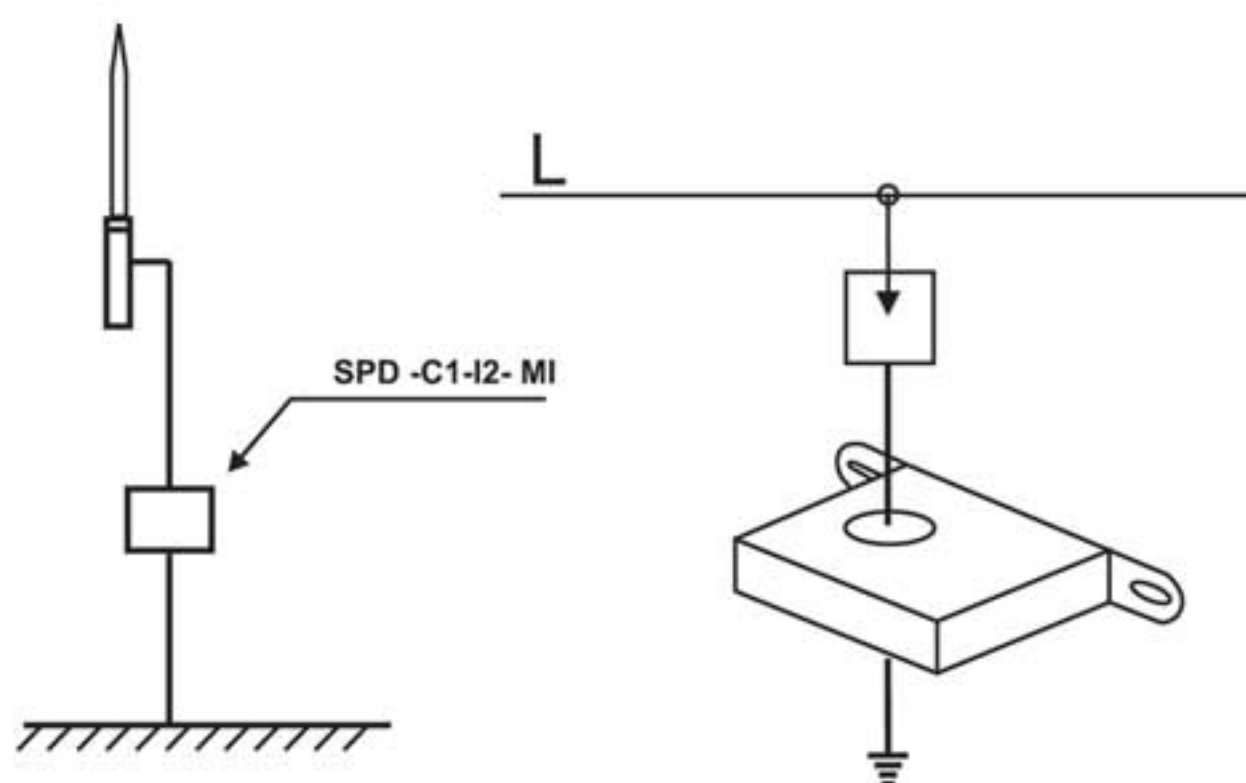


Dimension

► Passive Lightning event counter is used for testing the lightning event in a certain area.

Type	SPD -C1-I2- MI
Counting Current (rise time > 8μs)	> 500A
Sequence of impulse	> 1s
Display Model	Electromechanical digital display
Indicator	Lightning Event 0~999999
Current Sample Mode	Inductive Probe (Built-in)
Working mode	No battery need
Operation temperature (°C)	-20~+60
Dimension of window (mm)	32
Dimension of counter (mm)	150x80.5x36
Enclosure material	Steel
Degree of protection	IP67

► Install:



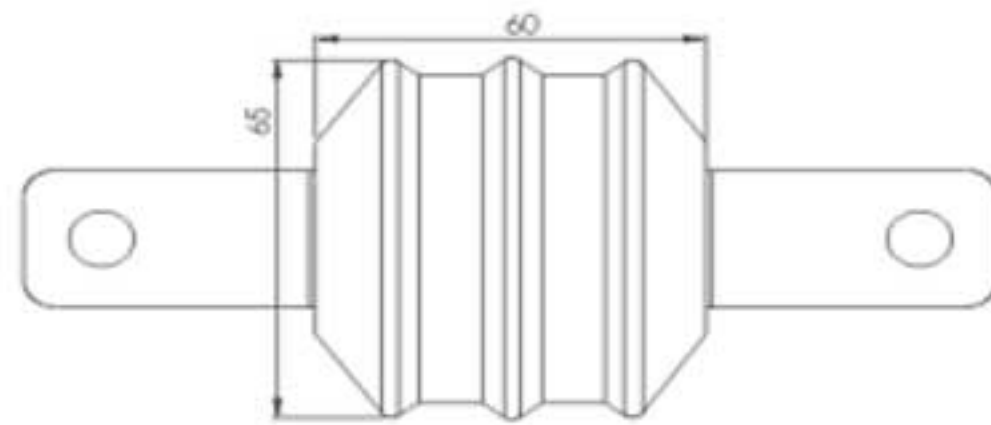


Dimension

Type	PAS – **** – BX** – **	
In accordance with	500	
Category IEC	IEC61643-1	
Normal Voltage (Un)	B	
Rated power-frequency withstand voltage (50 Hz)	385	
Impulse Breakdown in Volts (6kV 1.2/50µs)	<1.4kV	<1.7kV
Measured Limiting Voltage (MLV @3kA)	<1.2kV	<1.5kV
Impulse Spark over voltage (1 kV/µs)	<800kV	
DC Breakdown Voltage Range (@100 V/s)	500 ± 20% V-DC	
Normal Discharge Current (In-8/20)	60kA	100kA
Max. Discharge Current (Imax-8/20)	80kA	120kA
Pulsed Current (Iimp-10/350)	12.5kA	
Follow Current (If)	<130A	
Response Time	<100 ns	
Protection Rating (IP Code)	IP 54	
Surge life at 10kA (8/20µs)(Number of event)	<50	<100
Housing Material	UL94 V-0 [Epoxy]	
Housing Design	Compact	
Temperature Range	-40 to +80°C	
Relative Humidity (noncondensing)	0-90 %	
Maximum Operating Altitude	3000 m	
Connections lug	Tublar cable lug	
Connections Cable	25-35 m ²	

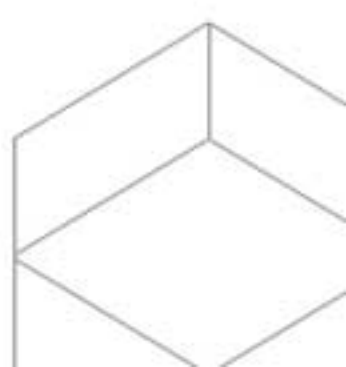
SPARK GAP

SPARK GAP



Dimension

Type	PAS – **** – BX** - **
In accordance with	500
Category IEC	IEC61643-1
Normal Voltage (Un)	B
Rated power-frequency withstand voltage (50 Hz)	385
Impulse Breakdown in Volts (6kV 1.2/50µs)	300
Measured Limiting Voltage (MLV @3kA)	<1.5kV
Impulse Spark over voltage (1 kV/µs)	<1.2kV
DC Breakdown Voltage Range (@100 V/s)	<800kV
Normal Discharge Current (In-8/20)	500 ± 20% V-DC
Max. Discharge Current (Imax-8/20)	100kA
Pulsed Current (Iimp-10/350)	120kA
Follow Current (If)	35kA
Response Time	<130A
Protection Rating (IP Code)	<100 ns
Surge life at 10kA (8/20µs)(Number of event)	IP 54
Housing Material	<100
Housing Design	UL94 V-0 [Epoxy]
Temperature Range	Compact
Relative Humidity (noncondensing)	-40 to +80°C
Maximum Operating Altitude	0-90 %
	3000 m



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