SURGE ARRESTERS
OVERVOLTAGE LIMITERS
LOW VOLTAGE LIMITERS

voltage in limits

acer VOLTAGE

CONTENT

COMPANY PROFILE

Originally named ACER, the company ACER VOLTAGE Ltd. was founded in Hradec Kralove in 1992. From 2006 the company operated under the name ACER HK Ltd. and was renamed ACER VOLTAGE s.r.o. in 2016. The current company name reflects better its scope of business and activities.

It is a purely Czech company, which is engaged in the development and production of surge arresters and overvoltage limiters for the protection of LV and HV power distribution systems. An important part of the manufacturing scheme are overvoltage limiters for AC high voltage systems from 1 to 39 kV and overvoltage limiters for DC systems from 1 to 6 kV. They form an entire type range, which is constantly being broadened. Moreover, we can produce non-standard types according to customer requirements and specifications. Recently the product range has been completed by gas-filled power arresters from 60 V to 1000 V DC.

In the past, the company developed and manufactured ZnO varistors for surge arresters in the LV applications. Our first type of surge arrester was SP 0.440 / 10, which was improved, and is now produced only in the SPB * / 10 design on various voltage levels depending on the type of installation. The production of ZnO varistors finished in 2006, and currently we use in surge arresters only varistors from external suppliers.

The main applications of the products can be found in railway industry, transportation enterprises, industrial plants and energy sector. Our products protect the equipment of our customers against atmospheric and switching overvoltage and also protect their health and well-being.

You may find details about ACER VOLTAGE product range in our catalogue or on the website:
www.acervoltage.cz

You can trust / rely on us

MAP OF OUR CUSTOMERS

We deliver our products to more than 20 European countries, to Middle East, Asia, Australia, USA and South America. We also cooperate with prestigious business partners in some of the countries.

With our superior technology (on a global scale), profound industry expertise, and knowledge of local markets, we can offer our customers products, system solutions, and services that help them to improve reliability of their transmission systems.

Our manufacturing programme ensures consistent supply of high quality products for customers worldwide. Our customers have easy access to the full range of products, either directly from us as the manufacturer, or from the system of distributors or wholesalers, which is constantly being expanded.

To check the quality of our products, 100% of the products is being thoroughly tested on measuring and control devices. The measuring equipment enables precise control of technical specifications of the entire production. For this purpose we have also obtained and we constantly renew certification as per EN ISO 9001: 2016 standard.

Why you should choose us?

- you can trust us
- our market presence dates back to 1992
- you can put single piece orders
- our delivery dates are short
- we are equipped with modern testing tools
- we guarantee high quality
- 100% of our products is being tested
- we are certified according to EN ISO 9001: 2016

DEFINITION OF OVERVOLTAGE

Overvoltage is voltage that exceeds the maximum value of operating voltage in an electric circuit.

Pulse overvoltage, its formation and division

Pulse overvoltage is short-term overvoltage, lasting in the order of nanoseconds up to milliseconds. It is one of the most noticeable and most harmful manifestations of electromagnetic interference (perturbing influences) and it poses a threat especially to electronic equipment containing semiconductor components.

According to its origin, pulse overvoltage is classified into:

- atmospheric overvoltage
  (LEMP - Lighting ElektroMagnetic Pulse)
- switching overvoltage
  (SEMP - Switching ElektroMagnetic Pulse)
- overvoltage formed during discharges of static electricity
  (ESD - ElektroStatic Discharge)
- overvoltage due to nuclear explosions
  (NEMP - Nuclear ElektroMagnetic Pulse

Atmospheric overvoltage (LEMP)

The most dangerous overvoltage which is induced primarily by thunderstorms with lightning discharges. Overvoltage may occur between a phase and the earth or between phase conductors. It is caused primarily by thunderstorm activity, specifically by lightning discharges, namely to overhead lines and in sections of unshilded cables. Atmospheric overvoltage may be generated by a direct or near strike of lightning into a overhead line, lightning rod, some metal structure, cable, etc.

The following may cause atmospheric overvoltage occurrence:
- direct strike to lightning conductor, metal structure, cables...
- distant lighting strike to overhead lines, causing surge waves following the cloud-cloud, lightning or lighting strike close to overhead lines
- distant lightning strike diverted through to earth.

The destructive effect of lightning current is given by its high energy released in a short time, which creates conditions for inducing stress in loops accompanied by adverse changes of earth resistance.

Switching overvoltage (SEMP)

They are very frequent overvoltage that occurs in both low-voltage and high-voltage systems. Switching overvoltage is generated by industrial activities:

- when great loads, especially inductive ones, are switched on and off, e.g. transformers or electric motors or even small household appliances, e.g. refrigerators, freezers
- in the event of short circuits in a distribution system and the like.
- Invisible voltage pulses that are immeasurable by usual means last only several millionths or thousandths of a second, yet they can cause the destruction mainly of electronic equipment, sometimes even a short circuit and subsequent fire.

ZnO overvoltage limiters

Currently for the construction of surge arresters are usually used voltage dependent resistors with metal-oxide ZnO varistors, which excel symmetrical current-voltage characteristics and a zero followed current after shock subside the surge. These basic properties allow the use of these resistors as ZnO surge limiters (arresters) without spark gaps.

The parameters on the basis of which we design the limiters are as follows:

- Continuous operating voltage of the limiter U_C – it represents the maximum value of voltage connected permanently to limiter terminals at mains frequency.
- Rated voltage of the limiter U_R – it represents the maximum effective value of voltage for which the limiter is designed while the correct function under conditions of temporary overvoltage at mains frequency is maintained. Such voltage is defined as voltage to which the limiter is exposed for 10 seconds following previous stress.
- Protective level of the limiter U_p – is voltage on terminals at a given shape and peak value of current passing though.
- Nominal discharge current I_n – the peak value of an atmospheric current pulse that is used for the classification of overvoltage limiters.

DEFINITION OF OVERVOLTAGE

- Residual voltage U_{RES} – it represents residual voltage on the overvoltage limiter. It is actually the peak value of voltage that appears between terminals of the overvoltage limiter when discharge current is passing through it.
- Working temperature ϑ – it represents the range of permissible ambient temperatures stated by the manufacturer for the limiter to work properly.
- Line discharge class – a number expressing the ability of the overvoltage limiter to absorb energy in the event that long lines are discharged.

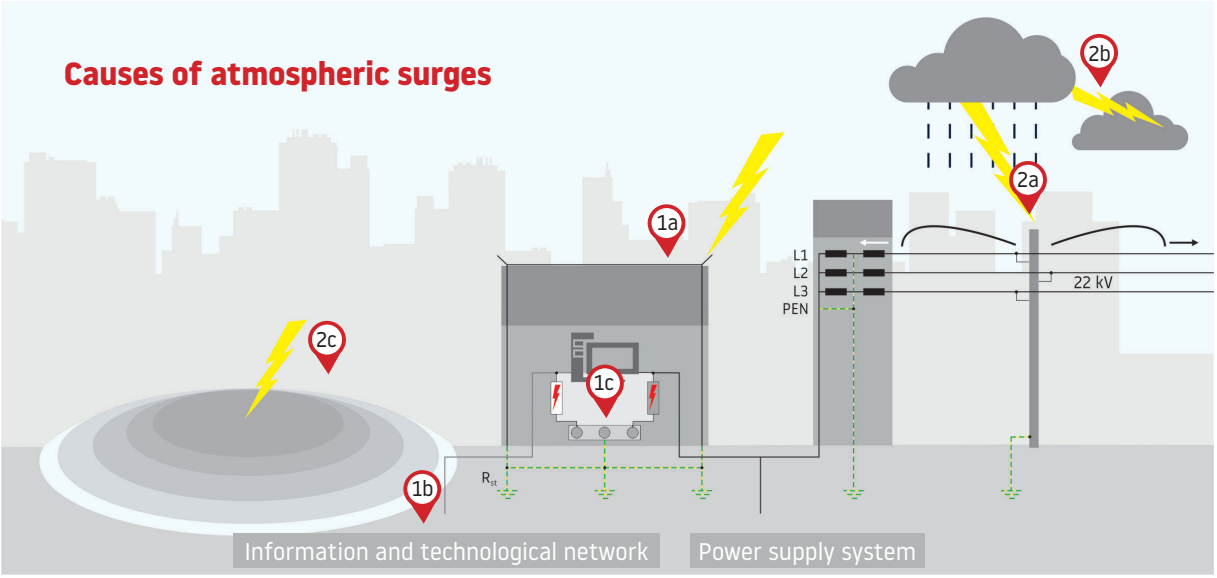
Overvoltage resistance of ZnO limiters

By the magnitude of permissible energy, the overvoltage limiters are divided into five classes. The higher the class, the higher is the energy capacity of the limiter. The energy that the limiter has to absorb during overvoltage rises with the voltage of the power supply system in which it is used. Voltage rises slower than energy. Limiters in systems with higher voltage must have a greater energy capacity than limiters in systems with lower voltage. The selection of the energy class and of the rated discharge current is based on the frequency at which the energy capacity is exceeded in the given application.
An energy class expresses the ability of the limiter to absorb both atmospheric and switching overvoltage. It is stated in the units kJ/kV of the limiter's voltage and is independent of nominal voltage.

Energy classes 1 to 5 divide the limiters into groups according to the magnitude of the permissible energy of overvoltage that they are able to absorb without being degraded or without losing heat stability at operating voltage. The higher the class, the greater is the energy capacity of the limiter.

The energy classes and an example of their use

Class 1 – use in HV systems without classification of Class (5 kA) or class 1 or 2 (10 kA)
Class 2 – use in 110 kV systems
Class 3 – use for 110-400 kV systems and for cable systems
Class 4 – 400 kV long system lines
Class 5 – extremely extensive 750 kV cable systems



Direct / close lightning strike

1a - Strike to lightning conductor, metal structure, cables
1b - Drop in voltage potential on grounding resistance R_{st}
1c - Induced voltage in circuits

Distant lightning strike

2a - Lightning strike to airline
2b - Surge waves following the cloud-to-cloud lightning or lightning strike close to overhead lines
2c - Lightning channel field

DIMENSIONING OF THE OVERVOLTAGE LIMITERS

The overvoltage limiters are sized based on a particular position in the system, i.e. whether they are to protect e.g. a line outlet, a line transition into a cable or transformer. Whatever their position, they have specific conditions for protection and overvoltage stress. The design of these protective equipment for given application always project-designer decides.

Selecting the operating voltage U_C of limiters

The operating voltage, voltage-current characteristics and all voltage parameters of the limiter are dependent upon the height of column of blocks. By contrast, all voltage parameters are set by the selection of operating voltage U_C.

Incorrect selection of voltage U_C may have a considerably negative effect on the limiter's function:

If a low U_C is selected, the protective level U_{RES} and also the risk of failure of the protected device associated with it will be favourably low. On the other hand, however, there will be a risk of thermal stress on the limiters caused by temporary overvoltage, so the probability of them failing will be high.

If a high U_C is selected, the risk of failure of the limiters owing to temporary overvoltage will be insignificant but a high protective level U_{RES} will imply a higher probability of the protected devices being destroyed.

The correct selection of continuous voltage U_C of the limiters should mean optimum parameters of protection, hence a balanced risk of reliability of the supply for both causes.

The protection parameters can be improved by connecting the limiters as close to the protected device as possible with as short interconnecting wires as possible!

The limiters limit voltage to a limiter's protective level U_P. A limiter's protective level U_P is voltage on terminals with a given shape and peak value of current passing through. Values characterising a limiter's protective level can be found in our catalogue. It is a limiter's residual voltage U_{RES}.

Characteristics of overvoltage protection of LV and HV systems

In LV and HV distribution systems with overhead lines, it is necessary to protect equipment primarily from atmospheric overvoltage. Switching overvoltage reaches substantially lower current and voltage levels than atmospheric.

The greatest overvoltage in cable systems without connected overhead lines is caused by short circuits and/or switching.

The primary task of protective measures which are economically fully justified is to protect the equipment of LV systems from destruction by atmospheric overvoltage by installing surge arresters and, at the same time, to enable the protection of installation by adequately reducing overvoltage in the system.

Principles for positioning and wiring in low voltage systems

Overvoltage limiters or surge arresters can be used in 1-phase and 3-phase systems TNC, TNS, IT and TT. Typically, their connections is recommended to make between phase and grounding conductor PE (or PEN with TNC systems in place of his ground). In the event that the grounding conductor is not accessible, it is necessary to use a suitable grounding electrode rod with a length at least 1 m. When designing and implementing of grounding is recommend to proceed according to PNE 33 0000-1 and PNE 33 0000-7.

Generally applicable rules for connecting of overvoltage limiters

1. The overvoltage limiters and the device that is to be protected must be earthed to a common earthing system. The galvanic interconnection between the earthing terminals of the limiters and the earthing of the protected device must be as short as possible.
2. The total length of conductors *a* and *b* of connection of the limiters to the protected device must be as short as possible.
3. It is always recommended that conductor *b* should be as short as possible or at least shorter than conductor *a*.

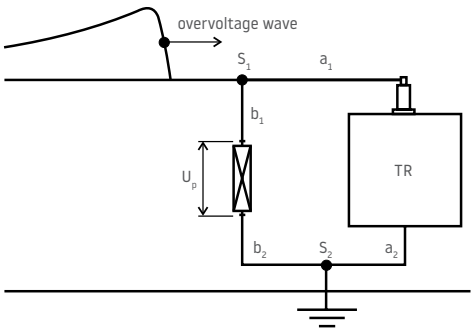
CONNECTION OF THE LIMITERS

4. Strip conductors are more suitable for connection than those with circular cross-section as with the same cross-section, becase strip conductors have smaller inductance and pulse losses of overvolt age in them are smaller. The minimum size of a connecting conductor is 16 mm^2.

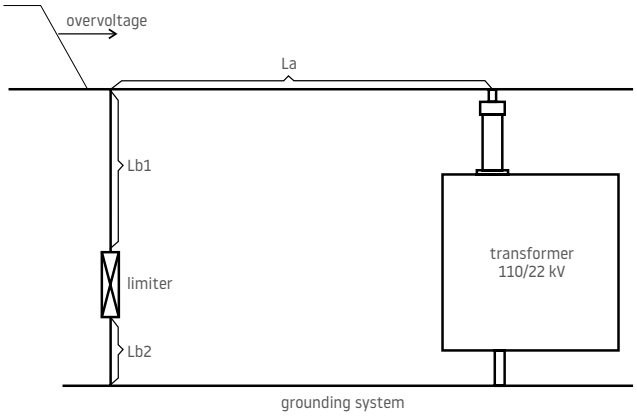
When designing and implementing of grounding it is recommended to proceed according to PNE 33 0000-1 and PNE 33 0000-8.

Above all, the installation of overvoltage limiters in every application is prevention of possible damage. A seemingly considerable cost of such protections tend to be only a fraction of a per cent of the acquisition value of the technology protected and a negligible sum for possible damage caused by breakdowns and destruction of technological equipment. Unprotected electric distribution systems, computer and data networks always poses a considerable risk to their users.

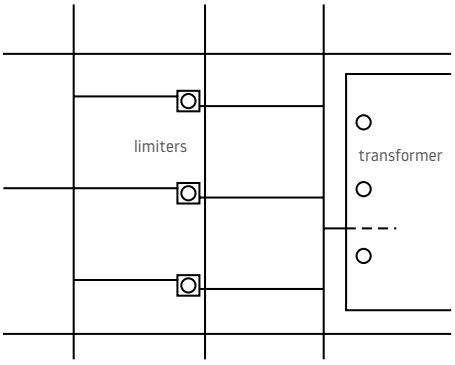
One-line diagram of protection with the marking of sections of conductor *a* and conductor *b*



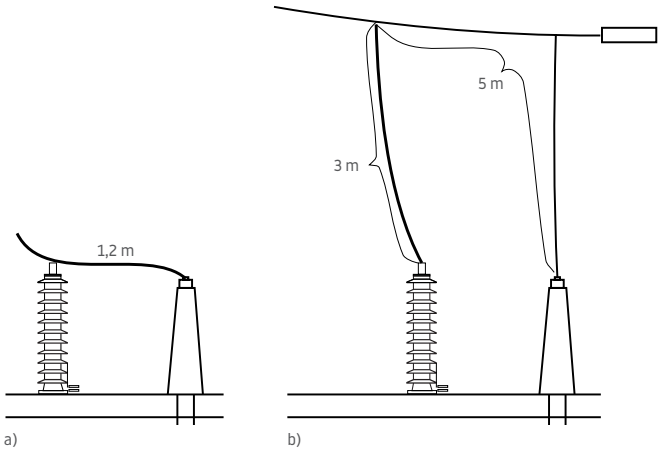
Connection of the limiters to the transformer



Ground plan of the grounding system of limiters at the transformer



Connection of the limiter: (a) correct connection, (b) incorrect connection



Maintenance and inspection of overvoltage limiters

Complexly recommendations for maintenance and inspection of overvoltage limiters ZnO are specified in EN 62305-4, where such control is divided into visual inspection alternatively complete revision include important electrical measurements.

This control is recommended to make especially:

- after any changes in protective elements belonging to the system installation
- periodically, at least once a year
- after direct strike to the protected instalation
- in case of confirmed damage of the equipment caused by overvoltage

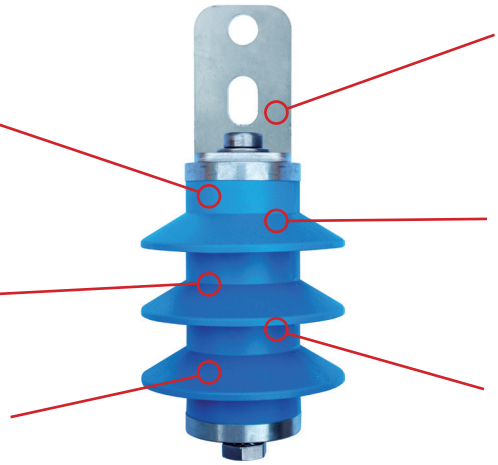
ADVANTAGES

LOW VOLTAGE LIMITERS

Resistance to:
- contamination and UV radiation
- shock and vibration
- explosion and rupture
- harsh treatment

very short reaction time (< 20 nsec)

high insulation resistance (> 2 GΩ)



easy and quick installation
without special tools necessary

high mechanical strength,
lifetime hydrophobic nature

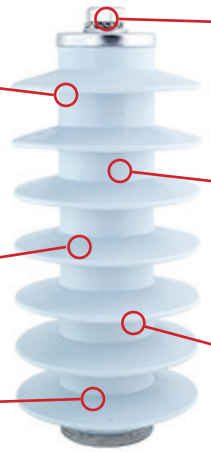
effortless transport
(also in horizontal position)
lowered transport costs

OVERVOLTAGE LIMITERS

Resistance to:
- contamination and UV radiation
- shock and vibration
- explosion and rupture
- harsh treatment

lower weight in comparison
to porcelain-housed surge arresters

maintenance-free



easy and quick installation
without special tools necessary

high mechanical strength,
lifetime hydrophobic nature

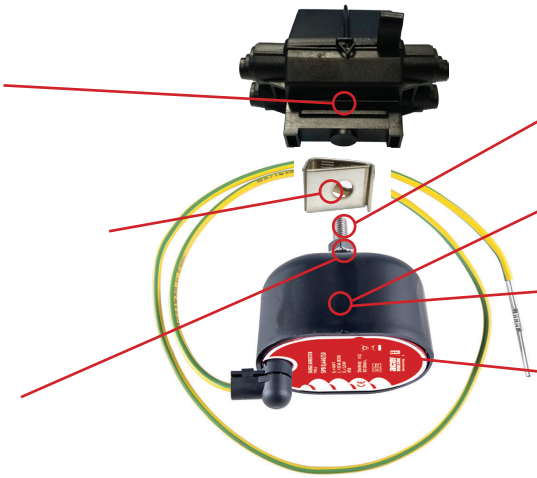
effortless transport
(also in horizontal position)
lowered transport costs

SURGE ARRESTERS

SPB */10 S * - to be installed on
insulated wires, with insulated
punching terminal

SPB */10 AlFe * - to be installed
on uninsulated AlFe wire with
stainless steel fixing lug and nut

SPB */10 PP * - to be installed
on flat busbars in switchboards
with serrated washer and nut



connecting screws and nuts
are made of stainless steel

Resistance to:
- contamination and UV radiation
- explosion and rupture

made of self-extinguishing material

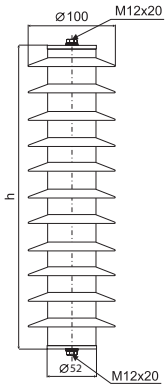
the failure is indicated by opened
bottom lid

PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN AC SYSTEMS

protection of high voltage transmission systems, transformers, switching equipment and HV cable systems

OVERVOLTAGE LIMITER PSP */5 kA - LINE DISCHARGE CLASS 1

outdoor and indoor use



PSP */5kA – overvoltage limiters designed for protecting of high-voltage transmission systems, transformers, switching equipment and HV cable distribution systems against atmospheric and switching overvoltage effects. The functional part of the limiters consists of a column of varistors sized for max. continuous operating voltage U_c. The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

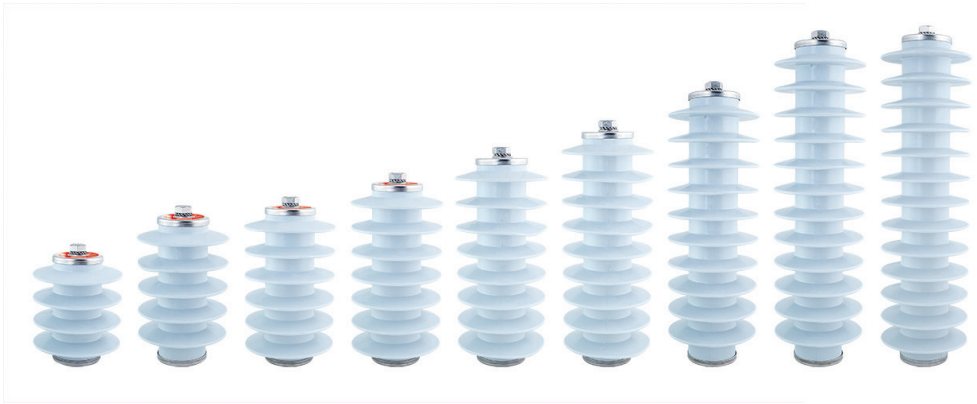
Type		PSP 2,45/5	PSP 7/5	PSP 10/5	PSP 12/5	PSP 14/5	PSP 17/5
Max. continuous operating voltage	U_c	2,45 kV	7 kV	10 kV	12 kV	14,5 kV	17 kV
Nominal voltage	U_r	3 kV	9 kV	12 kV	15 kV	18 kV	21 kV
Nominal discharge current	I_n	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
High impulse current (4/10)		2x65 kA	2x65 kA	2x65 kA	2x65 kA	2x65 kA	2x65 kA
Long current impulse (2 ms)		150 A	150 A	150 A	150 A	150 A	150 A
Discharge class acc. to EN 60099-4		1	1	1	1	1	1
Residual voltage at I_n	U_{res}	≤ 9 kV	≤ 27 kV	≤ 35 kV	≤ 45 kV	≤ 52,2 kV	≤ 62 kV
Height	h	93 mm	135 mm	157 mm	175 mm	196 mm	220 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP65					
Weight	m	0,65 kg	0,9 kg	1 kg	1,1 kg	1,3 kg	1,4 kg
Article number		91008	91001	91016	91004	91018	91006

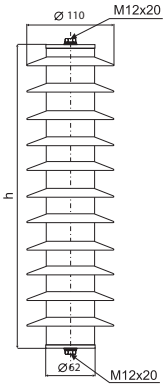
Type		PSP 22/5	PSP 24/5	PSP 30/5	PSP 32/5	PSP 36/5	PSP 39/5
Max. continuous operating voltage	U_c	22 kV	24 kV	29 kV	32 kV	36 kV	39 kV
Nominal voltage	U_r	27 kV	30 kV	36 kV	39 kV	45 kV	48 kV
Nominal discharge current	I_n	5 kA	5 kA	5 kA	10 kA	5 kA	5 kA
High impulse current (4/10)		2x65 kA	2x65 kA	2x65 kA	2x65 kA	2x65 kA	2x65 kA
Long current impulse (2 ms)		150 A	150 A	150 A	150 A	150 A	150 A
Discharge class acc. to EN 60099-4		1	1	1	1	1	1
Residual voltage at I_n	U_{res}	≤ 79 kV	≤ 88 kV	≤ 108 kV	≤ 117 kV	≤ 131 kV	≤140 kV
Height	h	262 mm	280 mm	325 mm	340 mm	380 mm	400 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP65					
Weight	m	1,7 kg	1,9 kg	2,15 kg	2,3 kg	2,5 kg	2,7 kg
Article number		91020	91010	91022	91024	91012	91014

Note: *The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSP */10 kA - LINE DISCHARGE CLASS 1

outdoor and indoor use





PSP */10kA – overvoltage limiters designed for protecting of high-voltage transmission systems, transformers, switching equipment and HV cable distribution systems against atmospheric and switching overvoltage effects. The functional part of the limiters consists of a column of varistors sized for max. continuous operating voltage U_c. The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

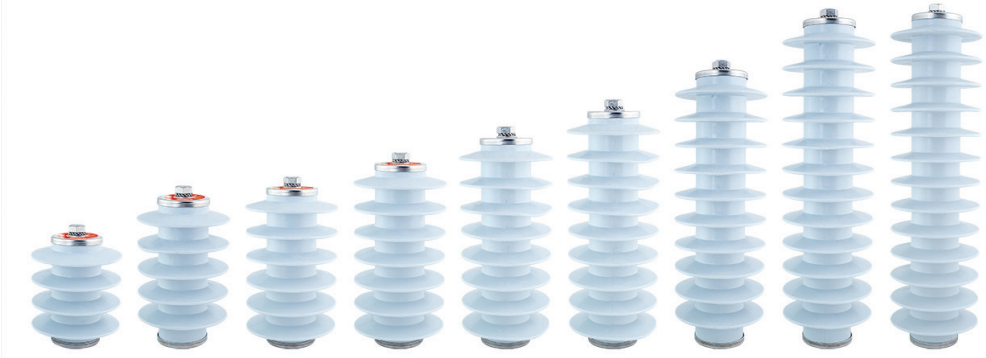
Type		PSP 2,45/10	PSP 7/10	PSP 10/10	PSP 12/10	PSP 14/10	PSP 17/10
Max. continuous operating voltage	U_c	2,45 kV	7 kV	10 kV	12 kV	14 kV	17 kV
Nominal voltage	U_r	3 kV	9 kV	12 kV	15 kV	18 kV	21 kV
Nominal discharge current	I_n	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
High impulse current (4/10)		2x100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		400 A	400 A	400 A	400 A	400 A	400 A
Discharge class acc. to EN 60099-4		1	1	1	1	1	1
Residual voltage at I_n	U_{res}	≤ 9 kV	≤ 27 kV	≤ 36 kV	≤ 45 kV	≤ 54 kV	≤ 63 kV
Height	h	93 mm	135 mm	154 mm	175 mm	190 mm	220 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP65					
Weight	m	0,8 kg	1,3 kg	1,45 kg	1,7 kg	1,9 kg	2,2 kg
Article number		91009	91002	91017	91005	91019	91007

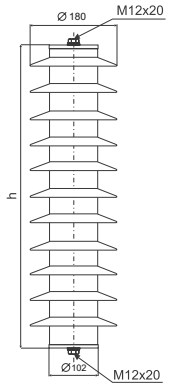
Type		PSP 22/10	PSP 24/10	PSP 30/10	PSP 32/10	PSP 36/10	PSP 39/10
Max. continuous operating voltage	U_c	22 kV	24 kV	29 kV	32 kV	36 kV	39 kV
Nominal voltage	U_r	27 kV	30 kV	36 kV	39 kV	45 kV	48 kV
Nominal discharge current	I_n	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		400 A	400 A	400 A	400 A	400 A	400 A
Discharge class acc. to EN 60099-4		1	1	1	1	1	1
Residual voltage at I_n	U_{res}	≤ 81 kV	≤ 90 kV	≤ 108 kV	≤ 117 kV	≤ 135 kV	≤ 144 kV
Height	h	253 mm	280 mm	313 mm	335 mm	380 mm	400 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP65					
Weight	m	2,6 kg	2,8 kg	3,2 kg	3,45 kg	3,9 kg	4,2 kg
Article number		91021	91011	91023	91025	91013	91015

Note: *The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSP */20/IV - LINE DISCHARGE CLASS 4

outdoor and indoor use





PSP */20/IV – overvoltage limiters designed for protecting of high-voltage transmission systems, transformers, switching equipment and HV cable distribution systems against atmospheric and switching overvoltage effects. The functional part of the limiters consists of a column of varistors sized for max. continuous operating voltage U_c. The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

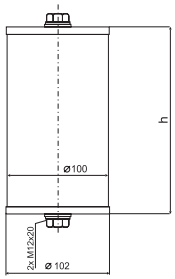
Type		PSP 4/20/IV	PSP 7/20/IV	PSP 10/20/IV	PSP 12/20/IV	PSP 15/20/IV	PSP 18/20/IV
Max. continuous operating voltage	U_c	4,25 kV	7,5 kV	10 kV	12,9 kV	15,4 kV	18 kV
Nominal voltage	U_r	5,1 kV	9 kV	12 kV	15 kV	18,5 kV	21,5 kV
Nominal discharge current	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		1500 A	1500 A	1500 A	1500 A	1500 A	1500 A
Discharge class acc. to EN 60099-4		4	4	4	4	4	4
Residual voltage at I_n	U_{res}	≤ 14,55 kV	≤ 25,65 kV	≤ 34,2 kV	≤ 43,65 kV	≤ 52,2 kV	≤ 60,75 kV
Height	h	107 mm	133 mm	154 mm	216 mm	237 mm	257 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP65					
Article number		93008	93009	93010	93011	93012	93013

Type		PSP 20/20/IV	PSP 24/20/IV	PSP 28/20/IV	PSP 32/20/IV	PSP 36/20/IV	PSP 40/20/IV
Max. continuous operating voltage	U_c	20 kV	24 kV	28 kV	32,5 kV	36,9 kV	39 kV
Nominal voltage	U_r	24 kV	29 kV	34 kV	39 kV	44 kV	46,5 kV
Nominal discharge current	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		1500 A	1500 A	1500 A	1500 A	1500 A	1500 A
Discharge class acc. to EN 60099-4		4	4	4	4	4	4
Residual voltage at I_n	U_{res}	≤ 66,75 kV	≤ 81,3 kV	≤ 95,85 kV	≤ 110,4 kV	≤ 124,95 kV	≤ 133,5 kV
Height	h	273 mm	309 mm	345 mm	381 mm	418 mm	438 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP65					
Article number		93014	93015	93016	93017	93018	93019

Note: *The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSPI */20/IV - LINE DISCHARGE CLASS 4

indoor use



PSPI */20/IV – overvoltage limiters designed for protecting of high-voltage transmission systems, transformers, switching equipment and and HV cable distribution systems against atmospheric and switching overvoltage effects. The functional part of the limiters consists of a column of varistors sized for max. continuous operating voltage U_c. The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

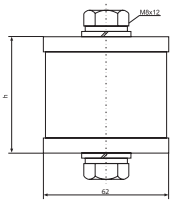
Type		PSPI 4/20/IV	PSPI 7/20/IV	PSPI 10/20/IV	PSPI 12/20/IV	PSPI 15/20/IV	PSPI 18/20/IV
Max. continuous operating voltage	U_c	4,25 kV	7,5 kV	10 kV	12,9 kV	15,4 kV	18 kV
Nominal voltage	U_r	5,1 kV	9 kV	12 kV	15 kV	18,5 kV	21,5 kV
Nominal discharge current	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		1500 A	1500 A	1500 A	1500 A	1500 A	1500 A
Discharge class acc. to EN 60099-4		4	4	4	4	4	4
Residual voltage at I_n	U_{res}	≤ 14,55 kV	≤ 25,65 kV	≤ 34,2 kV	≤ 43,65 kV	≤ 52,2 kV	≤ 60,75 kV
Height	h	107 mm	133 mm	154 mm	216 mm	237 mm	257 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP62					
Article number		94015	94016	94017	94018	94019	94020

Type		PSPI 20/20/IV	PSPI 24/20/IV	PSPI 28/20/IV	PSPI 32/20/IV	PSPI 36/20/IV	PSPI 40/20/IV
Max. continuous operating voltage	U_c	20 kV	24 kV	28 kV	32,5 kV	36,9 kV	39 kV
Nominal voltage	U_r	24 kV	29 kV	34 kV	39 kV	44 kV	46,5 kV
Nominal discharge current	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		1500 A	1500 A	1500 A	1500 A	1500 A	1500 A
Discharge class acc. to EN 60099-4		4	4	4	4	4	4
Residual voltage at I_n	U_{res}	≤ 66,75 kV	≤ 81,3 kV	≤ 95,85 kV	≤ 110,4 kV	≤ 124,95 kV	≤ 133,5 kV
Height	h	273 mm	309 mm	345 mm	381 mm	418 mm	438 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP62					
Article number		94021	94022	94023	94024	94025	94026

Note: *The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSPI */10 - LINE DISCHARGE CLASS 1

indoor use



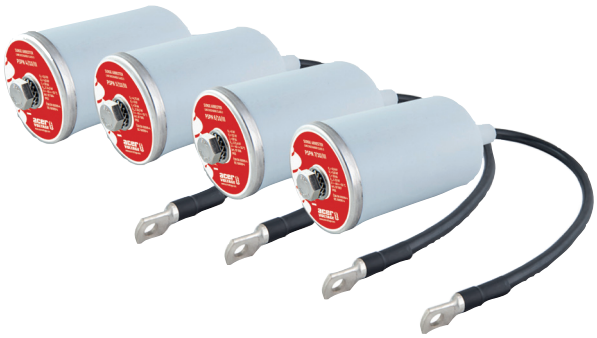
PSPI */10 - overvoltage limiters designed for internal use to protect high-voltage transmission systems, transformers, switching equipment and HV cable distribution systems and, in particular, cable heads of enclosed substations from the effects of atmospheric and switching overvoltage. The functional part of the limiters consists of a column of varistors sized for max. continuous operating voltage U_c. The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSPI series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

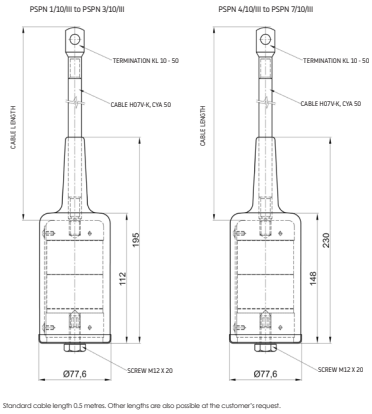
Type		PSPI 0,280/10	PSPI 0,440/10	PSPI 0,8/10	PSPI 1/10	PSPI 1,6/10
Max. continuous operating voltage	U_c	0,28 kV	0,44 kV	0,8 kV	1 kV	1,6 kV
Nominal voltage	U_r	0,33 kV	0,55 kV	1 kV	1,25 kV	2 kV
Nominal discharge current	I_n	10 kA	10 kA	10 kA	10 kA	10 kA
Max. discharge current (8/20)	I_{max}	40 kA	40 kA	40 kA	40 kA	40 kA
Long current impulse (2 ms)		300 A	300 A	300 A	300 A	300 A
Discharge class acc. to EN 60099-4		1	1	1	1	1
Residual voltage at I_n	U_{res}	≤ 1,25 kV	≤ 1,8 kV	≤ 3,3 kV	≤ 3,6 kV	≤ 5,5 kV
Height	h	65 mm	67 mm	69 mm	73 mm	75 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C				
Protection type		IP62				
Weight	m	425 g	445 g	470 g	490 g	520 g
Article number		92999	93000	93001	93002	93003

Note: *The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSPN */10/III - LINE DISCHARGE CLASS 3

indoor use





PSPN */10/III - overvoltage limiters designed for indoor use to protect high-voltage transmission systems, transformers, switching equipment and HV cable distribution systems against atmospheric and switching overvoltage. The functional part of the limiters consists of a column of varistors sized for max. continuous operating voltage U_c. The outer insulating shell is made from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSPN series conform to the standards EN 60099-4: 2014 and IEC 60099-4: 2014.

Type		PSPN 1/10/III	PSPN 2/10/III	PSPN 3/10/III	PSPN 4/10/III	PSPN 5/10/III	PSPN 6/10/III	PSPN 7/10/III
Max. continuous operating voltage	U_c	0,88 kV	1,75 kV	3 kV	3,9 kV	4,75 kV	6 kV	6,9 kV
Nominal voltage	U_r	1,1 kV	2,2 kV	3,75 kV	4,8 kV	6 kV	7,5 kV	8,6 kV
Nominal discharge current	I_n	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		850 A	850 A	850 A	850 A	850 A	850 A	850 A
Discharge class acc. to EN 60099-4		3	3	3	3	3	3	3
Residual voltage at I_n	U_{res}	≤ 3,5 kV	≤ 7 kV	≤ 10,7 kV	≤ 14,5 kV	≤ 18,3 kV	≤ 21,4 kV	≤ 25 kV
Height	h	195 mm	195 mm	195 mm	230 mm	230 mm	230 mm	230 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C						
Protection type		IP62						
Weight	m	1,6 kg	1,6 kg	1,6 kg	2,3 kg	2,3 kg	2,3 kg	2,3 kg
Article number		97001	97002	97003	97004	97005	97006	97007

Note: *Standard cable length 0,5 metres. Other lengths are also possible at the customer's request.*
Note: *The height and weight are indicative only and may vary. We can send accurate data on your request.*

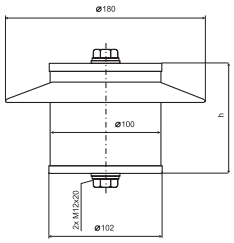
PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN DC SYSTEMS

protection of DC traction system, rail traction vehicles and equipment in DC systems

PSP 1/10/III

OVERVOLTAGE LIMITER PSP */10/III - LINE DISCHARGE CLASS 3

outdoor and indoor use



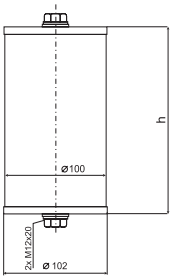
PSP */10/III - overvoltage limiters designed to protect converter stations and DC systems of electric traction systems linked to them from the effects of atmospheric and switching overvoltage. They are used for protecting traction lines, electrical equipment of trolleybuses, trams and electric trains. They do not require any maintenance during their operation. The PSP */10/III series is intended for outdoor and indoor applications. The functional part of the limiters consists of a column of varistors sized for continuous operating voltage U_c. The outer insulating shell is composed from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014, IEC 60099-4: 2014 and EN 50526-1: 2012.

Type		PSP 1/10/III	PSP 1/10/III SL	PSP 2/10/III	PSP 3/10/III	PSP 4/10/III
Continuous operating voltage (DC) U_c(= U_r) *		1,25 kV	1 kV	2,5 kV	3,75 kV	4,2 kV
Nominal discharge current	I_n	10 kA	10 kA	10 kA	10 kA	10 kA
Use in power net		600/750 V	600/750 V	1500 V	special application	3000 V
High impulse current (4/10)		2 x 100 kA	2 x 70 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		850 A	850 A	850 A	850 A	850 A
Discharge class acc. to EN 60099-4		3	3	3	3	3
Residual voltage at I_n	U_{res}	≤ 3,5 kV	≤ 2,5 kV	≤ 7 kV	≤ 10,5 kV	≤ 10,7 kV
Height	h	83 mm	83 mm	90 mm	102 mm	110 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C				
Protection type		IP65				
Weight	m	1,7 kg	1,7 kg	1,9 kg	2,3 kg	2,5 kg
Article number		92001	92001/SL	92003	92004	92002

**The rated voltage U_r of the arrester coincides with the continuous operating voltage U_c.*
***Note:** The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSPI */10/III - LINE DISCHARGE CLASS 3

indoor use



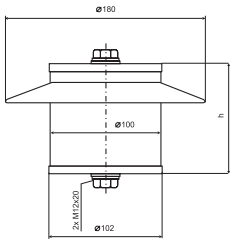
PSPI */10/III - overvoltage limiters designed to protect converter stations and DC systems of electric traction systems linked to them from the effects of atmospheric and switching overvoltage. They are used for protecting traction lines, electrical equipment of trolleybuses, trams and electric trains. They do not require any maintenance during their operation. The PSPI */10/III series is intended for indoor applications. The functional part of the limiters consists of a column of varistors sized for continuous operating voltage U_C. The outer insulating shell is composed from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSPI series conform to the standards EN 60099-4: 2014, IEC 60099-4: 2014 and EN 50526-1: 2012.

Type		PSPI 1/10/III	PSPI 1/10/III SL	PSPI 2/10/III	PSPI 3/10/III	PSPI 4/10/III	PSPI 5/10/III	PSPI 6/10/III
Continuous operating voltage (DC) $U_C(=U_r)$ *		1,25 kV	1 kV	2,5 kV	3,75 kV	4,2 kV	5,5 kV	6,7 kV
Nominal discharge current	I_n	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
Use in power net		600/750 V	600/750 V	1500 V	special application	3000 V	special application	special application
High impulse current (4/10)		2 x 100 kA	2 x 70 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		850 A	850 A	850 A	850 A	850 A	850 A	850 A
Discharge class acc. to EN 60099-4		3	3	3	3	3	3	3
Residual voltage at I_n	U_{res}	≤ 3,5 kV	≤ 2,5 kV	≤ 7 kV	≤ 10,5 kV	≤ 10,7 kV	≤ 14,2 kV	≤ 17,7 kV
Height	h	83 mm	83 mm	88 mm	106 mm	115 mm	123 mm	125 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C						
Protection type		IP62						
Weight	m	1,5 kg	1,5 kg	1,6 kg	1,9 kg	2,1 kg	2,3 kg	2,6 kg
Article number		94001	94001/SL	94003	94006	94002	94004	94005

**The rated voltage U_r of the arrester coincides with the continuous operating voltage U_C.*
***Note:** The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSP */20/IV - LINE DISCHARGE CLASS 4

outdoor and indoor use



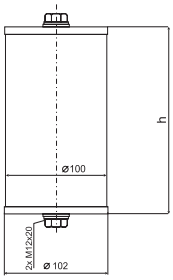
PSP */20/IV - overvoltage limiters designed to protect converter stations and DC systems of electric traction systems linked to them from the effects of atmospheric and switching overvoltage. They are used for protecting traction lines, electrical equipment of trolleybuses, trams and electric trains. They do not require any maintenance during their operation. The PSP */20/IV series is intended for outdoor and indoor applications. The functional part of the limiters consists of a column of varistors sized for continuous operating voltage U_C. The outer insulating shell is composed from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSP series conform to the standards EN 60099-4: 2014, IEC 60099-4: 2014 and EN 50526-1: 2012.

Type		PSP 1/20/IV	PSP 2/20/IV	PSP 3/20/IV	PSP 4,2/20/IV	PSP 4,7/20/IV
Continuous operating voltage (DC) U_c(= U_r) *		1,2 kV	2,35 kV	3,5 kV	4,2 kV	4,7 kV
Nominal discharge current	I_n	20 kA	20 kA	20 kA	20 kA	20 kA
Use in power net		600/750 V	1500 V	special application	3000 V	3000 V
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		1350 A	1350 A	1350 A	1350 A	1350 A
Discharge class acc. to EN 60099-4		4	4	4	4	4
Residual voltage at I_n	U_{res}	≤ 3,1 kV	≤ 6,2 kV	≤ 9,3 kV	≤ 11,8 kV	≤ 12,4 kV
Height	h	85 mm	102 mm	117 mm	130 mm	134 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C				
Protection type		IP65				
Weight	m	2 kg	2,5 kg	3,1 kg	3,5 kg	3,65 kg
Article number		92005	92006	92007	92010	92008

**The rated voltage U_r of the arrester coincides with the continuous operating voltage U_c.*
***Note:** The height and weight are indicative only and may vary. We can send accurate data on your request.*

OVERVOLTAGE LIMITER PSPI */20 kA - LINE DISCHARGE CLASS 4

indoor use



PSPI */20/IV - overvoltage limiters designed to protect converter stations and DC systems of electric traction systems linked to them from the effects of atmospheric and switching overvoltage. They are used for protecting traction lines, electrical equipment of trolleybuses, trams and electric trains. They do not require any maintenance during their operation. The PSPI */20/IV series is intended for indoor applications. The functional part of the limiters consists of a column of varistors sized for continuous operating voltage U_C. The outer insulating shell is composed from silicon material (grey colour). The material of the shell shows high resistance to the effects of surface leakage currents and to electric arc, possesses hydrophobic properties and shows excellent resistance to weather effects, pollution and UV radiation. The cover caps, connecting screws, nuts and terminals are made of stainless steel. With their design and technical parameters, the overvoltage limiters of the PSPI series conform to the standards EN 60099-4: 2014, IEC 60099-4: 2014 and EN 50526-1: 2012.

Type		PSPI 1/20/IV	PSPI 2/20/IV	PSPI 3/20/IV	PSPI 4,2/20/IV	PSPI 4,7/20/IV	PSPI 5/20/IV
Continuous operating voltage (DC) U_c(= U_r) *		1,2 kV	2,35 kV	3,5 kV	4,2 kV	4,7 kV	5,85 kV
Nominal discharge current	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Use in power net		600/750 V	1500 V	special application	3000 V	3000 V	special application
High impulse current (4/10)		2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA	2 x 100 kA
Long current impulse (2 ms)		1350 A	1350 A	1350 A	1350 A	1350 A	1350 A
Discharge class acc. to EN 60099-4		4	4	4	4	4	4
Residual voltage at I_n	U_{res}	≤ 3,1 kV	≤ 6,2 kV	≤ 9,3 kV	≤ 11,8 kV	≤ 12,4 kV	≤ 15,5 kV
Height	h	85 mm	102 mm	117 mm	130 mm	134 mm	151 mm
Operating temperature range	ϑ	- 40 °C ÷ + 55 °C					
Protection type		IP62					
Weight	m	1,9 kg	2,3 kg	2,9 kg	3,3 kg	3,4 kg	4 kg
Article number		94008	94009	94010	94013	94011	94012

**The rated voltage U_r of the arrester coincides with the continuous operating voltage U_c.*
***Note:** The height and weight are indicative only and may vary. We can send accurate data on your request.*

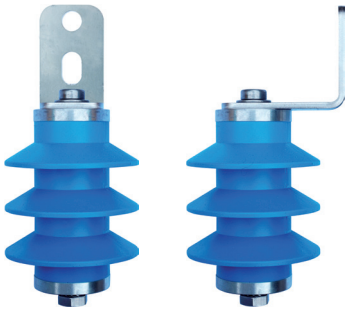
LOW VOLTAGE LIMITERS FOR RAILWAY VEHICLES IN DC SYSTEMS

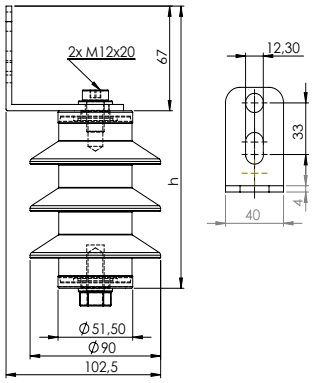
protection of non-live parts of metal structures in DC traction power supply systems

P250G

LOW VOLTAGE LIMITER P60G, P120G - (VLD-F)

outdoor and indoor use





P60G and P120G – are new types of low voltage limiters Type 1 VLD-F based on requirements of EN 50122-1: 2011, which are designed to protect the non-live parts of metallic structures in DC or AC traction power supply systems. They are used to effectively protect persons who may come into contact with these parts during lightning strikes or in case of a defect of the tractive overhead line. The limiter has a high internal resistance if there is a voltage lower than its specified DC sparkover voltage U_{VDC} and becomes conductive when this level is exceeded. In case of failure due to connection between live part of traction power supply system and the conductive part unintentionally connected to the return circuit, the limiter protects against impermissible touch voltage by becoming conductive and causing the power to turn off. According to EN 50122-1: 2011, this type of limiter is recommended mainly for the connection between the protected part and return circuit in the overhead line areas (or pantograph areas) that may be in contact with the conductors or damaged current collector, then on the support structures pylons which can become live due to an insulation failure. After the applied voltage drops again below the specified value of its nominal level, the limiter returns into a non-conductive state again.

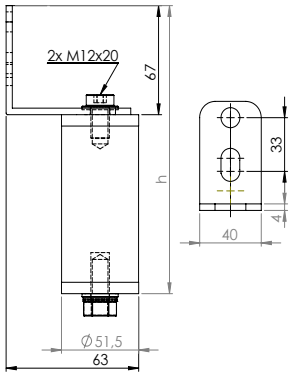
Type		P60G	P120G
Classification acc. EN 50122-1 and EN 61643-11		Type 1 (VLD-F) / Type 1	
DC sparkover voltage	U_{VDC}	60 V_{DC} ± 20 %	120 V_{DC} ± 20 %
Service life: 5 operations 50 Hz, 1 sec 1 operation 50 Hz, 0,5 sec 1 operation 50 Hz, 0,25 sec, max. load 20 operations 8/20 µsec[1)] 3 operation 10/350 µsec	 I_n I_{imp}	 100 A_{rms} 200 A_{rms} 4 kA_{rms} 100 kA 50 kA	
Impulse sparkover voltage at 1 kV/µsec	U_{res}	< 700 V	< 800 V
Protection level at I_{imp} = 50 kA[2)]	U_p	< 500 V	
Fail-save reliability test 1 operation 50 Hz, 120 sec		100 A_{rms}	
Insulation resistance	R_{iso}	> 2 GΩ at 25 V_{DC}	> 2 GΩ at 50 V_{DC}
Response time[2)]		< 20 nsec	
Protection type		IP65	
Operating temperature range		- 40 °C ÷ + 90 °C	
Total height including mounting bracket	h	180 mm	
Weight		c. 700 g	
Encapsulation		silicon rubber	
Article number		50800	50801

1) R_{iso}>107 Ω after completion of loading sequence
2) Typical value

Functional part P60G (P120G) is made using a special gas-filled gas discharge tube (GDT) with shortened response time 20 nsec, rated for up to 3 consecutive strikes of lightning current 50 kA (10/350). On the outer insulating cover is used a light blue silicone rubber. Working chamber of built GDT is equipped with technically sophisticated fail-save mode hardware that provides an automatically transition to short-circuit mode in the event of longtime overloads above 500 A DC (AC) (this state is non-reversible). On the outer insulating cover is used a blue silicone rubber, which is hydrophobic and has excellent resistance against weathering, pollution and UV rays. Mounting bracket, connecting bolts and nuts are made from stainless steel, suitable for connection of conductors with cross section 16-50 mm^2 Fe (Cu). The product is delivered with an integrated bracket, allowing direct mounting of P60G (P120G) to the protected metal structure (pillar, wall or flange). Recommended mounting position is vertical bracket up. Limiter is installed directly to a protected building construction (using two bolts M12), so that in the event of its activation was generated a conductive connection between this structure and the return path. The limiter can be activated either by lightning current or current resulting from contact protected metallic structure with a fallen overhead line. In such a case occurs between these parts of the occurrence of a potential difference of more than 60 V (valid for P60G), or 120 V (valid for P120G). Built-in GDT ignites instantly (response time is typically 20 nsec) and for a transitional period of both parts electrically interconnects (typical internal resistance initialized P60G (P120G) is 0,001 ÷ 0,002 Ω). The duration of this transient process is automatically broken up by potential equalization between the protected structures and a return path, when it comes to an automatic switching off GDT due to recombination its gas filling.

LOW VOLTAGE LIMITER P60GI, P120GI - (VLD-F)

indoor use



P60GI and P120GI – are new types of low voltage limiters Type 1 VLD-F based on requirements of EN 50122-1: 2011, which are designed to protect the non-live parts of metallic structures in DC or AC traction power supply systems. They are used to effectively protect persons who may come into contact with these parts during lightning strikes or in case of a defect of the tractive overhead line. The limiter has a high internal resistance if there is a voltage lower than its specified DC sparkover voltage U_{VDC} and becomes conductive when this level is exceeded. In case of failure due to connection between live part of traction power supply system and the conductive part unintentionally connected to the return circuit, the limiter protects against impermissible touch voltage by becoming conductive and causing the power to turn off. According to EN 50122-1: 2011, this type of limiter is recommended mainly for the connection between the protected part and return circuit in the overhead line areas (or pantograph areas) that may be in contact with the conductors or damaged current collector, then on the support structures pylons which can become live due to an insulation failure. After the applied voltage drops again below the specified value of its nominal level, the limiter returns into a non-conductive state again.

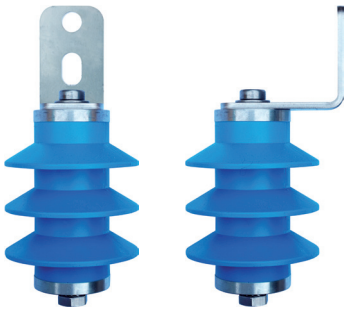
Type		P60GI	P120GI
Classification acc. EN 50122-1 and EN 61643-11		Type 1 (VLD-F) / Type 1	
DC sparkover voltage	U_{VDC}	60 V_{DC} ± 20 %	120 V_{DC} ± 20 %
Service life: 5 operations 50 Hz, 1 sec 1 operation 50 Hz, 0,5 sec 1 operation 50 Hz, 0,25 sec, max. load 20 operations 8/20 µsec[1] 3 operation 10/350 µsec	 I_n I_{imp}	 100 A_{rms} 200 A_{rms} 4 kA_{rms} 100 kA 50 kA	
Impulse spark-over voltage at 1 kV/µsec	U_{res}	< 700 V	< 800 V
Protection level at I_{imp} = 50 kA[2]	U_p	< 500 V	
Fail-save reliability test 1 operation 50 Hz, 120 sec		100 A_{rms}	
Insulation resistance	R_{iso}	> 2 GΩ at 25 V_{DC}	> 2 GΩ at 50 V_{DC}
Response time[2]		< 20 nsec	
Protection type		IP62	
Operating temperature range		- 40 °C ÷ + 90 °C	
Total height including mounting bracket	h	180 mm	
Weight		c. 580 g	
Encapsulation		silicon rubber	
Article number		50800/I	50801/I

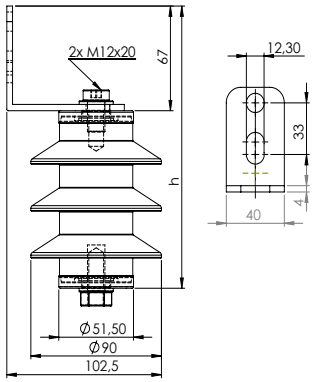
[1] R_{iso}>107 Ω after completion of loading sequence
[2] Typical value

Functional part P60GI (P120GI) is made using a special gas-filled gas discharge tube (GDT) with shortened response time 20 nsec, rated for up to 3 consecutive strikes of lightning current 50 kA (10/350). On the outer insulating cover is used a light blue silicone rubber. Working chamber of built GDT is equipped with technically sophisticated fail-save mode hardware that provides an automatically transition to short-circuit mode in the event of longtime overloads above 500 A DC (AC) (this state is non-reversible). On the outer insulating cover is used a blue silicone rubber, which is hydrophobic and has excellent resistance against weathering, pollution and UV rays. Mounting bracket, connecting bolts and nuts are made from stainless steel, suitable for connection of conductors with cross section 16-50 mm² Fe (Cu). The product is delivered with an integrated bracket, allowing direct mounting of P60GI (P120GI) to the protected metal structure (pillar, wall or flange). Recommended mounting position is vertical bracket up. Limiter is installed directly to a protected building construction (using two bolts M12), so that in the event of its activation was generated a conductive connection between this structure and the return path. The limiter can be activated either by lightning current or current resulting from contact protected metallic structure with a fallen overhead line. In such a case occurs between these parts of the occurrence of a potential difference of more than 60 V (valid for P60GI), or 120 V (valid for P120GI). Built-in GDT ignites instantly (response time is typically 20 nsec) and for a transitional period of both parts electrically interconnects (typical internal resistance initialized P60GI (P120GI) is 0,001 ÷ 0,002 Ω). The duration of this transient process is automatically broken up by potential equalization between the protected structures and a return path, when it comes to an automatic switching off GDT due to recombination its gas filling.

LOW VOLTAGE LIMITER P250G, P400G - (VLD-F)

outdoor and indoor use





P250G and P400G – are new types of low voltage limiters Type 1 VLD-F based on requirements of EN 50122-1: 2011, which are designed to protect the non-live parts of metallic structures in DC or AC traction power supply systems. They are used to effectively protect persons who may come into contact with these parts during lightning strikes or in case of a defect of the tractive overhead line. The limiter has a high internal resistance if there is a voltage lower than its specified DC sparkover voltage U_{VDC} and becomes conductive when this level is exceeded. In case of failure due to connection between live part of traction power supply system and the conductive part unintentionally connected to the return circuit, the limiter protects against impermissible touch voltage by becoming conductive and causing the power to turn off. According to EN 50122-1: 2011, this type of limiter is recommended mainly for the connection between the protected part and return circuit in the overhead line areas (or pantograph areas) that may be in contact with the conductors or damaged current collector, then on the support structures pylons which can become live due to an insulation failure. After the applied voltage drops again below the specified value of its nominal level, the limiter returns into a non-conductive state again.

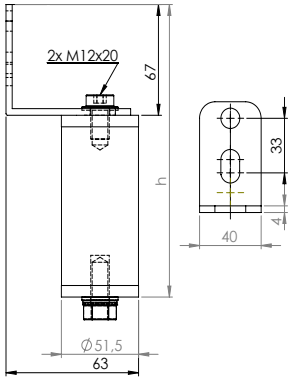
Type		P250G	P400G
Classification acc. EN 50122-1 and EN 61643-11		Type 1 (VLD-F) / Type 1	
DC sparkover voltage	U_{VDC}	250 V_{DC} ± 20 %	400 V_{DC} ± 20 %
Service life: 5 operations 50 Hz, 1 sec 1 operation 50 Hz, 0,5 sec 1 operation 50 Hz, 0,25 sec, max. load 20 operations 8/20 µsec[1] 3 operation 10/350 µsec	 I_n I_{imp}	 100 A_{rms} 200 A_{rms} 4 kA_{rms} 100 kA 50 kA	
Impulse spark-over voltage at 1 kV/µsec	U_{res}	< 800 V	< 1000 V
Protection level at I_{imp}= 50 kA[2]	U_p	< 700 V	< 800 V
Insulation resistance	R_{iso}	> 1 GΩ at 100 V_{DC}	
Response time[2]		< 20 nsec	
Protection type		IP65	
Operating temperature range		- 40 °C ÷ + 90 °C	
Total height including mounting bracket	h	187 mm	
Weight		c. 700 g	
Encapsulation		silicon rubber	
Article number		50804	50803

[1] R_{iso}>107 Ω after completion of loading sequence
[2] Typical value

Functional part P250G (P400G) is made using a special gas-filled gas discharge tube (GDT) with shortened response time 20 nsec, rated for up to 3 consecutive strikes of lightning current 50 kA (10/350). On the outer insulating cover is used a light blue silicone rubber. Working chamber of built GDT is equipped with technically sophisticated fail-save mode hardware that provides an automatically transition to short-circuit mode in the event of longtime overloads above 500 A DC (AC) (this state is non-reversible). On the outer insulating cover is used a blue silicone rubber, which is hydrophobic and has excellent resistance against weathering, pollution and UV rays. Mounting bracket, connecting bolts and nuts are made from stainless steel, suitable for connection of conductors with cross section 16-50 mm^2 Fe (Cu). The product is delivered with an integrated bracket, allowing direct mounting of P250G (P400G) to the protected metal structure (pillar, wall or flange). Recommended mounting position is vertical bracket up. Limiter is installed directly to a protected building construction (using two bolts M12), so that in the event of its activation was generated a conductive connection between this structure and the return path. The limiter can be activated either by lightning current or current resulting from contact protected metallic structure with a fallen overhead line. In such a case occurs between these parts of the occurrence of a potential difference of more than 250 V (valid for P250G), or 400 V (valid for P400G). Built-in GDT ignites instantly (response time is typically 20 nsec) and for a transitional period of both parts electrically interconnects (typical internal resistance initialized P250G (P400G) is 0,001 ÷ 0,002 Ω). The duration of this transient process is automatically broken up by potential equalization between the protected structures and a return path, when it comes to an automatic switching off GDT due to recombination its gas filling.

LOW VOLTAGE LIMITER P250GI, P400GI - (VLD-F)

indoor use



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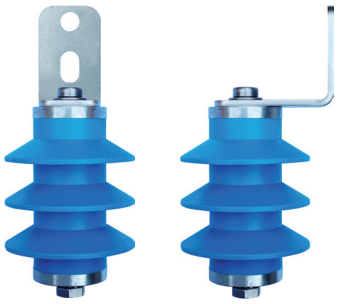
Type		P250GI	P400GI
Classification acc. EN 50122-1 and EN 61643-11		Type 1 (VLD-F) / Type 1	
DC sparkover voltage	U_{VDC}	250 V_{DC} ± 20 %	400 V_{DC} ± 20 %
Service life: 5 operations 50 Hz, 1 sec 1 operation 50 Hz, 0,5 sec 1 operation 50 Hz, 0,25 sec, max. load 20 operations 8/20 µsec[1)] 3 operation 10/350 µsec	 I_n I_{imp}	 100 A_{rms} 200 A_{rms} 4 kA_{rms} 100 kA 50 kA	
Impulse spark-over voltage at 1 kV/µsec	U_{res}	< 800 V	< 1000 V
Protection level at I_{imp}= 50 kA[2)]	U_p	< 700 V	< 800 V
Insulation resistance	R_{iso}	> 1 GΩ at 100 V_{DC}	
Response time[2)]		< 20 nsec	
Protection type		IP62	
Operating temperature range		- 40 °C ÷ + 90 °C	
Total height including mounting bracket	h	187 mm	
Weight		c. 620 g	
Encapsulation		silicon rubber	
Article number		50804/I	50803/I

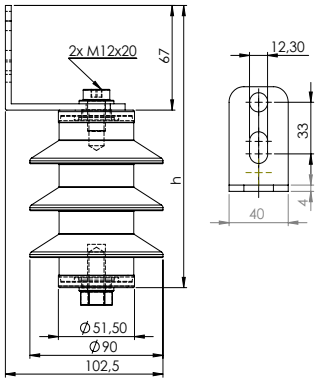
[1)] R_{iso}>107 Ω after completion of loading sequence
[2)] Typical value

Functional part P250GI (P400GI) is made using a special gas-filled gas discharge tube (GDT) with shortened response time 20 nsec, rated for up to 3 consecutive strikes of lightning current 50 kA (10/350). On the outer insulating cover is used a light blue silicone rubber. Working chamber of built GDT is equipped with technically sophisticated fail-save mode hardware that provides an automatically transition to short-circuit mode in the event of longtime overloads above 500 A DC (AC) (this state is non-reversible). On the outer insulating cover is used a blue silicone rubber, which is hydrophobic and has excellent resistance against weathering, pollution and UV rays. Mounting bracket, connecting bolts and nuts are made from stainless steel, suitable for connection of conductors with cross section 16-50 mm^2 Fe (Cu). The product is delivered with an integrated bracket, allowing direct mounting of P250GI (P400GI) to the protected metal structure (pillar, wall or flange). Recommended mounting position is vertical bracket up. Limiter is installed directly to a protected building construction (using two bolts M12), so that in the event of its activation was generated a conductive connection between this structure and the return path. The limiter can be activated either by lightning current or current resulting from contact protected metallic structure with a fallen overhead line. In such a case occurs between these parts of the occurrence of a potential difference of more than 250 V (valid for P250GI), or 400 V (valid for P400GI). Built-in GDT ignites instantly (response time is typically 20 nsec) and for a transitional period of both parts electrically interconnects (typical internal resistance initialized P250GI (P400GI) is 0,001 ÷ 0,002 Ω). The duration of this transient process is automatically broken up by potential equalization between the protected structures and a return path, when it comes to an automatic switching off GDT due to recombination its gas filling.

POWER GAS DISCHARGE TUBE P600G

outdoor and indoor use





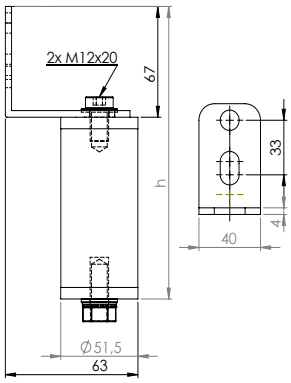
P600G - a power gas discharge tube (GDT) designed for potential equalisation on the installation components of buildings or technological units, which are not electrically connected to each other (according to EN 62305: 2011). It is recommended primarily for bridging of insulated flanges and insulated threaded joints in the pipeline cathodic protected parts of industrial technology. If between these parts arise some potential difference greater than 600V, GDT immediatelly ignites for a temporary period and both parth electrically interconnects (typical internal resistance initialized P600G is 0,001 ÷ 0,002 Ω). P600G installation can be done both inside and outside buildings, in damp and underground spaces. P600G functional part is made using a special gas dischage tube with shortened response time 20 nsec, designed for lightning current 100 kA (10/350). On the outer insulating cover is used a blue silicone rubber, which is hydrophobic and has excellent resistance against weathering, pollution and UV rays. Mounting bracket, connecting bolts and nuts are made from stainless steel, suitable for connection of conductors with cross section 16-50 mm^2 Fe (Cu). The product is delivered with an integrated bracket, allowing direct mounting of P600G to the protected metal structure (pillar, wall or flange).

Type		P600G
Classification acc. EN 61643-11 a IEC 61643-11		Type 1
DC sparkover voltage	U_{VDC}	600 V ÷ 1000 V
Max. continuous operating voltage 50 Hz	U_c	255 V_{rms}
Nominal discharge current (8/20)	I_n	100 kA
Impulse current (10/350)	I_{imp}	100 kA
- charge	Q	50 Asec
- specific energy	W/R	2500 kJ/Ω
Follow current interrupting rating at U_c	I_{fi}	100 A_{rms}
Protection level at at I_{imp} [1)]	U_p	< 1 kV
DC discharge current, 1 operation		400 A/0,5 sec
AC discharge current at 1200 V_{rms} (TOV)[2)], 1 operation		300 A_{rms}/0,2 sec
Response time[1)]	t_A	< 20 ns
Insulation resistance at 100 V_{DC}	R_{iso}	> 1 GΩ
Protection type		IP65
Operating temperature range		- 40 °C ÷ + 90 °C
Total height including mounting bracket	h	187 mm
Weight	m	c. 700 g
Encapsulation		silicon rubber
Article number		50802

[1)] Typical value
[2)] TOV – Temporary overvoltage

POWER GAS DISCHARGE TUBE P600GI

indoor use



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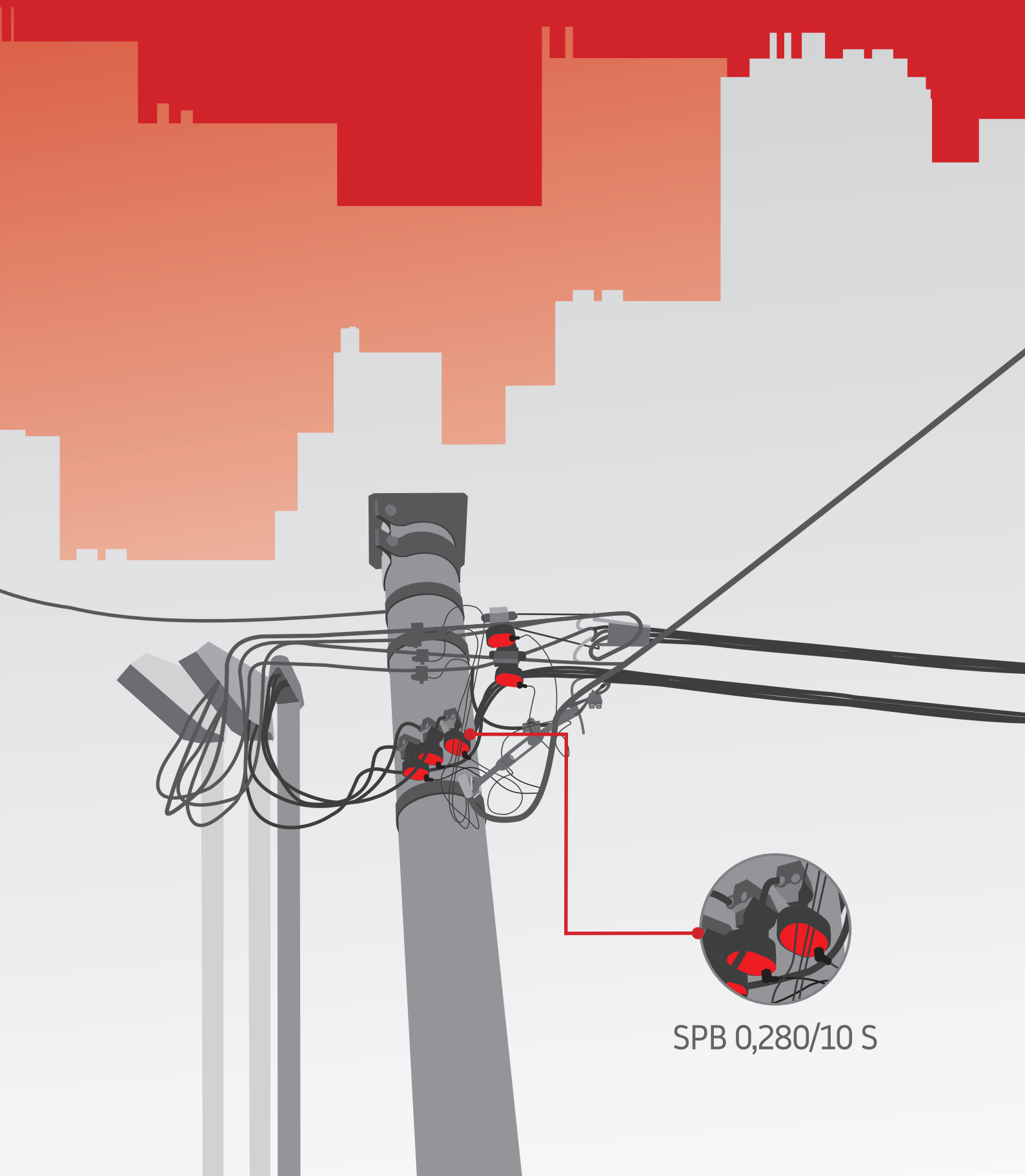
Type		P600GI
Classification acc. EN 61643-11 a IEC 61643-11		Type 1
DC sparkover voltage	U_{VDC}	600 V ÷ 1000 V
Max. continuous operating voltage 50 Hz	U_c	255 V_{rms}
Nominal discharge current (8/20)	I_n	100 kA
Impulse current (10/350)	I_{imp}	100 kA
- charge	Q	50 Asec
- specific energy	W/R	2500 kJ/Ω
Follow current interrupting rating at U_c	I_{fi}	100 A_{rms}
Protection level at at I_{imp} [1)]	U_p	< 1 kV
DC discharge current, 1 operation		400 A/0,5 sec
AC discharge current at 1200 V_{rms} (TOV)[2)], 1 operation		300 A_{rms}/0,2 sec
Response time[1)]	t_A	< 20 ns
Insulation resistance at 100 V_{DC}	R_{iso}	> 1 GΩ
Protection type		IP62
Operating temperature range		- 40 °C ÷ + 90 °C
Total height including mounting bracket	h	187 mm
Weight	m	c. 620 g
Encapsulation		silicon rubber
Article number		50802/I

[1)] Typical value
[2)] TOV – Temporary overvoltage

PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN AC SYSTEMS

protection of LV outdoor lines, household connections, distribution transformer switchboards



SPB 0,280/10 S

SURGE ARRESTER SPB */10 PP ** - on flat busbars
SURGE ARRESTER SPB */10 DT ** - into distribution transformers

SPB */10 PP **

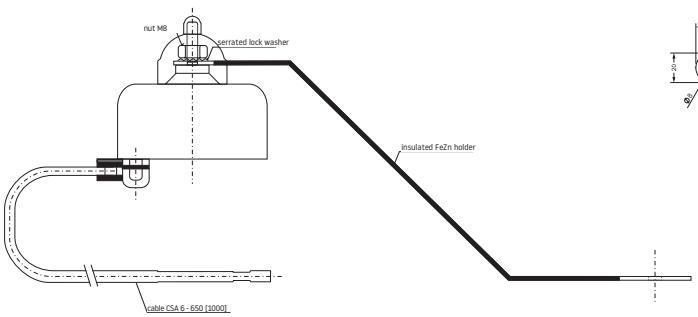
SPB */10 DT **

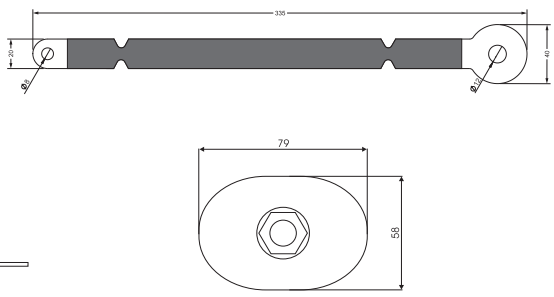
SPB */10 PP* - a surge arrester as per EN 61643-11: 2012 with a nominal discharge current of 10 kA and a maximum continuous operating voltage of U_c = 280 V, 440 V, 500 V or 660 V. They provide protection against low-voltage overvoltage, they protect in low-voltage overhead power distribution systems, electrical equipment, instruments, switchgears of distribution transformers and reduce the risk of damage to in-house systems and their equipment by atmospheric and switching overvoltage in AC systems with a frequency of 48-62 Hz. The SPB surge arresters protect against the destructive effects of lightning and switching overvoltage. It is recommended to use them in places secured against contact, e.g. by a position or barrier. The SPB surge arresters do not require any special maintenance, only a check after thunderstorms with atmospheric discharges. The destruction of arresters due to great overloading is indicated by the lifting-off of a red signalling cap. Considering the fact that an arrester is not destroyed in the event of its excessive overloading above guaranteed limits and subsequent thermal breakdown. This arrester can be mounted into switchboards directly on the buses of a power circuit-breaker.

Type		SPB 0,280/10 PP (DT) **	SPB 0,440/10 PP (DT) **	SPB 0,500/10 PP (DT) **	SPB 0,660/10 PP (DT) **
Category tested in accordance with EN 61643-11		Type 2			
Max. continuous operating voltage	U_c	280 V AC 350 V DC	440 V AC 585 V DC	500 V AC 670 V DC	660 V AC 895 V DC
Nominal discharge current (8/20)	I_n	10 kA			
Max. discharge current (8/20)	I_{max}	40 kA			
Voltage protection level at I_N	U_p	< 1,25 kV	< 1,8 kV	< 2,2 kV	< 2,5 kV
Response time	t_A	< 25 ns			
Operating temperature range	ϑ	- 40 °C ÷ + 80 °C			
Operating position		vertically with max. departure ± 45 °C			
Protection type		IP55			
Protection		internal thermal disconnector			
Weight	m	230 g	235 g	250 g	270 g
* : conductor lenght and color		Article number			
100gy : 100 cm, green-yellow		90176, (90176/DT)	90170, (90170/DT)	90210, (90210/DT)	90216, (90216/DT)
100b : 100 cm, black		90177, (90177/DT)	90171, (90171/DT)	90211, (90211/DT)	90217, (90217/DT)
80gy : 80 cm, green-yellow		90178, (90178/DT)	90172, (90172/DT)	90212, (90212/DT)	90218, (90218/DT)
80b : 80 cm, black		90179, (90179/DT)	90173, (90173/DT)	90213, (90213/DT)	90219, (90219/DT)
60gy : 65 cm, green-yellow		90180, (90180/DT)	90174, (90174/DT)	90214, (90214/DT)	90220, (90220/DT)
65b : 65 cm, black		90181, (90181/DT)	90175, (90175/DT)	90215, (90215/DT)	90221, (90221/DT)

*SPB */10 PP ** - on flat busbars in switchboards with a serrated lock washer and nut.*

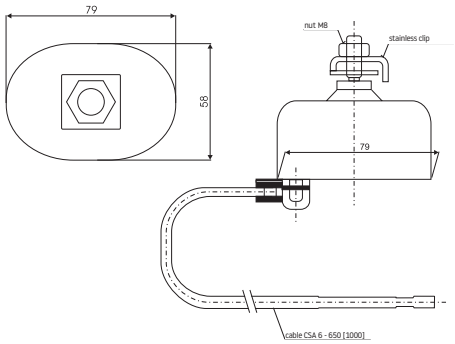
*SPB */10 DT ** - version with insulated FeZn holder intended for installation in distribution transformers.*





SURGE ARRESTER SPB */10 AlFe*

on bare overhead conductors



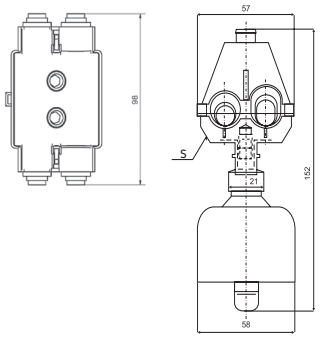
SPB */10 AlFe* - a surge arrester as per EN 61643-11: 2012 with a nominal discharge current of 10 kA and a maximum continuous operating voltage of U_c = 280 V, 440 V, 500 V or 660 V. They provide protection against low-voltage overvoltage, they protect in low-voltage overhead power distribution systems electrical equipment, instruments, switchgears of distribution transformers and reduce the risk of damage to in-house systems and their equipment by atmospheric and switching overvoltage in AC systems with a frequency of 48-62 Hz. The SPB surge arresters protect against the destructive effects of lightning and switching overvoltage. It is recommended to use them in places secured against contact, e.g. by a position or barrier. The SPB surge arresters do not require any special maintenance, only a check after thunderstorms with atmospheric discharges. The destruction of arresters due to great overloading is indicated by the lifting-off of a red signalling cap. Considering the fact that an arrester is not destroyed in the event of its excessive overloading above guaranteed limits and subsequent thermal breakdown. This arrester can be mounted on a bare AlFe conductor with a stainless clip and nut.

Type		SPB 0,280/10 AlFe *	SPB 0,440/10 AlFe *	SPB 0,500/10 AlFe *	SPB 0,660/10 AlFe *
Category tested in accordance with EN 61643-11		Type 2			
Max. continuous operating voltage	U_c	280 V AC / 350 V DC	440 V AC / 585 V DC	500 V AC / 670 V DC	660 V AC / 895 V DC
Nominal discharge current (8/20)	I_n	10 kA			
Max. discharge current (8/20)	I_{max}	40 kA			
Voltage protection level at I_N	U_P	< 1,25 kV	< 1,8 kV	< 2,2 kV	< 2,5 kV
Response time	t_A	< 25 ns			
Operating temperature range	ϑ	- 40 °C ÷ + 80 °C			
Operating position		vertically with max. departure ± 45 °C			
Protection type		IP55			
Protection		internal thermal disconnector			
Weight	m	248 g	255 g	270 g	290 g
* : conductor lenght and color		Article number			
100gy : 100 cm, green-yellow		90106	90100	90118	90112
100b : 100 cm, black		90107	90101	90119	90113
80gy : 80 cm, green-yellow		90108	90102	90120	90114
80b : 80 cm, black		90109	90103	90121	90115
60gy : 65 cm, green-yellow		90110	90104	90122	90116
65b : 65 cm, black		90111	90105	90123	90117

*SPB */10 AlFe * - on a bare AlFe conductor with a stainless clip and nut*

SURGE ARRESTER SPB */10 S*

on insulated overhead conductors



SPB */10 AlFe* - a surge arrester as per EN 61643-11: 2012 with a nominal discharge current of 10 kA and a maximum continuous operating voltage of U_C = 280 V, 440 V, 500 V or 660 V. They provide protection against low-voltage overvoltage, they protect in low-voltage overhead power distribution systems, electrical equipment, instruments, switchgear of distribution transformers and reduce the risk of damage to in-house systems and their equipment by atmospheric and switching overvoltage in AC systems with a frequency of 48-62 Hz. The SPB surge arresters protect against the destructive effects of lightning and switching overvoltage. It is recommended to use them in places secured against contact, e.g. by a position or barrier. The SPB surge arresters do not require any special maintenance, only a check after thunderstorms with atmospheric discharges. The destruction of arresters due to great overloading is indicated by the lifting-off of a red signalling cap. Considering the fact that an arrester is not destroyed in the event of its excessive overloading above guaranteed limits and subsequent thermal breakdown. This arrester can be mounted on an insulated line with an insulated terminal ENSTO SL 9.22.

Type		SPB 0,280/10 S *	SPB 0,440/10 S *	SPB 0,500/10 S *	SPB 0,660/10 S *
Category tested in accordance with EN 61643-11		Type 2			
Max. continuous operating voltage	U_C	280 V AC / 350 V DC	440 V AC / 585 V DC	500 V AC / 670 V DC	660 V AC / 895 V DC
Nominal discharge current (8/20)	I_n	10 kA			
Max. discharge current (8/20)	I_{max}	40 kA			
Voltage protection level at I_N	U_P	< 1,25 kV	< 1,8 kV	< 2,2 kV	< 2,5 kV
Response time	t_A	< 25 ns			
Operating temperature range	ϑ	- 40 °C ÷ + 80 °C			
Operating position		vertically with max. departure ± 45 °C			
Protection type		IP55			
Protection		internal thermal disconnector			
Weight	m	337 g	345 g	370 g	390 g
* : conductor lenght and color		Article number			
100gy : 100 cm, green-yellow		90156	90150	90190	90196
100b : 100 cm, black		90157	90151	90191	90197
80gy : 80 cm, green-yellow		90158	90152	90192	90198
80b : 80 cm, black		90159	90153	90193	90199
60gy : 65 cm, green-yellow		90160	90154	90194	90200
65b : 65 cm, black		90161	90155	90195	90201

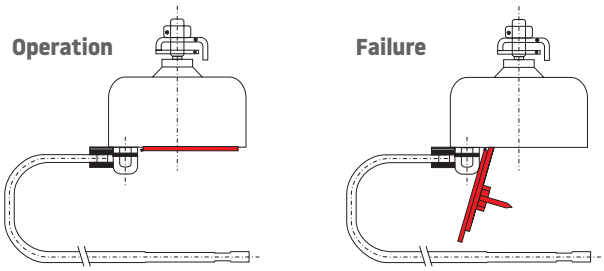
*SPB */10 S * - on an insulated line with an insulated terminal ENSTO SL 9.22*

Characteristics and performance

Predominantly capacitative current in the order of hundreds of μA passes through the surge arrester at continuous operating voltage. The active component of the current is negligible. When the terminal voltage of the surge arrester increases, the surge arrester changes smoothly to an on-state and limits all types of overvoltage. The response time is very small (in the order of 100 ns) so the surge arrester reliably limits even steep surges of atmospheric overvoltage. The surge arrester consists of a plastic housing with connecting leads, a separately enclosed watertight and electrically isolated varistor encapsulated in silicon caoutchouk, thermal disconnector and a signalling cap in the bottom part of the housing. Easy assembly is an advantage as well. The plastic of the housing is resistant to UV radiation, weather effects and is flame-retardant – Class V0. The connecting screws and terminals are made of stainless steel. The surge arrester is fitted with an earthing cable with an end – green-yellow or black in colour as required by the customer, with a length of 0,65 m, 0,8 m or 1,0 m, or with other lengths as agreed with the customer. The built-in disconnector is used to disconnect the limiter from the mains in the event of its overloading, which may occur owing to the limit parameters of the varistor being exceeded (absorption of greater energy, e.g. due to a long-term increase in the operating voltage above U_c, or due to great voltage induced by a lightning strike in the immediate vicinity). The maximum current of the varistor is 100 kA, 4/10 μs. In the event of two consecutive pulses of 65 kA, 4/10 μs, the varistor temperature may reach a value at which the disconnector gets disconnected.. Disconnection is signalled in such a way that the red cap of the surge arrester in the bottom part of the housing is lifted off. In the event of varistor breakdown (e.g. when the maximum current is exceeded owing to a steep pulse), the enclosed varistor may be carried up from the housing by short-circuit current without the outer shell of the surge arrester being damaged or destroyed. This will ensure that the surge arrester is disconnected from the mains without potential damage to surrounding objects (except the bottom part) or a flashover between busbars in the switchgear. The disconnection is again indicated by the lifting off of the cap. When an insulated terminal is used, all the live parts remain sufficiently insulated and protected against accidental contact.

Operating status indication

Disconnection is signalled in such a way that the red cap of the limiter in the bottom part of the housing is lifted off.



Transport, handling and storage requirements

The surge arresters shall be packed individually in a polyethylene bag and transported in non-returnable cardboard boxes. Other packaging is possible by agreement with the customer. The surge arresters shall be stored in cartons in indoor closed stores at a temperature from - 30 °C to + 30 °C. Foam or water may be used as extinguishing agents. During transport it is necessary to handle the product with care so as not to damage the carton packaging.

Effect on the environment

There is no risk of a negative influence on the environment during the transport, handling, storage and use of the product. The disposal of damaged products shall be carried out by taking them to a waste dump. The waste catalogue number is 07 02 99.

SURGE ARRESTERS SPD17 ÷ SPD510, SPD17S ÷ SPD510S, SPD17FM ÷ SPD510FM

indoor use

SPD275, SPD275S and SPD275FM are representatives of a wide range of surge protection devices Class 2 + 3 according to EN 61643-11: 2012 and IEC 61643-11: 2011 for general use in AC power supply systems. Having a high absorbency at the disposal of interference voltage components propagating along the lines of the result of the switching processes alternatively due to the effects of storm activity. SPD can be applied without the use of DIN rails even in places where there is a tight installation space, as well as an additional measure in applications where the occurrence of overvoltage operates during operation problems. Acc. to customer´s demand it is possible to supply this protection device for max. continuous AC operating voltage U_C from 17 to 510 V (see table 1). Way to access the protected device is designed with flexible leads 1,5 mm² with length of 20 cm. SPD should be installed as close as possible to the protected equipment. Each SPD is equipped with a internal thermal fuse, which is used as main fuse and turn off the power protected equipment when it is activate by MOV´s failure.

Type		SPD275	SPD275S	SPD275FM
Classification acc. to EN 61643-11 and IEC 61643-1		Type 2 + 3		
Nominal operating voltage	U_N	230 VAC		
Max. Continuous operating voltage	U_C	275 VAC		
Max. discharge current (8/20)	I_{max}	25 kA		
Nominal discharge current (8/20)	I_n	10 kA		
Combined impulse	U_{OC}	< 10 kV		
Voltage protection level at I_n	U_P	< 1 kV		
Voltage protection level at U_{OC}	U_P	< 1,2 kV		
Response time	t_A	< 25 nsec		
TOV endurability	U_T	335 VAC/5 s		
Max. external back-up fuse		25 A		
Local fault indication		----	Put out the green LED diode OPERATION	The floatig NC contact switch off (max. 230 VAC/0,5 A)
AC current of protected equipment	I_r	max. 10 A		
Disconnecting overloaded varistor and protected equipment from low voltage system by MOV´s failure		YES		
Protection type / operating temperature	IP	IP62 / - 40 °C ÷ + 55 °C		
Weight / dimensions	m	c. 30 g / 50 x 35 x 22 mm		
Conductor length	l	200 mm, wires 1,5 mm² and 0,35 mm²		
Operating position		any		
Article number		50919 (see table 1)	50919/S (see table 1)	50919/FM (see table 1)

Each SPD is equipped with an internal thermal fuse, which is used as main fuse and turn off the power protected equipment when it is activated by MOV´s failure. This fuse can be also mechanicaly coupled with second internal disconnecting (NC) contact, which according to the selected version controls:
- disconnecting overloaded varistor and protected equipment from low voltage system (basic version SPDxxx)
- local internal fault indication LED diode OPERATIONS (SPDxxxS version)
- NC contact FM remote fault - called Fail Monitoring (SPDxxxFM version)

SURGE ARRESTERS SPD17 ÷ SPD510, SPD17S ÷ SPD510S, SPD17FM ÷ SPD510FM
indoor use

Table 1 Summary of produced types:

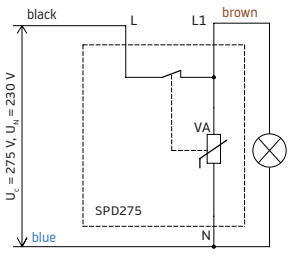
Type	Max. continuous operating voltage U_c	Varistor voltage		Clamping voltage		Discharge current(8/20)		Voltage protection level		Maximum energy 10/1000 µsec J	Article number
	AC	V_{1mA}		V_c at I_P		I_n	I_{max}	U_P at I_P			
	V	min	max	V	A	kA		V	kA		
SPD17(S)(FM)	17	24	31	53	35	3	6	90	3	33	50900(S)(FM)
SPD20(S)(FM)	20	30	36	65				120		42	50901(S)(FM)
SPD25(S)(FM)	25	35	43	77		4	8	150	4	49	50902(S)(FM)
SPD30(S)(FM)	30	42	52	93				220		60	50903(S)(FM)
SPD35(S)(FM)	35	50	62	110		5	10	220	5	72	50904(S)(FM)
SPD40(S)(FM)	40	61	75	135				220		85	50905(S)(FM)
SPD50(S)(FM)	50	74	90	135	175	8	16	330		98	50906(S)(FM)
SPD60(S)(FM)	60	90	110	165				330		122	50907(S)(FM)
SPD75(S)(FM)	75	108	132	200				400		146	50908(S)(FM)
SPD95(S)(FM)	95	139	162	250				400		185	50909(S)(FM)
SPD115(S)(FM)	115	167	195	300				500		218	50910(S)(FM)
SPD130(S)(FM)	130	186	216	340		10	25	500	10	252	50911(S)(FM)
SPD140(S)(FM)	140	204	238	360				600		280	50912(S)(FM)
SPD150(S)(FM)	150	223	260	395				600		302	50913(S)(FM)
SPD175(S)(FM)	175	251	292	455				700		340	50914(S)(FM)
SPD190(S)(FM)	190	279	324	500				700		375	50915(S)(FM)
SPD210(S)(FM)	210	306	357	550				800		410	50916(S)(FM)
SPD230(S)(FM)	230	334	389	595				900		465	50917(S)(FM)
SPD250(S)(FM)	250	362	422	650				900		520	50918(S)(FM)
SPD275(S)(FM)	275	399	465	710				1000		575	50919(S)(FM)
SPD300(S)(FM)	300	437	508	775				1000		630	50920(S)(FM)
SPD320(S)(FM)	320	474	551	845				1200		665	50921(S)(FM)
SPD350(S)(FM)	350	520	605	925				1500		720	50922(S)(FM)
SPD385(S)(FM)	385	576	670	1025				1500		790	50923(S)(FM)
SPD420(S)(FM)	420	632	735	1120				1800		790	50924(S)(FM)
SPD460(S)(FM)	460	697	810	1240				1800		825	50925(S)(FM)
SPD510(S)(FM)	510	762	886	1355				2000		840	50926(S)(FM)

Note. 1: *Selection of the protection unit SPD* for AC system user selects acc. to column 2 of the table 1 (the max. continuous AC operating voltage U_c). It must observe the rule that U_c has to be 20% higher than the nominal operating voltage U_N.*

For instance for the required U_c = 275 V AC (ie. U_N = 230 V), select:
SPD275 (basic version) or SPD275S (version with local fault LED diode indication) or SPD275FM version (version with remote indication faults)

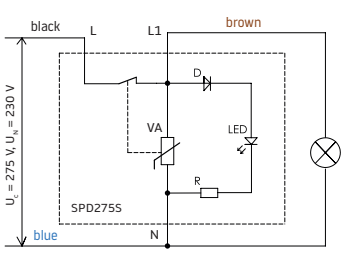
Note. 2: *Connection of the AC input voltage to the SPDxxx(S) FM is carried out between black-blue (L-N) wires. AC connection of the protected equipment to the SPDxxx(S)(FM) is performed between conductors brown-blue (L1-N) wires.*

application example of SPD275



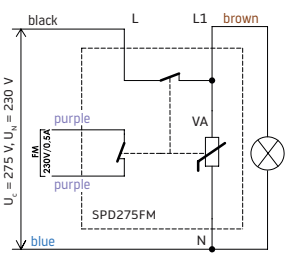
Load disconnection of varistor and protected equipment at failure without fault indication

application example of SPD275S



Load disconnection of varistor and protected equipment at failure with LED diode fault indication

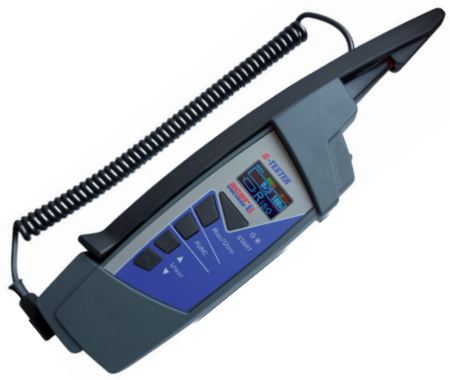
application example of SPD275FM



Load disconnection of varistor and protected equipment at failure with remote fault indication

THE PORTABLE TESTER

for measuring of varistors mA point, DC ignition voltage of GDTs and insulating resistances



Simple portable diagnostic device designed for quick control of surge protection devices (SPD) containing metal oxide varistors and gas-filled surge arresters (GDT).

The device allows you to control:

a) The value of the so-called varistor voltage U_V at 1 mA [V] for the SPD to 1000 V containing varistors.
b) The level of DC ignition voltage U_{VDC} [V] for the SPD to 1000 V containing gas discharge tubes (GDT).
c) The value of an insulation resistance R_{iso} (from 25 V DC up to 1000 V DC).

Insulation resistances	
Measuring range	0,100 MΩ ÷ 1,999 GΩ (U = 25 V ÷ 99 V) 0,100 MΩ ÷ 3,999 GΩ (U = 100 V ÷ 249 V) 0,100 MΩ ÷ 9,999 GΩ (U = 250 V ÷ 1000 V)
Resolution range	0,001 MΩ / 0,01 MΩ / 0,1 MΩ / 0,001 GΩ
Basic measurement error	± (2% of MH + 10 D)* (R < 1 GΩ) ± (4% of MH + 15 D)* (R ≥ 1 GΩ)
Operating measurement error	± (3% of MH + 20 D)* (R < 1 GΩ) ± (5% of MH + 25 D)* (R ≥ 1 GΩ)
Rated measuring current	≥ 1 mA
Short circuit current	< 3 mA
Automatic discharge of measured object	yes

Voltage DC and AC	
Measuring range U_{In}	0 V ÷ 600 V DC / AC (45 Hz ÷ 65 Hz)
Resolving range	1 V
Basic measurement error	± (2% of MH + 2 D)*
Operating measurement error	± (3% of MH + 3 D)*

Surge protection devices	
Measuring range	40 V ÷ 1050 V
Resolution range	1 V
Basic measurement error	± (2% of MH + 2 D)*
Operating measurement error	± (3% of MH + 3 D)*
The measurement principle	increase voltage measurement through the SPD

Universally	
Power	4 x AAA (LR03) alkaline batteries 1,5 V or NiMH accumulator 1,2 V
Display	OLED, multicolored graphic
Protection class	II (double insulation)
Overvoltage category	CAT III / 300 V or CAT II / 600 V
Degree of pollution	2
Protection type	IP43
Dimensions	260 x 70 x 40 mm
Weight	0,36 kg
Article number	99000

- **MH** denotes a measured value, **D** represents a digit

Buttons specification:

1) ⏻ ☼
- Key used to on (1x) or off (2x) device. If the device is switched on, you can briefly press the button to turn on (or off) light LEDs located on the front wall.

2) R_{iso}/U_{SPD} - Measuring mode selection button
- **R_{iso} mode** - in this mode it is necessary to preset setpoint max. measuring voltage using the buttons ↓ ↑ U_{TEST} (can be adjusted 25, 50, 100, 250, 500 or 1000 V). After starting the measurement with the START button on the bottom right display shows the measured value Riso.

SPD mode - in this mode takes place after the start of the measurement by pressing START testing non-linear element connected DC current of 1 mA. If the measured element is metal oxide varistor, the display shows the value of current through the SPD U_V at 1 mA [V].If the measured component is the gas-filled surge arrester (GDT), the display shows the value its DC ignition voltage U_{VDC} [V].
-

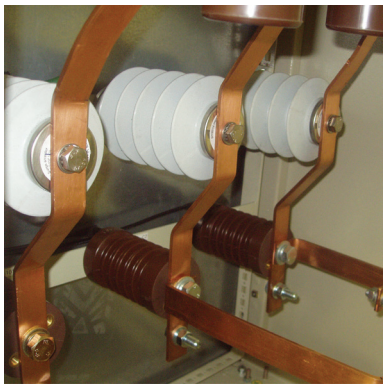
3) FUNC
- Button enabling in mode U_{SPD} set minimum (DC_{min}) or maximum (DC_{max}) level transmitter mA point U_V (in volts) for the so-called repeated measurements of the same type SPD. Setting these levels to the desired value using the buttons ↓↑ U_{TEST}.

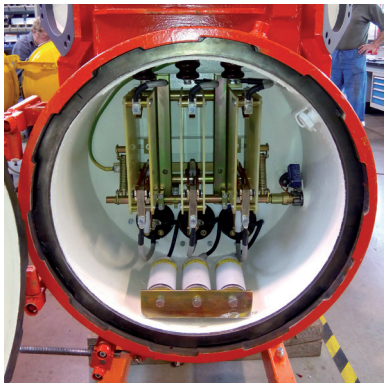
Note: *If the setting of levels DC_{min} and DC_{max} are done correctly, the test result SPD display text is either .... Test OK ....or TEST x.*

Detailed instructions for using the G-TESTER can be found at www.acervoltage.com

PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN AC SYSTEMS

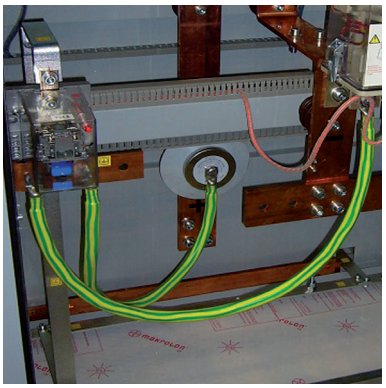
protection of high voltage transmission systems, transformers, switching equipment and HV cable systems

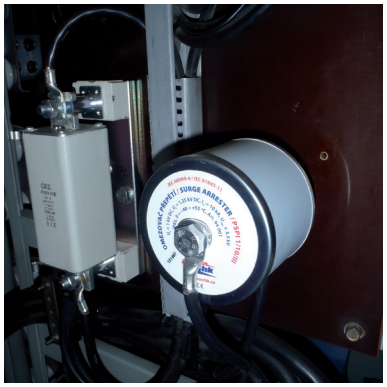




PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN DC SYSTEMS

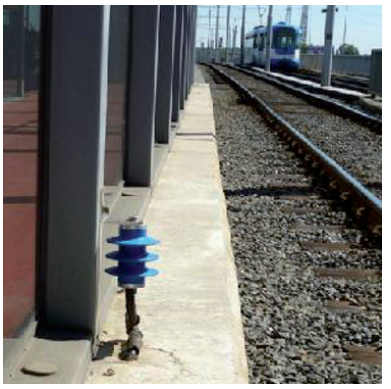
protection of DC traction system, rail traction vehicles and equipment in DC systems





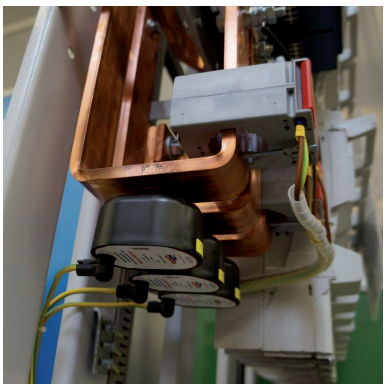
LOW VOLTAGE LIMITERS FOR RAILWAY VEHICLES IN DC NETWORK

protection of non-live parts of metal structures in DC traction power supply systems


PROTECTION AGAINST ATMOSPHERIC AND SWITCHING OVERVOLTAGE IN AC NETWORKS

protection of LV outdoor lines, household connections, distribution transformer switchboards



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