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THE QUEEN OF POWER

Catalogue

26. edition

Surge Protection Device

Insulation Monitoring Device

WHY HAKEL ?


MORE THAN 20 YEARS
OF EXPERIENCE


CERTIFIED
ISO 9001
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GUARANTEE
5
YEARS
GUARANTEE


MADE IN
CZECH REPUBLIC


OWN TESTING LABORATORY


WORLDWIDE EXPORT

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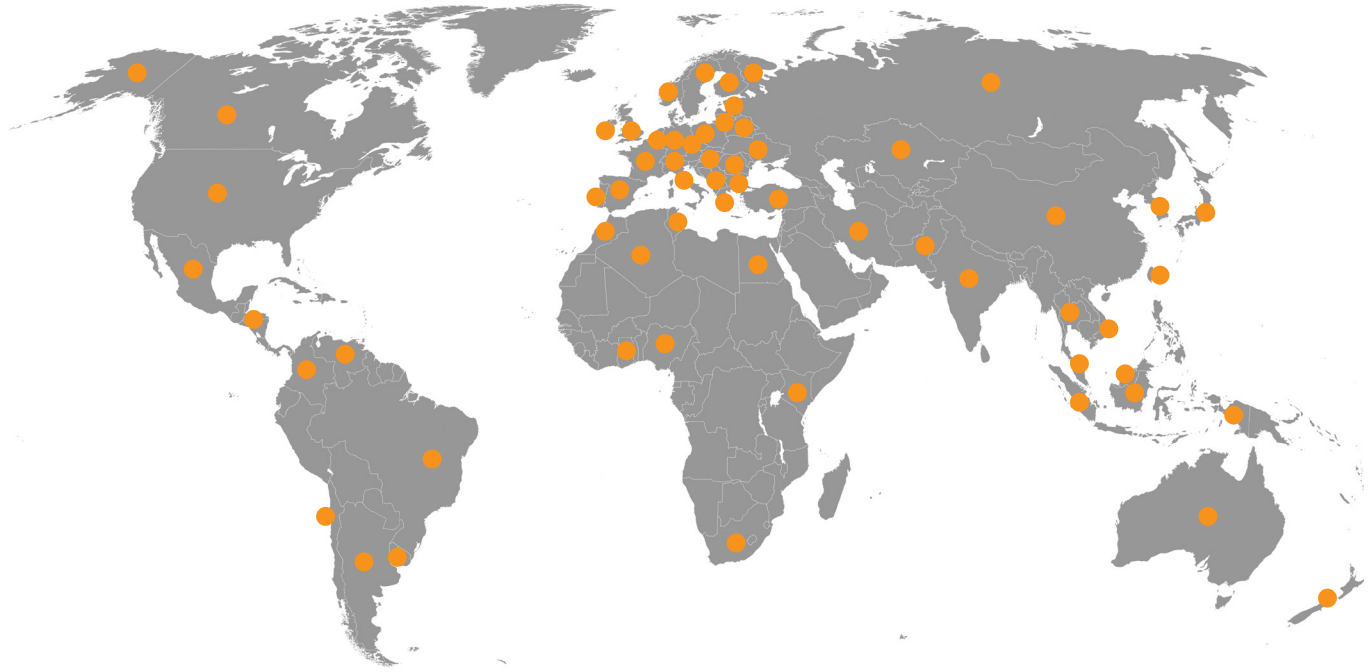
Hakel Ltd. Since its establishment in 1994 is a major producer of surge protection devices in Europe. The company obtained ISO 9001 certificate in 1997. The production of surge protection devices is a specific and technical area with great demands on professional knowledge of the company's management as well as the production and research staff. Introduction of new technologies and using the latest testing equipment enables engineers to extend their technical knowledge. The use of surge protection devices is becoming a common necessity nowadays. Large power systems, which are operated by complicated electronics are more and more sensitive to electromagnetic and overvoltage damage. Failure of electronic equipment owing to surges can cause reduction of orders or even company's bankruptcy. Surge protection devices produced by Hakel company can be easily applied in every industry, domestic, commercial and industrial. Hakel company also passes its experience on to college and university students and helps them to acquaint with new solutions in electromagnetic compatibility. Experience obtained from working with power electronics in industry are closely related to the company's market leading position in the Czech Republic. Hakel's exports products worldwide through its partner companies which it has helped to train and develop their mutual businesses. The surge protection product range offered by Hakel enables customers to easily apply the products in every industrial, commercial and domestic situation. The continual, investment in new technologies and product development helps Hakel to achieve higher standards and better technical solutions than its competitors. That is one of the reasons why Hakel is a world market leader in the field of surge protection. All Hakel products are tested according to the most up to date international and European standards which include EN61643-11 and IEC61643-1.

Hakel Ltd. produces and exports to countries on all continents important safety products Insulation monitoring devices, these enable users to improve their safety in ungrounded IT power supply systems, railway, engineering, shipbuilding, hospitals and transport facilities.

sales map



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Definition and terminology according to the standard EN 61 643-11 and IEC 61643-11

The international standard EN 61 643-11 and IEC 61643-11 compiles lightning arresters and surge arresters under the integrated term SPD (Surge Protection Device).

Definition:

Surge protection device (SPD)
a device that is intended to limit transient overvoltages and divert surge currents; it contains at least one nonlinear component.

One - port SPD
an SPD connected in shunt with the circuit to be protected; a one-port device may have separate input and output terminals without a specific series impedance between these terminals.

Two - port SPD
an SPD with two sets of terminals, input and output; a specific series impedance is inserted between these terminals.

Voltage switching type
an SPD that has a high impedance when no surge is present, but can have a sudden change in impedance to a low value in response to a voltage surge; common examples of components used as voltage switching devices are spark gaps, gas tubes, thyristors (silicon-controlled rectifiers) and triacs; these SPDs are sometimes called „crowbar types".

Voltage limiting type SPD
an SPD that has a high impedance when no surge is present, but will reduce it continuously with increased surge current and voltage; common examples of components used as nonlinear devices are varistors and suppressor diodes; these SPDs are sometimes called „clamping type".

Combination type SPD
an SPD that incorporates both voltage switching type components and voltage limiting type components may exhibit voltage switching, voltage limiting or both voltage switching and voltage limiting behaviour depending upon the characteristics of the applied voltage.

Modes of protection
an SPDs protective component may be connected line-to-line or line-to-earth or line-to-neutral or neutral-to-earth and combination there of; these paths are referred to as modes of protection.

Sparkover voltage of a voltage switching SPD
maximum voltage value before disruptive discharge between the electrodes of the gap of a SPD; it is used for classification of the SPD class I and II by testing impulse with waveshape 1,2/50μs.

Nominal discharge current I_n (8/20)
the crest value of the current through the SPD having a current waveshape of 8/20; this is used for the classification of the SPD for class II test and also for preconditioning of the SPD for class I and II tests; arrester must discharge this current at least 15 times without any essential changes in its qualities.

Maximum discharge current I_{max} for class II test
crest value of a current through the SPD having an 8/20 waveshape and magnitude according to the test sequence of the class II operating duty test; I_{max} is greater than I_n ; arrester must safely discharge this current without an obvious damage or aberration from the temperature stability; records of the voltage and current development musn´t show any marks of disruptive discharge or sparkover.

Impulse current I_{imp}
it is defined by a current peak value I_{peak} and the charge Q; tested according to the test sequence of the operating duty test; this is used for the classification of the SPD for class I test; arrester must safely discharge this current without any obvious damage or aberration from the temperature stability; records of the voltage and current development musn´t show any marks of disruptive discharge or sparkover.

1,2/50μs voltage impulse
a voltage impulse with a virtual front time (time to rise from 10% to 90% of the peak value) of 1,2μs and a time to half-value of 50μs; it is used for classification of the SPD class I and II.

Combination wave
the combination wave is delivered by a generator that applies a 1,2/50μs voltage impulse across an open circuit, and an 8/20 current impulse into a short circuit; the voltage, current amplitude and waveforms that are delivered to the SPD are determined by the generator and the impedance of the SPD to which the surge is applied. The ratio of peak open-circuit voltage to peak short-circuit current is 2Ω; this is defined as the fictive impedance Z_f; the short-circuit current is symbolized by I_{SC} ; the open-circuit voltage is symbolized by U_{OC}.
Note: In practice when it comes to the arresters (class III) there are data I_{max} (8/20) and I_n (8/20) often mentioned in place of U_{OC} because of the commercial reasons. They are always mentioned in relation to the stated voltage protection level U_p (the data concerned are always derived from the tests by the standardized combined impulse with the amplitude U_{OC}; the test is carried out by use of a hybrid generator with inside resistance 2Ω).

Specific energy W/R for class I test
the energy dissipated by the impulse current I_{imp} in a unit resistance of 1Ω; it is equal to the time integral of the square of the current; expressed in kJ/Ω or in kA^2s.

$$W / R = \int i^2 \cdot dt$$

Charge Q
- it equals the time integral of the current according to the time; expressed in As.

$$Q = \int i \cdot dt$$

Thermal stability
- an SPD is thermally stable if after the operating duty test causing temperature rise, the temperature of the SPD decreases with time when the SPD is energized at specified maximum continuous operating voltage and at specified ambient temperature conditions (it is monitored for 30 minutes, active power dissipation must show constant decline for the last 15 minutes).

Short-circuit withstand capability I_P
the SPD shall be able to carry the power short-circuit current until it is interrupted either by the SPD itself, by an internal or external overcurrent disconnector or by the backup overcurrent protection; expressed in kA_{rms} (tested according to short-circuit withstand capability test in conjunction with backup overcurrent protection).

Nominal voltage U_N
an effective value of the alternating voltage or value of the direct voltage, which is set for the SPD by manufacturer

Maximum continuous operating voltage U_C
the maximum r.m.s. or d.c. voltage which may continuously applied to the SPDs mode of protection; this is equal to the rated voltage.

Rated load current I_L
the maximal effective value of the alternating current or value of the direct current, which can be constantly taken away by the load connected to the SPD output.

Continuous operating current I_C
the current flowing through each mode of protection of the SPD when energized at the maximum continuous operating voltage U_C for each mode.
Note: I_C corresponds to the sum of currents flowing in the protective component of the SPD and in all internal circuits connected in parallel with the protective components of the SPD.

Follow current I_f
current supplied by the electrical power system and flowing through the SPD after a discharge current impulse; the folow current is significantly different from the continuous operating current I_c ; expressed in kA_{rms}.

Follow current interrupting rating I_{fi}
the prospective short-circuit follow current that is SPD able to self-extinquish after its previous activation (without a back-up fuse); this current is indicated in some company's materials as "Follow current extinguishing capability at U_c" or " Eliminates short circuit current without back-up fuse at U_c ", alternatively "Quenching short circuit current without back-up fuse".

Voltage protection level U_P
a parameter that characterizes the performance of the SPD in limiting the voltage across the terminals, which is selected from a list of preferred values; this value shall be greater than the highest value of the measured limiting voltages.

Operating temperature ϑ
an extent of the allowed surrounding temperatures, where manufacturer guarantees the right operating SPD.

Response time t_A
the response time defines the reaction speed of protective elements built-in the SPD; the response time can vary in different limits, which are dependent on the rate of rise du/dt of the impulse voltage or on the di/dt of the impulse current.

Insertion loss
at a given frequency, the insertion loss of an SPD connected into a given power system is defined as the ratio of voltages appearing across the mains immediately beyond the point of insertion before and after the insertion of the SPD under test; this result is expressed in decibels (dB).

SPD disconnector
a device for disconnecting an SPD from the system in the event of SPD failure; it is to prevent a persistent fault on the system and to give visible indication of the SPD failure; some kinds of the SPD are extra fitted with so-called non-potential signall contact for needs of remote failure signalling.

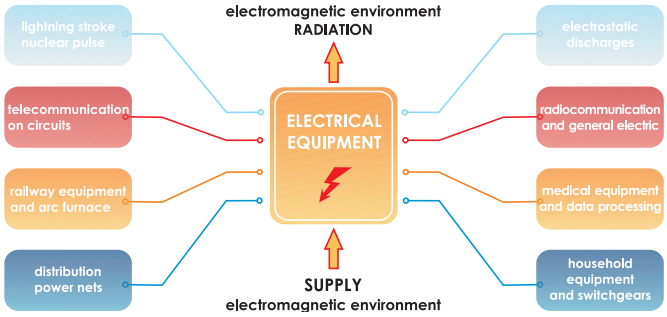
Backup overcurrent protection
an overcurrent device (e.g. fuse or circuit breaker), which is a part of the electrical installation located externally up-stream of the SPD, to avoid overheating and destruction in case the SPD is unable to interrupt the power frequency short-circuit current.

Residual current device (RCD)
an electromechanical switching device or association of devices intended to cause the opening of the contacts when the residual or unbalanced current attains a given value under specified conditions.

Degrees of protection provided by enclosure (IP code)
the extent of protection provided by an enclosure against access to hazardous parts, against ingress of solid foreign objects and/or against ingress of water (see IEC 60 529).

Electromagnetic compatibility

Electromagnetic compatibility is a discipline, which is involved in securing maximum reliability of each electrical and electronic equipment and devices. In nature, there are relations between elements or system components, which must be predicted in advance in order to prevent interference.



Electromagnetic compatibility seems to be a relatively new discipline, which arose in the sixties in the USA. It started on basis of the necessity to secure flawless and reliable activity of electrotechnical equipment and devices working especially in military or aerospace systems. Electromagnetic compatibility begins to affect all of us by the development of electronics, especially microprocessor technique, which effect our day to day lives. That is why EU issued the directive No. 89/336/EEC, whose aim is to enforce electromagnetic compatibility conditions on all states involved including the states that have signed associate agreement. The Czech Republic has also signed this agreement so all the conditions of the directive apply. Of course it is necessary that the Czech Republic would gradually have made appropriate legislative steps, which would turn this directive to live. The decree of the Czech goverment No. 17/2003 and the law No. 22/97 Coll. means non-replaceable move in this sphere.

Other very important decrees concerning this sphere are obligatory norms as for example CSN 332000-1, paragraph 131.6.2 saying:
„People, lifestock and also property must be protected against harm caused by surge, which can arise from other reasons, for example atmospheric events, switching overvoltages and static electric."
At the figure there are particular links among electrical equipment and enviroment shown. They can be expressed as two relations:

- electromagnetic susceptibility (resistance)
- electromagnetic interference (disturbance)

Surge is just one of the main problems arising from the solving of electromagnetic compatibility problems. If we deal with parameters of electric energy, we must remember four qualitative aspects:

- the level of voltage
- the level of frequency
- nonlinear distortion
- the level of surge (frequency of surge peaks)

On basis of these aspects the electric energy can be taken as merchandise and these qualitative parameters can be required. The main aim is to create such conditions that would be able to ensure maximum reliability and functioning of all the electronic equipment connected to LV power systems.

Terms and definitions of surge

Overvoltage is any voltage, whose peak value exceeds the appropriate peak value of the highest operating voltage in the LV power system. Overvoltage is usually an accidental phenomenon, which differs in time history and the place of its occurrence. Its parameters are defined by its cause (lightning stroke, switching in heavy-current network and so on) and also by electrical character of the circuit (wave resistance, ending impedance, discharge ability and so on). In the past few years the range of current and voltage courses for different uses has been standardized. These courses enable implementation of testing on equipment and constructive elements under the same conditions. In the following text the most important parameters of the most used standardized courses will be defined (according to EN 61 643-11 and IEC 61643-11, IEC 60-1 and CSN 34 5640).

Peak value (amplitude) U_{max}, I_{max}
peak value is the maximal value of voltage or current, which is achieved by monitored impulse course

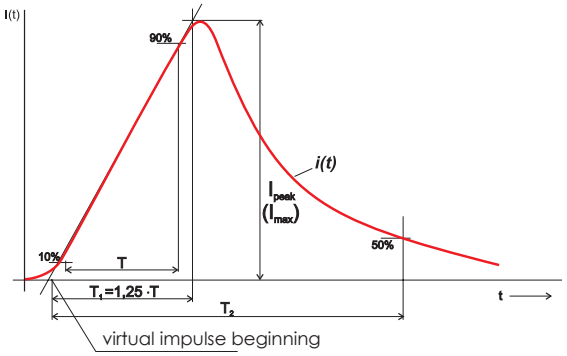
Front of impulse
a part of voltage or current impulse before the peak value

Front time of current impulse T_1
1,25 multiple of the time interval between moments, when actual current value rise from 10% to 90% of the peak value

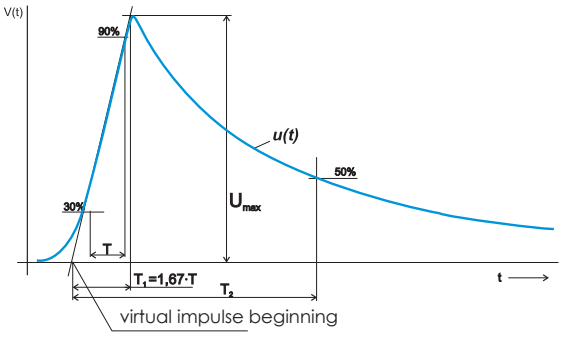
Front time of voltage impulse T_1
1,67 multiple of the time interval between moments, when actual voltage value rise from 30% to 90% of the peak value

Tail of impulse
a part of voltage or current impulse after the peak value

Time to half-value T_2
the time interval between virtual beginning of impulse and the moment, when observed course reduces to 50% of its peak value
Note: The virtual beginning is an intersection of time axis and bisector, which goes through points, where actual value of the front of impulse at first time reaches partly given lower value and partly given higher value …in detail see the following two figures.



Current impulse, definition of front time and time to half-value



Voltage impulse, definition of front time and time to half-value

Standardized testing current impulse
two basic types of testing current impulses are used during SPD tests:

a) testing impulse of lightning current I_{imp}(10/350) – it is used for simulation of lightning current (so-called test by lightning current)
b) testing current impulse I_{max}(8/20) – it is used for simulation of indirect effect of lightning and switching overvoltages

Arrester must discharge cca 17,5x higher charge during test by the testing impulse of lightning current I_{imp}(10/350), than during testing by the current impulse I_{max}(8/20) with the same amplitude. Also resulting in a different construction of the lightning current arresters tested by the lightning current impulse I_{imp}(10/350) and surge arresters tested by the current impulse I_{max}(8/20).

Course and parameters of lightning voltages and currents

In the chart shown below there are typical courses and parameters of lightning impulse voltages and currents, which occur in conductive parts of landscape, building constructions and metal lines in consequence of lightning stroke (taking in account influences caused by galvanic, inductive or capacitive coupling).

The typical values of lightning impulse voltages and currents, which occur in conductive parts of landscape, building constructions and metal lines.

	Surge (peak values)	Currents (peak values)	Halftail time
Direct lightning stroke	- up to few hundreds of kV	> 30 kA (50% of all strokes) > 100 kA (5% of all strokes) > 150 kA (1% of all strokes)	cca 200 μs ... 1000 μs
Galvanic coupling	- up to few tens of kV	distant strokes: up to 1kA near strokes: up to few kA straight strokes: up to few tens kA	typical: cca 700 μs
Inductive coupling	- transverse surge up to few kV - lengthwise surge up to few tens of kV	up to few kA up to few tens of kA	typical: cca 20 μs
Capacitive coupling	- transverse surge up to few kV - lengthwise surge up to few kV	up to few kA	typical: 50 to 100 μs

Testing current impulse in the waveform of 10/350μs is most often used for simulation of currents infiltrating into power lines and electric equipment in consequence of galvanic coupling. In case of inductive and capacitive coupling the voltage and current impulses are considerably shorter. The examination of interfering lightning effects in relation to inductive surges (currents) in consequence of inductive coupling is most often carried out by the testing current impulses in the waveform of 8/20μs. The examination of lightning effects in relation to interfering surges (currents) in consequence of capacitive coupling is similarly carried out by the testing voltage impulses in the waveform of 1,2/50μs.

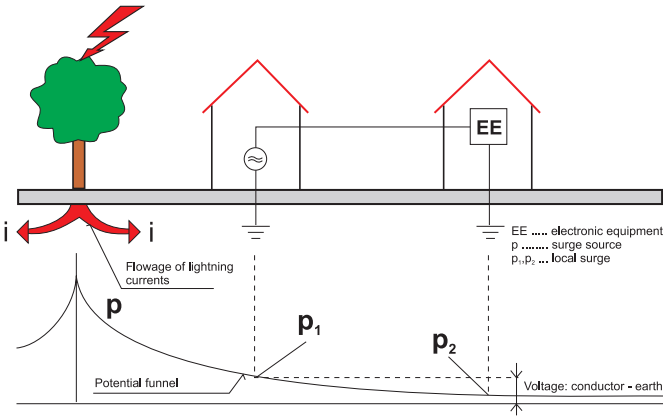
Kinds of surge couplings

Generally

Disturbing energies (e.g. voltages, currents, fields) can infiltrate into the building by ways of different couplings whereas cabling and its layout represent an important part here. Following, there are three most important mechanisms of coupling described.

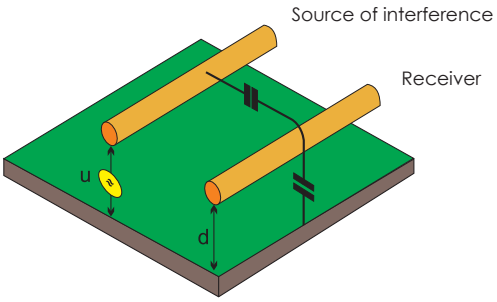
Galvanic coupling

During near and direct lightning strokes into the lightning conductors of buildings, the overvoltage shows in consequences of a galvanic coupling. The galvanic coupling is given by a different size of ground potentials along the building. By arrangements for equipotential bonding (earth electrodes, protective connection etc.) it is possible to achieve certain flattening of potential funnel. This flattening results in reducing the difference of potentials in regard of its center - place of stroke. However, the difference of potentials can never be fully eliminated in consequence of impedances of conductive lines of LV power system and indispensable impedance of earth.



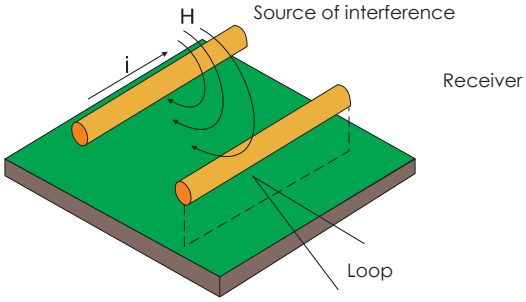
Capacitive coupling

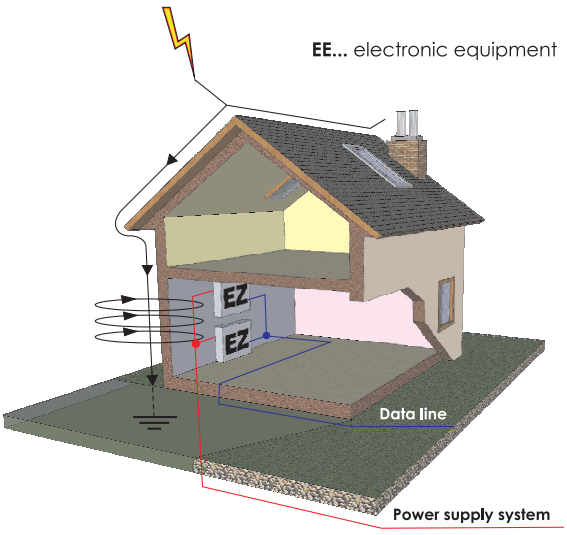
There is always a capacitive coupling (parasitic capacity) between the source of interference and the receiver. The higher the front rate of rise of the disturbing voltage impulse (du/dt) is, the stronger its interference effect is.



Inductive coupling

There is always an inductive coupling (magnetic field) between the source of interference and the receiver. The higher the front rate of rise of the disturbing current impulse (di/dt) activating the magnetic field is, the higher the interference effect is.





Types of surge

Atmospheric surge (LEMP)

Lightning is an electric discharge between electrically charged cloud and ground (earth lightnings), between two or more clouds mutually, or between different parts of one cloud (cloud lightnings). Only a small portion of discharges occurs between clouds and the ground. Lightnings originate in storm cells, which reach up to several kilometers at average. Every storm cell is active for up to 30 minutes and generates at average two to three lightnings per minute. It reaches a height of 10 kilometers, whereas the

lower boundary of clouds is situated at a height of one to two kilometers. In the middle of the storm cell there is a strong upward current, which causes a separation of positive and negative charges. The positive charge is generally bound to the ice crystals on top of the cell, while a negative charge is mostly bound to the water drops at the bottom. Nearby the earth the cell is charged with positive charge, usually caused by corona discharge, especially from the forest. Except the storm cells originating from the summer heat there are storm cells in the frontal cloudiness due to the movement of large air masses. The frequency of storms is related to particular season. In the summer months of July and August there are, at average, five times more storms than during the winter months. Formation of the summer storms is supported by the sun heating the land. During autumn gives the necessary energy for the formation of thunderstorms over the sea a warm water near the shore. According to a set of standards DIN EN 62305 ed. 2, the lightning discharge can be characterized by five basic parameters. Another important parameter, which is mentioned in a classification of storm activity is called as Intensity of storm activity, or Frequency of lightning strikes per km^2 / year. In our latitudes, ranging from 2-8 strikes / km^2 / year in subtropical to tropical areas it is 30 to 70 strikes / km^2 / year.

Switching surge (SEMP)

They are very numerous surges caused by industrial activity when switching mheavy loads, especially those inductive, such as transformers, electric motors and small household appliances. Switching process can be scheduled or faulty. Among the scheduled processes we can place an intentional switch-on/off of the circuits, eg. switching contactors or switches. Faulty process, which can be caused by significant overvoltage is e.g. a release of the circuit breaker at short circuit. Invisible and practically immeasurable voltage pulses last only a few thousandths or millionths of a second, but can cause a damage, especially of electronic equipment, sometimes even a short circuit and subsequent fire.

Electrostatic discharge (ESD)

It is a sudden and momentary electric current between two objects with different electrical potential. It originates during a mechanical friction between two insulators (e.g in technologies, or during the movement of persons on unsuitable floor etc.). In technologies it is a serious problem mainly in electronic components, especially in integrated circuits, where in imperceptible moment comes to a destruction of the circuit by simply touching an object of different electrical potential (for the integrated circuits it can be even a human). It is preceded by an antistatic device to ensure safe grounding eg. by suitable adjustment of material, conductive coatings, ionization, and so on.

Nuclear Surge (NEMP)

Caused by a nuclear explosion, where the explosion released gamma radiation knocks the electrons from air molecules. These electrons are accelerated in a radial direction, and thus separated from the non-ionised air molecules. Due to this arises in a few nanoseconds a strong electric field and owing to rapidly time-changing transport of electronic charge is emitted a short electromagnetic pulse. A nuclear explosion may have an impact on living organisms on earth, but also cause overvoltage conditions for electrical equipment and overhead lines with similar effects, such as a lightning strike, but with a greater proportion of high frequencies.

Direct Lightning Stroke

A lightning stroke is an electric discharge between an electrically charged cloud and earth surface (earth lightning), between two or more clouds and each other or between parts of one cloud (cloud lightning). Just a small percentage of strokes happens between the surface and the clouds. The lightning strokes originate in the „storm cells", which stretch average out up to few kilometers. Every storm cell is active for up to 30 minutes and generates from two to three lightning strokes per minute. The storm cell often reaches the height of over 10 kilometres, whereas the bottom visible part of the clouds is usually at the height of one to two kilometres. In the centre of the storm cell there exists a strong rising air flow, which causes separation of positive and negative charges. The positive charge is at the top of the storm cell, while negative charge is on water drops at the bottom of the cell. Nearby the earth the cell is charged with positive charge which is usually caused by discharge especially from forest. Beyond the storm cells originating from the summer heat there are storm cells originating from the frontal cloudiness as a result of big air masses movement. The storm frequency depends on the season. In summer months (July–August) there are on average 5 times more storms than in winter months (December–February). The environmental heating up supports the storm creation. In autumn warm water near the seacoast gives the necessary energy for the storm creation. According to IEC 1312-1:1995 and IEC 62305 it is possible to describe lightning charges by five basic parameters:

	Unit	Range
Total impulse lightning charge Q_t	C	max 300C
The first stroke charge Q_s	C	max 100C
The first stroke peak current I_{imp}	kA	max 200kA
Specific energy the first stroke current W/R	MJ/Ω	max 10MJ/Ω
Rate of rise of the current dI/dt	kA/μs	max 200kA/μs

Another important parameter, which is presented during the classification of storm activity is so-called intensity of storm activity or the frequency of the lightning strokes per km^2/year. The frequency in our geographical latitudes varies from 2 to 8 strokes/km^2/year, but in subtropical and tropical climate it varies from 30 to 70 strokes/km^2/year.

Hakelsoft software

Hakelsoft software is designed according to Standard EN 62305-2 and respects all the requirements of this standard. It is used to calculate the risk R1 to R4 and their control using protective equipment in accordance with EN 62305 and IEC 61634-11. Its challege is to simplify and streamline a project engineer's work with risk management. Although this program offers many useful guides, as lately as a qualified specialist use the software it becomes a real powerful implement. To obtain the closest calculation it is neccessary to know engineering systems entering the building, internal systems, allocation of LPZ zones, expected numbers of people in the building and its vicinity, the economic value of buildings and many other factors.

General distribution of lightning current when an object is hit by lightning, principle of LV power system protection thanks to cascaded 3-stage protection

Protection system of LV power system consisting of lightning current arresters and surge arresters SPD must be able to discharge lightning currents or their substantial parts without

their damage. It is generally recommended to come out from the ohmic resistance of the building earthing, pipeline, power distribution system and so on for the purposes of establishing current distribution going through SPD in case of direct lightning stroke into a building protected by the outside lightning system. The following figure shows a typical example of lightning current distribution in an object hit by direct lightning stroke.

Where an individual evaluation is not possible, it can be assumed that:

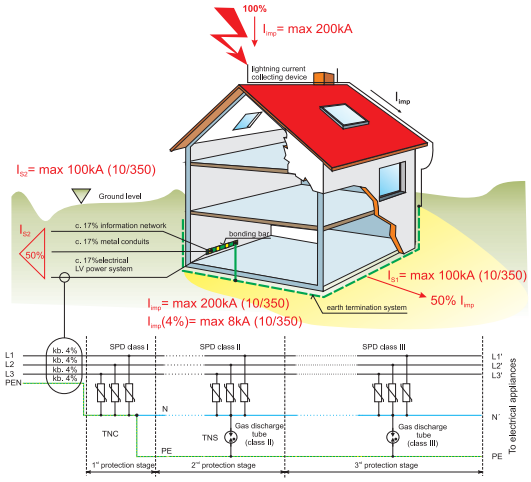
- 50% of the total lightning current I_{imp}=200kA (10/350)…. I_{S1}= 100kA (10/350) enters the earth termination system of the LPS (lightning protection system) of the structure considered
- 50% of I_{imp}=200kA (10/350)…. I_{S2}= 100kA (10/350) is distributed among the services entering the structure (external conductive parts, el.power, communication lines, etc.) The value of the current flowing in each service I_i is given by I_s/n, where **n** is the number of the above mentioned services (see the above figure).

For evaluating the current I_v in individual conductors in unscreened cables, the cable current I_i is divided by **m**, the number of conductors, i.e. $I_v = I_i/m$.

For shielded cables, the current will flow along the shield.

Requirement on dimensioning of protective system SPD in the most usual connection of the building and LV power system (TNC - system 230/400V/50Hz) results from this reasoning:

For maximum lightning current size I_{imp} = 200kA (10/350) it is enough to dimension the protective cascade of each phase conductor entering the object on approx. 4% I_{imp}, that is on approx. 8kA (10/350) in most cases.



Distribution of protected area into the lightning protection zones

The standard IEC 13 12-1 and IEC 62 305 defines the lightning protection zones LPZ from the respect of the direct even indirect lightning effect. These zones are characteristic thanks to fundamental breaks of the electromagnetic conditions in their limited zones.

LPZ 0_A:

Zone where items are subject to direct lightning strokes, and therefore may have to carry up to the full lightning current; the unattenuated electromagnetic field occurs here.

LPZ 0_B:

Zone where items are not subject to direct lightning strokes, but the unattenuated electromagnetic field occurs.

LPZ 1:

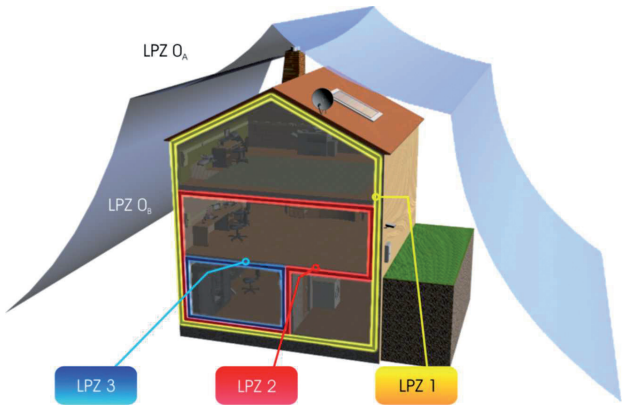
Zone where items are not subject to direct lightning strokes and where currents on all conductive parts within this zone are further reduced compared with zones 0_B. In this zone the electromagnetic field may also be attenuated depending on the screening measures.

The subsequent zones (LPZ 2 and so on):

If a further reduction of conducted currents and/or electromagnetic field is required, subsequent zones shall be introduced. The requirement for those zones shall be selected according to the required environmental zones of the system to be protected. In general, the higher the number of the zones, the lower the electromagnetic environment parameters. At the boundary of the individual zones, bonding of all metal penetrations shall be provided and screening measures might by installed.

Note: Bonding at the boundary between LPZ 0_A, LPZ 0_B and LPZ 1 is defined in IEC 13 12-1 and IEC 62 305. The electromagnetic fields inside a structure are influenced by opening windows, by currents on metal conductors (e.g. bonding bars, cable shields and tubes), and by cable routing.

The following figure shows an example for dividing a structure into several zones. There all electric power and signal lines enter the protected volume (LPZ 1) at one point, and are bonded to bonding bar 1 at the boundary of LPZ 0_A, LPZ 0_B and LPZ 1. In addition, the lines are bonded to the internal bonding bar 2 at the boundary of LPZ 1 and LPZ 2. Furthermore, the outer shield 1 of the structure is bonded to bonding bar 1 and the inner shield 2 to bonding bar 2. Where cables pass from one LPZ to another, the bonding must be executed at each boundary. LPZ 2 is constructed in such a way that partial lightning currents are not transferred into this volume and cannot pass through it.



The above described segmentation of the protected object into protection zones gives possibilities of active protection of the LV power system thanks to insertion of the protective SPDs (usually at the zone boundary LPZ 0→1and LPZ 1→2) and other protective SPDs at the zone boundary LPZ 2→3. Standardly it is recommended to insert so-called 1st stage protection – surge arrester class I tested by lightning current I_{imp}(10/350) at the zone boundary LPZ 0→1. It is recommended to insert 2nd stage protection - surge arrester class II tested by testing impulse I_{max} (8/20) at the boundary zone LPZ 1→2. At the boundary of LPZ 2→3 and subsequently along the consequential circuit there is also recommended to shoulder after every cca 10m by so-called 3rd stage protection class III also tested by testing impulse I_{max} (8/20) or U_{OC}. For extra important

protected equipment it is recommended to secure it by a quality continuous surge protection class III with high-frequency filter at the boundary of LPZ 2→3. If there are adjacent structures between which power and communication cables pass, the earthing system shall be interconnected, and it is beneficial to have many parallel paths to reduce current in the cables. A meshed earthing system fulfills this requirement. The lightning currents are further reduced, e.g. by enclosing all the cables in metal conduits or gridlike reinforced concrete ducts, which must be integrated into the meshed earthing system.

Components used in surge protections

Generally

Components and equipment for protection against surge are always based on a fundamental principle - to keep the isolation state up to acceptable voltage level. Short-circuit happens after exceeding this level and thereby very high difference of potentials between conducting parts of one equipment or appliance is restricted to an acceptable value. Electronic switches used for this purpose are called surge arresters or devices for protection against surge. Nowadays open spark gaps, closed spark gaps, gas discharge tubes, varistors, limiting diodes or their combinations are used for protection against lightning and overvoltage.

Spark gap

The arresters class I are the applications of the SPD most oftenly used on principle of a spark gap. They are designed for 1st stage of surge protection. It is possible to divide them on so-called „open" or „closed" spark gaps according to constructional implementation. The shape of electrodes, their material and the distance between electrodes determine the protection level, discharge ability and features, which characterize behaviour of the spark gap when follow current extinguish. Open spark gaps excel in very high discharge abilities (up to I_{imp} = 50 kA (10/350) during high levels of self-extinguishing follow current (up to I_{fi} = 50 kA_{rms}). Their fundamental inadequacy is burning plasma bursting from SPD housing during their activation by lightning current. This fact significantly complicates projective preparation (switchboard construction) regarding fire safety. The construction of the closed spark gaps has this inadequacy solved, although at the expense of parameters of self-extinguishing follow current (I_{fi} = max 25 kA_{rms}) being decreased. Some constructions of the closed spark gaps have very high discharge abilities (I_{imp} > 100 kA (10/350), on the other hand the level of self-extinguishing follow current is low (I_{fi} = cca 100 A_{rms}), so their application possibilities are comparable with gas discharge tubes.

Gas discharge tubes

In the inactive condition gas filled arresters and spark gaps (gas discharge tubes) behave as high resistance isolators thanks to application of corundum ceramic. They are usually constructed in the shape of cylindric ceramic housing, closed by metal electrodes on both sides. They are filled by inert gas mixture under low pressure generally. They excel in their short response time and high-level discharge ability up to I_{imp} = 100 kA (10/350). They have small self-capacity (few of pF units) and high isolation resistance (> 1000 MΩ). Gas discharge tube´s application posibilities are restricted by their generally low values of self-extinguishing follow current (I_{fi} = c. 100 A_{rms}). Quality guarantee for a particular application is carried out with by specific choice of used material, gas filling and electrode geometry. The special dilatation composition is used for a production of modern gas discharge tubes, because they ensure their high resistance against high temperatures up to 2000°C and extreme pressure during discharge in gas, during currents up to 100kA in the waveform of 10/350μs. The electrical parameters can be predicted in a large range. E.g. direct switching voltage can be set up from 100V to 2000V with typical tolerance +/-20%. Gas discharge tubes have long lifetime and parameter stability. So they fulfil basic presumptions for their usage at the constructions of maintenance-free arresters with long lifetime.

Varistors

Varistors are voltage dependent resistances with symetrical voltampere characteristic. They consist of 90% ZnO as a ceramic basis and 10% additives. High possible load of this type of arresters during their loading by impulse discharge currents is achieved by application of its great mass varistor capacity for energy absorbtion. Almost universal possibilities of varistors are limited only in the field of high frequency, where relatively high capacity (few of nF units) has a negative effect.

Limiting diodes

Limiting diodes are basically Zenner diodes dimensioned for high peak current values and extremely short access time (a few ps units). These diodes are highly suitable for protection of sensitive electronic circuits thanks to their small size, short access time and low protection levels in data and telecommunication systems.


Spark gap


Gas discharge tube


Varistor


Transil

Grounding and protective conductors

The CSN standard 33 2000-5-54 deals with this problem. The standard determines implementation of earth termination system, the resistance value of ground electrodes, voltage level of the ground electrodes, contact voltage and current-carrying capacity of particular ground electrodes. We will mention the grounding conductors in the following part.

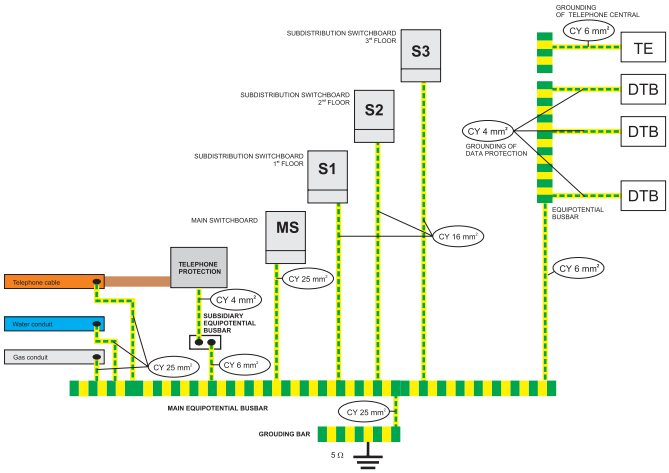
Grounding conductors must suit by their cross-sections, which must not be smaller then cross-section designed for the following formula:

$$S=\frac{\sqrt{I^2.t}}{k}$$

(This formula is only possible to be used during time of flowing ***I***, which doesn´t overrun 5 seconds)
S – cross-section of grounding conductor in [mm^2]
I – an effective value of alternating current in [A], traversing because of failure with irrelevant impedance by protection element
t – disconnection time of protection equipment in seconds [s]

k – coefficient depending on material of protection conductor, on isolation and on other parts, on temperature before and after short-circuit (values ***k*** for differently designed protection conductors are given in CSN standard 33 2000-5-54)

Minimal cross-section of grounding conductors must be minimally 16mm^2 Cu. They are placed in earth and protected against corrosion but not protected against mechanical damage. If these are not protected against corrosion (doesn´t mater if they are protected against mechanical damage or not), minimal cross-section of grounding conductor must be 25mm^2 Cu (exceptionally Al, which is however not recommended for use in earth).



The grounding conductor must be laid in such a way to resist all external influences, which can be expected during operating. At the same time it must not cause fire danger, eventually it should not influence operating of other equipment. It is laid to be as short as possible, without sharp curves, unnecessary arcs and loops. Overground parts of grounding conductors must be placed so they can be controllable. Outside part of grounding conductor must be suitably protected by panelling or by placing into tubes in places where danger of damage can occur (for example while going through a wall, going into earth). Conductive construction elements of metal constructions can be used as random grounding conductors. They create continually connected complex, as for example cable trays, cable frames, pillars, rails of crane, steel poles, reinforcement of columns made of flow spinning concrete and metal conduits. Connections of grounding conductors and ground electrodes must be correctly carried out and must be desirably dimensioned. While using clamps principle governs that the used clamp must not mechanically damage neither ground electrode (for example conduit) nor grounding conductor.

Power and communication equipment – interrelation

The smallest distance between the part of grounding communication device, which is not connected into its own transformer station should be at least 20m from the grounding power equipment part up to 1000V and 40m far from the grounding power equipment part over 1000V. If there is no way how to abide at least half of the mentioned distances, there is urgency to make one of the following arrangements:

a) It is necessary to make sure by calculating or measuring, that voltage on a communication equipment induced by the highest currents in grounding of power equipment doesn´t exceed permissible limit.

b) Both groundings are connected through, if it doesn´t evoke undesirable consequences of direct coupling (for example importation of dangerous or disturbing voltage into communication system, creation of route for stray currents or creation of macrocell with electrodes created by particular groundings).

The grounding of conductors and power equipment doesn´t have to be connected together, if the distance between two groundings in foundation soil is bigger than 5m. The grounding of the communication equipment should be as far from grounding of conductors as possible. If the distance between grounding of conductors and any other part of grounding of communication equipment is smaller than 5m, the both groundings must be connected through. Then joint earth termination system must agree with the standard EN 62 305 and with the rule set for communication equipment. Operating grounding of the overvoltage conductors is connected to protective grounding equipment, which are protected by surge arrester. In the chapter Grounding and protective conductors there is mentioned that generally protective conductor PE can be bare and must be laid together with outlying conductors. Grounding conductor, which goes to subsidiary grounding conductor, must be isolated so as it´s prevented from contact with protective conductor or any part connected to it or with dead parts, which are connected to the protective conductor. It is necessary to fulfill this condition so as by-pass of detectors is avoided. Protective conductor can be connected only to dead parts of those electrical subjects and equipment, whose power supply is disconnected in case of voltage protector equipage failing. The dead parts must be connected to a protective conductor during compliance of given conditions for every recommended kind of power system grounding. The dead parts, which are touch accessible at the same time, must be connected to the same earth termination system separately, in groups or together. These conductible parts must be connected together into so-called main protection connection in every building: protection conductor, grounding bonding bar or main protection clamp, conduit distribution in a building, for example water and gas, metal constructions and central heating and air-conditioning (if they are in the building). The conductible parts, which come into the building from outside must be connected as close to their entrance into the building as possible. Of course the conductors of main connection must comply with their cross-sections. The main connection must be done at every metal coating of communication cables. However it is necessary to obtain an approval of these cables owner or operator.

Grounding

The grounding of overvoltage protection to a quality ground is a requirement for their correct functioning. The ground is presented by protection conductor PE. The conductor PE is separately laid down in 5-conductor TNS system, which is enacted by standard. It is enacted for households, offices and industry. Energetics should secure this system type at the secondary side of a transformer already. All the installed overvoltage protection devices are connected to the equipotential busbar PAS by means of PE conductors. This PAS busbar has the closest potential to the ground potential. In TNC systems overvoltage protection devices are grounded onto PEN conductor, where differential balancing currents are flowing. That is why it doesn´t ensure as quality conditions for overvoltage protection functioning as the PE

conductor. The values of the whole grounding resistance and the resistance of grounding conductors PE, PEN in the conductor routing at the ends, are stipulate by standard CSN 33 2000-4-41. It is necessary to avoid loop connection of switchboards during the realization of the building grounding which make conditions for flow of faulty currents and a potential difference between conductors PE and PEN in their route towards ground potential. Star configuration drawing of the grounding conductors acc. to EN 62 305 is the optimal way how to eliminate these unfavourable effects.

Application of HAKEL SPD

Dimensioning of SDP type 1		
EN 62305 ed. 2		
Location of SPD type 1: On the boundaries LPZ 0 and LPZ 1		
LPL	**Lightning**	**Arresters total**
I.	up to 200 kA	100 kA
II.	up to 150 kA	75 kA
III.	up to 100 kA	50 kA
IV.	up to 100 kA	50 kA

Application of HAKEL SPD type 1		
EN 62305 ed. 2		
Location of SPD type 1: On the boundaries LPZ 0 and LPZ 1		
LPL	**Lightning**	**Arresters total**
I. a II.	up to 200 kA	up to 100 kA
Conditions fulfil:		
HZ110, HS50-50	*- big industrial buildings*	
	- buildings with particular importance	
SPC25	*- technological lines*	
	- administrative buildings	
	- small technological lines	
	- administrative properties	
	(if SPD type 1 and type 2 are placed into one switchboard)	

Application of HAKEL SPD type 1		
EN 62305 ed. 2		
Location of SPD type 1: On the boundaries LPZ 0 and LPZ 1		
LPL	**Lightning**	**Arresters total**
III. a IV.	up to 150 kA	up to 75 kA
Conditions fulfil:		
SPC25, SPC12,5 a PIV12,5	*- smaller administrative buildings*	
	- houses with standard equipments	
	- family houses	

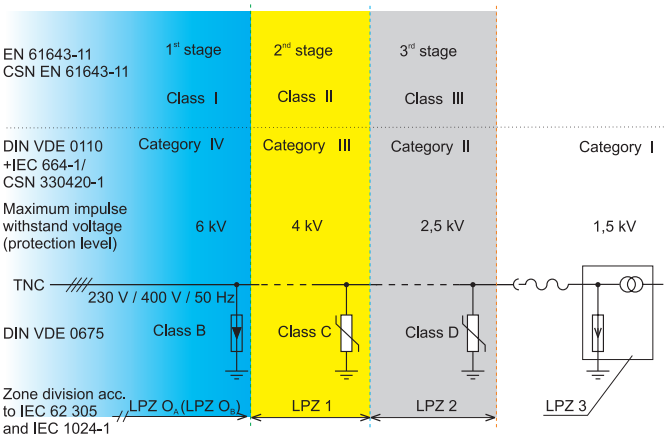
Application of HAKEL SPD type 2	
EN 62305 ed. 2	
Location of SPD type 2: On the boundaries LPZ 1 and LPZ 2	
Conditions fulfil:	
PIII, PIIIM	*- all types of electrical sets*
	- system type (TN, IT, TT)
	- mode of connection
	- nominal voltage

Application of HAKEL SPD type 3	
EN 62305 ed. 2	
Location of SPD type 3: On the boundaries LPZ 2 and LPZ 3	
Conditions fulfil:	
PI-k, PI-3k, P-3k, Pk2, ZS-1DSM	*- all types of electrical sets (located in switchboard)*
Sockets ZS	*- all types of electrical sets (sockets with inbuilt surge protection the closest to the protected equipment)*
	- all types of electrical sets (adaptors with inbuilt surge protection)
	- flexible solution

Technical standards relating to the installation of surge protection devices

All the EN standards apply to the Czech Republic, because the Czech Republic has signed the association agreement with the European Union. The directive No.89/336 EEC, the law No. 22/97 Coll. and the regulations NV 17 and 18/ 2003 Coll. enact abidance of electromagnetic compability (EMC) conditions for electrical equipment. In the other countries are these questions usually determined by relevant national directions. Mounting of the overvoltage protection devices solves most related problems and sufficiently protects electronics against influence of overvoltage spreading through galvanic routes.
Nowadays it is necessary to abide internationally recognized standard EN 61 643-11 and IEC 61643-11 which characterizes stages of overvoltage protections and their tests. Other standards relating to this are being prepared (for example the revisions of overvoltage protection devices).

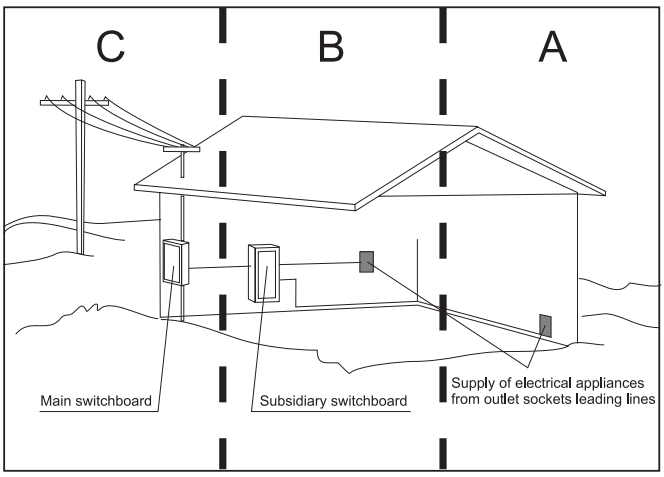
Because nowadays there is considerable assortment of SPDs with accompanying documentation according to DIN VDE 0675 or DIN VDE 0110 in the Czech Republic, it is advisable here to make a comparison of basic segmentation of SPDs according to these standards and standards obligatory in the Czech Republic, in particular IEC 664-1/CSN 33 0420-1. The standard EN 61 643-11 and IEC 61643-11 obligatory in the Czech Republic divides SPDs into stages (1st, 2nd and 3rd) and classes (I, II and III), whereas the standard DIN VDE 0675 divides SPDs into classes (A, B, C and D). The class A arresters are designed for protection of overground LV power system outside of the protected objects. The class B, C and D arresters are designed for usage at the boundaries LPZ 0→1, 1→2 and 2→3. On the other hand the standard DIN VDE 0110 states the definition of overvoltage category, which had been taken up by the standards IEC 664-1/CSN 33 0420-1. These standards define classification of LV power system into four categories (IV, III, II, I) and define so-called maximal impulse withstand voltages (protection levels), permitted for connected appliances. (For example overvoltage at input of distribution TNC 230/400V/50Hz must not exceed 6kV level, it must not exceed 4kV behind the main switchboard, it must not exceed 2,5kV at outputs from subdistribution switchboards and 1,5kV in the part designed for connection of protected appliances to fixed installation.)



Classification comparison of particular LV power system (acc.to EN 61 643-11 and IEC 61643-11, EN 61 643-11, DIN VDE 0110, IEC 664-1/CSN33 0420 and DIN VDE 0675) relating to protection levels of surge protection cascade and to zone division acc. to EN 62 305 and IEC 1024-1.

Interesting is a similar comparison of these classifications of low voltage network system (LV) sections owing to the overvoltage cascades protection stages in the building electric installations based on the oversea C62.41.2 - 2002 standard ANSI/IEEE (American National Standard Institute/Institute of Electrical and Electronics Engineers). This standard devides 1st, 2nd and 3rd SPD classes into C, B, A categories (Location Categories).

Nevertheless, C category is classified into 2 levels (low, high) according to so-called „exposure degreeses“ resulting from isokeraunic maps of “storms activity“ levels.

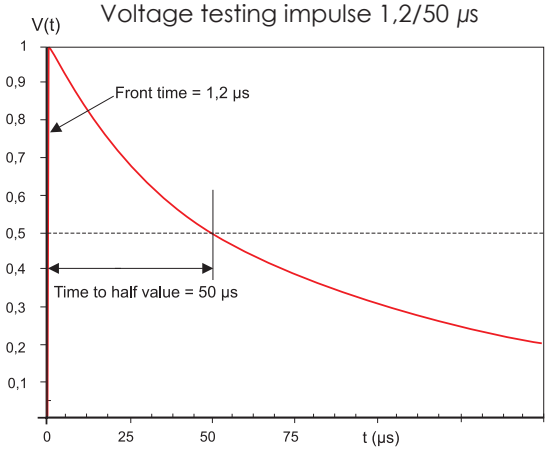


Summary of Surge Location Categories Guidelines Per IEEE C62.41.2-2002

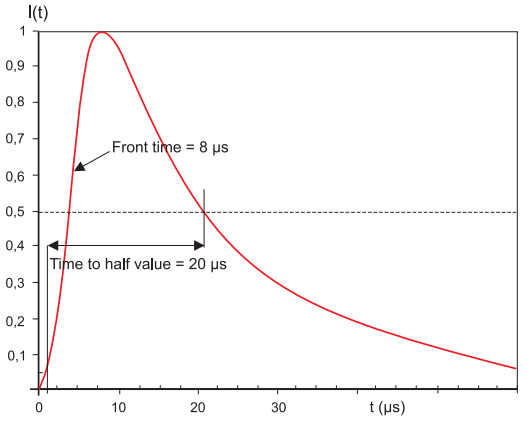
Summary of Surge Location Categories Guidelines (Per IEEE C62.41.2 - 2002)		
Location A	A	
Within a building		6kV 0.2kA 0.5us - 100kHz Ring Wave (30Ω)
Outlets and long branch circuits		6kV 0.5kA 1.2/50us 8/20us (12Ω)
All outlets more than 10m (30ft) from Category B		
All outlets more than 20m (60ft) from Category C		
Location B	B	
Near the service entrance		6kV 0.5kA 0.5us - 100kHz Ring Wave (12Ω)
Feeders and short branch circuits		6kV 3kA 1.2/50us 8/20us (2Ω)
Distribution Panel devices		
Bus and feeder industrial plants		
Heavy appliance outlets near service entrance		
Lighting systems in large buildings		
Location C		
External building		6kV 3kA 1.2/50us 8/20us (2Ω)
Outside and service entrance	C Low	6kV 100kHz Ring Wave
Service drop from pole to building		2.0 x V_{Peak} 10/1000 Combo. Wave
Run between meter and panel		10kV 10kA 1.2/50us 8/20us (1Ω)
Overhead line to detached building	C High	6kV 100kHz Ring Wave
Underground line to well pump		2.3 x V_{Peak} 10/1000 Combo. Wave

It is worth mentioning that actually a complete SPD range of category C, B and A according to ANSI/IEEE is based on the tests by a combined impulse (1,2/50; 8/20μs) with a generator's internal resistance of 1 or 2 or 12Ω and partly by a test impulse at wave shape 0,5μs/100kHz (with the generator's internal resistance of 12Ω for B and C categoryies, alternatively 30Ω for A category). The standard ANSI/IEEE also defines a test current impulse at wave shape 10/1000μs. It is however recommended to use it only as so-called „additional test“ performance. The test impulse at 10/350μs wave shape had been for the first time defined in VDE 0675 standard in 1986 and later on subsequently taken over by EN 61 643-11 and IEC 61643-11. The following five pictures give you a well arranged information about the most used test impulse wave shapes according to IEC, EN, CSN standards, alternatively acc. to ANSI standard for the SPD testing intended for a use in a low voltage distribution networks.

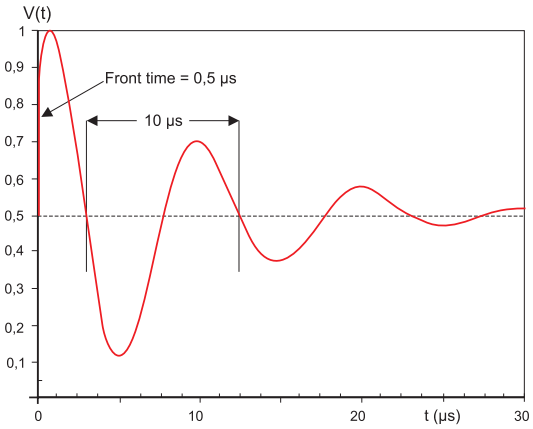
Voltage testing impulse 1,2/50 μs



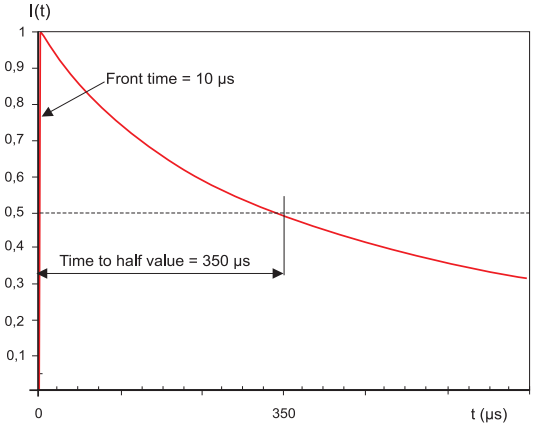
Current testing impulse 8/20 μs



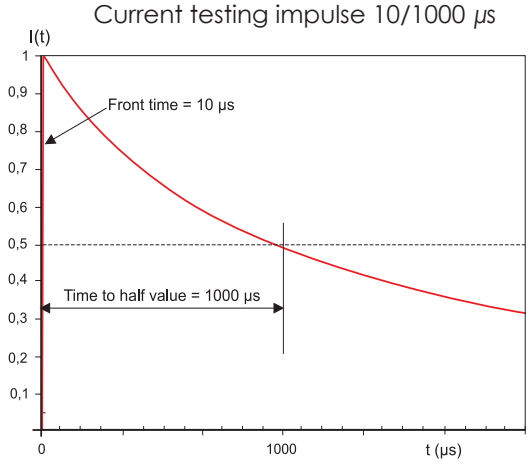
Ringwave current testing impulse 0,5/100 kHz



Lightning current testing impulse 10/350 μs



Current testing impulse 10/1000 μs

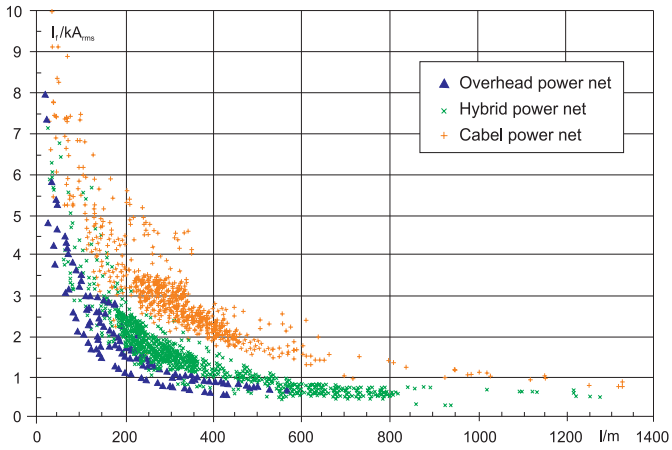


Possible usage of 1st stage surge protection

Varistor arresters of lightning current offer quality protection for their application in 1st stage of surge protection cascade with amplitude up to I_{imp} = 20 kA(10/350). In most applications it suits as well in case of so-called low voltage overground input into a building. If endurance against all higher amplitudes of lightning current is demanded, it is recommended to use arresters of spark gap type. It is necessary to pay attention to the parameter level of self-extinguishing follow current I_{fi} at U_C while a spark gap is choosed, because during the activation of a spark gap there is short-circuit in the place of its installation. Varistor arresters don´t have this property.

The follow currents at the spark gaps application in a protective overvoltage cascades

The follow short circuit currents occure in the spark gap based surge arresters (HS 45, HS 55, HS 60-20, HS 50-50, HS 50-16, HS 50-3) after their activation by an impulse discharge current, whereas their magnitude is restricted by an arised short circuit overall impedance of the energetic power network. These follow currents are spontaneously extinguished by an overpressure acting in an individual operative spark-gap chambers during the first net's half-period transit through a zero. The amplitude of a prospective short circuit current, in place of a defined application, partly depends on the type of power system and partly on a lead distance of given application from a distribution transformer. The following diagram describes the results of measurement evaluation of these prospective follow currents performed in 2325 three-phase network of 29 distribution plants, from that 315 were made on an overhead lines, 1215 on a combine lines and 715 on a cabel network. This graf shows that the value of prospective short circuit current never exeeds the value of 3kA_{rms} applicable for any power net type (overhead, combine or cabel network) for example while using an application distance of 600 m from a distribution transformer. The above mentioned diagram is a favourably applicable in a project practice for a qualified estimation of a suitable spark-gap selection for a defined application and first of all for I_{fi} parameter determination (self-extinguish follow current at U_c). The eventual doubts, caused by a defined application specification, depends totaly on a designer to cover them by a reasonable safety coefficient (the exact measurement is from the financial and technical point of view rather demanding). For example, if the value of a prospective follow current according to the qualified estimation is 3kA_{rms} then it is suitable to choose the surge arrester with an approximately twice higher parameter of I_{fi}.



Usage of surge separating inductors between particular stages of surge protection

Surge separating inductors with impedance 2÷15μH ensure energetic coordination of particular stages of overvoltage protection cascade in few cases. They are inserted in conduct in case that the distance between 1st and 2nd stage or between 2nd and 3rd stage is smaller than 10m. Short distance or missing surge separating inductor creates a certain possibility of damage of some arrester in overvoltage protection cascade by progressing lightning current impulse. It is important to pay a special attention to the coordination between 1st and 2nd stage of surge protection cascade in all cases where the 1st stage is fitted by spark-gap based lightning arresters. The most economical way is to secure that the 1st protection cascade is placed in other switchboard than the 2nd stage (with the min. distance of 10m between them). If this min. distance is impossible to fulfil either from the constructive or structural reasons, it is recommended to use separating inductors of 15μH.

Surge protection backup

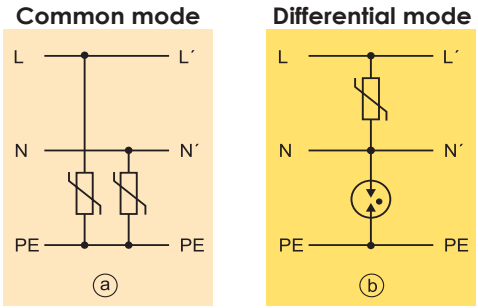
It is necessary to use additional protection of particular SPDs for protection against short-circuit in 1st and 2nd stages of overvoltage protection cascades. The protection is secured by backup safety fuses. Generally, every manufacturer of overvoltage protection devices declares dimensioning of these backup fuses in the accompanying documentation.

Recommendation for the installation of 3rd stage surge protection with the high frequency filter

3rd protection stage is an essential part of 3-stage overvoltage protection cascade. The typical representatives of this protection type are for example transient overvoltage protections-range PI-k* and PI-3k*. The products reduce overvoltage (thanks to their inside connection-high protection, filter, low protection) to the level U_P<0,8 up to 1kV, which is safe for the final appliances. They are usually constructively fitted on DIN rail 35mm. It is important to place these products as near to the protected appliance (for example flat switchboards) as possible. The distance between switchboard and appliance must not overreach 15m. When there is a longer distance it is necessary to use other class III overvoltage protection devices (for example protection sockets or overvoltage protection on DIN rail) cca 10m far away from each other along the protected socket line. On the other hand protected sockets are in no way equivalent substitution for 3rd stage protection with high-frequency filter.

Standardized implementation of the particular surge cascade stages

It is possible to connect the particular stages of overvoltage cascades in two ways:



Connection ***a*** prefers protection against lenghtwise overvoltage. Connection ***b*** prefers protection against transverse overvoltage. Because statistical results of long-term made measurements affirm generally higher danger of transverse overvoltage (on clamps of appliances L/N) than lengthwise overvoltage (on clamps of appliances L/PE, L/PE), are all the connections and applications of SPD manufacturing range of the Hakel company oriented on preferential protection of appliances against transverse overvoltage.

Test rooms

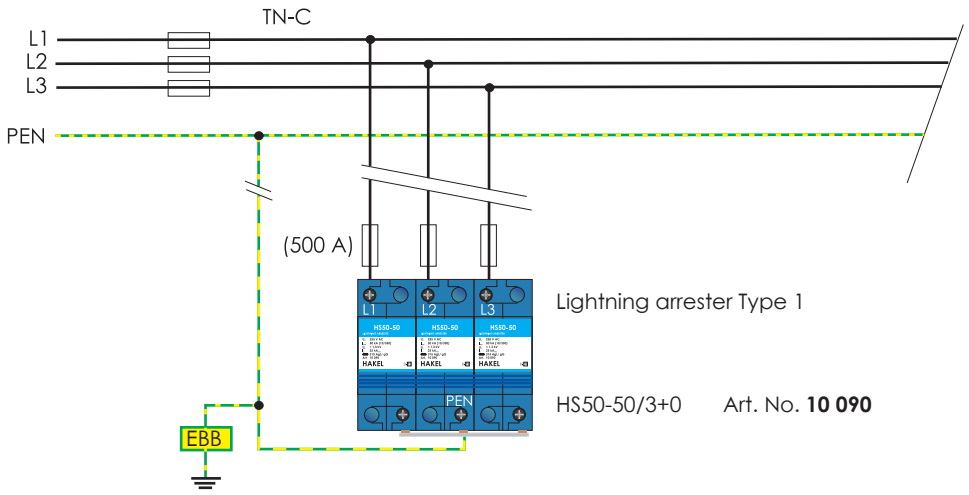
Surge protection device examination and their testing is the only way for ensuring and verification of their supposed endurance and serviceability under the hardest operation conditions. A new product final finish and all of its important components are examined within the scope of the type tests and the certification procedure. Self-tests are performed with help of the surge generators, which in a way „substitute" the current pulses of a natural character under a defined conditions. Testing wave shapes are set by even further connecting standards, particularly EN 616 43-11, IEC 62 305, IEC 60-1 and CSN 34 5640. Only a few working places, equipped with the wave shape generators 8/20μs, are situated in the Czech Republic. Mostly only with max. operational capacity up to I_{max} = 10kA(8/20) or 20kA(8/20). The only one working place in the Czech Republic is equipped with the currents generators with wave shape 10/350μsec. Namely, it is Hakel's test room in Hradec Kralove, which has at its disposal such generator with operational capacity I_{imp} = up to 210kA(10/350). This test room has even at its disposal two testing current pulse generators with operational capacity I_{max} = 60kA(8/20) and I_{max} = 240kA(8/20).

LIGHTNING PROTECTION LEVEL I

Classification of typical objects	System	No. of phases	Circuit	Type 1-at boundaries of LPZ 0-1 (lightning arrester) SPD type	Installation	Coordination T1 and T2 < 5 m
Buildings with considerable level of protection LPL I (I_{imp} = 100 kA) *Hospitals* *Banks* *Transmission point for GSM,BTS* *Water stations* *Power plants* *Aerodrome control tower* *Buildings with danger of explosion* ***Bigger industrial buildings*** ***Buildings with particular importance***	TNC	1	1+0	 HS50-50	Substation Switchboard (kWh) Main switchboard	5 metres cable or decoupling element PI-L (16-120 A)
		3	3+0	 HS50-50/3+0	Substation Switchboard (kWh) Main switchboard	
				 SPC25/3+0	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
	TNS	1	1+1	 HS50-50/1+1	Substation Switchboard (kWh) Main switchboard	5 metres cable or decoupling element PI-L (16-120 A)
			2+0	 HS50-50/2+0		
		3	3+1	 SPC25/3+1	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
			4+0	 SPC25/4+0		

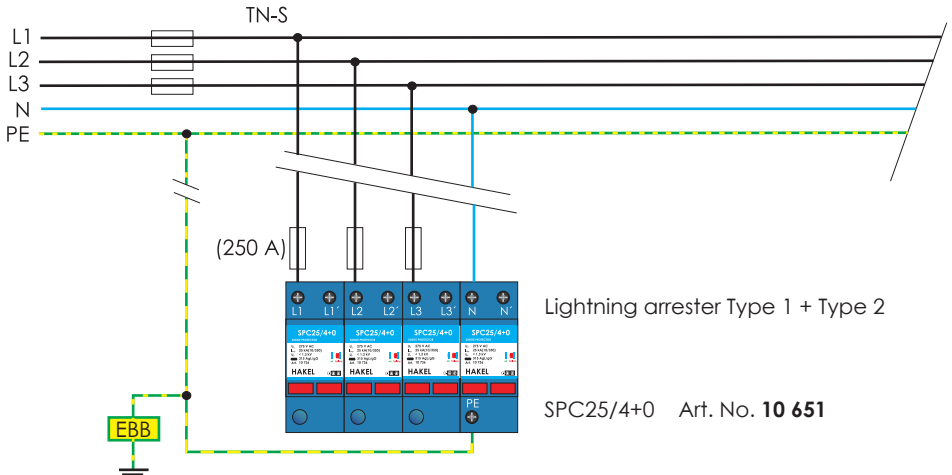
Step 1
(object selection)

Step 2
(selection of SPD T1)



Lightning arrester Type 1

HS50-50/3+0 Art. No. **10 090**



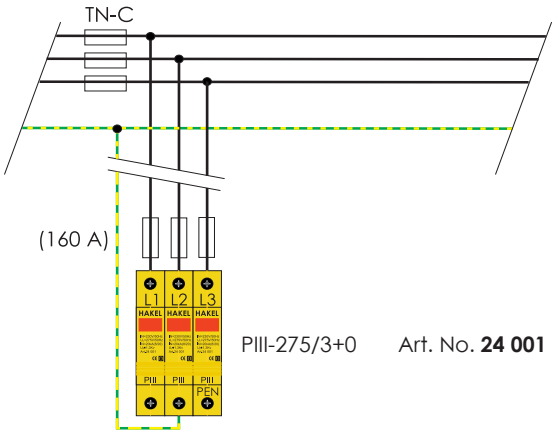
Lightning arrester Type 1 + Type 2

SPC25/4+0 Art. No. **10 651**

Type 2 - at boundaries of LPZ 1-2 (surge arrester)		Coordination T2 a T3
SPD type	Installation	< 5 m
PIIIM-275	Subsidiary switchboard, Switchboards on every floor of the object or in every control panel	5 meters of cable or decoupling element PI-L(16-120 A) *(Decoupling elements(PI-L) are installed for coordination of T2 and T3. These protect SPD T3 against destruction. If there is a distance between T2 and T3 < 5 m, it is necessary to use decoupling elements. The recommended connection is in series, hence is required to know the nominal voltage of existing conductor.*
PIII-275/3+0		
PIII-275/3+0	If the distance from T1 is > 30 m, then it is necessary to install SPD T2	
PIII-275/1+1	Subsidiary switchboard, Switchboards on every floor of the object or in every control panel	5 meters of cable or decoupling element PI-L(16-120 A) *(Decoupling elements(PI-L) are installed for coordination of T2 and T3. These protect SPD T3 against destruction. If there is a distance between T2 and T3 < 5 m, it is necessary to use decoupling elements. The recommended connection is in series, hence is required to know the nominal voltage of existing conductor.*
PIIIM-275/1+1		
PIII-275/3+1	If the distance from T1 is > 30 m, then it is necessary to install SPD T2	
PIIIM-275/3+1		

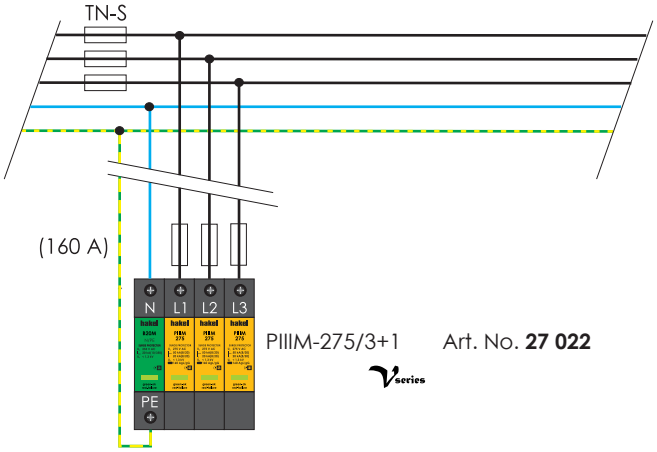
Type 3 - at boundaries of LPZ 2-3 (surge arrester)			
SPD + EMI filter		Additional SPD	
SPD type	Installation	SPD type	Installation
PI-k(8-150A)	To the switchboard, which is closest to the protected equipment *(In case of electronic control protection, the installation is directly to the appliance)*	ZS-1DSM	*Outlet circuits which are longer than 20 m. Flush-mounted sockets and cable ducts. It is recommended to install SPD into the outlet circuit to every fourth socket or to the point of supply. The installation eliminates induced overvoltage which is enducing into the object's service cables.*
		Pk2	
PI-3k(16-120A)		ZS-1I	
PI-k(8-150A)	To the switchboard, which is closest to the protected equipment *(In case of electronic control protection, the installation is directly to the appliance)*	ZS-1P	*Outlet circuits which are longer than 20 m. Flush-mounted sockets and cable ducts. It is recommended to install SPD into the outlet circuit to every fourth socket or to the point of supply. The installation eliminates induced overvoltage which is enducing into the object's service cables.*
		PDU	
PI-3k(16-120A)		PK2	
		ZS-1DSM	

Step 3
(selection of SPD T2)



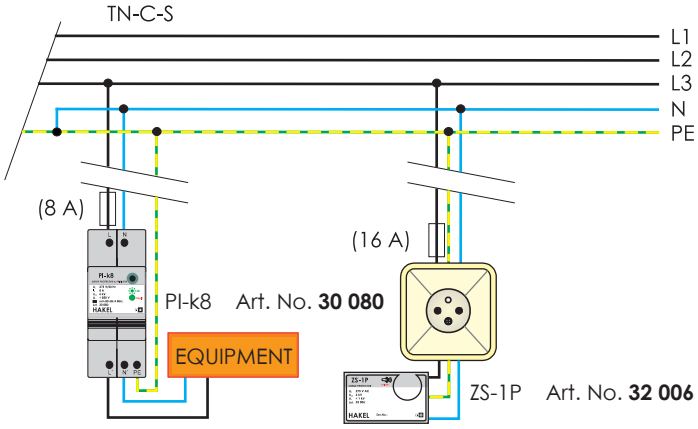
PIII-275/3+0 Art. No. **24 001**

Surge arrester Type 2



PIIIM-275/3+1 Art. No. **27 022**

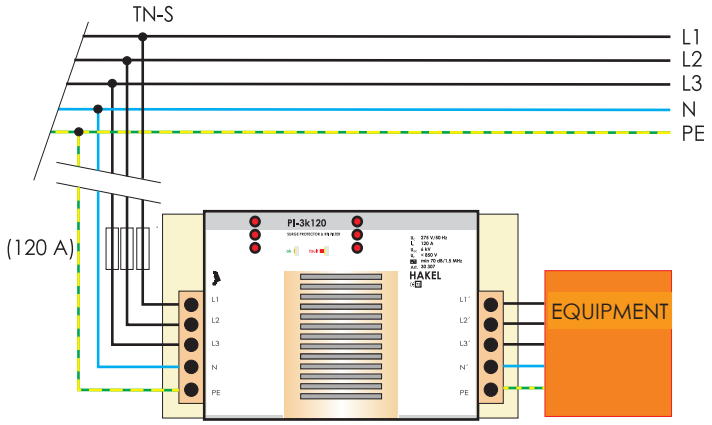
Step 4
(selection of SPD T3)



PI-k8 Art. No. **30 080**

ZS-1P Art. No. **32 006**

Surge arrester Type 3

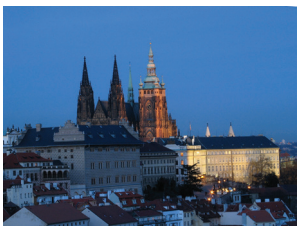


PI-3k120 Art. No. **30 307**

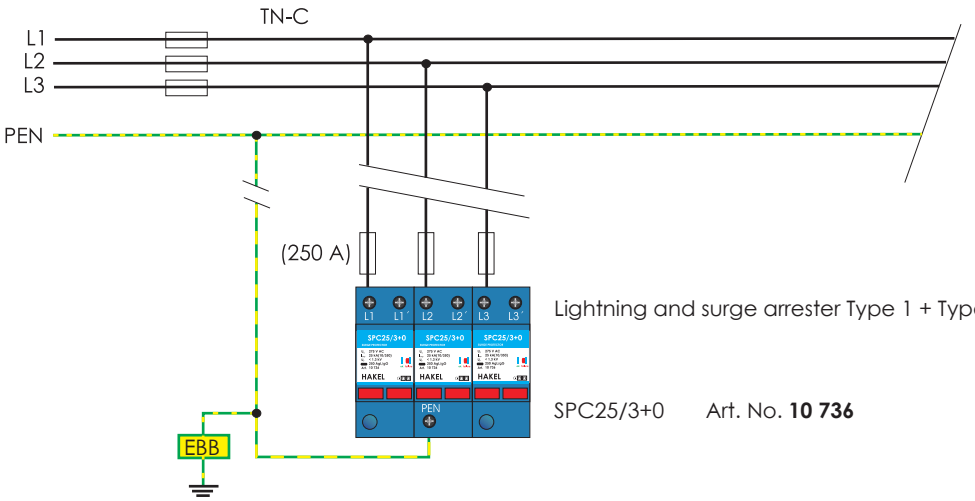
100 %
(property protection)

Classification of typical objects	System	No. of phases	Circuit	Type 1-at boundaries of LPZ 0-1 (lightning arrester)		Coordination T1 and T2
				SPD type	Installation	< 5 m
Buildings with considerable level of protection LPL II (I_{imp} = 75 kA) *Industrial buildings* *Administrative buildings* *Schools* *Supermarkets* *Cathedrals* **Objects connected by buried cable.**	TNC	1	1+0	 HS50-50	Substation Switchboard (kWh) Main switchboard	5 metres cable or decoupling element PI-L (16-120 A)
		3	3+0	 HS50-50/3+0	Substation Switchboard (kWh) Main switchboard	
				 SPC25/3+0	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
	TNS	1	1+1	 HS50-50/1+1	Substation Switchboard (kWh) Main switchboard	5 metres cable or decoupling element PI-L (16-120 A)
			2+0	 HS50-50/2+0		
		3	3+1	 SPC25/3+1	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
			4+0	 SPC25/4+0		

Step 1
(object selection)

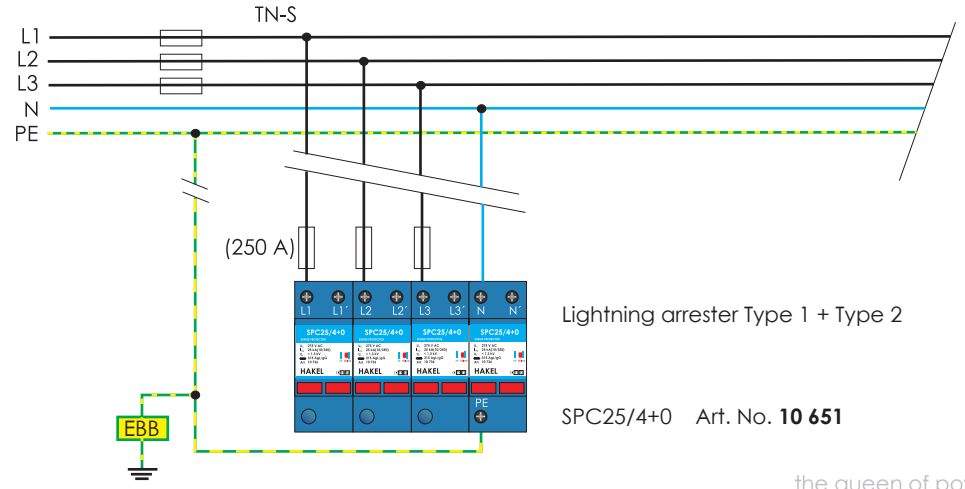


Step 2
(selection of SPD T1)



Lightning and surge arrester Type 1 + Type 2

SPC25/3+0 Art. No. **10 736**



Lightning arrester Type 1 + Type 2

SPC25/4+0 Art. No. **10 651**

Type 2 - at boundaries of LPZ 1-2 (surge arrester)

Coordination T2 a T3

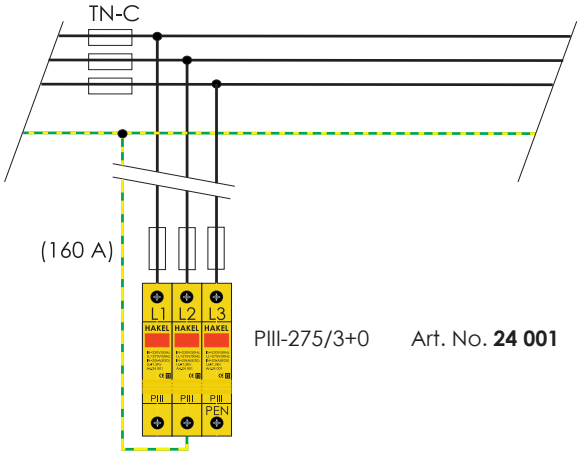
Type 3 - at boundaries of LPZ 2-3 (surge arrester)

SPD + EMI filter

Additional SPD

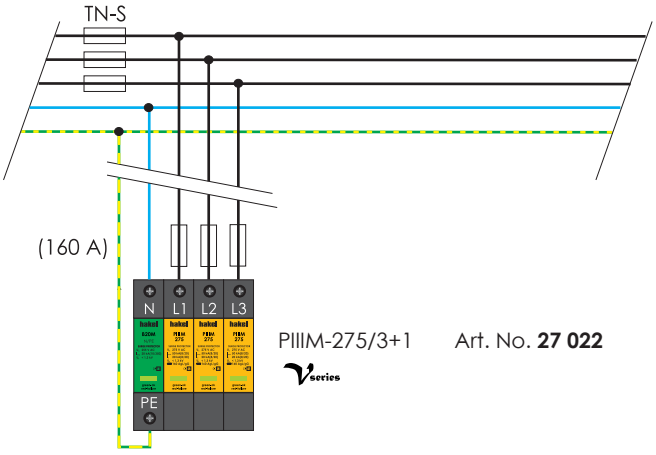
SPD type	Installation	< 5 m	SPD type	Installation	SPD type	Installation
PIIIM-275 V series PIII-275/3+0	Subsidiary switchboard, Switchboards on every floor of the object or in every control panel	5 meters of cable or decoupling element PI-L(16-120 A) *(Decoupling elements(PI-L) are installed for coordination of T2 and T3. These protect SPD T3 against destruction. If there is a distance between T2 and T3 < 5 m, it is necessary to use decoupling elements. The recommended connection is in series, hence is required to know the nominal voltage of existing conductor.*	PI-k(8-150A) PI-3k(16-120A)	To the switchboard, which is closest to the protected equipment *(In case of electronic control protection, the installation is directly to the appliance)*	ZS-1DSM Pk2 ZS-1I	*Outlet circuits which are longer than 20 m. Flush-mounted sockets and cable ducts. It is recommended to install SPD into the outlet circuit to every fourth socket or to the point of supply. The installation eliminates induced overvoltage which is enducing into the object's service cables.*
PIII-275/3+0	If the distance from T1 is > 30 m, then it is necessary to install SPD T2					
PIII-275/1+1 PIIIM-275/1+1 V series	Subsidiary switchboard, Switchboards on every floor of the object or in every control panel	5 meters of cable or decoupling element PI-L(16-120 A) *(Decoupling elements(PI-L) are installed for coordination of T2 and T3. These protect SPD T3 against destruction. If there is a distance between T2 and T3 < 5 m, it is necessary to use decoupling elements. The recommended connection is in series, hence is required to know the nominal voltage of existing conductor.*	PI-k(8-150A) PI-3k(16-120A)	To the switchboard, which is closest to the protected equipment *(In case of electronic control protection, the installation is directly to the appliance)*	ZS-1P PDU PK2 ZS-1DSM	*Outlet circuits which are longer than 20 m. Flush-mounted sockets and cable ducts. It is recommended to install SPD into the outlet circuit to every fourth socket or to the point of supply. The installation eliminates induced overvoltage which is enducing into the object's service cables.*
PIII-275/1+1 PIIIM-275/3+1 V series	If the distance from T1 is > 30 m, then it is necessary to install SPD T2					

Step 3
(selection of SPD T2)



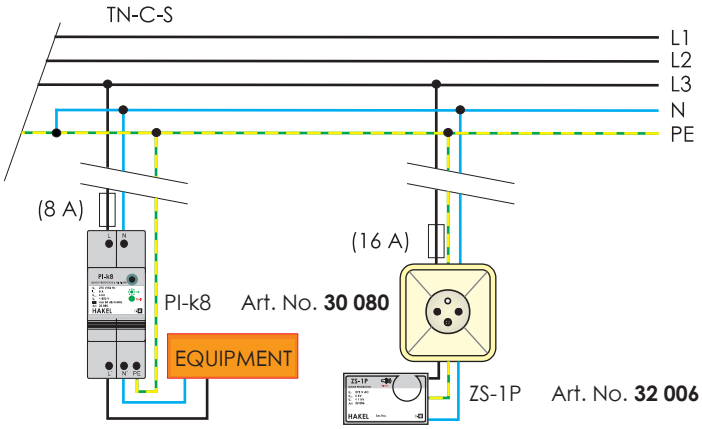
PIII-275/3+0 Art. No. **24 001**

Surge arrester Type 2



PIIIM-275/3+1 V series Art. No. **27 022**

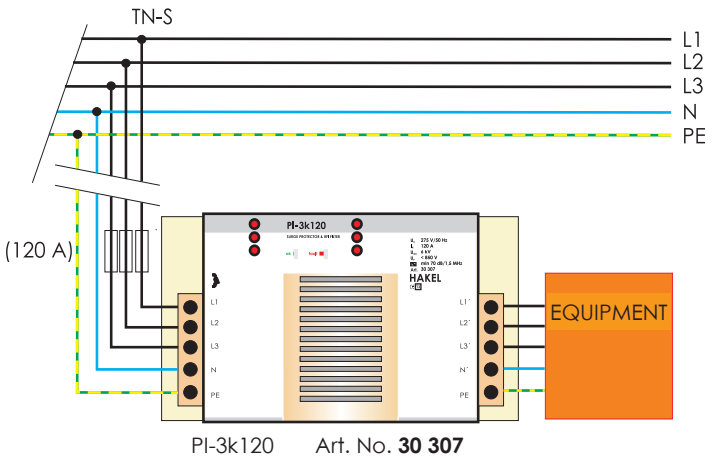
Step 4
(selection of SPD T3)



PI-k8 Art. No. **30 080**

ZS-1P Art. No. **32 006**

Surge arrester Type 3



PI-3k120 Art. No. **30 307**

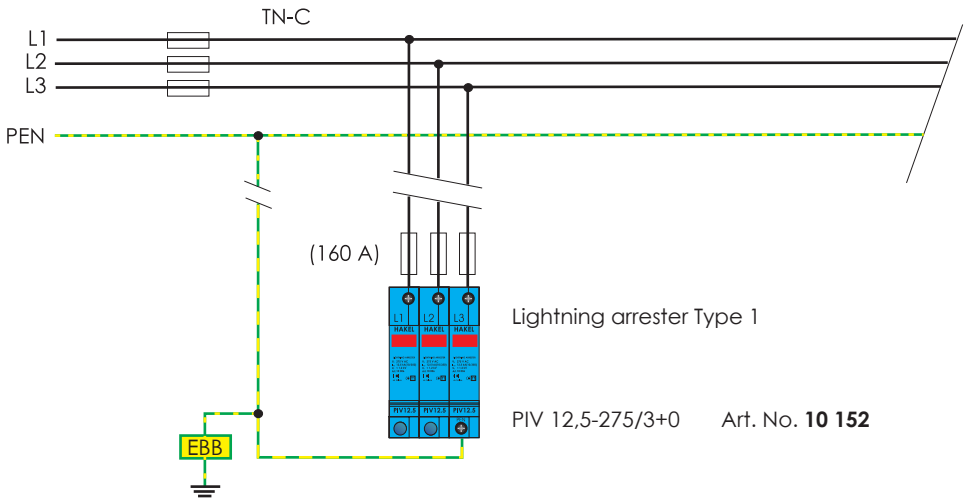
100 %
(property protection)

LIGHTNING PROTECTION LEVEL III a IV

Classification of typical objects	System	No. of phases	Circuit	Type 1-at boundaries of LPZ 0-1 (lightning arrester) SPD type	Installation	Coordination T1 and T2 < 5 m
Buildings with considerable level of protection LPL III and IV (I_{imp} = 50 kA) *LPL III* *Apartment houses* *Small administartive buildings* *Family houses* *Agricultural structures* *LPL IV* *Buildings and halls without occurrence of persons and internal equipment* **Objects with the main back-up fuse up to 63A connected by buried cable.**	TNC	1	1+0	 SPC25	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
		3	3+0	 PIV12.5/3+0	Main switchboard	5 metres cable or decoupling element PI-L (16-120 A)
				 SPC25/3+0	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
	TNS	1	1+1	 SPC25/1+1	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
			2+0	 SPC25/2+0		
		3	3+1	 SPC12,5/3+1	Main switchboard Coordination of SPC with SPU doesn't require separation by longer cable or by decoupling element. (The installation of SPD T2 is necessary, if the length is > 30 m from T1)	
			4+0	 PIV12,5/4+0	Main switchboard	5 metres cable or decoupling element PI-L (16-120 A)

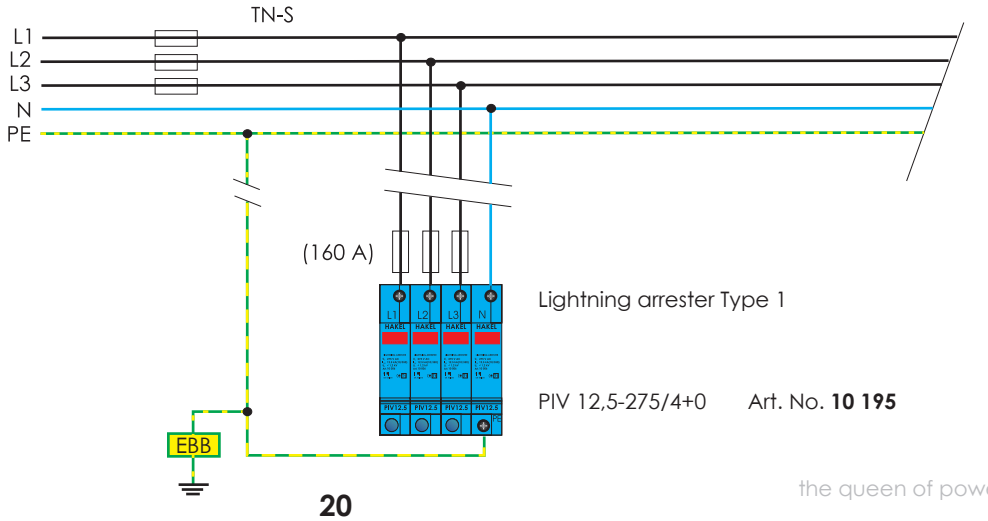
Step 1
(object selection)

Step 2
(selection of SPD T1)



Lightning arrester Type 1

PIV 12,5-275/3+0 Art. No. **10 152**



Lightning arrester Type 1

PIV 12,5-275/4+0 Art. No. **10 195**

Type 2 - at boundaries of LPZ 1-2 (surge arrester)

Coordination T2 a T3

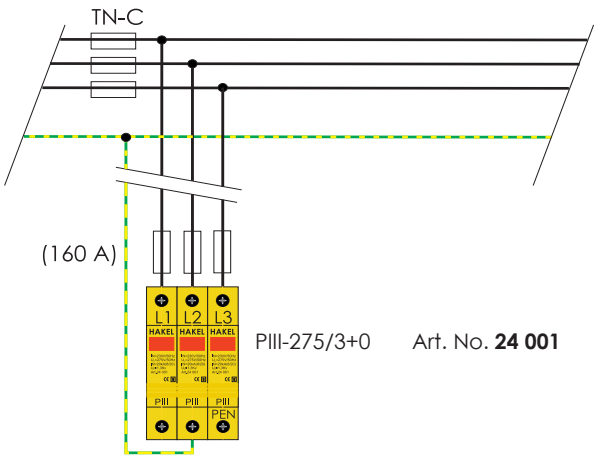
Type 3 - at boundaries of LPZ 2-3 (surge arrester)

SPD + EMI filter

Additional SPD

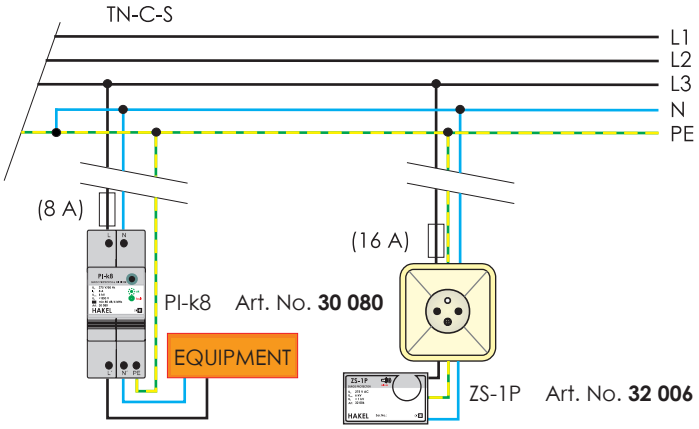
SPD type	Installation	< 5 m	SPD type	Installation	SPD type	Installation
 PIIIM-275 V series  PIII-275/3+0	Subsidiary switchboard, Switchboards on every floor of the object or in every control panel	5 meters of cable or decoupling element PI-L(16-120 A) *(Decoupling elements(PI-L) are installed for coordination of T2 and T3. These protect SPD T3 against destruction. If there is a distance between T2 and T3 < 5 m, it is necessary to use decoupling elements. The recommended connection is in series, hence is required to know the nominal voltage of existing conductor.*	 PI-k(8-150A)   PI-3k(16-120A)	To the switchboard, which is closest to the protected equipment *(In case of electronic control protection, the installation is directly to the appliance)*	 ZS-1DSM  Pk2  ZS-1I	*Outlet circuits which are longer than 20 m. Flush-mounted sockets and cable ducts. It is recommended to install SPD into the outlet circuit to every fourth socket or to the point of supply. The installation eliminates induced overvoltage which is enducing into the object's service cables.*
 PIII-275/1+1  PIIIM-275/1+1 V series  PIII-275/1+1  PIIIM-275/3+1 V series	Subsidiary switchboard, Switchboards on every floor of the object or in every control panel If the distance from T1 is > 30 m, then it is necessary to install SPD T2	5 meters of cable or decoupling element PI-L(16-120 A) *(Decoupling elements(PI-L) are installed for coordination of T2 and T3. These protect SPD T3 against destruction. If there is a distance between T2 and T3 < 5 m, it is necessary to use decoupling elements. The recommended connection is in series, hence is required to know the nominal voltage of existing conductor.*	 PI-k(8-150A)   PI-3k(16-120A)	To the switchboard, which is closest to the protected equipment *(In case of electronic control protection, the installation is directly to the appliance)*	 ZS-1P  PDU  PK2  ZS-1DSM	*Outlet circuits which are longer than 20 m. Flush-mounted sockets and cable ducts. It is recommended to install SPD into the outlet circuit to every fourth socket or to the point of supply. The installation eliminates induced overvoltage which is enducing into the object's service cables.*

Step 3
(selection of SPD T2)



PIII-275/3+0 Art. No. **24 001**

Step 4
(selection of SPD T3)

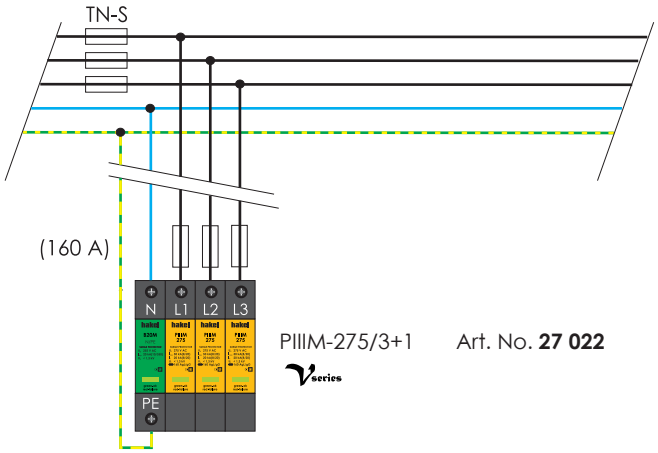


PI-k8 Art. No. **30 080**

ZS-1P Art. No. **32 006**

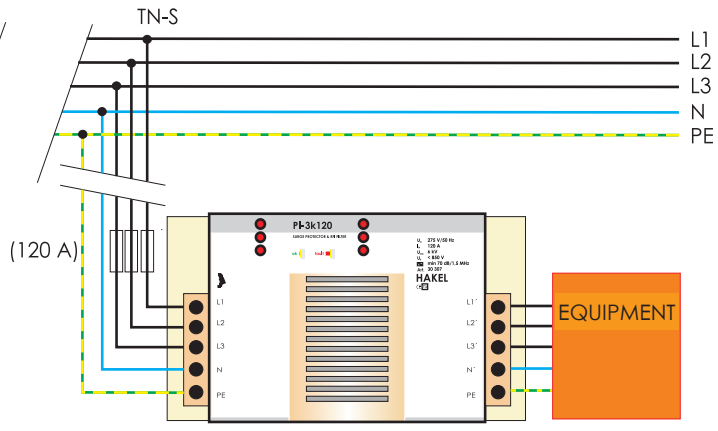
100 %
(property protection)

Surge arrester Type 2



PIIIM-275/3+1 V series Art. No. **27 022**

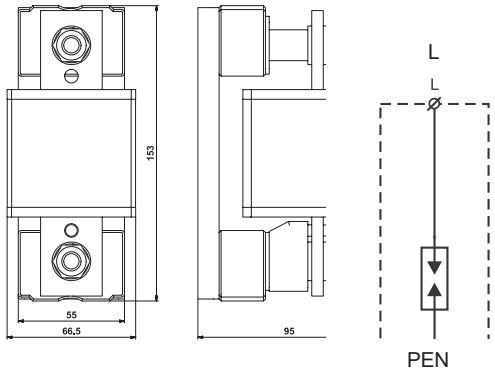
Surge arrester Type 3



PI-3k120 Art. No. **30 307**

Lightning arrester / spark gap / TYPE 1

TYPE 1 / CLASS I / TN-C / CE



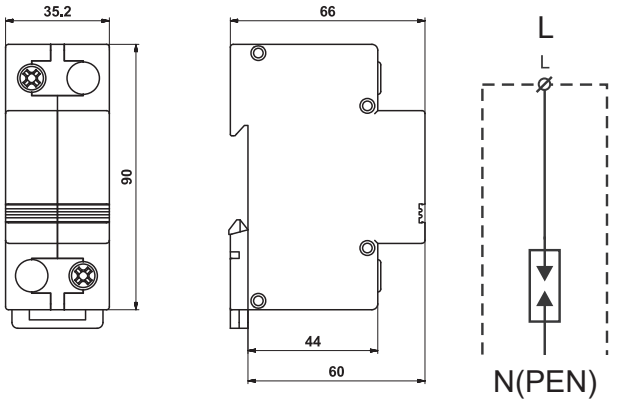
HZ110
HZ110/500

HZ110 is a lightning arrester type 1 according to EN 61643-11 and IEC 61643-11. This is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where it provides the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The lightning arrester is constructed as an encapsulated, non-exhaust, multiple spark gap, which does not have any special requirements for installation in the main switchboards in terms of the gas exhaustion generated during the passage of the lightning current. HZ110 is mainly intended for use in the power lines, which are operated as a system TN-C.

Type		**HZ110**	**HZ110/500**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1, CLASS I	
Max. continuous operating voltage	U_C	255 V AC	500 V AC
Lightning impulse current (10/350)	I_{imp}	110 kA	
- charge	Q	55 As	
- specific energy	W/R	3000 kJ/Ω	
Nominal discharge current (8/20)	I_n	50 kA	
Voltage protection level at I_{imp}	U_P	< 2,5 kV	
Temporary overvoltage (TOV)	U_T	334 V/5 s	690 V/5 s
Response time	t_A	< 100 ns	
Follow current interrupting rating at U_C	I_{fi}	10 kA_{rms}	8 kA_{rms}
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	I_p	50 kA_{rms}	
LPZ		0-1	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP00	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 8 Nm)		min. 50 mm^2	
Mounting on		holder SP50U10	
Lifetime		min.100 000 h	
Weight	m	1000 g	
Article number		10 120	10 125

Lightning arrester / spark gap / TYPE 1

TYPE 1 / CLASS I / TN-C / CE



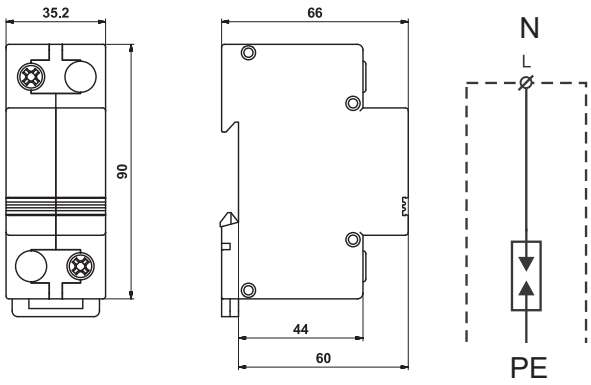
HS50-50 **HS55**

HS50-50, HS50-50 DS and HS55 are the lightning arresters type 1 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The lightning arresters are constructed as the encapsulated, non-exhaust, multiple spark gaps, which do not have any special requirements for installation in the main switchboards in terms of the gas exhaustion generated during the passage of the lightning current. They are mainly intended for use in the power lines, which are operated as a system TN-C. For TNS and TT systems it is necessary to combine these arresters with single spark gap lightning arrester HS100 (or JK110). The main usage of the HS lightning arresters is in those objects, which belong according to EN 62305 to the protective level LPL I.

Type		**HS50-50**	**HS55**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1, CLASS I	
Max. continuous operating voltage	U_C	255 V AC	440 V AC
Lightning impulse current (10/350)	I_{imp}	50 kA	
- charge	Q	25 As	
- specific energy	W/R	600 kJ/Ω	
Nominal discharge current (8/20)	I_n	50 kA	
Voltage protection level at I_{imp}	U_P	< 2 kV	< 2,5 kV
Temporary overvoltage (TOV)	U_T	334 V/5 s	690 V/5 s
Response time	t_A	< 100 ns	
Follow current interrupting rating at U_C	I_{fi}	3 kA_{rms}	
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	I_p	25 kA_{rms}	
LPZ		0-1	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)	
Mounting on		DIN rail 35 mm	
Lifetime		min.100 000 h	
Weight	m	225 g	
Article number		10 090	10 055

Lightning arrester / total spark gap / TYPE 1

TYPE 1 / CLASS I / TN-S / TT / CE



HS100 **JK110**

HS100 and JK110 are the total current spark gaps type 1 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Zones Concept at the boundaries of LPZ 0 - 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The lightning arresters are constructed as the encapsulated, non-exhaust, multiple spark gaps, which do not have any special requirements for installation in the main switchboards in terms of the gas exhaustion generated during the passage of the lightning current.
They are intended for use in TN-S and TT systems. HS100 and JK110 are to be installed only between N and PE in modifications of 3+1 or 1+1.

Type		**HS100**	**JK110**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1, CLASS I	
Max. continuous operating voltage	U_C	255 V AC	
Lightning impulse current (10/350)	I_{imp}	100 kA	110 kA
- charge	Q	50 As	55 As
- specific energy	W/R	2500 kJ/Ω	3000 kJ/Ω
Nominal discharge current (8/20)	I_n	75 kA	
Voltage protection level at I_{imp}	U_P	< 2 kV	
Temporary overvoltage (TOV)	U_T	1200 V / 0,2 s	
Response time	t_A	< 100 ns	
Follow current interrupting rating at U_C	I_{fi}	100 A_{rms}	
LPZ		0-1	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)	
Mounting on		DIN rail 35 mm	
Lifetime		min.100 000 h	
Weight	m	360 g	
Article number		10 100	10 110

Lightning arrester TYPE 1

Application table

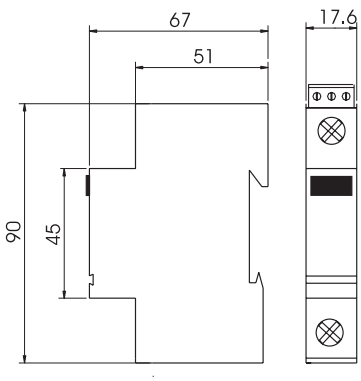
Type	Art. No.		TE	Weight (g)	No. of poles	Connection	I_{imp} (kA)	U_C (V)	Mode of protection
HZ110	10 120		-	1000	1	1+0	110	255	L/N, L/PEN, L/PE
HZ110/500	10 125		-	1000	1	1+0	110	500	L/N, L/PEN, L/PE
HS50-50	10 090		2	225	1	1+0	50	255	L/N, L/PEN, L/PE
HS55	10 055		2	225	1	1+0	50	440	L/N, L/PEN, L/PE
HS100	10 100		2	360	1	0+1	100	255	N/PE
JK110	10 110		2	360	1	0+1	110	255	N/PE

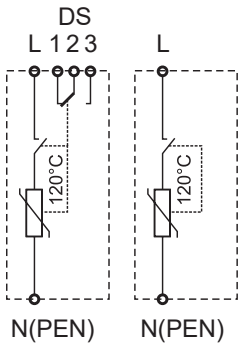
Type		Consisting of	TE	Weight (g)	No. of poles	Connection	I_{total} (kA)	Application
Recommended sets for TN-C system								
HS50-50/3+0		3xHS50-50	6	675	3	3+0	150	Transformers, main switchboard and before electrometer
HS55/3+0		3xHS55	6	675	3	3+0	150	Transformers and main switchboard
Recommended sets for TN-S system								
HS50-50/4+0		4xHS50-50	6	900	4	4+0	200	Transformers, main switchboard and before electrometer
HS55/4+0		4xHS55	6	900	4	4+0	200	Transformers and main switchboard
Recommended sets for TN-S and TT systems								
HS50-50/3+1		3xHS50-50 + 1xHS100	8	1035	4	3+1	100	Transformers, main switchboard and before electrometer
HS55/3+1		3xHS55 + 1xJK110	8	1035	4	3+1	110	Transformers and main switchboard

TE - diving unit (17,5 mm)

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / CE





PIV12,5-275
PIV12,5-275 DS

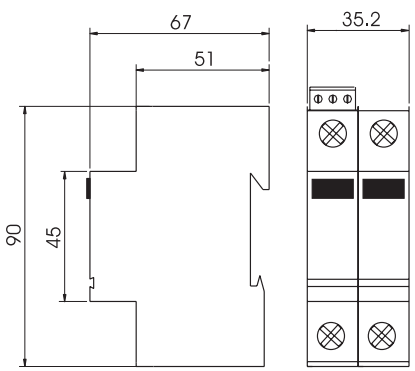
PIV is a single-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where it provides the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIV12,5-275 is mainly in the power supply lines. The main use of PIV12,5-275 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

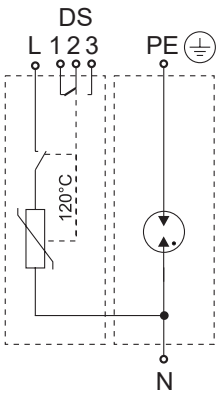
The marking of DS specifies a version with remote monitoring

Type		**PIV12,5-275, PIV12,5-275 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	140 g
Article number		
PIV12,5-275		10 006
PIV12,5-275 DS		10 020

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE





PIV12,5-275/1+1
PIV12,5-275 DS/1+1

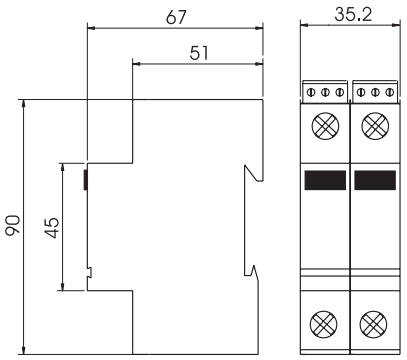
PIV12,5-275/1+1 is a two-pole, metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305 ed.2), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIV12,5-275/1+1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of PIV12,5-275/1+1 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

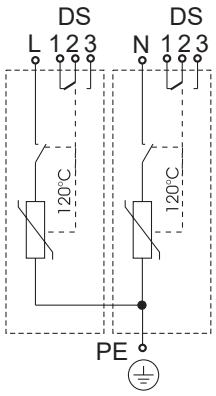
The marking of DS specifies a version with remote monitoring.

Type		**PIV12,5-275/1+1, PIV12,5-275 DS/1+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Total lightning current (10/350) L1+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level at	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	256 g
Article number		
PIV12,5-275/1+1		10 160
PIV12,5-275 DS/1+1		10 161

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE





PIV12,5-275/2+0
PIV12,5-275 DS/2+0

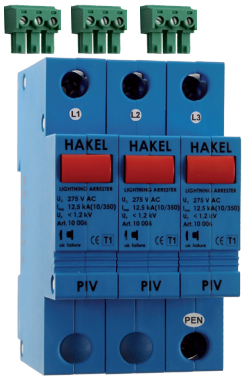
PIV12,5-275/2+0 is a two-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIV12,5-275/2+0 is mainly in the power supply lines, which are operated as TN-S system. The main use of PIV12,5-275/2+0 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

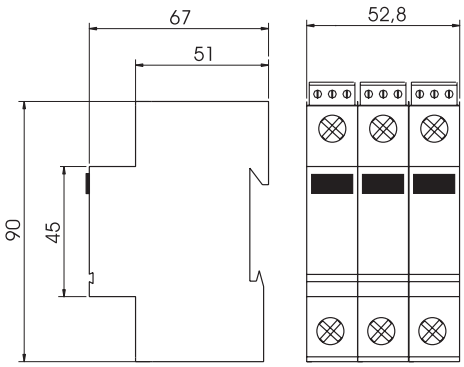
The marking of DS specifies a version with remote monitoring.

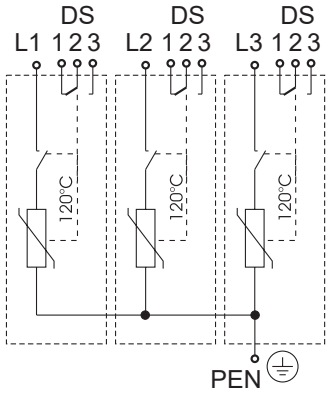
Type		**PIV12,5-275/2+0, PIV12,5-275 DS/2+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Total lightning current (10/350) L1+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	280 g
Article number		
PIV12,5-275/2+0		10 158
PIV12,5-275 DS/2+0		10 159

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-C / CE







PIV12,5-275/3+0
PIV12,5-275 DS/3+0

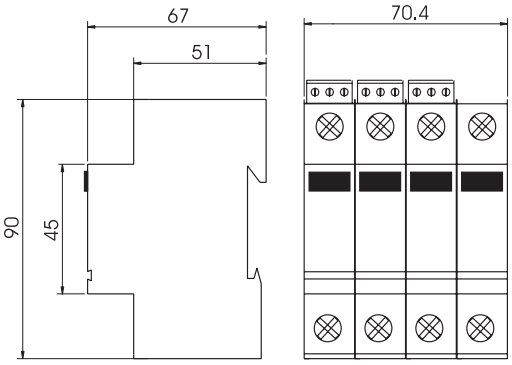
PIV12,5-275/3+0 is a three-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIV12,5-275/3+0 is mainly in the power supply lines, which are operated as TN-C system. The main use of PIV12,5-275/3+0 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

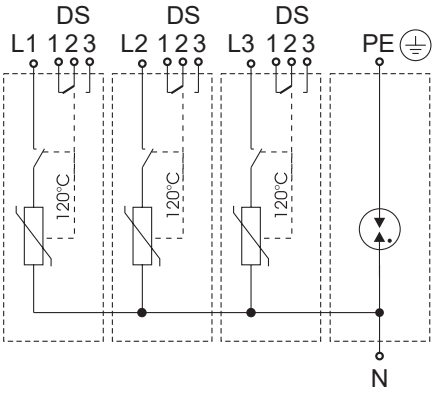
The marking of DS specifies a version with remote monitoring.

Type		**PIV12,5-275/3+0, PIV12,5-275 DS/3+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Total lightning current (10/350) L1+L2+L3→PEN	I_{total}	37,5 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		25 mm^2 (solid)
(at tightening moment of clamps 4 Nm)		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	420 g
Article number		
PIV12,5-275/3+0		10 152
PIV12,5-275 DS/3+0		10 153

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE





PIV12,5-275/3+1
PIV12,5-275 DS/3+1

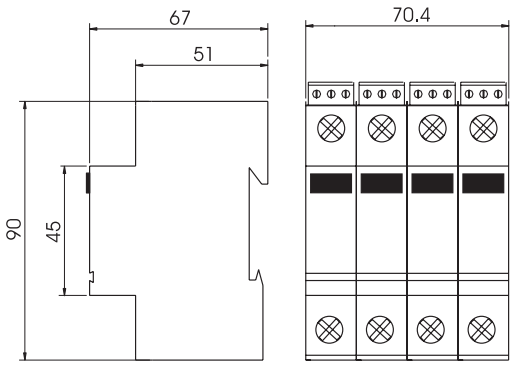
PIV12,5-275/3+1 is a four-pole, metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305 ed.2), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIV12,5-275/3+1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of PIV12,5/3+1 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

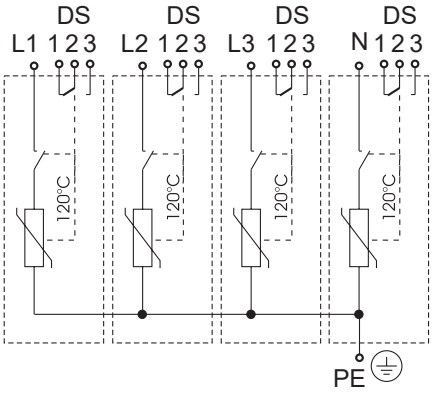
The marking of DS specifies a version with remote monitoring.

Type		**PIV12,5-275/3+1, PIV12,5-275 DS/3+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	50 kA
- charge	Q	25 As
- specific energy	W/R	625 kJ/Ω
Total lightning current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	536 g
Article number		
PIV12,5-275/3+1		10 154
PIV12,5-275 DS/3+1		10 155

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE





PIV12,5-275/4+0
PIV12,5-275 DS/4+0

PIV12,5-275/4+0 is a four-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIV12,5-275/4+0 is mainly in the power supply lines, which are operated as TN-S system. The main use of PIV12,5-275/4+0 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

The marking of DS specifies a version with remote monitoring.

Type		**PIV12,5-275/4+0, PIV12,5-275 DS/4+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Total lightning current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		25 mm^2 (solid)
(at tightening moment of clamps 4 Nm)		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	560 g
Article number		
PIV12,5-275/4+0		10 195
PIV12,5-275 DS/4+0		10 196

Lightning and surge arrester / TYPE 1+2

Application table

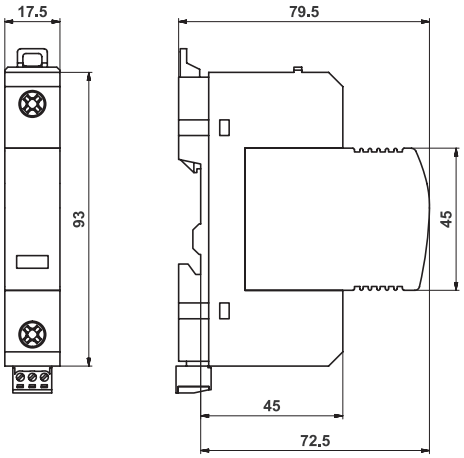
Type	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{imp} (kA)	U_C (V)	Mode of protection
PIV12,5-75 / PIV12,5-75 DS	10 053 / 10 054	1	100	1	1+0	12,5	75	L/N, L/PEN, L/PE
PIV12,5-150 / PIV12,5-150 DS	10 048 / 10 049	1	110	1	1+0	12,5	150	L/N, L/PEN, L/PE
PIV12,5-275 / PIV12,5-275 DS	10 006 / 10 020	1	140	1	1+0	12,5	275	L/N, L/PEN, L/PE
PIV12,5-320 / PIV12,5-320 DS	10 148 / 10 149	2	234	1	1+0	12,5	320	L/N, L/PEN, L/PE
PIV12,5-385 / PIV12,5-385 DS	10 150 / 10 151	2	234	1	1+0	12,5	385	L/N, L/PEN, L/PE
PIV12,5-440 / PIV12,5-440 DS	10 014 / 10 024	2	236	1	1+0	12,5	440	L/N, L/PEN, L/PE
PIV12,5-600 / PIV12,5-600 DS	10 010 / 10 025	3	330	1	1+0	12,5	600	L/N, L/PEN, L/PE
PIV12,5-720 / PIV12,5-720 DS	10 011 / 10 017	3	374	1	1+0	12,5	720	L/N, L/PEN, L/PE
PIV12,5-850 / PIV12,5-850 DS	10 016 / 10 027	3	385	1	1+0	12,5	850	L/N, L/PEN, L/PE
B25	30 024	1	72	1	0+1	25	255	N/PE
B50	10 050	1	116	1	0+1	50	255	N/PE
B80	10 080	1	116	1	0+1	80	255	N/PE
B100	10 001	2	228	1	0+1	100	255	N/PE

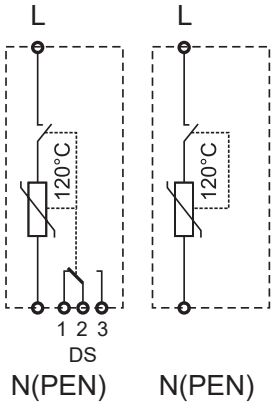
Recommended sets for TN-C system	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{total} (kA)	Application
PIV12,5-275 / PIV12,5-275 DS	10 006 / 10 020	1	140	1	1+0	12,5	Residential houses with standard equipment, industrial structures free of people and internal equipment
PIV12,5-275/3+0 / PIV12,5-275 DS/3+0	10 152 / 10 153	3	420	3	3+0	37,5	
Recommended sets for TN-S system							
PIV12,5-275/2+0 / PIV12,5-275 DS/2+0	10 158 / 10159	2	280	2	2+0	25	Residential houses with standard equipment, industrial structures free of people and internal equipment
PIV12,5-275/4+0 / PIV12,5-275 DS/4+0	10195 / 10196	4	560	4	4+0	50	
Recommended sets for TN-S a TT systems							
PIV12,5-275/1+1 / PIV12,5-275 DS/1+1	10 160 / 10 161	2	256	2	1+1	25	Residential houses with standard equipment, industrial structures free of people and internal equipment
PIV12,5-275/3+1 / PIV12,5-275 DS/3+1	10 154 / 10 155	4	536	4	3+1	50	

TE - diving unit (17,5 mm)

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / CE





PIVM12,5-275
PIVM12,5-275 DS

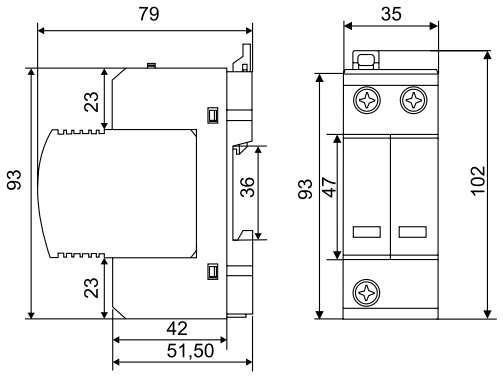
PIVM12,5-275 **Vseries** is a single-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where it provides the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIVM12,5-275 **Vseries** is mainly in the power supply lines. The main use of PIVM12,5-275 **Vseries** arrester is in structures of LPL III – IV according to EN 62305 ed.2.

The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIVM12,5-275, PIVM12,5-275 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	140 g
Article number		
PIVM12,5-275		16 046
PIVM12,5-275 DS		16 047
Varistor-based spare module		PIVM12,5-275/M
		16 058

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE



PIVM12,5-275/1+1
PIVM12,5-275 DS/1+1

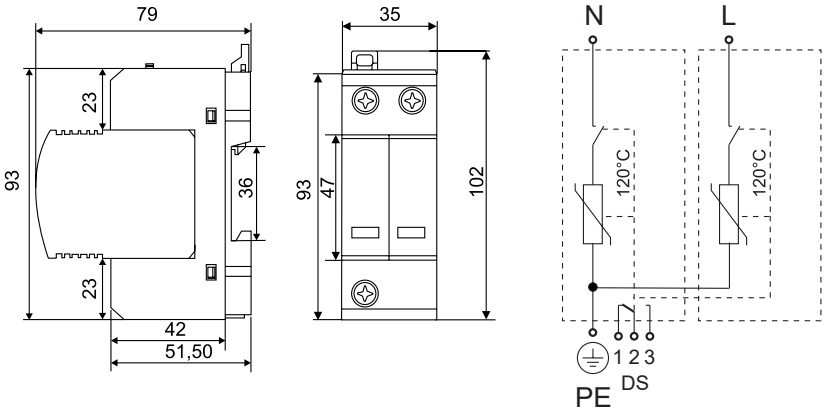
PIVM12,5-275/1+1 **V series** is a two-pole, metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305 ed.2), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIVM12,5-275/1+1 **V series** is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of PIVM12,5-275/1+1 **V series** arrester is in structures of LPL III – IV according to EN 62305 ed.2.

The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type		**PIVM12,5-275/1+1, PIVM12,5-275 DS/1+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Total lightning current (10/350) L1+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	171 g
Article number		
PIVM12,5-275/1+1		16 048
PIVM12,5-275 DS/1+1		16 049
Varistor-based spare module		PIVM12,5-275/M
		16 058
GDT spare module		B25M/M
		16 041

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE



PIVM12,5-275/2+0
PIVM12,5-275 DS/2+0

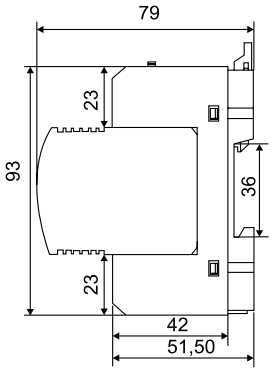
PIVM12,5-275/2+0 **Vseries** is a two-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIVM12,5-275/2+0 **Vseries** is mainly in the power supply lines, which are operated as TN-S system. The main use of PIVM12,5-275/2+0 **Vseries** arrester is in structures of LPL III – IV according to EN 62305 ed.2.

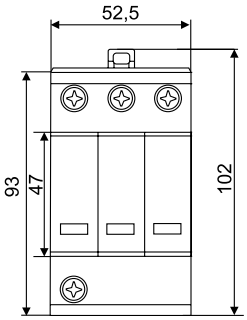
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

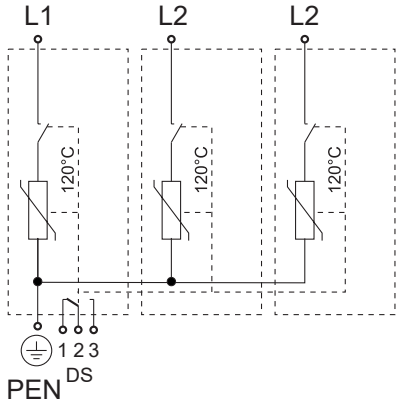
Type Vseries		**PIVM12,5-275/2+0, PIVM12,5-275 DS/2+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Total lightning current (10/350) L1+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		25 mm^2 (solid)
(at tightening moment of clamps 4 Nm)		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	280 g
Article number		
PIVM12,5-275/2+0		16 050
PIVM12,5-275 DS/2+0		16 051
Varistor-based spare module		PIVM12,5-275/M
		16 058

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-C / CE







PIVM12,5-275/3+0
PIVM12,5-275 DS/3+0

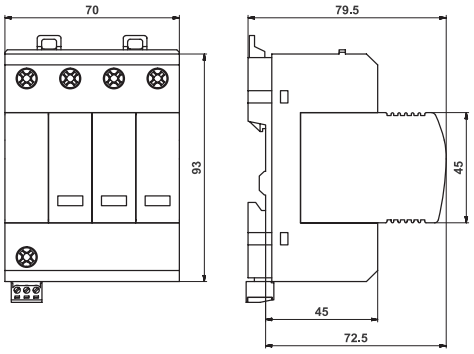
PIVM12,5-275/3+0 **Vseries** is a three-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIVM12,5-275/3+0 **Vseries** is mainly in the power supply lines, which are operated as TN-C system. The main use of PIVM12,5-275/3+0 **Vseries** arrester is in structures of LPL III – IV according to EN 62305 ed.2.

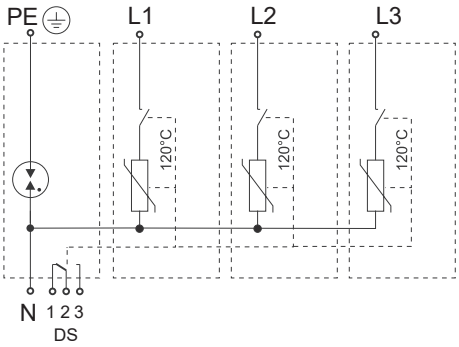
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIVM12,5-275/3+0, PIVM12,5-275 DS/3+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Total lightning current (10/350) L1+L2+L3→PEN	I_{total}	37,5 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		25 mm^2 (solid)
(at tightening moment of clamps 4 Nm)		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	420 g
Article number		
PIVM12,5-275/3+0		16 052
PIVM12,5-275 DS/3+0		16 053
Varistor-based spare module		PIVM12,5-275/M
		16 058

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE





PIVM12,5-275/3+1
PIVM12,5-275 DS/3+1

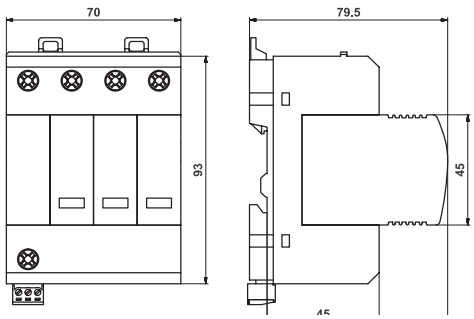
PIVM12,5-275/3+1 **Vseries** is a four-pole, metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to ICE EN 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIVM12,5-275/3+1 **Vseries** is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of PIVM12,5-275/3+1 **Vseries** arrester is in structures of LPL III – IV according to IEC EN 62305.

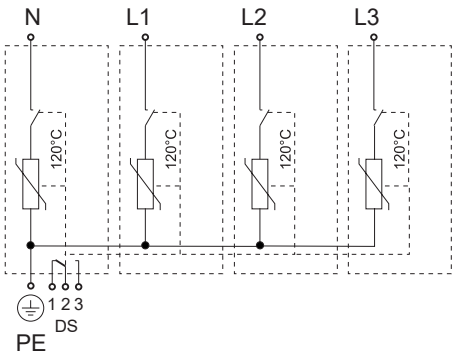
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIVM12,5-275/3+1, PIVM12,5-275 DS/3+1**
Test class according to IEC EN 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	50 kA
- charge	Q	25 As
- specific energy	W/R	625 kJ/Ω
Total lightning current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	536 g
Article number		
PIVM12,5-275/3+1		16 054
PIVM12,5-275 DS/3+1		16 055
Varistor-based spare module		PIVM12,5-275/M
		16 058
GDT spare module		B50M/M
		16 060

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE





PIVM12,5-275/4+0
PIVM12,5-275 DS/4+0

PIVM12,5-275/4+0 **Vseries** is a four-pole lightning and surge arrester Type 1+2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0 – 1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters PIVM12,5-275/4+0 **Vseries** is mainly in the power supply lines, which are operated as TN-S system. The main use of PIVM12,5-275/4+0 **Vseries** arrester is in structures of LPL III – IV according to EN 62305 ed.2.

The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIVM12,5-275/4+0, PIVM12,5-275 DS/4+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6,25 As
- specific energy	W/R	39 kJ/Ω
Total lightning current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		25 mm^2 (solid)
(at tightening moment of clamps 4 Nm)		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	560 g
Article number		
PIVM12,5-275/4+0		16 056
PIVM12,5-275 DS/4+0		16 057
Varistor-based spare module		PIVM12,5-275/M
		16 058

Lightning and surge arrester / TYPE 1+2

Application table								
Type	**Art. No.**	**TE**	**Weight (g)**	**No. of poles**	**Connection**	**I_{imp} (kA)**	**U_C (V)**	**Mode of protection**
PIVM12,5-275 Vseries / PIVM12,5-275 DS Vseries	16 046 / 16 047	1	140	1	1+0	12,5	275	L/N, L/PEN, L/PE
B50M Vseries	16 059	1	116	1	0+1	50	255	N/PE

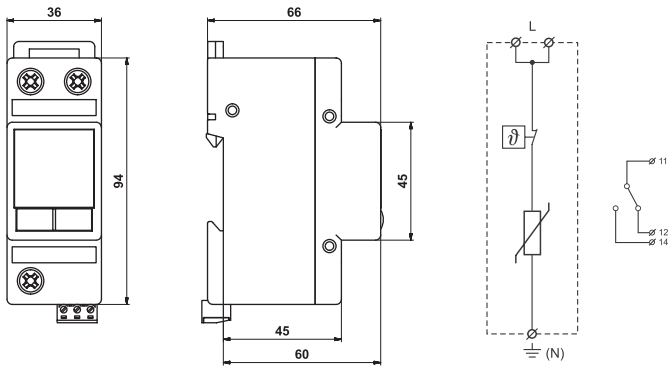
Recommended sets for TN-C system	**Art. No.**	**TE**	**Weight (g)**	**No. of poles**	**Connection**	**I_{total} (kA)**	**Application**
PIVM12,5-275 Vseries / PIVM12,5-275 DS Vseries	16 046 / 16 047	1	140	1	1+0	12,5	Residential houses with standard equipment, industrial structures free of people and internal equipment
PIVM12,5-275/3+0 Vseries /PIVM12,5-275 DS/3+0 Vseries	16 052 / 16 053	3	420	3	3+0	37,5	
Recommended sets for TN-S system							
PIVM12,5-275/2+0 Vseries / PIVM12,5-275 DS/2+0 Vseries	16 050 / 16 051	2	280	2	2+0	25	Residential houses with standard equipment, industrial structures free of people and internal equipment
PIVM12,5-275/4+0 Vseries / PIVM12,5-275 DS/4+0 Vseries	16 056 / 16 057	4	560	4	4+0	50	
Recommended sets for TN-S a TT systems							
PIVM12,5-275/1+1 Vseries / PIVM12,5-275 DS/1+1 Vseries	16 048 / 16 049	2	256	2	1+1	25	Residential houses with standard equipment, industrial structures free of people and internal equipment
PIVM12,5-275/3+1 Vseries / PIVM12,5-275 DS/3+1 Vseries	16 054 / 16 055	4	536	4	3+1	50	

Spare module			
Type	**Art. No.**		**Weight (g)**
PIVM12,5-275/M Vseries	16 058		92
B50M/M Vseries	16 060		71

TE - diving unit (17,5 mm)

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / CE



SPC12,5
SPC12,5 DS

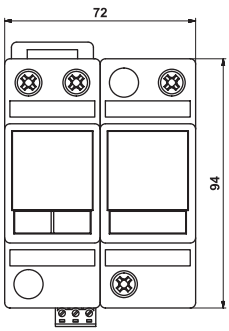
SPC12,5 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC12,5 is mainly in the power supply lines. The main use of SPC12,5 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

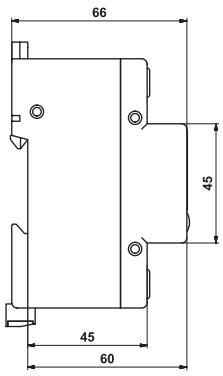
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

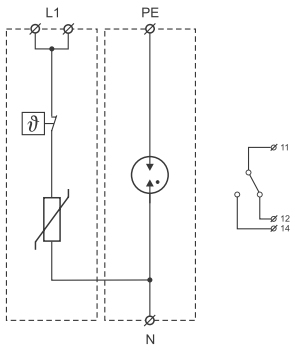
Type		**SPC12,5, SPC12,5 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6 As
- specific energy	W/R	36 kJ/Ω
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	240 g
Article number		
SPC12,5		10 744
SPC12,5 DS		10 644

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE







SPC12,5/1+1
SPC12,5 DS/1+1

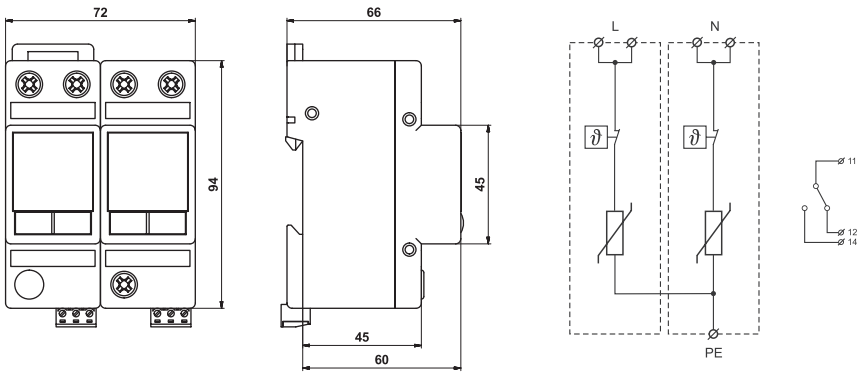
SPC12,5/1+1 is a metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11.These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC12,5/1+1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of SPC12,5/1+1 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC12,5/1+1, SPC12,5/1+1 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA
- charge	Q	6 As
- specific energy	W/R	36 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Total lightning impulse current (10/350) L1+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+N→PE	I_{total}	100 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	370 g
Article number		
SPC12,5/1+1		10 740
SPC12,5 DS/1+1		10 640

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE



SPC12,5/2+0
SPC12,5 DS/2+0

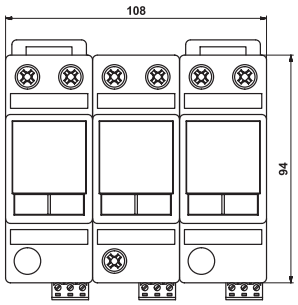
SPC12,5/2+0 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC12,5/2+0 is mainly in the power supply lines. The main use of SPC12,5/2+0 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

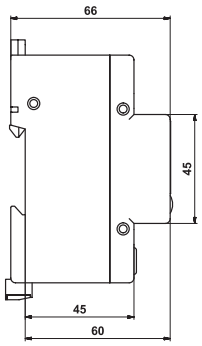
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

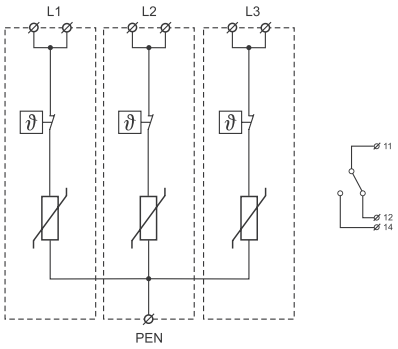
Type		**SPC12,5/2+0, SPC12,5 DS/2+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6 As
- specific energy	W/R	36 kJ/Ω
Total lightning impulse current (10/350) L+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L+N→PE	I_{total}	100 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	480 g
Article number		
SPC12,5/2+0		10 754
SPC12,5 DS/2+0		10 755

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-C / CE







SPC12,5/3+0
SPC12,5 DS/3+0

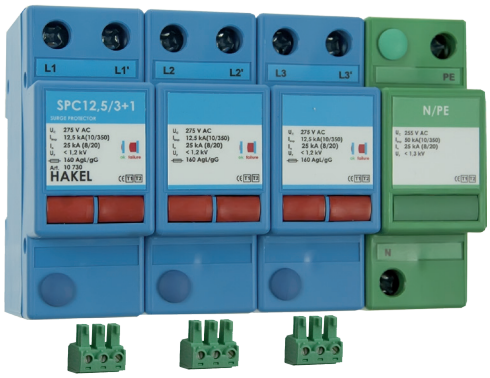
SPC12,5/3+0 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC12,5/3+0 is mainly in the power supply lines. The main use of SPC12,5/3+0 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

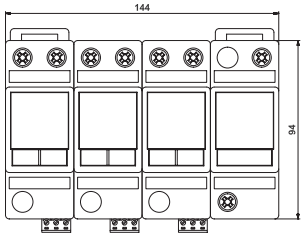
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

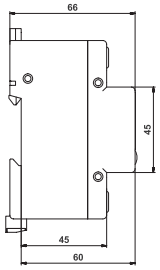
Type		**SPC12,5/3+0, SPC12,5 DS/3+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6 As
- specific energy	W/R	36 kJ/Ω
Total lightning impulse current (10/350) L1+L2+L3→PEN	I_{total}	37,5 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+L2+L3→PEN	I_{total}	150 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	720 g
Article number		
SPC12,5/3+0		10 734
SPC12,5 DS/3+0		10 634

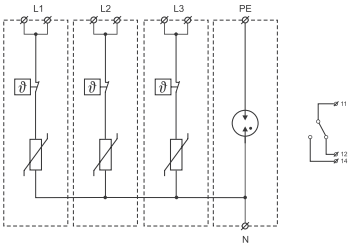
Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE









SPC12,5/3+1
SPC12,5 DS/3+1

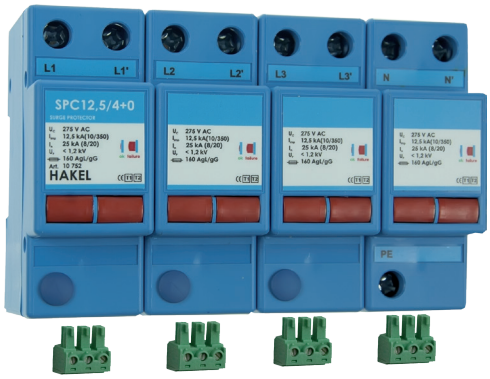
SPC12,5/3+1 is a metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11.These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC12,5/3+1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of SPC12,5/3+1 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

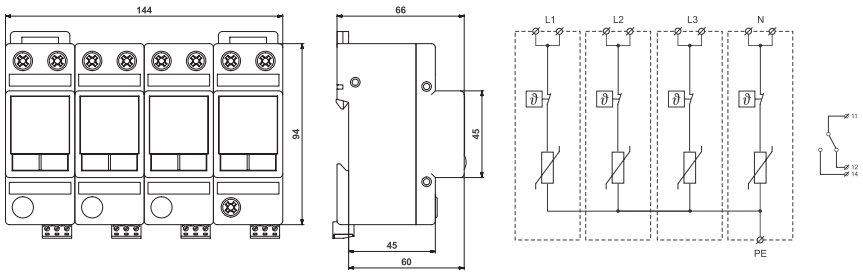
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC12,5/3+1, SPC12,5/3+1 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA
- charge	Q	6 As
- specific energy	W/R	36 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	50 kA
- charge	Q	25 As
- specific energy	W/R	625 kJ/Ω
Total lightning impulse current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+L2+L3+N→PE	I_{total}	100 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid)
		25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	1030 g
Article number		
SPC12,5/3+1		10 730
SPC12,5 DS/3+1		10 630

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE





SPC12,5/4+0
SPC12,5 DS/4+0

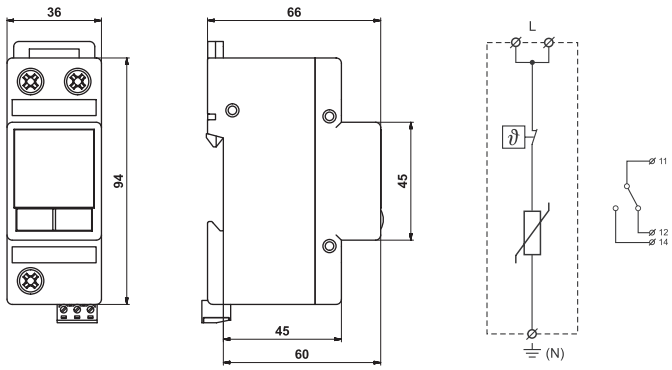
SPC12,5/4+0 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC12,5/4+0 is mainly in the power supply lines. The main use of SPC12,5/4+0 arrester is in structures of LPL III – IV according to EN 62305 ed.2.

Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC12,5/4+0, SPC12,5 DS/4+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	12,5 kA
- charge	Q	6 As
- specific energy	W/R	36 kJ/Ω
Total lightning impulse current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+L2+L3+N→PE	I_{total}	200 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	960 g
Article number		
SPC12,5/4+0		10 752
SPC12,5 DS/4+0		10 753

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / CE



SPC25
SPC25 DS

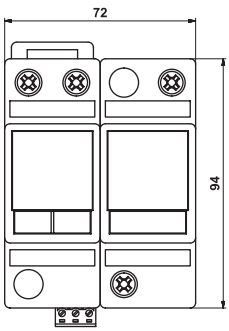
SPC25 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC25 is mainly in the power supply lines. The main use of SPC25 arrester is in structures of LPL I – II according to EN 62305 ed.2.

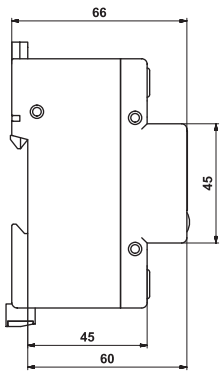
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

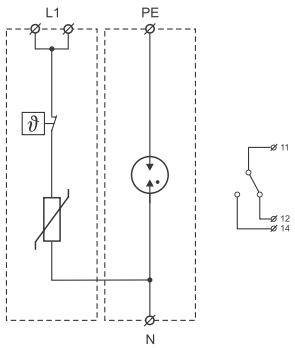
Type		**SPC25, SPC25 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350 μs)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		250 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	300 g
Article number		
SPC25		10 746
SPC25 DS		10 646

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE







SPC25/1+1
SPC25 DS/1+1

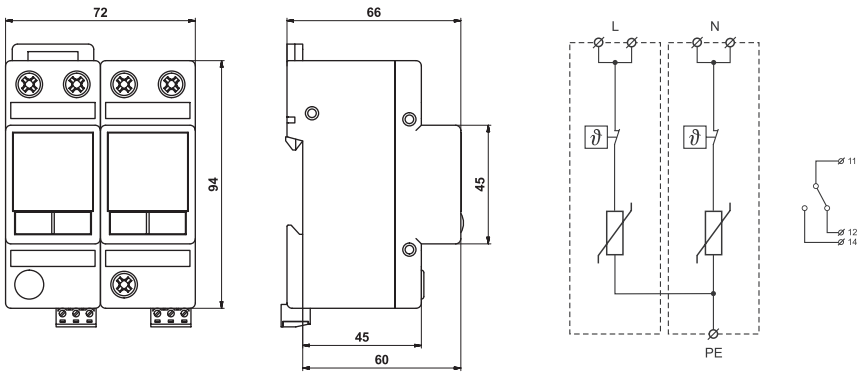
SPC25/1+1 is a metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11.These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC25/1+1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of SPC25/1+1 arrester is in structures of LPL I – II according to EN 62305 ed.2.

Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC25/1+1, SPC25 DS/1+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350) L/N	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	50 kA
- charge	Q	25 As
- specific energy	W/R	625 kJ/Ω
Total lightning impulse current (10/350) L1+N→PE	I_{total}	25 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+N→PE	I_{total}	100 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		250 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	460 g
Article number		
SPC25/1+1		10 742
SPC25 DS/1+1		10 642

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE



SPC25/2+0
SPC25 DS/2+0

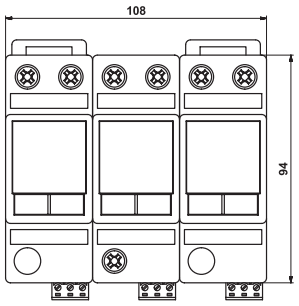
SPC25/2+0 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC25/2+0 is mainly in the power supply lines. The main use of SPC25/2+0 arrester is in structures of LPL I – II according to EN 62305 ed.2.

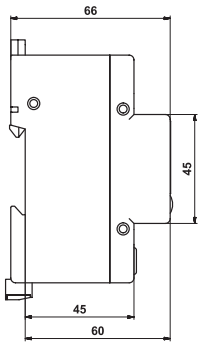
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

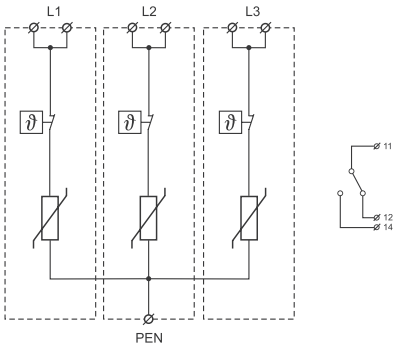
Type		**SPC25/2+0, SPC25 DS/2+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Total lightning impulse current (10/350) L+N→PE	I_{total}	50 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L+N→PE	I_{total}	100 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		250 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	600 g
Article number		
SPC25/2+0		10 653
SPC25 DS/2+0		10 650

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-C / CE







SPC25/3+0
SPC25 DS/3+0

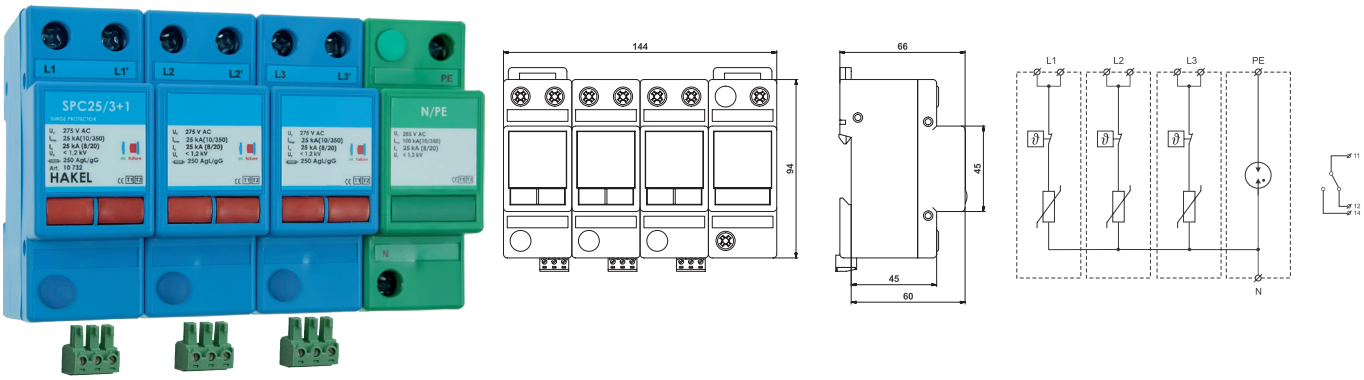
SPC25/3+0 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC25/3+0 is mainly in the power supply lines. The main use of SPC25/3+0 arrester is in structures of LPL I – II according to EN 62305 ed.2.

Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC25/3+0, SPC25 DS/3+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Total lightning impulse current (10/350) L1+L2+L3→PEN	I_{total}	75 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+L2+L3→PEN	I_{total}	150 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		250 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
Protection type		IP20
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	900 g
Article number		
SPC25/3+0		10 736
SPC25 DS/3+0		10 636

Lightning and surge arrester / varistor + gas discharge tube / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / TT / CE



SPC25/3+1
SPC25 DS/3+1

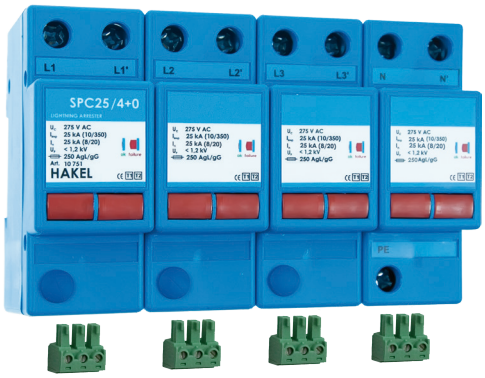
SPC25/3+1 is a metal oxid varistor lightning and surge arrester, combined with gas discharge tube Type 1+2 according to EN 61643-11 and IEC 61643-11.These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC25/3+1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of SPC25/3+1 arrester is in structures of LPL I – II according to EN 62305 ed.2.

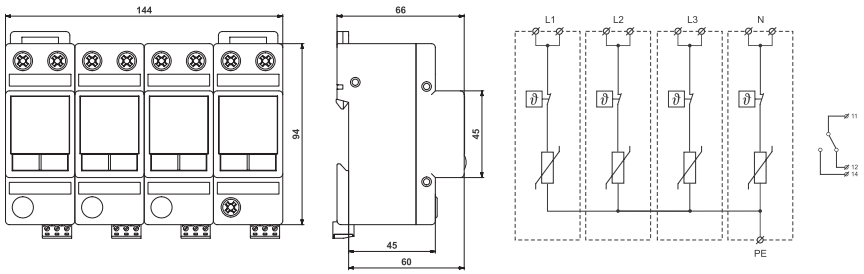
Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC25/3+1, SPC25/3+1 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350) L/N	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Lightning impulse current (10/350) N/PE	I_{imp}	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/Ω
Total lightning impulse current (10/350) L1+L2+L3+N→PE	I_{total}	100 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+L2+L3+N→PE	I_{total}	200 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		250 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid)
		25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	1125 g
Article number		
SPC25/3+1		10 732
SPC25 DS/3+1		10 632

Lightning and surge arrester / varistor / TYPE 1+2

TYPE 1+2 / CLASS I+II / TN-S / CE





SPC25/4+0
SPC25 DS/4+0

SPC25/4+0 is a metal oxid varistor lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of both, the lightning current and the switching surge, which are generated in power supply systems entering the building. The use of the lightning current arresters SPC25/4+0 is mainly in the power supply lines. The main use of SPC25/4+0 arrester is in structures of LPL I – II according to EN 62305 ed.2.

Double terminals of the device allow the "V" connection at the maximum current-carrying capacity of 125A.

Type		**SPC25/4+0, SPC25 DS/4+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Lightning impulse current (10/350)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Ω
Total lightning impulse current (10/350) L1+L2+L3+N→PE	I_{total}	100 kA
Nominal discharge current (8/20)	I_n	25 kA
Max. discharge current (8/20)	I_{max}	50 kA
Total lightning current (8/20 μs) L1+L2+L3+N→PE	I_{total}	200 kA
Voltage protection level	U_P	< 1,2 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		250 A gL/gG
Max. back-up fuse („V" connection)		125 A gL/gG
Short-circuit withstand capability	I_p	80 kA_{rms}
LPZ		0-1
Housing material		Polyamid PA6, UL 94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40 °C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm^2 (solid) 25 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100 000 h
Weight	m	1200 g
Article number		
SPC25/4+0		10 751
SPC25 DS/4+0		10 651

Application table

Type	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{imp}/I_{total} (kA)	U_C (V) L-N/N-PE	Mode of protection
Industrial buildings, administration buildings, schools, supermarkets and cathedrals.								
SPC12,5 / SPC12,5 DS	10 744 / 10 644	2	240	1	1+0	12,5/-	275/-	L/N, L/PEN, L/PE
SPC12,5 DS/1+1 / SPC12,5/1+1	10 644 / 10 740	2	240	1	1+0	12,5/25	275/-255	L/N, N/PE
SPC12,5/2+0 / SPC12,5 DS/2+0	10 754 / 10 755	4	480	2	2+0	12,5/25	275/275	L/N, N/PE
SPC12,5/3+0 / SPC12,5 DS/3+0	10 734 / 10 634	6	720	3	3+0	12,5/37,5	275/-	L/PEN
SPC12,5/3+1 / SPC12,5 DS/3+1	10 730 / 10 630	8	1030	4	3+1	12,5/50	275/255	L/N, N/PE
SPC12,5/4+0 / SPC12,5 DS/4+0	10 752 / 10 753	8	960	4	4+0	12,5/50	275/275	L/N, N/PE

TE - diving unit (17,5 mm)

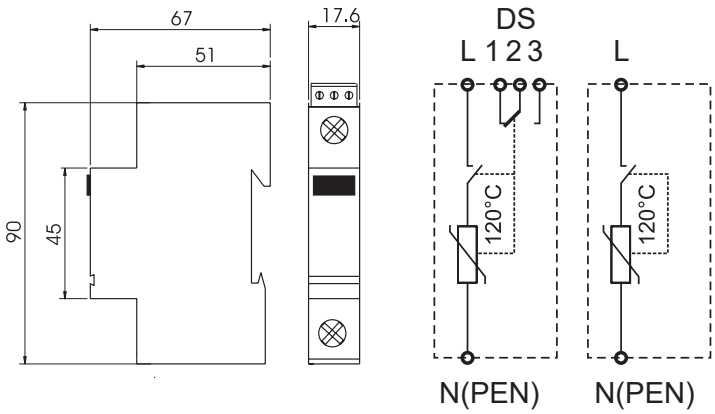
Application table

Type	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{imp}/I_{total} (kA)	U_C (V) L-N/N-PE	Mode of protection
Hospitals, banks, mobile operator stations, water-stations, power plants, airport buildings for air traffic control and all structures with explosive risk.								
SPC25 / SPC25 DS	10 746 / 10 646	2	300	1	1+0	25/-	275/-	L/N, L/PEN, L/PE
SPC25/1+1 / SPC25 DS/1+1	10 742 / 10 642	4	460	2	1+1	25/50	275/255	L/N, N/PE
SPC25 /2+0 / SPC25 DS/2+0	10 053 / 10 650	4	600	2	2+0	25/50	275/-275	L/PEN
SPC25/3+0 / SPC25 DS/3+0	10 736 / 10 636	6	900	3	3+0	25/75	275/-	L/PEN
SPC25/3+1 / SPC25 DS/3+1	10 732 / 10 632	8	1125	4	3+1	25/100	275/255	L/N, N/PE
SPC25/4+0 / SPC25DS /4+0	10 751 / 10 651	8	1200	4	4+0	25/100	275/275	L/N, N/PE

TE - diving unit (17,5 mm)

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / CE



PIII-275
PIII-275 DS

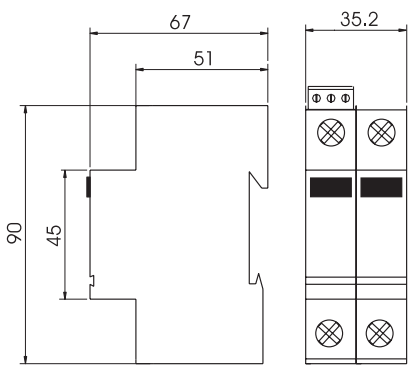
PIII-275 is a single-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIII-275 arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

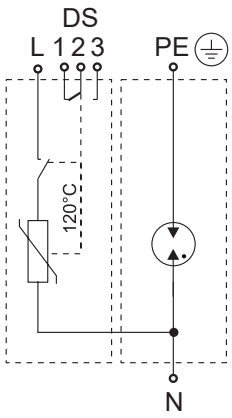
The marking of DS specifies a version with remote monitoring.

Type		**PIII-275, PIII-275 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	96 g
Article number		
PIII-275		24 001
PIII-275 DS		24 020

Surge arrester / varistor + gas discharge tube / TYPE 2

TYPE 2 / CLASS II / TN-S / TT / CE





PIII-275/1+1
PIII-275 DS/1+1

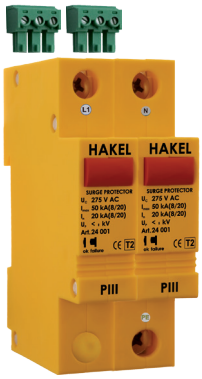
PIII-275/1+1 is a two-pole, metal oxid varistor surge arrester combined with gas discharge tube, Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIII-275/1+1 arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

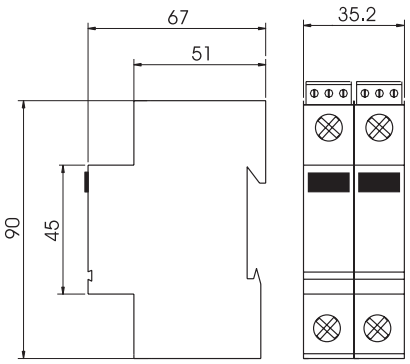
The marking of DS specifies a version with remote monitoring.

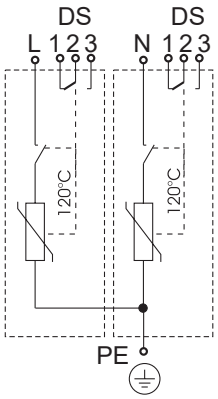
Type		**PIII-275/1+1, PIII-275 DS/1+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20) L/N	I_n	20 kA
Nominal discharge current (8/20) N/PE	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Lightning impulse current (10/350) N/PE	I_{imp}	20 kA
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure indication		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	174 g
Article number		
PIII-275/1+1		24 144
PIII-275 DS/1+1		24 145

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / TN-S / CE







PIII-275/2+0
PIII-275 DS/2+0

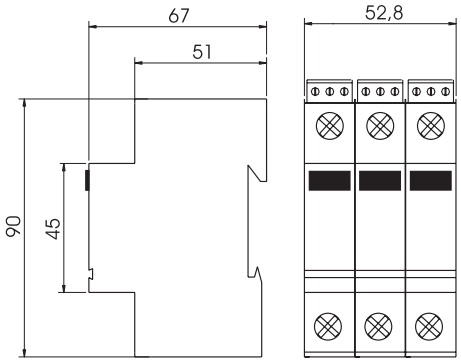
PIII-275/2+0 is a two-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIII-275/2+0 arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

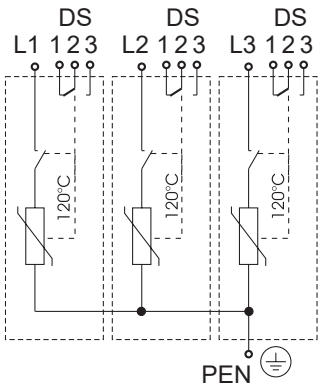
The marking of DS specifies a version with remote monitoring.

Type		**PIII-275/2+0, PIII-275 DS/2+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	192 g
Article number		
PIII-275/2+0		24 146
PIII-275 DS/2+0		24 147

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / TN-C / CE





PIII-275/3+0
PIII-275 DS/3+0

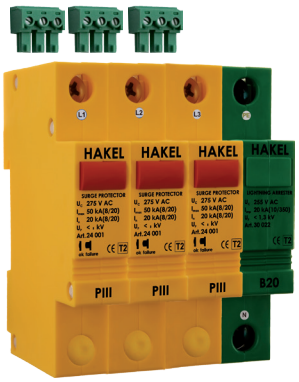
PIII-275/3+0 is a three-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIII-275/3+0 arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

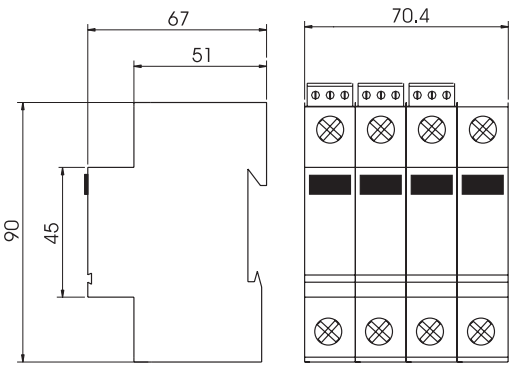
The marking of DS specifies a version with remote monitoring.

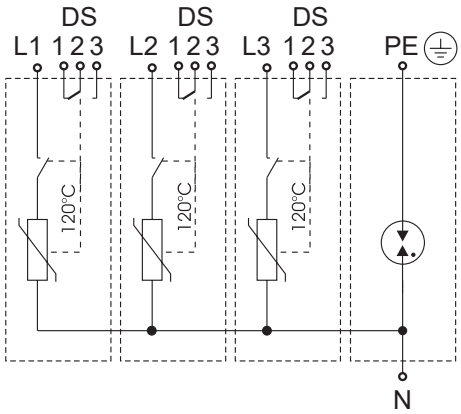
Type		**PIII-275/3+0, PIII-275 DS/3+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	288 g
Article number		
PIII-275/3+0		24 004
PIII-275 DS/3+0		24 005

Surge arrester / varistor + gas discharge tube / TYPE 2

TYPE 2 / CLASS II / TN-S / TT / CE







PIII-275/3+1
PIII-275 DS/3+1

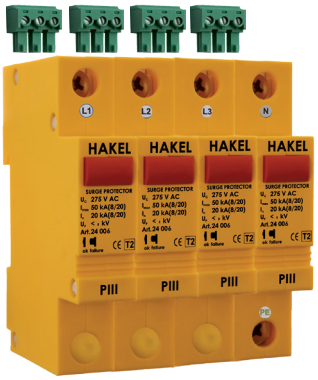
PIII-275/3+1 is a four-pole, metal oxid varistor surge arrester combined with gas discharge tube, Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIII-275/3+1 arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

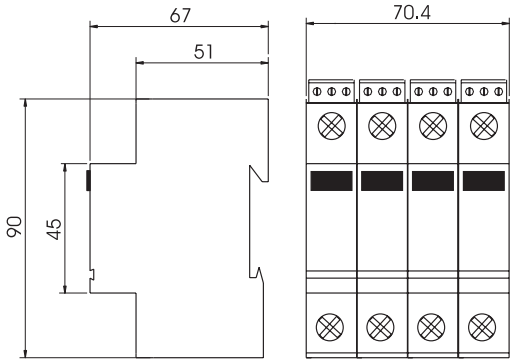
The marking of DS specifies a version with remote monitoring.

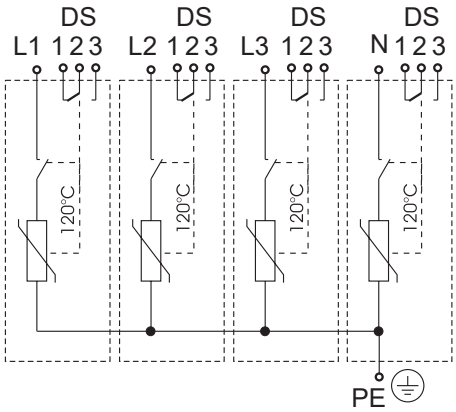
Type		**PIII-275/3+1, PIII-275 DS/3+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20) L/N	I_n	20 kA
Nominal discharge current (8/20) N/PE	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Lightning impulse current (10/350) N/PE	I_{imp}	20 kA
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure indication		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	366 g
Article number		
PIII-275/3+1		24 148
PIII-275 DS/3+1		24 149

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / TN-S / CE







PIII-275/4+0
PIII-275 DS/4+0

PIII-275/4+0 is a four-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIII-275/4+0 arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

The marking of DS specifies a version with remote monitoring.

Type		**PIII-275/4+0, PIII-275 DS/4+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	384 g
Article number		
PIII-275/4+0		24 006
PIII-275 DS/4+0		24 007

Surge arrester / TYPE 2

Application table

Type	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	U_c (V)	Mode of protection
PIII-75 / PIII-75 DS	24 002 / 24 021	1	80 / 86	1	1+0	40	75	L/N, L/PEN, L/PE
PIII-150 / PIII-150 DS	24 120 / 24 121	1	84 / 92	1	1+0	40	150	L/N, L/PEN, L/PE
PIII-275 / PIII-275 DS	24 001 / 24 020	1	93 / 96	1	1+0	50	275	L/N, L/PEN, L/PE
PIII-320 / PIII-320 DS	24 320 / 24 321	1	98 / 100	1	1+0	50	320	L/N, L/PEN, L/PE
PIII-385 / PIII-385 DS	24 322 / 24 323	1	95 / 102	1	1+0	40	385	L/N, L/PEN, L/PE
PIII-440 / PIII-440 DS	24 009 / 24 040	1	103 / 110	1	1+0	40	440	L/N, L/PEN, L/PE
PIII-600 / PIII-600 DS	24 010 / 24025	1	109 / 110	1	1+0	40	600	L/N, L/PEN, L/PE
PIII-720 / PIII-720 DS	24 014 / 24 070	1	116 / 118	1	1+0	40	720	L/N, L/PEN, L/PE
PIII-850 / PIII-850 DS	24 015 / 24 016	1	122 / 124	1	1+0	40	850	L/N, L/PEN, L/PE
B20	30 022	1	76	1	0+1	50	255	N/PE

Recommended sets for TN-C system

Set	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	Application
PIII-275 / PIII-275 DS	24 001 / 24 020	1	93 / 96	1	1+0	50	Secondary switchboard, control box
PIII-275/3+0 / PIII-275 DS/3+0	24 004 / 24 005	3	279 / 288	3	3+0	50	Secondary switchboard, control box

Recommended sets for TN-S system

Set	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	Application
PIII-275/2+0 / PIII-275DS/2+0	24 146 / 24 147	2	192 192	2	2+0	50	Secondary switchboard, control box
PIII-275/4+0 / PIII-275DS/4+0	24 006 / 24 006	4	384 / 385	4	4+0	50	Secondary switchboard, control box

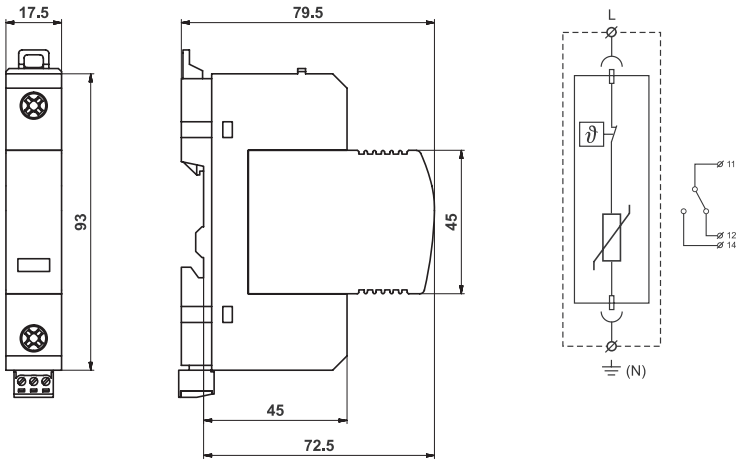
Recommended sets for TN-S a TT systems

Set	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	Application
PIII-275/1+1 / PIII-275DS/1+1	24 144 / 24 145	2	174 / 174	2	1+1	50	Secondary switchboard, control box
PIII-275/3+1 / PIII-275DS/3+1	24 148 / 24 149	4	366 / 367	4	3+1	50	Secondary switchboard, control box

TE - diving unit (17,5 mm)

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / CE



PIIIM-275
PIIIM-275 DS

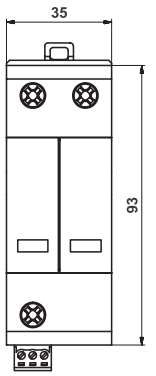
PIIIM-275 **Vseries** is a single-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIIIM-275 **Vseries** arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

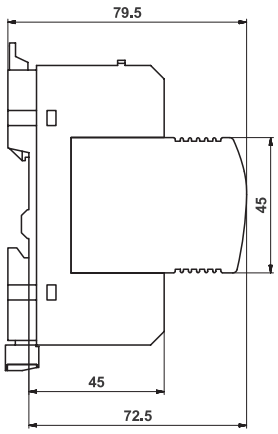
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

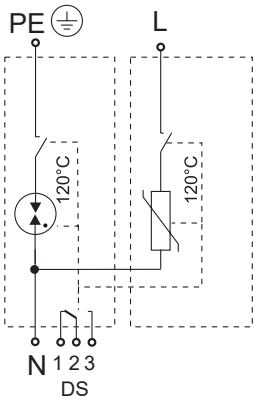
Type Vseries		**PIIIM-275, PIIIM-275 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	90 g
Article number		
PIIIM-275		27 004
PIIIM-275 DS		27 005
Varistor-based spare module		PIIIM-275/M
		27 044

Surge arrester / varistor + gas discharge tube / TYPE 2

TYPE 2 / CLASS II / TN-S / TT / CE







PIIIM-275/1+1
PIIIM-275 DS/1+1

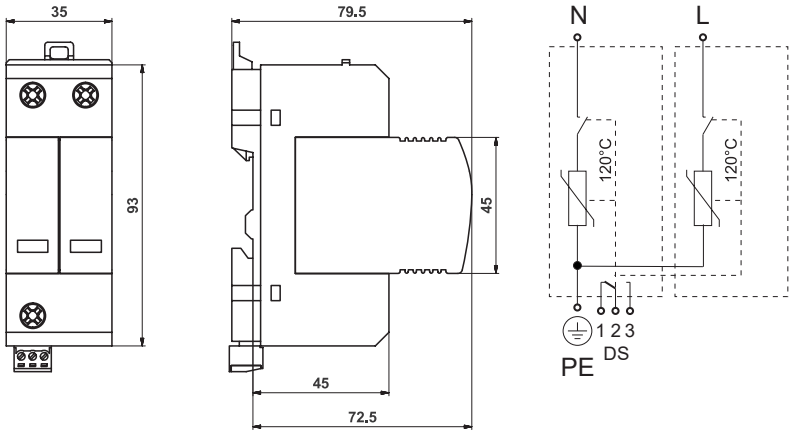
PIIIM-275/1+1 **Vseries** is a two-pole, metal oxid varistor surge arrester combined with gas discharge tube, Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIIIM-275/1+1 **Vseries** arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIIIM-275/1+1, PIIIM-275 DS/1+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20) L/N	I_n	20 kA
Nominal discharge current (8/20) N/PE	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Lightning impulse current (10/350) N/PE	I_{imp}	20 kA
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure indication		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	166 g
Article number		
PIIIM-275/1+1		27 014
PIIIM-275 DS/1+1		27 015
Varistor-based spare module		PIIIM-275/M
		27 044
GDT spare module		B20M/M
		27 049

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / TN-S / CE



PIIIM-275/2+0
PIIIM-275 DS/2+0

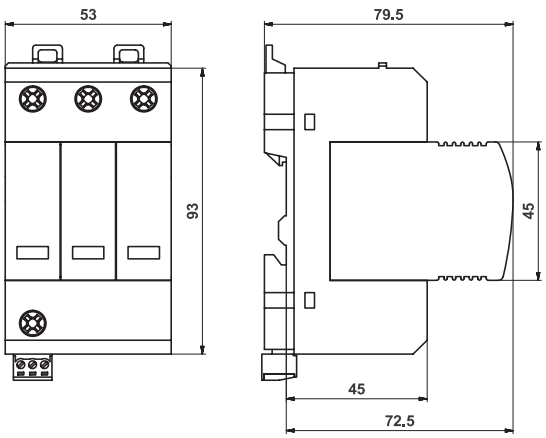
PIIIM-275/2+0 **Vseries** is a two-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIIIM-275/2+0 **Vseries** arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

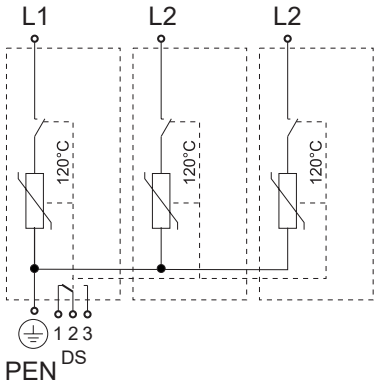
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIIIM-275/2+0, PIIIM-275 DS/2+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	180 g
Article number		
PIIIM-275/2+0		27 050
PIIIM-275 DS/2+0		27 051
Varistor-based spare module		PIIIM-275/M
		27 044

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / TN-C / CE





PIIIM-275/3+0
PIIIM-275 DS/3+0

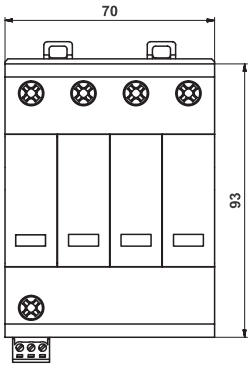
PIIIM-275/3+0 **Vseries** is a three-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIIIM-275/3+0 **Vseries** arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

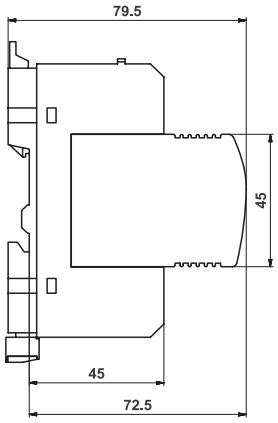
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

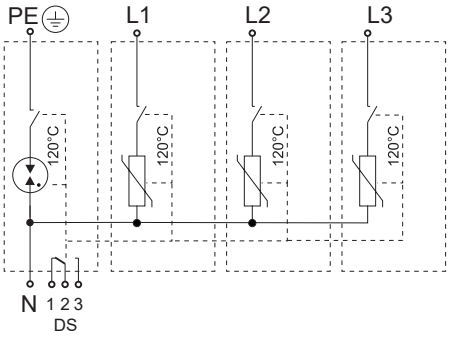
Type Vseries		**PIIIM-275/3+0, PIIIM-275 DS/3+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	270 g
Article number		
PIIIM-275/3+0		27 032
PIIIM-275 DS/3+0		27 033
Varistor-based spare module		PIIIM-275/M
		27 044

Surge arrester / varistor + gas discharge tube / TYPE 2

TYPE 2 / CLASS II / TN-S / TT / CE







PIIIM-275/3+1
PIIIM-275 DS/3+1

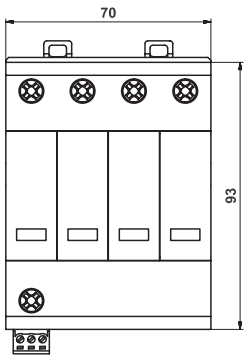
PIIIM-275/3+1 **Vseries** is a four-pole, metal oxid varistor surge arrester combined with gas discharge tube, Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIIIM-275/3+1 **Vseries** arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

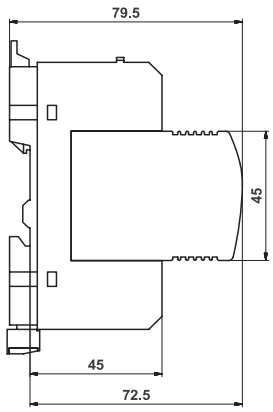
The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

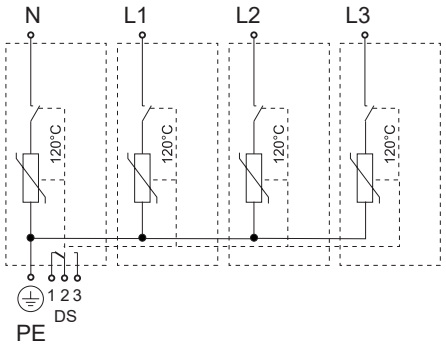
Type Vseries		**PIIIM-275/3+1, PIIIM-275 DS/3+1**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20) L/N	I_n	20 kA
Nominal discharge current (8/20) N/PE	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Lightning impulse current (10/350) N/PE	I_{imp}	20 kA
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0,2 s
Response time L/N	t_A	< 25 ns
Response time N/PE	t_A	< 100 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure indication		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	346 g
Article number		
PIIIM-275/3+1		27 022
PIIIM-275 DS/3+1		27 023
Varistor-based spare module		PIIIM-275/M
		27 044
GDT spare module		B20M/M
		27 049

Surge arrester / varistor / TYPE 2

TYPE 2 / CLASS II / TN-S / CE







PIIIM-275/4+0
PIIIM-275 DS/4+0

PIIIM-275/4+0 **Vseries** is a four-pole, metal oxid varistor surge arrester Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 1312-1 and EN 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building. The main use of PIIIM-275/4+0 **Vseries** arrester is in all kinds of industry, residential and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.

The marking **M** specifies a type of construction with removable module. The marking of **DS** specifies a version with remote monitoring.

Type Vseries		**PIIIM-275/4+0, PIIIM-275 DS/4+0**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	275 V AC / 350 V DC
Max. discharge current (8/20)	I_{max}	50 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	335 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_p	60 kA_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid)
		16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	360 g
Article number		
PIIIM-275/4+0		27 052
PIIIM-275 DS/4+0		27 053
Varistor-based spare module		PIIIM-275/M
		27 044

Surge arrester / TYPE 2

Application table

Type	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	U_C (V)	Mode of protection
PIIIM-75 γseries / PIIIM-75 DS γseries	27 000 / 27 001	1	78 / 82	1	1+0	40	75	L/N, L/PEN, L/PE
PIIIM-150 γseries / PIIIM-150 DS γseries	27 002 / 27 003	1	82 / 85	1	1+0	40	150	L/N, L/PEN, L/PE
PIIIM-275 γseries / PIIIM-275 DS γseries	27 004 / 27 005	1	85 / 89	1	1+0	50	275	L/N, L/PEN, L/PE
PIIIM-320 γseries / PIIIM-320 DS γseries	27 008 / 27 009	1	80 / 90	1	1+0	50	320	L/N, L/PEN, L/PE
PIIIM-385 γseries / PIIIM-385 DS γseries	27 010 / 27 011	1	92 / 100	1	1+0	40	385	L/N, L/PEN, L/PE
PIIIM-440 γseries / PIIIM-440 DS γseries	27 012 / 27 013	1	98 / 106	1	1+0	40	440	L/N, L/PEN, L/PE
B20M γseries	27 048	1	74	1	0+1	50	255	N/PE

Recommended sets for TN-C system

Set	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	Application
PIIIM-275 γseries / PIIIM-275 DS γseries	27 004 / 27 005	1	85 / 89	1	1+0	50	Secondary switchboard, control box
PIIIM-275/3+0 γseries / PIIIM-275 DS/3+0 γseries	27 032 / 27 033	3	255 / 267	3	3+0	50	Secondary switchboard, control box

Recommended sets for TN-S system

Set	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	Application
PIIIM-275/2+0 γseries / PIIIM-275 DS/2+0 γseries	27 050 / 27 051	2	180 / 182	2	2+0	50	Secondary switchboard, control box
PIIIM-275/4+0 γseries / PIIIM-275 DS/4+0 γseries	27 052 / 27 053	4	360 / 360	4	4+0	50	Secondary switchboard, control box

Recommended sets for TN-S system

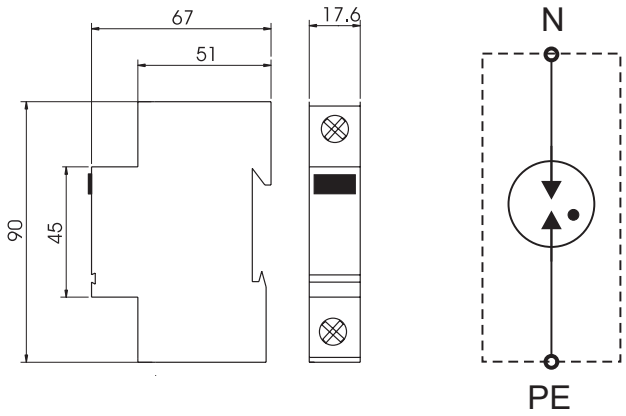
Set	Art. No.	TE	Weight (g)	No. of poles	Connection	I_{max} (kA)	Application
PIIIM-275/1+1 γseries / PIIIM-275 DS/1+1 γseries	27 014/ 27 015	2	165 / 167	2	1+1	50	Secondary switchboard, control box
PIIIM-275/3+1 γseries / PIIIM-275 DS/3+1 γseries	27 022 / 27 023	4	330 / 347	4	3+1	50	Secondary switchboard, control box

Spare module	Art. No.
PIIIM-75/M γseries	27 042
PIIIM-150/M γseries	27 043
PIIIM-275/M γseries	27 044
PIIIM-320/M γseries	27 045
PIIIM-385/M γseries	27 046
PIIIM-440/M γseries	27 047
B20M/M γseries	27 049

TE - diving unit (17,5 mm)

Lightning arrester / gas discharge tube / TYPE 1

TYPE 1 / CLASS I / TN-S / TT / CE



B25 **B50**

B25 and B50 are the encapsulated gas discharge tubes Type 1 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 1312-1 and EN 62305), in the power supply lines, which are operated as TN-S and TT systems, where they provide the equipotential bonding between N and PE in the connections of 1+1 or 3+1. Thanks to the high insulation resistance at the release condition, the GDT will not cause the activation of RCD (residual current-operated protective device)

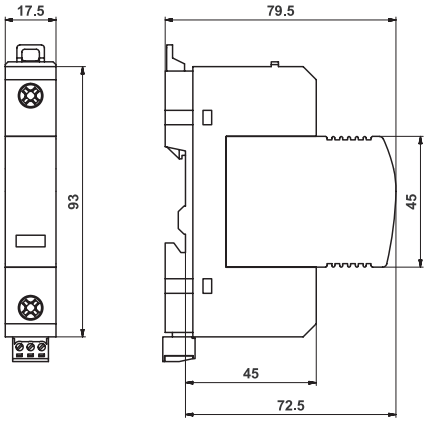
Note : For IT power supply networks use a special variant of gas dicharge tubes - find more in the catalogue's annex for IT networks.

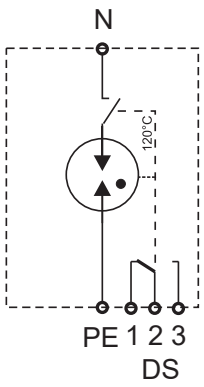
Type		**B25**	**B50**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1, CLASS I	
Max. continuous operating voltage	U_C	255 V AC	
Lightning impulse current (10/350)	I_{imp}	25 kA	50 kA
- charge	Q	12,5 As	25 As
- specific energy	W/R	156 kJ/Ω	625 kJ/Ω
Nominal discharge current (8/20)	I_n	30 kA	50 kA
Voltage protection level at lim_p	U_P	< 1,3 kV	
Temporary overvoltage (TOV)	U_T	1200 V/0,2 s	
Response time	t_A	< 100 ns	
Follow current interrupting rating at UC	I_{fi}	100 A_{rms}	
LPZ		0-1	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)	
Mounting on		DIN rail 35 mm	
Lifetime		min.100 000 h	
Weight	m	72 g	116 g
Article number		30 024	10 050

Lightning arrester / gas discharge tube / TYPE 1

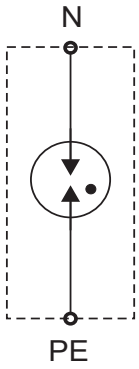
TYPE 1 / CLASS I / TN-S / TT / CE

B25M **B50M**





B25M



B50M

B25M $\mathcal{V}$series and B50M $\mathcal{V}$series are the encapsulated gas discharge tubes Type 1 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 1312-1 and EN 62305), in the power supply lines, which are operated as TN-S and TT systems, where they provide the equipotential bonding between N and PE in the connections of 1+1 or 3+1. Thanks to the high insulation resistance at the release condition, the GDT will not cause the activation of RCD.

Note : For IT power supply networks use a special variant of gas dicharge tubes - find more in the catalogue's annex for IT networks.

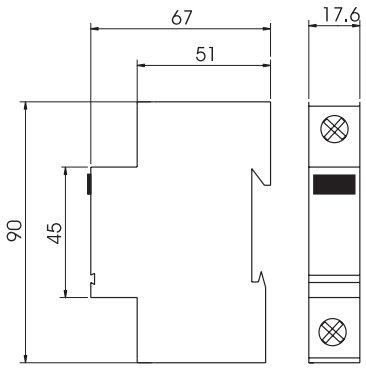
The marking M specifies a type of construction with removable module.
The marking of DS specifies a version with remote monitoring.

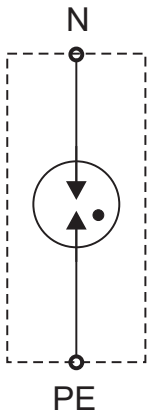
Type $\mathcal{V}$series		**B25M**	**B50M**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1, CLASS I	
Max. continuous operating voltage	U_C	255 V AC	
Lightning impulse current (10/350)	I_{imp}	25 kA	50 kA
- charge	Q	12,5 As	25 As
- specific energy	W/R	156 kJ/Ω	625 kJ/Ω
Nominal discharge current (8/20)	I_n	30 kA	50 kA
Voltage protection level at lim_p	U_P	< 1,3 kV	
Temporary overvoltage (TOV)	U_T	1200 V/0,2 s	
Response time	t_A	< 100 ns	
Follow current interrupting rating at UC	I_{fi}	100 A_{rms}	
LPZ		0-1	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)	
Mounting on		DIN rail 35 mm	
Failure signalisation (B25M)		green - ok / red - failure	
Potential free signal contact (DS) (B25M) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A	
Lifetime		min.100 000 h	
Weight	m	73 g	116 g
Article number		16 040	16 059

Varistor-based spare module		B25M/M	B50M/M
		16 041	16 060

Surge arrester / gas discharge tube / TYPE 2

TYPE 2 / CLASS II / TN-S / TT / CE





B20

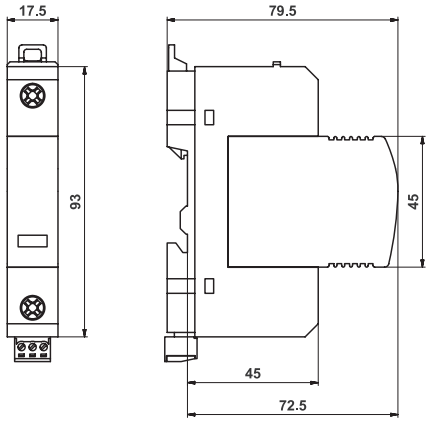
B20 is the encapsulated gas discharge tube Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 62305 and EN 62305), in the power supply lines, which are operated as TN-S and TT systems, where they provide the equipotential bonding between N and PE in the connections of 1+1 or 3+1. Thanks to the high insulation resistance at the release condition, the GDT will not cause the activation of RCD.

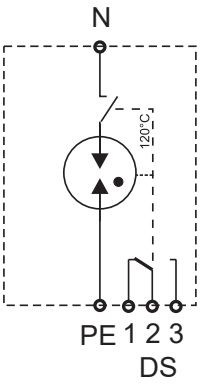
Note : For IT power supply networks use a special variant of gas dicharge tubes - find more in the catalogue's annex for IT networks.

Type		**B20**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	255 V AC
Lightning impulse current (10/350)	I_{imp}	20 kA
- charge	Q	10 As
- specific energy	W/R	100 kJ/Ω
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level at lim_p	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	1200 V/0,2 s
Response time	t_A	< 100 ns
Follow current interrupting rating at UC	I_{fi}	100 A_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Lifetime		min.100 000 h
Weight	m	78 g
Article number		30 022

Surge arrester / gas discharge tube / TYPE 2

TYPE 2 / CLASS II / TN-S / TT / CE





B20M

B20M **vseries** is the encapsulated gas discharge tube Type 2 according to EN 61643-11 and IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 62305 and EN 62305), in the power supply lines, which are operated as TN-S and TT systems, where they provide the equipotential bonding between N and PE in the connections of 1+1 or 3+1. Thanks to the high insulation resistance at the release condition, the GDT will not cause the activation of RCD.

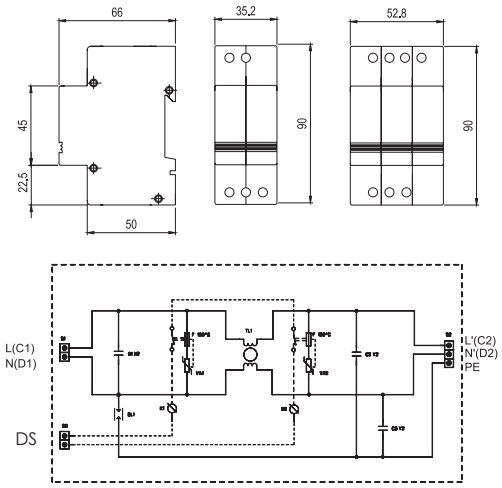
Note : For IT power supply networks use a special variant of gas dicharge tubes - find more in the catalogue's annex for IT networks.

The marking M specifies a type of construction with removable module.
The marking of DS specifies a version with remote monitoring.

Type vseries		**B20M**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 2, CLASS II
Max. continuous operating voltage	U_C	255 V AC
Lightning impulse current (10/350)	I_{imp}	20 kA
- charge	Q	10 As
- specific energy	W/R	100 kJ/Ω
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level at lim_p	U_P	< 1,3 kV
Temporary overvoltage (TOV)	U_T	1200 V/0,2 s
Response time	t_A	< 100 ns
Follow current interrupting rating at UC	I_{fi}	100 A_{rms}
LPZ		1-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm^2 (solid) 16 mm^2 (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min.100 000 h
Weight	m	76 g
Article number		27 048
GDT spare module		B20M/M
		27 049

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE



PI-k8
PI-k8 DS

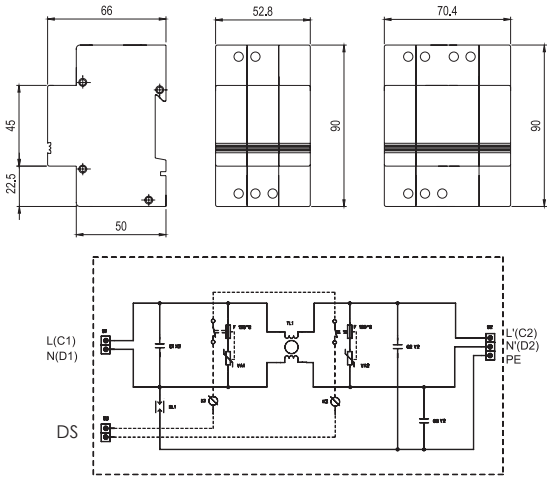
PI-k8 is a single-phase surge arrester type 3, which is equipped with high-frequency filter, according to EN 61643-11 and IEC 61643-11. It is intended for use in the power supply lines, which are operated as TN-S system. The arrester PI-k8 is constructed for mounting on DIN rail 35mm and designed for protection of single-phase electronic appliances in L.V. power supply systems against the transient surge and high-frequency disturbance. The type PI-k8 is fitted with a light indicator signalling the right function (greed LED diode), type PI-k8 DS indicates the failure by target disconnection of mechanical thermal fuse.

They can be manufactured in a comprehensive range of the Nominal voltages U_N = 6, 12, 24, 48, 60, 80, 110, 120, 130, 160 and 230V (AC/DC).

Type		**PI-k8, PI-k8 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	275 V AC
Rated load current	I_L	8 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE) 5 kA (N/PE)
Combined impulse	U_{OC}	6 kV (L/N,L/PE)
		10 kV (N/PE)
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)
Asymmetrical attenuation of filter (band-stop filter)		min. 80 dB at 4 MHz
		min. 40 dB (0,15 - 30 MHz)
Filters constans	C_x C_y L	150 nF 22 nF 1,2 mH
Power loss at winding temp. 20°C		< 2,2 W
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)
Back-up fuse		8 A
LPZ		2-3
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +55 °C
Cross-section of the connected conductors		2,5 mm² Cu
Mounting on		DIN rail 35 mm
Failure signalisation PI-k8 Failure signalisation PI-k8 DS		light on - ok / light off - failure pushed in - ok / pushed out - failure
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100.000 h
Weight	m	130 g, 170 g
Article number		
PI-k8		30 080
PI-k8 DS		30 082

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE



PI-k16, PI-k25, PI-k32
PI-k16 DS, PI-k25 DS

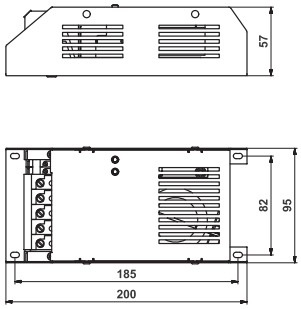
PI-k16, PI-k25 and PI-k32 are the single-phase surge arresters type 3, which are equipped with high-frequency filters, according to EN 61643-11 and IEC 61643-11. They are intended for use in the power supply lines, which are operated as TN-S system. The arresters PI-k8, PI-k25 and PI-k32 are constructed for mounting on DIN rail 35mm and designed for protection of single-phase electronic appliances in L.V. power supply systems against the transient surge and high-frequency disturbance. The types PI-k8, PI-k25 and PI-k32 are fitted with light indicator signalling the right function (greed LED diode), types PI-k16 DS, PI-k25 DS and PI-k32 DS indicate the failure by target disconnection of mechanical thermal fuses.

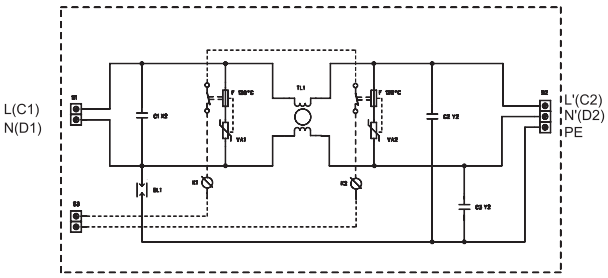
They can be manufactured in a comprehensive range of the Nominal voltages U_N = 6, 12, 24, 48, 60, 80, 110, 120, 130, 160 and 230V (AC/DC).

Type		**PI-k16, PI-k16 DS**	**PI-k25, PI-k25 DS**	**PI-k32**
Test class according to EN 61643-11 and IEC 61643-11			TYPE 3, CLASS III	
Nominal voltage	U_N		230 V AC	
Max. continuous operating voltage	U_C		275 V AC	
Rated load current	I_L	16 A	25 A	32 A
Nominal discharge current I_n(8/20)	I_n		3 kA (L/N, L/PE) 5 kA (N/PE)	
Combined impulse	U_{OC}		6 kV (L/N,L/PE)	
			10 kV (N/PE)	
Voltage protection level at U_{OC}	U_P		< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)	
Asymmetrical attenuation of filter (band-stop filter)			min. 80 dB at 4 MHz	
			min. 40 dB (0,15 - 30 MHz)	
Filters constans	C_x		220 nF	
	C_y		22 nF	
	L	1,8 mH	2,3 mH	2,3 mH
Power loss at winding temp. 20°C		< 3,5 W	< 3,5 W	< 4 W
Response time	t_A		< 25 ns (L/N) < 100 ns (L/PE, N/PE)	
Back-up fuse		16 A	25 A	32 A
LPZ			2-3	
Housing material			Polyamid PA6, UL94 V-0	
Protection type			IP20	
Operating temperature range	ϑ		-40°C ... +55 °C	
Cross-section of the connected conductors		4 - 6 mm² Cu	6 - 10 mm² Cu	6 - 10 mm² Cu
Mounting on			DIN rail 35 mm	
Failure signalisation PI-k*			light on - ok / light off - failure	
Failure signalisation PI-k* DS			pushed in - ok / pushed out - failure	
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)			AC: 250 V / 0,5 A, DC: 250 V / 0,1 A	
Lifetime			min. 100.000 h	
Weight	m	170 g, 224 g	240 g	240 g
Article number				
PI-k*		30 004	30 017	30 005
PI-k* DS		30 027	30 034	-

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE





PI-k32 DS, PI-k50
PI-k63, PI-k80

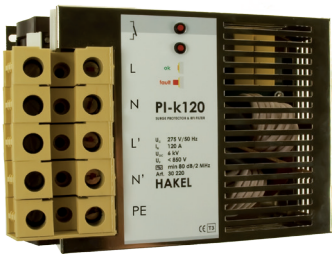
While mounting surge arresters PI-k32, 50, 63 and 80 it is necessary to ensure that the ventilation holes in their housing are not covered. These arresters are to be placed as near to the protected appliance as possible, for example near to the electronic control systems of NC machines, electronics of robotic production and another sensitive electronic appliances. It is recommended to connect the protected appliance by appropriately dimensioned and shielded conductor.

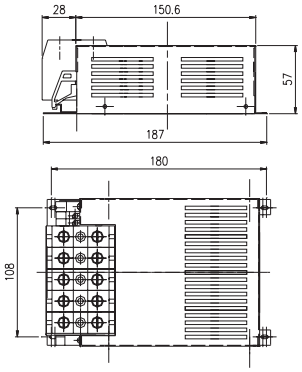
PI-k32, PI-k50, PI-k63 and PI-k80 are standardly manufactured with DS switching contact.

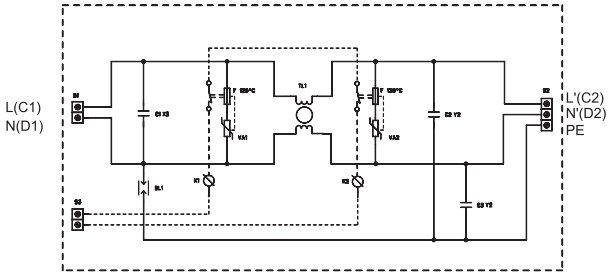
Type		PI-k32 DS	PI-k50	PI-k63	PI-k80
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III			
Nominal voltage	U_N	230 V AC			
Max. continuous operating voltage	U_C	275 V AC			
Rated load current	I_L	32 A	50 A	63 A	80 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE) 5 kA (N/PE)			
Combined impulse	U_{OC}	6 kV (L/N,L/PE)			
		10 kV (N/PE)			
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)			
Asymmetrical attenuation of filter (band-stop filter)		min. 80 dB at 4 MHz			
		min. 40 dB (0,15 - 30 MHz)			
Filters constans	C_x	M68			
	C_y	22 nF			
	L		2,2 mH	2,2 mH	1,4 mH
Power loss at winding temp. 20°C		< 4 W	< 7 W	< 9 W	< 12 W
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)			
Back-up fuse		32 A	50 A	63 A	80 A
LPZ		2-3			
Housing material		metal plate 0,8 mm			
Protection type		IP20			
Operating temperature range	ϑ	-40°C ... +55 °C			
Cross-section of the connected conductors		25 mm^2 Cu			
Mounting on		DIN rail 35 mm or by screws M4 on chassis			
Failure signalisation		pushed in - ok / pushed out - failure			
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A			
Lifetime		min. 100.000 h			
Weight	m	240	970 g		1040 g
Article number		30 028	30 100	30 200	30 180

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE







PI-k120
PI-k150

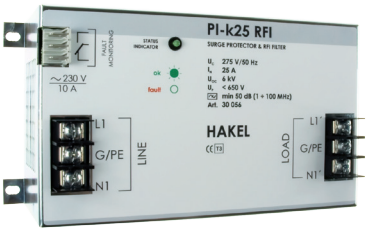
While mounting surge arresters PI-k120 and PI-k150 it is necessary to ensure that the ventilation holes in their housing are not covered. These arresters are to be placed as near to the protected appliance as possible, for example near to the electronic control systems of NC machines, electronics of robotic production and another sensitive electronic appliances. It is recommended to connect the protected appliance by appropriately dimensioned and shielded conductor.

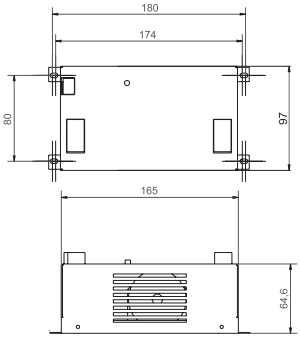
PI-k120 and PI-k150 are standardly manufactured with DS switching contact.

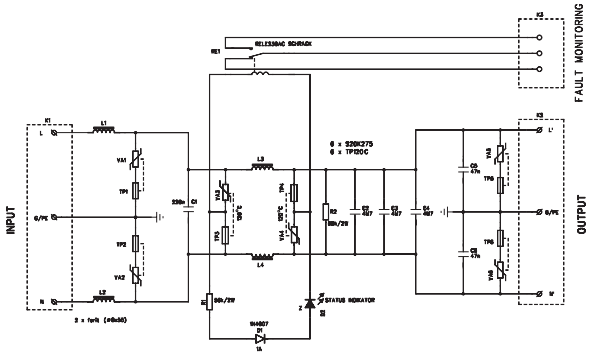
Type		**PI-k120**	**PI-k150**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III	
Nominal voltage	U_N	230 V AC	
Max. continuous operating voltage	U_C	275 V AC	
Rated load current	I_L	120 A	150 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE) 5 kA (N/PE)	
Combined impulse	U_{OC}	6 kV (L/N,L/PE)	
		10 kV (N/PE)	
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)	
Asymmetrical attenuation of filter (band-stop filter)		min. 80 dB at 2 MHz	
		min. 30 dB (0,15 - 30 MHz)	
Filters constans	C_x C_y L	2M 22 nF 1 mH	0,6 mH
Power loss at winding temp. 20°C		< 20 W	
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)	
Back-up fuse		120 A	150 A
LPZ		2-3	
Housing material		metal plate 0,8 mm	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +55 °C	
Cross-section of the connected conductors		25 - 35 mm^2 Cu	
Mounting on		DIN rail 35 mm or by screws M4 on chassis	
Failure signalisation		pushed in - ok / pushed out - failure	
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A	
Lifetime		min. 100.000 h	
Weight	m	1300 g	1350 g
Article number		30 220	30 230

Surge arrester / varistor & EMC / RFI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE







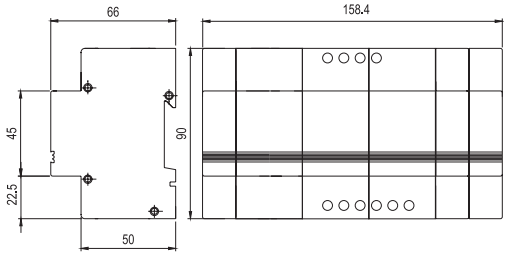
PI-k25 RFI

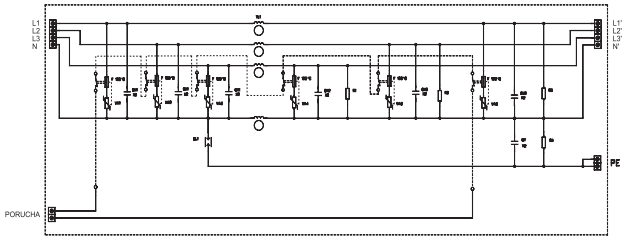
PI-k25RFI is a single-phase surge arrester type 3 according to EN 61643-11 and IEC 61643-11, which is equipped with specially-designed hybrid low noise filter intended for a high effective protection of expensive electronic equipment against high frequency disturbance and against transient overvoltage. This filter is constructed for mounting on DIN rail 35mm or straight onto the construction of switchboard by four screws M4. The basic version of PI-k25RFI is for rated load current I_L = 25A and nominal voltage U_N = 230V AC (DC) for use in TNS systems. However, it is possible to supply this arrester for U_N = 6, 12, 24, 48, 60, 80, 110, 120, 130 or 160 V AC(DC) on a special demand. All fitted varistors are equipped with thermal disconnectors that react to the varistors overheating at overload. This device is equipped with optical indicator of right function STATUS INDICATOR and with remote monitoring of failure (FAULT MONITORING) by potential-free switching contact. While mounting PI-k25RFI it is necessary to ensure that the ventilation holes in its housing are not covered.

Type		**PI-k25 RFI**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	275 V AC
Rated load current	I_L	25 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE)
Combined impulse	U_{OC}	6 kV (L/N,L/PE, N/PE)
Voltage protection level at U_{OC}	U_P	< 1,9 kV (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)
Asymmetrical attenuation of filter (band-stop filter)		min. 50 dB (1 - 100 MHz) min. 30 to 50 dB (0,1 - 1 MHz)
Filters constans	C_x C_y L R	220 nF + 3 x 4 μF 2 x 47 nF 2 x 1 μH+ 2 x 44 μH 68 kΩ
Power loss at winding temp. 20°C		< 29 W
Response time	t_A	< 25 ns (L/N)
Back-up fuse		25 A
LPZ		2-3
Housing material		metal plate 0,8 mm
Protection type		IP00
Operating temperature range	ϑ	-40°C ... +55 °C
Cross-section of the connected conductors		4 mm^2 Cu
Mounting on		DIN rail 35 mm or by screws M4 on chassis
Failure signalisation		light on - ok / light off - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm^2)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100.000 h
Weight	m	1140 g
Article number		30 056

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE





PI-3k16
PI-3k25

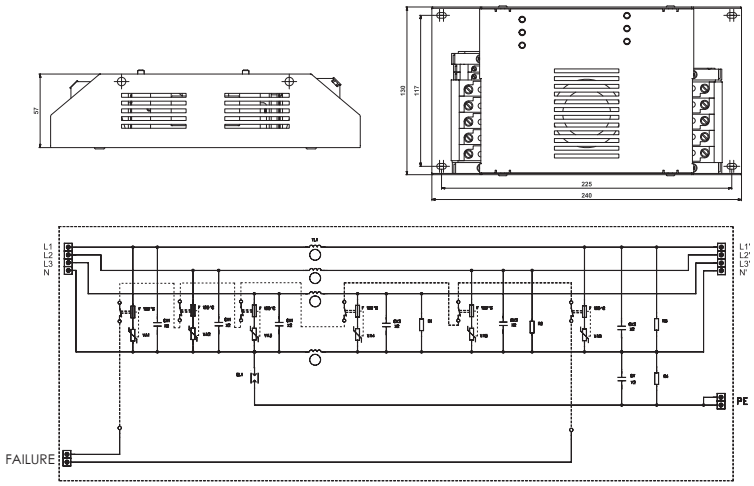
PI-3k is a three-phase surge arrester type 3, which is equipped with high-frequency filter, according to EN 61643-11 and IEC 61643-11. They are produced for rated load current within the range of 16, 25, 32, 50, 63, 80 and 120A for application use in TNS and TNC systems. éPI-3k range is designed for protection of three-phase electronic appliances in L.V. power supply systems against transient overvoltage and high-frequency disturbance. The function failure of varistors is indicated by target disconnection of mechanical thermal fuses which react to the varistors overheating above c. 120°C.

They can be manufactured in a comprehensive range of the Nominal voltages U_N= 4, 48, 60, 80, 110, 120, 130, 160 and 230V (AC/DC).

Type		**PI-3k16**	**PI-3k25**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III	
Nominal voltage	U_N	3 x 230 / 400 V AC	
Max. continuous operating voltage	U_C	3 x 275 / 480 V AC	
Rated load current	I_L	16 A	25 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE) 5 kA (N/PE)	
Combined impulse	U_{OC}	6 kV (L/N,L/PE)	
		10 kV (N/PE)	
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)	
Asymmetrical attenuation of filter (band-stop filter)		min. 80 dB at 2 MHz	
		min. 40 dB (0,15 - 30 MHz)	
Filters constans	C_{x1} C_{x2} C_y L	M15 M33 2 x 47 nF 1,3 mH	1,4 mH
Power loss at winding temp. 20°C		< 7,5 W	
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)	
Back-up fuse		16 A	25 A
LPZ		2-3	
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +55 °C	
Cross-section of the connected conductors		4 - 6 mm² Cu	
Mounting on		DIN rail 35 mm	
Failure signalisation		pushed in - ok / pushed out - failure	
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A	
Lifetime		min. 100.000 h	
Weight	m	500 g	520 g
Article number		30 300	30 306

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE



PI-3k32, PI-3k50
PI-3k63, PI-3k80

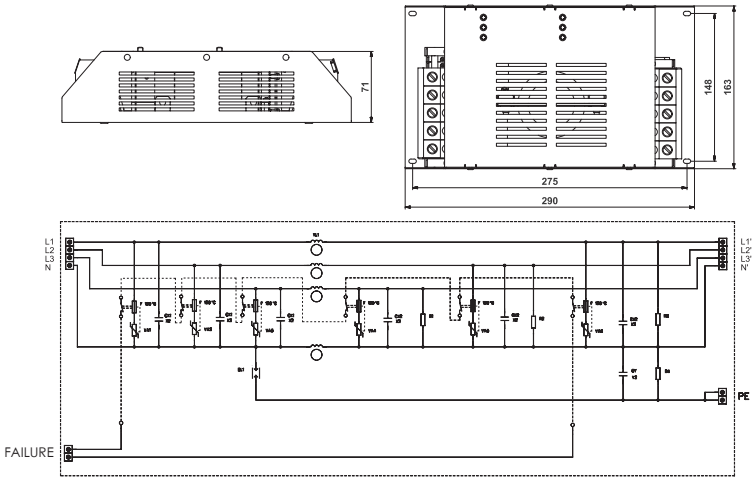
PI-3k is a three-phase surge arrester type 3, which is equipped with high-frequency filter, according to EN 61643-11 and IEC 61643-11. It is intended for use in the power supply lines, which are operated as TN-S system. PI-3k120 is designed for protection of three-phase electronic appliances in L.V. power supply systems against the transient overvoltage and high-frequency disturbance. The function failure of varistors is indicated by target disconnection of mechanical thermal fuses which react to the varistors overheating above c. 120°C.

They can be manufactured in a comprehensive range of the Nominal voltages U_N = 6, 12, 24, 48, 60, 80, 110, 120, 130, 160 and 230V (AC/DC).

Type		**PI-3k32**	**PI-3k50**	**PI-3k63**	**PI-3k80**
Test class according to EN 61643-11 ed.2 and IEC 61643-11		TYPE 3, CLASS III			
Nominal voltage	U_N	3 x 230 / 400 V AC			
Max. continuous operating voltage	U_C	3 x 275 / 480 V AC			
Rated load current	I_L	32 A	50 A	63A	80 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE) 5 kA (N/PE)			
Combined impulse	U_{OC}	6 kV (L/N,L/PE) 10 kV (N/PE)			
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)			
Asymmetrical attenuation of filter (band-stop filter)		min. 80 dB at 2 MHz min. 40 dB (0,15 - 30 MHz)	min. 80 dB at 1,5 MHz min. 40 dB (0,15 - 30 MHz)	min. 80 dB at 2 MHz min. 40 dB (0,15 - 30 MHz)	min. 80 dB at 1,5 MHz min. 40 dB (0,15 - 30 MHz)
Filters constans	C_{x1} C_{x2} C_y L	M15 M68 2 x 47 nF 2,15 mH	1 mH	2,15 mH	0,9 mH
Power loss at winding temp. 20°C		< 8 W	< 9 W	< 8 W	< 15 W
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)			
Back-up fuse		32 A	50 A	63 A	80 A
LPZ		2-3			
Housing material		metal plate 0,8 mm			
Protection type		IP20			
Operating temperature range	ϑ	-40°C ... +55 °C			
Cross-section of the connected conductors		6 mm² Cu	10 mm² Cu		25 mm² Cu
Mounting on		DIN rail 35 mm or by screws M4 on chassis			
Failure signalisation Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		pushed in - ok / pushed out - failure AC: 250 V / 0,5 A, DC: 250 V / 0,1 A			
Lifetime		min. 100.000 h			
Weight	m	1500 g	1600 g		1730 g
Article number		30 301	30 305	30 303	30 302

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE



PI-3k120

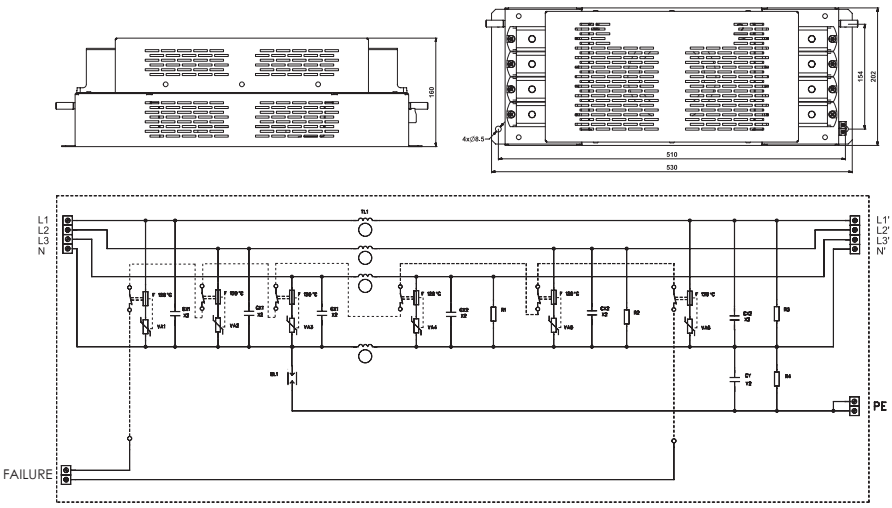
PI-3k120 is a three-phase surge arrester type 3, which is equipped with high-frequency filter, according to EN 61643-11 and IEC 61643-11. It is intended for use in the power supply lines, which are operated as TN-S system. PI-3k120 is designed for protection of three-phase electronic appliances in L.V. power supply systems against the transient overvoltage and high-frequency disturbance. The function failure of varistors is indicated by target disconnection of mechanical thermal fuses which react to the varistors overheating above c. 120°C.

They can be manufactured in a comprehensive range of the Nominal voltages U_N = 6, 12, 24, 48, 60, 80, 110, 120, 130, 160 and 230V (AC/DC).

Type		**PI-3k120**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III
Nominal voltage	U_N	3 x 230 / 400 V AC
Max. continuous operating voltage	U_C	3 x 275 / 480 V AC
Rated load current	I_L	120 A
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE) 5 kA (N/PE)
Combined impulse	U_{OC}	6 kV (L/N,L/PE) 10 kV (N/PE)
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 1,5 kV (L/PE) < 1,2 kV (N/PE)
Asymmetrical attenuation of filter (band-stop filter)		min. 70 dB at 1,5 MHz min. 30 dB (0,15 - 30 MHz)
Filters constans	C_{x1} C_{x2} C_y L	M15 M68 2 x 47 nF 1 mH
Power loss at winding temp. 20°C		< 25 W
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)
Back-up fuse		120 A
LPZ		2-3
Housing material		metal plate 0,8 mm
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +55 °C
Cross-section of the connected conductors		25 - 35 mm² Cu
Mounting on		DIN rail 35 mm or by screws M4 on chassis
Failure signalisation		pushed in - ok / pushed out - failure
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100.000 h
Weight	m	2600 g
Article number		30 307

Surge arrester / varistor & EMC / EMI filter / TYPE 3

TYPE 3 / CLASS III / TN-S / CE



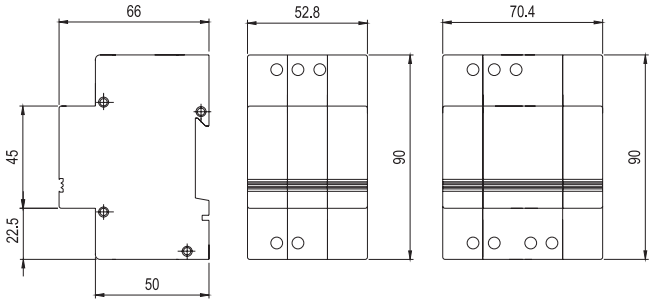
PI-3k250
PI-3k400

PI-3k250 and PI-3k400 are the three-phase surge arresters, which are equipped with high-frequency filters, according to EN 61643-11 and IEC 61643-11. They are produced in basic version for mounting straight onto the switchboard's construction by screws M8. They are intended for protection of three-phase electronic appliances against the effects of the lightning current and switching overvoltage, which are generated in the L.V. power supply networks. The device includes a two-pole output terminal for remote monitoring, which is solved on the basis of a potential-free swithing contact. This contact is enabled for opening in case of failure of any in-built protective varistors.

Type		**PI-3k250**	**PI-3k400**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 1+2+3, CLASS I+II+III	
Nominal voltage	U_N	3 x 230 / 400 V AC	
Max. continuous operating voltage	U_C	3 x 335 / 570 V AC	
Rated load current	I_L	250 A	400 A
Combined impulse	U_{OC}	6 kV	
Nominal discharge current I_n(8/20)	I_n	40 kA (L/N, L/PE)	
		50 kA (N/PE)	
Max. discharge current I_{max} (8/20)	I_{max}	100 kA	
Lightning impulse current (10/350) L/N	I_{imp}	12,5 kA	
Lightning impulse current (10/350) N/PE	I_{imp}	50 kA	
Total lightning current (10/350) L1+L2+L3+N→PE	I_{total}	50 kA	
Voltage protection level at U_{OC}	U_P	< 1,25 kV	
Asymmetrical attenuation (band-stop filter)		min. 70 dB at 1,5 MHz	
		min. 30 dB (0,15 - 30 MHz)	
Filters constans	C_{x1}	2M2	
	C_{x2}	2M2	
	R_x	1 MΩ	
	C_y	2 x 50 nF	
	R_y	1 MΩ	
	L	1,5 mH	
Power loss at winding temp. 20°C		cca 70 W	cca 125 W
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)	
Back-up fuse		250 A	400 A
LPZ		0-3	
Housing material		metal plate 0,8 mm	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +55 °C	
Cross sectional area of connected Al/Cu wires		35-120 mm² / 26 Nm 150-240 mm² / 55 Nm	
Installation method		horizontal with exposed ventilation holes by screws M8 on chassis	
Failure signalisation (F/M)		230 V AC / 0,5 A Potential free release contact (NC TYPE)	
Lifetime		min. 100.000 h	
Weight	m	8 kg	10 kg
Article number		30 309	30 308

Surge arrester / varistor + gas discharge tube / TYPE 3

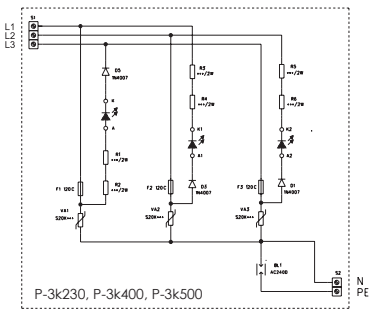
TYPE 3 / CLASS III / TN-S / TN-C / TT / CE



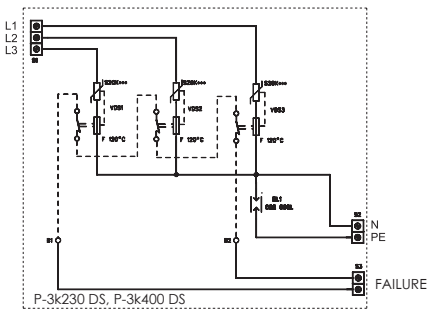
P-3k230, P-3k400, P-3k500
P-3k230 DS, P-3k400 DS

P-3k are the three-phase surge arresters type 3 according to EN 61643-11 and IEC 61643-11. These parallel devices are intended for protection of electronic appliances against the impulse surge effects. They fully meet the demands of users for applications in three-phase power supply networks operated as TN-S, TN-C and TT systems. All varistors in P-3k devices are fitted with thermal fuses against the short and permanent overloading. P-3k units are to be connected as near to the protected electronic appliance as possible. The right function of P-3k230, P-3k400 and P-3k500 devices is indicated by three green LED diodes. The function failure of P-3k230 DS and P-3k400 DS devices is indicated by target disconnection of mechanical thermal fuses which react to the varistors overheating above c. 120°C. If one of the three thermal fuses reacts, the free-potential contact FAILURE disconnects at the same time (in case of DS version only).

Type		**P-3k230, P-3k230 DS**	**P-3k400, P-3k400 DS**	**P-3k500**
Test class according to EN 61643-11 and IEC 61643-11			TYPE 3, CLASS III	
Nominal voltage	U_N	230 V AC	400 V AC	500 V AC
Max. continuous operating voltage	U_C	275 V AC	480 V AC	600 V AC
Nominal discharge current I_n(8/20)	I_n		3 kA (L/N, L/PE) 5 kA (N/PE)	
Combined impulse	U_{OC}		6 kV (L/N,L/PE) 10 kV (N/PE)	
Voltage protection level at U_{OC}	U_P	< 1,2 kV (L/N) < 1,2 kV (L/PE) < 1,2 kV (N/PE)	< 1,5 kV (L/N) < 1,5 kV (L/PE) < 1,5 kV (N/PE)	< 1,8 kV (L/N) < 1,5 kV (L/PE) < 1,5 kV (N/PE)
Power loss at winding temp. 20°C			cca 3 VA / 0,1 VA	
Response time	t_A		< 25 ns (L/N) < 100 ns (L/PE, N/PE)	
Back-up fuse			16 A	
LPZ			2-3	
Housing material			Polyamid PA6, UL94 V-0, UL94 V-0	
Protection type			IP20	
Operating temperature range	ϑ		-40°C ... +80 °C	
Cross-section of the connected conductors			2,5 - 4 mm² Cu	
Mounting on			DIN rail 35 mm	
Failure signalisation P-3k*			light on - ok / light off - failure	
Failure signalisation P-3k* DS			pushed in - ok / pushed out - failure	
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)			AC: 250 V / 0,5 A, DC: 250 V / 0,1 A	
Lifetime			min. 100.000 h	
Weight	m		140 g / 205 g	150 g
Article number				
P-3k*		30 105	30 101	30 102
P-3k* DS		30 106	30 103	-



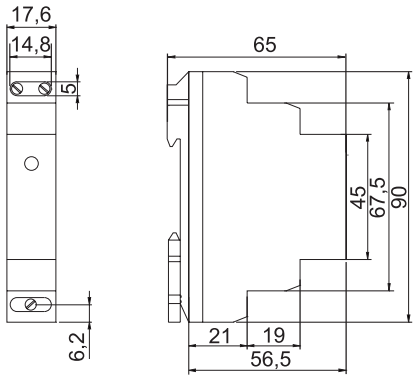
P-3k230, P-3k400, P-3k500

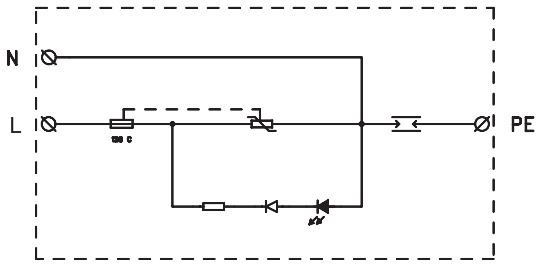


P-3k230 DS, P-3k400 DS

Surge arrester / varistor + gas discharge tube / TYPE 3

TYPE 3 / CLASS III / TN-S / TN-C / TT / CE





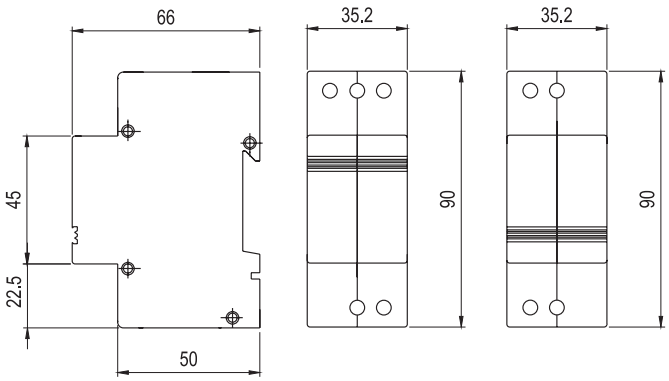
ZS-1DSM

ZS-1DSM is a single-phase surge arrester, which is designed for universal application for protection of all kinds of electrical appliances connected to L.V. power supply system against the impulse surge effects. Type ZS-1DSM is intended for use in the power supply lines, which are operated as TN-S, TN-C and TT system. ZS-1DSM meets the requirement for Type 3 surge arrester according to EN 61643-11 and IEC 61643-11. The right function is indicated by fitted green LED diode. The connection to L.V. power supply system is provided by means of screw terminals.

Type		**ZS-1DSM**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	275 V AC
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE)
		5 kA (N/PE)
Combined impulse	U_{OC}	6 kV (L/N,L/PE) 10 kV (N/PE)
Voltage protection level at U_{OC}	U_P	< 1 kV (L/N)
		< 1,2 kV (L/PE)
		< 1,2 kV (N/PE)
Power loss at winding temp. 20°C		< 0,5 W
Response time	t_A	< 25 ns (L/N)
		< 100 ns (L/PE, N/PE)
Back-up fuse		16 A
Temporary overvoltage (TOV)	U_T	335 V / 5 s (L/N)
		1200 V + U_0 / 200 ms (L/PE)
LPZ		2-3
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		1,5 mm² Cu
Mounting on		DIN rail 35 mm
Failure signalisation		light on - ok / light off - failure
Lifetime		min. 100.000 h
Weight	m	45 g
Article number		32 016

Surge arrester / varistor + gas discharge tube / TYPE 3

TYPE 3 / CLASS III / TN-S / TN-C / TT / CE



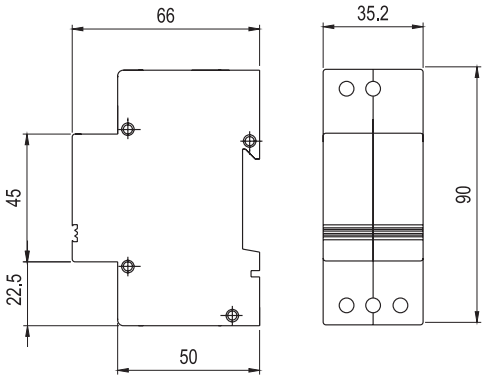
PK2
PK2 DS

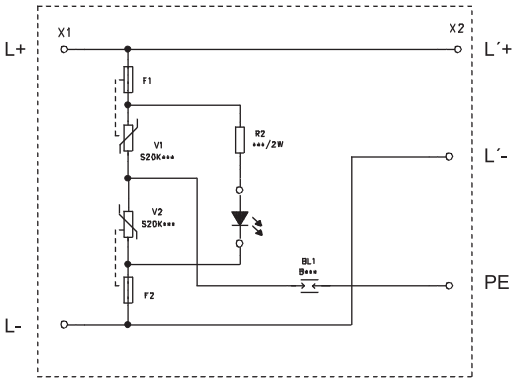
Pk2 is a single-phase surge arrester type 3 according to EN 61643-11 and IEC 61643-11. It is designed for universal application for protection of all kinds of electrical appliances connected to L.V. power supply system against the impulse surge effects. The device is suitable for use in the power supply lines, which are operated as TN-S, TN-C and TT system. On a special customer's demand it is possible to supply this arrester for different nominal voltages then 230V/50Hz. The function failure of varistor is indicated by target disconnection of mechanical thermal fuse which reacts to the varistor overheating above c. 120°C.

Type		**PK2, PK2 DS**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	275 V AC
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N, L/PE)
		5 kA (N/PE)
Combined impulse	U_{OC}	6 kV (L/N,L/PE) 10 kV (N/PE)
Voltage protection level at U_{OC}	U_P	< 1 kV (L/N)
		< 1,2 kV (L/PE)
		< 1,2 kV (N/PE)
Power loss at winding temp. 20°C		< 0,5 W
Response time	t_A	< 25 ns (L/N)
		< 100 ns (L/PE, N/PE)
Back-up fuse		16 A
Temporary overvoltage (TOV)	U_T	335 V / 5 s (L/N)
		1200 V + U_0 / 200 ms (L/PE)
LPZ		2-3
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors		1,5 - 2,5 mm² Cu
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure
Potential free release contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Lifetime		min. 100.000 h
Weight	m	100 g
Article number		
PK2		32 030
PK2 DS		32 008

Surge arrester / varistor + gas discharge tube / TYPE 3

TYPE 3 / CLASS III / DC / CE





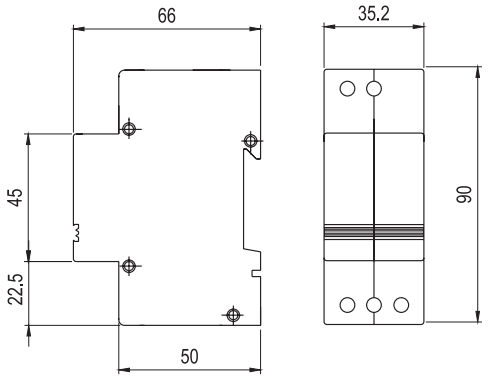
P-k16/12 DC, P-k16/24 DC, P-k16/48 DC
P-k16/60 DC, P-k16/110 DC

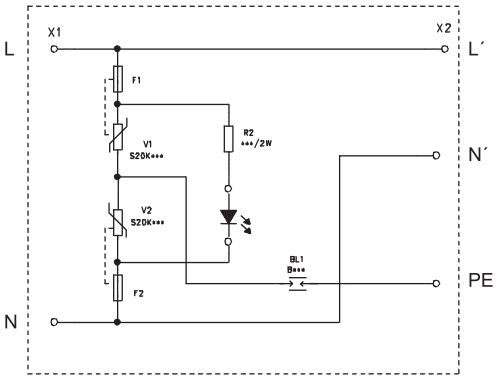
Series of the arresters P-k16*DC is designed for protection of electronic appliances in L.V. power supply DC systems against the impulse surge effects. They are constructed for mounting on DIN rail 36mm for rated load currents 16A according to IEC 61643-11, EN 61643-11 and EN 62305 standards (arrester class III - 3rd stage protection). Right function of the in-built protective elements, MOV varistors, is signalized by green light on the front panel of the equipment.

Type		**P-K16/12 DC**	**P-K16/24 DC**	**P-K16/48 DC**	**P-K16/60 DC**	**P-K16/110 DC**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III				
Network		DC				
Nominal voltage	U_N	12 V =	24 V =	48 V =	60 V =	110 V =
Max. continuous operating voltage	U_C	14,4 V =	28,8 V =	57,6 V =	72 V =	132 V =
Rated load current	I_L	16 A				
Combined impulse	U_{OC}	2 kV				6 kV
Voltage protection level at U_{OC}	U_P	< 130 V (L+/L-)	< 200 V (L+/L-)	< 370 V (L+/L-)	< 400 V (L+/L-)	< 680 V (L+/L-)
			< 600 V (L/PE)			< 800 V (L/PE)
Response time	t_A	< 25 ns (L+/L-)				
		< 100 ns (L/PE)				
Back-up fuse		16 A				
LPZ		2-3				
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0				
Protection type		IP20				
Operating temperature range	ϑ	-40°C ... +80 °C				
Cross-section of the connected conductors		2,5 mm² Cu				
Mounting on		DIN rail 35 mm				
Failure signalisation		light on - ok / light off - failure				
Lifetime		min. 100.000 h				
Weight	m	95 g				
Article number		30 001	30 002	30 014	30 018	30 020

Surge arrester / varistor + gas discharge tube / TYPE 3

TYPE 3 / CLASS III / AC / CE





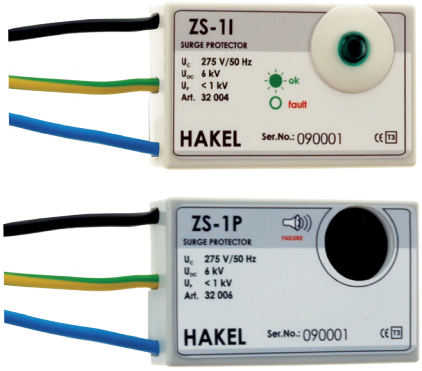
P-k16/110 AC
P-k16/230 AC

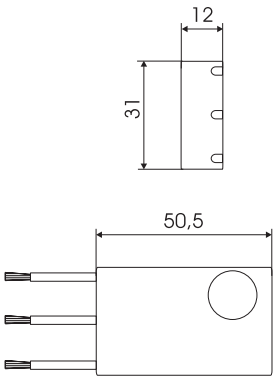
Series of the arresters P-k16*AC is designed for protection of electronic appliances in L.V. power supply AC systems against the impulse surge effects. They are constructed for mounting on DIN rail 36mm for rated load currents 16A according to IEC 61643-11, EN 61643-11 and EN 62305 standards (arrester class III - 3rd stage protection). Right function of the in-built protective elements, MOV varistors, is signalized by green light on the front panel of the equipment.

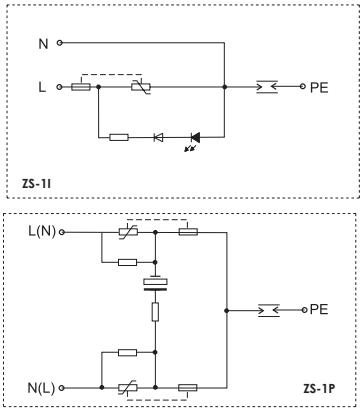
Type		**P-K16/110 AC**	**P-K16/230 AC**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III	
Network		AC	
Nominal voltage	U_N	110 V AC	230 V AC
Max. continuous operating voltage	U_C	132 V AC	275 V AC
Rated load current	I_L	16 A	
Combined impulse	U_{OC}	6 kV	
Voltage protection level at U_{OC}	U_P	< 850 V (L/N) < 800 V (L,N/PE)	< 1300 V (L/N) < 1200 V (L,N/PE)
Response time	t_A	< 25 ns (L/N)	
		< 100 ns (L,N/PE)	
Back-up fuse		16 A	
Temporary overvoltage (TOV)	U_T	-	335 V / 5 s (L/N)
		-	1200 V + U_0 / 0,2 s (L/PE)
LPZ		2-3	
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors		2,5 mm² Cu	
Mounting on		DIN rail 35 mm	
Failure signalisation		light on - ok / light off - failure	
Lifetime		min. 100.000 h	
Weight	m	95 g	
Article number		30 015	30 008

Surge arrester / varistor + gas discharge tube / TYPE 3

TYPE 3 / CLASS III / TN-S / CE







ZS-1I
ZS-1P

ZS-1I, ZS-1P are the surge arresters type 3 according to EN 61643-11 and IEC 61643-11 and IEC 61643-11 designed for installation into electrical installation systems, e.g.: cable ducts and flush-mounted sockets as an additional protection. These devices are suitable supplements of socket distribution which are protected by PI-k protector. The right function of ZS-1I type is indicated by green LED diode. When the indicator is dark, the device must be replaced or technically checked. ZS-1P contains an acoustic fault indicator (buzzer).

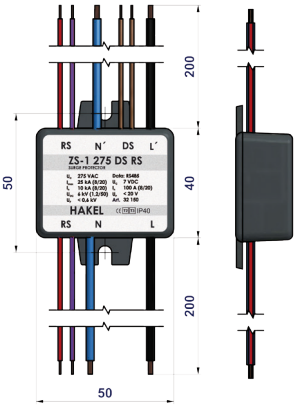
Type		**ZS-1I**	**ZS-1P**
Test class according to EN 61643-11 and IEC 61643-11		TYPE 3, CLASS III	
Nominal voltage	U_N	230 V AC	
Max. continuous operating voltage	U_C	275 V AC	
Nominal discharge current I_n(8/20)	I_n	3 kA (L/N), L(N)/PE)	
Combined impulse	U_{OC}	6 kV (L/N,L(N)/PE)	
Voltage protection level at U_{OC}	U_P	< 1 kV (L/N)	< 1,3 kV (L/N)
		< 1,2 kV (L(N)/PE)	< 1 kV (L(N)/PE)
Response time	t_A	< 25 ns (L/N) < 100 ns (L/PE, N/PE)	
Back-up fuse		16 A	
Temporary overvoltage (TOV)	U_T	335 V / 5 s (L/N) 1200 V + U_0 / 200 ms (L/PE)	
LPZ		2-3	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Failure signalisation		light on - ok / light off - failure	inbuilt piezosiren
Lifetime		min. 100.000 h	
Weight	m	20 g	30 g
Article number			
		32 004	32 006

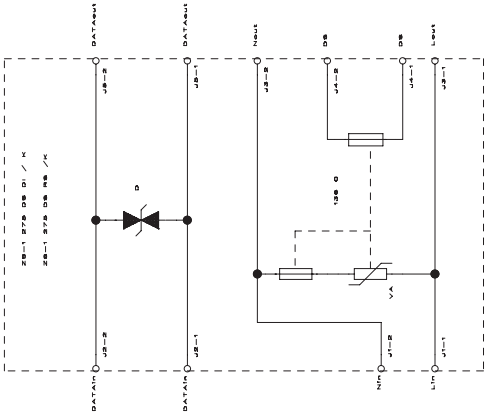
Surge arrester for LED lighting protection / varistor / TYPE 2+ TYPE 3

TYPE 2+3 / CLASS II+III / TN / CE

out

in





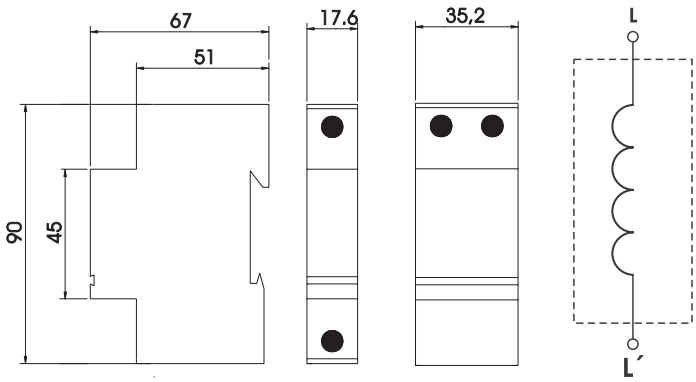
ZS-1 275 DS RS
ZS-1 275 DS DI

ZS-1 275 DS RS and ZS-1 275 DS DI are surge arresters Type 2+3 (TYPE 3 protects the device only to 5m lead) according to EN 61643-11 and EN 62305 designed for LED lighting protection for installations largely e.g. in tunnels, properties and premises, street lights etc. Efficiently protect both the input supply voltage and the data communication lines for the remote control of lighting fixture (protocol RS485 eventually DALI (DI)). Both types are equipped with the internal disconnecting signal contacts (DS), which are activated when the inbuilt varistor overheats above 136°C. The way to connect to a given application is by the pull-wire terminals.

Type		**ZS-1 275 DS RS (IP40)**	**ZS-1 275 DS DI (IP40)**
		ZS-1 275 DS RS (IP65)	**ZS-1 275 DS DI (IP65)**
Test class according to EN 61643-11 and IEC 61643-11			
Nominal voltage	U_N	230 V AC	
Max. continous operating voltage	U_C	275 V AC	
Max. discharge current (8/20)	I_{max}	25 kA	
Nominal discharge current (8/20)	I_n	10 kA	
Combined impulse	U_{OC}	6 kV	
Voltage protection level at I_n	U_P	< 0,65 kV	
Voltage protection level at U_{OC}	U_P	< 0,6 kV	
Response time	t_A	< 25 ns	
Max. backup fuse		16 A	
Temporary overvoltage TOV	U_T	335V/5 s	
Lifetime		min. 100.000 h	
Fault indication (DS)		potential free contact max. 230 V AC/0,5 A 230VAC/0,5 A	
IP code		IP40 (standard)	
		IP65 (only on special request)	

Data part			
- max. continous operating voltage	U_C	7 VDC	28 VDC
- max. discharge current	I_{FSM}	200 A/8,3 ms	200 A/8,3 ms
- Nominal discharge current (8/20)	I_n	100 A	100 A
- Voltage protection level at I_n	U_P	< 20 V	< 40 V
- Protocol of data transmission		RS 485	DALI
Weight	m	55 g	
Length of supply lead	l	200 mm (conductor 1,5 mm² and conductor 0,35 mm²)	
Recommended working/position		any	
Mounting on		wall mounted or plate mounted by two screws o 4 mm	
Article number (IP40 version)		32 150	32152
Article number (IP65 version)		32 154	32155

Decoupling inductors

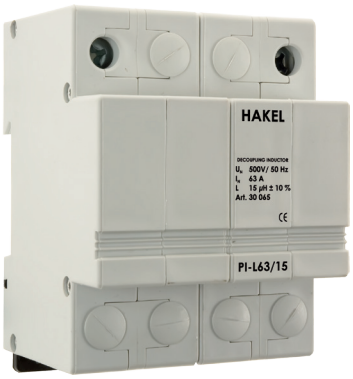


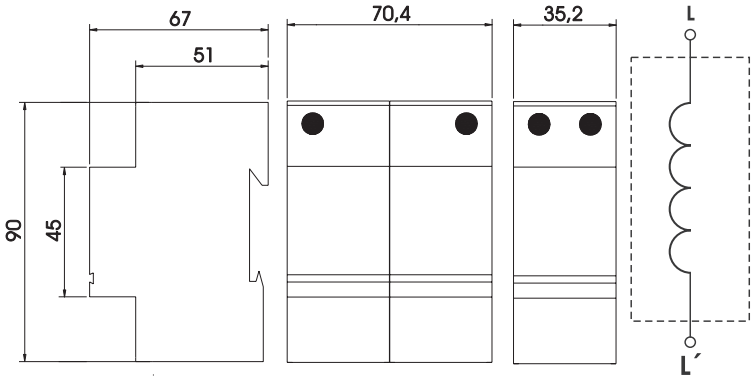
PI-L16, PI-L16/15 PI-L32, PI-L32/15

Decoupling inductors are intended for rated load currents within the range of 16 and 32A. These inductors, sometimes also called decoupling impedance, ensure the energy coordination between the arresters type 1 and type 2 or the arresters type 2 and type 3 according to IEC 1024-1 and EN 61643-11 and IEC 61643-11, especially in the places where there is no adequate distance between the arresters (e.g. when there are two successive arrester types placed in one switchboard). If the energy coordination of surge protection is not achieved, the lightning current impulse can damage some arrester type of the protection cascade. If there is at least 5m distance between two successive arrester types (in case of two successive arrester types in two different switchboards), this section impedance can be considered as adequate.

Type		**PI-L16, PI-L16/15**	**PI-L32, PI-L32/15**
Nominal voltage	U_N	500 V AC	
Rated load current	I_L	16 A	32 A
Inductance	L	6 μH ± 10% /15 μH ± 10%	
DC resistance		< 0,01 Ω	
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		4 mm^2	6 mm^2
Max. back-up fuse		16 A	32 A
Lifetime		min. 100.000 h	
Weight	m	141 g / 157 g	157 g / 330 g
Article number		30 000, 30 036	30 030, 30 035

Decoupling inductors



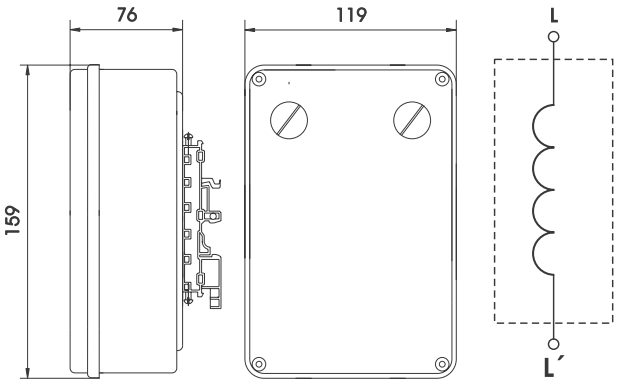


PI-L63/15 **PI-L63, PI-L80**

Decoupling inductors are intended for rated load currents within the range of 63 and 80A. These inductors, sometimes also called decoupling impedance, ensure the energy coordination between the arresters type 1 and type 2 or the arresters type 2 and type 3 according to IEC 1024-1 and EN 61643-11 and IEC 61643-11, especially in the places where there is no adequate distance between the arresters (e.g. when there are two successive arrester types placed in one switchboard). If the energy coordination of surge protection is not achieved, the lightning current impulse can damage some arrester type of the protection cascade. If there is at least 5m distance between two successive arrester types (in case of two successive arrester types in two different switchboards), this section impedance can be considered as adequate.

Type		**PI-L63, PI-L63/15**	**PI-L80**
Nominal voltage	U_N	500 V AC	
Rated load current	I_L	63 A	80 A
Inductance	L	6 μH ± 10% / 15 μH ± 10%	4 μH ± 10%
DC resistance		< 0,01 Ω	
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +80 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		16 mm^2	25 mm^2
Max. back-up fuse		63 A	80 A
Lifetime		min. 100.000 h	
Weight	m	360 g / 630 g	360 g
Article number		30 060, 30 065	30 081

Decoupling inductors

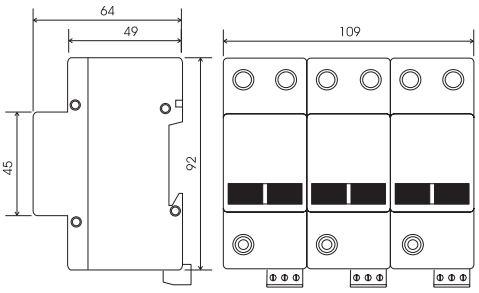


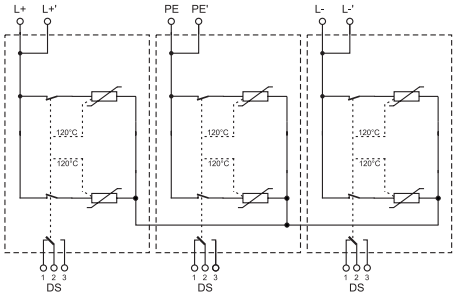
PI-L120

Decoupling inductor is intended for the rated load current of 120A. This inductor, sometimes also called decoupling impedance, ensures the energy coordination between the arresters type 1 and type 2 or the arresters type 2 and type 3 according to IEC 1024-1 and EN 61643-11 and IEC 61643-11, especially in the places where there is no adequate distance between the arresters (e.g. when there are two successive arrester types placed in one switchboard). If the energy coordination of surge protection is not achieved, the lightning current impulse can damage some arrester type of the protection cascade. If there is at least 5m distance between two successive arrester types (in case of two successive arrester types in two different switchboards), this section impedance can be considered as adequate.

Type		**PI-L120**
Nominal voltage	U_N	500 V AC
Rated load current	I_L	120 A
Inductance	L	6 μH ± 10%
DC resistance		< 0,01 Ω
Housing material		Polyamid PA6, UL94 V-0, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +80 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		50 mm^2
Max. back-up fuse		120 A
Lifetime		min. 100.000 h
Weight	m	1153 g
Article number		30 120

TYPE 1 + 2 / CLASS I + II / CE





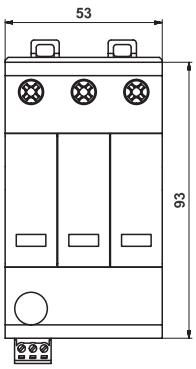
SPC PV 600, SPC PV 800, SPC PV 1000
SPC PV 600 DS, SPC PV 800 DS, SPC PV 1000 DS

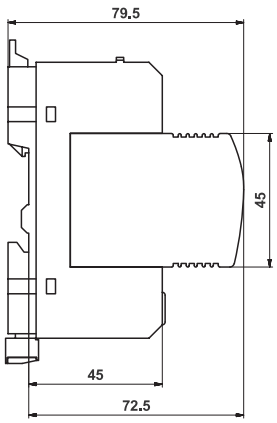
SPC PV is a lightning and surge arrester type 1+2 according to IEC EN 61643-11 and EN 50539-11. It is designed for protection of positive and negative busbars of photovoltaic systems against the surge effects. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC EN 62305). Particular varistor sectors are equipped with internal disconnectors, which are activated when the varistors fail (overheat). Operational status indication of these disconnectors is partly mechanical (by exserted red signaling target in case of failure) and partly remote monitoring (by potential free change over contacts – only DS types).

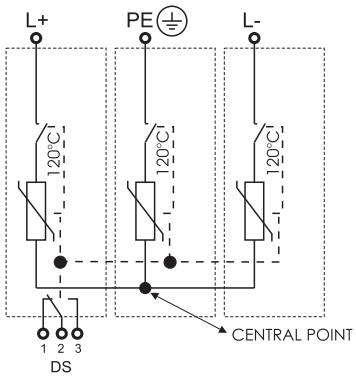
Type		**SPC PV 600, SPC PV 600 DS**	**SPC PV 800, SPC PV 800 DS**	**SPC PV 1000, SPC PV 1000 DS**
Test class according to IEC EN 61643-11 and EN 50539-11		TYPE 1+2, CLASS I+II		
Max. continuous operating voltage	U_{cpv}	650 V DC	880 V DC	1000 V DC
Open circuit voltage of PV generator	U_{OCSTC}	$U_{OCSTC} < U_{CPV}/1,2 = 540$ V	$U_{OCSTC} < U_{CPV}/1,2 = 740$ V	$U_{OCSTC} < U_{CPV}/1,2 = 830$ V
Short circuit withstand	I_{SCPV}	25 A		
Lightning impulse current (10/350)	I_{imp}	12,5 kA		
- charge	Q	6 As		
- specific energy	W/R	36 kJ/Ω		
Application		L+/L-, L+/PE, L-/PE		
Nominal discharge current (8/20)	I_n	25 kA		
Voltage protection level at I_n	U_P	< 2,4 kV	< 3,1 kV	< 3,5 kV
Response time	t_A	< 25 ns		
LPZ		0-2		
Housing material		Polyamid PA6, UL94 V-0		
Protection type		IP20		
Operating temperature range	ϑ	-40°C ... +70 °C		
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		35 mm² (solid)		
		25 mm² (wire)		
Mounting on		DIN rail 35 mm		
Failure signalisation		pushed in - ok / pushed out - failure		
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A		
Weight	m	900 g		
Lifetime		min.100 000 h		
Article number				
SPC PV*		10 168	10 169	10 170
SPC PV* DS		10 068	10 069	10 070

Lightning and surge arrester / photovoltaic systems / varistor / TYPE 1 + 2

TYPE 1 + 2 / CLASS I + II / CE







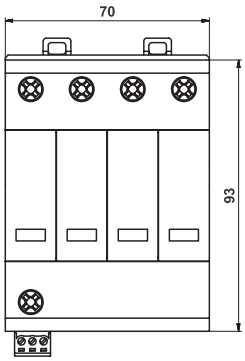
PIVM PV 600 Vseries
PIVM PV 600 DS Vseries

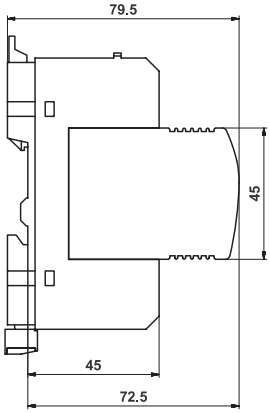
PIVM PV is a lightning and surge arrester type 1+2 according to EN 61643-11 and IEC 61643-11 and UTE C 61-740-51. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC EN 62305) for equipotential bonding of positive and negative busbars of photovoltaic systems and elimination of transient overvoltage that originates during the atmospheric discharges or switching processes. Particular varistor sectors, connected between the terminals L+, L- and PE, are equipped with internal disconnectors, which are activated when the varistors fail (overheat). Operational status indication of these disconnectors is partly visual (discoloration of the signal field) and partly remote monitoring (by potential free change over contacts – only DS types).
The marking **M** specifies a type of construction with removable module.

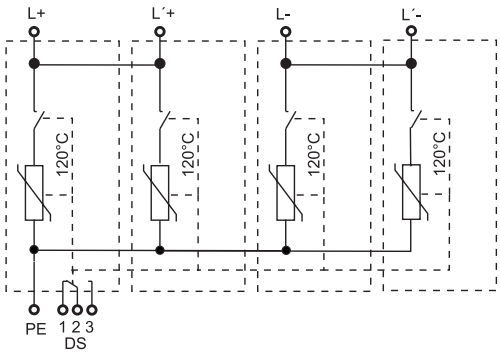
Type Vseries		**PIVM PV 600, PIVM PV 600 DS**
Test class according to IEC EN 61643-11 and EN 50539-11		TYPE 1+2, CLASS I+II
Max. continuous operating voltage	U_{cpv}	600 V DC
Open circuit voltage of PV generator	U_{OCSTC}	$U_{OCSTC} < U_{CPV}/1,2 = 500$ V
Short circuit withstand	I_{SCPV}	100 A
Lightning impulse current (10/350)	I_{imp}	7 kA
- charge	Q	3,5 As
- specific energy	W/R	12 kJ/Ω
Application		L+/L-, L+/PE, L-/PE
Max. discharge current (8/20)	I_{max}	40 kA
Nominal discharge current (8/20)	I_n	20 kA
Voltage protection level at I_n	U_P	< 2,6 kV
Response time	t_A	< 25 ns
LPZ		0-2
Housing material		Polyamid PA6, UL94 V-0
Protection type		IP20
Operating temperature range	ϑ	-40°C ... +70 °C
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm² (solid) 16 mm² (wire)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A
Weight	m	300 g
Lifetime		min.100 000 h
Article number		
PIVM PV*		16 070
PIVM PV* DS		16 071
Varistor-based spare module		PIVM PV-600/M
		16 072

Lightning and surge arrester / photovoltaic systems / varistor / TYPE 1 + 2

TYPE 1 + 2 / CLASS I + II / CE







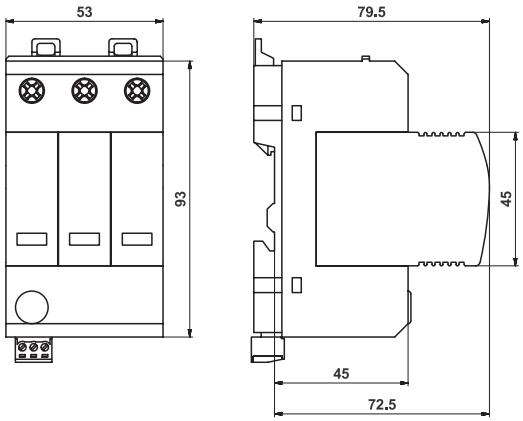
PIVM PV 800 V series , PIVM PV 1000 V series
PIVM PV 800 DS V series , PIVM PV 1000 DS V series

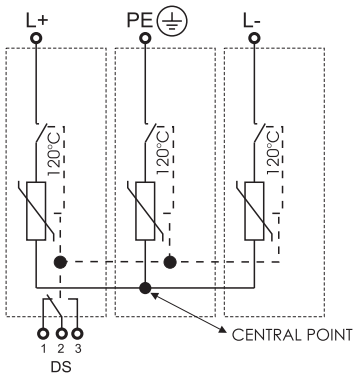
PIVM PV are the lightning and surge arresters type 1+2 according to EN 61643-11 and IEC 61643-11 and UTE C 61-740-51. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC EN 62305) for equipotential bonding of positive and negative busbars of photovoltaic systems and elimination of transient overvoltage that originates during the atmospheric discharges or switching processes. Particular varistor sectors, connected between the terminals L+, L- and PE, are equipped with internal disconnectors, which are activated when the varistors fail (overheat). Operational status indication of these disconnectors is partly visual (discoloration of the signal field) and partly remote monitoring (by potential free change over contacts – only DS types).
The marking **M** specifies a type of construction with removable module.

Type V series		**PIVM PV 800, PIVM PV 800 DS**	**PIVM PV 1000, PIVM PV 1000 DS**
Test class according to IEC EN 61643-11 and EN 50539-11		TYPE 1+2, CLASS I+II	
Max. continuous operating voltage	U_{cpv}	800 V DC	1050 V DC
Open circuit voltage of PV generator	U_{OCSTC}	$U_{OCSTC} < U_{CPV}/1,2 = 730$ V	$U_{OCSTC} < U_{CPV}/1,2 = 875$ V
Short circuit withstand	I_{SCPV}	100 A	
Lightning impulse current (10/350)	I_{imp}	6,5 kA	
- charge	Q	3,25 As	
- specific energy	W/R	10 kJ/Ω	
Application		L+/L-, L+/PE, L-/PE	L+/L-, L+/PE, L-/PE
Max. discharge current (8/20)	I_{max}	40 kA	
Nominal discharge current (8/20)	I_n	15 kA	
Voltage protection level at I_n (L+/L-)	U_P	< 3,3 kV	< 3,8 kV
Voltage protection level at I_n (L/PE)	U_P	< 1,65 kV	< 1,9 kV
Response time	t_A	< 25 ns	
LPZ		0-2	
Housing material		Polyamid PA6, UL94 V-0	
Protection type		IP20	
Operating temperature range	ϑ	-40°C ... +70 °C	
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm² (solid) 16 mm² (wire)	
Mounting on		DIN rail 35 mm	
Failure signalisation		green - ok / red - failure	
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A	
Weight	m	390 g	400 g
Lifetime		min.100 000 h	
Article number			
PIVM PV*		16 073	16 076
PIVM PV* DS		16 074	16 077
Varistor-based spare module		PIVM PV-800/M	PIVM PV-1000/M
		16 075	16 078

Surge arrester / photovoltaic systems / varistor / TYPE 2

TYPE 2 / CLASS II / CE





PIIIM PV 600 Vseries, PIIIM PV 800 Vseries, PIIIM PV 1000 Vseries
PIIIM PV 600 DS Vseries, PIIIM PV 800 DS Vseries, PIIIM PV 1000 DS Vseries

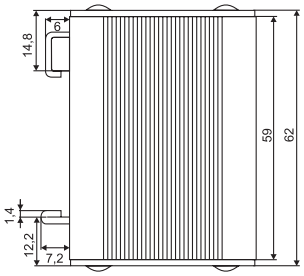
PIIIM PV are the lightning and surge arresters type 2 according to EN 61643-11 and IEC 61643-11 and UTE C 61-740-51. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC EN 62305) for equipotential bonding of positive and negative busbars of photovoltaic systems and elimination of transient overvoltage that originates during the atmospheric discharges or switching processes. Particular varistor sectors, connected between the terminals L+, L- and PE, are equipped with internal disconnectors, which are activated when the varistors fail (overheat). Operational status indication of these disconnectors is partly visual (discoloration of the signal field) and partly remote monitoring (by potential free change over contacts – only DS types).
The marking **M** specifies a type of construction with removable module.

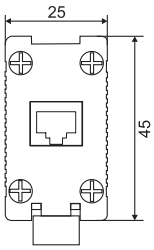
Type Vseries		**PIIIM PV 600, PIIIM PV 600 DS**	**PIIIM PV 800, PIIIM PV 800 DS**	**PIIIM PV 1000, PIIIM PV 1000 DS**
Test class according to IEC EN 61643-11 and EN 50539-11		TYPE 2, CLASS II		
Max. continuous operating voltage	U_{cpv}	600 V DC	870 V DC	1050 V DC
Open circuit voltage of PV generator	U_{OCSTC}	$U_{OCSTC} < U_{CPV}/1,2 = 500$ V	$U_{OCSTC} < U_{CPV}/1,2 = 730$ V	$U_{OCSTC} < U_{CPV}/1,2 = 875$ V
Short circuit withstand	I_{SCPV}	100 A		
Application		L+/L-, L+/PE, L-/PE		
Max. discharge current (8/20)	I_{max}	40 kA		
Nominal discharge current (8/20)	I_n	20 kA	15 kA	
Voltage protection level at I_n	U_P	< 2,6 kV	< 3,3 kV	< 3,8 kV
Response time	t_A	< 25 ns		
LPZ		1-2		
Housing material		Polyamid PA6, UL94 V-0		
Protection type		IP20		
Operating temperature range	ϑ	-40°C ... +70 °C		
Cross-section of the connected conductors (at tightening moment of clamps 4 Nm)		25 mm² (solid)		
		16 mm² (wire)		
Mounting on		DIN rail 35 mm		
Failure signalisation		green - ok / red - failure		
Potential free signal contact (DS) (recommended cross-section of remote monitoring max.1 mm²)		AC: 250 V / 0,5 A, DC: 250 V / 0,1 A		
Weight	m	270 g		420 g
Lifetime		min.100 000 h		
Article number				
PIIIM PV*		27 060	27 056	27 054
PIIIM PV* DS		27 061	27 059	27 058

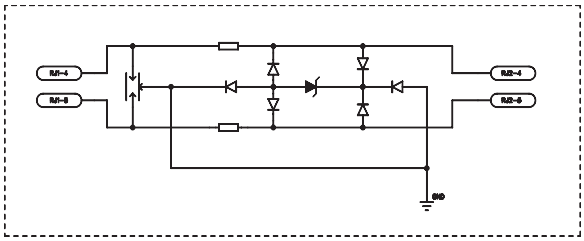
Varistor-based spare module		PIIIM PV-600/M	PIIIM PV-800/M	PIIIM PV-1000/M
		27 062	27 068	27 055

Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE







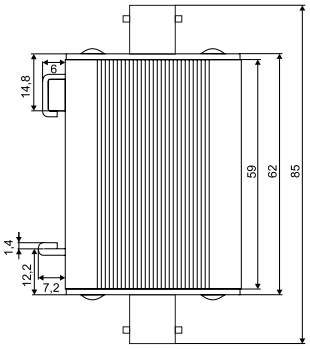
HT-ISDN Xseries

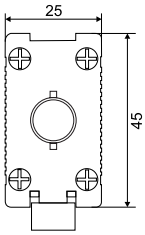
Hakel Transmition-ISDN is designed to protect telecommunication lines, which transmit the ISDN technology. The casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance. I_{max}= 2 kA. It is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 according to EN 62305.

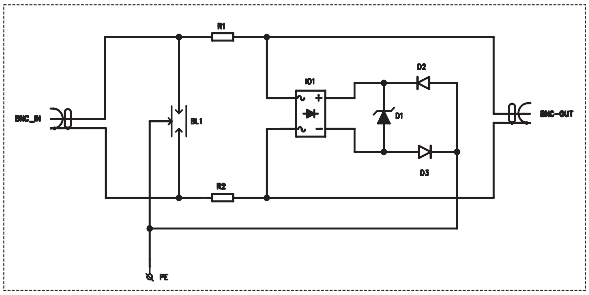
Type		HT-ISDN
Number of protected pairs		1
Connector type		RJ45
Nominal voltage	U_N	120 V
Max. continuous operating voltage	U_C	144 V
Rated load current	I_L	100 mA
C2 Max. discharge current (8/20)	I_{max}	2 kA
C2 Nominal discharge current (8/20)	I_n	1 kA
C2 Voltage protection level at I_n	U_P	200 V
C3 Voltage protection level at 1kV/μs	U_P	150 V
Response time	t_A	< 30 ns
Data rate		10 MBit/s
Series impedance per line		1,5 -10 Ω
Parasitic capacitance	C	1,5 nF
LPZ		1-2
Protection type		IP20
Operating temperatue range	ϑ	-40°C ÷ + 80°C
Recommended cable cross-section		0,3 mm^2
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1
Article number		57 000

Surge protection devices for information technology systems

LPZ 1-2-3 / IP20 / CE







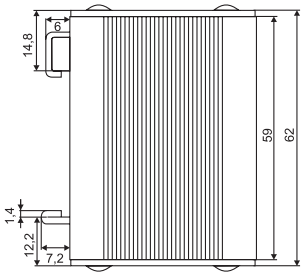
HT-CCTV 6 Xseries
HT-CCTV 12 Xseries

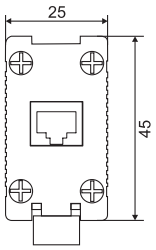
Hakel Transmition-CCTV is designed to protect video transmission equipment, which process the transferred video signal. The casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance. I_{max}= 5 kA. It is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2-3 according to EN 62305.

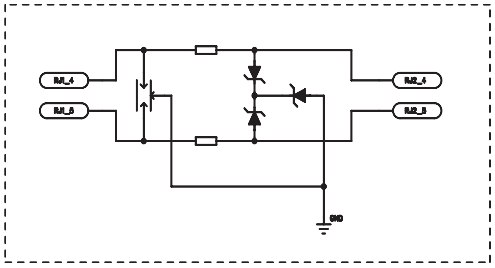
Type		HT-CCTV 6	HT-CCTV 12
Number of protected pairs		1	
Connector type		BNC (F/F, F/M)	
Nominal voltage	U_N	6 V	12 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V
Rated load current	I_L	300 mA	
C2 Max. discharge current (8/20)	I_{max}	5 kA	
C2 Nominal discharge current I_n (8/20)	I_n	1 kA	
C2 Voltage protection level at I_n	U_P	22 V	44 V
C3 Voltage protection level at 1kV/μs	U_P	10 V	20 V
Response time	t_A	< 30 ns	
Data rate		10 MBit/s	
Parasitic capacitance	C	< 27 pF	
Series impedance per line	R	10 Ω	
LPZ		2-3	
Protection type		IP20	
Operating temperatue range	ϑ	-40°C - +80°C	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Article number		57 001	57 002

Surge protection devices for information technology systems

LPZ 1-2-3 / IP20 / CE







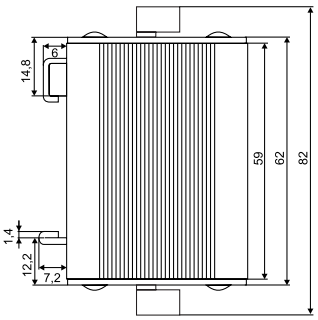
HT-TEL Xseries

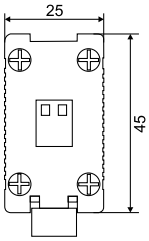
Hakel Transmition-TEL is designed to protect telecommunications equipment. The casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance. I_{max} = 2 kA. It is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2-3 according to EN 62305.

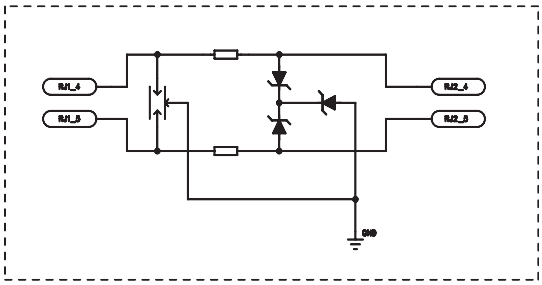
Type		HT-TEL
Number of protected pairs		1
Connector type		RJ45
Nominal voltage	U_N	170 V
Max. continuous operating voltage	U_C	204 V
Rated load current	I_L	100 mA
C2 Max. discharge current (8/20)	I_{max}	2 kA
C2 Nominal discharge current (8/20)	I_n	1 kA
C2 Voltage protection level at I_n (8/20)	U_P	500 V
C3 Voltage protection level at 1kV/μs	U_P	290 V
Response time	t_A	< 30 ns
Data rate		1 MBit/s
Series impedance per line		2,2 Ω
Parasitic capacitance	C	1,5 nF
LPZ		3
Protection type		IP20
Operating temperatue range	ϑ	-40°C ÷ + 80°C
Recommended cable cross-section		0,25 - 1,5 mm^2
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1
Article number		57 003

Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE







HT-DATA 1/* Xseries
HT-NV 1/*/0,5 Xseries

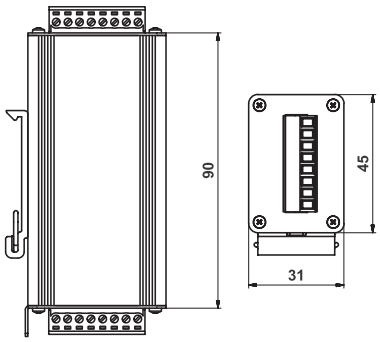
Hakel Transmition - Data is designed to protect transmission of information signals and Hakel Transmition-NV to protect links of power supply lines. The casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance. I_{max}=10kA. It is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 according to EN 62305.

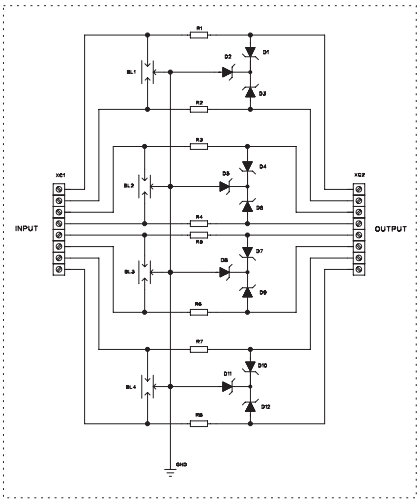
Type		HT-DATA 1/6	HT-DATA 1/12	HT-DATA 1/24	HT-DATA 1/48	HT-DATA 1/T
Number of protected pairs				1		
Connector type		Two-pole, screw type, slip-on terminal block DEGSON 2EDGK- 5.08				
Nominal voltage	U_N	6 V	12 V	24 V	48 V	170 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V	204 V
Rated load current	I_L			100 mA		
C2 Max. discharge current (8/20)	I_{max}			10 kA		
C2 Nominal discharge current (8/20)	I_n			1 kA		
C2 Voltage protection level at I_n(8/20)	U_P	15 V	28 V	64 V	160 V	500 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V	290 V
Response time	t_A			< 30 ns		
Data rate				1 MBit/s		
Series impedance per line				2,2 Ω		
Parasitic capacitance	C			1,5 nF		
LPZ				1-2		
Protection type				IP20		
Operating temperatue range	ϑ			-40°C ÷ + 80°C		
Recommended cable cross-section				0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000				A2, B2, C2, C3, D1		
Article number		57 005	57 006	57 007	57 008	57 009

Type		HT-NV 1/6/0,5	HT-NV 1/12/0,5	HT-NV 1/24/0,5	HT-NV 1/48/0,5
Number of protected pairs			1		
Connector type		Two-pole, screw type, slip-on terminal block DEGSON 2EDGK- 5.08			
Nominal voltage	U_N	6 V	12 V	24 V	48 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V
Rated load current	I_L		0,5 A		
D1 Lightning impulse current (10/350)	I_{imp}		5 kA		
D1 Lightning impulse current (10/350) line/PE	I_{imp}		2,5 kA		
C2 Max. discharge current (8/20)	I_{max}		10 kA		
C2 Nominal discharge current (8/20)	I_n		1 kA		
C2 Voltage protection level at I_n(8/20)	U_P	15 V	28 V	64 V	85 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V
Response time	t_A		< 30 ns		
Data rate			1 MBit/s		
Insert inductance			4,7 μH		
LPZ			1-2		
Protection type			IP20		
Operating temperatue range	ϑ		-40°C ÷ + 80°C		
Parasitic capacitance	C		1,5 nF		
Recommended cable cross-section			0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000			A2, B2, C2, C3, D1		
Article number		57 010	57 011	57 012	57 013

Surge protection devices for information technology systems

LPZ 0-3 / IP20 / CE





HT-D 4/* X series
HT-NV 4/*/0,5 X series

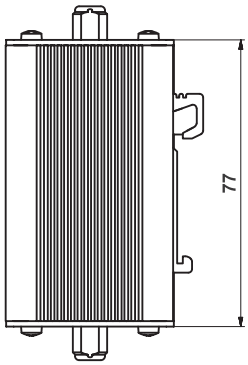
Hakel Transmition - is designed to protect transmission of information signals and Hakel Transmition-NV for protection of supply lines. The casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance. It is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-3 according to EN 62305 ed.2

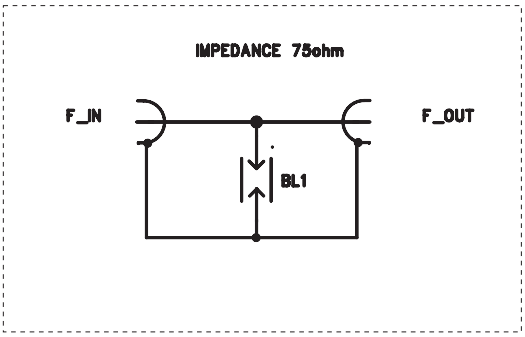
Type		HT-D 4/6	HT-D 4/12	HT-D 4/24	HT-D 4/48
Number of protected pairs			4		
Connector type			Eight-pole, screw / screwless type, slip-on terminal block		
Nominal voltage	U_N	6 V	12 V	24 V	48 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V
Rated load current	I_L		100 mA		
C2 Nominal discharge current (8/20)	I_n		1 kA		
C2 Voltage protection level at I_n(8/20)	U_P	15 V	28 V	64 V	160 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V
Response time	t_A		< 30 ns		
Data rate			1 MBit/s		
Series impedance per line			2,2 Ω		
Parasitic capacitance	C		1,5 nF		
LPZ			0-3		
Protection type			IP20		
Operating temperatue range	ϑ		-40°C ÷ + 70°C		
Recommended cable cross-section			0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000			A2, B2, C2, C3, D1		
Article number		35 003	35 004	35 005	35 006

Type		HT-NV 4/6/0,5	HT-NV 4/12/0,5	HT-NV 4/24/0,5	HT-NV 4/48/0,5
Number of protected pairs			4		
Connector type			Eight-pole, screw type, slip-on terminal block		
Nominal voltage	U_N	6 V	12 V	24 V	48 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V
Rated load current	I_L		0,5 A		
C2 Nominal discharge current (8/20)	I_n		1 kA		
C2 Voltage protection level at I_n (8/20)	U_P	15 V	28 V	64 V	85 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V
Response time	t_A		< 30 ns		
Data rate			1 MBit/s		
Insert inductance			4,7 μH		
LPZ			0-3		
Protection type			IP20		
Operating temperatue range	ϑ		-40°C ÷ + 70°C		
Parasitic capacitance	C		1,5 nF		
Recommended cable cross-section			0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000			A2, B2, C2, C3, D1		
Article number		35 007	35 008	35 009	35 010

Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE





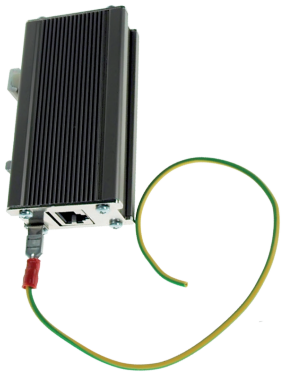
HT-SAT Xseries

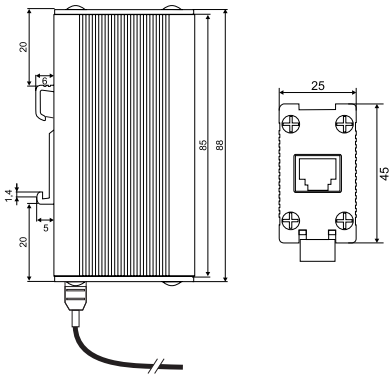
Hakel Transmition-SAT is designed to protect satellite equipment. Casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance.

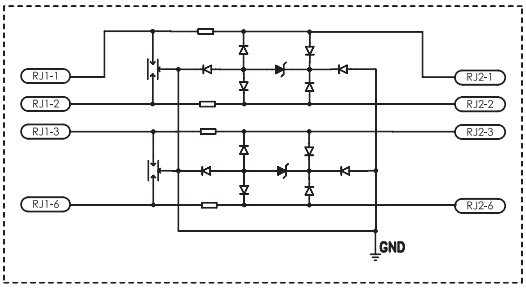
Technical data		HT-SAT
Connector type		F
Max. continous operating voltage	U_C	72 V
Rated load current	I_N	0,5 A
D1 Max. lightning impulse current (10/350)	I_{imp}	2 kA
C2 Max. discharge current (8/20)	I_{max}	10 kA
C2 Nominal discharge current (8/20)	I_n	5 kA
Voltage protection level at 1kV/ms	U_P	500 V
Frequency range		0-2 GHz
Max. transmission power capacity		50 W
Insertion loss		< 0,5 dB
Return loss		> 20 dB
Characteristic impedance		75 W
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1
Article number		57 004

Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE







HT-NET 2/100 5cat *x*series

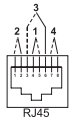
These surge protection devices intended for computer networks are specially designed for securing a faultless data transfer within computer networks category 5. They protect input electronic circuits of network cards against damage caused by surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 according to EN 62305. It is recommended to use these protection devices at the input of protected equipment.

Type		**HT-NET 2/100 5cat**
Number of protected pairs		2
Connector type input/output		RJ45/RJ45
Nominal voltage	U_N	6 V
Max. continuous operating voltage	U_C	7,2 V
Rated load current	I_L	300 mA
C2 Max. discharge current (8/20)	I_{max}	2 kA
C2 Nominal discharge current (8/20)	I_n	1 kA
C3 Voltage protection level at 1kV/μs	U_P	< 10 V
Data rate		max. 100 Mbit/s
Max. attenuation		< 0,4 dB (at 100 MHz)
Near-end crosstalk		> 40 dB (at 100 MHz)
Return loss		< 14 dB (at 100 MHz)
Series impedance per line		2,2 Ω
Response time	t_A	< 25 ns
Parasitic capacitance	C	<42 pF
LPZ		1-2
Protection type		IP20
Operating temperatue range	ϑ	-40°C ÷ + 80°C
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1
Article number		57 015

Connection of RJ45 pins
acc.to EIA/TIA 568, type B

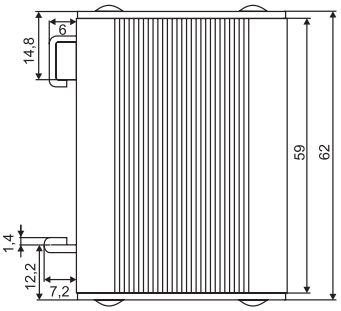
- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

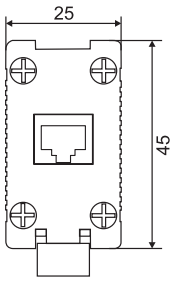
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair

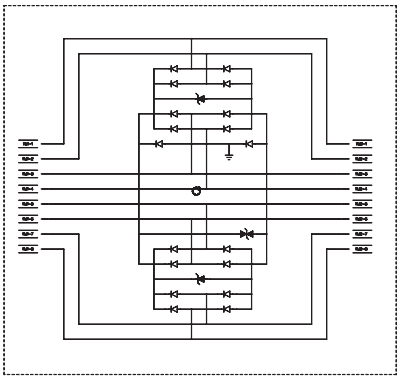


Surge protection devices for information technology systems

LPZ 2-3 / IP20 / CE







HT-NET 4/100M 5cat *X*series

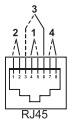
These surge protection devices intended for computer networks are specially designed for securing a faultless data transfer within computer networks category 5. The casing of this protector is made out of light alloy, which ensures high mechanical and thermal resistance. It is recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 2-3 according to EN 62305.

Type		**HT-NET 4/100M 5cat**
Number of protected pairs		4
Connector type		RJ45/RJ45
Nominal voltage	U_N	6 V
Max. continuous operating voltage	U_C	7,2 V
Rated load current	I_L	300 mA
C2 Nominal discharge current (8/20)	I_n	20 A
C3 Voltage protection level at 1kV/μs	U_P	10 V
Response time	t_A	< 25 ns
Data rate		max. 100 MBit/s
Parasitic capacitance	C	47 pF
LPZ		2-3
Protection type		IP20
Operating temperatue range	ϑ	-40°C ÷ + 80°C
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1
Article number		57 014

Connection of RJ45 pins
acc.to EIA/TIA 568, type B

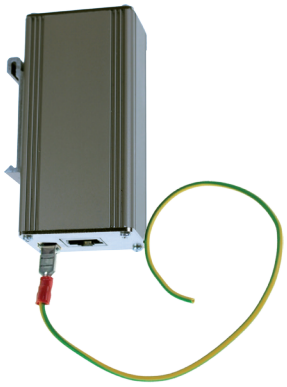
- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

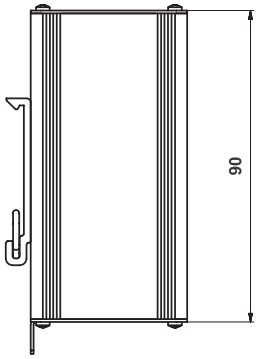
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair

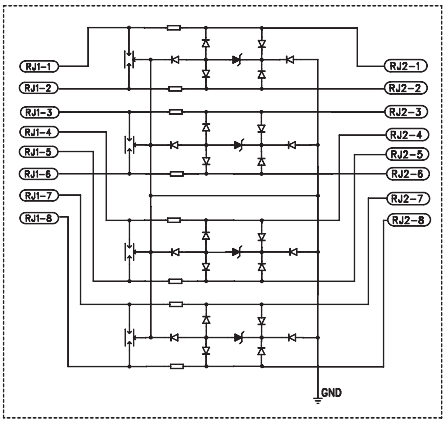


Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE







HT-NET 5Ecat/RJ *X*series

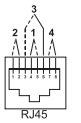
These surge protection devices intended for computer networks are specially designed for securing a faultless data transfer within computer networks category 5. They protect input electronic circuits of network cards against damage caused by surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 according to EN 62305. It is recommended to use these protection devices at the input of protected equipment.

Type		**HT-NET 5Ecat/RJ**
Number of protected pairs		4
Connector type input/output		RJ45/RJ45
Nominal voltage	U_N	48 V
Max. continuous operating voltage	U_C	57,6 V
Rated load current	I_L	300 mA
C2 Max. discharge current (8/20)	I_{max}	2 kA
C2 Nominal discharge current (8/20)	I_n	1 kA
C3 Voltage protection level at 1kV/μs	U_P	< 80 V
Data rate		max. 250 Mbit/s
Series impedance per line		2,2 Ω
Response time	t_A	< 25 ns
Parasitic capacitance	C	< 42 pF
LPZ		1-2
Protection type		IP20
Operating temperatue range	ϑ	-40°C ÷ + 80°C
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1
Article number		57 017

Connection of RJ45 pins
acc.to EIA/TIA 568, type B

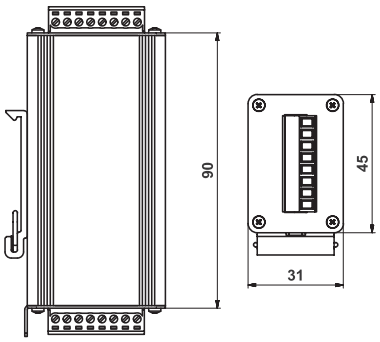
- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

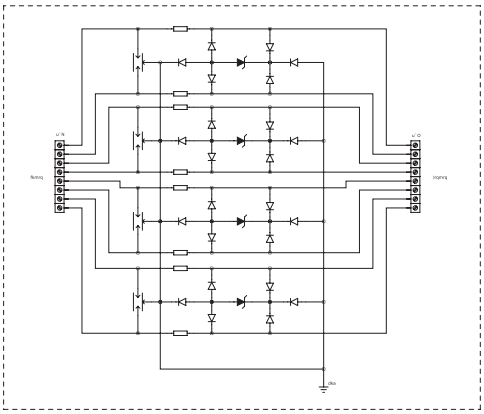
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair



Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE





HT-NET 5Ecat/D X series

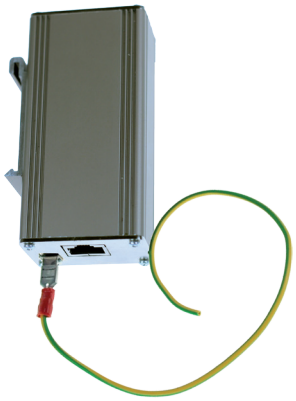
These surge protection devices intended for computer networks are specially designed for protection and faultless data transmission within the 5th category computer networks. They protect the input circuit network cards against damage caused by overvoltage effects within the LPZ concept at the boundaries of LPZ 1-2 according to EN 62305 ed.2. It is recommended to use these protective devices at the input of the protected equipment.

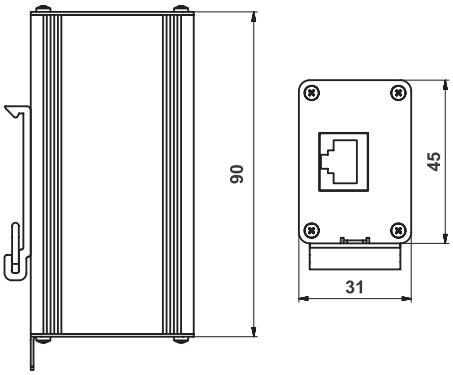
HT-NET 5Ecat/D are available in a version with screw terminals or screwless terminal block.

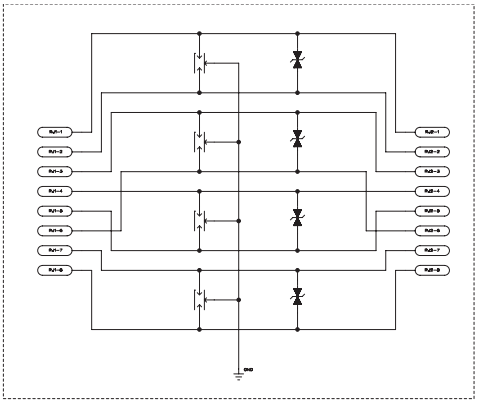
Type		**HT-NET 5Ecat/D**
Number of protected pairs		4
Connector type input/output		Screw / screwless terminal (DEGSON)
Nominal voltage	U_N	48 V
Max. continuous operating voltage	U_C	57,6 V
Rated load current	I_L	300 mA
C2 Max. discharge current (8/20)	I_{max}	2 kA
C2 Nominal discharge current (8/20)	I_n	1 kA
C3 Voltage protection level at 1kV/μs	U_P	< 80 V
Data rate		max. 250 Mbit/s
Series impedance per line		2,2 Ω
Response time	t_A	< 25 ns
Parasitic capacitance	C	< 42 pF
LPZ		1-2
Protection type		IP20
Operating temperatue range	ϑ	-40°C ÷ + 80°C
Category tested acc. to EN 61643-21+A1,A2		A2, B2, C2, C3, D1
Article number		57 018

Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE







HT-NET PoE 6cat Xseries

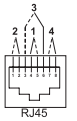
These surge protection devices intended for computer networks are specially designed for securing a faultless data transfer within computer networks category 6. They protect input electronic circuits of network cards against damage caused by surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 according to EN 62305. It is recommended to use these protection devices at the input of protected equipment.

TYPE		HT-NET PoE 6cat
Connector type		RJ45/RJ45
Max. continous operating voltage(DC)	U_C	58 V
Max. continous operating voltage(AC)	U_C	41 V
Rated load current	I_L	1 A
C2 Max. discharge current line/PE	I_{max}	2 kV/ 1 kA
C1 Nominal discharge current line/line	I_n	300 V/ 150 A
C3 Voltage protection level at 1kV/μs	U_P	< 120 V
Voltage protection level line/line	U_P	< 150 V
Voltage protection level line/PE	U_P	< 700 V
Max. frequency		max. 500 MHz
Protection type		IP20
Operating temperature	ϑ	-40°C ÷ + 70°C
LPZ		1-2-3
Tested acc. to EN 61643-21+A1,A2		B2, C1, C2, C3
Approvals and certifications		Kat. 6A/EA, ISO/IEC 11801
PoE		IEEE 802.3af
Article number		57 101

Connection of RJ45 pins
acc.to EIA/TIA 568, type B

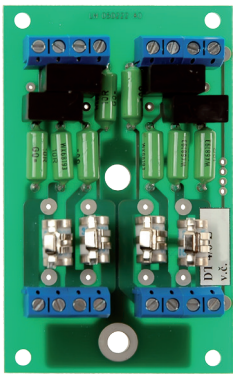
- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

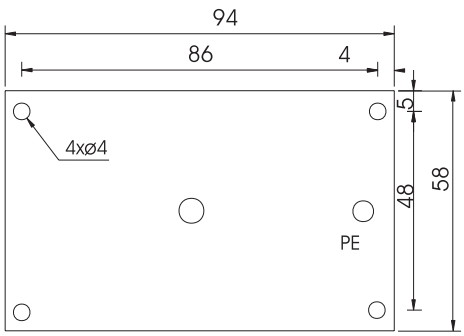
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair

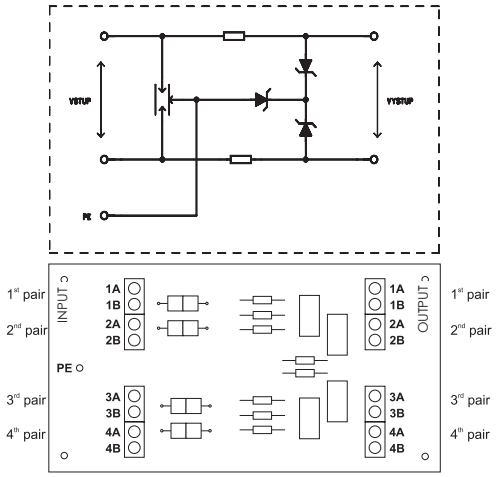


Surge protection devices for information technology systems

LPZ 1-2 / IP00 / CE







DT */*
DT */*-L

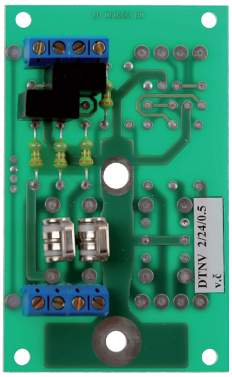
DT is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ -1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,1A.

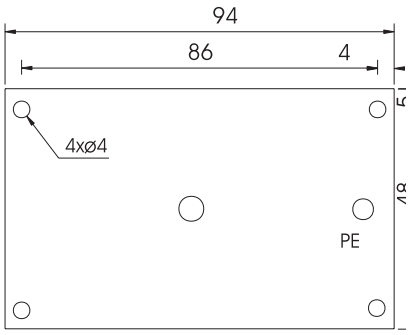
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-4). These devices are produced for nominal voltage within the range of 6V-170V. Maximum discharge current is 10kA (8/20), in case of "L" design the maximum discharge current is 20kA (8/20). For the protection of telephone lines it is recommended to use DT type with nominal voltage U_N=170V (with code mark "T").

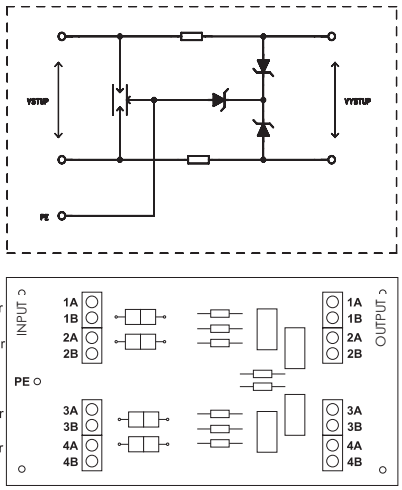
Type Number of protected pairs	1 2 3 4	**DT 1/6** **DT 2/6** **DT 3/6** **DT 4/6**	**DT 1/12** **DT 2/12** **DT 3/12** **DT 4/12**	**DT 1/24** **DT 2/24** **DT 3/24** **DT 4/24**	**DT 1/48** **DT 2/48** **DT 3/48** **DT 4/48**	**DT 1/T** **DT 2/T** **DT 3/T** **DT 4/T**
Nominal voltage	U_N	6 V	12 V	24 V	48 V	170 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V	204 V
Rated load current	I_L	100 mA				
C2 Max. discharge current (8/20)	I_{max}	10 kA				
C2 Nominal discharge current (8/20)	I_n	1 kA				
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	160 V	500 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V	290 V
Response time	t_A	< 30 ns				
Data rate		1 MBit/s				
Series impedance per line		1,5 -10 Ω				
Parasitic capacitance	C	1,5 nF				
Recommended cable cross-section		0,25 - 1,5 mm²				
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1				
Article number		48 101 48 201 48 301 48 401	48 102 48 202 48 302 48 402	48 103 48 203 48 303 48 403	48 104 48 204 48 304 48 404	48 105 48 205 48 305 48 405

Surge protection devices for information technology systems

LPZ 1-2 / IP00 / CE







DTNV */*/0,5
DTNV */*/0,5-L

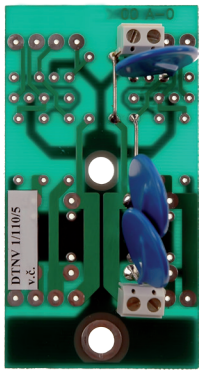
DTNV 0,5 is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,5A.

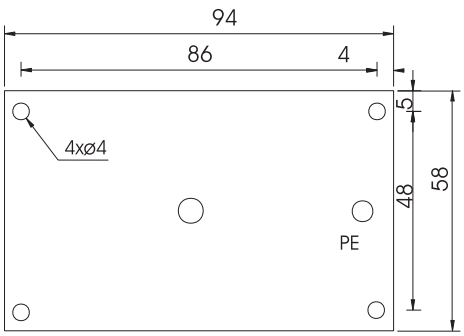
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-4). These devices are produced for nominal voltage within the range of 6V-48V. Maximum discharge current is 10kA (8/20), in case of "L" design the maximum discharge current is 20kA (8/20).

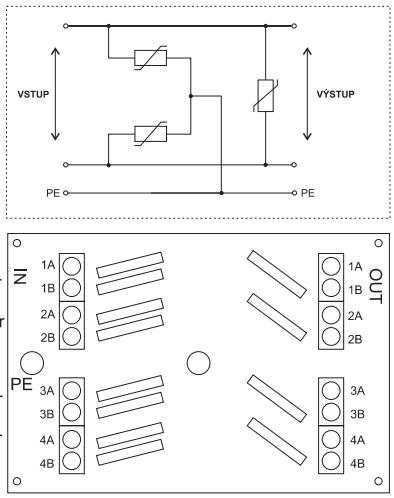
Type Number of protected pairs	1 2 3 4	**DTNV 1/6/0,5** **DTNV 2/6/0,5** **DTNV 3/6/0,5** **DTNV 4/6/0,5**	**DTNV 1/12/0,5** **DTNV 2/12/0,5** **DTNV 3/12/0,5** **DTNV 4/12/0,5**	**DTNV 1/24/0,5** **DTNV 2/24/0,5** **DTNV 3/24/0,5** **DTNV 4/24/0,5**	**DTNV 1/48/0,5** **DTNV 2/48/0,5** **DTNV 3/48/0,5** **DTNV 4/48/0,5**
Nominal voltage	U_N	6 V	12 V	24 V	48 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V
Rated load current	I_L	0,5 A			
C2 Max. discharge current (8/20)	I_{max}	10 kA			
C2 Nominal discharge current (8/20)	I_n	1 kA			
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	160 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V
Response time	t_A	< 30 ns			
Data rate		1 MBit/s			
Series impedance per line		4,7 μH			
Parasitic capacitance	C	1,5 nF			
Recommended cable cross-section		0,25 - 1,5 mm^2			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Article number		50 101 50 201 50 301 50 401	50 102 50 202 50 302 50 402	50 104 50 204 50 304 50 404	50 106 50 206 50 306 50 406

Surge protection devices for information technology systems

LPZ 2-3 / IP00 / CE







DTNV */*/5

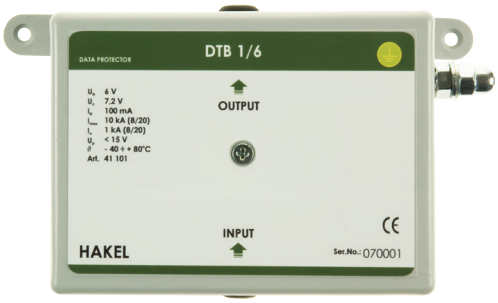
DTNV 5 is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 5A.

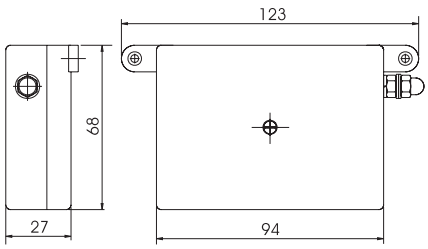
These devices consist of MOVs only. The number of protected pairs is optional (1-4). These devices are produced for nominal voltage within the range of 12V-110V. Maximum discharge current is different according to various types from 2kA (8/20) to 8kA (8/20).

Type Number of protected pairs	1 2 3 4	**DTNV 1/12/5** **DTNV 2/12/5** **DTNV 3/12/5** **DTNV 4/12/5**	**DTNV 1/24/5** **DTNV 2/24/5** **DTNV 3/24/5** **DTNV 4/24/5**	**DTNV 1/48/5** **DTNV 2/48/5** **DTNV 3/48/5** **DTNV 4/48/5**	**DTNV 1/80/5** **DTNV 2/80/5** **DTNV 3/80/5** **DTNV 4/80/5**
Nominal voltage	U_N	12 V	24 V	48 V	80 V
Max. continuous operating voltage	U_C	14,4 V	28,6 V	57,6 V	96 V
Rated load current	I_L	5 A			
C2 Max. discharge current (8/20)	I_{max}	2 kA			6,5 kA
C2 Nominal discharge current (8/20)	I_n	1 kA			
C2 Voltage protection level at I_n	U_P	56 V	90 V	170 V	280 V
C3 Voltage protection level at 1kV/μs	U_P	27 V	51 V	118 V	200 V
Response time	t_A	< 30 ns			
Parasitic capacitance	C	10 nF			
Recommended cable cross-section		0,25 - 1,5 mm^2			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Article number		50 103 50 203 50 303 50 403	50 105 50 205 50 305 50 405	50 107 50 207 50 307 50 407	50 108 50 208 50 308 50 408

Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE

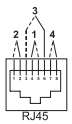


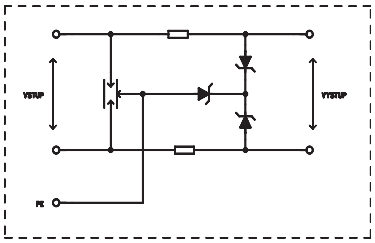


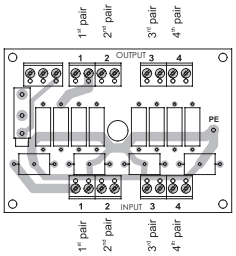
Connection of RJ45 pins
acc.to EIA/TIA 568, type B

- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair







DTB */*/*

DTB, DTB-R is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,1A.

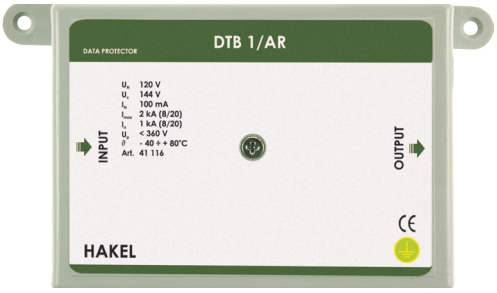
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-4). These devices are produced for nominal voltage within the range of 6V-170V. Maximum discharge current is 10kA (8/20) for type DTB and 2kA (8/20) for DTB-R type. For the protection of telephone lines it is recommended to use DTB type with nominal voltage U_N = 170V (with code mark "T"). The connection of protected lines is carried out by screw terminals for type DTB and by RJ45 connectors for type DTB-R.

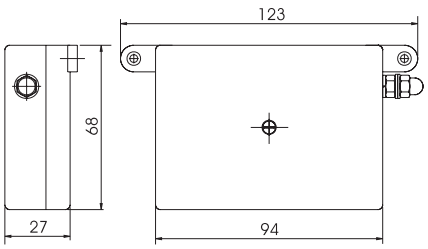
Type Number of protected pairs	1 2 3 4	**DTB 1/6** **DTB 2/6** **DTB 3/6** **DTB 4/6**	**DTB 1/12** **DTB 2/12** **DTB 3/12** **DTB 4/12**	**DTB 1/24** **DTB 2/24** **DTB 3/24** **DTB 4/24**	**DTB 1/48** **DTB 2/48** **DTB 3/48** **DTB 4/48**	**DTB 1/T** **DTB 2/T** **DTB 3/T** **DTB 4/T**
Nominal voltage	U_N	6 V	12 V	24 V	48 V	170 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V	204 V
Rated load current	I_L			100 mA		
C2 Max. discharge current (8/20)	I_{max}			10 kA		
C2 Nominal discharge current (8/20)	I_n			1 kA		
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	160 V	500 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V	290 V
Response time	t_A			< 30 ns		
Data rate				1 MBit/s		
Series impedance per line				1,5 -10 Ω		
Parasitic capacitance	C			1,5 nF		
Recommended cable cross-section				0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000				A2, B2, C2, C3, D1		
Article number		41 101 42 101 43 101 44 101	41 102 42 102 43 102 44 102	41 103 42 103 43 103 44 103	41 104 42 104 43 104 44 104	41 105 42 105 43 105 44 105

Type Number of protected pairs	1 2 3 4	**DTB 1/6 R** **DTB 2/6 R** **DTB 3/6 R** **DTB 4/6 R**	**DTB 1/12 R** **DTB 2/12 R** **DTB 3/12 R** **DTB 4/12 R**	**DTB 1/24 R** **DTB 2/24 R** **DTB 3/24 R** **DTB 4/24 R**	**DTB 1/48 R** **DTB 2/48 R** **DTB 3/48 R** **DTB 4/48 R**	**DTB 1/T R** **DTB 2/T R** **DTB 3/T R** **DTB 4/T R**
Nominal voltage	U_N	6 V	12 V	24 V	48 V	170 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V	204 V
Rated load current	I_L			100 mA		
C2 Max. discharge current (8/20)	I_{max}			2 kA		
C2 Nominal discharge current (8/20)	I_n			1 kA		
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	160 V	500 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V	290 V
Response time	t_A			< 30 ns		
Data rate				1 MBit/s		
Series impedance per line				1,5 -10 Ω		
Parasitic capacitance	C			1,5 nF		
Recommended cable cross-section				0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000				A2, B2, C2, C3, D1		
Article number		41 111 42 111 43 111 44 111	41 112 42 112 43 112 44 112	41 113 42 113 43 113 44 113	41 114 42 114 43 114 44 114	41 115 42 115 43 115 44 115

Surge protection devices for information technology systems

LPZ 1-2-3 / IP20 / CE

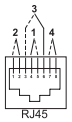


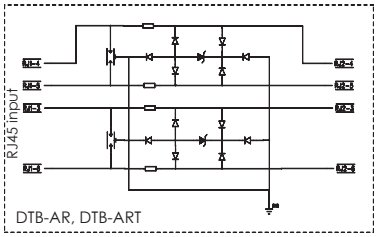


Connection of RJ45 pins
acc.to EIA/TIA 568, type B

- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair





DTB */*

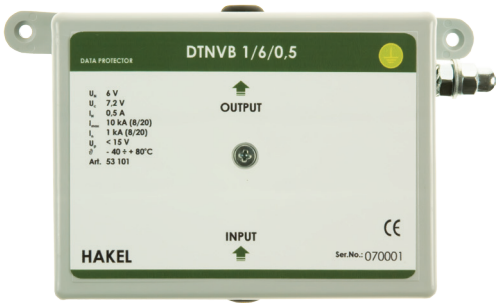
DTB-L, DTB-AR and DTB-ART is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,1A.

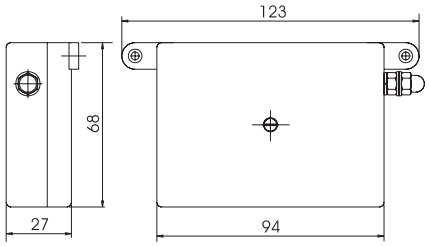
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-4). These devices are produced for nominal voltage within the range of 6V-170V. DTB-AR and DTB-ART types are designed for the protection of equipment using DSL technology. Maximum discharge current of DTB-L is 20kA (8/20) and 2kA (8/20) for DTB-AR and DTB-ART types. For the protection of telephone lines it is recommended to use a type with nominal voltage U_N=170V (with code mark "T"). The connection of protected lines is carried out by screw terminals for type DTB-L and by RJ45 connectors for types DTB-AR and DTB-ART.

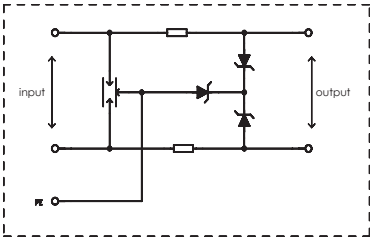
Type Number of protected pairs	1 2	**DTB 1/AR** **DTB 2/AR**	**DTB 1/ART** **DTB 2/ART**
Nominal voltage	U_N	120 V	170 V
Max. continuous operating voltage	U_C	144 V	204 V
Rated load current	I_L	100 mA	
C2 Max. discharge current (8/20)	I_{max}	2 kA	
C2 Nominal discharge current (8/20)	I_n	1 kA	
C2 Voltage protection level at I_n	U_P	360 V	520 V
C3 Voltage protection level at 1kV/μs	t_A	< 30 ns	
Response time		10 MBit/s	
Data rate		1,5 -10 Ω	
Series impedance per line	C	1,5 nF	
Parasitic capacitance	ϑ	-40°C ÷ + 80°C	
Recommended cable cross-section		0,3 mm²	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Article number		41 116 42 116	41 117 42 117

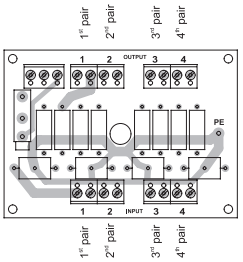
Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE









DTNVB */*/0,5

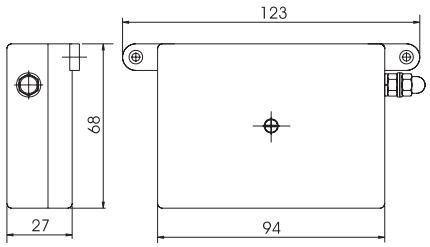
DTNVB 0,5 is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,5A.

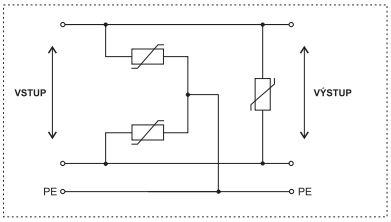
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-4). These devices are produced for nominal voltage within the range of 6V-48V. Maximum discharge current is 10kA (8/20).

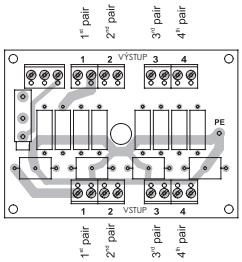
Type Number of protected pairs	1 2 3 4	**DTNVB 1/6/0,5** **DTNVB 2/6/0,5** **DTNVB 3/6/0,5** **DTNVB 4/6/0,5**	**DTNVB 1/12/0,5** **DTNVB 2/12/0,5** **DTNVB 3/12/0,5** **DTNVB 4/12/0,5**	**DTNVB 1/24/0,5** **DTNVB 2/24/0,5** **DTNVB 3/24/0,5** **DTNVB 4/24/0,5**	**DTNVB 1/48/0,5** **DTNVB 2/48/0,5** **DTNVB 3/48/0,5** **DTNVB 4/48/0,5**
Nominal voltage	U_N	6 V	12 V	24 V	48 V
Max. continuous operating voltage	C_U	7,2 V	14,4 V	28,6 V	57,6 V
Rated load current	I_L	0,5 A			
C2 Max. discharge current (8/20)	I_{max}	10 kA			
C2 Nominal discharge current (8/20)	I_n	1 kA			
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	160 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V
Response time	t_A	< 30 ns			
Data rate		1 MBit/s			
Series impedance per line		4,7 μH			
Parasitic capacitance	C	1,5 nF			
Recommended cable cross-section		0,25 - 1,5 mm^2			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Article number		53 101 53 201 53 301 53 401	53 102 53 202 53 302 53 402	53 104 53 204 53 304 53 404	53 106 53 206 53 306 53 406

Surge protection devices for information technology systems

LPZ 2-3 / IP20 / CE







DTNVB */*/5

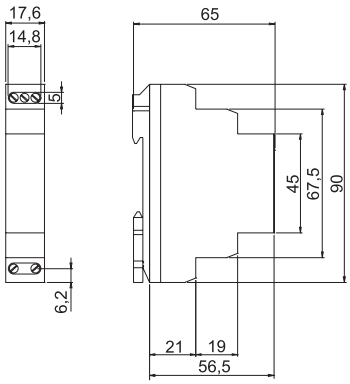
DTNVB 5 je komplexní řada přepěťových ochran určených pro ochranu měřicích a regulačních vedení před účinky přepětí. Doporučuje se pro použití na rozhraní ochranných zón LPZ 2-3 podle ČSN EN 62305 ed. 2. Všechny TYPE y zabezpečují efektivní ochranu připojených zařízení proti příčnému i podélnému přepětí podle ČSN EN 61643-21+A1,A2. Jmenovitý provozní proud jednotlivých chráněných linek I_N = 5A.

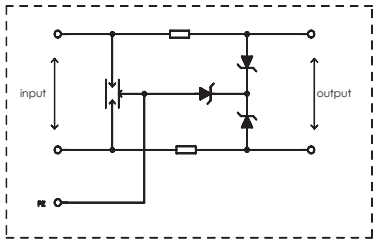
Tento TYPE ochrany je řešen pouze aplikací MOV varistorů. Počet chráněných párů je volitelný 1-4. Vyrábí se na jmenovité provozní napětí 12V-110V. Maximální výbojový proud je odlišný dle TYPE u od 2kA(8/20) do 8kA(8/20).

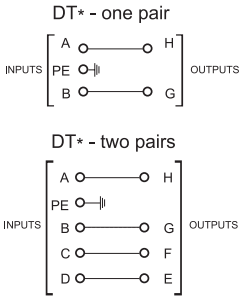
TYPE Počet párů		1 2 3 4	**DTNVB 1/12/5** **DTNVB 2/12/5** **DTNVB 3/12/5** **DTNVB 4/12/5**	**DTNVB 1/24/5** **DTNVB 2/24/5** **DTNVB 3/24/5** **DTNVB 4/24/5**	**DTNVB 1/48/5** **DTNVB 2/48/5** **DTNVB 3/48/5** **DTNVB 4/48/5**	**DTNVB 1/80/5** **DTNVB 2/80/5** **DTNVB 3/80/5** **DTNVB 4/80/5**
Jmenovité provozní napětí	U_N	12 V	24 V	48 V	80 V	
Max. trvalé provozní napětí	U_C	14,4 V	28,6 V	57,6 V	96 V	
Jmenovitý proud	I_N	5 A				
C2 Max. výbojový proud (8/20)	I_{max}	2 kA			6,5 kA	
C2 Nominal discharge current (8/20)	I_n	1 kA				
C2 Voltage protection level při I_n	U_P	56 V	90 V	170 V	280 V	
C3 Voltage protection level při 1kV/μs	U_P	27 V	51 V	118 V	200 V	
Response time	t_A	< 30 ns				
Parazitní kapacita	C	10 nF				
Dop. průřez připojovaných vodičů		0,25 - 1,5 mm^2				
Testováno dle ČSN EN 61643-21+A1,A2		A2, B2, C2, C3, D1				
Article number		53 103 53 203 53 303 53 403	53 105 53 205 53 305 53 405	53 107 53 207 53 307 53 407	53 108 53 208 53 308 53 408	

Surge protection devices for information technology systems

LPZ 1-2-3 / IP20 / CE







DTE */*

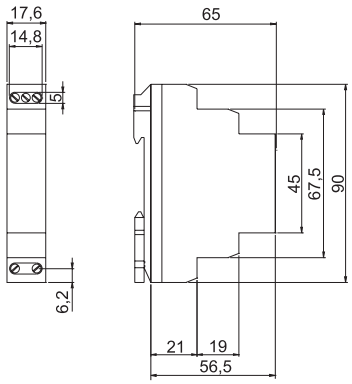
DTE is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,1A.

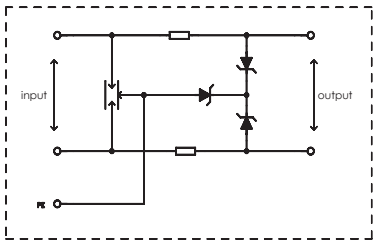
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-2). These devices are produced for nominal voltage within the range of 6V-170V. Maximum discharge current is 10kA (8/20). For the protection of telephone lines it is recommended to use a type with nominal voltage U_N=170V (with code mark "T").

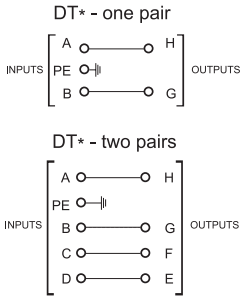
Type Number of protected pairs	1 2	**DTE 1/6** **DTE 2/6**	**DTE 1/12** **DTE 2/12**	**DTE 1/24** **DTE 2/24**	**DTE 1/48** **DTE 2/48**	**DTE 1/T** **DTE 2/T**
Nominal voltage	U_N	6 V	12 V	24 V	48 V	170 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	57,6 V	204 V
Rated load current	I_L			100 mA		
C2 Max. discharge current (8/20)	I_{max}			10 kA		
C2 Nominal discharge current (8/20)	I_n			1 kA		
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	160 V	500 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	66 V	290 V
Response time	t_A			< 30 ns		
Data rate				1 MBit/s		
Series impedance per line				1,5 -10 Ω		
Parasitic capacitance	C			1,5 nF		
Recommended cable cross-section				0,25 - 1,5 mm²		
Category tested acc. to IEC 61643:21-2000				A2, B2, C2, C3, D1		
Article number		41 301 42 301	41 302 42 302	41 303 42 303	41 304 42 304	41 306 42 306

Surge protection devices for information technology systems

LPZ 1-2-3 / IP20 / CE







DTNVE */*/0,5

DTNVE 0,5 is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,5A.

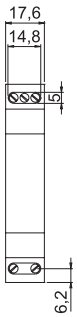
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-2). These devices are produced for nominal voltage within the range of 6V-115V. Maximum discharge current is 10kA (8/20).

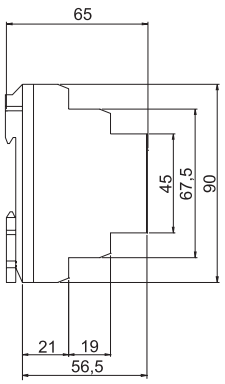
Type Number of protected pairs	1 2	**DTNVE 1/6/0,5** **DTNVE 2/6/0,5**	**DTNVE 1/12/0,5** **DTNVE 2/12/0,5**	**DTNVE 1/24/0,5** **DTNVE 2/24/0,5**	**DTNVE 1/30/0,5** **DTNVE 2/30/0,5**
Nominal voltage	U_N	6 V	12 V	24 V	30 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	28,6 V	36 V
Rated load current	I_L	0,5 A			
D1 Lightning impulse current (10/350)	I_{imp}	5 kA			
D1 Lightning impulse current (10/350) line/PE	I_{imp}	2,5 kA			
C2 Max. discharge current (8/20)	I_{max}	10 kA			
C2 Nominal discharge current (8/20)	I_n	1 kA			
C2 Voltage protection level at I_n	U_P	15 V	28 V	64 V	75 V
C3 Voltage protection level at 1kV/μs	U_P	9 V	18 V	34 V	54 V
Response time	t_A	< 30 ns			
Data rate		1 MBit/s			
Series impedance per line		4,7 μH			
Parasitic capacitance	C	1,5 nF			
Recommended cable cross-section		0,25 - 1,5 mm^2			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Article number		41 313 42 323	41 324 42 316	41 308 42 308	41 309 42 309

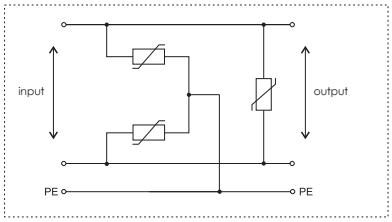
Type Number of protected pairs	1 2	**DTNVE 1/48/0,5** **DTNVE 2/48/0,5**	**DTNVE 1/80/0,5** **DTNVE 2/80/0,5**
Nominal voltage	U_N	48 V	80 V
Max. continuous operating voltage	U_C	57,6 V	96 V
Rated load current	I_L	0,5 A	
D1 Lightning impulse current (10/350)	I_{imp}	5 kA	
D1 Lightning impulse current (10/350) line/PE	I_{imp}	2,5 kA	
C2 Max. discharge current (8/20)	I_{max}	10 kA	
C2 Nominal discharge current (8/20)	I_n	1 kA	
C2 Voltage protection level at I_n	U_P	85 V	500 V
C3 Voltage protection level at 1kV/μs	U_P	66 V	120 V
Response time	t_A	< 30 ns	
Data rate		1 MBit/s	
Series impedance per line		4,7 μH	
Parasitic capacitance	C	1,5 nF	
Recommended cable cross-section		0,25 - 1,5 mm^2	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Article number		41 310 42 311	41 338 42 322

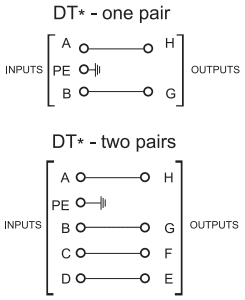
Surge protection devices for information technology systems

LPZ 2-3 / IP20 / CE









DTNVE */*/5

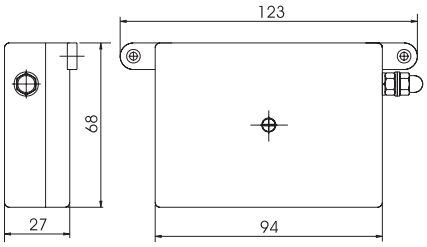
DTNVE 5 is a complex range of surge protection devices designed for protection of data, communication, measuring and control lines against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 5A.

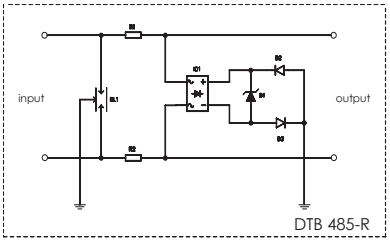
These devices consist of MOVs only. The number of protected pairs is optional (1-2). These devices are produced for nominal voltage within the range of 12V-230V. Maximum discharge current is different according to various types from 2kA (8/20) to 10kA (8/20).

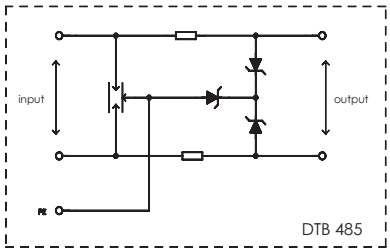
Type Number of protected pairs	1 2	**DTNVE 1/12/5** **DTNVE 2/12/5**	**DTNVE 1/24/5** **DTNVE 2/24/5**	**DTNVE 1/30/5** **DTNVE 2/30/5**	**DTNVE 1/48/5** **DTNVE 2/48/5**	**DTNVE 1/80/5** **DTNVE 2/80/5**
Nominal voltage	U_N	12 V	24 V	30 V	48 V	80 V
Max. continuous operating voltage	U_C	14,4 V	28,6 V	36 V	57,6 V	96 V
Rated load current	I_L			5 A		
C2 Max. discharge current (8/20)	I_{max}			2 kA		
C2 Nominal discharge current (8/20)	I_n			1 kA		
C2 Voltage protection level at I_n	U_P	56 V	90 V	140V	170 V	280 V
C3 Voltage protection level at 1kV/μs	U_P	27 V	51 V	100 V	118 V	200 V
Response time	t_A			< 30 ns		
Parasitic capacitance	C			10 nF		
Recommended cable cross-section				0,25 - 1,5 mm^2		
Category tested acc. to IEC 61643:21-2000				A2, B2, C2, C3, D1		
Article number		41 312 42 317	41 307 42 307	41 311 42 312	41 318 42 321	41 334 42 328

Surge protection devices for information technology systems

LPZ 1-2-3 / IP20 / CE







DTB 485*
DTB 2/485*

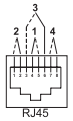
DTB 485 is a complex range of surge protection devices designed for protection of lines interface RS485 against surge effects. These surge protection devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305. All types provide effective protection of connected equipment against common mode and differential mode surge effects according to IEC 61643-21. The rated load current of individual protected lines I_L < 0,1A.

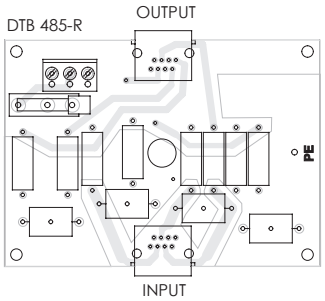
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-2). These devices are produced for nominal voltage of 6V. Maximum discharge current is 10kA (8/20) for type DTB, 20kA (8/20) for type DTB-L and 2kA (8/20) for type DTB-R. The connection of protected lines is carried out by screw terminals for type DTB and by RJ45 connectors for type DTB-R.

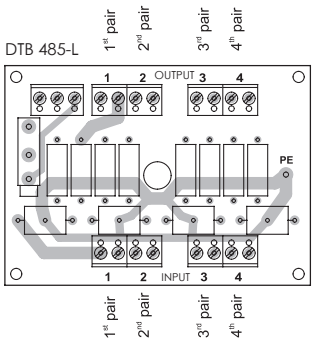
Type Number of protected pairs	1 2	**DTB 485** **DTB 2/485**	**DTB 485 R** **DTB 2/485 R**
Nominal voltage	U_N	6 V	6 V
Max. continuous operating voltage	U_C	7,2 V	7,2 V
Rated load current	I_L	100 mA	
D1 Lightning impulse current (10/350)	I_{imp}	5 kA	-
D1 Lightning impulse current (10/350) line/PE	I_{imp}	-	-
C2 Max. discharge current (8/20)	I_{max}	10 kA	2 kA
C2 Voltage protection level at I_n	U_P	15 V	
C3 Voltage protection level at 1kV/μs	U_P	9 V	
Response time	t_A	< 30 ns	
Data rate		1 MBit/s	10 MBit/s
Series impedance per line		1,5 Ω	
Recommended cable cross-section		0,25 - 1,5 mm²	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Article number		41 585 41 586	41 785 41 786

Connection of RJ45 pins
acc.to EIA/TIA 568, type B

- 1 whiteorange 1 - blue pair
- 2 orange 2 - orange pair
- 3 whitegreen 3 - green pair
- 4 blue 4 - brown pair
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

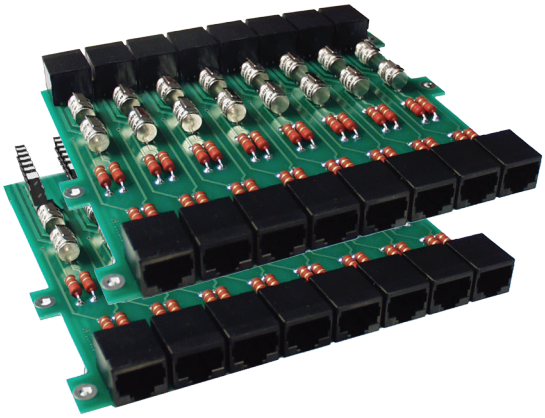


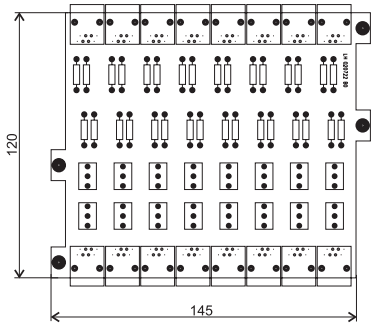




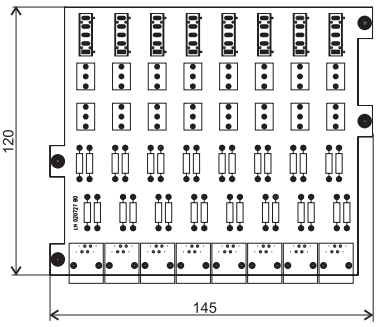
Surge protection devices for information technology systems

LPZ 3 / IP00 / CE





HAKELTEL 8 (RJ/RJ)



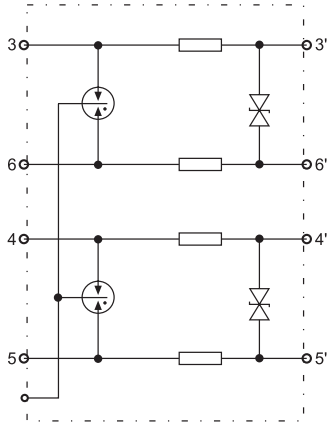
HAKELTEL 8 (LSA/RJ)

HAKELTEL 8.*RJ/RJ
HAKELTEL 8.*LSA/RJ

Hakeltel is a complex range of protection devices specially designed for the protection of analog telecommunication appliances against surges. These devices are recommended for use in the Lightning Protection Zones Concept at the boundaries of protection zones LPZ $0_{A(B)}$ - 1 according to EN 62305.

HAKELTEL is produced in two basic versions intended in preference for mounting to metal panel PSK 24 which is appropriate for installation into 19" rackmounts. For variant RJ/RJ is fitted to use the PSK24-19" type and for variant LSA/RJ is fitted to use the PSK 24/LSA-19" type. These types provide effective protection against surge for 8 telephone lines. The number of protected pairs of each telephone line is optional (1 or 2 pairs).

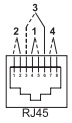
Type No. of telephone lines		**HAKELTEL 8.1 RJ/RJ** 8	**HAKELTEL 8.2 RJ/RJ** 8	**HAKELTEL 8.1 LSA/RJ** 8	**HAKELTEL 8.2 LSA/RJ** 8
No. of protected pairs per line		1	2	1	2
Nominal voltage	U_N	170 V DC			
Max. continuous operating voltage	U_C	204 V DC			
Rated load current	I_L	150 mA			
C2 Nominal discharge current	I_n	2,5 kA		5 kA	
C2 Voltage protection level I_n					
line/line line/PE	U_P	< 250 V < 600 V		< 275 V < 600 V	
C3 Voltage protection level 1 kV/μs					
line/line line/PE	U_P	< 230 V < 600 V			
Response time					
line/line line/PE	t_A	< 25 ns < 100 ns			
Data rate		1 MBit/s			
Series impedance per line	R	2,2 Ω			
Parasitic capacitance					
line/line line/PE	C	300 pF 15 pF			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Connector type input/output		RJ45/RJ45		LSA-PLUS/RJ45	
Pinning		4/5	3/6, 4/5	4/5	3/6, 4/5
Article number		45 024	45 026	45 025	45 027



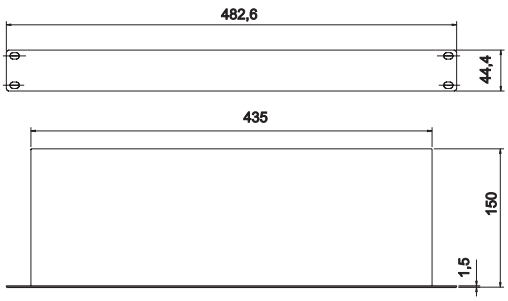
Connection of RJ45 pins
acc.to EIA/TIA 568, type B

- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

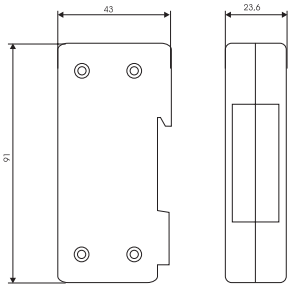
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair

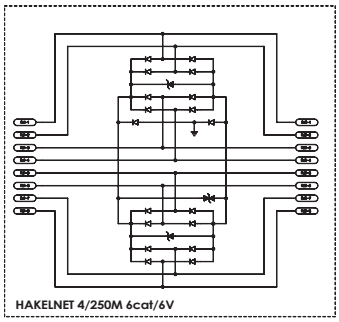


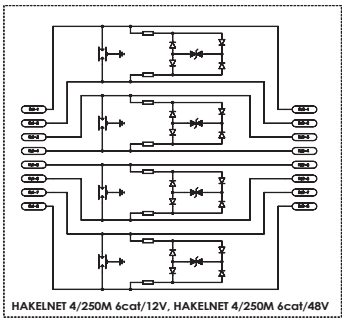
PSK24 is a metal suitable for fitting in 19" rackmounts. It is possible to mount up to 3 pieces of HAKELTEL 8.* into this panel.



LPZ 3 / IP20 / CE







HAKELNET 4/250M 6cat/*

Hakelnet 4/250M 6 cat is designed to protect 5E/6 data and communications lines. All protected lines are equipped with Transient Voltage Suppressor Diode which eliminates common mode and differential mode surge effects during computer networks operation.

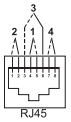
Hakelnet 4/250M 6cat consists of a plastic box and patch cords which are terminated with RJ45 connectors. Required length of patch cords (a, b) is to be specified by customer.

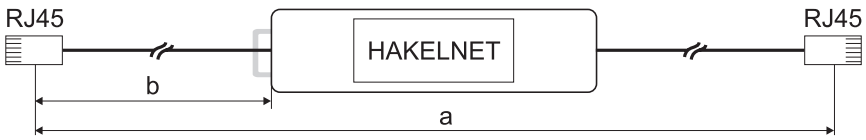
Type Number of protected pairs		**HAKELNET 4/250M 6cat** 4	**HAKELNET 4/250M 6cat/12V** 4	**HAKELNET 4/250M 6cat/48V** 4
Nominal voltage	U_N	6 V	12 V	48 V
Max. continuous operating voltage	U_C	7,2	14,4 V	57,6 V
Rated load current	I_L		200 mA	
Mode of protection			line-line, line-G(PE)	
Frequency handling line-line	f_g		250 MHz	
C2 Nominal discharge current I_n (8/20) line/line	I_n	20 A	150 A	150 A
C3 Voltage protection level line/line at 1 kV/μs (line/line)	U_p	< 15 V	< 40 V	< 150 V
Insertion loss for 250 MHz			< 3 dB	
Parasitic capacitance line/line	c	max. 5 pF	max. 160 pF	max. 160 pF
Mounting on			DIN rail 35 mm	
Input/output, pinning			RJ45/RJ45, 1/2, 3/6, 4/5, 7/8	
Length of patch cords				
Total length **a**			1,5 m or 3 m	
Supply length **b**			acc. to customer's specification	
Grounding method			trough DIN rail 35 mm by special metal clip on the back side of box	
Housing material			Polyamid PA6, UL94 V-0	
Colours			grey	
Category tested acc. to			EN 61643-21+A1,A2	
Approvals and certifications			cat. 6, ISO/IEC 11801	
Article number		45 034	45 038	45 037

Connection of RJ45 pins
acc.to EIA/TIA 568, type B

- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

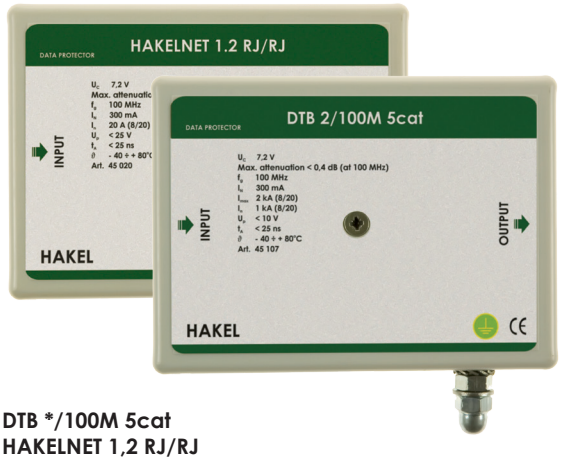
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair

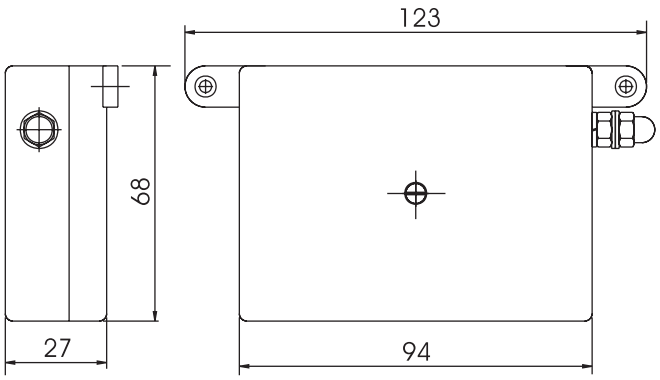




Surge protection devices for information technology systems

LPZ 2-3 / IP20 / CE



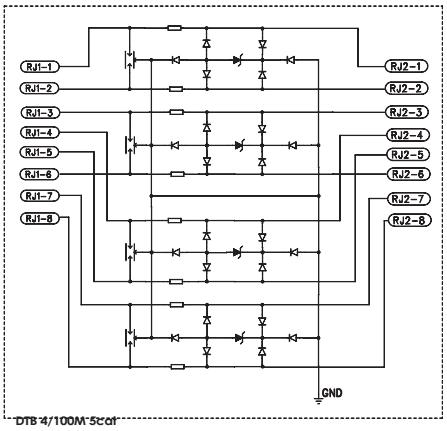


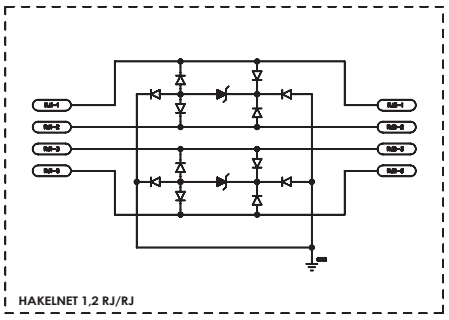
DTB */100M 5cat
HAKELNET 1,2 RJ/RJ

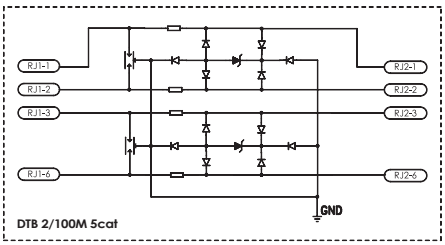
These surge protection devices intended for computer networks are specially designed for securing a faultless data transfer within computer networks category 5. They protect input electronic circuits of network cards against damage caused by surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ -1 and higher according to EN 62305. It is recommended to use these protection devices at the input of protected equipment.

Models:
DTB*/100M 5cat is suitable for mounting on a wall. DTB 2/100M 5cat protects two pairs and DTB 4/100M 5cat protects four pairs of conductors.
Hakelnet 1.2RJ/RJ protects one line with two protected pairs. It is supplyed in a plastic housing enabling bolt fastening on a wall. Alternatively, it can be attached to the protected appliance with a double-sided tape. Connectors RJ45 are at the input and output side of the device.

Type Number of protected pairs		**DTB 2/100M 5cat** 2	**DTB 4/100M 5cat** 4	**HAKELNET 1,2 RJ/RJ** 2
Connector type input/output		RJ45/RJ45	RJ45/RJ45	RJ45/RJ45
Nominal voltage	U_N	6 V		
Max. continuous operating voltage	U_C	7,2 V		
Rated load current	I_L	300 mA		
C2 Max. discharge current (8/20)	I_{max}	2 kA		-
C2 Nominal discharge current I_n (8/20)	I_n	1 kA		20 A
C3 Voltage protection level at 1kV/μs	U_P	< 10 V		< 25 V
Frequency handling line-line	f_g	100 MHz		
Max. attenuation		< 0,4 dB (at 100 MHz)		
Near-end crosstalk		> 40 dB (at 100 MHz)		
Return loss		< 14 dB (at 100 MHz)		
Series impedance per line		1,5 Ω	1,5 Ω	-
Characteristic impedance		100 Ω		
Response time	t_A	< 25 ns		
Parasitic capacitance	C	< 42 pF		< 47 pF
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1		
Article number		45 107	45 109	45 020



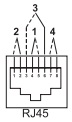




Connection of RJ45 pins
acc.to EIA/TIA 568, type B

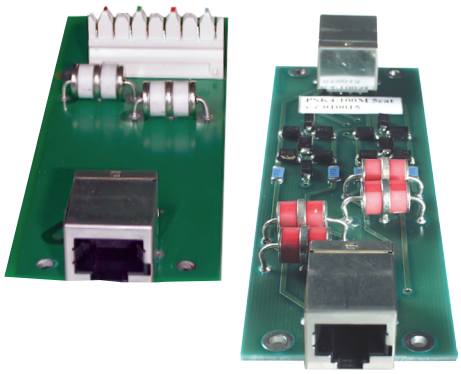
- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

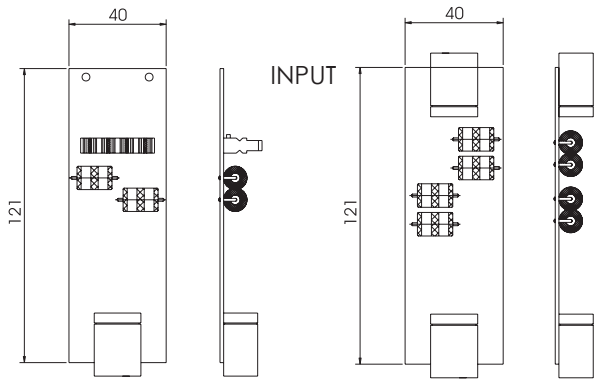
1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair



Surge protection devices for information technology systems

LPZ 1-2 / IP00 / CE



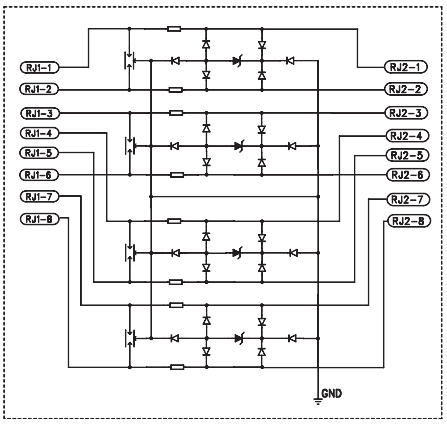


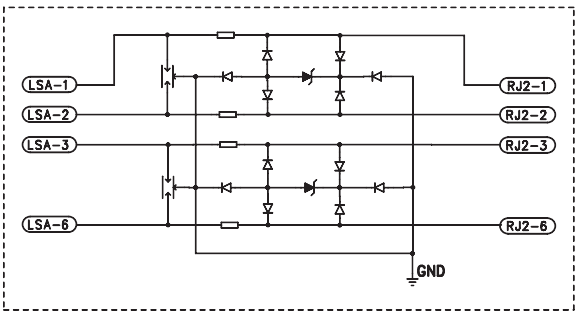
PSK */100M 5cat

These surge protection devices intended for computer networks are specially designed for securing a faultless data transfer within computer networks category 5. They protect input electronic circuits of network cards against damage caused by surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 and higher according to EN 62305. It is recommended to use these protection devices at the input of protected equipment.

Models:
PSK*/100M 5cat is a printed circuit board intended for mounting into PSK 10 which is appropriate for installation into 19" rackmounts.
PSK 2/100M 5cat designed for protection of two pairs has LSA-PLUS connector at the input side and RJ45 connector at the output side.
PSK 4/100M 5cat designed for protection of four pairs has RJ45 connector at the input and output sides.

Type Number of protected pairs		**PSK 2/100M 5cat** 2	**PSK 4/100M 5cat** 4
Connector type input/output		LSA-PLUS/RJ45	RJ45/RJ45
Nominal voltage	U_N	6 V	
Max. continuous operating voltage	U_C	7,2 V	
Rated load current	I_L	300 mA	
C2 Max. discharge current (8/20)	I_{max}	10 kA	2 kA
C2 Nominal discharge current I_n (8/20)	I_n	1 kA	
C2 Voltage protection level at I_n	U_P	10 V	
C3 Voltage protection level at 1kV/μs	U_P	< 10 V	
Response time	t_A	< 25 ns	
Parasitic capacitance	C	< 42 pF	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Article number		45 011	45 012

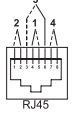




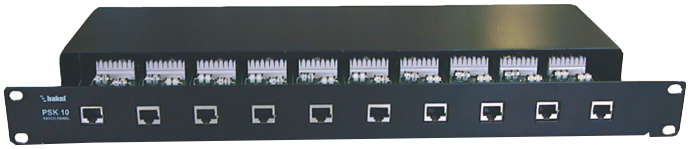
Connection of RJ45 pins
acc.to EIA/TIA 568, type B

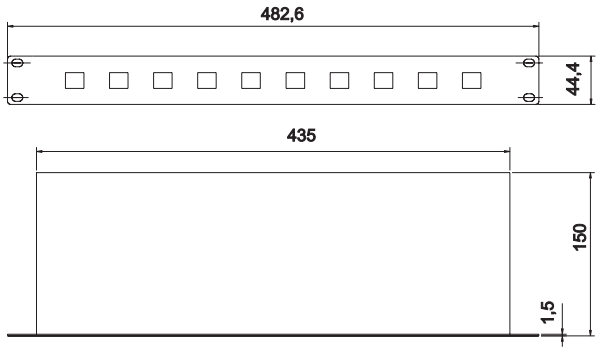
- 1 whiteorange
- 2 orange
- 3 whitegreen
- 4 blue
- 5 whiteblue
- 6 green
- 7 whitebrown
- 8 brown

1 - blue pair
2 - orange pair
3 - green pair
4 - brown pair



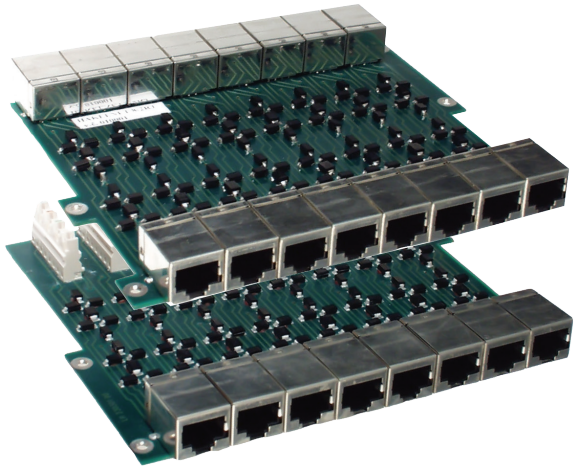
PSK 10 is a metal panel suitable for fitting in 19" rackmounts. It is possible to mount up to 3 pieces of HAKELNET 8.4 into this panel.

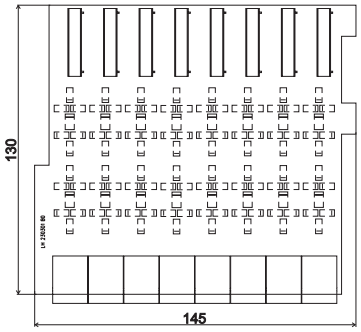




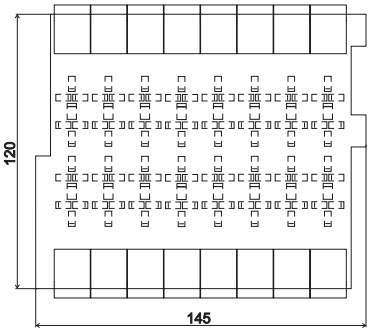
Surge protection devices for information technology systems

LPZ 3 / IP00 / CE





HAKELNET (LSA/RJ)



HAKELNET (RJ/RJ)

HAKELNET 8.4 RJ/RJ
HAKELNET 8.4 LSA/RJ

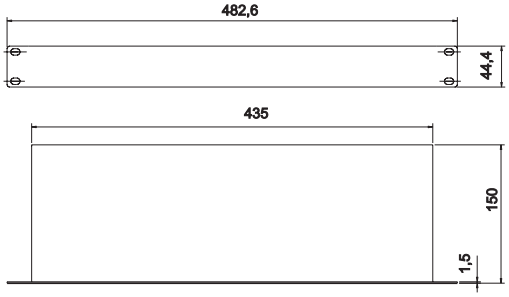
Hakelnet is a complex range of protection devices specially designed for faultless data transfers within computer networks category 5. They protect the input electronic circuits of network cards against a damage caused by surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ -1 and higher according to EN 62305. It is recommended to use these protection devices at the input of protected equipment.

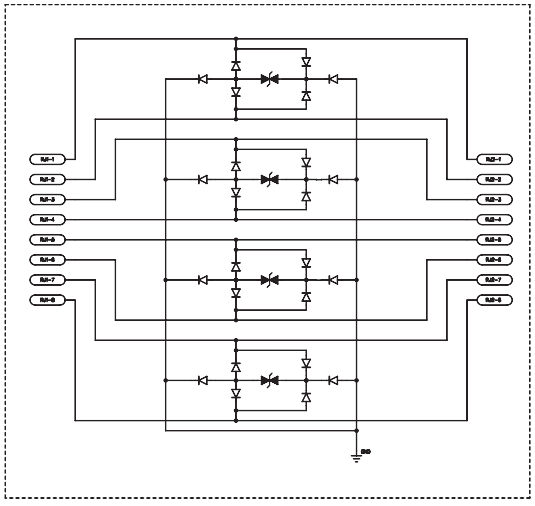
Models:
HAKELNET 8.4 RJ/RJ designed for protection of eight lines with four protected pairs has RJ45 connectors at the input and output sides of the device.
HAKELNET 8.4 LSA/RJ designed for protection of eight lines with four protected pairs has LSA-PLUS connectors at the input side and RJ45 connectors at the output side of the device.

For the option with RJ/RJ is intended a metal plate type 19" PSK 24. For the option with LSA/RJ is intended a metal plate type PSK24/LSA.

Type Number of protected pairs		**HAKELNET 8.4 RJ/RJ** 8	**HAKELNET 8.4 LSA/RJ** 8
No. of protected pairs per line		4	4
Connector type input/output		RJ45/RJ45	LSA-PLUS/RJ45
Nominal voltage	U_N	6 V	
Max. continuous operating voltage	U_C	7,2 V	
Rated load current	I_L	300 mA	
C2 Nominal discharge current I_n (8/20)	I_n	20 A	
C2 Voltage protection level at I_n	U_P	25 V	
C3 Voltage protection level at 1kV/μs	U_P	< 10 V	
Frequency handling line-line	f_g	100 MHz	
Max. attenuation		< 0,4 dB (at 100 MHz)	
Near-end crosstalk		> 40 dB (at 100 MHz)	
Return loss		< 14 dB (at 100 MHz)	
Characteristic impedance		100 Ω	
Response time	t_A	< 25 ns	
Parasitic capacitance	C	< 47 pF	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Article number		45 021	45 022

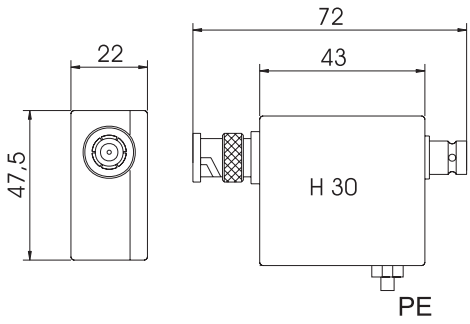
PSK 24 is a metal panel suitable for fitting in 19" rackmounts. It is possible to mount up to 3 pieces of HAKELNET 8.4 into this panel.





Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE

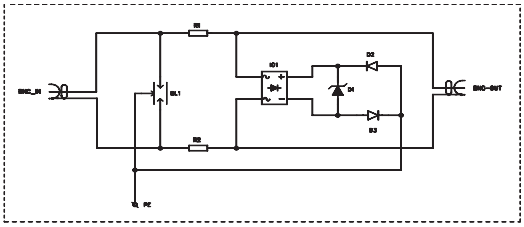


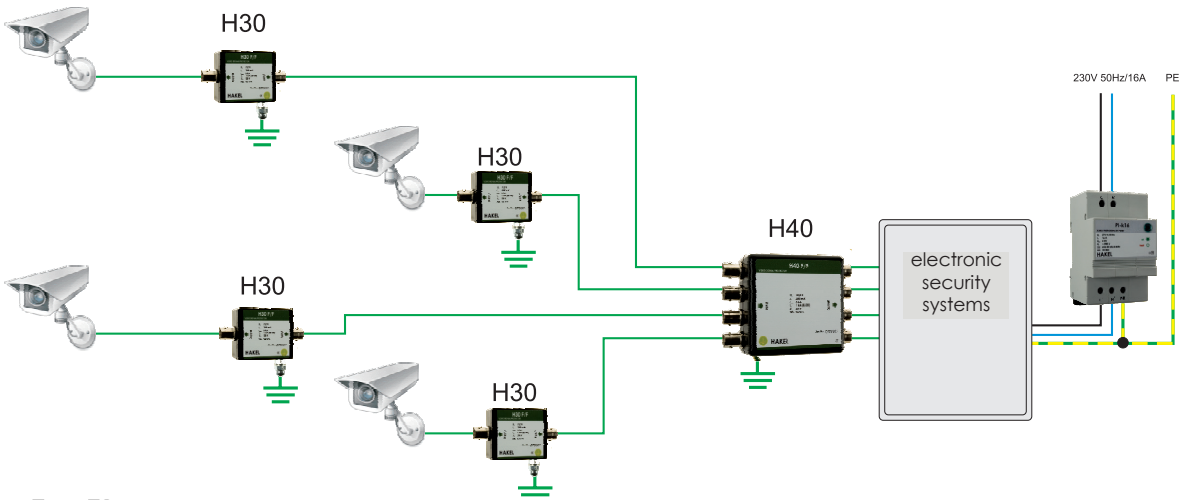
H30/*
H30-L/*

H30 and H30-L are designed for coaxial lines protection of 50Ω or 75Ω against induced surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305.

These devices are mainly used for protection of cameras and video signal concentrators. They are applicable to security and fire systems. H30-L version is equipped with more efficient nonlinear elements to reach higher discharge current up to 6,5kA (8/20).

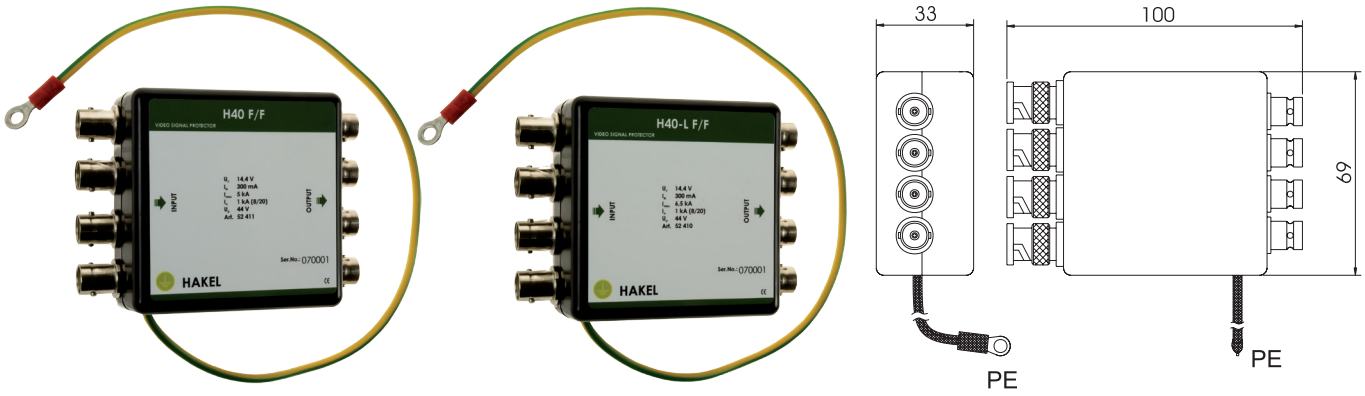
Type Number of protected pairs		**H30/6** 1	**H30/12** 1	**H30-L/6** 1	**H30-L/12** 1
Connector type		BNC (F/F, F/M)			
Nominal voltage	U_N	6 V	12 V	6 V	12 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	7,2 V	14,4 V
Rated load current	I_L	300 mA			
C2 Max. discharge current (8/20)	I_{max}	5 kA		6,5 kA	
C2 Nominal discharge current I_n (8/20)	I_n	1 kA			
C2 Voltage protection level at I_n	U_P	22 V	44 V	22 V	44 V
C3 Voltage protection level at 1kV/μs	U_P	10 V	20 V	10 V	20 V
Response time	t_A	< 30 ns			
Parasitic capacitance	C	< 27 pF			
Series impedance per line	R	10 Ω			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Article number		52 310	52 312	52 300	52 313





Surge protection devices for information technology systems

LPZ 1-2 / IP20 / CE

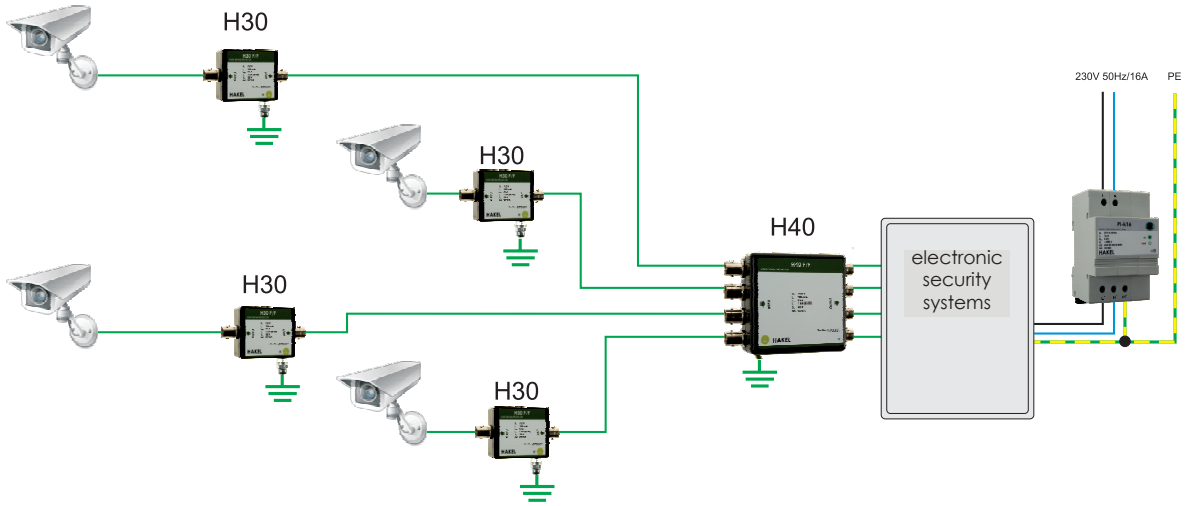


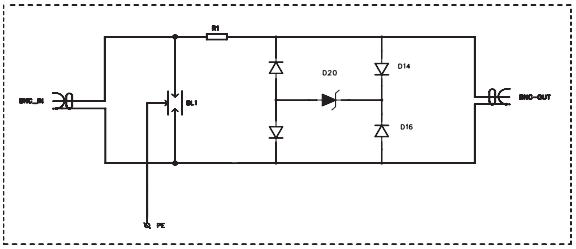
H40/*
H40-L/*

H40 and H40-L are designed for coaxial lines protection of 50Ω or 75Ω against induced surge effects in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ - 1 according to EN 62305.

These devices are especially used for protection of cameras and video signal concentrators. They are applicable to security and fire systems. H40-L version is equipped with more efficient nonlinear elements to reach higher discharge current up to 6,5kA (8/20).

Type Number of protected pairs		**H40/6** 4	**H40/12** 4	**H40-L/6** 4	**H40-L/12** 4
Connector type		BNC (F/F, F/M)			
Nominal voltage	U_N	6 V	12 V	6 V	12 V
Max. continuous operating voltage	U_C	7,2 V	14,4 V	7,2 V	14,4 V
Rated load current	I_L	300 mA			
C2 Max. discharge current (8/20)	I_{max}	5 kA		6,5 kA	
C2 Nominal discharge current I_n (8/20)	I_n	1 kA			
C2 Voltage protection level at I_n	U_P	22 V	44 V	22 V	44 V
C3 Voltage protection level at 1kV/µs	U_P	10 V	20 V	10 V	20 V
Response time	t_A	< 30 ns			
Parasitic capacitance	C	< 47 pF			
Series impedance per line	R	10 Ω			
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1			
Article number		52 410	52 412	52 400	52 413

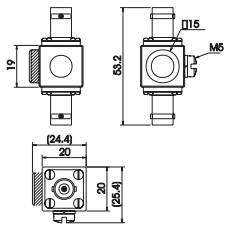




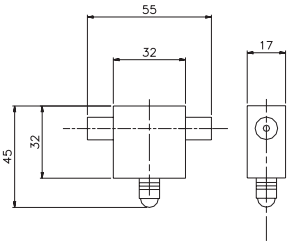
Coaxial high-frequency protection

LPZ 0_B-1 / IP20 / CE

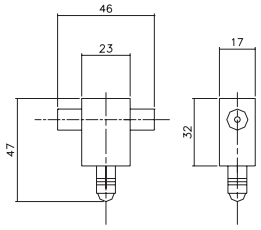
KO*G



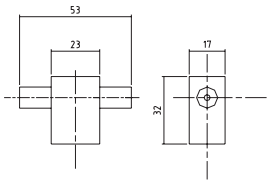
KO*P



KO-9P



KO-10P



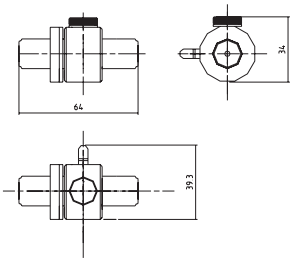
KO* is an innovated coaxial high-frequency protection range designed for protection of equipment connected to an aerial system by means of coaxial cables. Special gas discharge tubes with maximum discharge current I_{max} (8/20) = 10kA (or 20 kA in case of KO-5GN) ensure a reliable protection of the receiving and transmitting systems even against a lightning stroke nearby. Hakel company offers a wide range of coaxial protectors for various connector types and transmission power grades enabling usage in many applications. These coaxial protectors are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ -1 and higher according to EN 62305.

Type		KO-1G	KO-2G	KO-1P	KO-2P	KO-9P	KO-10P
Connector type		BNC				F	TV
Max. continuous operating voltage	U_C	90 V	200 V	90 V	200 V	90 V	90 V
Rated load current	I_L	2,5 A				0,5 A	
D1 Max. lightning impulse current (10/350)	I_{imp}	2 kA					
C2 Max. discharge current (8/20)	I_{max}	10 kA					
C2 Nominal discharge current I_n (8/20)	I_n	5 kA					
C3 Voltage protection level at 1kV/µs	U_P	600 V					
Frequency range		0-1 GHz				0-2,15 GHz	0-1 GHz
Max. transmission power capacity		50 W	400 W	50 W	400 W	50 W	50 W
Insertion loss		< 0,2 dB				< 0,5 dB	< 1,2 dB
Return loss		> 20 dB					
Characteristic impedance		50 Ω				75 Ω	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1					
Article number		55 001	55 002	55 007	55 015	55 016	55 017

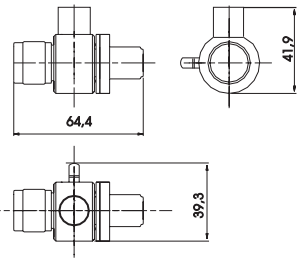
Coaxial high-frequency protection

LPZ 0_B-1 / IP65 / IP20 / IP65 / CE

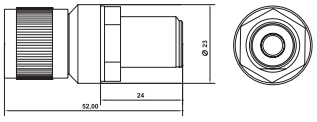
KO*GN



KO-5GN



KO-6GN



KO* is an innovated coaxial high-frequency protection range designed for protection of equipment connected to an aerial system by means of coaxial cables. Special gas discharge tubes with maximum discharge current I_{max} (8/20) = 10kA (or 20 kA in case of KO-5GN) ensure a reliable protection of the receiving and transmitting systems even against a lightning stroke nearby. Hakel company offers a wide range of coaxial protectors for various connector types and transmission power grades enabling usage in many applications. These coaxial protectors are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ -1 and higher according to EN 62305.

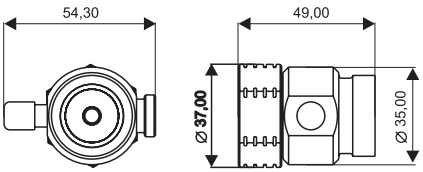
Type		KO-3GN (F/F)	KO-3GN (F/M)	KO-4GN (F/F)	KO-4GN (F/M)	KO-5GN (F/F)	KO-5GN (F/M)	KO-6GN (F/M)
Connector type					N			
Max. continuous operating voltage	U_C	90 V		350 V		-	-	135 V
Rated load current	I_L	5 A				-	-	5 A
D1 Max. lightning impulse current (10/350)	I_{imp}	2 kA				5 kA		1 kA
C2 Max. discharge current (8/20)	I_{max}	10 kA				20 kA		10 kA
C2 Nominal discharge current I_n (8/20)	I_n	5 kA				10 kA		5 kA
C3 Voltage protection level at 1kV/µs	U_P	200 V		850 V		< 2 V		< 500 V
Frequency range		0-3 GHz				5-5,4 GHz		0-5,8 GHz
Max. transmission power capacity		50 W		400 W		200 W		50 W
Insertion loss		< 0,65 dB				< 0,2 dB		
Return loss		> 20 dB						
Characteristic impedance		50 Ω						
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1						
Article number		55 018	55 019	55 020	55 021	55 024	55 025	55 026

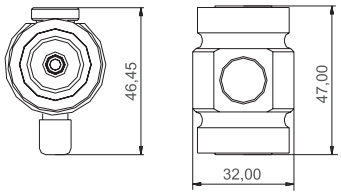
Coaxial high-frequency protection

LPZ 0_B-1 / IP62 / CE

KO-7/16 FM

KO-7/16 FF



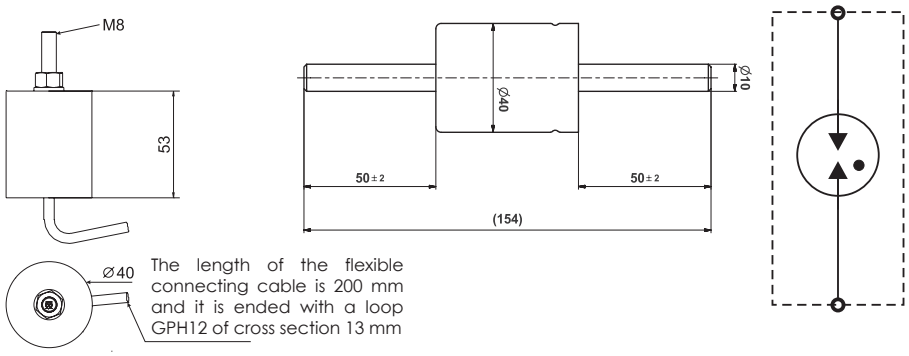


KO-7/16 is an innovated coaxial high-frequency protection range designed for protection of equipment connected to an aerial system by means of coaxial cables. Special gas discharge tubes with maximum discharge current I_{max} (8/20) = 10kA (or 20 kA in case of KO-7/16-R) ensure a reliable protection of the receiving and transmitting systems even against a lightning stroke nearby. This range is produced with 7/16" connector type for various transmission power grades enabling usage in many applications. They are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ $0_{A(B)}$ -1 and higher according to EN 62305.

Type		KO-7/16 (F/M)	KO-7/16 (F/F)
Connector type			
Max. continuous operating voltage	U_C	350 V	350 V
Rated load current	I_L	5 A	
D1 Max. lightning impulse current (10/350)	I_{imp}	2 kA	
C2 Max. discharge current (8/20)	I_{max}	10 kA	
C2 Nominal discharge current I_n (8/20)	I_n	5 kA	
C3 Voltage protection level at 1kV/μs	U_P	850 V	
Frequency range		0-2,6 Ghz	
Max. transmission power capacity		400 W	
Insertion loss		< 0,5 dB	
Return loss		> 15 dB	
Characteristic impedance		50 Ω	
Category tested acc. to IEC 61643:21-2000		A2, B2, C2, C3, D1	
Weight		175 g	165 g
Article number		55 033	55 032

Equipotential bonding of conducting parts of the electrical installation

High power gas discharge tube / LPZ 0_B-1 / IP66 / CE



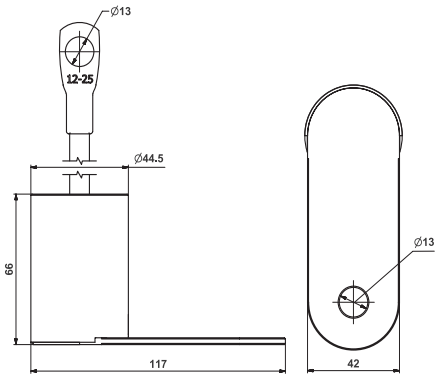
HGS100
HGS100 EB

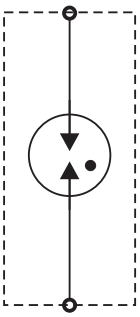
HGS100 and HGS100 EB are a separating high power gas discharge tubes intended for equipotential bonding of an installation parts of buildings, which are not interconnected. In case of origin of p.d. (potential diference) between those parts, the high power gas discharge tube ignites and interconnects both parts for a transient time (typical value of internal resistance at startup of HGS100 is 0,001 ÷ 0,002 Ω). Recommended installation is inside of the buildings, outdoors, in the damp rooms as well as in the subterraneous areas. For lightning protection equipotential bonding in accordance with IEC 61024-1 and EN 62561-3.

Type		**HGS100**	**HGS100 EB**
Class to EN 62561-3		H (for high loading)	
DC-Sparkover voltage		400 ÷ 750 V DC	
Max. discharge current (8/20 μs)	I_{max}	100 kA	
Nominal discharge current (8/20 μs)	I_n	75 kA	
Rated over power frequency withstand voltage	$U_{W\,AC}$	285 V	
Rated DC withstand voltage	$U_{W\,DC}$	350 V	
Rated impulse sparkover voltage	$U_{r\,imp}$	< 1400 V	
Max. lightning impulse current (10/350 μs)	I_{imp}	100 kA	
- charge	Q	50 As	
- specific energy	W/R	2500 kJ/Ω	
Voltage protection level at I_{imp}	U_P	< 1 kV	
Capacitance at 1 MHz	C	5 pF	
Casing		corundum/binary resin with an external steel coat, resistant to climatic effects	
Protection type		IP66	
Operating temperature range	ϑ	-40°C ... +90 °C	
Lifetime		min. 100.000 h	
Weight	m	320 g	
Article number		10 005	10 009

Equipotential bonding of conducting parts of the electrical installation

High power gas discharge tube / LPZ 0_B-1 / IP67 / CE



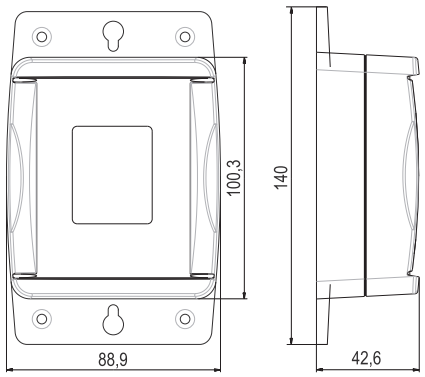


HGS100 Ex

HGS100 Ex - Separating high power gas discharge tube HGS100 Ex for use in explosion hazards areas. It is intended for equipotential bonding of the installation parts of buildings or technological entities which are not interconnected operationaly. In case of p.d. (potential difference) origin between those parts, the high power gas discharge tube ignites and interconnects both parts for a transient time (typical value of internal resistance at startup of HGS100 Ex is 0,001÷ 0,002Ω). Recommended installation is inside of the buildings, outdoors, in the damp rooms as well as in the subterraneous areas.
It is an explosion-proof gas discharge tube with flexible connecting cable for equipotential bonding acc. to IEC 61024-1 and also for the use in IT installations acc. to IEC 60364-5-54. It complies with EN 50014 and EN 50028 standards. It is recommended for insulated flanges and insulated screw joints bridging in cathodic protected parts of industrial technology.

Type		**HGS100 Ex IP 67**
EC-Type examination certificate		II 2G Ex mb II T6 Gb, II 2D Ex mb IIIC T80°C Db
Approvals, certification		FTZU 04 ATEX 0255X
DC-Sparkover voltage		400 ÷ 750 V DC
Max. discharge current (8/20)	I_{max}	100 kA
Nominal discharge current (8/20)	I_n	75 kA
Max. lightning impulse current (10/350)	I_{imp}	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/Ω
Voltage protection level at I_{imp}	U_P	< 1 kV
Insulation resistance at 100 V DC	R_i	< 1 GΩ
Capacitance at 1 MHz	C	5 pF
Casing		corundum/binary resin with an external steel coat, resistant to climatic effects
Protection type		IP67
Operating temperature range	ϑ	-40°C ... +90 °C
Lifetime		min. 100.000 h
Weight	m	550 g
Article number		10 201

Digital lightning strike counter / CE



PBI-5

PBI-5 is intended for counting and recording a surge impulses which are caused by lightning strikes that flow through the lightning protection systems. PBI-5 is mounted directly on lightning down conductor. The current withstand of this lightning strikes counter is 100kA (10/350). By connecting the device to the protective system of the building gives you an overview of the frequency and time setout of atmospheric discharges that affect the object. Depending on the measured data in the device is then possible to perform preventative maintenance or inspection of the entire system.

Type		PBI-5
Threshold current	I_{tc}	1 kA (8/20)
Maximum discharge current	I_{mcw}	100 kA (10/350)
Number of events logged		999
Average baterry lifetime		5 years
Enclosure protection class		IP65
Dimensions		144 x 88 x 44
Mounting		Round of flat down conductor
Weight	m	360 g
Temperature range		-20°C ÷ +60°C
Storage temperature		-30°C ÷ +80°C
Article number		70 045

Measuring equipment

Measuring instrument GIGATESTpro-SPD / CE

GIGATESTpro-SPD

Usage, characteristics:
- measuring of insulation resistance with voltage 50 V ÷ 1000 V
- measuring of surge protection devices
- extended database of surge protection devices which is saved in the instrument's memory enables easy and fast data evaluation of measuring
- measuring of AC and DC voltage
- new storage system of the test tips in the transport position is patent-protected
- high contrast bright multicolour graphic OLED display ensures excellent legibility
- possibility to illuminate the measured object by a bright white LED light
- possibility to charge the battery right in the instrument

Scope of delivery: measuring intrument, twisted test lead with measuring tip,pouch, calibration certificate, warranty document, user's manual, cardboard shipping case.

Insulation resistance	
Measurement range	0,100 MΩ ÷ 1,999 GΩ (U = 50 V ÷ 99 V)
Nominal measurement range	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% z MH + 10 D)* (R < 1 GΩ)
	± (4% z MH + 15 D)* (R ≥ 1 GΩ)
Operating measurement error	± (3% z MH + 20 D)* (R < 1 GΩ)
	± (5% z MH + 25 D)* (R ≥ 1 GΩ)
Nominal measurement current	≥ 1 mA
Short-circuit current	< 3 mA
Automatic discharge of the measured object	yes

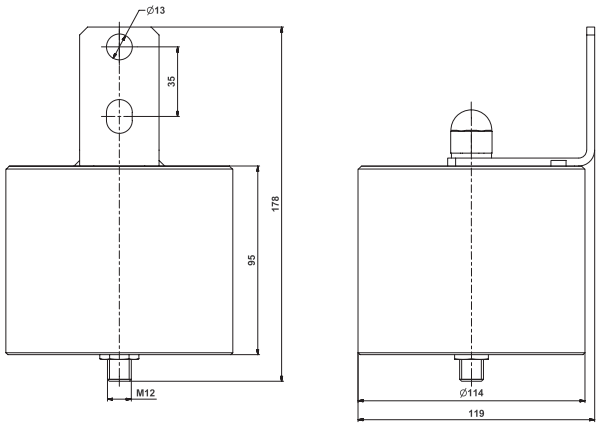
Surge protection devices	
Measurement range	40 V ÷ 1050 V
Resolution range	1 V
Basic measurement error	± (2% z MH + 2 D)*
Operating measurement error	± (3% z MH + 3 D)*
Principle of measuring the varistor	increase of the voltage with measurement of the so-called mA (milliamper) point
Principle of measuring the gas discharge tube	increase of the voltage with the assessment of the maximum

DC and AC voltage (actual effective value TRMS)	
Measurement range	0 V ÷ 600 V DC/AC (45 Hz ÷ 65 Hz)
Resolution range	1 V
Basic measurement error	± (2% z MH + 2 D)*
Operating measurement error	± (3% z MH + 3 D)*

Generally	
Power supply	4 pcs of AAA (LR03) alkaline battery 1,5 V or NiMH battery 1,2 V
Display	OLED, multicolour, graphic
Protection level	II (double insulation)
Surge protection category	CAT III / 300 V or CAT II / 600 V
Pollution level	2
Protection type	IP43
Dimensions	approx. 260 x 70 x 40 mm
Weight (including batteries and measuring tip)	approx. 0,36 kg
* MV means measuring value, D means digit	
Article number	70 002

Scope of delivery: measuring intrument, twisted test lead with measuring tip,poach, calibration certificate, warranty document, user's manual, cardboard shipping case

Low voltage limiter for railway application



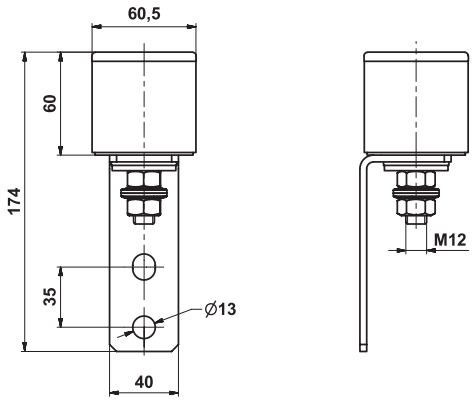
HL120

HL120* is a low voltage limiter (LVL acc. to EN 50122-1 ed. 2) intended for the protection of non-live parts of metal structures in AC or DC traction systems. It is used for the effective protection of people who might come into contact with these parts during a lightning stroke or in the case a fault of traction lines. HL is installed directly on the protected construction structure (using two M12 bolts) so that if it is activated it creates a conductive connection between this structure and the tracks. The principle of the HL construction is based on the parallel connection of three non-linear elements (1 high power metal oxide varistor MOV plus 2 high-performance thyristors) built into a stainless steel cover. If the HL is activated by lightning current or current from the contact of the protected metal structure with for example a fallen trolley line, this current is instantly shorted to the track by the fast reaction of the MOV (the standardly given time of its reaction is 25 nsec). The maximum value of this current's amplitude may be 40kA (10/350). For the duration of activation of the MOV a voltage protection level about 500V is formed on it. So that the heat released in the MOV does not damage its structure, a delay element is built into the HL hardware which for approximately 1msec ignites both the built-in high performance thyristors, and this moment is derived from the VPL on the varistor. According to the polarity of voltage on the MOV, the relevant thyristor from the built-in pair is activated and it takes up current which to that time have been conducted by the activated MOV. Depending on the immediate current value of the passing current, the voltage level on this thyristor can be in the range 1÷3V. If the arising activation current is significantly lower than the maximum working current of the used thyristor, this process can last up to tens of seconds (for the HL120 this process is characterised by the typical value 300A/60sec... reversibly), which corresponds to the charge passing through of 18000 Asec. A large power loss is on the thyristor for the time of its activation, and so the construction of the HL sleeve is based on the principle of conducting the released heat to its metal outer casing and then via this casing to the construction building structure. One important requirement of the HL is the assumption of the creation of an internal short circuit in the case of the voltage, current or heat overloading of the built-in MOV, which is met in the case of the HL internal construction described above.

Advantages - vandal resistant, weather proof, long lifetime

Type	**HL 120**
Class to EN 50526-2	2.2
Maximum withstand voltage U_w	60 VAC
Maximum spark voltage U_s	120 VDC
Nominal short-term withstand current	10 kA / 0,01 sec
Reversible current I_{rev}	300 A for 60 s
Long-term current impulse L_w without guaranteed reversibility	500 A for 1800 s
Technical data of built-in metal-oxide varistors acc. to EN 61643-11 ed. 2 and EN 60099-4 ed. 2	
Nominal discharge current I_n	40 kA (8/20 μs)
Surge impulse current I_{hc}	100 kA (4/10 μs)
Lightning impulse current I_{imp}	40 kA (10/350 μs)
Maximum operational voltage U_c	115 VAC
Varistor voltage U_v@ 1mA	180 VDC
Residual voltage U_p at nominal discharge current I_n	500 V
Long current impulse	6 x 3 x 1500 A (2000 μs)
Operating conditions:	
Temperature	-40°C to + 55°C
Tightening torque	16 Nm
Height above sea level	without restriction
Protection type	IP 67
Weight / Dimensions	c. 4,65 kg / Ø 114 mm, l = 95 mm
Article number	10 240

Low voltage limiter for railway application



HGS100 RW

It is range of voltage limiters designed for overvoltage protection of personnel and equipment in DC and AC rail traction systems. It is recommended to install this limiter between the current return path and non-electrified parts of structures laying adjacent to the rails. Internal construction of HGS is based at application of high power gas-filled gas discharge tube (GDT), which is built in to stainless steel box. In case of overvoltage, HGS100 RW generates a durable conductive path between the overloaded area and the railway's substation. This results in increased current loads that are sensed at the substation, tripping the safety switch and thus protecting personnel and equipment. In addition, all overvoltages generated by lightning are effectively limited by Hakel's internal construction of HGS100 RW. All requirements given by EN 50122-1 and EN 61643-1/A11 relating to electrical safety earthing for this specific use are also fulfiled.

Type	**HGS100 RW**
Examinations according to	EN 61643-11/A11, EN 50122-1
DC Spark-Over Voltage [1)]	300 ÷ 500 V
AC Spark-Over Voltage	> 250 V_{rms}
Impulse Spark-Over Voltage at 5 kV/μs - for 99% of measured values (wave 1,2/50 μs, 6 kV)	< 1200 V
Max. Impulse Discharge Current I_{max} (8/20 μs)	200 kA
Nominal Impulse Discharge Current I_n (8/20 μs)	100 kA
Max. Lightning Impulse Current I_{imp} (10/350 μs)	100 kA
Charge	75 As
Specific Energy	5500 kJ/Ω
Rated withstand current	up to 8 kA_{rms} / 100 msec (AC - mode)
	up to 20kA / 30 msec (DC - mode)
Behaviour after substantial overloading	internal short circuit inside HGS body
Insulation Resistance at 100 VDC	> 1 GΩ
Capacitance at 1 MHz	< 5 pF
Housing	IP66
Operating and Storage Temperature	- 40 ÷ + 90°C
Weight	950 g
Climatic Category (IEC 60068-1)	40/90/21
Article number	10 002

[1)] In ionised mode

Terms in accordance with ITU-T Rec. K-12, DIN 57845/VDE 0845 and EN 61643-11:2002

H-SPD-05-09-2015-EN-sales

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