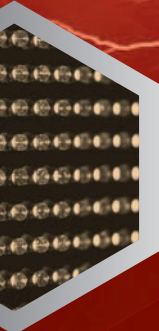


**Kumwell**



**SPD**  
**Surge Protective Device**



## < About Us

**Kumwell** emphasizing on Safety to Society for human life and maintain power quality with perfect Grounding and Lightning Protection System. Lightning is natural phenomena that can cause life and property damage to both structure and electrical system / electronic system. Kumwell has designed complete range of products for Grounding System / Lightning Protection System / Surge Protection Device / Lightning Detection and Warning System in accordance with international standards, and subsequently has provided stable safety foundation in various countries' infrastructures starting from the electricity segment (power generation plant, solar plant, wind turbine, transmission line, distribution line, etc.), transportation segment (metro line, sky train, high-speed train, airports, seaports, toll way, highway, motorway, etc.), telecommunication segment (microwave station, radio station, TV station, mobile transmission station, data center, etc.) industrial segment (petrochemical plants, oil and gas refinery, steel mill, farm, etc.) and building segment (high-rise building, building complex, stadium, hospital, school, house, palace, temple, etc.).

## < About Us



**Kumwell** has announced Corporate Shared Value (CSV) :

Safety to Society program around Thailand and ASEAN countries to provide and share knowledge of Grounding and Lightning Protection System to Government networking such as Ministry of Labour, Ministry of Education, Ministry of Industry, and Council of Engineers. And Private networking such as The Engineering Institute of Thailand, Thai Electrical & Mechanical Contractors Association, and other engineering institutions to ensure that each segment shall generate qualified professional engineers and professional technicians whom serve the local society of how to design, install, inspect and maintenance Grounding System / Lightning Protection System / Surge Protection Device / Lightning Detection and Warning System with a highly concerned of operating sustainable business practice.

The industry, community and environment have to grow together by a good support among one another.

**Kumwell** Learning Center was established to serve Government and Private networking of Grounding and Lightning Protection System knowledge to create understanding which shall lead to innovation with designers, consultants, contractors, engineering institutions and various key customers and partners for safety to society.

## < About Us



Kumwell has moved forward to invest complete laboratory testing equipment according to 7 parts of IEC 62561:2012 Standard “Lightning Protection Component Series” (IEC 62561-1 Requirement for Connection components, IEC 62561-2 Requirement for Conductors and Earth Electrodes, IEC 62561-3 Requirement for Isolating Spark Gaps (ISG), IEC 62561-4

Requirement for Conductor Fasteners, IEC 62561-5 Requirement for Earth



Electrode Inspection Housings and Electrode Seals Concrete

Inspection Pit, IEC 62561-6 Requirement for Lightning

Strike Counters,

IEC 62561-7 Requirement for Earthing Enhancing Compounds). The testing

equipment has composed of Environment Test (Humid Sulphurous

Atmosphere Treatment and Salt Mist

Treatment), Mechanical Test (Tensile and Compressive Machine),

Electrical Test (Lightning Impulse High Current Machine and Contact Resistance Measurement Machine), SPD functional test

cover all SPD application, AC power, communication, DC system which comply to IEC 61643-11, 21, 31. A list of some of the existing

equipment is below : 60 kA Lightning Impulse current generator, 10/350  $\mu$ S and 8/20  $\mu$ S waveshape for LPS and SPD (Class I,II)

testing, 20 kV/10 kA Combination wave impulse generator for SPD class III testing, 10/700  $\mu$ S ring wave generator for communication SPD test,

SO<sub>2</sub> simulation environment chamber corrosion test, Salt spray simulation environment chamber test, Universal mechanical tensile test, Micro ohm

contact resist 50Hz 2000 A power source to ensure Kumwell components shall be manufactured and delivered high standard and quality product.



## < About Us



Kumwell have ASEAN partners (Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Vietnam, Singapore) and international partners (China, Hong Kong, Japan, Korea, Bangladesh, Sri Lanka, Pakistan, Iran, United Arab Emirate, Qatar, Oman, Yemen, Saudi Arabia, Syria, France, Belgium, Switzerland, Germany, Sweden, Denmark, South America etc.).



We get the international certified as UL Listed (UL 467 Ground Rod, Mould and Powder for Exothermic Welding, C-Clamp / UL 486 Copper Lug), Kema Quality from DEKRA (Lightning Protection Component Series), KERI (IEEE 837 Standard for Qualifying Permanent Connections Used in Substation Grounding), VDE (SPD class I and II VDE 0675-6-11) and Quality Management System Certification



(ISO 9001:2015) from BUREAU VERITAS. And we get government awards from Prime Minister's Export Award 2008 and 2012, ASEAN Outstanding Engineering Achievement Award, ASEAN Federation of Engineering Organization (CAFEO) 2010 and 2013, and Thailand Trusted Mark (TTM) 2012. also has created an awareness of our business and technology through many international exhibitions (Thailand, ASEAN, India, Pakistan, Iran, United Arab Emirates, Saudi Arabia etc.) and international conferences (Asia-Pacific International Conference on Lightning (APL), International Conference on Lightning Protection (ICLP) etc.). With a strong determination as the Leader of Total Solution in Grounding & Lightning Protection System, Kumwell will move forward to protect you from the dangers of lightning strike from all directions. Kumwell The Leader of Total Solution in Grounding & Lightning Protection System. "We Take You to Safety"

# < Certificates & Awards



- 2001** Product & Certificate acceptance from EGAT
  
- 2003** Satisfactory Certificate (Keretapi Tanah Melayu Berhad)  
 Certificate of Material Performance (Asia Communication & Electronic SDN BHD)  
 Metropolitan Electricity Authority (MEA)  
 Provincial Electricity Authority (PEA)  
 State Railway of Thailand  
 Satisfactory Keretapi Tanah Melayu Berhad  
 Material Performance Asia Communication & Electronic SDN BHD
  
- 2004** Recommended List  
 Research Designs & Standards Organization (RDSO)  
 Recommended AVL List Research Designs & Standards Organization (RDSO) India
  
- 2005** Certificate of Acceptance PTT Public Company Limited  
 Test Report for Standard UL 467 Underwriters Laboratories Inc.
  
- 2006** Test Report for Standard IEEE 837 – 2000  
 Test Certificate for Standard IEEE 837-2000
  
- 2007** Certificate of Taiwan Power Company  
 Taiwan Power Company
  
- 2008** Prime Minister's Export Award 2008, Thai-owned brand category, Ministry of Commerce, Thailand
  
- 2009** The Cooperation in Preservation and Rehabilitation Chao Phraya River Outstanding Award 2009, Ministry of Industry, Thailand  
 Outstanding Corporate Social Responsibility Award, The Federation of Thai Industries, Nonthaburi Chapter, Thailand  
 Honorable Trophy on Training Support, Ministry of Labour, Thailand  
 Acceptance PTT Public Company Limited  
 Test Certificate for Standard UL 467 (Grounding and Bonding Equipment) Underwriters Laboratories Inc.

## < Certificates & Awards

- 2010** White Factor Award (Drug Free Factory), Ministry of Labour Social Welfare, Thailand  
Outstanding in accordance with sufficient economy philosophy, The Federation of Thai Industries, Nonthaburi, Thailand  
First Class Winner, Outstanding Workplace The Federation of Thai Industries, Nonthaburi, Thailand  
Good Governance Award, The Federation of Thai Industries, Department of Industrial Promotion, Nonthaburi, Thailand  
ASEAN Outstanding Engineering Achievement Award, ASEAN Federation of Engineering Organization (AFEO)  
UL 486 Listed  
Underwriters Laboratories Inc.
- 2011** CSR-DIW Award, Standard for Corporate Social Responsibility, Department of Industrial Work
- 2012** The Prime Minister's Industry Award, Ministry of Industry, Thailand  
CSR DIW Continuous Award, Standard for Corporate Social Responsibility, Department of Industrial Work  
UL 467 Listed Copper C-Clamp Compression Connection  
Additional Graphite Mould & Certificate Approved
- 2013** CSR DIW Continuous Award, Standard for Corporate Social Responsibility, Department of Industrial Work  
Green Industry Award, Department of Industrial Work  
ASEAN Outstanding Engineering Achievement Award  
ASEAN Federation of Engineering Organization (AFEO)
- 2014** CSR-DIW Continuous Award, Standard for Corporate Social Responsibility, Department of Industrial Work  
Test Certificate for Standard IEC 62561 Certified by KEMA
- 2016** Obtained Premium Products of Thailand - The Pride of Thais from Ministry of Industry
- 2017** Obtained ISO 9001 : 2015 Certification assessed by BUREAU VERITAS



## < R&D

**Kumwell** has continuously concentrated to develop both in-house and co-partners in research and development (R&D) for innovative technology and modern product for SPD.

### 2012 Power Supply SPD

- Class I Single and Multi-pole SPD, Maximum 50 kA per pole (Spark gaps technology)
- Class I+II Combine Set, Maximum 50 kA per pole (Spark gaps and MOV technology)
- Class II Single and Multi-pole SPD, Maximum 50 kA per pole (MOV technology)
- Class II Single and Multi-pole DC Power SPD

### 2013 Class III Compact Single and Multi-pole SPD

SPD for Photovoltaic Systems

Coaxial Surge Protection

### 2014 Lightning Strike Counter

### 2015 Class I,II Compact Single and Multi-pole SPD 25 kA per pole (TOV Technology)

Signal Surge Protection

### 2016 Surge Counter

CCTV Surge Protection

### 2017 SPD Circuit Breaker (SCB) for Fuse replacement

SCB with automatic recloser

Smart SPD monitoring

LED Lighting Surge Protection

Class II Single and Multi-pole SPD, Maximum 160 kA per pole (MOV technology)

Surge Counter with RS485 function



Power Surge Protection



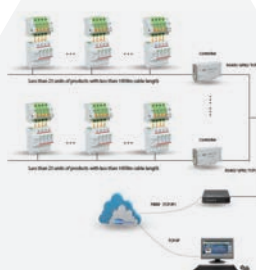
Signal Surge Protection



SPD for Photovoltaic Systems



CCTV Surge Protection



Smart SPD Systems



Lightning & Surge Counter



## < R&D

In addition Kumwell has continuity to develop R&D Network to participate with International Conference on Lightning Protection (ICLP) is a scientific/technical organization aiming at promoting scientific research on lightning physics besides methods for improving protection of living beings and properties against the effects of lightning. ICLP will organize regular international meetings on lightning events and lightning protection of structures and services in research and practical application, once every 2 years. The hosted venue is rotating changed each time to all of the member countries. The first ICLP was organized in Germany in 1951. The latest conference was the 33<sup>rd</sup> time in Portuguese, and the 34<sup>th</sup> Conference will be in Poland, 2018. The crucial point of ICLP history that lead to the first complete lightning protection standard was when ICLP and International Electrotechnical Commission (IEC) cooperated to draft the lightning protection standard in ICLP's conference, also provide a platform to develop scientists worldwide network in lightning studies. The scientific knowledge, research and practical application shared have been used to create the first complete lightning protection in IEC 62305: Protection Against Lightning, first published in 2006. The IEC 62305 consisted of 4 parts in which will be revised every 5 years (the 3<sup>rd</sup> revision will publish in 2018.) Moreover, other lightning protection related standards have been completed over the years such as Lightning Protection System Components, Thunderstorm Warning System (TWS), Lightning Density Based on Lightning Locating System (LLS) and etc.



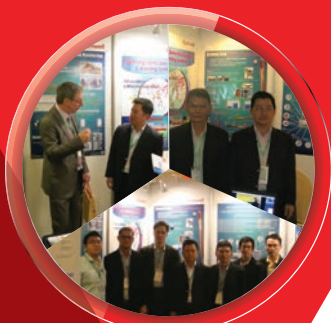
**ICLP 2008**  
Uppsala, Sweden



**ICLP 2010**  
Cagliari, Italy



**ICLP 2012**  
Vienna, Austria



**ICLP 2014**  
Shanghai, China



**ICLP 2016**  
Estoril, Portugal



**APL 2017**  
Krabi, Thailand



## « CSV Corporate Shared Value



## Safety to Society



**Kumwell** has announced Corporate Shared Value (CSV) : Safety to Society program around the country and ASEAN networking to provide and share knowledge of Grounding and Lightning Protection System to government networking such as Ministry of Labour, Ministry of Education, Ministry of Industry, and Council of Engineers. And private networking such as The Engineering Institute of Thailand, Thai Electrical & Mechanical Contractors Association, and other engineering institutions to ensure that each segment shall generate qualified professional engineers and professional technicians whom serve the local society of how to design, install, inspect and maintenance Grounding System / Lightning Protection System / Surge Protection Device / Lightning Detection and Warning System with a highly concerned of operating sustainable business practice. The industry, community and environment have to grow together by a good support among one another.

## World Class Quality

Kumwell Total Solution Provider and Specialist in manufacturing of earthing, lightning protection, surge protective device products such as exothermic welding, copper bond ground rods ,clamps, conductors, supports, air terminals, earth resistance remote monitoring, SPD and so on.

Though its determination to provide superior products and to meet the diverse and ever-changing demands of customers, company has recognized the importance of research and development. To this end, company has successfully attained such.

- **Surge Protective Device (SPD)** meet IEC 61643-11 and certified by VDE (Verband Dutscher Klekrotechniker) and SPD applied in telecommunication and signalling networks, also has been designed according to IEC 61643-21 standard
- **Exothermic welding connectors** meet IEEE 837 standard and certified by Keri (Korea Electrotechnology Research Institute) and meet UL standard number 467 certified by UL (Underwriters Laboratories)
- **Earth rods, C-Clamps** meet UL standard number 467 and Copper Lugs meet UL standard number 486 and certified by UL
- **Clamp connectors** meet IEC 62561-1 Standard and certified by KEMA Quality from DEKRA
- **Conductors and Air Termination** meet IEC 62561-2 Standard and certified by KEMA Quality from DEKRA
- **Earth Pit** meet IEC 62561-5 standard and certified by KEMA Quality from DEKRA
- **More effective grounding (MEG)** meet IEC 62561-7 and certified by KEMA Quality from DEKRA







a DEKRA company

These certifications clearly indicate that company is consistently committed to manufacturing products of Quality which is on a part with the highest international standards.

### Quality System Assurance

ISO 9001-2015 certification, company was independently assessed by BUREAU VERITAS certification as having fully achieved the requirements of the prestigious.

ISO 9001:2015 certification is a fitting reward and recognition of their hardwork and dedication.



## Research and Development Center

Kumwell has always determined to develop in-house R&D for new technology and modern tooling for Earthing & Lightning Protection and Surge Protective Device.

Kumwell has moved forward to develop and invest testing laboratory to ensure Kumwell components can be manufactured and delivered high standard quality to customers in accordance to international standard. The lab equipment has determined as below :

### High Current Impulse Tested Machine

Used to generate high current impulse tested SPD Class I and Class II according to IEC 61643-11:2011 (Low-voltage surge protective devices. Surge protective devices connected to low-voltage power systems. Requirements and test methods)



**Test performed: (according to IEC 61643-11)**

- Operating duty test for test classes I, II
- Voltage protection level
- TOV Tests

**Test equipment capability :**

- 60kA, Waveshape 10/350 $\mu$ s
- 60kA, Waveshape 8/20 $\mu$ s
- (W/R) max = 900 kJ/Ohm

### High Impulse Combination Wave Tested Machine

Used to generate impulse of exponential shapes to perform high energy surge tests .The system can output combination wave (open circuit voltage & short circuit current) for testing SPD Class III according to IEC 61643-11:2011 Low-voltage surge protective devices. Surge protective devices connected to low-voltage power systems. Requirements and test methods.



**Test performed: (according to IEC 61643-11)**

- Limiting voltage with combination wave
- Operating duty test for test classes III

This machine also can perform testing SPD applied to telecommunications and signalling networks according to IEC 61643-21:2000 (Low voltage surge protective devices - Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods)

**Test performed: (according to IEC 61643-21)**

- Impulse limiting voltage
- Operating duty test
- Impulse durability

**Test equipment capability :**

Generate impulse voltage and current waveform for test SPD following technical detail.

- 2kV to 20kV with voltage waveform 1.2/50µs in open circuit (impedance of 2 Ohms).
- 1kA to 10kA with current waveform 8/20µs in short-circuit (impedance of 2 Ohms).
- 1kV to 10kV with voltage wave from 10/700µs in open circuit (impedance of 40 Ohms).
- 25-250kA with current waveform 5/300µs in short-circuit (impedance of 40 Ohms).

## Impulse Voltage Generator Tester

Portable test equipment for quick diagnostics and operation ability of SPD – Class III (all kinds of Kumwell data, communication and coaxial performance)



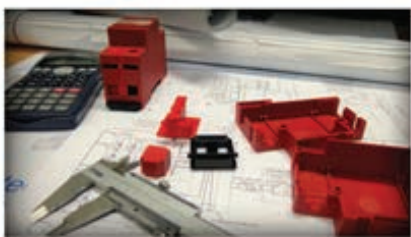
Test performed:

- used for quick diagnostics of SPDs
- used for servicing activity in field test



Test equipment capability:

- generate 1kV, 2kV, and 3kV test impulse voltage waveform 1.2/50 µs



## Certification

Kumwell guarantee/certify customer to receive the best quality products complying with international standards.

This system enhances Kumwell to improve and develop existing and new products. Kumwell has testing Earthing and Lightning Protection and SPD to conform to:

- **IEC 62561-1:2012** Lightning protection system components (LPSC) - Part 1: Requirements for connection components (Exothermic Welding, Saddle, Flexible connector, Ground bar connector)
- **IEC 62561-2:2012** Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes (Earth rod, Air terminal, Down connector)
- **IEC 62561-3:2012** Lightning protection system components (LPSC) - Part 3: Requirements for isolating spark gaps (ISG)
- **IEC 62561-4:2010** Lightning protection system components (LPSC) - Part 4: Requirements for conductor fasteners (Metal Sheet Clamp, Tape Support, Cable Support)
- **IEC 62561-5:2011** Lightning protection system components (LPSC) - Part 5: Requirements for earth electrode inspection housings and earth electrode seals (Concrete Inspection Pit)
- **IEC 62561-6:2011** Lightning protection system components (LPSC) - Part 6: Requirements for lightning strike counters (LSC)
- **IEC 62561-7:2011** Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds
- **IEC 61643-11:2011** (Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods)
- **IEC 61643-21:2000** (Low voltage surge protective devices - Part 21: Surge protective devices connected to telecommunications and signalling networks - Performance requirements and testing methods)
- **EN 50539-11:2013** (Low-voltage surge protective devices - Surge protective devices for specific application including d.c. - Part 11 : Requirements and tests for SPDs in photovoltaic applications)

**SPD Certification certified by VDE  
(Verband Deutscher Elektrotechniker)**





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## Terms and definitions

Surge Protective Device

SPD

A device that is intended to limit transient overvoltages and divert surge currents; it contains at least one nonlinear component.

Combination type SPD

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 behavior depending upon the characteristics of the applied voltage.

Mode of Protection of an SPD

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.

10/350 current impulse

Current impulse with a virtual front time of 10  $\mu\text{s}$  and a time to half-value of 350  $\mu\text{s}$

8/20 current impulse

Current impulse with a virtual front time of 8  $\mu\text{s}$  and a time to half-value of 20  $\mu\text{s}$

1.2/50 voltage impulse

Voltage impulse with a virtual front time of 1.2  $\mu\text{s}$  and a time to half-value of 50  $\mu\text{s}$

Combination wave

A wave characterized by defined voltage amplitude ( $U_{oc}$ ) and waveshape under open-circuit conditions and a defined current amplitude ( $I_{cw}$ ) and waveshape under short-circuit conditions

**NOTE** : The voltage amplitude; current amplitude and waveform that is delivered to the SPD are determined by the combination wave generator (CWG) impedance  $Z_f$  and impedance of the DUT

Specific energy (for class I test)

W/R

The energy dissipated by the impulse current  $I_{imp}$  in a unit resistance of  $1\Omega$ ; it is equal to the time integral of the square of the current; expressed in  $\text{kJ}/\Omega$  or in  $\text{kA}^2\text{s}$ .

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

Charge Q

It equals the time integral of the current according to the time; expressed in As.

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

Maximum continuous operating voltage

$U_c$

Maximum r.m.s. voltage which may be continuously applied to the SPD's mode of protection.

Voltage protection level

$U_p$

A parameter that characterizes the performance of the SPD in limiting the voltage across its terminals, which is selected from a list of preferred values. This value is greater than the highest value of the measured limiting voltages

Residual voltage

$U_{res}$

Peak value of voltage that appears between the terminals of an SPD due to the passage of discharge current.

Reference test voltage

$U_{REF}$

r.m.s. value of voltage used for testing which depends on the mode of protection of the SPD, the nominal system voltage, the system configuration and the voltage regulation within the system

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

Temporary overvoltage test value of the SPD

$U_T$

Test voltage applied to the SPD for a specific duration  $t_T$ , to simulate the stress under TOV conditions

**NOTE** : It is a characteristic declared by the manufacturer that gives information about the behavior of the SPD when stressed with voltages  $U_T$  above  $U_C$  for a given specific duration  $t_T$  (this behavior may either be no change in the performance after application of the temporary overvoltage or a defined failure without hazard for either personnel, equipment or facility)

Temporary overvoltage value of the power system

$U_{TOV}$

Power frequency overvoltage occurring on the network at a given location, of relatively long duration. TOVs may be caused by faults inside the LV system ( $U_{TOV(LV)}$ ) or inside the HV system ( $U_{TOV(HV)}$ )

**NOTE** : Temporary overvoltages, typically lasting up to several seconds, usually originate from switching operations or faults (for example, sudden load shedding, single-phase faults, etc.) and/or from non-linearity (ferroresonance effects, harmonics, etc.)

Open circuit voltage

$U_{OC}$

Open circuit voltage of the combination wave generator at the point of connection of the device under test

Continuous operating current

$I_C$

Current flowing through each mode of protection of the SPD when energized at the maximum continuous operating voltage ( $U_C$ ) for each mode

Nominal discharge current

$I_n$  (only for classes I and II)

The crest value of the current through the SPD having a current waveshape of 8/20. This parameter 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

Impulse current

$I_{imp}$  (for class I tests)

It is defined by three parameters, a current peak value  $I_{peak}$ , a charge  $Q$  and a specific energy  $W/R$ . Tested according to the test sequence of the operating duty test. This is used for the classification of the SPD for class I test

Maximum discharge current for class II test

$I_{max}$

The 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  $I_n$

## Follow Current

$I_f$

Peak current supplied by the electrical power system and flowing through the SPD after a discharge current impulse.

The follow current is significantly different from the continuous operating current ( $I_c$ )

## Follow current interrupting rating

$I_{fi}$

Prospective short-circuit follow current that an SPD is able to interrupt without operation of a disconnector

## Residual current

$I_{PE}$

Current flowing through the PE terminal, when the SPD is energized at the maximum continuous operating voltage ( $U_c$ ) when connected according to the manufacturer instructions

## 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 protective; express in  $kA_{rms}$  (tested according to short-circuit withstand capability test in conjunction with backup overcurrent protection)

## Short-circuit current rating

$I_{SCCR}$

Maximum prospective short-circuit current from the power system for which the SPD, in conjunction with the disconnector specified, is rated

## Rated load current

$I_L$

Maximum continuous rated r.m.s. current that can be supplied to a resistive load connected to the protected output of an SPD

## Total discharge current

( $I_{Total}$ )

Current which flows through the PE or PEN conductor of a multipole SPD during the total discharge current test

NOTE 1: The aim is to take into account cumulative effects that occur when multiple modes of protection of a multipole SPD conduct at the same time.

NOTE 2:  $I_{Total}$  is particularly relevant for SPDs tested according to test class I, and is used for the purpose of lightning protection equipotential bonding according to IEC 62305 series

## Operating temperature

$\theta$

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

Device (internal and/or external) required for disconnecting an SPD from the power system

NOTE : This disconnecting device is not required to have isolating capability. It is to prevent a persistent fault on the system and is used to give indication of the SPD failure.

There may be more than one disconnecter function. For example, an over-current protection function and a thermal protection function. These functions may be integrated into one unit or performed in separate units.

#### Short-circuit withstand

Maximum prospective short-circuit current that the SPD is able to withstand

NOTE : This definition refers both to d.c. and a.c. 50/60 Hz.

Two short-circuit withstand values may be defined for two-port SPDs or one-port SPDs having separated input and output terminals : one corresponding to an internal short circuit (by-passing the internal active part) and another one corresponding to an external short circuit (load side short-circuit) directly at the output terminals (case of a failure at the load).

#### Impulse test classification

##### *Class I tests*

Tests carried out with the impulse discharge current  $I_{imp}$  with an 8/20 current impulse with a rest value equal to the crest value of  $I_{imp}$  and with 1.2/50  $\mu$ s

##### *Class II tests*

Tests carried out with the nominal discharge current  $I_n$  and The 1.2/50 voltage impulse

##### *Class III tests*

Tests carried out with the 1.2/50 voltage-8/20 current combination wave generator

#### Specific energy for class I test

W/R

Energy dissipated by a unit resistance of 1  $\Omega$  with the impulse discharge current  $I_{imp}$

#### Rated impulse withstand voltage

$U_w$

Impulse withstand voltage assigned by the manufacturer to the equipment or to a part of it, characterizing the specified withstand capability of its insulation against overvoltages

#### Status Indicator

Device that indicates the operational status of and SPD, or a part of and SPD

NOTE : Such indicators may be local with visual and / or audible alarms and/or may have remote signaling and / or output contact capability

#### Output contact

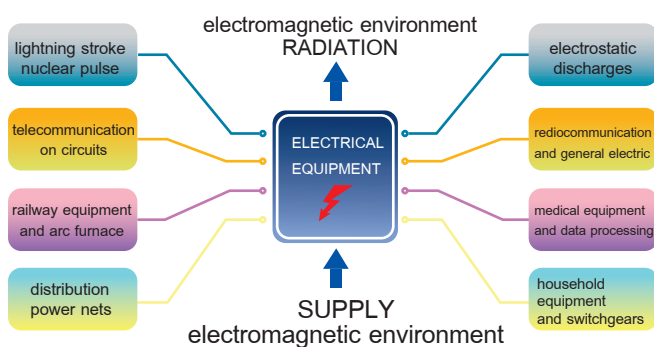
Contact included in a circuit separate from the main circuit of an SPD, and linked to a disconnecter or status indicator

## Table 1 - The list of abbreviation

Abbreviation	Description
General abbreviations	
TOV	temporary overvoltage
SPD	surge protective device
IP	degree of protection of enclosure
W/R	specific energy for class I test
Q	Charge
$t_A$	Response time
Abbreviations related current	
$I_c$	Continuous operating current
$I_f$	Follow current
$I_{fi}$	Follow current interrupting rating
$I_{imp}$	Impulse current for class I test
$I_L$	Rated load current
$I_{max}$	Maximum discharge current for class II test
$I_n$	Nominal discharge current
$I_p$	Prospective short-circuit current of a power supply
$I_{Total}$	Total discharge current
$I_{SCCR}$	Short-circuit current rating
$I_{PE}$	Residual current
Abbreviations related voltage	
$U_c$	Maximum continuous operating voltage
$U_N$	Nominal voltage of the system phase to earth
$U_o$	Line-to-neutral voltage of the system
$U_{OC}$	Open-circuit voltage for class III test
$U_p$	Voltage protection level
$U_{ref}$	Reference voltage test value
$U_{res}$	Residual voltage
$U_T$	Temporary overvoltage test value
$U_{TOV}$	Temporary overvoltage of the power system
$U_{TOV(HV)}$	Temporary overvoltage of the network inside the high-voltage system
$U_{TOV(LV)}$	Temporary overvoltage of the network inside the low-voltage system
$U_W$	Rated impulse withstand voltage

## General Knowledge about SPD

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.



At the figure there are particular links among electrical equipment and environment 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.

### Term and definition of surge

#### Overvoltage

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 IEC 61643-11)

**Peak value (amplitude)  $U_{max}$ ,  $I_{max}$**

- peak value is the maximum 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

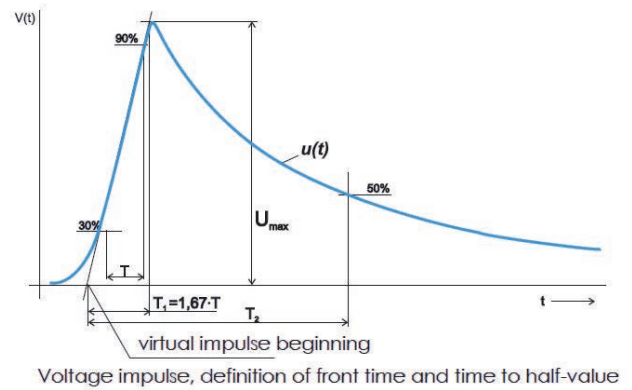
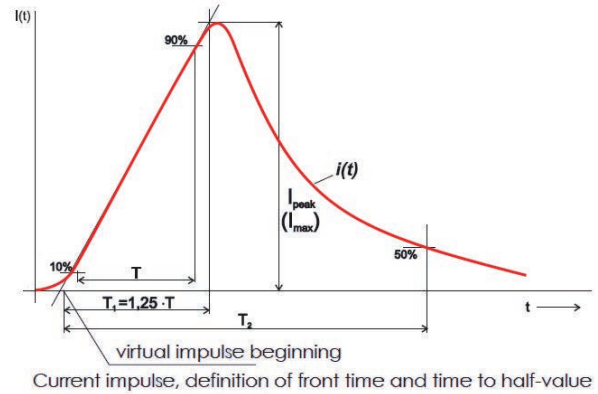
**Tail of impulse**

- 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

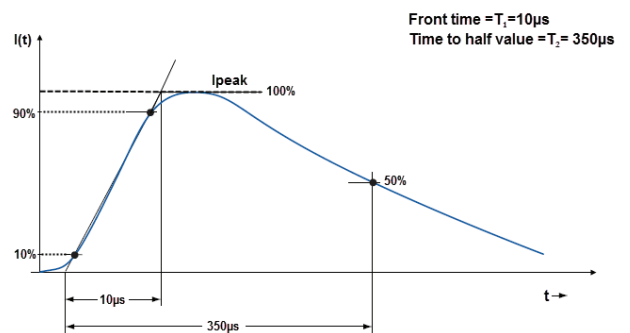
**NOTE :** The virtual beginning is an intersection of time axis and bisector, which goes through points, where actual value of the front of impulse at first time reaches partly given lower value and partly given higher value ...in detail see the following two figures.



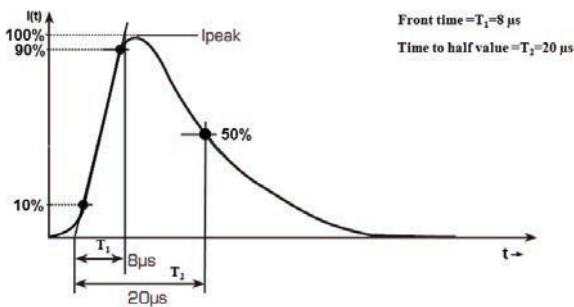
**Standardized testing current impulse**

Two basic type of testing current impulse are used during SPD tests according to IEC 61643-11:

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  $I_{max}(8/20)$ .



### Standardized testing combination wave

#### 1.2/50 μs (voltage surge) - 8/20 μs (current surge) combination wave

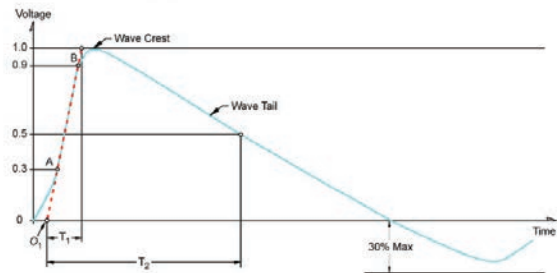
The combination wave is delivered by a generator that can apply a 1.2/50 μs voltage wave across an open circuit and an 8/20 μs current wave into a short circuit. The exact waveform that is delivered is determined by the generator and the impedance to which the surge is applied.

These combination wave used for testing SPD Class III according to IEC 61643-11 and all other cases, such as power lines short signal connections and short-distance connections.

- Combination wave, Open-circuit voltage (1.2/50 μs)

$$T = \text{Time B} - \text{Time A} \quad T_1 = 1.67T = 1.2 \mu\text{s} \pm 30\% \quad T_2 = 50 \mu\text{s} \pm 20\%$$

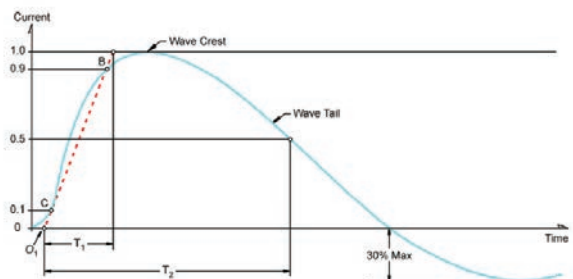
Undershoot  $\leq 30\%$  of the crest.



- Combination wave, Short-circuit current (8/20 μs)

$$T = \text{Time B} - \text{Time C} \quad T_1 = 1.25T = 8 \mu\text{s} \pm 30\% \quad T_2 = 20 \mu\text{s} \pm 20\%$$

Undershoot  $\leq 30\%$  of the crest.

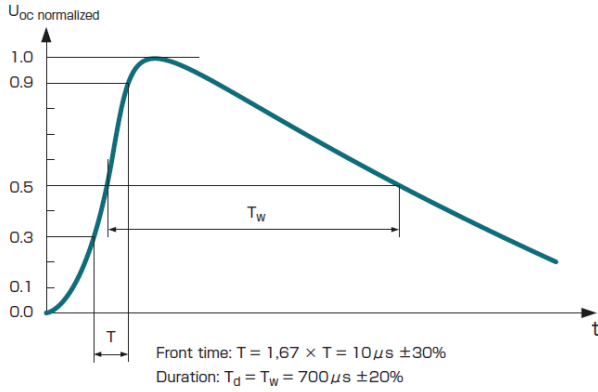


#### 10/700 μs (voltage surge) - 5/320 μs (current surge) combination wave

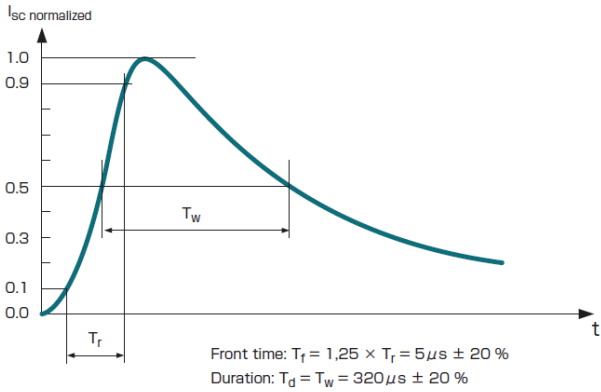
10/700 μs combination wave is applied to ports connected to outdoor telecommunication lines only. Outdoor telecommunication lines are typically greater than 300 in length, as the result of this length 10/700 μs wave is more representative. Telecommunication lines are usually protected by a primary protector installed at the cable entry to building. Testing shall be performed with the intended primary protector



• Open circuit voltage waveform (10/700  $\mu$ s)



• Short circuit current waveform (5/320  $\mu$ s)

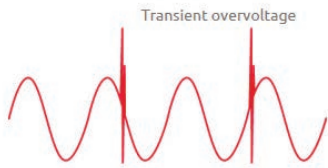


**Type of overvoltages**

The overvoltages are classified into two kinds :

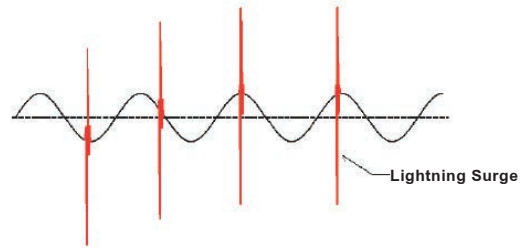
1. Temporary overvoltage (TOV)
2. Transient overvoltage (Surge)

**Transient overvoltage (Surge)**

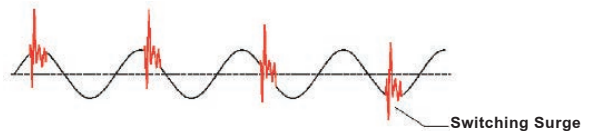


Transient overvoltages in electrical transmission and distribution networks result from the unavoidable effects of lightning strikes and network switching operations. These overvoltages have the potential to result in large financial losses each year due to damaged equipment and lost production. Transient overvoltages can be classified as two common forms

- Lightning Surge (Direct and Indirect lightning Strikes) are lightning induced disturbances in magnetic fields with a subsequent induced overvoltage on electrical systems with in the building



- Switching Surge are the switching of inductive loads



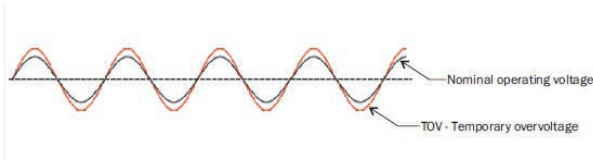
Transient overvoltages are surge that reach values of tens of kilovolts with a duration of the order of microseconds.

Despite their short duration, they cause the destruction of equipment connected to the network, causing :

- Serious damage or destruction.
- Service interruption.

## Temporary overvoltages (TOVs)

Temporary overvoltage are defines as AC overvoltages with significant duration and amplitude appearing in a system following a fault condition. A wide range of phenomena, either resulting from normal system operating or from accidental conditions such as a line-to-earth fault in three-phase system, loss of neutral in a single-phase, Ferroresonance effects, harmonics, etc. ,these cause can be produce overvoltages, which must be distinguished from other surge overvoltages due to their longer duration time.



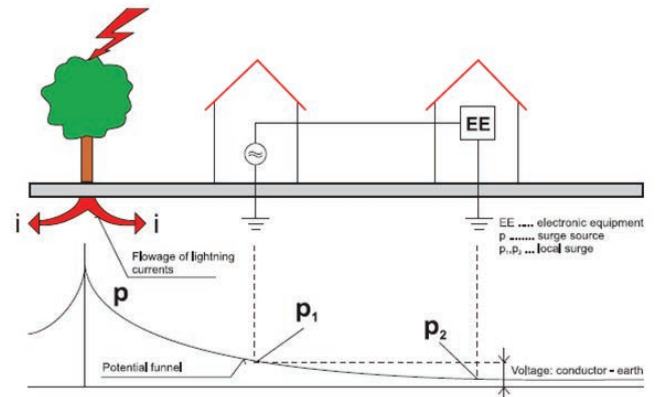
## Kinds of surge couplings

### 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.

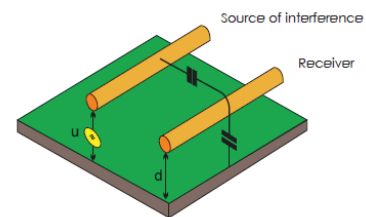
### Galvanic coupling

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.



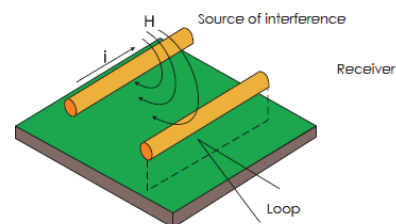
### Capacitive coupling

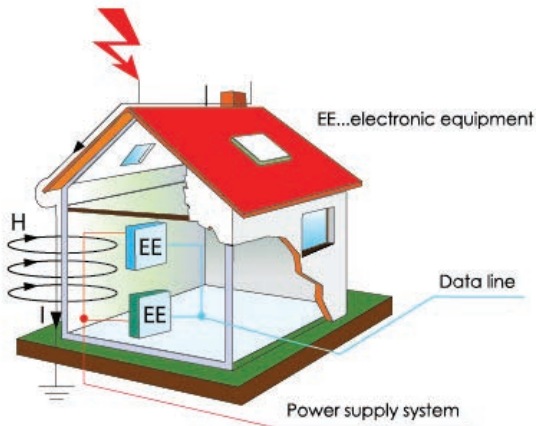
There is always a capacitive coupling (parasitic capacity) between the source of interference and the receiver. The higher the front rate of rise of the disturbing voltage impulse ( $du/dt$ ) is, the stronger its interference effect is.



### Inductive coupling

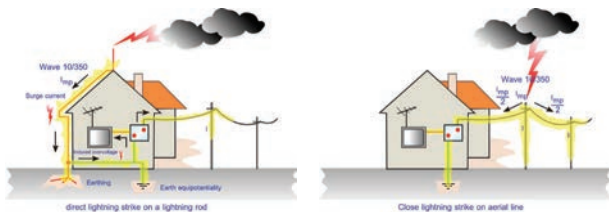
There is always an inductive coupling (magnetic field) between the source of interference and the receiver. The higher the front rate of rise of the disturbing current impulse ( $di/dt$ ) activating the magnetic field is, the higher the interference effect is.





### Surge from Direct Lightning Strikes

Lightning currents that can occur during a direct lightning strike can be imitated with the surge current of waveform 10/350  $\mu$ s. The lightning test current imitates both the fast rise and the high energy content of natural lightning.



### Surge from Indirect Effect of Lightning Strikes

The electromagnetic fields created by the lightning current generate inductive and capacitive coupling, leading to other overvoltages. The surges are imitated with test impulse current waveform 8/20  $\mu$ s. The energy content of this impulse is significantly lower than the lightning current waveform 10/350  $\mu$ s.



### Distribution of protected area into the lightning protection zones

The standard IEC 1312-1 and IEC 62305 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.

### Lightning Protection Zones

#### LPZ 0<sub>A</sub>:

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<sub>B</sub>:

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<sub>B</sub>. In this zone the electromagnetic field may also be attenuated depending on the screening measures.

#### The subsequent zones (LPZ 2 and so on):

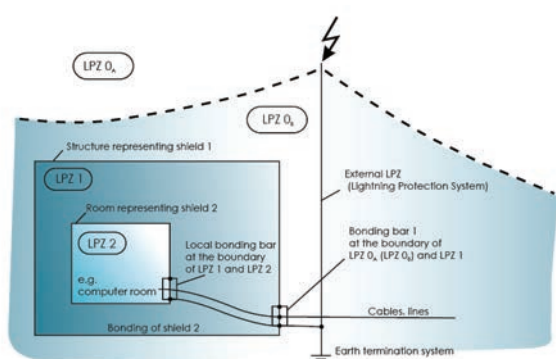
If a further reduction of conducted currents and/or electromagnetic field is required, subsequent zones shall be introduced. The requirement for those zones shall be selected according to the required environmental zones of the system to be protected. In general, the higher the number of the zones, the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

**NOTE** : Bonding at the boundary between LPZ 0<sub>A</sub>, LPZ 0<sub>B</sub> and LPZ 1 is defined in IEC 1312-1 and IEC 62305.

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<sub>A</sub>, LPZ 0<sub>B</sub> 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 picture 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 → 1 and LPZ 1 → 2) and other protective SPDs at the zone boundary LPZ 2 → 3.

Standardly it is recommended to insert so called 1<sup>st</sup> 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 2<sup>nd</sup> 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 3<sup>rd</sup> 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 grid like reinforced concrete ducts, which must be integrated into the meshed earthing system.

## Type of SPD classified by component structure

### 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 often used on principle of a spark gap. They are designed for 1<sup>st</sup> 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 behavior of the spark gap when follow current extinguish. Open spark gaps excel in very high discharge abilities (up to  $I_{imp} = 50\text{kA}$  (10/350)) during high levels

of self-extinguishing follow current (up to  $I_{fi} = 50\text{kA}_{rms}$ ). 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 ( $I_{fi} = \text{max } 25\text{kA}_{rms}$ ) being decreased. Some constructions of the closed spark gaps have very high discharge abilities ( $I_{imp} > 100\text{kA}$  (10/350)), on the other hand the level of self-extinguishing follow current is low ( $I_{fi} = \text{cca } 100\text{A}_{rms}$ ), so their application possibilities are comparable with gas discharge tubes.

### Gas discharge tubes



In the quiescent 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  $I_{imp} = 100\text{kA}$  (10/350). They have small self capacity (few of pF units) and high isolation resistance ( $> 1000\text{M}\Omega$ ). Gas discharge tube’s application possibilities 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



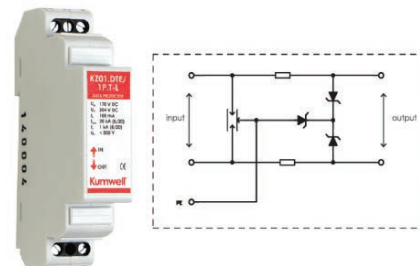
Varistors are voltage dependent resistances with symmetrical voltampere characteristic. They consist of 90% ZnO as a ceramic basis and 10% additives. High possible load of this type of arresters during their loading by impulse discharge currents is achieved by application of its great mass varistor capacity for energy absorption. 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 Zener 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.

### Hybrid



Hybrid surge protection devices combine at least two types of surge components such as

- MOVs and GDT for surge protection of AC Power Lines
- Combination SPD consist of gas discharge tubes, series impedance and transils, these devices was designed for protection of data, communication, measuring and control lines against surge effects.

## Application Of Kumwell SPD for Low Voltage Power Systems

Dimensioning of SPD type 1 IEC 62305		
Location of SPD type 1: On the boundaries of 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

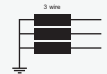



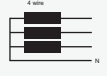

Application of Kumwell SPD type 1 IEC 62305	
Kumwell SPD type 1: On the boundaries of LPZ 0 to LPZ 1	
KZ01 series	<ul style="list-style-type: none"> <li>- big industrial buildings</li> <li>- buildings with particular importance</li> <li>- photovoltaic systems</li> <li>- Install in main distribution board (MDB)</li> </ul>

Application of Kumwell SPD type 1+2 IEC 62305	
Kumwell SPD type 1+2: On the boundaries of LPZ 0 to LPZ 2	
KZ0112 series MBC.I25K series	<ul style="list-style-type: none"> <li>- Industrial installations such as substations, main switchboard of large industrial structures</li> </ul>


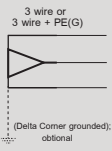
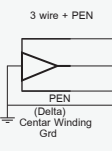
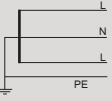
Application of Kumwell SPD type 2 IEC 62305	
Kumwell SPD type 2: On the boundaries of LPZ 1 to LPZ 2	
KZ12 series D12 series	<ul style="list-style-type: none"> <li>- all types of electrical sets</li> <li>- all kinds of industry, residential and administration buildings</li> <li>- Install in sub distribution board (SDB) or into control box</li> <li>- photovoltaic systems</li> </ul>
KZ12.DC series	<ul style="list-style-type: none"> <li>- Modular SPD for DC power systems</li> </ul>

Application of Kumwell SPD type 3 IEC 62305	
Kumwell SPD type 3: On the boundaries of LPZ 2 to LPZ 3	
KZ23 series	
KZ23.PK2, KZ23.P3K, KZ23.PK8	<ul style="list-style-type: none"> <li>- all types of electrical sets (located in switchboard)</li> </ul>
KZ23.PK16	<ul style="list-style-type: none"> <li>- Compact SPD for DC power systems</li> </ul>

**Table 1**  
**Reference test voltage values (IEC 61643-11)**

Power distribution system	Nominal AC system voltage L-PE/L-L V	Expected voltage regulation of the power distribution system max +(%)	Reference test voltage $U_{REF}$ (depending on the mode of protection) V				
			L-N (PEN)	L-PE	L-L	N-PE	
Three phase TT-system without PE and Neutral distribution	 230 / 400	10	--	255	440	--	
Three phase TT-system with Neutral distribution	 230 / 400	10	255	255	440	255	
Three phase TN-C system with PEN distribution	 230 / 400	10	255	255	440	--	
Three phase TN-S-system with PE and Neutral distribution		230 / 400	10	255	255	440	255
		240 / 415	6	255	255	440	255
		120 / 208	10	132	132	230	50
		277 / 480	10	305	305	530	115
Three phase IT-system with Neutral distribution	 230 / 400	10	255	440	440	255	
Three phase IT-system without Neutral distribution	 230	10	--	255	255	--	



Power distribution system	Nominal AC system voltage L-PE/L-L V	Expected voltage regulation of the power distribution system max +(%)	Reference test voltage $U_{REF}$ (depending on the mode of protection) V			
			L-N (PEN)	L-PE	L-L	N-PE
				230	10	255
120	132	132	---	132		
Three phase (Delta) Corner grounded TN system or TT system or IT system  <small>(Delta Corner grounded); optional</small>	230	10	---	264	264	---
	200 (202)		---	222	222	---
	460		---	528	528	---
Three phase (Delta) Central winding grounded TN system or TT system 	230	10	132	264	264	---
	200 (202)		---	129 192	222	---
	460		---	528	528	---
Split phase TN system 	120 / 240	10	132	132	264	132

**NOTE** If higher voltage regulation is required for certain applications (for example +15%), subject to a special agreement between the manufacturer and the user.

**SOURCE** : Table A.1 - Reference test voltage values (IEC 61643-11)

## TOV Ratings (IEC 61643-11)

The test procedure on the intended application of an SPD in a low-voltage power distribution system according to the installation instructions given by the manufacturer.

For systems defined in IEC 60364 series, values are given below in Table 2

Table 2 - TOV test values for systems complying with IEC 60364 series			
Application	TOV test parameters		
	For $t_r=5$ s (LV-system faults in consumer installation) (requirement to 7.2.8.1 and test 8.3.8.1)	For $t_r=120$ min (LV-system faults in distribution system and loss of neutral) (requirement to 7.2.8.1 and test 8.3.8.1)	For $t_r=200$ ms (HV-system faults) (requirement to 7.2.8.2 and test 8.3.8.2)
SPDs connected to :	Withstand mode required	Withstand or safe failure mode acceptable	Withstand or safe failure mode acceptable
TOV test Values $U_T$ (V)			
TN-systems			
Connected L-(PE)N or L-N	$1,32 \times U_{REF}$	$\sqrt{3} \times U_{REF}$	
Connected N-PE			
Connected L-L			
TT-systems			
Connected L-PE	$\sqrt{3} \times U_{REF}$	$1,32 \times U_{REF}$	$1200 + U_{REF}$
Connected L-N	$1,32 \times U_{REF}$	$\sqrt{3} \times U_{REF}$	
Connected N-PE			1200
Connected L-L			
IT-systems			
Connected L-PE			$1200 + U_{REF}$
Connected L-N	$1,32 \times U_{REF}$	$\sqrt{3} \times U_{REF}$	
Connected N-PE			$1200 + U_{REF}$
Connected L-L			

$U_{REF}$  reference test voltage used for testing and taking into account the maximum voltage regulation of the power system (see Annex A).

$U_o$  in TN- and TT-systems: nominal a.c. r.m.s. line voltage to earth; in IT-systems: nominal a.c. voltage between line conductor and neutral conductor or midpoint conductor, as appropriate (see 442.1.2 of IEC 60364-4-44:2007)

$1,32 \times U_{REF}$  equals  $1,45 \times U_o$  in case the voltage regulation does not exceed +10 % (see 442.5 of IEC 60364-4-44:2007)

**NOTE** : As voltage regulation exceeds 10 % in some countries, only  $U_{REF}$  is use in this standard for general applicability. Further information on voltage regulation can be found in IEC 60038.

**SOURCE** : Table B.1 - TOV test values for systems complying with IEC 60364 series (IEC 61643-11)

**Short circuit backup protection and surge withstand (IEC 61643-12)**

Table 3 - Example of ratio between single shot withstand and full preconditioning/operating duty test								
Typical rated current of the fuse	Typical Pre-arcing value, crest current from simplified formula in 1 and real testing							
	Cyl gG				NH gG			
	Pre-arcing $I^2t$	Calculated 8/20	After test 8/20	Ratio	Pre-arcing $I^2t$	Calculated 8/20	After test 8/20	Ratio
25	800	7.6	5	0.66				
32	1,300	9.6	7	0.73				
40	2,500	13.4	10	0.75				
50	4,200	17.3	15	0.87				
63	7,500	23.1	17	0.73				
80	14,500	32.2	25	0.78				
100	24,000	41.4	30	0.72	20,000	8.8	5	0.57
125	40,000	53.4	40	0.75	33,000	11.3	7	0.62
160					60,000	15.3	10	0.65
200					100,000	19.75	15	0.76
250					200,000	27.93	20	0.72
315					300,000	34.21	25	0.73

SOURCE : Table P.1 - (IEC 61643-12)

**1. Information single shot 8/20 and 10/350 fuses withstand**

Use the  $I^2t$  calculation of wave shape compared to fuse  $I^2t$  ( 1ms ) from fuse manufacturer is a possible way to guess its surge withstand for a single shot.

$I^2t$  surge can be estimated knowing the crest value of the surge and its wave shape with these formulas.

For wave shape 10/350 :

$$I^2t = 256.3 \times I_{crest}^2$$

For wave shape 8/20 :

$$I^2t = 14.01 \times I_{crest}^2$$

With  $I_{crest}$  in kA,  $I^2t$  in  $A^2s$

**Examples :**

To withstand a single shot of surge current of 9 kA 8/20, the backup fuse must have a minimum pre-arcing value greater than :

$$I^2t = 14.01 \times 9^2 = 1134.8 A^2s$$

**NOTE : Typical pre-arcing value for 32 A cylindrical fuse gG type is : 1300 A<sup>2</sup>s**

To withstand a single shot of surge current of 5 kA 10/350, the backup fuse must have a minimum pre-arcing value greater than :

$$I^2t = 256.3 \times 5^2 = 6407.5 A^2s$$

**NOTE : Typical pre-arcing value for 63 A NH fuse gG type is : 6500 A<sup>2</sup>s**

A new fuse with a pre-arcing value of 24 000 A<sup>2</sup>t (100 A cylinder fuse gG type) can withstand a 8/20 single shot of :

$$I_{crest} = \frac{\sqrt{24000}}{14.01} = 41.4 \text{ kA}$$

## SPD Parameter Selection (IEC 61643-12)

### U<sub>c</sub> Maximum continuous operating voltage of the SPD

U<sub>c</sub> shall be higher than the maximum continuous operating voltage of the power system U<sub>cs</sub> (= k × U<sub>o</sub>)

$$U_c > U_{cs}$$

Table 4 – Minimum recommended U<sub>c</sub> of the SPD for various power systems (IEC 61643-12)

SPDs connected between:	System configuration of distribution network				
	TT	TN-C	TN-S	IT with distributed neutral	IT without distributed neutral
Each line conductor and neutral conductor	1,1 U <sub>o</sub>	NA	1,1 U <sub>o</sub>	1,1 U <sub>o</sub>	NA
Each line conductor and PE conductor	1,1 U <sub>o</sub>	NA	1,1 U <sub>o</sub>	$\sqrt{3} \times U_o$ (see <b>NOTE 3</b> )	NA
Neutral conductor and PE conductor	U <sub>o</sub> (see <b>NOTE 3</b> )	NA	U <sub>o</sub> (see <b>NOTE 3</b> )	U <sub>o</sub> (see <b>NOTE 3</b> )	Line to line voltage (see <b>NOTE 3</b> )
Each line conductor and PEN conductor	NA	1,1 U <sub>o</sub>	NA	NA	NA

NA : not applicable

**NOTE 2** U<sub>o</sub> is the line to neutral voltage of the low voltage system.

**NOTE 3** These values are related to worst case fault conditions, therefore the tolerance of 10 % is not taken into account.

**NOTE 4** In extended IT systems, higher values of U<sub>c</sub> may be necessary.

### U<sub>T</sub> Temporary overvoltage rating of the SPD

U<sub>T</sub> values shall be higher than the temporary overvoltage (TOV) that is expected to occur in the installation due to faults in the low-voltage system

$$U_T > U_{TOV(LV)}$$

Table 5 – Typical TOV test values (IEC 61643-12)

Application	TOV test values $U_T$	
	for 5s	for 200ms
<b>SPDs connected to:</b>		
<b>TN-systems</b>		
Connected L- (PE)N or L-N	$1,32 \times U_{cs}$	
Connected N-PE		
Connected L-L		
<b>TT-systems</b>		
Connected L-PE	$1,55 \times U_{cs}$	$1200 + U_{cs}$
Connected L-N	$1,32 \times U_{cs}$	
Connected N-PE		1200
Connected L-L		
<b>IT-systems</b>		
Connected L-PE		$1200 + U_{cs}$
Connected L-N	$1,32 \times U_{cs}$	
Connected N-PE		1200
Connected L-L		
<b>TN, TT and IT-systems</b>		
Connected L-PE	$1,55 \times U_{cs}$	$1200 + U_{cs}$
Connected L-N	$1,32 \times U_{cs}$	
Connected N-PE		1200
Connected L-L		

**NOTE 2 :** This table satisfies the requirements given in IEC 60364-5-53. For this purpose  $U_{cs} = 1,1 \times U_o$ .

**NOTE 3 :** The different power networks and earthing practices not complying with IEC installations rules may require different values to those given in the table above.

In some cases where the TOVs have too high a magnitude, it may be difficult to find an SPD which is able to provide equipment with acceptable surge protection. If the probability of occurrence is low enough, it can be decided to use an SPD which cannot withstand the TOV stress. In this case, suitable disconnecting devices shall be used.

$I_n, I_{max}, I_{imp}$

$I_n$  is related to the protective level  $U_p$  where  $I_{max}, I_{imp}$  is necessary for selection of the appropriate energy withstand.

The choice of the SPD energy withstand (choice of either  $I_{imp}, I_{max}$  or  $U_{oc}$  depending on the class of test) shall be based on a risk analysis (see Clause 7) which compares the probability of occurrence of surges, the price of the equipment to be protected and the acceptable failure rate, completed with a coordination analysis when more than one SPD is involve.

## Required impulse withstand voltage of equipment ( $U_w$ )

Equipment shall be selected so that its rated impulse withstand voltage is not less than the required impulse withstand voltage as specified in Table 6 (Table 44B in IEC 60364-4-44)

**Table 6-Require and impulse withstand voltage of equipment**

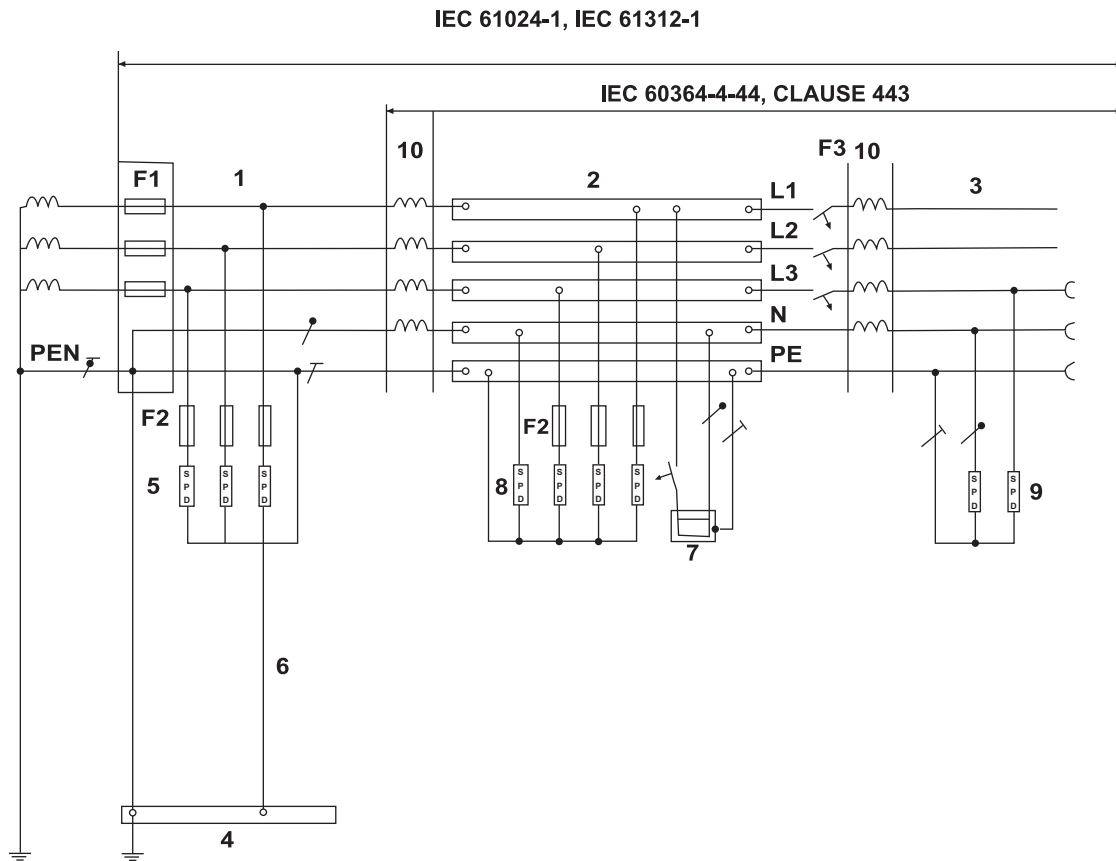
Nominal voltage of the installation <sup>a</sup> V		Required impulse withstand voltage for kV <sup>c</sup>			
Three-phase systems	Single-phase systems with middle point	Equipment at the origin of the installation (overvoltage category IV)	Equipment of distribution and final circuits (overvoltage category III)	Appliances and current using equipment (overvoltage category II)	Specially protected equipment (overvoltage category I)
–	120-240	4	2.5	1.5	0.8
230/400 <sup>b</sup> 277/480 <sup>b</sup>	–	6	4	2.5	1.5
400/690	–	8	6	4	2.5
1000	–	12	8	6	4

<sup>a</sup> According to IEC 60038.

<sup>b</sup> In Canada and USA, for voltage to earth higher than 300 V, the impulse withstand voltage corresponding to the next highest voltage in column one applies.

<sup>c</sup> This impulse withstand voltage is applied between live conductor and PE.

## Installation of class I, II and III tested SPDs, for example in TN-C-S system, IEC 60364-5-53



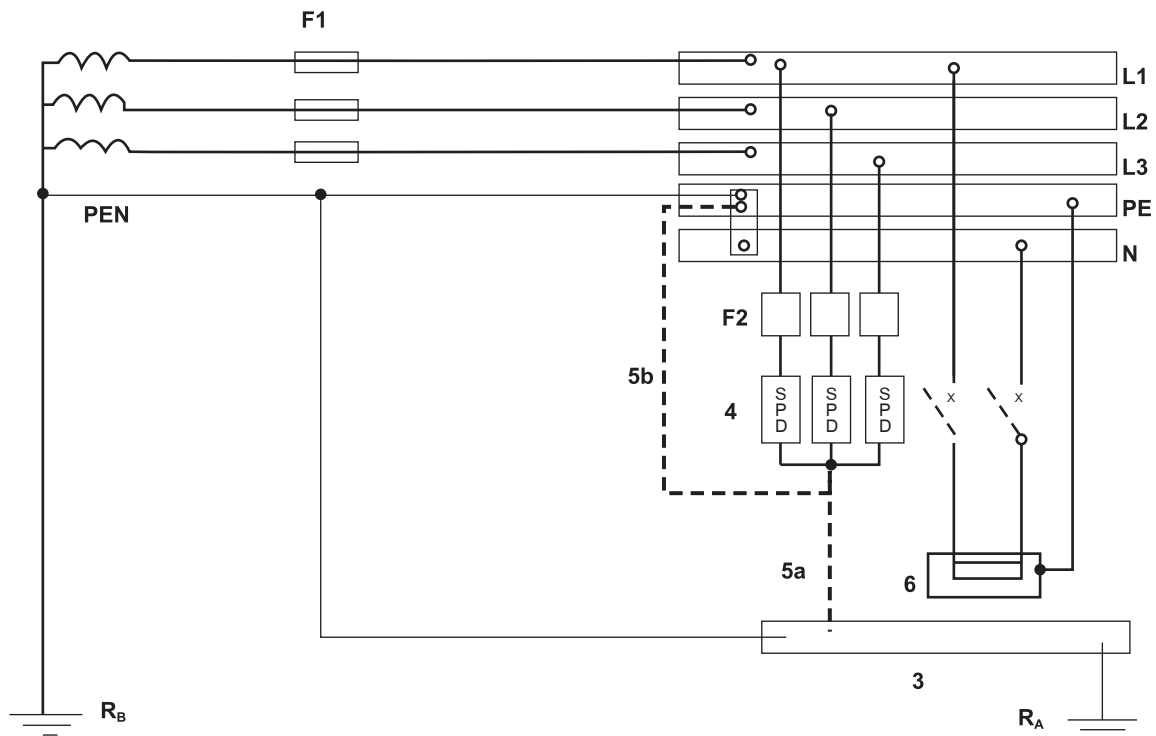
- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1 Origin of the installation</li> <li>2 Distribution board</li> <li>3 Distribution outlet</li> <li>4 Main earthing terminal or bar</li> <li>5 Surge protection device, test class I</li> <li>6 Earthing connection (earthing conductor) of surge protective device</li> </ul> | <ul style="list-style-type: none"> <li>7 Fixed equipment to be protected</li> <li>8 Surge protective device, test class II</li> <li>9 Surge protective device, test class II or III</li> <li>10 Decoupling element or line length</li> </ul> <p>F1, F2, F3 Overcurrent protective device</p> |
|--|--|

**NOTE** : 1 Reference should be made to IEC 61643-12 for further information.

**NOTE** : 2 SPD 5 and 8 can be combined in a single SPD

### Installation of class I, II and III tested SPDs

## Installation of surge protective devices in TN systems, IEC 60364-5-53



- 3 Main earthing terminal or bar
- 4 Surge protective devices providing protection against overvoltages of category II
- 5 Earthing connection of surge protective devices, either 5a or 5b
- 6 Equipment to be protected

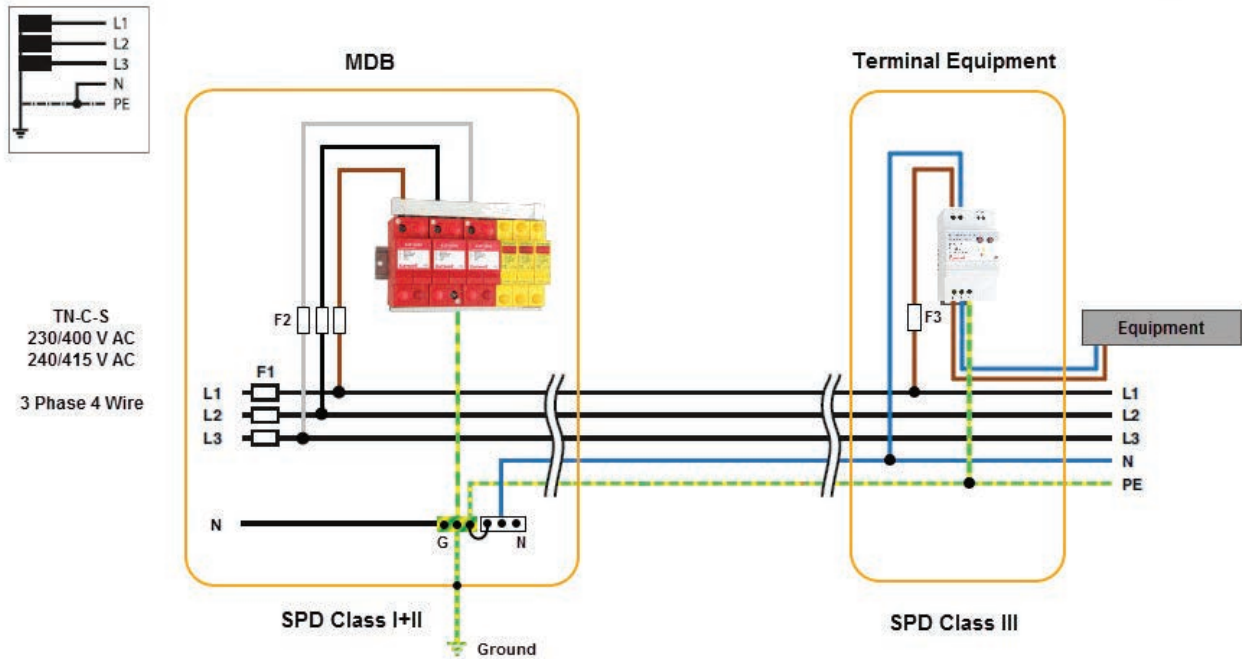
- F1 Protective device at the origin of the installation
- F2 Protective device required by the manufacturer of the SPD
- RA Earthing electrode (earthing resistance) of the Installation
- RB Earthing electrode (earthing resistance) of the supply system

### SPDs in TN systems

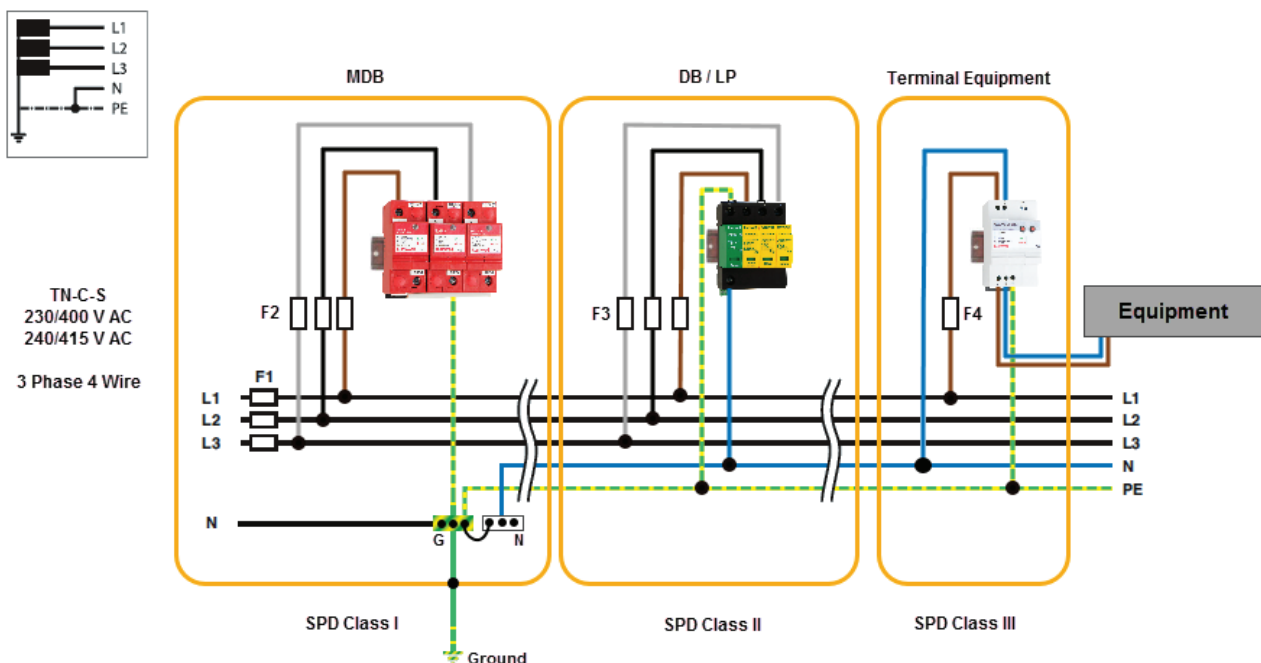


## Installation of surge protective devices, for example in TN-C-S system (Thailand) (3 Phase 4 Wire)

### Surge Protection for AC Power Supply Systems

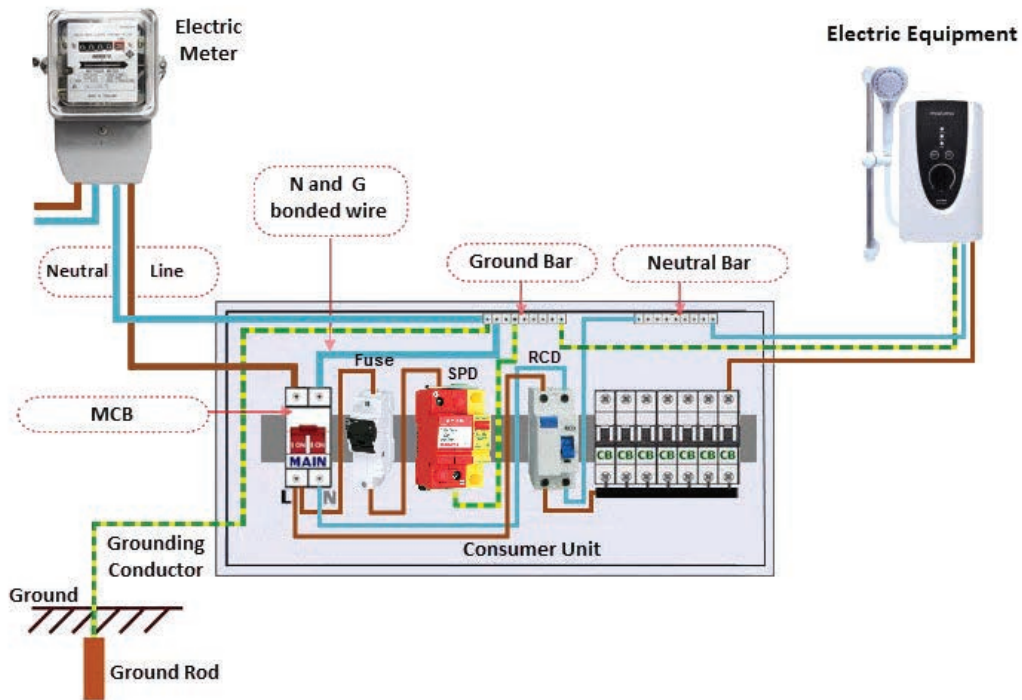


Installation of SPD class I and class II combined set + class III (without DB / LP) in TN-C-S system (Thailand) (3 Phase 4 Wire)



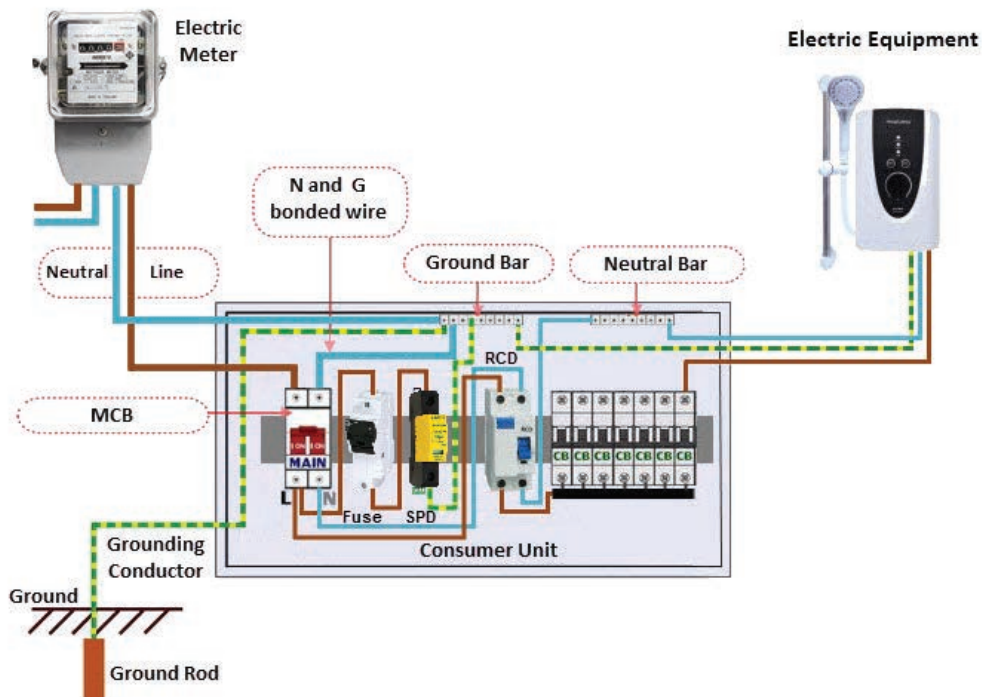
Installation of SPD class I and class II installed separately + class III in TN-C-S system (Thailand) (3 Phase 4 Wire)

# Installation of surge protective devices for Home (Single Phase) TN-C-S system in Thailand



**Installation of SPD class I+II in Consumer Unit**

(in case the home located in area where a direct lightning strike risk is high, especially when the home is equipped with LPS or lightning rod, opening area or on the mountain)



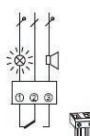
**Installation of SPD class II in Consumer Unit**

(in case the home located in area of indirect lightning strike risk , on installations without LPS (lightning rods))

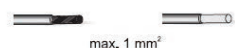
**> Surge Protection For Low Voltage  
Power Systems**

**1**

**Kumwell KZ01.I050.ds** and **KZ01.U0440.ds** are the surge protective device class I according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 62305), where they provide the equipotential bonding and discharge of both, the lightning current and 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. They are mainly intended for use in the power lines, which are operated as a system TN-C.



AC: 250 V / 0,5 A  
DC: 250 V / 0,1 A  
125 V / 0,2 A  
75 V / 0,5 A



### KZ01.lxxx.ds

Remote signal (optional)  
Lightning impulse current :  $I_{imp}$  (kA)  
Lightning protection zone: LPZ 0-1

### KZ01.Uxxx.ds

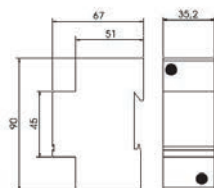
Remote signal (optional)  
Max. continuous operating voltage :  $U_c$   
Lightning protection zone: LPZ 0-1

## Spark gap / Class I

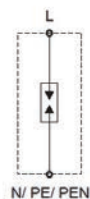
Technical data		KZ01.I050.ds	KZ01.U440.ds
Test class according to IEC 61643-11		CLASS I	
Nominal voltage	$U_N$	230 V AC	400 V AC
Max. continuous operating voltage	$U_C$	350 V AC	440 V AC
Lightning impulse current (10/350)	$I_{imp}$	50 kA	
- charge	Q	25 As	
- specific energy	W/R	600 kJ/Ω	
Nominal discharge current (8/20)	$I_n$	50 kA	
Voltage protection level at $I_n$	$U_p$	< 2 kV	< 2.5 kV
Temporary overvoltage (TOV)	$U_T$	462 V/5 s	690 V/5 s
Response time	$t_A$	< 100 ns	
Follow current interrupting rating at $U_C$	$I_{fi}$	3 kA <sub>rms</sub>	
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	$I_p$	25 kA <sub>rms</sub>	
LPZ		0-1	
Protection type		IP20	
Operating temperature range	$\vartheta$	-40°C to + 80°C	
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)	
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)	
Mounting on		DIN rail 35 mm	

Accessories	Pcs.
FSPD3-500A (HRC Fuse)	1
FBSPD3-630A-1P (Fuse Base)	1

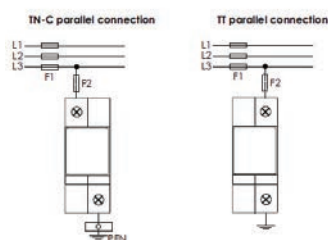
### Dimensions



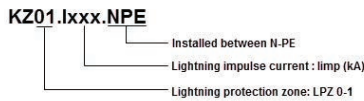
### Internal configuration



### Network connections



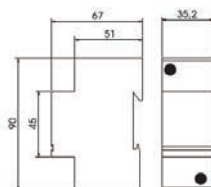
**Kumwell KZ01.I100.NPE and KZ01.I110.NPE** are the total current spark gaps class I according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 62305), where they provide the equipotential bonding and discharge of both, the lightning current and 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. They are intended for use in TN-S and TT systems. KZ01.I100.NPE and KZ01.I110.NPE are to be installed only between N and PE in modification of 3+1 or 1+1



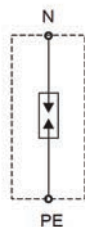
## Total current spark gap / Class I / N-PE

Technical data		KZ01.I100.NPE	KZ01.I110.NPE
Test class according to IEC 61643-11			CLASS I
Nominal voltage	$U_N$		230 V AC
Max. continuous operating voltage	$U_C$		350 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 $U_C$	$I_n$		100 A <sub>rms</sub>
LPZ			0-1
Protection type			IP20
Operating temperature range	$\vartheta$		-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)	
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)	
Mounting on		DIN rail 35 mm	

Dimensions



Internal configuration



Kumwell KZ01.\*.ds-1/1 are a lightning arresters class I according to IEC 61643-11. These are recommended for use in Lightning Protection Zone Concept at the boundaries of LPZ 0-1 (according to IEC 62305).

KZ01.\*.ds-1/1 can be used in industrial installations such as substations, main switchboards of large industrial structures and also places with high risk of a direct lightning strikes occurrence.

These arresters are combine with KZ01.\*.NPE which is recommended to install between N and PE for TN-S and TT systems.

LPZ  
0 → 1

IP  
20





AC: 250 V / 0,5 A  
DC: 250 V / 0,1 A  
125 V / 0,2 A  
75 V / 0,5 A

KZ01.UNxxx.ds-1/1

- Protection modes: L-N, N-PE
- Remote signal (optional)
- Nominal voltage :  $U_N$
- Lightning protection zone: LPZ 0-1



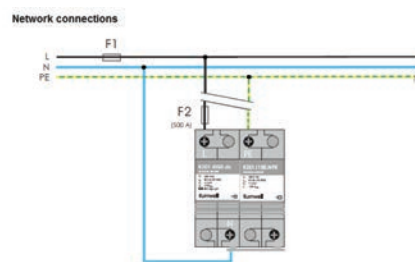
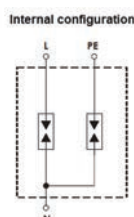
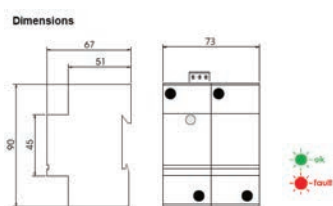
max. 1 mm<sup>2</sup>



## Spark gap / Class I / Single-Phase for TN-S and TT System

Technical data		KZ01.UN230.ds-1/1	KZ01.UN400.ds-1/1
Test class according to IEC 61643-11		CLASS I	
Nominal voltage	$U_N$	230 V AC	400 V AC
Max. continuous operating voltage	$U_C$	350 V AC	440 V AC
Lightning impulse current (10/350) L/N	$I_{imp}$	50 kA	
- charge	Q	25 As	
- specific energy	W/R	600 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 current (10/350) L+N → PE	$I_{total}$	100 kA	
Nominal discharge current (8/20)	$I_n$	50 kA	
Voltage protection level at $I_n$ (L/N)	$U_p$	< 2 kV	< 2.5 kV
Voltage protection level at $I_{imp}$ (N/PE)	$U_p$	< 1.3 kV	
Sparkover voltage 1.2/50μs (N-PE)		< 1.5 kV	
Temporary overvoltage (TOV) L/N	$U_T$	462 V/5 s	690 V/5 s
Temporary overvoltage (TOV) N/PE	$U_T$	1200 V/ 0.2 s	
Response time	$t_A$	< 100 ns	
Follow current interrupting rating at $U_C$ (L/N)	$I_{fi}$	3 kA <sub>rms</sub>	
Follow current interrupting rating at $U_C$ (N/PE)	$I_{fi}$	100 A <sub>rms</sub>	
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	$I_p$	25 kA <sub>rms</sub>	
LPZ		0-1	
Protection type		IP20	
Operating temperature range	$\theta$	-40°C to + 80°C	
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)	
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)	
Mounting on		DIN rail 35 mm	

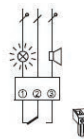
Accessories	Pcs.
FSPD3-500A (HRC Fuse)	1
FBSPD3-630A-1P (Fuse Base)	1



Kumwell KZ01.\*.ds-3/0 are a lightning arresters class I according to IEC 61643-11. These are recommended for use in the Lightning Protection Zone Concept at the boundaries of LPZ 0-1 (according to IEC 62305).

KZ01.\*.ds-3/0 can be used in industrial installations such as substations, main switchboards of large industrial structures and also places with high risk of a direct lightning strikes occurrence.

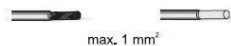
These arresters are intended for use in TN-C power supply system.



AC: 250 V / 0,5 A  
DC: 250 V / 0,1 A  
125 V / 0,2 A  
75 V / 0,5 A

KZ01.UNxxx.ds-3/0

Protection modes: L-N(G) / L-PEN  
Remote signal (optional)  
Nominal voltage :  $U_N$   
Lightning protection zone: LPZ 0-1



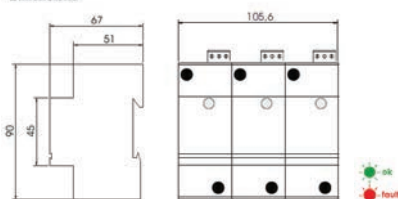
max. 1 mm<sup>2</sup>

### Spark gap / Class I / Three-Phase for TN-C System

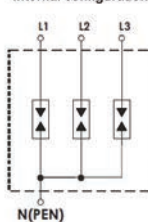
Technical data		KZ01.UN230.ds-3/0	KZ01.UN400.ds-3/0
Test class according to IEC 61643-11		CLASS I	
Nominal voltage	$U_N$	230/400 V AC	400/690 V AC
Max. continuous operating voltage	$U_C$	350 V AC	440 V AC
Lightning impulse current (10/350)	$I_{imp}$	50 kA	
- charge	Q	25 As	
- specific energy	W/R	600 kJ/Ω	
Total lightning current (10/350) L1+L2+L3 → PEN	$I_{total}$	150 kA	
Nominal discharge current (8/20)	$I_n$	50 kA	
Voltage protection level at $I_n$	$U_P$	< 2 kV	< 2.5 kV
Temporary overvoltage (TOV)	$U_T$	462 V/5 s	690 V/5 s
Response time	$t_A$	< 100 ns	
Follow current interrupting rating at $U_C$	$I_{fi}$	3 kA <sub>rms</sub>	
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	$I_P$	25 kA <sub>rms</sub>	
LPZ		0-1	
Protection type		IP20	
Operating temperature range	$\vartheta$	-40°C to + 80°C	
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)	
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)	
Mounting on		DIN rail 35 mm	

Accessories	Pcs.
FSPD3-500A (HRC Fuse)	3
FBSPD3-630A-3P (Fuse Base)	1

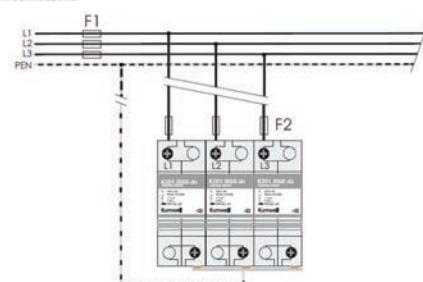
Dimensions



Internal configuration



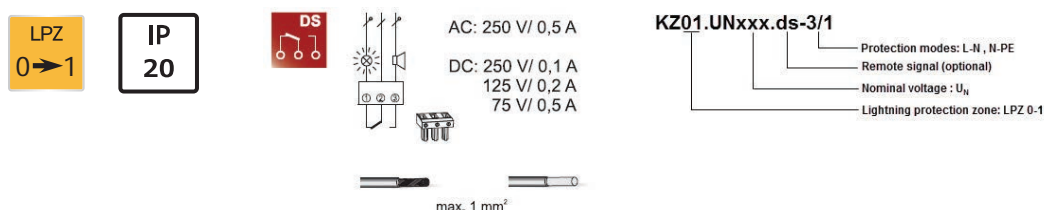
Network connections



**Kumwell KZ01.\*.ds-3/1** are a lightning arresters class I according to IEC 61643-11. These are recommended for use in Lightning Protection Zone Concept at the boundaries of LPZ 0-1 (according to IEC 62305).

KZ01.\*.ds-3/1 can be used in industrial installations such as substations, main switchboards of large industrial structures and also places with high risk of a direct lightning strikes occurrence.

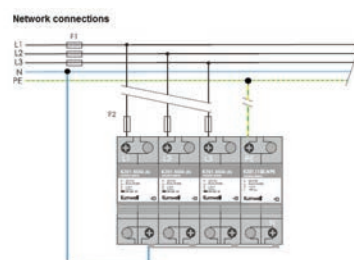
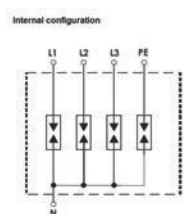
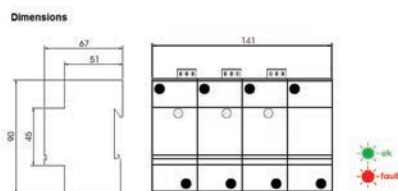
These arresters are combine with KZ01.\*.NPE which is recommended to install between N and PE for TN-S and TT systems.



### Spark gap / Class I / Three-Phase for TN-S and TT System

Technical data		KZ01.UN230.ds-3/1	KZ01.UN400.ds-3/1
Test class according to IEC 61643-11		CLASS I	
Nominal voltage	$U_N$	230/400 V AC	400/690 V AC
Max. continuous operating voltage	$U_C$	350 V AC	440 V AC
Lightning impulse current (10/350) L/N	$I_{imp}$		50 kA
- charge	Q		25 As
- specific energy	W/R		600 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 current (10/350) L1+L2+L3+N → PE	$I_{total}$		100 kA
Nominal discharge current (8/20)	$I_n$		50 kA
Voltage protection level at $I_n$ (L/N)	$U_p$	< 2 kV	< 2.5 kV
Voltage protection level at $I_{imp}$ (N/PE)	$U_p$		< 1.3 kV
Sparkover voltage 1.2/50μs (N-PE)			< 1.5 kV
Temporary overvoltage (TOV) L/N	$U_T$	462 V/5 s	690 V/5 s
Temporary overvoltage (TOV) N/PE	$U_T$		1200 V/ 0.2 s
Response time	$t_A$		< 100 ns
Follow current interrupting rating at $U_C$ (L/N)	$I_{fi}$		3 kA <sub>rms</sub>
Follow current interrupting rating at $U_C$ (N/PE)	$I_{fi}$		100 A <sub>rms</sub>
Max. back-up fuse			500 A gL/gG
Short-circuit withstand capability at max. back-up fuse	$I_p$		25 kA <sub>rms</sub>
LPZ			0-1
Protection type			IP20
Operating temperature range	$\vartheta$		-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)	
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)	
Mounting on		DIN rail 35 mm	

Accessories	Pcs.
FSPD3-500A (HRC Fuse)	3
FBSPD3-630A-3P (Fuse Base)	1





**Kumwell** MBC.I25K.ds is a metal oxide varistor lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 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 MBC.I25K.ds is mainly in the power supply lines. The main use of MBC.I25K.ds 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.



### Varistor/ Class I+II

#### Technical data

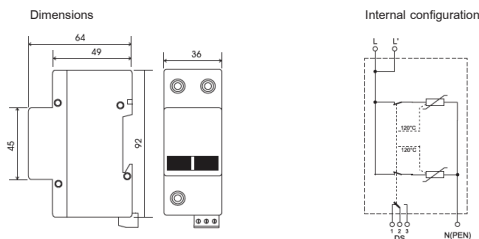
#### MBC.I25K.ds

Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230 V AC
Max. continuous operating voltage	$U_C$	275 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA
Lightning impulse current (10/350)	$I_{imp}$	25 kA
- charge	$Q$	12.5 As
- specific energy	$W/R$	156 kJ/Ω
Nominal discharge current (8/20)	$I_n$	25 kA
Voltage protection level at $I_{imp}$	$U_p$	< 1.2 kV
Temporary overvoltage (TOV)	$U_T$	335 V/5 s
Response time	$t_A$	< 25 ns
Max. back-up fuse (Branch wiring)		250 A gL/gG
Max. back-up fuse (“V” connection )		125 A gL/gG
Short-circuit withstand capability	$I_p$	80 kA <sub>rms</sub>
LPZ		0-1
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

#### Pcs.

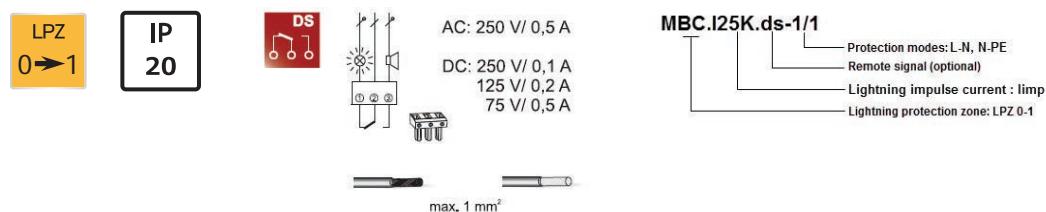
FSPD1-250A (HRC Fuse) (Branch wiring)	1
FBSPD1-250A-1P (Fuse Base)	1
FSPD00-125A (HRC Fuse) (“V” connection )	1
FBSPD00-125A-1P (Fuse Base)	1



**Kumwell** MBC.I25K.ds-1/1 is a metal oxide varistor combined with gas discharge tube lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 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 MBC.I25K.ds-1/1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of MBC.I25K.ds-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.



## Varistor/ Class I+II / Single-Phase for TN-S and TT System

### Technical data

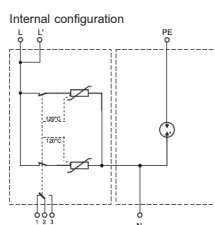
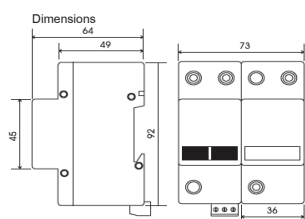
### MBC.I25K.ds-1/1

Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230 V AC
Max. continuous operating voltage	$U_C$	275 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA
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 current (10/350) L1+N → PE	$I_{total}$	50 kA
Nominal discharge current (8/20)	$I_n$	25 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 (Branch wiring)		250 A gL/gG
Max. back-up fuse (“V” connection)		125 A gL/gG
Short-circuit withstand capability	$I_p$	80 kA <sub>ms</sub>
LPZ		0-1
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Failure signalisation		pushed in - ok / pushed out - failure

### Accessories

### Pcs.

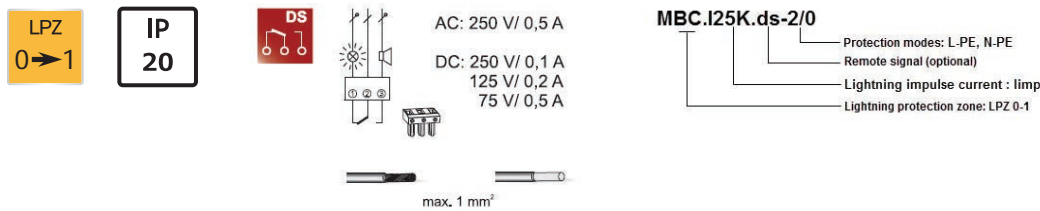
FSPD1-250A (HRC Fuse) (Branch wiring)	1
FBSPD1-250A-1P (Fuse Base)	1
FSPD00-125A (HRC Fuse) (“V” connection )	1
FBSPD00-125A-1P (Fuse Base)	1



**Kumwell** MBC.I25K.ds-2/0 is a metal oxide varistor lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 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 MBC.I25K.ds-2/0 is mainly in the power supply lines. The main use of MBC.I25K.ds-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.



### Varistor/ Class I+II / Single-Phase for TN-S System

#### Technical data

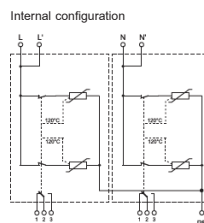
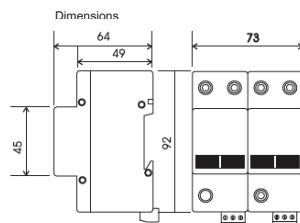
#### MBC.I25K.ds-2/0

Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230 V AC
Max. continuous operating voltage	$U_C$	275 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA
Lightning impulse current (10/350)	$I_{imp}$	25 kA
- charge	$Q$	12.5 As
- specific energy	$W/R$	156 kJ/Ω
Total lightning current (10/350) L1+N → PE	$I_{total}$	50 kA
Nominal discharge current (8/20)	$I_n$	25 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 (Branch wiring)		250 A gL/gG
Max. back-up fuse (“V” connection )		125 A gL/gG
Short-circuit withstand capability	$I_p$	80 kA <sub>rms</sub>
LPZ		0-1
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

#### Pcs.

FSPD1-250A (HRC Fuse) (Branch wiring)	1
FBSPD1-250A-1P (Fuse Base)	1
FSPD00-125A (HRC Fuse) (“V” connection )	1
FBSPD00-125A-1P (Fuse Base)	1



**Kumwell** MBC.I25K.ds-3/0 is a metal oxide varistor lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 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 MBC.I25K.ds-3/0 is mainly in the power supply lines. The main use of MBC.I25K.ds-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.



### Varistor/ Class I+II / Three-Phase for TN-C System

#### Technical data

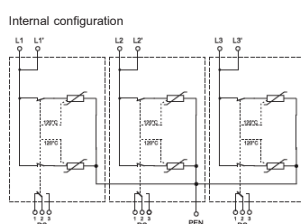
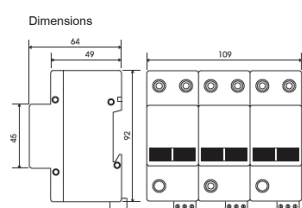
#### MBC.I25K.ds-3/0

Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	275 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA
Lightning impulse current (10/350)	$I_{imp}$	25 kA
- charge	$Q$	12.5 As
- specific energy	$W/R$	156 kJ/Ω
Total lightning current (10/350) L1+L2+L3 → PEN	$I_{total}$	75 kA
Nominal discharge current (8/20)	$I_n$	25 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 (Branch wiring)		250 A gL/gG
Max. back-up fuse (“V” connection )		125 A gL/gG
Short-circuit withstand capability	$I_p$	80 kA <sub>rms</sub>
LPZ		0-1
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

#### Pcs.

FSPD1-250A (HRC Fuse) (Branch wiring)	3
FBSPD1-250A-3P (Fuse Base)	1
FSPD00-125A (HRC Fuse) (“V” connection )	3
FBSPD00-125A-3P (Fuse Base)	1

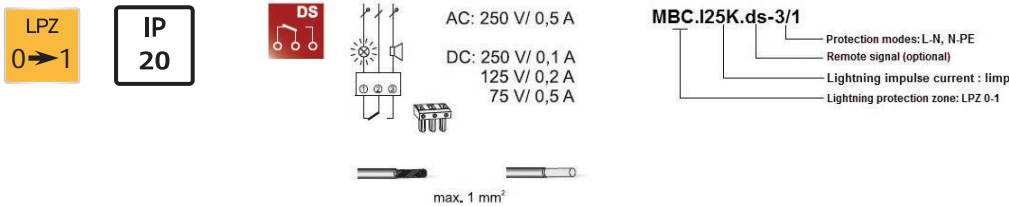


## CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER 3-PHASE TN-S AND TT SYSTEM

**Kumwell MBC.I25K.ds-3/1** is a metal oxide varistor lightning and surge arrester, combined with gas discharge tube class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 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 MBC.I25K.ds-3/1 is mainly in the power supply lines, which are operated as TN-S and TT systems. The main use of MBC.I25K.ds-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.



### Varistor/ Class I+II / Three-Phase for TN-S and TT System

#### Technical data

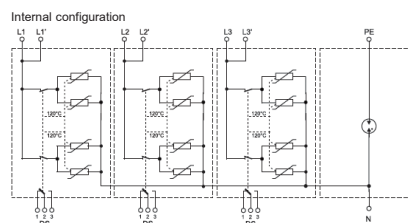
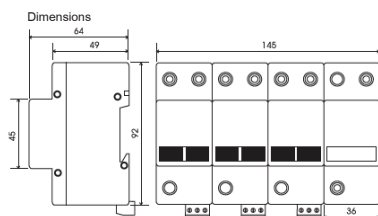
#### MBC.I25K.ds-3/1

Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	275 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA
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 current (10/350) L1+L2+L3+N → PE	$I_{total}$	100 kA
Nominal discharge current (8/20)	$I_n$	25 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 (Branch wiring)		250 A gL/gG
Max. back-up fuse (“V” connection )		125 A gL/gG
Short-circuit withstand capability	$I_p$	80 kA <sub>ms</sub>
LPZ		0-1
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

#### Pcs.

FSPD1-250A (HRC Fuse) (Branch wiring)	3
FBSPD1-250A-3P (Fuse Base)	1
FSPD00-125A (HRC Fuse) (“V” connection )	3
FBSPD00-125A-3P (Fuse Base)	1



**Kumwell MBC.I25K.ds-4/0** is a metal oxide varistor lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0–1 (according to IEC 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 MBC.I25K.ds-4/0 is mainly in the power supply lines. The main use of MBC.I25K.ds-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.



### Varistor/ Class I+II / Three-Phase for TN-S System

#### Technical data

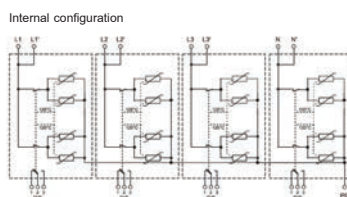
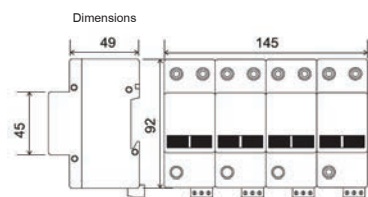
#### MBC.I25K.ds-4/0

Technical data		MBC.I25K.ds-4/0
Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	275 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA
Lightning impulse current (10/350)	$I_{imp}$	25 kA
- charge	$Q$	12.5 As
- specific energy	$W/R$	156 kJ/Ω
Total lightning current (10/350) L1+L2+L3+N → PE	$I_{total}$	100 kA
Nominal discharge current (8/20)	$I_n$	25 kA
Voltage protection level	$U_p$	< 1.2 kV
Temporary overvoltage (TOV)	$U_T$	335 V/5 s
Response time L/N	$t_A$	< 25 ns
Max. back-up fuse (Branch wiring)		250 A gL/gG
Max. back-up fuse (“V” connection )		125 A gL/gG
Short-circuit withstand capability	$I_p$	80 kA <sub>rms</sub>
LPZ		0-1
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

#### Pcs.

FSPD1-250A (HRC Fuse) (Branch wiring)	3
FBSPD1-250A-3P (Fuse Base)	1
FSPD00-125A (HRC Fuse) (“V” connection )	3
FBSPD00-125A-3P (Fuse Base)	1



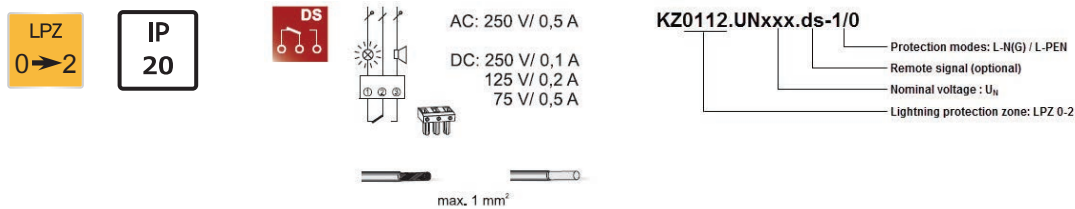
## CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR

**Kumwell** Combine set is lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC 62305) for lightning current equipotential bonding and elimination of switching surges that originate in power supply systems entering the building.

**Kumwell** Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using in non-measurable part of electrical systems and its special construction is intended for using in non-measurable part of electrical systems.



**KZ0112.UN230.ds-1/0** can be used industrial installations such as substation, main switchboards of large industrial structures and also place with high risk of a direct lightning strikes occurrence. This device is intended for use in TN-C power supply system.



### 1+0 Coordinated lightning and surge arrester

#### Technical data

#### KZ0112.UN230.ds-1/0

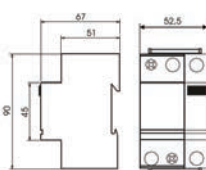
Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230 V AC
Max. continuous operating voltage	$U_C$	255 V AC
Lightning impulse current (10/350)	$I_{imp}$	50 kA
Nominal discharge current (8/20)	$I_n$	20 kA
Voltage protection level	$U_P$	< 1.3 kV
Follow current interrupt rating at $U_C$	$I_{fi}$	3 kA <sub>rms</sub>
Short circuit withstand capability	$I_p$	25 kA <sub>rms</sub>
Response time	$t_A$	< 25 ns
TOV overvoltage (TOV) L/N	$U_T$	334 V/5 sec
Back-up fuse		160 A gL/gG
LPZ		0-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

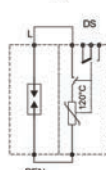
#### Pcs.

FSPD00-160A (HRC Fuse)	1
FBSPD00-160A-1P (Fuse Base)	1

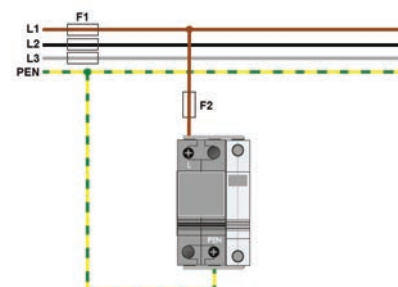
#### Dimensions



#### Internal configuration



#### Network connections

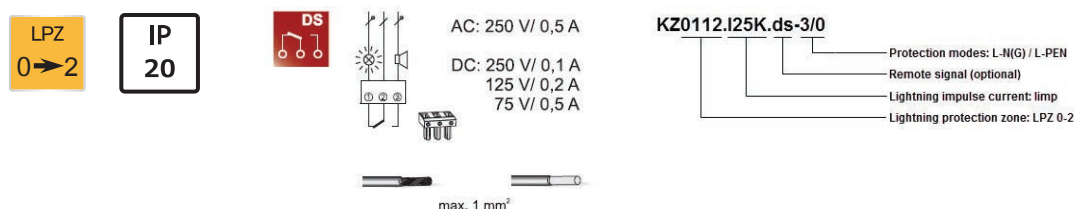


**Kumwell** Combine set is lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC 62305) for lightning current equipotential bonding and elimination of switching surges that originate in power supply systems entering the building.

**Kumwell** Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using in non-measurable part of electrical systems.



**KZ0112.I25K.ds-3/0** can be used industrial installations such as substation, main switchboards of large industrial structures and also place with high risk of a direct lightning strikes occurrence. This device is intended for use in TN-C power supply system.



### 3+0 Coordinated lightning and surge arrester

#### Technical data

#### KZ0112.I25K.ds-3/0

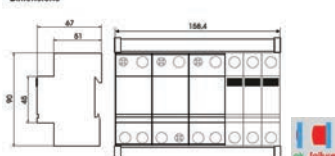
Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	U <sub>N</sub>	230/400 V AC
Max. continuous operating voltage	U <sub>C</sub>	350 V AC
Lightning impulse current (10/350)	I <sub>imp</sub>	25 kA
Total lightning impulse current (10/350) L1+L2+L3 → PEN	I <sub>total</sub>	75 kA
Nominal discharge current (8/20)	I <sub>n</sub>	20 kA
Max. discharge current (8/20)	I <sub>max</sub>	40 kA
Voltage protection level	U <sub>P</sub>	< 1.5 kV
Follow current interrupt rating at U <sub>c</sub>	I <sub>fi</sub>	3 kA <sub>rms</sub>
Short circuit withstand capability	I <sub>p</sub>	25 kA <sub>rms</sub>
Response time	t <sub>A</sub>	< 25 ns
TOV overvoltage (TOV) L/N	U <sub>T</sub>	462 V/5 sec
Back-up fuse		160 A gL/gG
LPZ		0-2
Protection type		IP20
Operating temperature range	θ	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

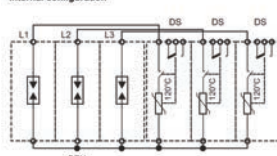
#### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

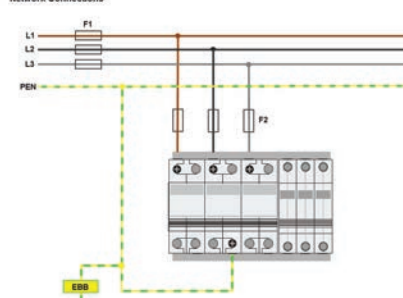
#### Dimensions



#### Internal configuration



#### Network Connections



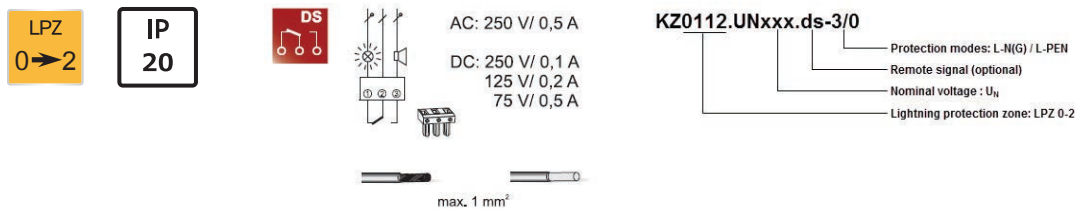


## CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR

**Kumwell** Combine set is lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC 62305) for lightning current equipotential bonding and elimination of switching surges that originate in power supply systems entering the building.

**Kumwell** Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using in non-measurable part of electrical systems.

**KZ0112.UN230.ds-3/0** can be used industrial installations such as substation, main switchboards of large industrial structures and also place with high risk of a direct lightning strikes occurrence. This device is intended for use in TN-C power supply system.



### 3+0 Coordinated lightning and surge arrester

#### Technical data

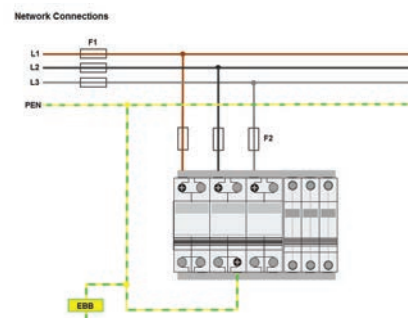
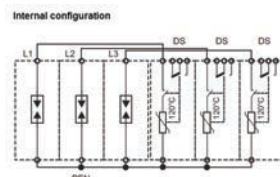
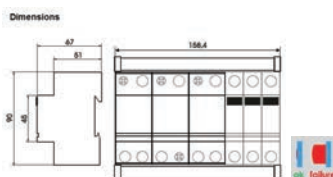
#### KZ0112.UN230.ds-3/0

Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	350 V AC
Lightning impulse current (10/350)	$I_{imp}$	50 kA
Total lightning impulse current (10/350) L1+L2+L3 → PEN	$I_{total}$	150 kA
Nominal discharge current (8/20)	$I_n$	20 kA
Max. discharge current (8/20)	$I_{max}$	40 kA
Voltage protection level	$U_P$	< 1.5 kV
Follow current interrupt rating at $U_C$	$I_{fi}$	3 kA <sub>rms</sub>
Short circuit withstand capability	$I_p$	25 kA <sub>rms</sub>
Response time	$t_A$	< 25 ns
TOV overvoltage (TOV) L/N	$U_T$	462 V/5 sec
Back-up fuse		160 A gL/gG
LPZ		0-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

#### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

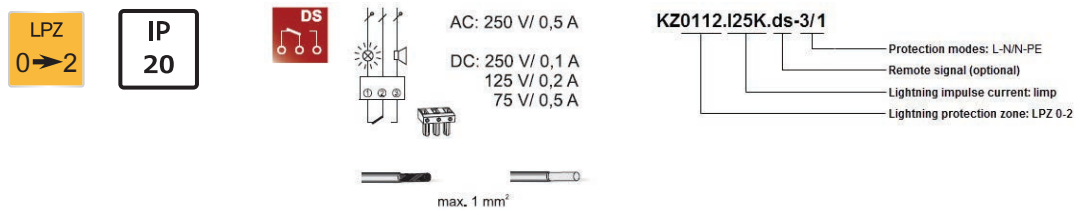


## CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR

**Kumwell** Combine set is lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC 62305) for lightning current equipotential bonding and elimination of switching surges that originate in power supply systems entering the building.

**Kumwell** Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using in non-measurable part of electrical systems.

**KZ0112.I25K.ds-3/1** can be used industrial installations such as substation, main switchboards of large industrial structures and also place with high risk of a direct lightning strikes occurrence. This device is intended for use in TN-S and TT power supply system.



### 3+1 Coordinated lightning and surge arrester

#### Technical data

#### KZ0112.I25K.ds-3/1

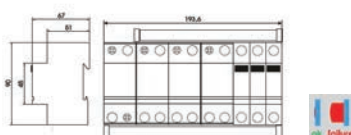
Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	350 V AC
Lightning impulse current (10/350) L/N	$I_{imp}$	25 kA
Lightning impulse current (10/350) N/PE	$I_{imp}$	110 kA
Total lightning impulse current (10/350) L1+L2+L3+N → PE	$I_{total}$	110 kA
Nominal discharge current (8/20)	$I_n$	20 kA
Max. discharge current (8/20)	$I_{max}$	40 kA
Voltage protection level	$U_P$	< 1.5 kV
Follow current interrupt rating at $U_C$	$I_{fi}$	3 kA <sub>rms</sub>
Short circuit withstand capability	$I_P$	25 kA <sub>rms</sub>
Response time	$t_A$	< 25 ns
TOV overvoltage (TOV) L/N	$U_T$	462 V/5 sec
TOV overvoltage (TOV) N/PE	$U_T$	1200 V/0.2 sec
Back-up fuse		160 A gL/gG
LPZ		0-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

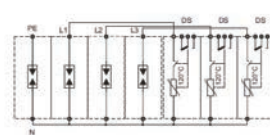
#### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

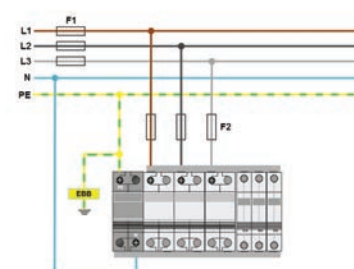
#### Dimensions



#### Internal configuration



#### Network connections



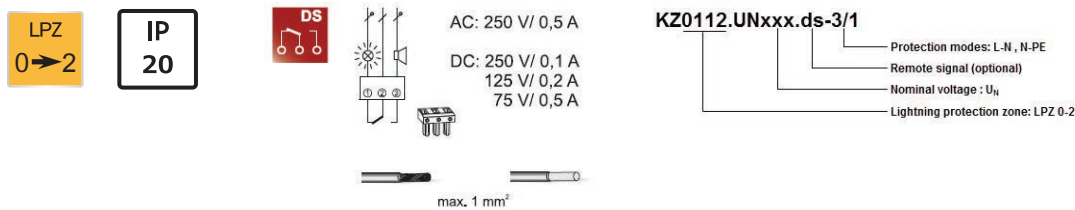
## CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR

**Kumwell** Combine set is lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-2 (according to IEC 62305) for lightning current equipotential bonding and elimination of switching surges that originate in power supply systems entering the building.

**Kumwell** Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using in non-measurable part of electrical systems.



**KZ0112.UN230.ds-3/1** can be used industrial installations such as substation, main switchboards of large industrial structures and also place with high risk of a direct lightning strikes occurrence. This device is intended for use in TN-S and TT power supply system.



### 3+1 Coordinated lightning and surge arrester

#### Technical data

#### KZ0112.UN230.ds-3/1

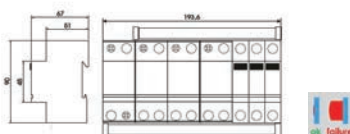
Technical data		CLASS I+II
Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	350 V AC
Lightning impulse current (10/350) L/N	$I_{imp}$	50 kA
Lightning impulse current (10/350) N/PE	$I_{imp}$	110 kA
Total lightning impulse current (10/350) L1+L2+L3+N → PE	$I_{total}$	110 kA
Nominal discharge current (8/20)	$I_n$	20 kA
Max. discharge current (8/20)	$I_{max}$	40 kA
Voltage protection level	$U_P$	< 1.5 kV
Follow current interrupt rating at $U_C$	$I_{fi}$	3 kA <sub>rms</sub>
Short circuit withstand capability	$I_B$	25 kA <sub>rms</sub>
Response time	$t_A$	< 25 ns
TOV overvoltage (TOV) L/N	$U_T$	462 V/5 sec
TOV overvoltage (TOV) N/PE	$U_T$	1200 V/0.2 sec
Back-up fuse		160 A gL/gG
LPZ		0-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure

#### Accessories

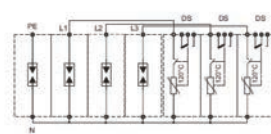
#### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

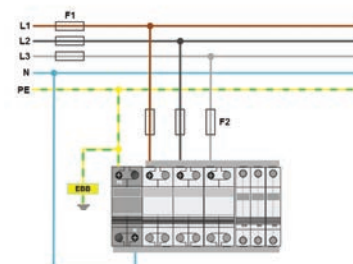
#### Dimensions



#### Internal configuration



#### Network connections

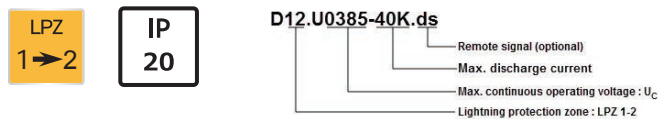


**Kumwell D12.U0385-40K.ds** surge arrester Class II (Type 2) according to IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 62305) for equipotential bonding and elimination of transient overvoltage that originate during atmospheric discharge or switching process.

The main use of D12.U0385-40K.ds arrester is in all kinds of industry, residential and administration buildings. They are to be place in to the secondary switchboards or into the control box.



Protected Mode: L-PE, N-PE (2P)



## Varistor / Class II / Single-Phase for TN-S System

### Technical data

### D12.U0385-40K.ds

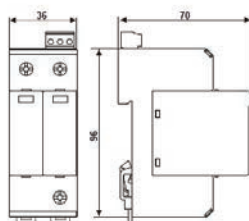
Test class according to IEC 61643-11		CLASS II
Nominal voltage	$U_N$	230 V AC
Max. continuous operating voltage	$U_C$	385 V AC
Max. discharge current (8/20)	$I_{max}$	40 kA
Nominal discharge current (8/20)	$I_n$	20 kA
Voltage protection level	$U_p$	$\leq 1.8$ kV
Response time	$t_A$	$< 25$ ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	$\vartheta$	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green (nomal) / red (failure)

### Accessories

### Pcs.

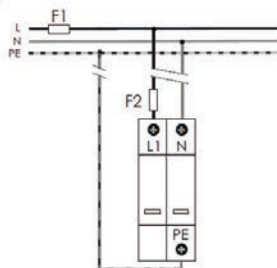
FSPD00-125A (HRC Fuse)	1
FBSPD00-160A-1P (Fuse Base)	1

Dimensions



Network connections

TN-S

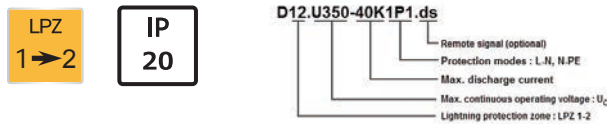


**Kumwell D12.U350-40K1P1.ds** is modular power surge protective device (SPD) Class II according to IEC 61643-11. Complete device consist of base part and pluggable module. These SPDs are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 62305).

The main use D12.U350-40K1P1.ds is applied to low-voltage distribution system, as a lightning surge protection device for various kinds of equipments, all kinds of industry, residential and administration buildings. They are be placed into the secondary switchboards or onto the control box by connected parallel in the power line.



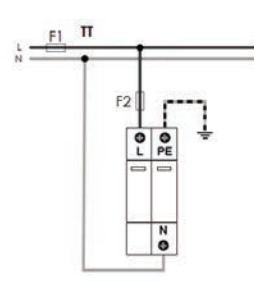
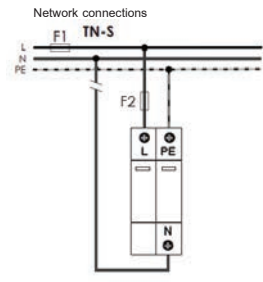
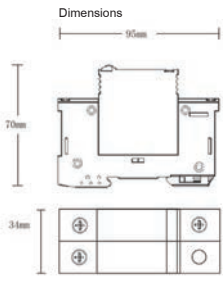
These SPDs consist of D12.U350-40K.ds installed between L-N and D12.U264-I020.NPE installed between N-PE applied for TN-S and TT-Systems



## Varistor / Class II / Single-Phase for TN-S System

Technical data		D12.U350-40K1P1.ds
Test class according to IEC 61643-11		CLASS II
Nominal voltage	$U_N$	240 V AC (230/400 V AC ... 240/415 V AC)
Max. continuous operating voltage	$U_C$ (L-N)	350 V AC
	$U_C$ (N-PE)	264 V AC
Max. discharge current (8/20)	$I_{max}$ (L-N)	40 kA
	$I_{max}$ (N-PE)	40 kA
Nominal discharge current (8/20)	$I_n$ (L-N)	20 kA
	$I_n$ (N-PE)	20 kA
Voltage protection level	$U_p$ (L-N)	$\leq 1.5$ kV
	$U_p$ (N-PE)	$\leq 1.5$ kV
Response time	$t_A$ (L-N)	$< 25$ ns
	$t_A$ (N-PE)	$< 100$ ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to +70°C
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green (nomal) / red (failure)

Accessories	Pcs.
FSPD00-125A (HRC Fuse)	1
FBSPD00-160A-1P (Fuse Base)	1

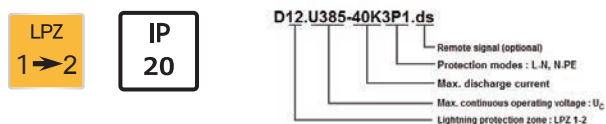


**Kumwell D12.U385-40K3P1.ds** is modular power surge protective device (SPD) Class II according to IEC 61643-11. Complete device consist of base part and pluggable module. These SPDs are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 62305).

The main use D12.U385-40K3P1.ds is applied to low-voltage distribution system, as a lightning surge protection device for various kinds of equipments, all kinds of industry, residential and administration buildings. They are be placed into the secondary switchboards or onto the control box by connected parallel in the power line.



These SPDs consist of D12.U0385-40K.ds installed between L-N and D12.I040.NPE installed between N-PE applied for TN-S and TT-Systems



## Varistor / Class II / Three-Phase for TN-S and TT System

### Technical data

### D12.U385-40K3P1.ds

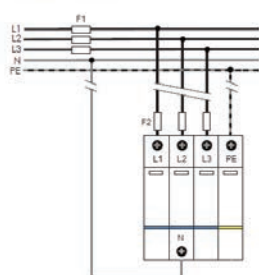
Test class according to IEC 61643-11		CLASS II
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$ (L-N)	385 V AC
	$U_C$ (N-PE)	385 V AC
Max. discharge current (8/20)	$I_{max}$ (L-N)	40 kA
	$I_{max}$ (N-PE)	40 kA
Nominal discharge current (8/20)	$I_n$ (L-N)	20 kA
	$I_n$ (N-PE)	20 kA
Voltage protection level	$U_p$ (L-N)	$\leq 1.8$ kV
	$U_p$ (N-PE)	$\leq 1.8$ kV
Response time	$t_A$ (L-N)	$< 25$ ns
	$t_A$ (N-PE)	$< 25$ ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to +70°C
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green (normal) / red (failure)

### Accessories

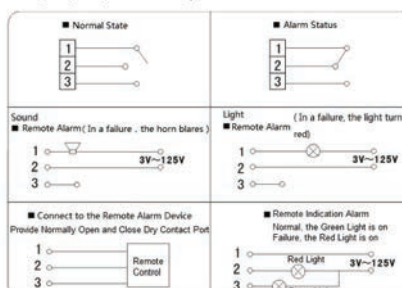
### Pcs.

FSPD00-125A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

Network connections

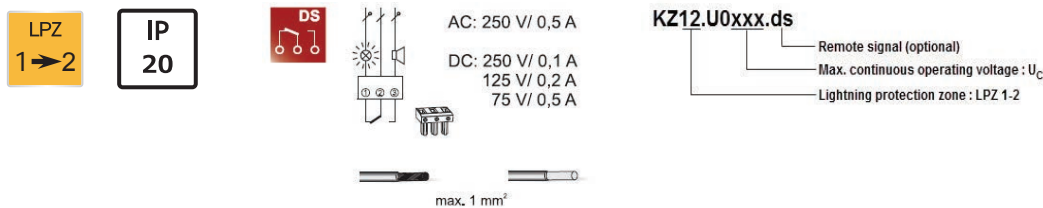


Wiring Diagram (Remote Alarm)



**Kumwell KZ12.\*.ds** series is a single-pole, metal oxide varistor surge arrester Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 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 KZ12.\*.ds series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



## Varistor/ Class II / Single-Phase for TN-S and TN-C System

### Technical data

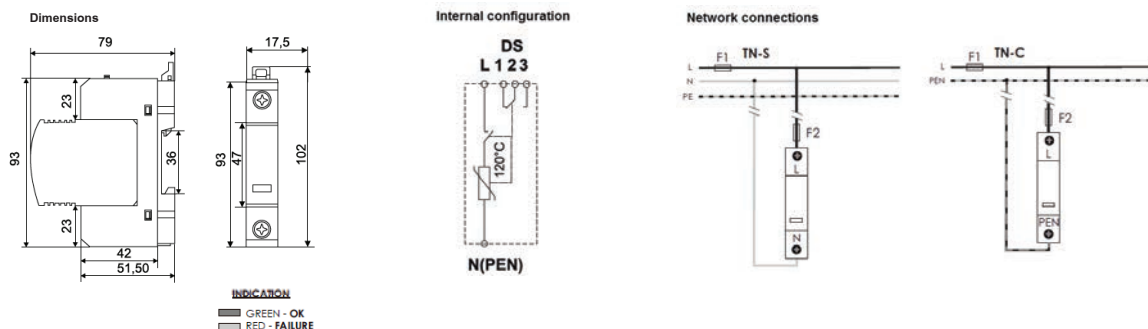
KZ12.U0275.ds    KZ12.U0320.ds    KZ12.U0385.ds    KZ12.U0440.ds

Test class according to IEC 61643-11		CLASS II			
Nominal voltage	$U_N$	230 V AC			
Max. continuous operating voltage	$U_C$	275 V AC	320 V AC	385 V AC	440 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA	50 kA	40 kA	40 kA
Nominal discharge current (8/20)	$I_n$	20 kA	20 kA	15 kA	15 kA
Voltage protection level	$U_P$	< 1.3 kV	< 1.45 kV	< 1.65 kV	< 2.15 kV
Temporary overvoltage (TOV)	$U_T$	335 V/5 s	410 V/5 s	465 V/5 s	530 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 <sub>rms</sub>			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

### Accessories

### Pcs.

FSPD00-160A (HRC Fuse)	1
FBSPD00-160A-1P (Fuse Base)	1



**Kumwell KZ12.I020.NPE** is the encapsulated gas discharge tube Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 62305), where they provide the equipotential bonding between N and PE in the connections of 1+1 or 3+1.



LPZ  
1 → 2

IP  
20

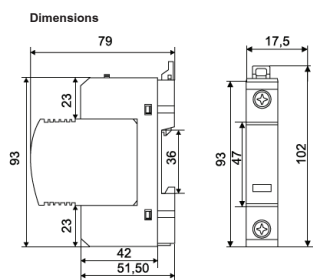
**KZ12.Ixxx.NPE**  
 Installed between N-PE  
 Lightning impulse current : I<sub>imp</sub> (kA)  
 Lightning protection zone : LPZ 1-2

## Gas Discharge Tube / Class II / N-PE

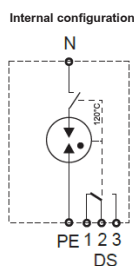
### Technical data

### KZ12.I020.NPE

Test class according to IEC 61643-11		CLASS II
Max. continuous operating voltage	$U_c$	255 V AC
Lightning impulse current (10/350 $\mu$ )	$I_{imp}$	20 kA
- charge	Q	10 As
- specific energy	W/R	100 kJ/ $\Omega$
Nominal discharge current (8/20)	$I_n$	20 kA
Voltage protection level at $I_{imp}$	$U_p$	< 1.3 kV
Temporary overvoltage (TOV)	$U_T$	1200V/0.2 s
Response time	$t_A$	< 100 ns
Follow current interrupting rating at $U_c$	$I_{fi}$	100 A <sub>rms</sub>
LPZ		1-2
Protection type		IP20
Operating temperature range	$\vartheta$	-40°C to +80°C
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure



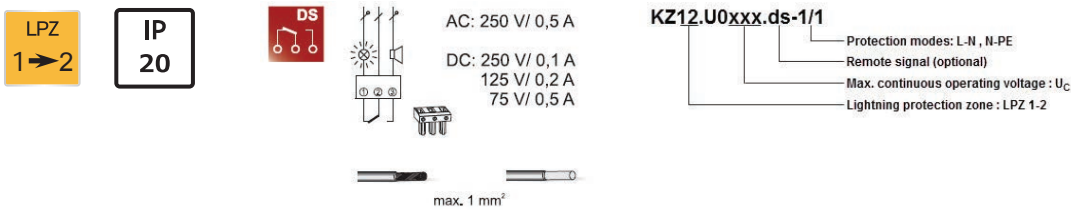
INDICATION  
 GREEN - OK  
 RED - FAILURE





**Kumwell KZ12.\*.ds-1/1** series is a two pole, metal oxide varistor surge arrester combined with gas discharge tubes, Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building.

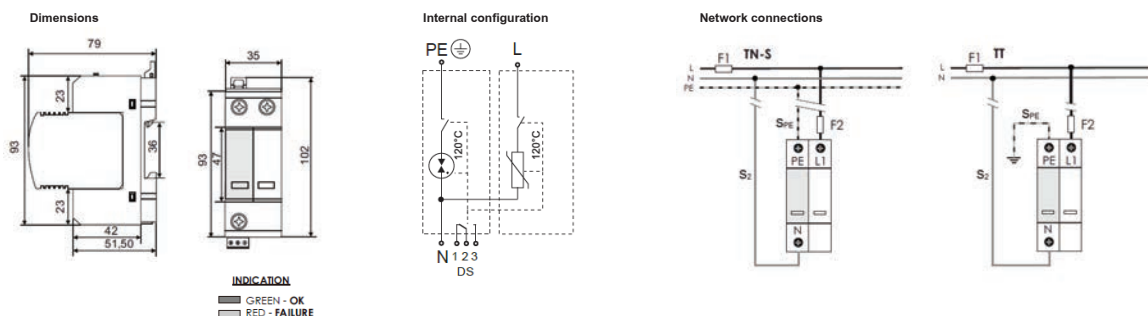
The main use of KZ12.\*.ds-1/1 series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



### Varistor/ Class II / Single-Phase for TN-S and TT System

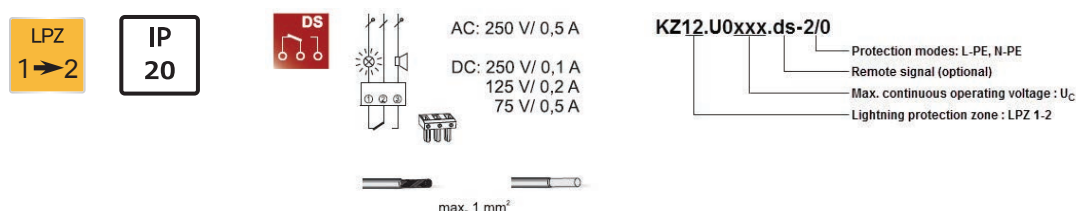
Technical data		KZ12.U0275.ds-1/1	KZ12.U0320.ds-1/1	KZ12.U0385.ds-1/1	KZ12.U0440.ds-1/1
Test class according to IEC 61643-11		CLASS II			
Nominal voltage	$U_N$	230 V AC			
Max. continuous operating voltage (L/N)	$U_C$	275 V AC	320 V AC	385 V AC	440 V AC
Max. continuous operating voltage (N/PE)	$U_C$	255 V AC			
Max. discharge current (8/20)	$I_{max}$	50 kA	50 kA	40 kA	40 kA
Nominal discharge current (8/20) L/N	$I_n$	20 kA	20 kA	15 kA	15 kA
Nominal discharge current (8/20) N/PE	$I_n$	20 kA			
Voltage protection level (L/N)	$U_p$	< 1.3 kV	< 1.45 kV	< 1.65 kV	< 2.15 kV
Voltage protection level (N/PE)	$U_p$	< 1.3 kV			
Lightning impulse current (10/350)	$I_{imp}$	20 kA			
Temporary overvoltage (TOV) L/N	$U_T$	335 V/5 s	410 V/5 s	465 V/5 s	530 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 <sub>rms</sub>			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

Accessories	Pcs.
FSPD00-160A (HRC Fuse)	1
FBSPD00-160A-1P (Fuse Base)	1



**Kumwell KZ12.\*.ds-2/0** series is a two pole, metal oxide varistor surge arrester Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 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 KZ12.\*.ds-2/0 series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



## Varistor/ Class II / Single-Phase for TN-S System

### Technical data

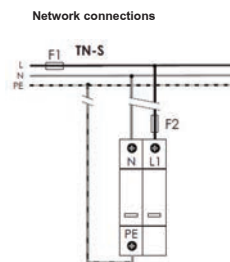
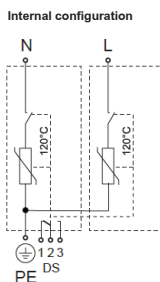
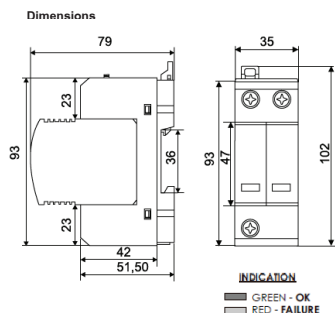
KZ12.U0275.ds-2/0    KZ12.U0320.ds-2/0    KZ12.U0385.ds-2/0    KZ12.U0440.ds-2/0

Test class according to IEC 61643-11		CLASS II			
Nominal voltage	$U_N$	230 V AC			
Max. continuous operating voltage	$U_C$	275 V AC	320 V AC	385 V AC	440 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA	50 kA	40 kA	40 kA
Nominal discharge current (8/20)	$I_n$	20 kA	20 kA	15 kA	15 kA
Voltage protection level	$U_P$	< 1.3 kV	< 1.45 kV	< 1.65 kV	< 2.15 kV
Temporary overvoltage (TOV)	$U_T$	335 V/5 s	410 V/5 s	465 V/5 s	530 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 <sub>rms</sub>			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

### Accessories

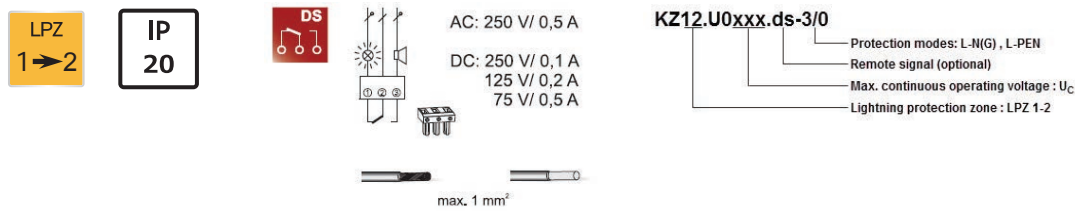
### Pcs.

FSPD00-160A (HRC Fuse)	1
FBSPD00-160A-1P (Fuse Base)	1



**Kumwell KZ12.\*.ds-3/0** series is a three pole, metal oxide varistor surge arrester Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building.

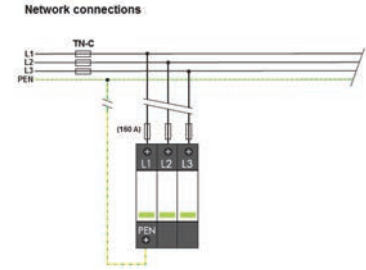
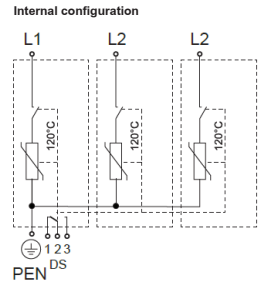
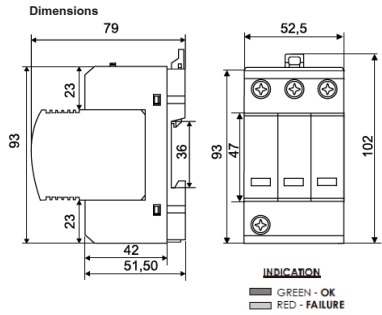
The main use of KZ12.\*.ds-3/0 series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



### Varistor/ Class II / Three-Phase for TN-C System

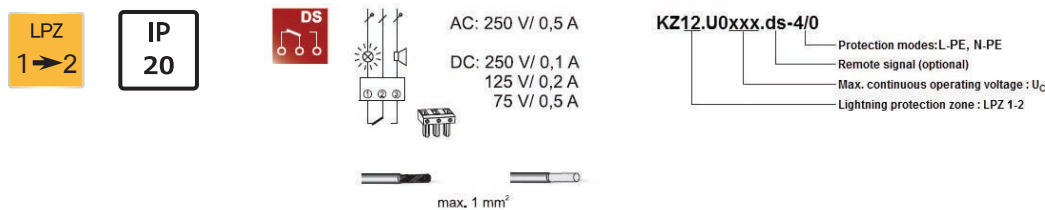
Technical data		KZ12.U0275.ds-3/0	KZ12.U0320.ds-3/0	KZ12.U0385.ds-3/0	KZ12.U0440.ds-3/0
Test class according to IEC 61643-11		CLASS II			
Nominal voltage	$U_N$	230/400 V AC			
Max. continuous operating voltage	$U_C$	275 V AC	320 V AC	385 V AC	440 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA	50 kA	40 kA	40 kA
Nominal discharge current (8/20)	$I_n$	20 kA	20 kA	15 kA	15 kA
Voltage protection level	$U_P$	< 1.3 kV	< 1.45 kV	< 1.65 kV	< 2.15 kV
Temporary overvoltage (TOV)	$U_T$	335 V/5 s	410 V/5 s	465 V/5 s	530 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 <sub>rms</sub>			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

Accessories	Pcs.
FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1



**Kumwell KZ12.\*.ds-4/0** series is a four-pole, metal oxide varistor surge arrester Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 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 KZ12.\*.ds-4/0 series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



## Varistor/ Class II / Three-Phase for TN-S System

### Technical data

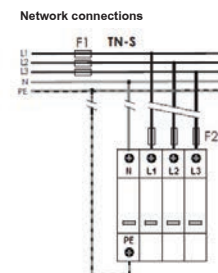
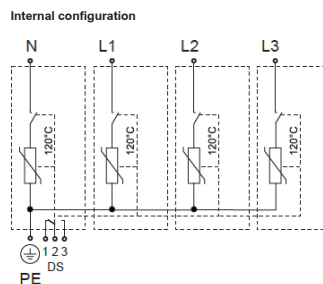
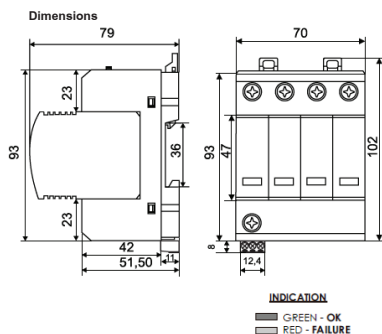
KZ12.U0275.ds-4/0    KZ12.U0320.ds-4/0    KZ12.U0385.ds-4/0    KZ12.U0440.ds-4/0

Test class according to IEC 61643-11		CLASS II			
Nominal voltage	$U_N$	230/400 V AC			
Max. continuous operating voltage	$U_C$	275 V AC	320 V AC	385 V AC	440 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA	50 kA	40 kA	40 kA
Nominal discharge current (8/20)	$I_n$	20 kA	20 kA	15 kA	15 kA
Voltage protection level	$U_P$	< 1.3 kV	< 1.45 kV	< 1.65 kV	< 2.15 kV
Temporary overvoltage (TOV)	$U_T$	335 V/5 s	410 V/5 s	465 V/5 s	530 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 <sub>rms</sub>			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

### Accessories

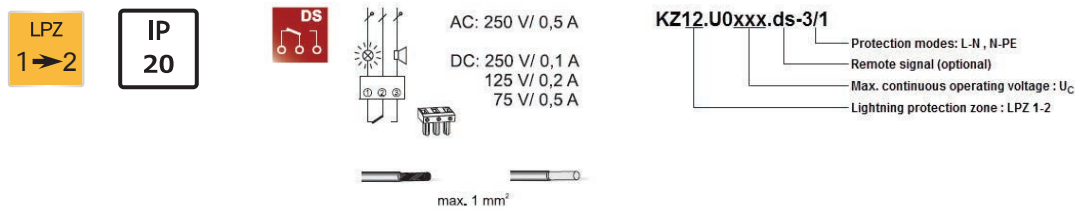
### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1



**Kumwell KZ12.\*.ds-3/1** series is a four pole, metal oxide varistor surge arrester combined with gas discharge tube, Class II according to IEC 61643-11. These arresters are recommended for used in Lightning Protection Zones Concept at boundaries of LPZ 1-2 (according to IEC 62305), where they provide the equipotential bonding and discharge of the switching overvoltage, which is generated in power supply systems entering the building.

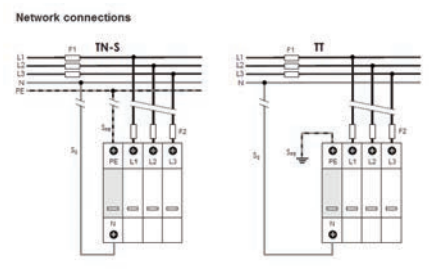
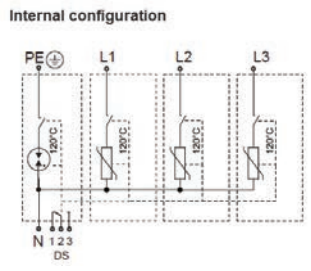
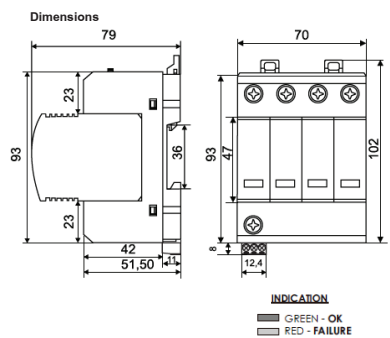
The main use of KZ12.\*.ds-3/1 series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



### Varistor/ Class II / Three-Phase for TN-S and TT System

Technical data		KZ12.U0275.ds-3/1	KZ12.U0320.ds-3/1	KZ12.U0385.ds-3/1	KZ12.U0440.ds-3/1
Test class according to IEC 61643-1		CLASS II			
Nominal voltage	$U_N$	230/400 V AC			
Max. continuous operating voltage	$U_C$	275 V AC	320 V AC	385V AC	440 V AC
Max. discharge current (8/20)	$I_{max}$	50 kA	50 kA	40 kA	40 kA
Nominal discharge current (8/20) L/N	$I_n$	20 kA	20 kA	15 kA	15 kA
Nominal discharge current (8/20) N/PE	$I_n$			20 kA	
Voltage protection level (L/N)	$U_p$	< 1.3 kV	< 1.45 kV	< 1.65 kV	< 2.15kV
Voltage protection level (N/PE)	$U_p$			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	410 V/5 s	465 V/5 s	530 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 <sub>rms</sub>			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

Accessories	Pcs.
FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1



INDICATION  
 GREEN - OK  
 RED - FAILURE

**Kumwell D12.U385-xxxK.DS/3P** series Parallel Modular Power SPD is designed according to IEC 61643-11 standard, with ability of large current discharge. The maximum discharge current  $I_{max}$  (8/20  $\mu$ s) of each line could be 100-160 kA. It is applicable for 230/400 V AC Power Distribution Systems lightning protection in all classes.

It is suitable for the low voltage main power distribution cabinet/box of buildings, and the equipments connected between three phase AC power supply and system in parallel, with advantage of extremely low residual voltage, quick response, large intake capacity, long work life and simple maintenance.



LPZ  
1 → 2

IP  
20

## Varistor/ Class II / Three-Phase for TN-C System

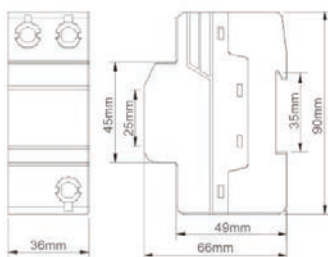
Technical data		D12.U385-100K.DS/3P	D12.U385-120K.DS/3P	D12.U385-160K.DS/3P
Test class according to IEC 61643-11			CLASS II	
Nominal voltage	$U_N$	230/400 V AC		
Max. continuous operating voltage	$U_C$	385 V AC		
Nominal discharge current (8/20 $\mu$ s)	$I_n$	50 kA	60 kA	80 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	100 kA	120 kA	160 kA
Voltage protection level at 10 kA (8/20 $\mu$ s)	$U_P$	< 1.5 kV	< 1.5 kV	< 1.5 kV
Voltage protection level at $I_n$ (8/20 $\mu$ s)	$U_P$	< 2.2 kV	< 2.5 kV	< 3.0 kV
Response time	$t_A$	< 25 ns		
Back-up fuse		160 A gL/gG		
Protection type		IP20		
Operating temperature range	$\vartheta$	-25°C to +70°C		
Relative Humidity		≤ 95%		
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)		
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)		
Mounting		Din rail 35 mm		
Indication Method		Indication Window, Turn Red When Malfunction		
Dimension (L x H x W) (mm)		110 x 90 x 69		

### Accessories

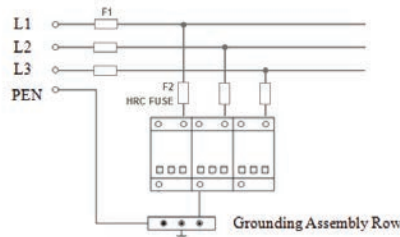
### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

Dimensions



Wiring connections



**Kumwell D12.U385-80K.DS/4P** four-poles modular power supply SPD Class II/Type 2 is designed according to IEC 61643-11. These SPDs are recommended for used in Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 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 these SPDs is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes of power supply lines, which are operated as TN-S system.



LPZ  
1 → 2

IP  
20

### Varistor/ Class II / Three-Phase for TN-S System

#### Technical data

D12.U385-80K.DS/4P

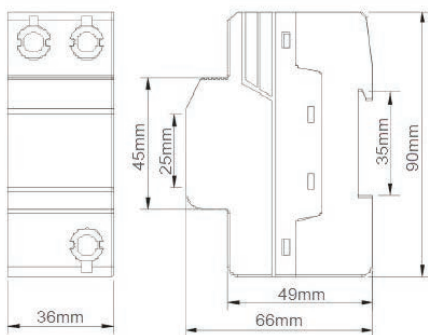
Nominal voltage	$U_N$	230/400 V AC
Max. continuous operating voltage	$U_C$	385 V AC
Nominal discharge current (8/20 $\mu$ s)	$I_n$	40 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	80 kA
Voltage protection level	$U_P$	$\leq 2$ kV
Response time	$t_A$	$\leq 25$ ns
Back-up fuse		160 A gL/gG
Protection type		IP20
LPZ		1-2
Operating temperature range	$\vartheta$	-25°C to + 70°C
Relative Humidity		$\leq 95\%$ RH
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)
Mounting		Din rail 35 mm
Indication Method		Indication Window, Turn Red When Malfunction
Dimension (L x H x W) (mm)		144 x 90 x 69

#### Accessories

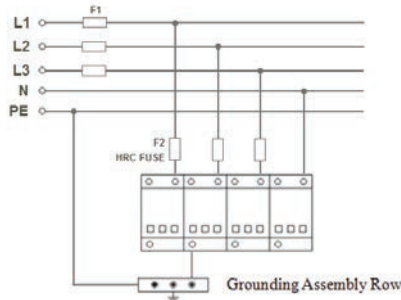
#### Pcs.

FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

Dimensions



Network connections



**Kumwell D12.U385-xxxK.DS/4P** series Parallel Modular Power SPD is designed according to IEC 61643-11 standard, with ability of large current discharge. The maximum discharge current  $I_{max}$  (8/20  $\mu$ s) of each line could be 100-160 kA. It is applicable for 230/400 V AC Power Distribution Systems lightning protection in all classes.

It is suitable for the low voltage main power distribution cabinet/box of buildings, and the equipments connected between three phase AC power supply and system in parallel, with advantage of extremely low residual voltage, quick response, large intake capacity, long work life and simple maintenance.



LPZ  
1 → 2

IP  
20

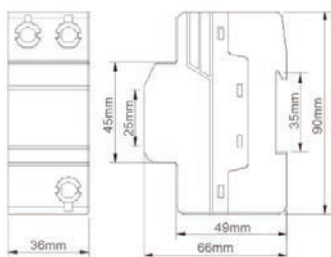
### Varistor/ Class II / Three-Phase for TN-S System

Technical data		D12.U385-100K.DS/4P	D12.U385-120K.DS/4P	D12.U385-160K.DS/4P
Test class according to IEC 61643-11			CLASS II	
Nominal voltage	$U_N$	230/400 V AC		
Max. continuous operating voltage	$U_C$	385 V AC		
Nominal discharge current (8/20 $\mu$ s)	$I_n$	50 kA	60 kA	80 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	100 kA	120 kA	160 kA
Voltage protection level at 10 kA (8/20 $\mu$ s)	$U_P$	< 1.5 kV	< 1.5 kV	< 1.5 kV
Voltage protection level at $I_n$ (8/20 $\mu$ s)	$U_P$	< 2.2 kV	< 2.5 kV	< 3.0 kV
Response time	$t_A$	< 25 ns		
Back-up fuse		160 A gL/gG		
Protection type		IP20		
Operating temperature range	$\vartheta$	-25°C to +70°C		
Relative Humidity		≤ 95%		
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)		
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)		
Mounting		Din rail 35 mm		
Indication Method		Indication Window, Turn Red When Malfunction		
Dimension (L x H x W) (mm)		144 x 90 x 69		

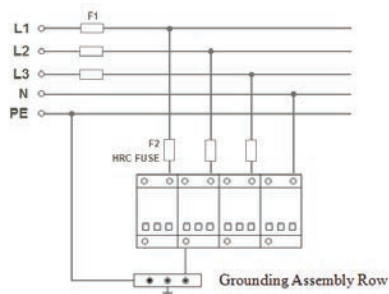
### Accessories

	Pcs.
FSPD00-160A (HRC Fuse)	3
FBSPD00-160A-3P (Fuse Base)	1

Dimensions



Wiring connections





**Kumwell KZ12.DC20K series surge arrester Class II (Type 2) for DC power systems** have been designed to meet the unique requirements of protection of DC power systems and complied with IEC 61643-1 and IEC 61643-11, achieve surge suppression, discharge current and amplitude limiting. To protect the power supply line, the equipment and personal safety which connected to the power supply line.

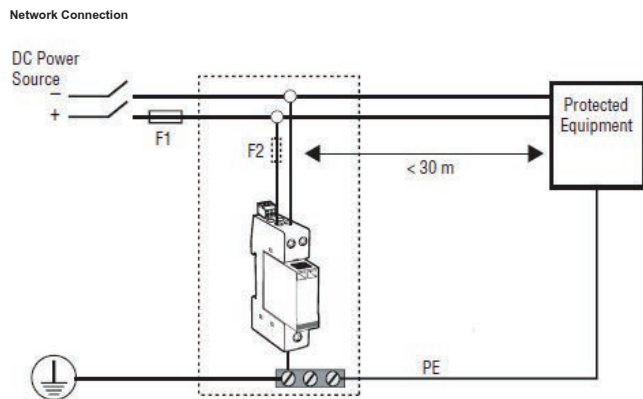


LPZ  
1 → 2

IP  
20

## Varistor / Class II / Modular SPD for DC Power System

Technical data		KZ12.DC20K-U24V.ds	KZ12.DC20K-U48V.ds	KZ12.DC20K-U110V.ds
Nominal voltage	$U_N$	24 V DC	48 V DC	110 V DC
Max. continuous operating voltage	$U_C$	28 V DC	56 V DC	150 V DC
Nominal discharge current (8/20 $\mu$ s)	$I_n$		10 kA	
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		20 kA	
Voltage protection level at $I_n$	$U_P$	$\leq 300$ V	$\leq 500$ V	$\leq 600$ V
Response time	$t_A$		< 25 ns	
Fuse (If required)			63 A gL/gG	
Temperature range	$\vartheta$		-40°C to + 70°C	
Connection type			Screw Terminal	
Conductor size			1.5-2.5 mm <sup>2</sup>	
Mounting			DIN rail 35mm	
Degree of protection			IP20	
Indication of disconnector operation			Red flag	



**Kumwell KZ12.DC40K series surge arresters Class II (Type 2) for DC power systems** have been designed to meet the unique requirements of protection of DC power systems and complied with IEC 61643-1 and IEC 61643-11, achieve surge suppression, discharge current and amplitude limiting . To protect the power supply line, the equipment and personal safety which connected to the power supply line.



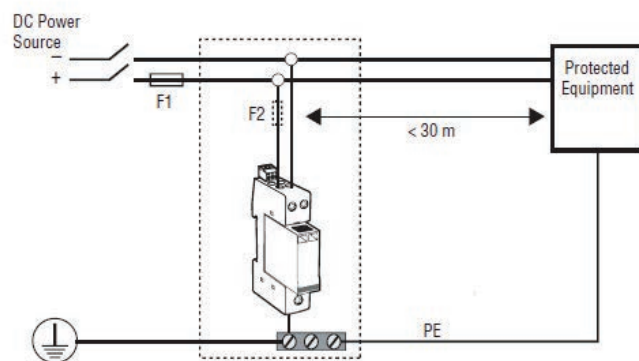
LPZ  
1 → 2

IP  
20

## Varistor / Class II / Modular SPD for DC Power Systems

Technical data		KZ12.DC40K-U24V.ds	KZ12.DC40K-U48V.ds	KZ12.DC40K-U110V.ds
Nominal voltage	$U_N$	24 V DC	48 V DC	110 V DC
Max. continuous operating voltage	$U_C$	28 V DC	64 V DC	150 V DC
Nominal discharge current (8/20 $\mu$ s)	$I_n$		20 kA	
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		40 kA	
Voltage protection level at $I_n$	$U_P$	$\leq 600 V$	$\leq 600 V$	$\leq 1.5 kV$
Response time	$t_A$		< 25 ns	
Fuse (If required)			63 A gL/gG	
Temperature range	$\vartheta$		-40°C to + 70°C	
Connection type			Screw Terminal	
Conductor size			1.5-2.5 mm <sup>2</sup>	
Mounting			DIN rail 35mm	
Degree of protection			IP20	
Indication of disconnector operation			Red flag	

Network Connection



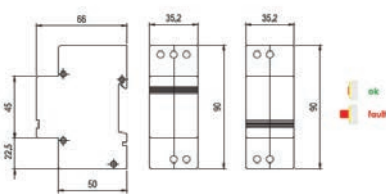
**Kumwell KZ23.PK2.UN230.ds** is a single-phase surge arrester class III according to IEC 61643-11. It is designed for universal application for protection of all kinds of electrical appliances connected to L.V. power supply system against the impulse surge effects.

The device is suitable for use in the power supply lines, which are operated as TN-S, TN-C and TT system. The function failure of varistor is indicated by target disconnection of mechanical thermal fuse which reacts to the varistor overheating above c.120°C

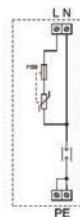


Class III / Single-Phase / MOV + GDT			KZ23.PK2.UN230.ds
Technical data			
Test class according to IEC 61643-11			CLASS III
Nominal voltage	$U_N$		230 V AC
Max. continuous operating voltage	$U_C$		275 V AC
Nominal discharge current (8/20)	$I_n$		3 kA (L/N, L/PE)
			5 kA (N/PE)
Combined impulse	$U_{oc}$		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
Protection type			IP20
Operating temperature range	$\vartheta$		-40°C to + 80°C
Cross-section of the connected conductors			1.5-2.5 mm <sup>2</sup> Cu
Mounting on			DIN rail 35 mm
Failure signalisation			pushed in - ok / pushed out - failure

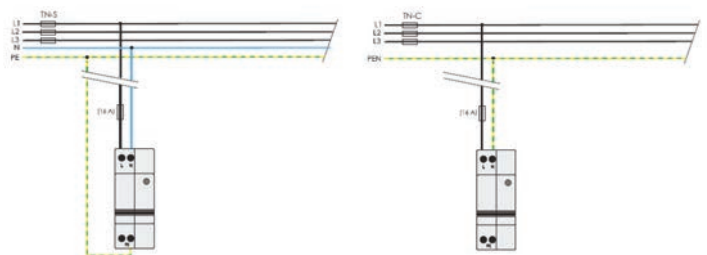
**Dimensions**



**Internal configuration**

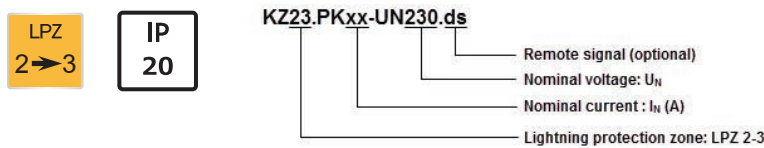


**Network connections**



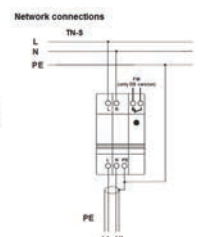
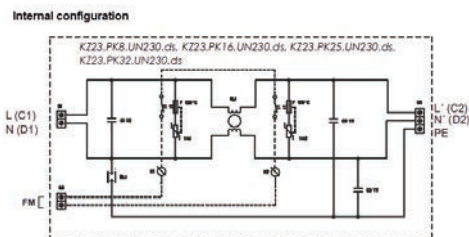
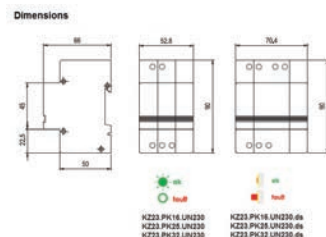
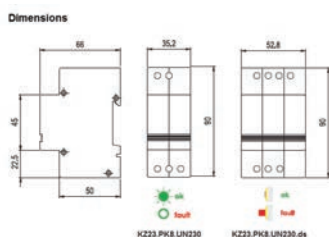
**Kumwell KZ23.PK\*** is a single-phase surge arrester class III which is a high-frequency filter according to IEC 61643-11. They are produced for nominal current with in the range of 8, 16, 25, 32A intended for use in the power supply lines, which are operated as TN-S systems. The types KZ23.PK\*-UN230 and KZ23.PK\*-UN230.ds 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 KZ23.PK\*-UN230 are fitted with green LED diode signaling the right functioning, type KZ23.PK\*-UN230.ds indicate the failure by target disconnection of mechanical thermal fuses.



## CLASS III / Single-Phase / 2-STAGE MOV & EMC/EMI FILTER

Technical data		KZ23.PK8-UN230.ds	KZ23.PK16-UN230.ds	KZ23.PK25-UN230.ds	KZ23.PK32-UN230.ds
Test class according to IEC 61643-11		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	16 A	25 A	32 A
Nominal discharge current (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 constants	$C_x$	150 nF	220 nF	220 nF	220 nF
	$C_y$		22 nF		
	L	1.2 mH	1.8 mH	2.3 mH	2.3 mH
Power loss at winding temp. 20°C		< 2.2 W	< 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		8 A	16 A	25 A	32 A
LPZ		2-3			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to + 55°C			
Cross-section of the connected conductors		1.5-2.5 mm <sup>2</sup> Cu	4-6 mm <sup>2</sup> Cu	6-10 mm <sup>2</sup> Cu	6-10 mm <sup>2</sup> Cu
Mounting on		DIN rail 35 mm			
Failure signalisation KZ23.PK*		light on - ok / light off - failure			
Failure signalisation KZ23.PK*.ds		pushed in - ok / pushed out - failure			



**Kumwell** KZ23.P3K.\*.ds are a three-phase surge arrester class III according to IEC 61643-11 suitable for use in TN-S, TN-C and TT systems.

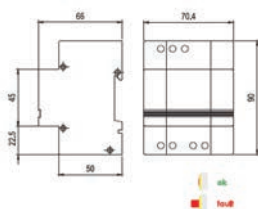
These are parallel devices intended for protection of electronic appliances against impulse surge. All varistors in KZ23. P3K devices are fitted with thermal fuses to prevent short and permanent overloading.

The function failure of KZ23.P3K.UN230.ds and KZ23.P3K.UN400.ds devices is indicated by target disconnection of mechanical thermal fuses which react to varistor overheating above c.120°C. If one of three thermal fuses reacts, the non-potential contact failure disconnects at the same time.

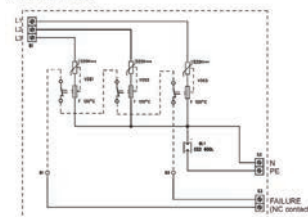


Class III / Three-Phase / MOV + GDT		KZ23.P3K.UN230.ds	KZ23.P3K.UN400.ds
<b>Technical data</b>			
Test class according to IEC 61643-11		CLASS III	
Nominal voltage	$U_N$	230 V AC	400 V AC
Max. continuous operating voltage	$U_C$	275 V AC	480 V AC
Nominal discharge current (8/20)	$I_n$	3 kA (L/N, L/PE) 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)
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	
Protection type		IP20	
Operating temperature range	$\vartheta$	-40°C to + 80°C	
Cross-section of the connected conductors		2.5-4 mm <sup>2</sup> Cu	
Mounting on		DIN rail 35 mm	
Failure signalisation		pushed in - ok / pushed out - failure	

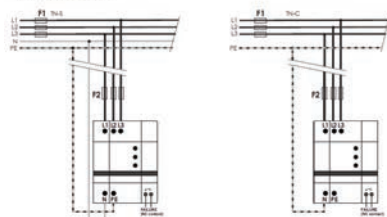
Dimensions



Internal configuration



Network connections



**Kumwell KZ23.PK16.U\*DC** is designed for protection of electronic appliances in L.V. power supply DC systems against the impulse surge effects. They are mounting on DIN rail 35mm for rated load currents 16A according to IEC 61643-11 and IEC 62305 standards (arrester class III - 3rd stage protection). Right function of the protective elements,MOV varistors, is signalized by green light on the front panel of the equipment



LPZ  
2 → 3

IP  
20

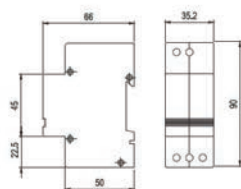
**KZ23.PK16.UxxDC**

Nominal voltage :  $U_N$   
Lightning protection zone : LPZ 2-3

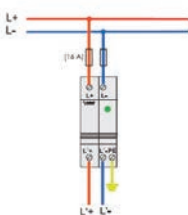
## Class III / Single-Phase / MOV + GDT

Technical data		KZ23.PK16.U12DC	KZ23.PK16.U24DC	KZ23.PK16.U48DC	KZ23.PK16.U60DC	KZ23.PK16.U110DC
Test class according to IEC 61643-11		CLASS III				
Network		DC				
Nominal voltage	$U_N$	12 V DC	24 V DC	48 V DC	60 V DC	110 V DC
Max. continuous operating voltage	$U_C$	14.4 V DC	28.8 V DC	57.6 V DC	72 V DC	132 V DC
Rated load current	$I_L$	16 A				
Max. discharge current	$I_{max}$	4 kA		13 kA		16 kA
Combined impulse		2 kV				6 kV
Voltage protection level at $U_{oc}$	$U_P$	< 130 V (L+/L-) < 600 V (L/PE)	< 200 V (L+/L-) < 600 V (L/PE)	< 370 V (L+/L-) < 600 V (L/PE)	< 400 V (L+/L-) < 600 V (L/PE)	< 680 V (L+/L-) < 800 V (L/PE)
Response time	$t_A$	< 25 ns (L+/L-) < 100 ns (L/PE)				
Back-up fuse		16 A				
LPZ		2-3				
Protection type		IP20				
Operating temperature range	$\vartheta$	-40°C to + 80°C				
Cross-section of the connected conductors		2.5-4 mm <sup>2</sup> Cu				
Mounting on		DIN rail 35 mm				
Failure signalisation		light on - ok / light off - failure				

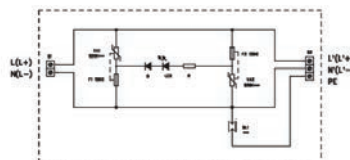
Dimensions



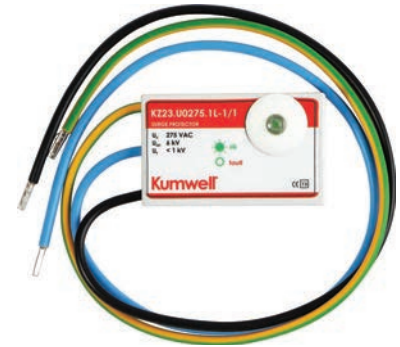
Recommended connection of KZ23.PK16.U\*DC



Basic circuit diagram of KZ23.PK16.U\*DC



Kumwell KZ23.U0275.1L-1/1 and KZ23.U0275.1P-1/1 are the surge arresters class III according to IEC 61643-11 designed for installation into electrical installation systems, e.g. : cable ducts and flush-mounted sockets as an additional protection. The right function of KZ23.U0275.1L-1/1 type is indicated by green LED diode. When the indicator is off, the device must be replaced or technically checked. KZ23.U0275.1P-1/1 contains an acoustic fault indicator (buzzer).



LPZ  
2 → 3

IP  
20

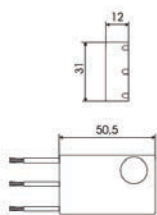
KZ23.U0275.1L-1/1

- Protection modes: L-PE, N-PE
- 1L = LED Indicator, 1P = Piezosiren Indicator
- Max. continuous operating voltage :  $U_c$
- Lightning protection zone: LPZ 2-3

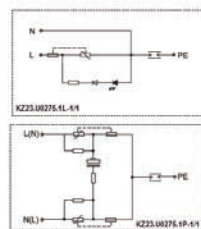
## Class III / MOV + GDT

Technical data		KZ23.U0275.1L-1/1	KZ23.U0275.1P-1/1
Test class according to IEC 61643-11			CLASS III
Nominal voltage	$U_N$		230 V AC
Max. continuous operating voltage	$U_c$		275 V AC
Nominal discharge current (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) < 1.2 kV (L(N)/PE)	< 1.3 kV (L/N) < 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 + $U_o$ / 200 ms (L/PE)
LPZ			2-3
Housing material			Polyamid PA6, UL94 V-0
Protection type			IP20
Operating temperature range	$\vartheta$		-40°C to + 80°C
Failure signalisation		light on - ok / light off - failure	inbuilt piezosiren

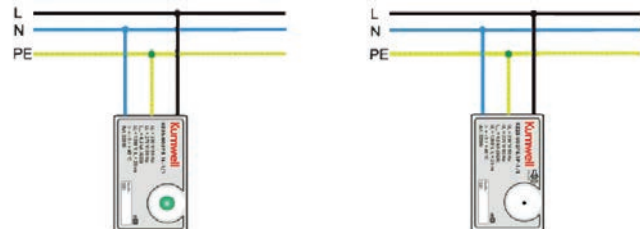
Dimensions



Internal configuration



Network connection



LED Street Lights Power SPD: SPD-LED-I10K designed for protecting LED Driver and could be connected perfectly with its input port, sealed enclosure, waterproof and dust proof IP67 protection grade, belongs to Class III power SPD. This SPD use common mode, differential mode, full protection with leakage current and cut the overcurrent capabilities.



The product size small, 81 x 37.6 x 13.5mm, using parallel wiring, attached with L, N and PE cable, very convenient in installing. The maximum discharge current is 10kA/line, nominal discharge current is 5kA/line, able to withstand voltage 20kV, the level of protection is below 1.1kV, especially good for protecting LED Street lights from lightning surge damage.

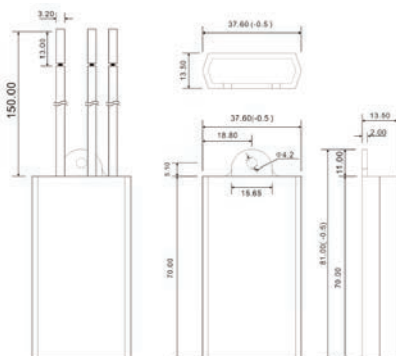
### Surge Protective Device for LED Lighting Systems

#### Technical data

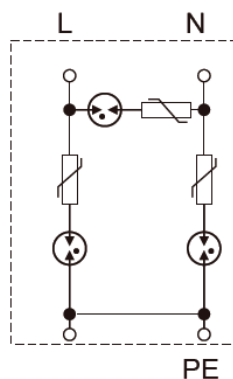
#### SPD-LED-I10K

Nominal voltage	$U_N$	110~277 V AC
Max. continuous operating voltage	$U_C$	390 V AC
Nominal discharge current (8/20)	$I_n$	5 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	10 kA
Nominal discharge voltage	$V_n$	10 kV
Max. discharge voltage	$V_{max}$	20 kV
Voltage protection level at $U_{oc}$	$U_P$	< 1.1 kV
Response time	$t_A$	25 ns
Cross-section area		1.5 mm <sup>2</sup> flexible
Operating temperature range	$\vartheta$	-40°C to + 80°C
Mounting on		Custom
Enclosure material		Thermoplastic
Size		81 x 37.6 x 13.5mm
Test standards		IEC 61643-11:2011
Outer casing protection grade		IP67

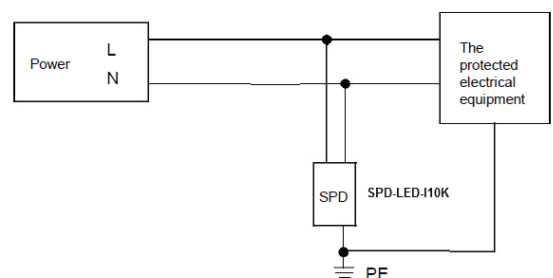
Dimensions



Basic circuit diagram



Wiring connection





LED Street Lights Power SPD: SPD-LED-I20K designed for protecting LED Driver and could be connected perfectly with its input port, sealed enclosure, waterproof and dust proof IP67 protection grade, belongs to Class III power SPD. This SPD use common mode, differential mode, full protection with leakage current and cut the overcurrent capabilities.



The product size small, 37 x 46 x 93mm, using parallel wiring, attached with L, N and PE cable, very convenient in installing. The maximum discharge current is 20 kA/line, nominal discharge current is 10 kA/line, able to withstand voltage 40kV, the level of protection is below 1.5kV, especially good for protecting LED Street lights from lightning surge damage.

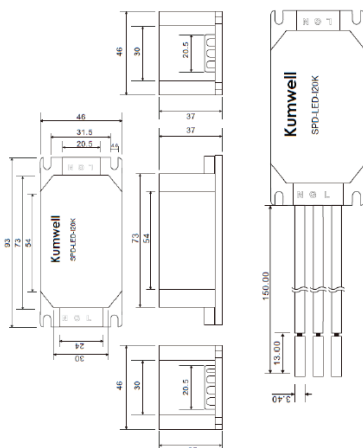
### Surge Protective Device for LED Lighting Systems

#### Technical data

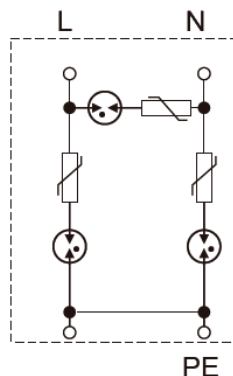
#### SPD-LED-I20K

Nominal voltage	$U_N$	110~277 V AC
Max. continuous operating voltage	$U_C$	390 V AC
Nominal discharge current (8/20)	$I_n$	10 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	20 kA
Nominal discharge voltage (T3)	$V_n$	20 kV
Max. discharge voltage (T3)	$V_{max}$	40 kV
Voltage protection level	$U_P$	< 1.5 kV
Response time	$t_A$	25 ns
Cross-section area		2.0 mm <sup>2</sup> flexible
Operating temperature range	$\vartheta$	-40°C to + 80°C
Mounting on		Custom
Enclosure material		Thermoplastic
Size		37 x 46 x 93mm
Test standards		IEC 61643-11
Outer casing protection grade		IP67

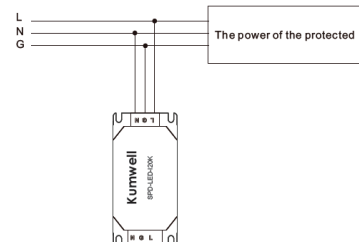
Dimensions



Basic circuit diagram



Wirina connection

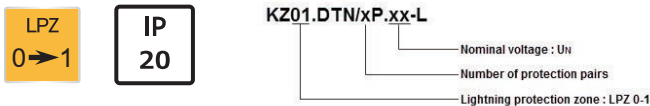


**> Surge Protection For Information  
Technology (IT) Systems and Equipment**

**2**

**Kumwell KZ01.DTN-L** 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<sub>A(B)</sub> - 1 according to IEC 62305. All types provide effect 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  $I_L < 0.5$  A

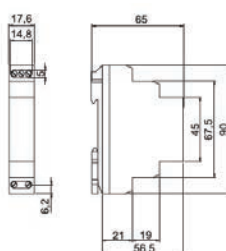
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-2). These devices are produced for nominal voltage within the range of 6V-80V. Maximum discharge current is 10 kA (8/20).



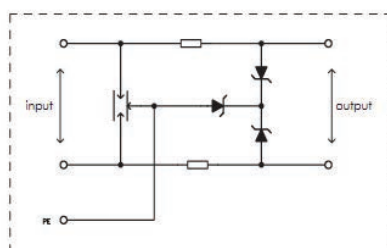
Type	1	KZ01.DTN/1P.6-L	KZ01.DTN/1P.12-L	KZ01.DTN/1P.24-L
Number of protected pairs	2	KZ01.DTN/2P.6-L	KZ01.DTN/2P.12-L	KZ01.DTN/2P.24-L
Nominal voltage	$U_N$	6 V	12 V	24 V
Max. continuous operating voltage	$U_C$	7.2 V	14.4 V	28.6 V
Rated load current	$I_L$		0.5 A	
D1 Lightning impulse current (10/350)	$I_{imp}$		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 $I_n$	$U_P$	15 V	28 V	64 V
C3 Voltage protection level at 1 kV/μs	$U_P$	9 V	18 V	34 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 <sup>2</sup>	
Category tested acc. To IEC 61643-21:2000			A2, B2, C2, C3, D1	

Type	1	KZ01.DTN/1P.30-L	KZ01.DTN/1P.48-L	KZ01.DTN/1P.80-L
Number of protected pairs	2	KZ01.DTN/2P.30-L	KZ01.DTN/2P.48-L	KZ01.DTN/2P.80-L
Nominal voltage	$U_N$	30 V	48 V	80 V
Max. continuous operating voltage	$U_C$	36 V	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 $I_n$	$U_P$	75 V	85 V	500 V
C3 Voltage protection level at 1 kV/μs	$U_P$	54 V	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 <sup>2</sup>	
Category tested acc. To IEC 61643-21:2000			A2, B2, C2, C3, D1	

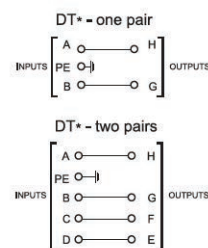
Dimensions



Internal configuration

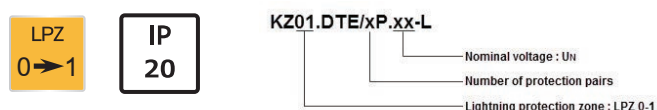


Wiring connection



**Kumwell KZ01.DTE-L** 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<sub>A(B)</sub> - 1 according to IEC 62305. All types provide effect 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  $I_L < 0.1$  A

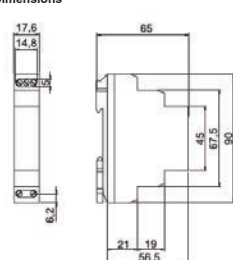
These devices consist of gas discharge tubes, series impedance and transils. The number of protected pairs is optional (1-2). These devices are produced for nominal voltage within the range of 6V-170V. Maximum discharge current is 10 kA (8/20). For the protection of telephone lines it is recommended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



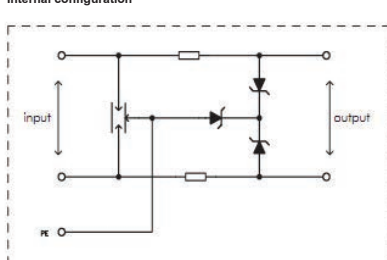
Type	1	KZ01.DTE/1P.6-L	KZ01.DTE/1P.12-L	KZ01.DTE/1P.24-L
Number of protected pairs	2	KZ01.DTE/2P.6-L	KZ01.DTE/2P.12-L	KZ01.DTE/2P.24-L
Nominal voltage	$U_N$	6 V	12 V	24 V
Max. continuous operating voltage	$U_C$	7.2 V	14.4 V	28.6 V
Rated load current	$I_L$		100 mA	
C2 Max. discharge current (8/20)	$I_{max}$		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
C3 Voltage protection level at 1 kV/ $\mu$ s	$U_P$	9 V	18 V	34 V
Response time	$t_A$		< 30 ns	
Data rate			1 MBit/s	
Series impedance per line			1.5 - 10 $\Omega$	
Parasitic capacitance	C		1.5 nF	
Recommended cable cross-section			0.25-1.5 mm <sup>2</sup>	
Category tested acc. To IEC 61643-21			A2, B2, C2, C3, D1	

Type	1	KZ01.DTE/1P.48-L	KZ01.DTE/1P.T-L
Number of protected pairs	2	KZ01.DTE/2P.48-L	KZ01.DTE/2P.T-L
Nominal voltage	$U_N$	48 V	170 V
Max. continuous operating voltage	$U_C$	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 $I_n$	$U_P$	160 V	500 V
C3 Voltage protection level at 1 kV/ $\mu$ s	$U_P$	66 V	290 V
Response time	$t_A$		< 30 ns
Data rate			1 MBit/s
Series impedance per line			1.5 - 10 $\Omega$
Parasitic capacitance	C		1.5 nF
Recommended cable cross-section			0.25-1.5 mm <sup>2</sup>
Category tested acc. To IEC 61643-21			A2, B2, C2, C3, D1

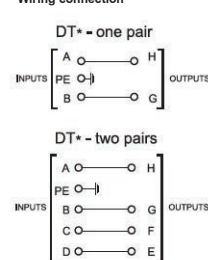
Dimensions



Internal configuration



Wiring connection



**Kumwell KLZ.NET-CAT6 SPD** is intended to protect Local Area Networks (LAN) from overvoltage surges and electrostatic discharges created by switching transients in buildings. LAN systems are particularly prone to such disturbances because of the often long cable lengths involved which behave like antennas to such atmospheric disturbances.

It provides protection to all 4 lines in the UTP, STP and is Cat 6 capable.

Ground potential equalization between signal and protective (network or PC chassis) ground is provided.

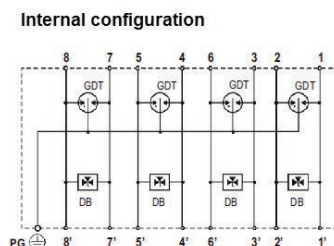
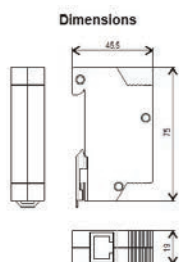
Product is designed to protect Cat 6 Local Area Networks. It is suitable for protection of 1 Gbit/s lines and fully compatible with standards IEEE 802.3af and IEEE 802.3at.



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<b>IEC/EN Category</b>	: D1/C1/C2/C3
<b>Protection</b>	: All 4 Pairs
<b>Voltages</b>	: 48 V DC
<b>Maximum Operating Voltage</b>	: 50 V DC
<b>Frequency Range</b>	: 250 MHz, up to Cat6, PoE Compatible
<b>Surge Discharge Ratings</b>	: $I_n$ 10 kA , $I_{imp}$ 1 kA
<b>Enclosure</b>	: UTB In-line Patch, Din Rail Mount
<b>Terminals</b>	: RJ45, Shielded
<b>Compliance</b>	: IEC 61643-21

<b>LAN Protection</b>		<b>KLZ.NET-CAT6</b>
<b>Technical data</b>		
Number of protected pairs		4 Pairs (8 Conductors)
Nominal operating voltage (DC)	$U_N$	48 V
Max. continuous operating voltage (DC)	$U_C$ (Line-Line) $U_C$ (Pair-Pair)	50 V 72 V
Rated load current at 25 °C	$I_L$	1 A
Nominal discharge current (8/20)	$I_n$ (Line-Line)	150 A
C2 Total discharge current (8/20)	$I_{max}$ (Line-Ground)	10 kA
D1 Lightning impulse current (10/350)	$I_{imp}$	1 kA
Voltage protection level at $I_n$	$U_p$ (Line-Line) $U_p$ (Line-Ground)	150 V 550 V
Response time overvoltage protection	$t_A$	< 1 ns
Cut-off Frequency	$F_G$	30 MHz
Connection type		Input/Output: RJ45 sockets
Temperature range		-40°C to + 80°C
Degree of protection		IP20
Mounting		DIN rail 35 mm



**Legend:**  
 GDT : gas discharge tube  
 DB : diode block  
 PG : protective grounding

## SURGE PROTECTION FOR INFORMATION TECHNOLOGY SYSTEM SIGNAL AND DATA LINE PROTECTION 10/100/1000M NETWORK SIGNAL SURGE PROTECTION

**Kumwell D01.LAN-RJ45 series network signal SPD** is designed according to IEC 61643-21 standard. This product is suitable for the 10/100/1000M network equipment lightning protection. The connector of this product is standard RJ45, 8 lines under the protection (1, 2, 3, 6 and 4, 5, 7, 8) easy installation and maintenance. Maximum discharge current  $I_{max}$  (8/20) is 10 kA/line., quick response time. It is suitable for the network lightning surge protection.

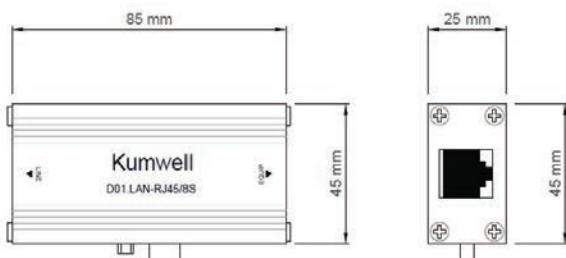


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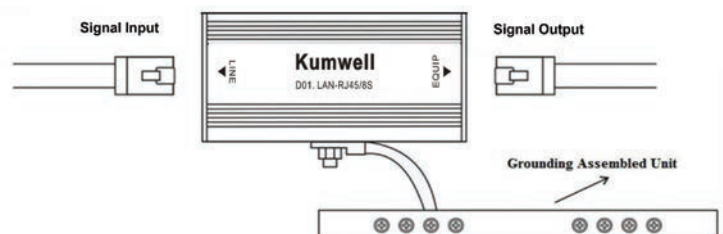
### 10/100/1000M Network Surge Protection

Technical data		D01.LAN-RJ45/8S	D01.LAN-RJ45/8SG
Rated working voltage	$U_N$		5 V
Max. continuous operating voltage	$U_C$		8 V
Nominal discharge current (8/20 $\mu$ s)	$I_n$		5 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		10 kA
Voltage protection level at 8/20 $\mu$ s	$U_P$		$\leq 10$ V (Line-Line) $\leq 90$ V (Line-PE)
Voltage protection level at 10/700 $\mu$ s	$U_P$		$\leq 30$ V
Response time	$t_A$		< 1 ns
Transmission Rate		100 Mbps	1000 Mbps
Insertion Loss			$\leq 0.5$ dB
Series impedance per line	R		0.5 $\Omega$
Connector type			RJ45
Quantity of Core Line under Protection			1, 2, 3, 6 (Fine Protection) 4, 5, 7, 8 (Rough Protection)
Housing material			Aluminum
Protection type			IP20
Working temperature			-25°C to + 70°C

Dimensions



Installation



**Kumwell D01.POE-RJ45 PoE Surge Protective Device** adopts aluminum alloy shell with feature of good appearance, easy installation and convenient wiring, it can long-term work stable under hostile environment.

It is suitable for PoE centralized power supply HD digital surveillance cameras, exchanger, concentrator and other equipment. It can prevent the equipment from lightning strike or induced overvoltage, overcurrent or other instantaneous surge voltage.

It has intelligent circuit recognition function in internal design. When it is used in PoE system, it can distinguish free line power supply method and data line power supply, which makes it suitable for all PoE power supply system. It has the features of multistage protection, low residual voltage, low capacitance design, good transmission performance, fast response and long life, etc.



**IP  
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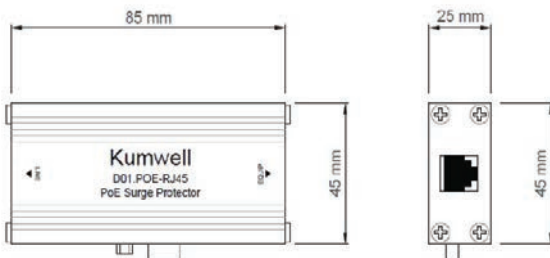
## 10/100M Network Surge Protection

### Technical data

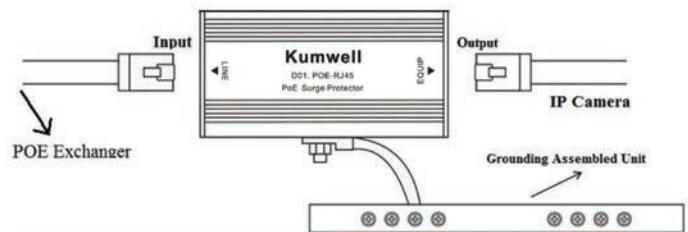
### D01.POE-RJ45

Signal Transmission Line		1, 2, 3, 6
Power Transmission Line		4, 5, 7, 8
Signal Line Rated working voltage (DC)	$U_N$	5 V
Signal Line Max. Continuous operating voltage (DC)	$U_C$	8 V
Voltage protection level at 10/700 $\mu$ s	$U_P$	$\leq 30$ V
Power Line Rated working voltage (DC)	$U_N$	48 V
Power Line Max. Continuous operating voltage (DC)	$U_C$	64 V
Power Line Rated Load Current	$I_L$	0.5 A
Power Line Voltage Protection Level (8/20 $\mu$ s)	$U_P$	$\leq 200$ V
Nominal discharge current (8/20 $\mu$ s)	$I_n$	5 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	10 kA
Insertion Loss		$\leq 0.5$ dB
Response time	$t_A$	$\leq 1$ ns
Transmission Rate		100 Mbps
Connector type		RJ45
Housing material		Aluminum
Protection type		IP20
Working temperature		-25°C to + 70°C
Working humidity		$\leq 95\%$ RH

Dimensions



Installation



## SURGE PROTECTION FOR INFORMATION TECHNOLOGY SYSTEM VIDEO SIGNAL SURGE PROTECTION BNC VIDEO SIGNAL LINE

**Kumwell D01.VSP20K-BNC** Video Signal SPD is designed according to IEC 61643-21 standard. It is suitable for lightning protection of video line of monitoring system, CATV, CCTV and other video line signal equipment. With features of integration metal structural design, high discharge capacity and fast response, it can effectively ensure the equipment to work properly.



**IP  
20**

### Video Signal Surge Protection

Technical data	D01.VSP20K-BNC	
Rated Working Voltage	$U_N$	1 V
Max. continuous operating voltage	$U_C$	8 V
Nominal discharge current (8/20 $\mu$ s)	$I_n$	10 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	20 kA
Voltage protection level at 10/700 $\mu$ s	$U_p$	$\leq 30$ V
Response time	$t_A$	$\leq 1$ ns
Insertion Loss		$\leq 0.5$ dB
Transmission Rate		2 Mbps
Connector type		BNC
Housing material		Aluminum
Protection type		IP20
Working temperature		-25°C to + 70°C
Working humidity		$\leq 95\%$ RH

#### Dimensions



#### Installation

##### Installation Diagram





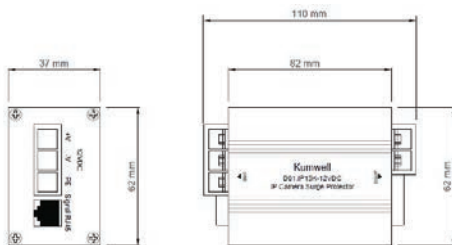
**Kumwell D01.IP15K Series** are designed according to IEC 61643-21 standard. Combined with power and network terminals together, they are suitable for lightning protection of power system and video signal of IP cameras. With features of high discharge capacity and fast response, they can effectively protect the IP cameras well.



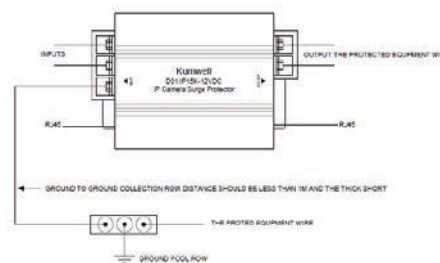
**IP  
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IP Camera Surge Protection		D01.IP15K-12VDC	D01.IP15K-24VAC	D01.IP15K-U275
<b>Number of protected pairs</b>				
<b>Power Line</b>				
Nominal voltage	$U_N$	12 V DC	24 V AC	220 V AC
Max. Continuous operating voltage	$U_C$	18 V DC	36 V AC	275 V AC
Nominal discharge current (8/20 $\mu$ s)	$I_n$		5 kA	
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		15 kA	
Voltage protection level at $I_n$ (8/20 $\mu$ s)	$U_P$	$\leq 100$ V	$\leq 200$ V	$\leq 1000$ V
Rated load current	$I_L$		5 A	
Response time	$t_A$		$\leq 10$ ns	
Connector type			Terminal Block	
<b>Signal Line</b>				
Nominal voltage	$U_N$		5 V	
Max. Continuous operating voltage	$U_C$		8 V	
Transmission rate			100 Mbps	
Nominal discharge current (8/20 $\mu$ s)	$I_n$		1 kA	
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		2 kA	
Voltage protection level at 10/700 $\mu$ s	$U_P$		$\leq 30$ V	
Insertion Loss			$\leq 0.5$ dB	
Response time	$t_A$		$\leq 1$ ns	
Connector type			RJ45 Socket	
<b>Mechanical data</b>				
Housing material			Aluminum	
Protection type			IP20	
Working temperature			-25°C to + 70°C	
Working humidity			$\leq 95\%$ RH	

**Dimensions**



**Installation**



## SURGE PROTECTION FOR INFORMATION TECHNOLOGY SYSTEM POWER AND VIDEO LINE PROTECTION CCTV CAMERA SURGE PROTECTION

**Kumwell D01.CCTV20K\*** surge protection is designed according to IEC 61643-21 standard. This product is used for power and video line 's lightning protection of the fix installed camera of security system. It is widely used for warehouse, residence community, road monitoring system.

This product can effectively prevent the damage caused by the potential difference transient increasing in the power or video system. It has fast response speed and high integration for combining protection in one device.



**IP  
20**

### CCTV Camera Surge Protection

Number of protected pairs

D01.CCTV20K-12VDC

D01.CCTV20K-24VAC

D01.CCTV20K-U0275

#### Power Line

		D01.CCTV20K-12VDC	D01.CCTV20K-24VAC	D01.CCTV20K-U0275
Nominal voltage	$U_N$	12 V DC	24 V AC	220 V AC
Max. Continuous operating voltage	$U_C$	18 V DC	36 V AC	275 V AC
Rated load current	$I_L$		5 A	
Nominal discharge current (8/20 $\mu$ s)	$I_n$		10 kA	
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		20 kA	
Voltage protection level at $I_n$ (8/20 $\mu$ s)	$U_P$	$\leq 100$ V	$\leq 450$ V	$\leq 1000$ V
Response time	$t_A$		$\leq 10$ ns	
Parasitic Capacitance	$C$		$\leq 150$ pF	
Series impedance per line	$R$		$\leq 0.1 \Omega$	
Protection mode		L1-PE, L2-PE		L-N-PE
Connector type			2P Terminal Block	

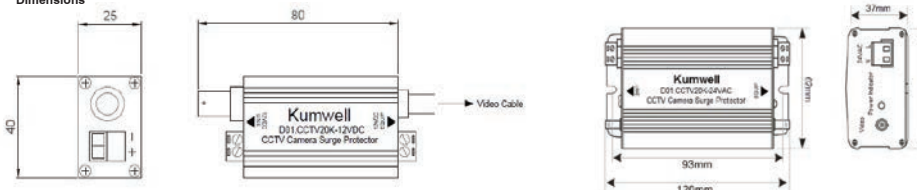
#### Signal Line

		D01.CCTV20K-12VDC	D01.CCTV20K-24VAC	D01.CCTV20K-U0275
Rated Working Voltage	$U_N$		1 V	
Max. continuous operating voltage	$U_C$		8 V	
Rated load current	$I_L$		250 mA	
Nominal discharge current (8/20 $\mu$ s)	$I_n$		5 kA	
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		10 kA	
Voltage protection level at $I_n$ (8/20 $\mu$ s)	$U_P$		$\leq 30$ V	
Voltage protection level at 10/700 $\mu$ s	$U_P$	$< 8$ V	$< 8$ V	$< 110$ V
Response time	$t_A$		$\leq 1$ ns	
Insertion Loss			$\leq 0.5$ dB	
Transmission Rate			2 Mbps	
Parasitic Capacitance	$C$		$\leq 50$ pF	
Impedance			75 $\Omega$	
Series impedance per line	$R$		$\leq 0.1 \Omega$	
Protection mode			Core-Shield-PE	
Connector type			BNC-K/J	

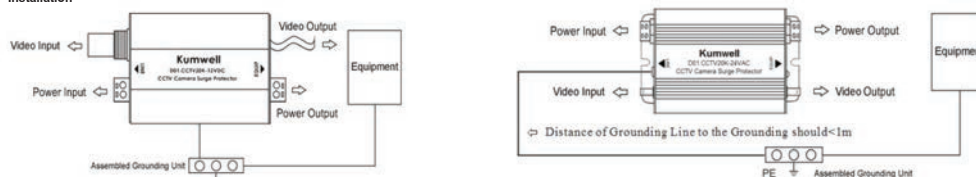
#### Mechanical data

Housing material			Aluminum
Protection type			IP20
Working temperature			-25°C to + 70°C
Working humidity			$\leq 95\%$ RH

#### Dimensions



#### Installation



**Kumwell D01.TEL-RJ11 Telephone Line Signal SPD** is designed according to IEC 61643-21 standard. It is suitable for lightning protection of telephone, SPC exchange, fax machine and ISDN equipments. With features of integration metal structural design, high discharge capacity and fast response, it can effectively ensure the equipment to work properly.



IP  
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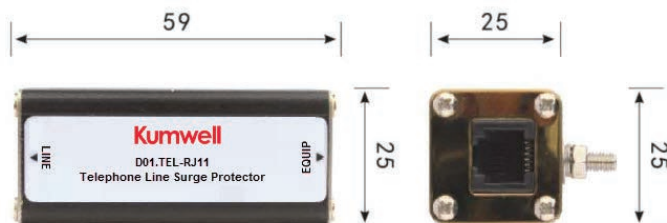
## Telephone Surge Protection

### Technical data

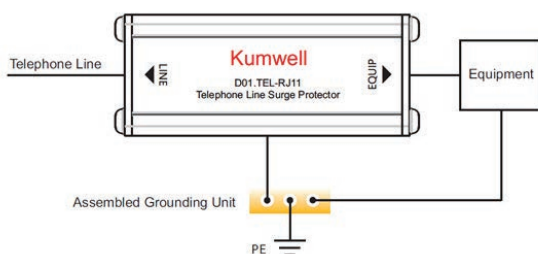
### D01.TEL-RJ11

Max. continuous operating voltage	$U_C$	200 V
Nominal discharge current (8/20 $\mu$ s)	$I_n$	5 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	10 kA
Voltage protection level at 10/700 $\mu$ s	$U_p$	$\leq 300$ V
Response time	$t_A$	$\leq 1$ ns
Impedance		10 $\Omega$
Insertion Loss		$\leq 0.5$ dB
Transmission Rate		2 Mbps
Connector type		RJ11
Housing material		Aluminum
Protection type		IP20
Working temperature		-25°C to + 70°C
Working humidity		$\leq 95\%$ RH

### Dimensions



### Installation



**> Surge Protection For Data /  
Signal Line Protection**

**3**

- > Surge Protection For Data / Signal Line Protection**
- > Surge Protection For Coaxial Protection**
- > Surge Protection For Equipotential Bonding**
- > Digital Lightning Strike Counter and Surge Counter**

Kumwell KSMH.SH series of surge protective devices has been developed to protect against the effects of induced voltages onto data, signal and communication circuits.

The circuit topology consists of a multi-stage protector providing both common (longitudinal) mode and differential (transverse) mode protection.

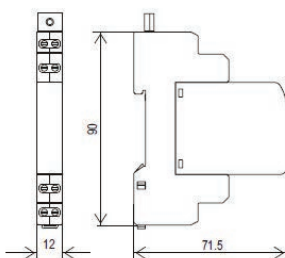
Coarse protection is provided by a three terminal GDT while fine protection is provided using a high speed silicon avalanche diodes or metal oxide varistor stage. Care is taken to ensure coordination between these two stages without voltage or surge current blind spots occurring.



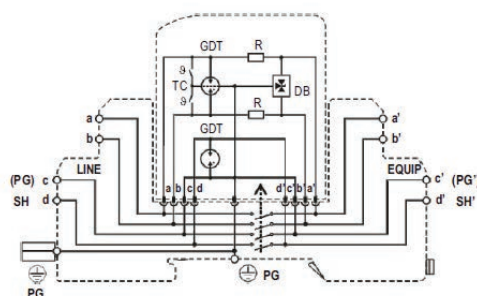
**IP  
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Type		KSMH.SH-xxxV							
Technical Data		5V	12V	15V	24V	30V	48V	60V	110V
<b>Electrical Data</b>									
Lines protected		1 (2 conductors)							
Nominal operating voltage (DC)	$U_n$	5V	12V	15V	24V	30V	48V	60V	110V
Max. continuous operating voltage (DC)	$U_C$	6V	15V	18V	28V	33V	52V	64V	170V
Rated load current at 25°C	$I_L$	1A							
C2 Nominal discharge current (8/20µs)	$I_n$	10kA							
Max. discharge current (8/20µs)	$I_{max}$	20kA							
D1 Lightning impulse current (10/350µs)	$I_{imp}$	2.5kA							
Residual voltage at 5 kA (8/20µs)	$U_{res}$ (line-line)	< 22V	< 42V	< 48V	< 70V	< 80V	< 140V	< 160V	< 450V
Rated spark overvoltage	(Shield-Ground)	184-276V							
	(Line-Line), (Line-Ground)	7-10V	16-21V	20-24V	30-36V	35-43V	55-68V	67-85V	184-264V
Response time	$t_A$ (Shield-Ground)	< 100 ns							
	(Line-Line), (Line-Ground)	< 1ns							
Insulation resistance of the protection	$R_{iso}$ (Shield-Ground)	>1GΩ/100V							
	(Line-Line), (Line-Ground)	≥6kΩ	≥15MΩ	≥18MΩ	≥28MΩ	≥33MΩ	≥52MΩ	≥64MΩ	≥170MΩ
Serial resistance	R	1.6-2.0Ω							
Transverse capacitance	C (Shield-Ground)	5pF							
	(Line-Line), (Line-Ground)	50pF							
Cut-off frequency	$f_G$	30MHz							
<b>Mechanical data</b>									
Temperature range		-40°C to + 80°C							
Terminal cross section		Stranded to 4 mm <sup>2</sup>							
Mounting		DIN rail 35mm							
Degree of protection		IP20							

Dimensions



Internal configuration



Legend:

- TC thermo-clip
- GDT gas discharge tube
- R resistor
- DB diode block
- PG protective grounding

Kumwell KSMH.TC series of surge protective devices has been developed to protect against the effects of induced voltages onto data, signal and communication circuits.

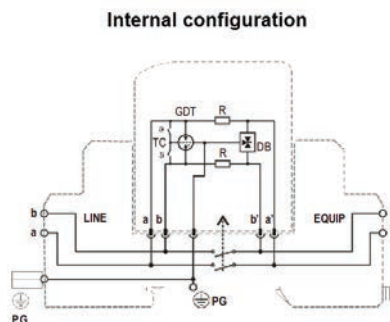
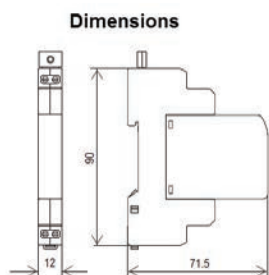
These efficient overvoltage barriers contain both coarse and fine protection stages and provide longitude and transverse surge protection. The initial protection stage comprises a three-pole gas discharge tube and is designed to divert the primary surge energy. The subsequent fine protection stage is carried out using fast bi-directional silicon avalanche diodes. Care is taken in the design of this fine protection stage to avoid capacitive line loading and thereby ensuring a low insertion loss and wide operating frequency range.



Series line impedances ensure energy co-ordination between the coarse and a fine protection stages at all levels of the incident surge. To protect against the hazards of electric shock and fire which often results when power frequency contact occurs between power and communication lines (often called main incursion), a thermo-clip is included on the primary protection stage to divert the power frequency current to ground

**IP  
20**

Type	KSMH.TC-xxxV								
Technical Data	5V	12V	15V	24V	30V	48V	60V	110V	
<b>Electrical Data</b>									
Lines protected	1 (2 conductors)								
Nominal operating voltage (DC)	$U_n$	5V	12V	15V	24V	30V	48V	60V	110V
Max. continuous operating voltage (DC)	$U_C$	6V	15V	18V	28V	33V	52V	64V	170V
Rated load current at 25°C	$I_L$	1A							
C2 Nominal discharge current (8/20µs)	$I_n$	10kA							
Max. discharge current (8/20µs)	$I_{max}$	20kA							
D1 Lightning impulse current (10/350µs)	$I_{imp}$	2.5kA							
Residual voltage at 5 kA (8/20µs)	$U_{res}$	< 22V	< 42V	< 48V	< 70V	< 80V	< 140V	< 160V	< 450V
Rated spark overvoltage	(a,b-PG)	7-10V	17-21V	21-25V	31-37V	36-44V	57-69V	68-84V	184-264V
	(a-b)	7-10V	17-21V	21-25V	31-37V	36-44V	57-69V	68-84V	184-264V
Response time	$t_A$	< 1ns							
Thermal protection		Yes							
Insulation resistance of the protection	$R_{iso}$	≥6kΩ	≥15MΩ	≥18MΩ	≥28MΩ	≥33MΩ	≥52MΩ	≥64MΩ	≥170MΩ
Serial resistance	$R$	1.6-2.0Ω							
Transverse capacitance	$C$	50pF							
Cut-off frequency	$f_G$	30MHz							
<b>Mechanical data</b>									
Temperature range		-40°C to + 80°C							
Terminal cross section		Stranded to 4 mm <sup>2</sup>							
Mounting		DIN rail 35mm							
Degree of protection		IP20							



Legend:  
 TC thermo-clip  
 GDT gas discharge tube  
 R resistor  
 DB diode block  
 PG protective grounding

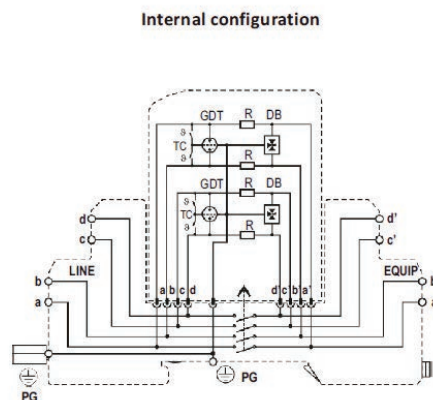
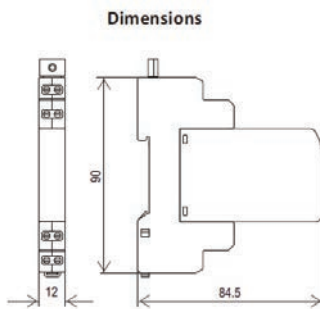
Kumwell KSMH2.TC series of surge protective devices has been developed to protect against the effects of induced voltages onto data, signal and communication circuits.

Like the KSMH.TC series, the KSMH2.TC provides the same level of protection to two independent circuits (pairs). A number of protection voltages are available to ensure the user is able to select the closest clampin voltage to the normal signal operation of the equipment being protected.



IP  
20

Type	KSMH2.TC-xxxV									
Technical Data		5V	12V	15V	24V	30V	48V	60V	110V	
<b>Electrical Data</b>										
Lines protected		2 (4 conductors)								
Nominal operating voltage (DC)	$U_n$	5V	12V	15V	24V	30V	48V	60V	110V	
Max. continuous operating voltage (DC)	$U_C$	6V	15V	18V	28V	33V	52V	64V	170V	
Rated load current at 25°C	$I_L$	1A								
C2 Nominal discharge current (8/20µs)	$I_n$	10kA								
Max. discharge current (8/20µs)	$I_{max}$	20kA								
D1 Lightning impulse current (10/350µs)	$I_{imp}$	5kA								
Residual voltage at 5 kA (8/20µs)	$U_{res}$	< 22V	< 42V	< 48V	< 70V	< 80V	< 140V	< 160V	< 450V	
Rated spark overvoltage	(Line-Ground)	7-10V	17-21V	21-25V	31-37V	36-44V	57-69V	68-84V	184-264V	
	(Line-Line)	7-10V	17-21V	21-25V	31-37V	36-44V	57-69V	68-84V	184-264V	
Response time of overvoltage protection	$t_A$	< 1ns								
Thermal protection		Yes								
Insulation resistance of the protection	$R_{iso}$	≥6kΩ	≥15kMΩ	≥18MΩ	≥28MΩ	≥33MΩ	≥52MΩ	≥64MΩ	≥170MΩ	
Serial resistance	$R$	1.6-2.0Ω								
Transverse capacitance	$C$	50pF								
Cut-off frequency	$f_G$	30MHz								
<b>Mechanical data</b>										
Temperature range		-40°C to + 80°C								
Terminal cross section		Stranded to 4 mm <sup>2</sup>								
Mounting		DIN rail 35mm								
Degree of protection		IP20								



Legend:  
 TC thermo-clip  
 GDT gas discharge tube  
 R resistor  
 DB diode block  
 PG protective grounding

Kumwell KSMH.SG series of surge protective devices has been developed to protect against the effects of induced voltages onto data, signal and communication circuits.

It is intended for those applications where high ground potential rises may frequency occur, such as in location close to electric railways.

The circuit topology consists of a multi-stage protector providing both common (longitudinal) mode and differential (transverse) mode protection.

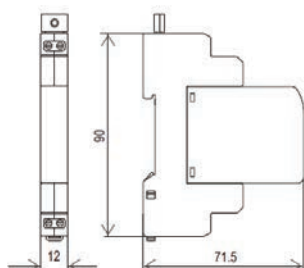
Coarse protection is provided by a three terminal GDT while fine protection is provided using a high speed silicon avalanche diodes or metal oxide varistor stage.



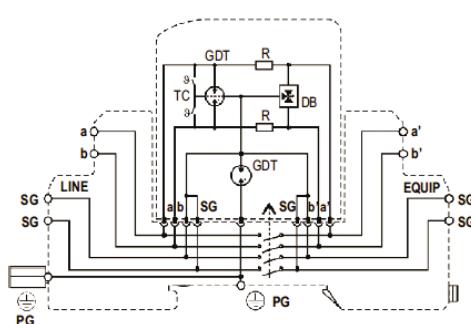
**IP  
20**

Type	KSMH.SG-xxxV									
Technical Data		5V	12V	15V	24V	30V	48V	60V	110V	
<b>Electrical Data</b>										
Lines protected		1 (2 conductors)								
Nominal operating voltage (DC)	$U_n$	5V	12V	15V	24V	30V	48V	60V	110V	
Max. continuous operating voltage (DC)	$U_C$	6V	15V	18V	28V	33V	52V	64V	170V	
Rated load current at 25°C	$I_L$	1A								
Nominal discharge current (8/20µs)	$I_n$	10kA								
Max. discharge current (8/20µs)	$I_{max}$	20kA								
Lightning impulse current (10/350µs)	$I_{imp}$	2.5kA								
Residual voltage at 5kA (8/20µs)	$U_{res}$ (line-line)	< 22V	< 42V	< 48V	< 70V	< 80V	< 140V	< 160V	< 450V	
Rated spark overvoltage	(SG-PG)	280-420V								
	(a-b), (a,b-SG)	7-10V	16-19V	20-24V	30-36V	35-43V	55-68V	67-85V	184-264V	
Response time of overvoltage protection	$t_A$ (a, b-SG) (SG-PG)	< 1 ns < 100ns								
Thermal protection		Yes								
Insulation resistance of the protection	$R_{iso}$ (a-b)	≥6kΩ	≥15MΩ	≥18MΩ	≥28MΩ	≥33MΩ	≥52MΩ	≥64MΩ	≥170MΩ	
Serial resistance	R	1.6-2.0Ω								
Transverse capacitance	C (a, b-SG)	50pF								
	(SG-PG)	5pF								
Cut-off frequency	$f_c$	30MHz								
<b>Mechanical data</b>										
Temperature range		-40°C to + 80°C								
Terminal cross section		Stranded to 4 mm <sup>2</sup>								
Mounting		DIN rail 35mm								
Degree of protection		IP20								

Dimensions



Internal configuration

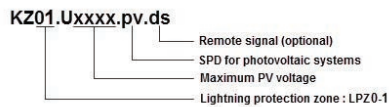


Legend:

- TC thermo-clip
- GDT gas discharge tube
- R resistor
- DB diode block
- PG protective grounding
- SG signal grounding

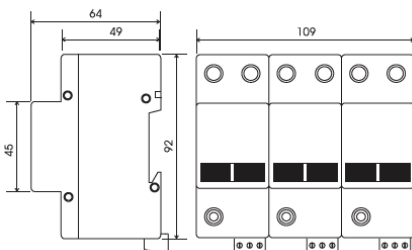


**Kumwell KZ01.\*.pv.ds** is a lightning and surge arrester class I+II according to IEC 61643-11 and EN-50539-11. It is designed for protection of positive and negative busbar of photovoltaic systems against the surge effects. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 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 exerted red signaling target in case of failure) and partly remote monitoring (by potential free change over contacts-only DS types).

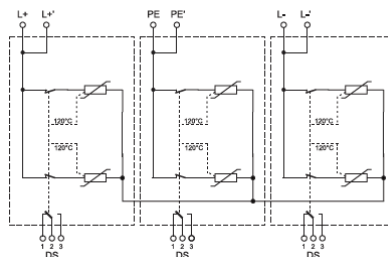


Varistor/ Class I+II / Photovoltaic System		KZ01.U0600.pv.ds	KZ01.U0800.pv.ds	KZ01.U1000.pv.ds
Technical data				
Test class according to IEC 61643-11 and EN 50539-11		CLASS I+II		
Max. continuous operating voltage	$U_{cpv}$	650 V AC	880 V DC	1000 V DC
Open circuit voltage of PV generator	$U_{ocstc}$	540 V	740 V	830 V
Short circuit withstand	$I_{scwpv}$	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		0-1		
Protection type		IP20		
Operating temperature range	$\vartheta$	-40°C to +80°C		
Cross-section of the connected conductors (solid)		16 mm <sup>2</sup> (min.) - 35 mm <sup>2</sup> (max.)		
Cross-section of the connected conductors (wire)		16 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)		
Mounting on		DIN rail 35 mm		
Failure signalisation		pushed in - ok / pushed out - failure		

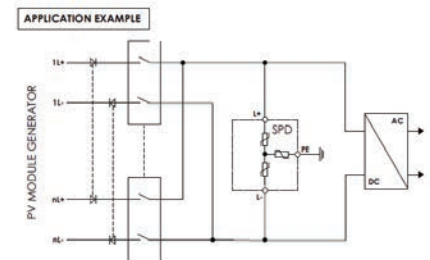
Dimensions



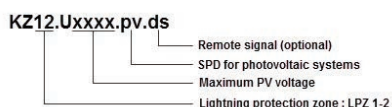
Internal configuration



Network connections



**Kumwell KZ12.\*.pv.ds** is a lightning and surge arrester class II according to IEC 61643-11 and IEC 61643-1. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 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 are equipped with internal disconnectors, which are activated when the varistors fail (overheat). Operational status indication of these disconnectors is partly mechanical (by exerted red signaling target in case of failure) and partly remote monitoring (by potential free change over contacts-only DS types).

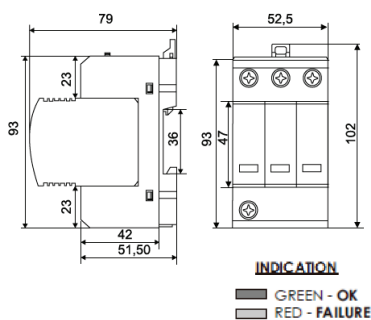


### Varistor/ Class II / Photovoltaic System

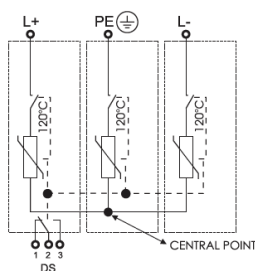
#### Technical data

		KZ12.U0600.pv.ds	KZ12.U0800.pv.ds	KZ12.U1000.pv.ds	KZ12.U1500.pv.ds
Test class according to IEC 61643-11 and EN 50539-11		CLASS II			
Max. continuous operating voltage	$U_{cpv}$	600 V DC	870 V DC	1050 V DC	1500 V DC
Open circuit voltage of PV generator	$U_{OCSTC}$	500 V	730 V	875 V	1250 V
Application		L+/L-, L+/PE, L-/PE			
Short circuit withstand	$I_{SCWPV}$	100 A			
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	< 4.5 kV
Response time	$t_A$	< 25 ns			
LPZ		1-2			
Protection type		IP20			
Operating temperature range	$\vartheta$	-40°C to +80°C			
Cross-section of the connected conductors (solid)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)			
Cross-section of the connected conductors (wire)		6 mm <sup>2</sup> (min.) - 16 mm <sup>2</sup> (max.)			
Mounting on		DIN rail 35 mm			
Failure signalisation		green - ok / red - failure			

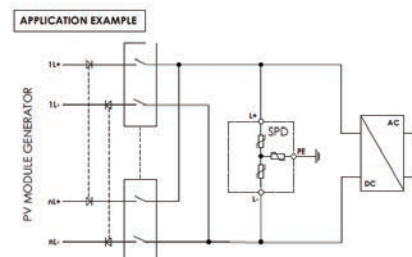
Dimensions



Internal configuration



Network connections



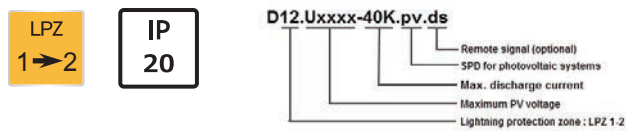
## CLASS II (TYPE 2) SURGE ARRESTERS - VARISTOR MODULAR DC SPD FOR PHOTOVOLTAIC SYSTEM

**Kumwell D12.\*.pv.ds** modular power surge protector uses for DC power distribution equipment protection, such as photovoltaic junction box, photovoltaic DC power distribution cabinet, photovoltaic inverter etc. and other PV system devices protection.

This product adopts the independent module design, good tightness, suitable for 35mm DIN rail, it is easy to convenient. Each set of lightning protection module with working indicator window. Temperature control breaker, building-in overcurrents fuse protector and thermal inductance breaker, degradation automatic release can completely avoid the fire and with remote alarm connection port, easy to remote monitoring, the main piece of lightning protection module and base pluggable.

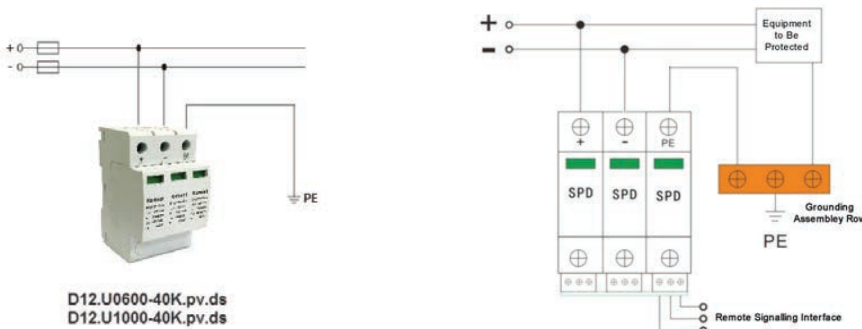


Lightning protection mode is (+)-PE , (-)-PE



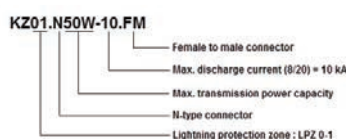
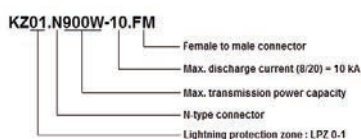
Varistor/ Class II / Photovoltaic System			
Technical data		D12.U0600-40K.pv.ds	D12.U1000-40K.pv.ds
Test class according to IEC 61643-11 and EN 50539-11		CLASS II	
Max. continuous operating voltage	$U_{cpv}$	600 V DC	1000 V DC
Application		(+)/(-) , (+)/PE, (-)/PE	
Max. discharge current (8/20)	$I_{max}$	40 kA	
Nominal discharge current (8/20)	$I_n$	20 kA	
Voltage protection level	$U_p$	$\leq 2$ kV	$\leq 3.5$ kV
Leakage current		$\leq 20$ $\mu$ A	
Response time	$t_A$	$\leq 25$ ns	
Status indication		Indicates windows faults is red	
Remote alarm function		Optional	
LPZ		1-2	
Protection type		IP20	
Operating temperature range	$\vartheta$	-25°C to +70°C	
Cross-section of the connected conductors (stranded)		6 mm <sup>2</sup> (min.) - 25 mm <sup>2</sup> (max.)	
Relative humidity		$\leq 95\%$ RH	
Mounting on		DIN rail 35 mm	

Network connections



**Kumwell KZ01.N50W-10.FM (FF)** and **KZ01.N900W-10.FM (FF)** 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  $I_{max} (8/20) = 10 \text{ kA}$  ensure a reliable protection of the receiving and transmitting systems even against a lightning stroke nearby.

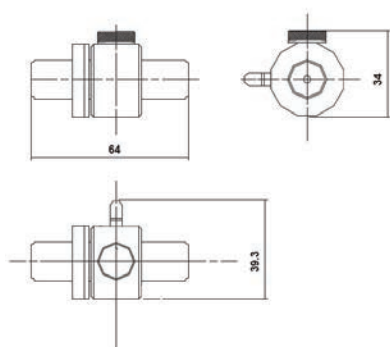
These coaxial protectors are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ  $0_{A(B)}$  -1 and higher according to IEC 62305.



### N Type Antenna Surge Protection

Technical data		KZ01.N900W-10.FM (FF)	KZ01.N50W-10.FM (FF)
Connector type			N
Max. continuous operating voltage	$U_C$		90 V
Rated load current	$I_L$		5 A
D1 Max. lightning impulse current (10/350 $\mu$ s)	$I_{imp}$		2 kA
C2 Max. discharge current (8/20 $\mu$ s)	$I_{max}$		10 kA
C2 Nominal discharge current (8/20 $\mu$ s)	$I_n$		5 kA
C3 Voltage protection level at 1kV/ $\mu$ s	$U_P$	600 V	200 V
Frequency range			0-3 GHz
Max. transmission power capacity		900 W	50 W
Insertion loss			< 1.5 dB
Return loss			> 20 dB
Characteristic impedance			50 $\Omega$
Degree of protection			IP65

Dimensions



**Kumwell KZ.ISG100** are 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 potential difference 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 KZ.ISG100 is 0.001 to 0.002  $\Omega$ )

Recommended installation is inside 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 IEC 62561-3



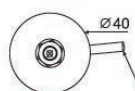
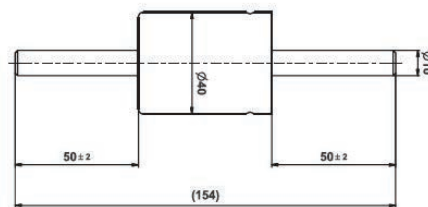
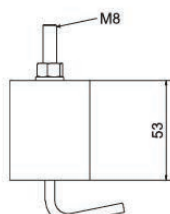
### Isolating Spark Gaps

#### Technical Data

#### KZ.ISG100

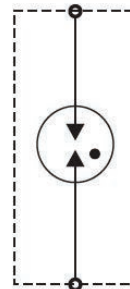
Class (lightning current carrying capability) to IEC/EN 62561-3		H (for high loading)
DC-Sparkover voltage		400 - 750 V DC
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	100 kA
Nominal discharge current (8/20 $\mu$ s)	$I_n$	75 kA
Rated over power frequency withstand voltage	$U_{W AC}$	285 V
Rated DC withstand voltage	$U_{W DC}$	350 V
Rated impulse sparkover voltage	$U_{r imp}$	< 1000 V
Max. lightning impulse current (10/350 $\mu$ s)	$I_{imp}$	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/ $\Omega$
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	$\vartheta$	-40°C to +90°C

Dimensions



The length of the flexible connecting cable is 200 mm and it is ended with a loop GPH12 of cross section 13 mm

Internal configuration



**Kumwell KZ.ISG100/350** are 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 potential difference 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 KZ.ISG100/350 is 0.001 to 0.002  $\Omega$ )

Recommended installation is inside 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 IEC 62561-3



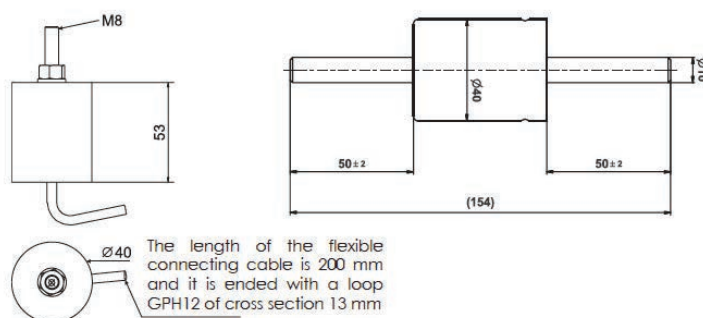
### Isolating Spark Gaps

#### Technical Data

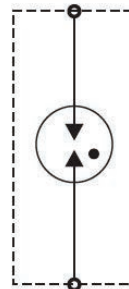
#### KZ.ISG100/350

Class (lightning current carrying capability) to IEC/EN 62561-3		H (for high loading)
DC-Sparkover voltage		280 - 420 V DC
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	100 kA
Nominal discharge current (8/20 $\mu$ s)	$I_n$	75 kA
Rated over power frequency withstand voltage	$U_{W AC}$	200 V
Rated DC withstand voltage	$U_{W DC}$	250 V
Rated impulse sparkover voltage	$U_{r imp}$	< 1000 V
Max. lightning impulse current (10/350 $\mu$ s)	$I_{imp}$	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/ $\Omega$
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	$\vartheta$	-40°C to +90°C

Dimensions



Internal configuration



**Kumwell KZ.ISG100-EX** is separating high power gas discharge tube 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 operationally. In case of origin of potential difference 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 KZ.ISG100-EX is 0.001 to 0.002  $\Omega$ )

Recommended installation is inside 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 according to IEC 61024-1 and also for the use in IT installation according 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.



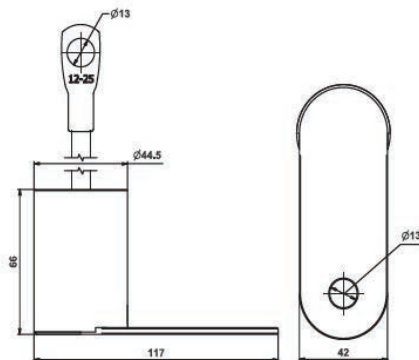
### High Power GDT For Use In Explosion Hazards Areas

#### Technical Data

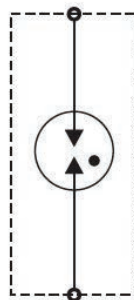
#### KZ.ISG100-EX

EC-Type examination certificate		II 2G Ex mb II T6 Gb, II 2D Ex mb III C T80°C Db
Approvals, certification		FTZU 04 ATEX 0255X
DC-Sparkover voltage		400 - 750 V DC
Max. discharge current (8/20 $\mu$ s)	$I_{max}$	100 kA
Nominal discharge current (8/20 $\mu$ s)	$I_n$	75 kA
Max. lightning impulse current (10/350 $\mu$ s)	$I_{imp}$	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/ $\Omega$
Voltage protection level at $I_{imp}$	$U_p$	< 1 kV
Insulation resistance at 100 V DC	$R_i$	< 1 G $\Omega$
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	$\vartheta$	-40°C to +90°C

Dimensions



Internal configuration



## ISOLATING SPARK GAPS HIGH POWER GAS DISCHARGE TUBE FOR EQUIPOTENTIAL BONDING OVERVOLTAGE PROTECTION IN RAILWAY NETWORKS

**Kumwell KZ.ISG100-RW** is a voltage limiter 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. In case of overvoltage, KZ.ISG100-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. All overvoltage generated by lightning are effectively limited by internal construction of KZ.ISG100-RW.



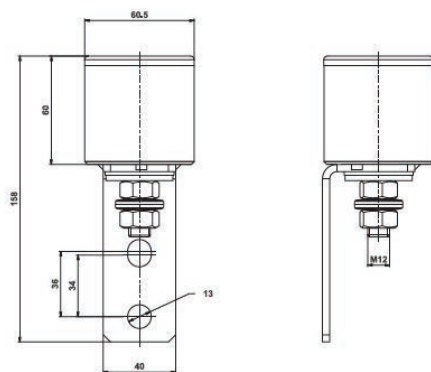
### High Power GDT For Overvoltage protection in railway networks

#### Technical Data

#### KZ.ISG100-RW

Examinations according to		IEC 61643-11, EN 50122-1
DC-Sparkover voltage		300 to 500 V DC*
AC-Sparkover voltage		> 250 V <sub>rms</sub>
Impulse sparkover voltage at 5 kV/μs - for 99% of measured values (wave 1.2/50 μs, 6 kV)		< 1200 V
Max. impulse discharge current (8/20)	$I_{max}$	200 kA
Nominal impulse discharge current (8/20)	$I_n$	100 kA
Max. lightning impulse current (10/350)	$I_{imp}$	150 kA
– Charge	Q	75 As
– Specific energy	W/R	5500 kJ/Ω
Rated withstand current		up to 8 kA <sub>rms</sub> / 100 ms (AC-mode) up to 20 kA <sub>rms</sub> / 30 ms (DC-mode)
Behaviour after substantial overloading		internal short circuit inside KZ.ISG100-RW body
Insulation resistance at 100 V DC	$R_i$	> 1 GΩ
Capacitance at 1 MHz	C	< 5 pF
Protection type		IP66
Operating temperature range	θ	-40°C to + 90°C

Dimensions



\* Special KZ.ISG100-RW for 200-300 V DC is available on demand.



**Kumwell KLSC-01** is intended for counting and recording a surge impulses which are caused by lightning strikes that flow through the lightning protection systems.

KLSC-01 is mounted direct on lightning down conductor. The current withstand of this lightning strikes counter is 100 kA (10/350). By connecting the device to the protective system 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.



- LCD Screen that shows number of lightning strikes, hour and date of lightning event
- Button for TIME/DATE setting and log viewing
- Replacable battery, working life minimum 5 years
- Contactless sensors-easy to install, no change in existing installation needed

IP65

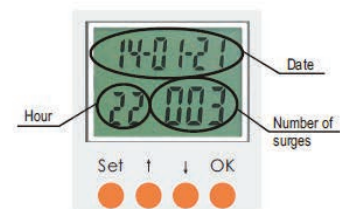
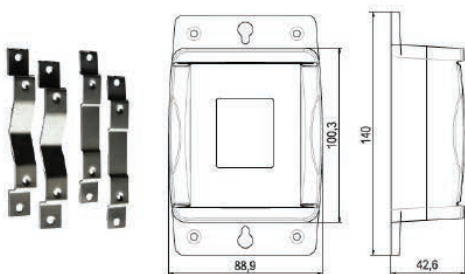
### Lightning Strike Counter

#### Technical Data

#### KLSC-01

Threshold Current (8/20 $\mu$ s)	$I_{tc}$	1 kA
Max. withstand current (10/350 $\mu$ s)	$I_{MCW}$	100 kA
Number of events logged		up to 999
Temperature range		-20°C to + 60°C
Degree of protection		IP65
Housing material		Polycarbonate
Mounting		Round of flat down conductor
Standards		IEC/EN 62561-6

Dimensions



**Kumwell KSC-I50A50** is a surge counter with an extra function. Beside surge number count it also logs hour and date for each surge counted. Its surge count and log of previous surges cannot be tempered with, so it can be used for cooperation with insurance companies. With additional time and date logging function, it is now possible to pinpoint the exact time of every surge and correlate it with equipment and power supply problems inside of building.

- LCD screen that shows number of surges, hour and date of surge event
- Button for TIME/DATE setting and log viewing
- Replacable battery, battery life minimum 4 years
- Easy to install, Snap-on surge current sensor
- Complies with: IEC/EN 62561-6, 61326-1



**IP  
20**

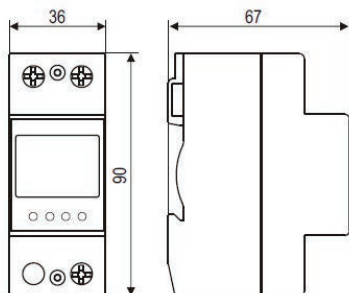
### Surge Counter

#### Technical Data

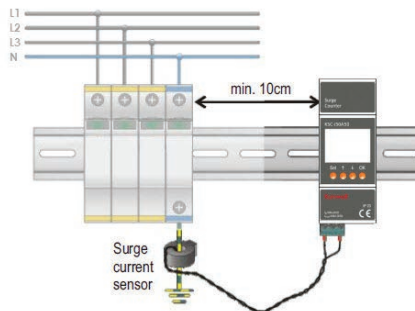
#### KSC-I50A50

Threshold Current (8/20 $\mu$ s)	$I_{tc}$	50 A
Max. counting discharge current (8/20 $\mu$ s)	$I_{MCW}$	50 kA
Number of events logged		up to 999
Operating temperature range		-20°C to + 70°C
Degree of protection		IP20
Housing material		Thermoplastic; extinguishing degree UL 94 V-0
Mounting		DIN rail 35mm, EN 60715
Replacable battery (CR123A)		4 years
Max.wired diameter through the current sensor		14 mm
Sensor cable		0.5 m
Standards		IEC/EN 62561-6

Dimensions



Application example



**Kumwell** KSC-I100K-RS485 surge counter is designed for counting the number of current discharged by surge protective devices to earth and applied in the distribution box with external lightning current sensor. The number of impulse counter recorded could be communicate with PC with RS485 communication function.

- Be able to detect lightning occurrence number
- With RS485 communication function, could be communicate with PC
- Easy to install, Snap-on surge current sensor



IP  
20

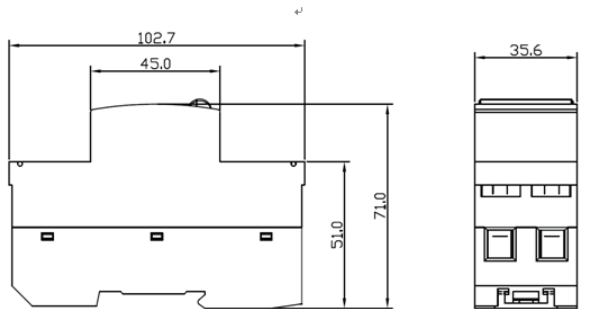
### Surge Counter with RS485 communication function

#### Technical Data

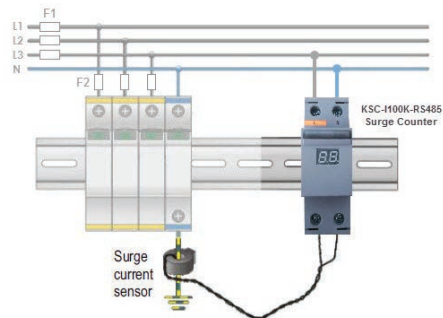
#### KSC-I100K-RS485

Rated operating voltage		85-265 V AC
Threshold current (8/20 $\mu$ s)	$I_{tc}$	1 kA
Max. counting discharge current (8/20 $\mu$ s)	$I_{MCW}$	100 kA
Indicator		2-Digit 7-Segment Display Counter (0-99)
Operating temperature range		-25°C to + 80°C
Degree of protection		IP20
Housing material		Thermoplastic; extinguishing degree UL94 V-0
Mounting		DIN rail 35mm
Wiring terminal		Screw
Communication		RS485
Standards		IEC 61643-11:2011

Dimensions



Application example



> TOV Immunity SPD

4

Kumwell KSB.BR25\* series of overvoltage surge protective device have been apply to protect against partial direct and indirect lightning discharges and are intended to provide protection in zone 0<sub>A</sub>-2 according to IEC 62305

KSB.BR25\* SPD is used in industrial installations such as transformers, the main switchboards of large industrial buildings. It is also suitable for applications in unmeasured parts of electrical installation and all in one protection from overvoltages, surges and transients in accordance to IEC/EN 61643-11

Network System : TT, TN-S

Protection mode : L-N, N-PE

Feature : High TOV Immunity

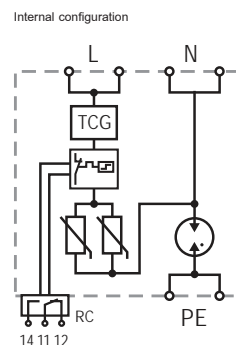
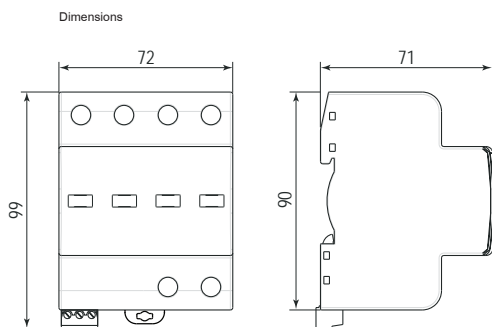
Leakage current : No leakage current

Complies with : IEC/EN 61643-11



## High energy MOV and GDT

Technical data		KSB.BR25-U275.ds-1/1	KSB.BR25-U440.ds-1/1
Max. continuous operating voltage	$U_c$ (L-N) $U_c$ (N-PE)	275 V AC	440 V AC
Nominal discharge current (8/20 $\mu$ s)	$I_n$ (L-N/N-PE)	25 kA/50 kA	25 kA/50 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$ (L-N/N-PE)	100 kA/100 kA	100 kA/100 kA
Lightning impulse current (10/350 $\mu$ s)	$I_{imp}$ (L-N/N-PE)	25 kA/50 kA	25 kA/50 kA
Total lightning impulse current (10/350 $\mu$ s)	$I_{total}$	50 kA	50 kA
Specific Energy	W/R	156 kJ/ $\Omega$ / 625 kJ/ $\Omega$	156 kJ/ $\Omega$ / 625 kJ/ $\Omega$
Charge	Q	12.5 As/25 As	12.5 As/25 As
Voltage protection level	$U_p$ (L-N) $U_p$ (N-PE)	< 1.5 kV	< 1.9 kV
Follow current Interrupt Rating	$I_{fi}$	100 A <sub>rms</sub>	100 A <sub>rms</sub>
Response time	$t_A$ (L-N/N-PE)	< 25 ns/< 100 ns	< 25 ns/< 100 ns
Back-Up Fuse (if mains > 250 A)		250 A gL/gG	250 A gL/gG
Short-Circuit Current Rating (AC)	$I_{SCCR}$	50 kA	50 kA
TOV withstand 5s	$U_T$ (L-N)	438 V AC	585 V AC
TOV withstand 200ms	$U_T$ (N-PE)	1200 V / 300 A	1200 V / 300 A
Temperature range	$\vartheta$	- 40°C to + 80°C	- 40°C to + 80°C
Conductor Cross Section (max)		35mm <sup>2</sup> (solid) / 25mm <sup>2</sup> (stranded)	35mm <sup>2</sup> (solid) / 25mm <sup>2</sup> (stranded)
Mounting		DIN rail 35mm	DIN rail 35mm
Degree of protection		IP 20	IP 20
Thermal Protection	(L-N)/(N-PE)	Yes/No	Yes/No
Fault Indication	(L-N)/(N-PE)	Red flag/No	Red flag/No
Remote contact		Yes	Yes



CLASS I, II (TYPE 1, 2)  
HIGH TOV IMMUNITY  
HIGH ENERGY MOV AND GDT  
3 PHASE NETWORK SYSTEM (3+0)

Kumwell KSB.BR25 series of overvoltage surge protective device have been apply to protect against partial direct and indirect lightning discharges and are intended to provide protection in zone 0<sub>A</sub>-2 according to IEC 62305

KSB.BR25 SPD is used in industrial installations such as transformers , the main switchboards of large industrial buildings. It is also suitable for applications in unmeasured parts of electrical installation and all in one protection from overvoltages, surges and transients in accordance to IEC/EN 61643-11



Network System : TN-C

Protection mode : L-PEN

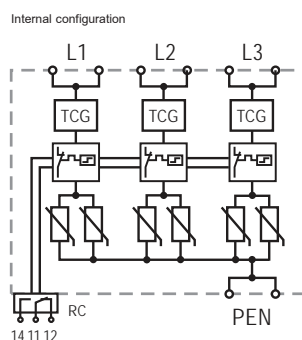
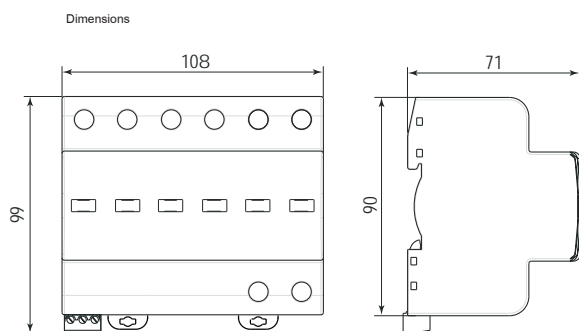
Feature : High TOV Immunity

Leakage current : No leakage current

Complies with : IEC/EN 61643-11

## High Energy MOV and GDT

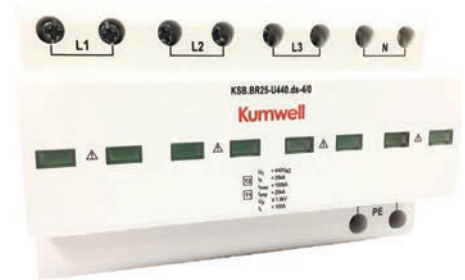
Technical data		KSB.BR25-U275.ds-3/0	KSB.BR25-U440.ds-3/0
Max. continuous operating voltage	$U_C$	275 V AC	440 V AC
Nominal discharge current (8/20 $\mu$ s)	$I_n$		25 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		100 kA
Lightning impulse current (10/350 $\mu$ s)	$I_{imp}$		25 kA
Total lightning impulse current (10/350 $\mu$ s)	$I_{total}$		75 kA
Specific Energy	W/R		156 kJ/ $\Omega$
Charge	Q		12.5 As
Voltage protection level	$U_P$	< 1.5 kV	< 1.9 kV
Response time	$t_A$		< 25 ns
Back-Up Fuse (if mains > 250 A)			250 A gL/gG
Short-Circuit Current Rating (AC)	$I_{SCCR}$		50 kA
TOV withstand 5s	$U_T$	438 V	585 V
Temperature range	$\vartheta$	- 40°C to + 85°C	
Conductor Cross Section (max)		35mm <sup>2</sup> (solid) / 25mm <sup>2</sup> (stranded)	
Mounting		DIN rail 35mm	
Degree of protection		IP20	
Housing material		Thermoplastic	
Thermal Protection		Yes	
Fault Indication		Red flag	
Remote contact		Yes	



**CLASS I, II (TYPE 1, 2)  
HIGH TOV IMMUNITY  
HIGH ENERGY MOV AND GDT  
3 PHASE NETWORK SYSTEM (4+0)**

Kumwell KSB.BR25 series of overvoltage surge protective device have been apply to protect against partial direct and indirect lightning discharges and are intended to provide protection in zone 0<sub>A</sub>-2 according to IEC 62305

KSB.BR25 SPD is used in industrial installations such as transformers, the main switchboards of large industrial buildings. It is also suitable for applications in unmeasured parts of electrical installation and all in one protection from overvoltages, surges and transients in accordance to IEC/EN 61643-11



Network System : TN-S

Protection mode : L-PE, N-PE

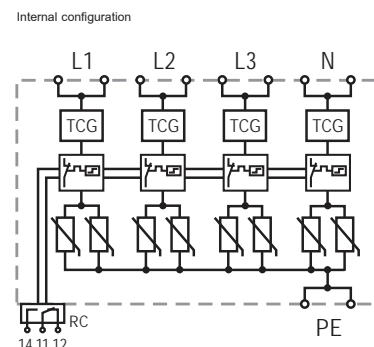
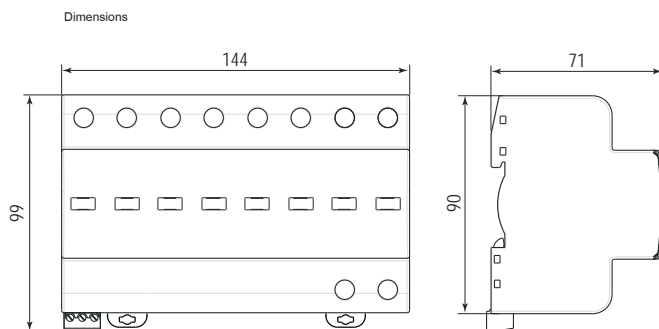
Safety : TOV immunity

Leakage current : No leakage current

Complies with : IEC/EN 61643-11

## High Energy MOV and GDT

Technical data		KSB.BR25-U275.ds-4/0	KSB.BR25-U440.ds-4/0
Max. continuous operating voltage	$U_C$	275 V AC	440 V AC
Nominal discharge current (8/20 $\mu$ s)	$I_n$		25 kA
Max. discharge current (8/20 $\mu$ s)	$I_{max}$		100 kA
Lightning impulse current (10/350 $\mu$ s)	$I_{imp}$		25 kA
Total lightning impulse current (10/350 $\mu$ s)	$I_{total}$		100 kA
Specific Energy	W/R		156 kJ/ $\Omega$
Charge	Q		12.5 As
Voltage protection level	$U_P$	< 1.5 kV	< 1.9 kV
Response time	$t_A$		< 25 ns
Back-Up Fuse (if mains > 250 A)			250 A gL/gG
Short-Circuit Current Rating (AC)	$I_{SCCR}$		50 kA
TOV withstand 5s	$U_T$	438 V	585 V
Temperature range	$\vartheta$	- 40°C to + 85°C	
Conductor Cross Section (max)		35mm <sup>2</sup> (solid) / 25mm <sup>2</sup> (stranded)	
Mounting		DIN rail 35mm	
Degree of protection		IP20	
Housing material		Thermoplastic	
Thermal Protection		Yes	
Fault Indication		Red flag	
Remote contact		Yes	



## **> Smart SPD Online Monitoring Devices**

**5**

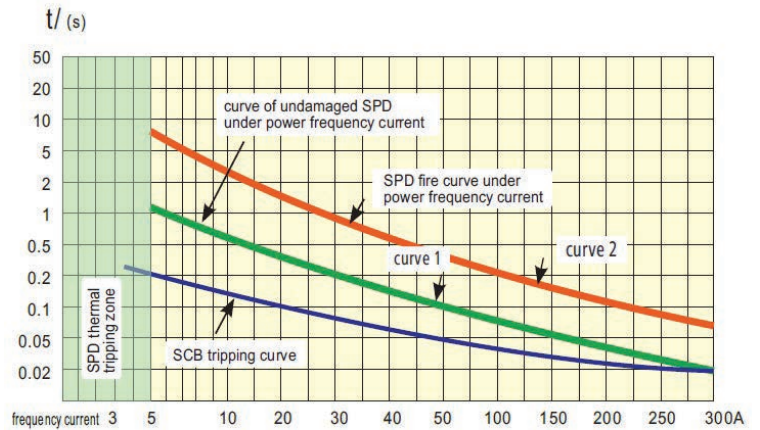
- > SCB-SPD Circuit Breaker**
- > SCB with Automatic Recloser**
- > Integrated Online Smart SPD**
- > Centralized Controller**



**Kumwell SCB**, exclusive SPD external disconnecter solves the fire problem caused by SPD degradation and power grid failure. It can avoid SPD external disconnecter tripping mistakenly under lightning stroke, thus keeping lightning protection performance. It solves protection blind problem that fuses and MCBs are used as external disconnecter. It has become the ideal matching component for SPD.

Characteristics :

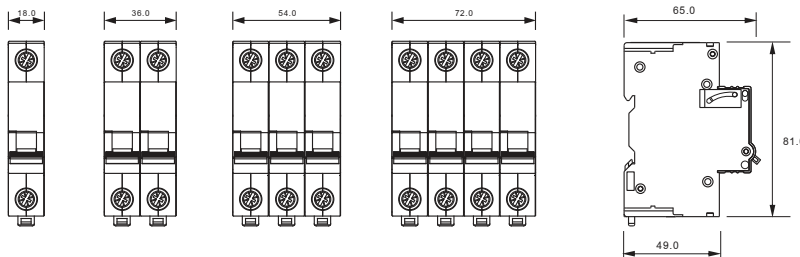
- Trip under 3A power frequency current
- No tripping and damage under surge current to guarantee continuous lightning protection
- Low residual voltage (Up value of SCB is very low, almost equal to fuse)
- Rated short circuit current up to 100 kA ( $I_{CS}$ )



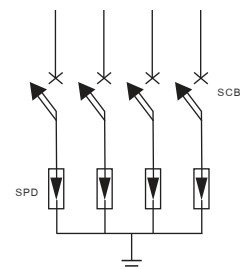
### Specifications

Product Series	Product model	Surge withstanding	Short circuit breaking capacity	Tripping value under power frequency	Pole
SCB	SCB-C15K1	15 kA (10/350 $\mu$ s)	50 kA	3 $\pm$ 1A	1P 2P 3P 4P
	SCB-C15K2	80 kA (8/20 $\mu$ s)	100 kA		
	SCB-C25K1	25 kA (10/350 $\mu$ s)	50 kA		
	SCB-C25K2	100 kA (8/20 $\mu$ s)	100 kA		
	SCB-80K1	80 kA (8/20 $\mu$ s)	20 kA		
	SCB-80K2		35 kA		
	SCB-60K1	60 kA (8/20 $\mu$ s)	6 kA		
	SCB-60K2		20 kA		

#### Product Dimension



#### Design Application



When SPD external disconnecter trips, electrical equipment will lose lightning protection. SCB with automatic recloser is suitable to be applied in distribution boards in the unmanned data center rooms, super high construction, large square, fire control, substation, etc. If SCB trips, automatic recloser will reclose automatically to guarantee continuous lightning protection.

Characteristics :

- With safe switch, more safe in manual operation
- Manual / automatic switch, more convenient in local maintenance
- Product with small shape and high stability
- Dry contact to remotely control reclosing, RS485 bus communication and alarm when failure



AR.TA2 & SCB (1P)



AR.TA2 & SCB (2P)



AR.TA3 & SCB (3P)

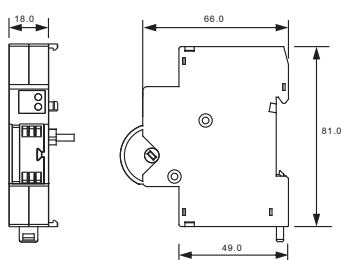


AR.TA2 & SCB (4P)

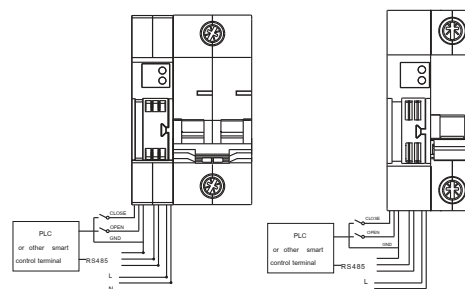
### Specifications

Model	AR.TA2	AR.TA3
Width	18 mm	36 mm
Operating voltage	AC100/230V 50/60 Hz	AC100/230V 50/60 Hz
Reclosing delay time(s)	5S	5S
Mechanical life	20000 times	10000 times
Remote control reclosing	≤ 3s	≤ 3s
Continuous reclosing number	3 times	3 times
EMC degree	IV	IV
Protection degree	IP20	IP20
Display	LED display (Optional)	LED display (Optional)
Operating temperature	-25°C to +60°C	-25°C to +60°C
Storage temperature	-40°C to +80°C	-40°C to +80°C
Humidity	≤ 90%RH	≤ 90%RH
Matched with	RCD (single phase) or SCB	RCD (single phase) or SCB
<b>Communication interface</b>		
Remote dry contact communication distance cable	≤ 500m@1.5mm <sup>2</sup> RVPP communication cable	≤ 500m@1.5mm <sup>2</sup> RVPP communication cable
RS485 bus control length cable	≤ 1000m@1.5mm <sup>2</sup> RVPP communication cable	≤ 1000m@1.5mm <sup>2</sup> RVPP communication cable

#### Product Dimension



#### Installation



**Kumwell** Integrated online smart SPD is the patent product and is able to detect microamps leakage current of SPD in the real time. it can detect itself status, collect data automatically and report actively. Integrated smart SPD adopts standard RS485 and it can be applied in the power distribution of railway, airport, electricity, petrochemicals, new energy, communication etc.

**Characteristics :**

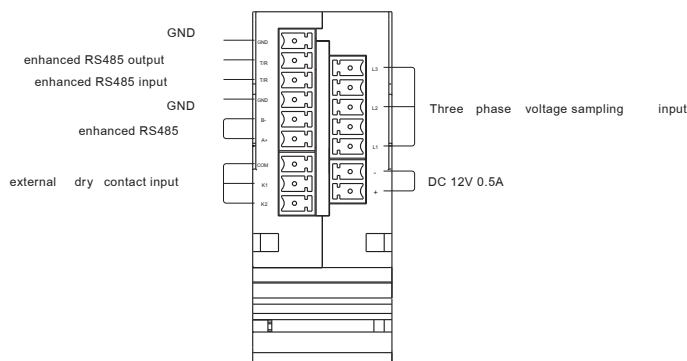
- CT sensor make it possible to detect 1μA level of SPD pure resistance leakage current
- Adopting reverse insertion technology and sophisticated mathematical model to gain real leakage current
- Built-in sensor to detect lightning peak current, polarity, number and time
- Monitoring lightning protection module status to judge it is normal or abnormal
- Monitoring SPD external disconnecter status
- Monitoring operating voltage and ambient temperature
- Flexible network, convenient for network monitoring and alarm within seconds
- Integrated small structure, no need to secondary wiring



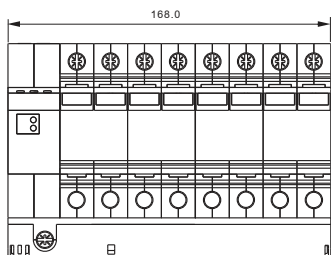
KA150BE1L	Class I
KA60E1L	Class II
KA40E1L	Class II
KA20E1L	Class II
KA10E1L	Class III

Specifications								
Product Name	Product model	$I_{imp}$	$I_n$	$U_c$	$U_p$	Lightning current triggering record value	Maximum record current	Leakage measuring accuracy
Integrated online smart SPD	KA150BE1L	15 kA	80 kA	440 V	$\leq 2.3$ kV	1 kA	100 kA	1 μA
	KA60E1L	/	60 kA	385 V	$\leq 2.3$ kV			
	KA40E1L	/	40 kA	385 V	$\leq 2.1$ kV			
	KA20E1L	/	20 kA	385 V	$\leq 1.8$ kV			
	KA10E1L	/	10 kA	320 V	$\leq 1.2$ kV			

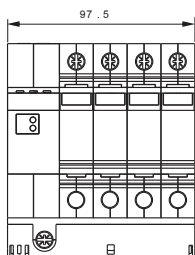
**Product Structure**



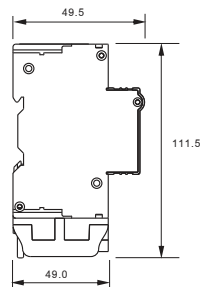
### Product Dimension



Class I



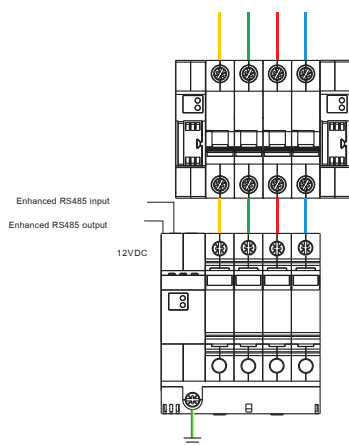
Class II or Class III



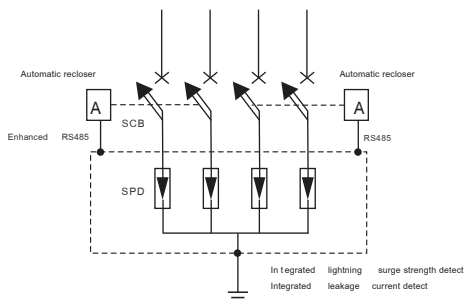
SPD

+

### Wiring



### Design Application



SMART MODULE

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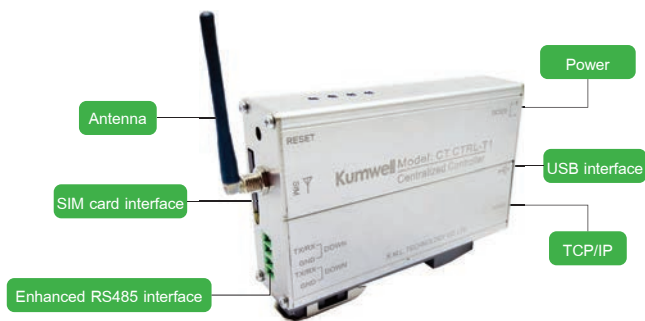
MICROAMPERE LEAKAGE CURRENT  
DETECTING MODULE  
LIGHTNING SURGE STRENGTH  
DETECTING MODULE

**Kumwell CT.CTRL-T1** (Centralized Controller) is the core part of smart SPD systems, centralized controller collects and transmits data to the computer via TCP/IP, GPRS or enhanced RS485.

Characteristics :

- Managing multi-circuit device
- Adopting enhance RS485 (Bidirection communication) communication
- Strong anti-interference ability (max. transmission length : 1000m)
- Master-slave communication with quick data transmission
- Report actively in the real-time

Product Structure



RS485, TCP/IP  
Centralized Controller



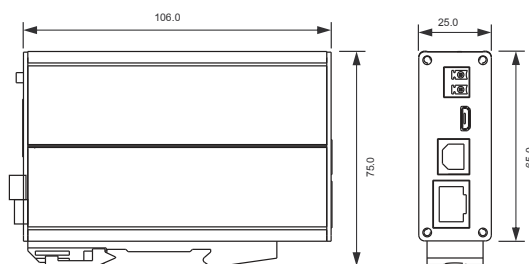
GPRS  
Centralized Controller

## Specifications

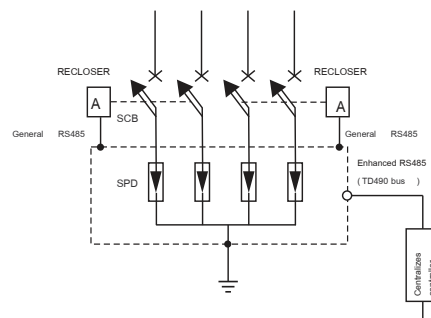
### Technical data

Power supply	12V DC
Communication method	TCP/IP, enhance RS485, GPRS
GSM GPRS	no limit distance
Ethernet TCP/IP	no limit distance
RS485 transmission distance	1000m

### Product Dimension



### Installation



# WORLD CLASS QUALITY



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