



SPD Surge Protective Device

Product Catalog 2023

Vision & Mission

A lightning strike or lightning bolt is a natural disaster that can cause enormous damage to our lives, properties, buildings, and various operating systems. As our world today is a modern society in adopting and integrating information and communication technologies at home, we need stability and high security to the electronics system which can prevent lightning strikes and electromagnetic waves that pose a threat to the operating system.

Vision

**Leader in Total Solution in Lightning Protection System and Safety Innovation
with the Strongest Global Brand and Sustainable Growth.**

Mission

- Create value of products and services to ensure customer satisfaction.
- Research and develop innovation to meet the market demand.
- Create soft power engagement by using sustainable goals with stakeholders under the Safety to Society – CSV (Creating Shared Value) project.
- Develop a management system toward high-performance organization.
- Support human assets by creating learning culture for lifelong learning.

Kumwell Corporation Public Company Limited operates as a manufacturer and distributor of Grounding systems such as ground rod, exothermic welding, more effective grounding (MEG), concrete inspection pit, etc. Lightning system such as air terminal, clamp connections, etc. Surge protection system, Lightning detection and warning system, and safety innovation. We have reached the national and international standards to serve security for people's lives, assets and operating systems in all sectors, especially in the electricity sector (generating system, transmission system, distribution system, solar power plant wind power plants, etc.), the transportation sector (high-speed trains, electric trains, subways, airports, ports, expressways, expressways, etc.), the telecommunication sector (radio stations, television stations, mobile phone transmission station, data center, etc.) industrial sector (Petrochemical plant oil refinery steel mills, automobiles, electronics, farms, etc.), office, residential sectors including the security sector (arsenals, radar stations, etc.) We are proud to introduce our innovations to reduce the risk of electromagnetic and lightning damage under the name "Kumwell" guarantee from 40 countries around the world exportation and distribution.

Quality Assurance

We are committed to providing high-quality products which is an important element to the efficient and effective system work. There are product policies that have to be tested and certified according to international standards UL, IEEE, IEC and Thai Industrial Standards (TIS), especially products in lightning protection systems; it must comply with the international standard IEC 62561, which can be divided into 8 sections according to the type of products.

1. Requirements for connection components
2. Requirements for conductors and earth electrodes
3. Requirements for isolating spark gaps (ISG)
4. Requirements for conductor fasteners
5. Requirements for earth electrode inspection housings and earth electrode seals
6. Requirements for lightning strike counters (LSC)
7. Requirements for earthing enhancing compounds
8. Requirements for components for isolated LPS



ISO/IEC 17025-2017
(Certificate Laboratory Accreditation)



Kumwell Test Report
(IEC 62561)



DEKRA Test Certificate
(IEC 62561)



VDE Test Certificate
(IEC 61643)



UL Test Certificate
(UL 467, UL 486)



UL Inspection Type R Service Report
(For UL Listed)

The company is concerned for every step starting with the design (Pattern and production process), the right material, mechanical strength and lightning resistance test as well as being resistant to weather conditions. We take into consideration the safety of people when installing and using our product. For example, Kumwell Metal Sheet Clamp has been tested according to the IEC 62561-4 standard with a tensile test which is 900 newtons, equivalent to a weight of 90 kilograms in order to be able to support the weight of the conductor on the roof, preventing damage to life and property also it prevents accidents that may occur during installation to operators as well. Therefore, to choose products that have been tested according to standards, is a prerequisite for effective lightning protection.

To comply with the standards in order to deliver quality products, the company therefore constructed a testing laboratory (Kumwell Laboratory), as a testing room for grounding equipment, lightning protection device, surge protection device and lightning alarm devices which was completed in 2013. Our laboratory is the one and only in Southeast Asia and has been accredited for the competence of the testing laboratory according to TIS 17025 – 2561 (ISO/IEC 17025: 2017) for the general requirements in the competence of testing and calibration laboratories in the electrical field, which is recognized by the ILAC organization (International Laboratory Accreditation Cooperation) in equivalent academic ability and able to perform tests by issuing a product test certificate (Test Report) to certify that Kumwell only provide high quality products.

Quality Assurance

Kumwell Laboratory can perform tests according to IEC 62561 and TIS 3024 standards such as Tensile Test, Electrical Resistivity Test, Load Test, Bending Test, Lightning Impulse Current / Surge Current, Environmental Test. Moreover, it is able to test equipment according to various standards such as UL 467: Grounding and Bonding Equipment, IEC 61643: Low-Voltages Surge Protective Device (SPD).



High Lightning Impulse Current Generator
10/350 μ s & 8/20 μ s



High Lightning Impulse Current
Combine Generator 8/20 μ s



TEMPERATURE (HUMIDITY) Test Chamber



SULFUR DIOXIDE Test Chamber



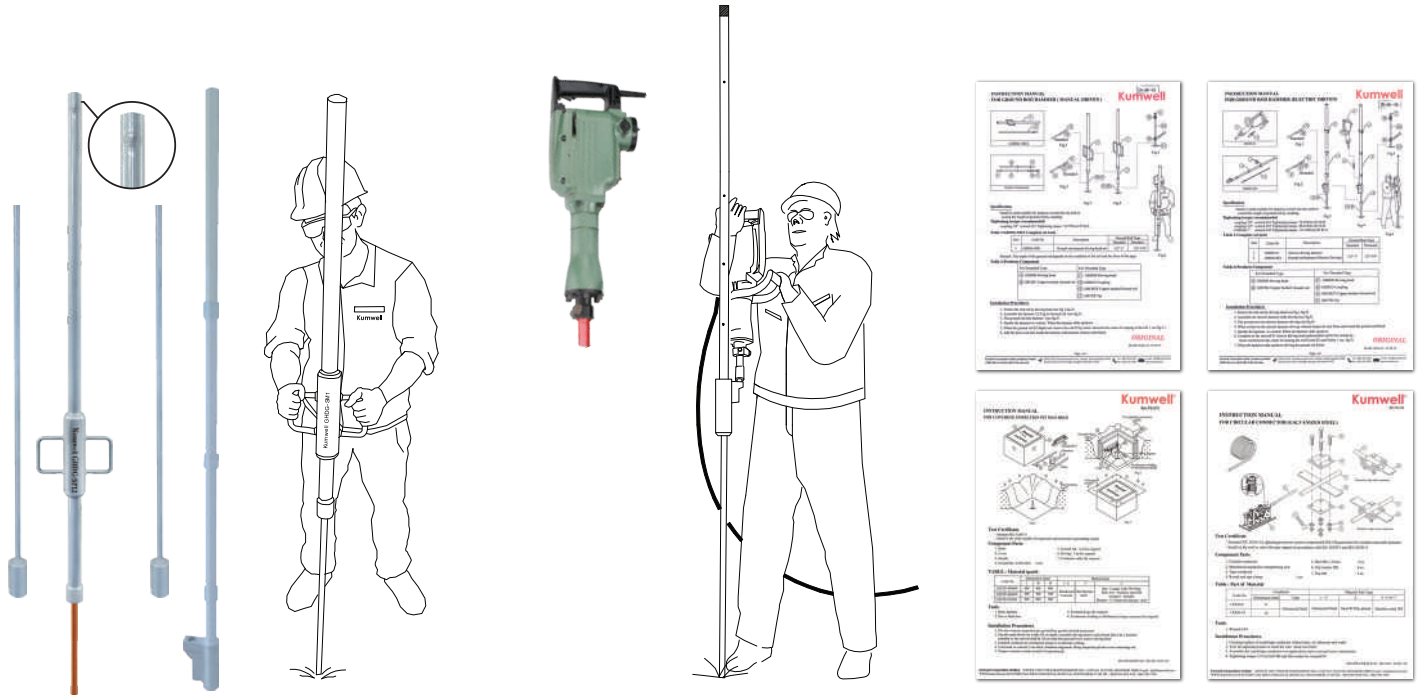
SALT SPRAY Test Chamber

- High lightning impulse current generator for Grounding system component & Lightning protection system components (LPSC) according to IEC 62561.
- Surge impulse current generator for Surge protective device (SPD) according to IEC 61643.
- Environment test chamber (Temperature / Humidity / Sulphur dioxide / Salt spray) for Grounding system component & LPSC according to IEC 62561.
- Universal mechanical testing machine (Tensile / Compressive) for Grounding system component & LPSC according to IEC 62561.

Quality Assurance

In addition, we intend to deliver high-quality system work that is user-friendly and worth the investment besides we create a system that is efficient and completely safe.

- **TOOLS & INSTRUCTION:** Develop products and installation tools that are easy to install such as ground rod driving hammer, conductor strengthener machines, 4P concrete inspection pits, etc.



- **INSTALL & DESIGN GUIDE:** Provide manuals and installation guides through various channels such as seminars to deliver knowledge; the Kumwell Metaverse Academy, Youtube Channel: Kumwell Official, on Facebook Page: Kumwell Official and Kumwell Brand, etc.

วันที่	หัวข้อ	เวลา
26 มกราคม	การออกแบบระบบสายดิน และการติดตั้งอุปกรณ์ ตามมาตรฐาน IEC 60324	09:00-16:30 น.
23 กุมภาพันธ์	การออกแบบระบบการต่อลงดิน (Grounding System Design)	09:00-16:30 น.
30 มีนาคม	การออกแบบระบบป้องกันแรงดันเกิน และการติดตั้ง SPD ตามมาตรฐาน IEC 61643	09:00-16:30 น.
27 เมษายน	การประเมินความเสียหายของสายดินตามมาตรฐาน IEC 62305-2	09:00-16:30 น.
25 พฤษภาคม	การออกแบบระบบป้องกันไฟสวิตช์ และการติดตั้ง SPD ตามมาตรฐาน IEC 61643	09:00-16:30 น.
29 มิถุนายน	การออกแบบระบบป้องกันแรงดันเกิน สำหรับสถานีไฟฟ้า (Substation Grounding Design according to IEEE 80)	09:00-16:30 น.
27 กรกฎาคม	การออกแบบระบบป้องกันฟ้าผ่า สำหรับอาคารโครงสร้างสูงและกรณีพิเศษ ตามมาตรฐาน IEC 60324	09:00-16:30 น.
31 สิงหาคม	ความจำเป็นในการเพิ่มประสิทธิภาพ (EMC) ที่ระบบป้องกัน	09:00-16:30 น.
28 กันยายน	การออกแบบระบบสายดิน และการติดตั้งอุปกรณ์ ตามมาตรฐาน IEC 60324	09:00-16:30 น.
26 ตุลาคม	การออกแบบระบบป้องกันแรงดันเกิน และการติดตั้ง SPD ตามมาตรฐาน IEC 61643	09:00-16:30 น.
30 พฤศจิกายน	การออกแบบระบบป้องกันฟ้าผ่า และการติดตั้งอุปกรณ์ ตามมาตรฐาน IEC 60324	09:00-16:30 น.
21 ธันวาคม	การออกแบบระบบสายดิน และการติดตั้งอุปกรณ์ ตามมาตรฐาน IEC 60324	09:00-16:30 น.

Innovation

Kumwell committed to research and development of products and innovations continuously and also creating collaborations with networks, partners and customers leading to the trial use and proven Technology.

Smart Lightning Management System (SLMS)

It is a smart innovation that can monitor the overall working status of the lightning protection system, the grounding system and the surge protection system. It can provide instant warning of threats from lightning and various electromagnetic fields to ensure the safety in life, working areas and public areas and to reduce damage.

The information will be report via Web User Interface (Client) and will be sent to the controller or central control system so it can be analyzed, examined, evaluated in order to formulate proactive maintenance measures and methods for the lightning protection system to be in perfect condition and ready to use at all times which have already been sold and installed for actual use, such as

- PTT Stadium
- PTT gas control station
- Srinagarind Dam (Characteristics of Dam & Power Plant)
- Joint research project with Electricity Generating Authority of Thailand Ubol Ratana Dam, Khon Kaen Province



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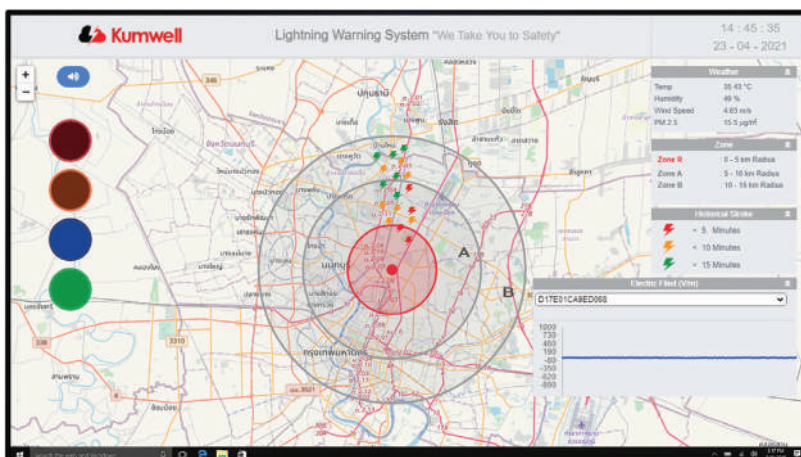
Innovation

Smart Lightning Warning System (SLWS)

The company has invested in lightning detection networks throughout Thailand and some parts of the ASEAN region and has researched, developed an outstanding lightning alarm innovation until being widely accepted.

Lightning detection network is a system that uses data from two types of IOT Sensors (High-Precision Lightning Detection Network System and E-Field Sensor). They are analyzed and processed together via the intelligent Alarm Viewer Software to alert with more than 95% accuracy. It is suitable for different types of projects in the field such as golf courses, power plants, oil refineries, mine area, airport, port, amusement park, school, etc., which has already been sold and installed for actual use, such as

- Bangkok Patana School
- PTT Stadium
- PTT Global Chemical (PTTGC)
- International School Ho Chi Minh City (ISHCMC)
- Joint research project with Electricity Generating Authority of Thailand Ubol Ratana Dam, Khon Kaen Province



Moving Forward

The company has established a process for business operations by taking into an account the whole working process to become a smart plant. Our aim is to expand business and reduce production costs, so we invested in developing factories. To become an unmanned plant, we use automation and robots in the process of production as well as improving and developing logistics systems to be Smart Logistic and applying the United Nations Global Compact (UNGC) and Bio Circular Green (BCG) model as a guideline for management. The company also installed solar power generation systems, wastewater treatment systems to reduce CO₂ and become a green industry (Green Industry).



Our new modern head office consists of sales and marketing, Research and Innovation, Department, Finance and Accounting, Warehouse Administration, Information and Communication Technology Department, Learning Center "Kumwell Metaverse Academy", Lightning Protection Testing Laboratory which complied the ISO/IEC 17025 and the Electromagnetic Compatibility (EMC) Testing Laboratory to make the testing practice more comprehensive and to strengthen the value of the organization's learning culture. The company has allocated space for exchanging information, knowledge, and brainstorming. We committed to a smart office that uses state-of-the-art ICT systems and stores important corporate assets in the Cloud for data security and to support the operations of employees in all forms and in all departments, such as operations outside the office, both domestically and internationally covering foreigners both short-term and long-term to support working from anywhere.

Awards

Best Company Performance Awards by the Stock Exchange of Thailand (SET) is an award given to listed companies with excellent performance in each group based on business performance, good corporate governance and compliance with the regulations of the Stock Exchange of Thailand. Kumwell received the Best Company Performance Awards in the category of Business Excellence for information disclosure and quality of financial statements and Sustainability Excellence in the Thai capital market's prestigious awards ceremony 2022 (SET Awards 2022) which emphasizes the strength of policies and effective business practices.



Best CEO Awards

Best Company Performance Awards

Sustainability



E: Environmental

- Invest in Solar Power, a clean alternative energy source instead of using thermal energy from gas which can cause greenhouse gasses.
- Invested in a Zero Liquid Discharge wastewater treatment system to eliminate effluents and reuse water from industrial processes.

S: Social

- Collaborate with the Council of Engineers to deliver knowledge and expertise on electromagnetic disaster risk reduction under Kumwell Academy.
- Create activities to deliver knowledge and help strengthen local economy such as the policy to employ people in the community nearby, organize training and practice financial management knowledge with Noburo, etc.

G: Governance

- To emphasize the efficient and effective in corporate governance practices of the company;
- Received prestigious SET Awards 2022
 - Setting up a sustainability, a risk management, and a good corporate governance committee, etc.






ESG risk consists of 3 aspects: environmental, social and governance. The company sets goals and action plans in each aspect for example;



SDGs - Sustainable Development Goals

There are 17 goals, divided into 5 dimensions: the environment dimension (planet), the social dimension (people), the economic dimension (prosperity), the Peace and institute dimension (Peace), and the development partnership dimension (Partnership). Our company has set goals and dimensions as follows: Planet dimension – 13th goal: Climate Action

- 
Planet dimension 13th goal: Climate Action
 - Propose solutions for disasters caused by electromagnetic waves such as lightning under 3rd approach: CSV.
- 
Prosperity dimension 11th goal: Sustainable cities and communities
 - MOU with various agencies in Research and development to create safety innovations for reducing disasters caused by electromagnetic waves.
- 
People dimension 4th goal: Quality Education
 - Kumwell has developed the value of human assets, both corporate inside and outside

Sustainability

CSV - Creating Shared Value is a way to drive value to society and business sector to achieve stable and sustainable growth. Kumwell has operated through the sustainability commitment "CSV - Safety to Society" project for more than 10 years in delivering knowledge and expertise to reduce life, property, and operating systems in all sectors damage and extending to cooperation with partners networks and clients such as



- Collaborate with the Council of Engineers under the project Kumwell Academy to upgrade the engineering profession and deliver safety to society.
- Sign a Memorandum of Understanding (MOU) with government and private agencies on lightning protection and safety innovations. In the test installation and create innovation to increase efficiency and effectiveness in the operating system. Reduce the risk of electromagnetic waves. Along with certifying the use of products (Proven Technology).



- Join the education sector to create an Engineering curriculum, system design handbook, and installation guide.

- Collaborate with the Thai Electrical and Mechanical Contractors Association (TEMCA) to implement a project "TEMCA Corporate Creating Shared Value (TEMCA C CSV)".



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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 μs and a time to half-value of 350 μs

8/20 current impulse

Current impulse with a virtual front time of 8 μs and a time to half-value of 20 μs

1.2/50 voltage impulse

Voltage impulse with a virtual front time of 1.2 μs and a time to half-value of 50 μs

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 Ω ; it is equal to the time integral of the square of the current; expressed in kJ/Ω or in kA^2s .

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

Charge Q

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

$$Q = \int i dt$$

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

I_{max} (for class II test)

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 ϑ

An extent of the allowed surrounding temperatures, where manufacturer guarantees the right operating SPD.

Response time t_A

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

Insertion loss

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

SPD disconnector

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 μ 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 Ω 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

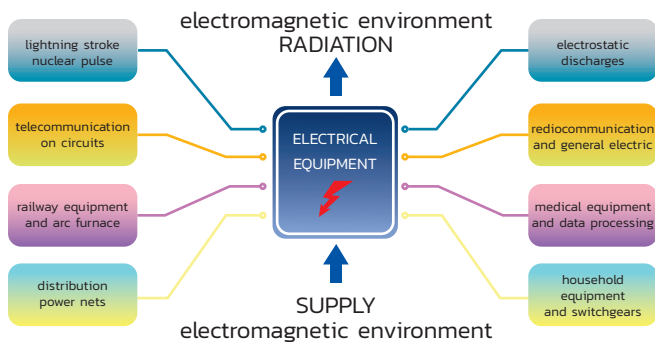
Contact included in a circuit separate from the main circuit of an SPD, and linked to a disconnecter or status indicator

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
Q	Charge (of impulse current)
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
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 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 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

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

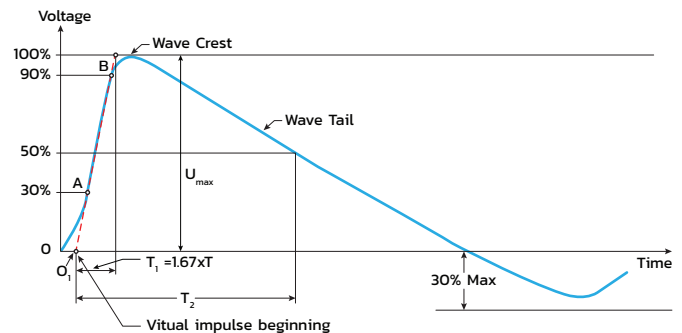
Tail of impulse

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

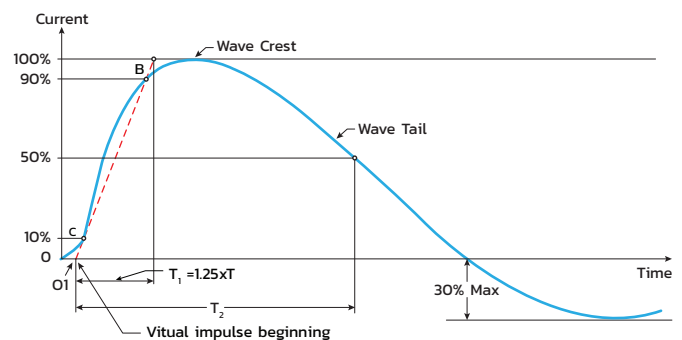
Time to half-value T_2

- 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.



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

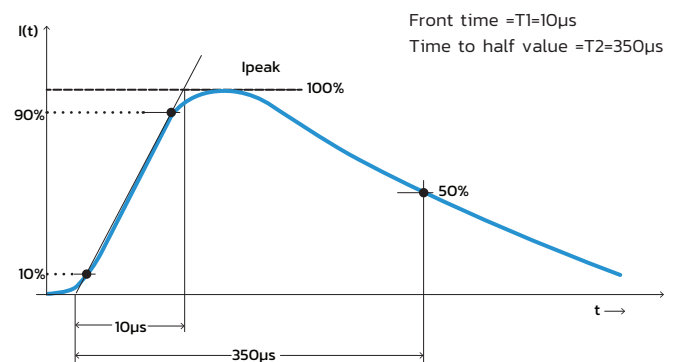


Current impulse, definition of front time and time to half-value

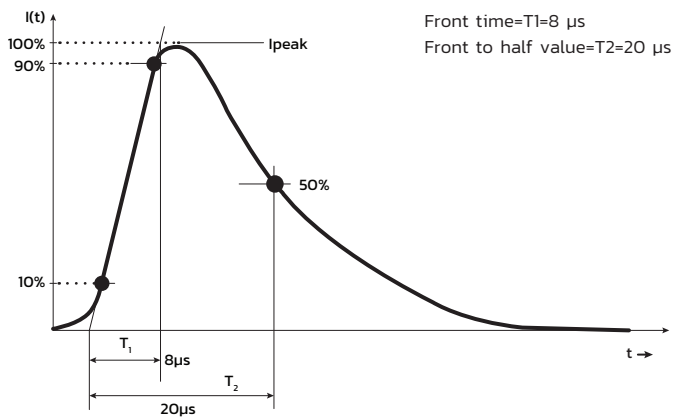
Standardized testing current impulse

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

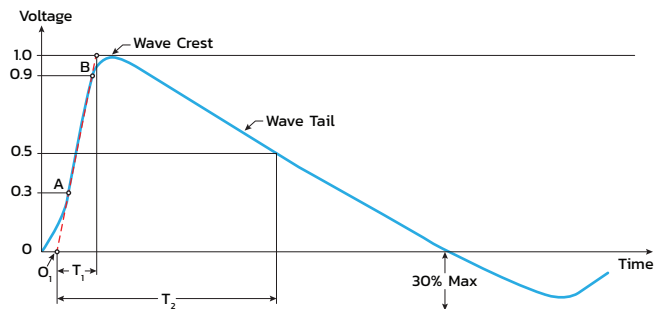
1.2/50 μs (voltage surge) – 8/20 μs (current surge)
combination wave

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.

This 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.

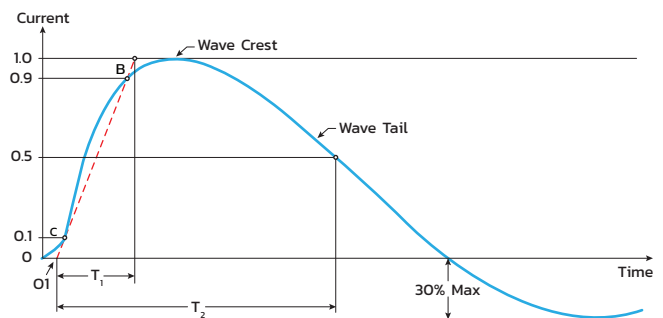
• Combination wave, Open-circuit voltage (1.2/50 μs)

$T = \text{Time B} - \text{Time A}$ $T_1=1.67T = 1.2 \mu s \pm 30\%$ $T_2 = 50 \mu s \pm 20\%$
Undershoot $\leq 30\%$ of the crest.



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

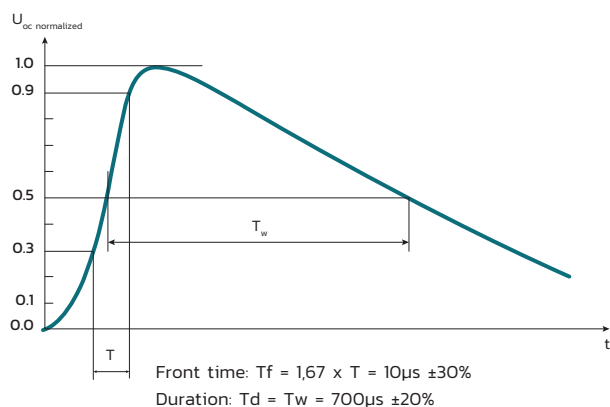
$T = \text{Time B} - \text{Time C}$ $T_1=1.25T = 8 \mu s \pm 30\%$ $T_2 = 20 \mu s \pm 20\%$
Undershoot $\leq 30\%$ of the crest.



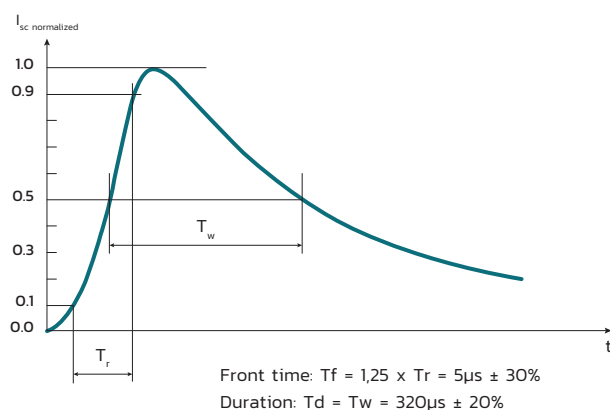
10/700 μs (voltage surge) – 5/320 μs (current surge)
combination wave

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 μ s)



• Short circuit current waveform (5/320 μ s)

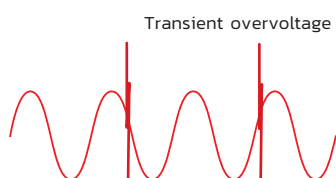


Type of overvoltages

The overvoltages are classified into two kinds:

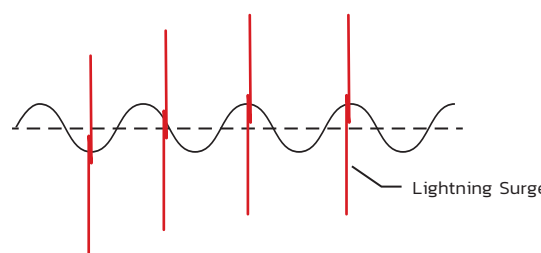
1. Temporary overvoltage (TOV)
2. Transient overvoltage (Surge)

Transient overvoltage (Surge)

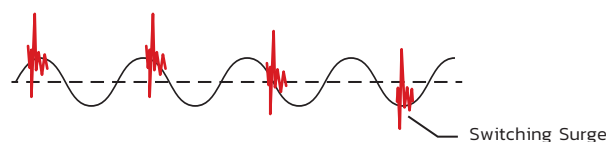


Transient overvoltages in electrical transmission and distribution networks result from the unavoidable effects of lightning strikes and network switching operations. These overvoltages have the potential to result in large financial losses each year due to damaged equipment and lost production. Transient 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 within the building



- Switching Surge are the switching of inductive loads

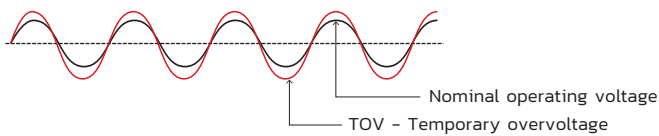


Transient overvoltages are surge that reach values of tens of kilovolts with a duration of the order of microseconds. Despite their short duration, they cause the destruction of equipment connected to the network, causing:

- 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.



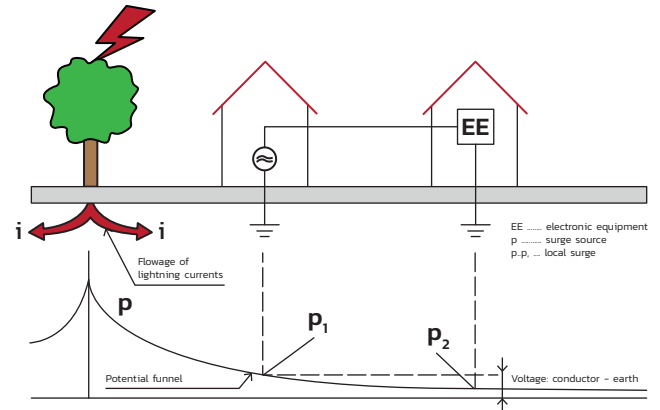
Kinds of surge couplings

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.

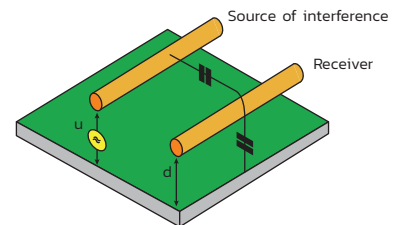
Galvanic coupling

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.



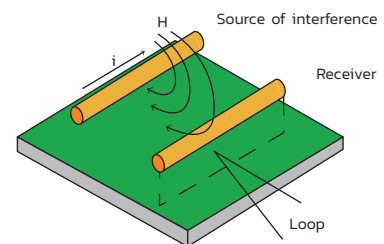
Capacitive coupling

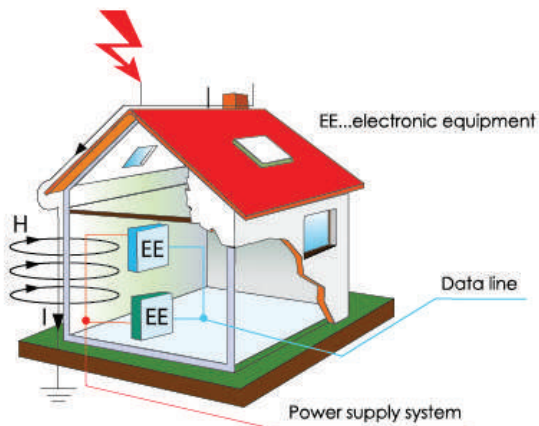
There is always a capacitive coupling (parasitic capacity) between the source of interference and the receiver. The higher the front rate of rise of the disturbing voltage impulse (du/dt) is, the stronger its interference effect is.



Inductive coupling

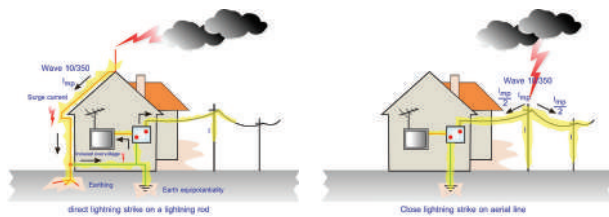
There is always an inductive coupling (magnetic field) between the source of interference and the receiver. The higher the front rate of rise of the disturbing current impulse (di/dt) activating the magnetic field is, the higher the interference effect is.





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 μ 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 μ s. The energy content of this impulse is significantly lower than the lightning current waveform 10/350 μ 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 O_A:

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

LPZ O_B:

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

LPZ 1:

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

The subsequent zones (LPZ 2 and so on):

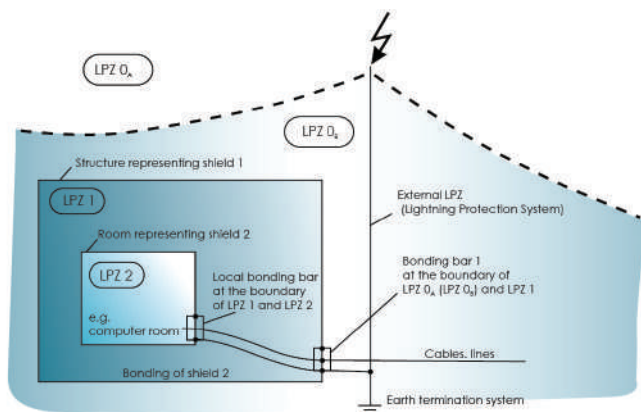
If a further reduction of conducted currents and/or electromagnetic field is required, subsequent zones shall be introduced. The requirement for those zones shall be selected according to the required environmental zones of the system to be protected. In general, the higher the number of the zones, the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

NOTE: Bonding at the boundary between LPZ O_A , LPZ O_B 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 O_A , LPZ O_B and LPZ 1.

In addition, the lines are bonded to the internal bonding bar 2 at the boundary of LPZ 1 and LPZ 2. Furthermore, the outer shield 1 of the structure is bonded to bonding bar 1 and the inner shield 2 to bonding bar 2. Where cables pass from one LPZ to another, the bonding must be executed at each boundary. LPZ 2 is constructed in such a way that partial lightning currents are not transferred into this volume and cannot pass through it.



The 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 1st stage protection-surge arrester class I tested by lightning current I_{imp} (10/350) at the zone boundary LPZ 0 → 1.

It is recommended to insert 2nd stage protection-surge arrester class II tested by testing impulse I_{max} (8/20) at the boundary zone LPZ 1 → 2.

At the boundary of LPZ 2 → 3 and subsequently along the consequential circuit there is also recommended to shoulder after every cca 10m by so called 3rd stage protection class III also tested by testing impulse I_{max} (8/20) or U_{OC} . For extra important protected equipment it is recommended to secure it by a quality continuous surge protection class III with high frequency filter at the boundary of LPZ 2 → 3.

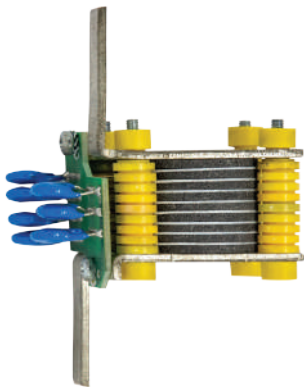
If there are adjacent structures between which power and communication cables pass, the earthing system shall be interconnected, and it is beneficial to have many parallel paths to reduce current in the cables. A meshed earthing system fulfills this requirement. The lightning currents are further reduced, e.g. by enclosing all the cables in metal conduits or 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 1st stage of surge protection. It is possible to divide them on so-called "open" or "closed" spark gaps according to constructional implementation. The shape of electrodes, their material and the distance between electrodes determine the protection level, discharge ability and features, which characterize 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 M Ω). Gas discharge tube's application possibilities are restricted

by their generally low values of self-extinguishing follow current ($I_f = c. 100 A_{rms}$). 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 100 kA in the waveform of 10/350 μs . The electrical parameters can be predicted in a large range. E.g. direct switching voltage can be set up from 100 V to 2000 V 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



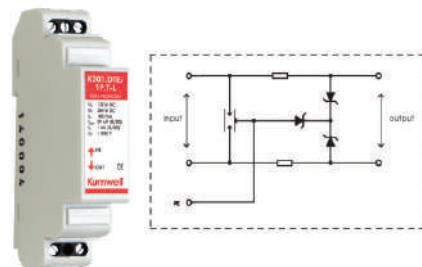
Varistors are voltage dependent resistances with symmetrical voltampere characteristic. They consist of 90% ZnO as a ceramic basis and 10% additives. High possible load of this type of arresters during their loading by impulse discharge currents is achieved by application of its great mass varistor capacity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

Kumwell SPD application for Low Voltage Power Systems

Dimensioning of SPD class I IEC 62305 ed.2 Location of SPD class I :On the boundaries of LPZ 0 and LPZ 1		
LPL	Maximum current (kA)	Total discharge current (10/350) (I_{Total})
I	200 kA	100 kA
II	150 kA	75 kA
III	100 kA	50 kA
IV	100 kA	50 kA







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

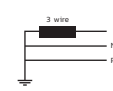
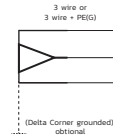
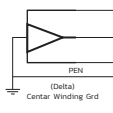
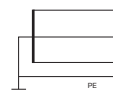
SPD Class I+II: On the boundaries of LPZ 0 to LPZ 2	
KZ012 series MBC.I25K series KLSA series KSB.BR25 series	<ul style="list-style-type: none"> - Industrial installations such as substations, main switchboard of large industrial structures

SPD Class II: On the boundaries of LPZ 1 to LPZ 2	
KZ12 series D12 series KHSA series SC40K series	<ul style="list-style-type: none"> - all types of electrical sets - all kinds of industry, residential and administration buildings - Install in sub distribution board (SDB) or into control box - photovoltaic systems
KZ12.DC series	- Modular SPD for DC power systems

SPD Class III: On the boundaries of LPZ 2 to LPZ 3	
KZ23 series	
KZ23.PK16 series	- Compact SPD for DC power systems

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	10	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 TT-system without Neutral distribution 	230	10	---	255	440	---

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
Single phase TT-S-system		230	10	255	255	---	255
		120		132	132		132
Three phase (Delta) Corner grounded TN system or TT system or IT system		230	10	---	264	264	---
		200 (202)			222	22	
		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		
SPDs connected to:	For $t_T=5$ s (LV-system faults in consumer installation) (requirement to 7.2.8.1 and test 8.3.8.1) Withstand mode required	For $t_T=120$ min (LV-system faults in distribution system and loss of neutral) (requirement to 7.2.8.1 and test 8.3.8.1) Withstand or safe failure mode acceptable	For $t_T=200$ ms (HV-system faults) requirement to 7.2.8.2 and 8.3.8.2 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			
TN-systems			
Connected N-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			
TN-systems			
Connected N-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_0 in TN- and TT-system: nominal a.c.r.m.s. line voltage to earth; in IT-system: nominal a.c. voltage between line conductor and neutral conductor or midpoint conductor, as appropriate (see 442.12 of IEC 60364-4-44:2007)

$1,32 \times U_{REF}$ equals $1.45 \times U_0$ in case the voltage regulation does not exceed +10% (see 442.5 of 60364-4-44:2007)

NOTE: As voltage regulation exceeds 10% in some countries, only U_{REF} is use in this standard for 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	Calculated	After test	Ratio	Pre-arcing	Calculated	After test	Ratio
	I ² t	8/20	8/20		I ² t	10/350	10/350	
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 I²t calculation of wave shape compared to fuse I²t (1 ms) from fuse manufacturer is a possible way to guess its surge withstand for a single shot.

I²t 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, I²t in A²s

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:

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

NOTE: Typical pre-arcing value for 32 A cylindrical fuse gG type is : 1300 A²s

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:

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

NOTE: Typical pre-arcing value for 63 A NH fuse gG type is : 6500 A²s

A new fuse with a pre-arcing value of 24 000 A²t (100 A cylinder fuse gG type) can withstand a 8/20 single shot of:

$$I_{crest} = \sqrt{\frac{24,000}{14.01}} = 41.4 \text{ kA}$$

SPD Parameter Selection (IEC 61643-12)

U_c Maximum continuous operating voltage of the SPD

U_c shall be higher than the maximum continuous operating voltage of power system U_{cs} ($=k \times U_o$)

$$U_c > U_{cs}$$

Table 4 - Minimum recommended U_c of the SPD for various power systems (IEC 61643-12)

System configuration of distribution network					
SPDs connected between:	TT	TN-C	TN-S	IT with distributed neutral	TT
Each line conductor and neutral conductor	1,1 U_o	NA	1,1 U_o	1,1 U_o	NA
Each line conductor and neutral conductor	1,1 U_o	NA	1,1 U_o	$\sqrt{3} \times U_o$ (see NOTE 3)	NA
Each line conductor and neutral conductor	U_o (see NOTE 3)	NA	U_o (see NOTE 3)	U_o (see NOTE 3)	Line to line voltage (see NOTE 3)
Each line conductor and neutral conductor	NA	1,1 U_o	NA	NA	NA

NA: not applicable

NOTE 2 U_o 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_c may be necessary.

U_T Temporary over voltage rating of the SPD

U_T 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
SPDs connected to:		
TN-systems		
Connected L-(PE)N or L-N	$1,32 \times U_{CS}$	
Connected N-PE		
Connected L-L		
TT-systems		
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		
IT-systems		
Connected L-PE		$1200 + U_{CS}$
Connected L-N	$1,32 \times U_{CS}$	
Connected N-PE		1200
Connected L-L		
TN, TT-systems		
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 $U_{CS} = 1,1 \times U_0$.

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)

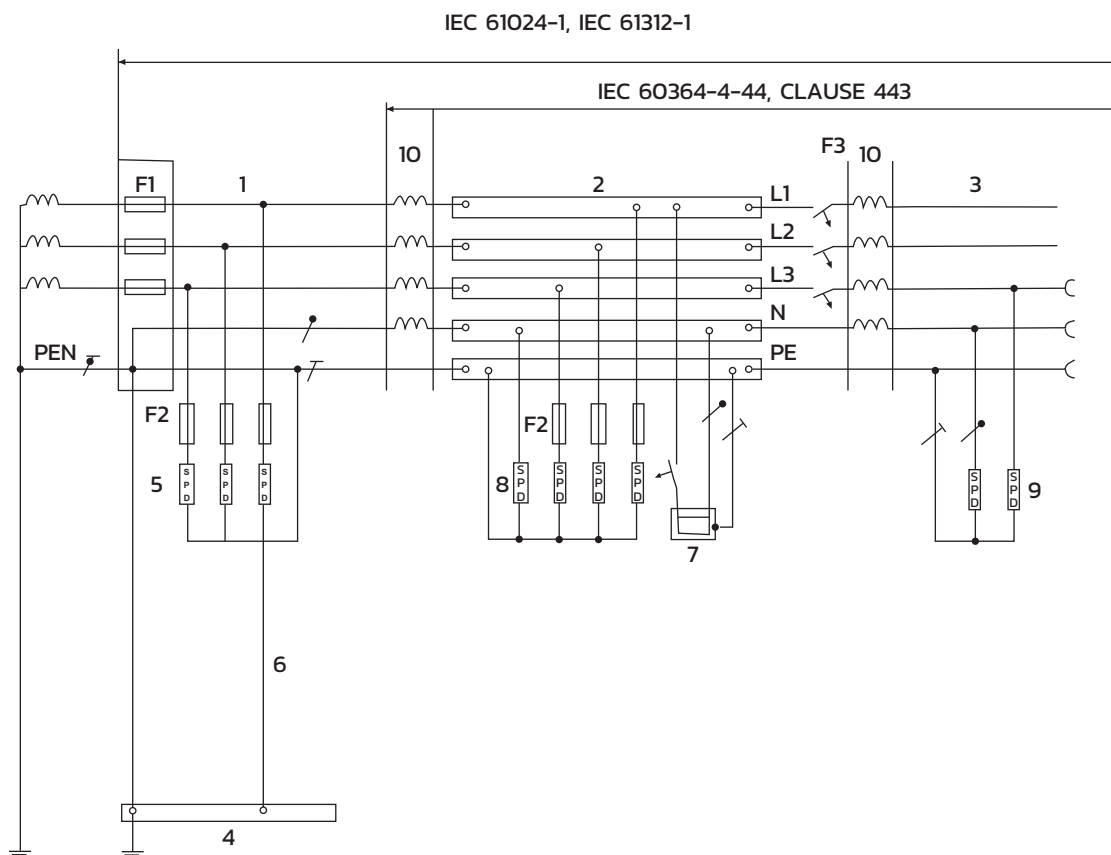
Table 6 - Required and impulse withstand voltage of equipment					
Nominal voltage of the installation ^a V		Required impulse withstand voltage for kV ^c			
Three-phase systems	Single-phase systems with middle point	Equipment at the origin of the installation (overvoltage category IV)	Equipment of distribution 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 ^b 277/480 ^b	-	6	4	2.5	1.5
400/690	-	8	6	4	2.5
1000	-	12	8	6	4

^a According to IEC 60038.

^b 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.

^c 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



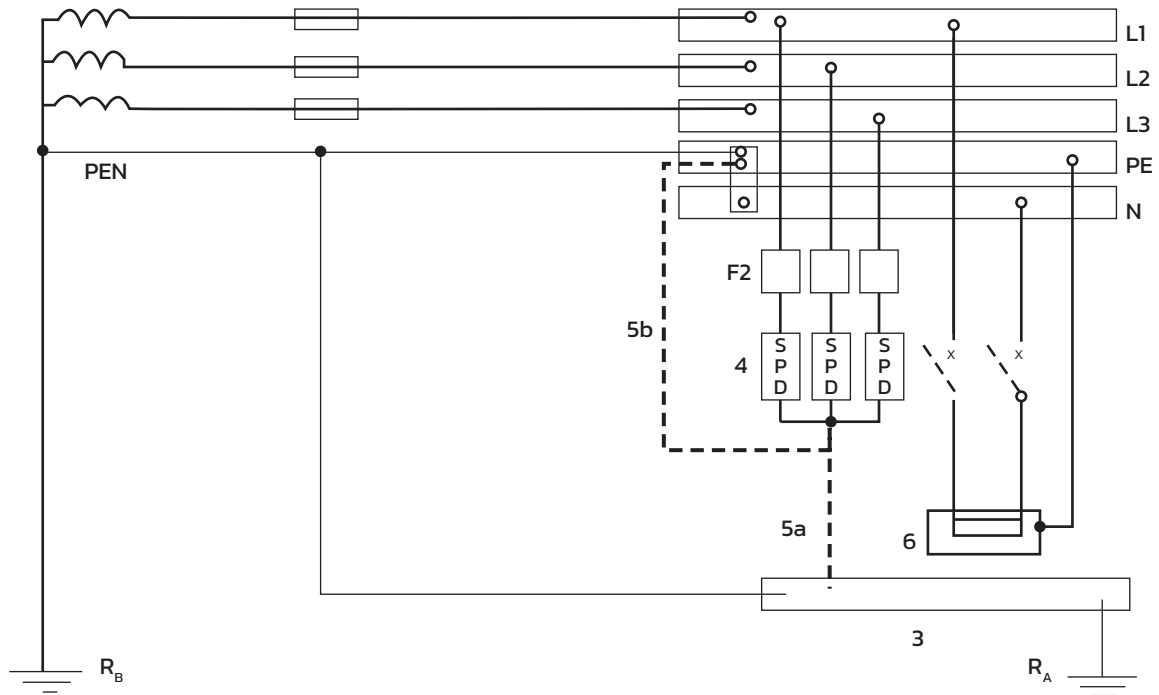
- | | |
|--|---|
| <ul style="list-style-type: none"> 1 Origin of the installation 2 Distribution board 3 Distribution outlet 4 Main earthing terminal or bar 5 Surge protection device, test class I 6 Earthing connection (earthing conductor) of surge protective device | <ul style="list-style-type: none">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

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



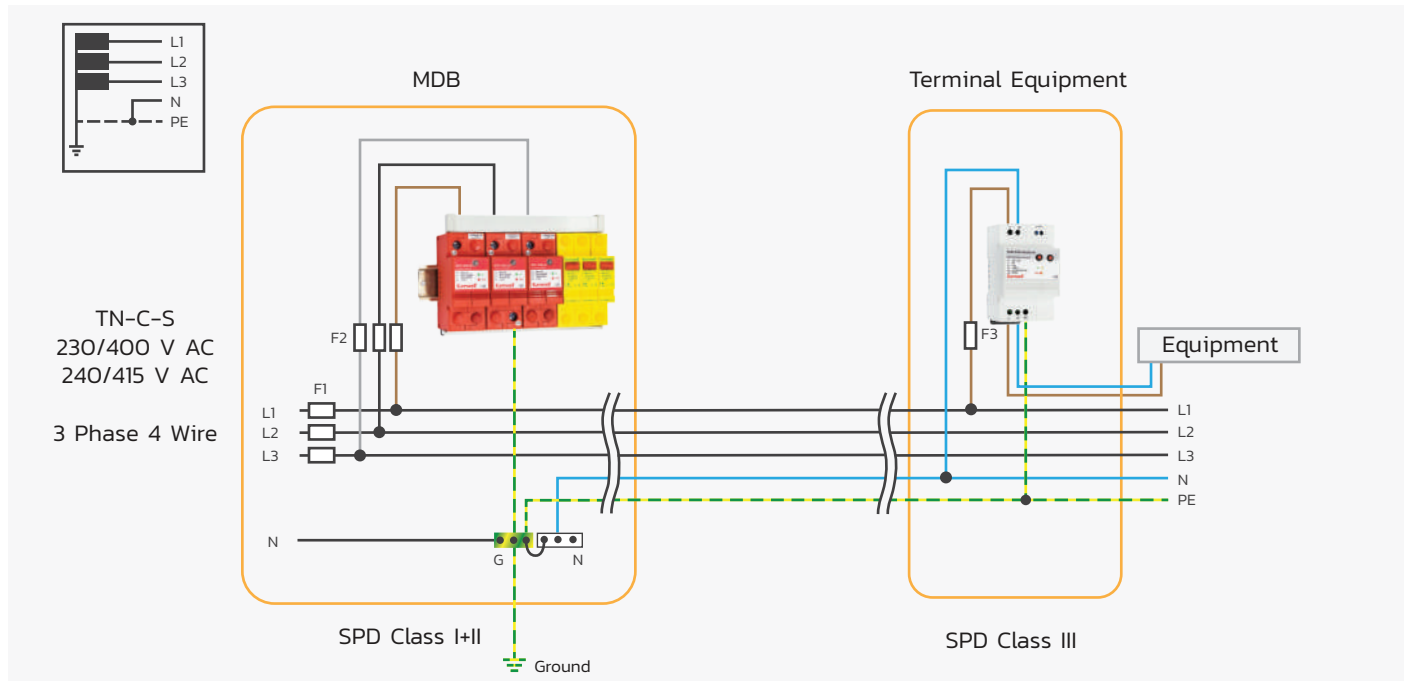
- 3 Main earthing terminal or bar
- 4 Surge protective devices providing protection against overvoltags of category II
- 5 Earthing connection of surge protective device, either 5a or 5b
- 6 Equipment to be protected

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

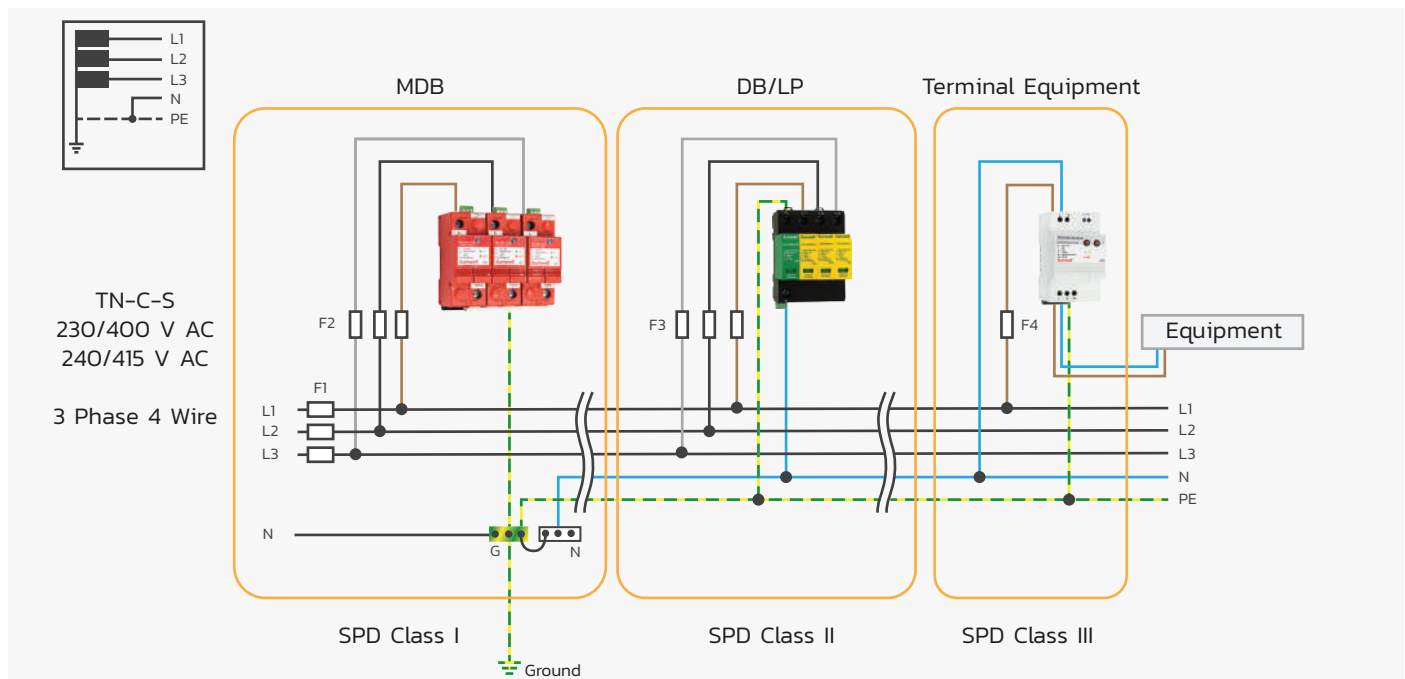
SPDs in TN systems

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

Surge Protection for AC Power Supply Systems

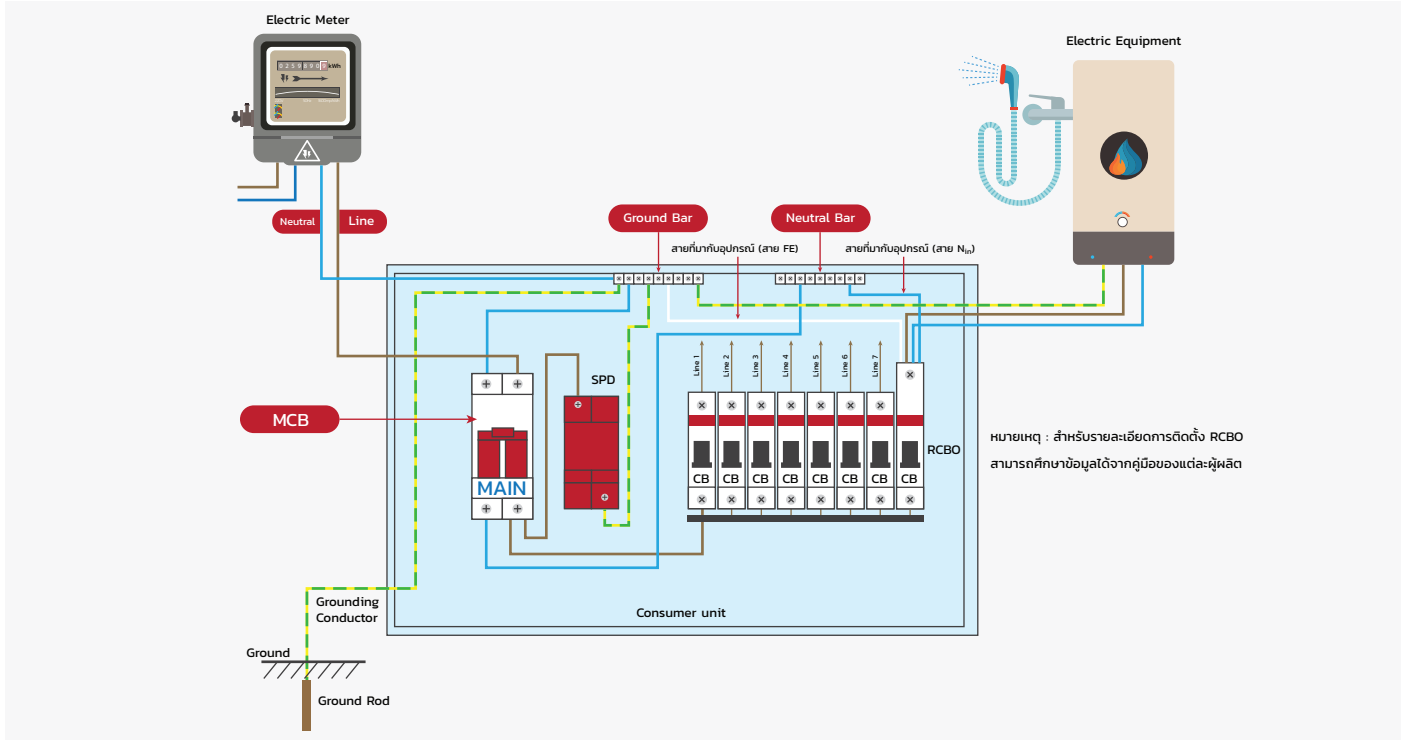


Installation of SPD class I and class II combined set + class III (without DB / LP) in TN-C-S system (Thailand) (3 Phase 4 Wire)

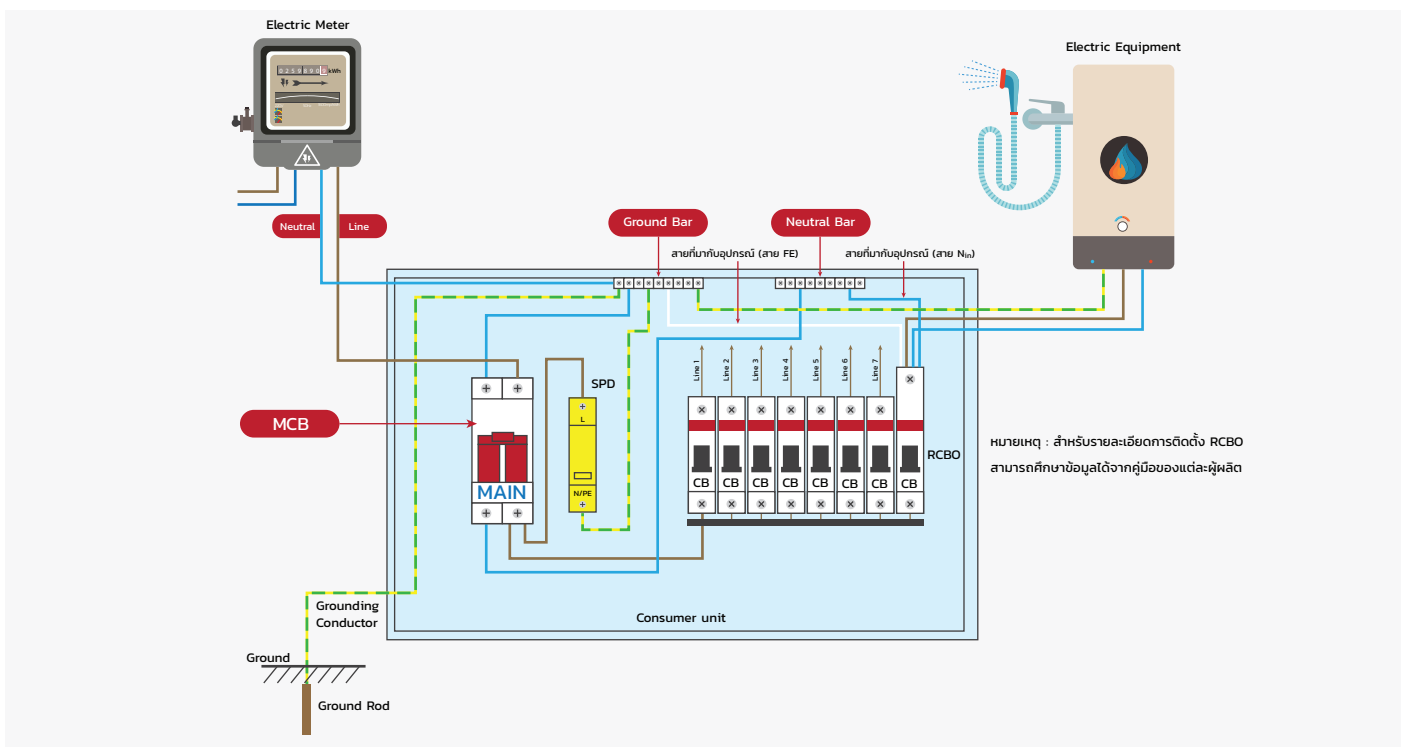


Installation of SPD class I and class II installed separately + class III in TN-C-S system (Thailand) (3 Phase 4 Wire)

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)

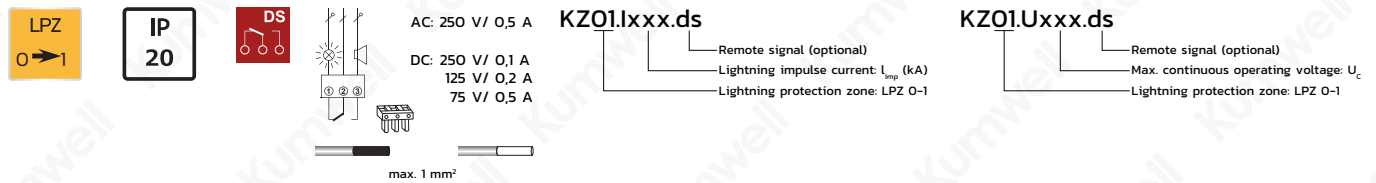


Installation of SPD class II in Consumer Unit
 (in case the home located in area of indirect lightning strike risk , on installations without LPS (lightning rods))

1 Surge Protection Class I, I+II for AC/DC Power Systems

CLASS I (TYPE 1) LIGHTNING ARRESTER SPARK GAP

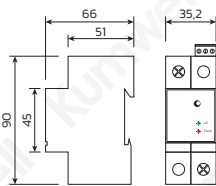
Kumwell KZ01.I050.ds and KZ01.U0440.ds are the surge protective device class I according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 62305), where they provide the equipotential bonding and discharge of both, 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.



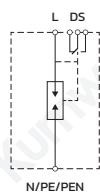
Spark gap / Class I

Technical data		KZ01.I050.ds	KZ01.U0440.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 μ s)	I_{imp}	50 kA	
- charge	Q	25 As	
- specific energy	W/R	600 kJ/Q	
Nominal discharge current (8/20 μ s)	I_n	50 kA	
Voltage protection level at I_{imp}	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 _{rms}	
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	I_p	25 kA _{rms}	
LPZ		0-1	
Protection type		IP20	
Operating temperature range	ϑ	-40°C to +80°C	
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)	
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)	
Mounting on		DIN rail 35 mm	
Failure signalisation		green - ok / red - failure	

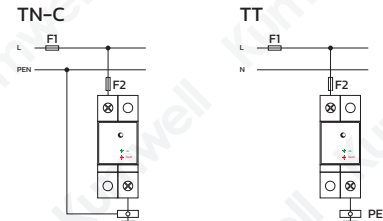
Dimensions



Internal configuration

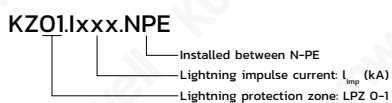


Network connections



CLASS I (TYPE 1) LIGHTNING ARRESTER TOTAL CURRENT SPARK GAP

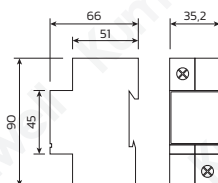
Kumwell KZ01.I100.NPE and KZ01.I110.NPE are the total current spark gaps class I according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 62305), where they provide the equipotential bonding and discharge of both, 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



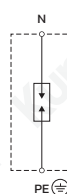
Total current spark gap / Class I / N-PE

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 μ s)	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 μ s)	I_n	75 kA	
Voltage protection level at I_{imp}	U_p	< 2 kV	
Temporary overvoltage (TOV)	U_T	1200 V/0.2 s	
Response time	t_A	< 100 ns	
Follow current interrupting rating at U_C	I_{fi}	100 A _{rms}	
LPZ		0-1	
Protection type		IP20	
Operating temperature range	ϑ	-40°C to +80°C	
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)	
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)	
Mounting on		DIN rail 35 mm	

Dimensions

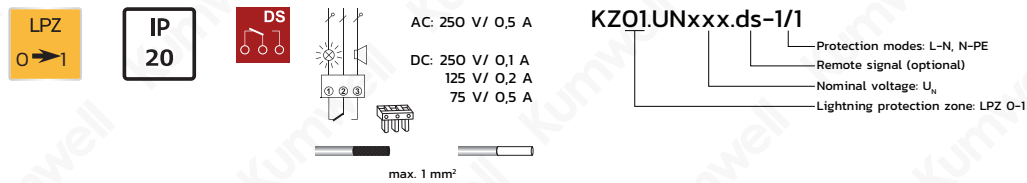


Internal configuration



CLASS I (TYPE 1) LIGHTNING ARRESTER 1-PHASE TN-S AND TT SYSTEM

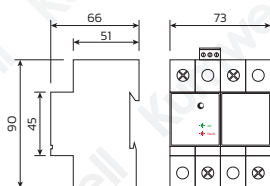
Kumwell KZ01.*.ds-1/1 are a lightning arresters class I according to IEC 61643-11. These are recommended for use in Lightning Protection Zone Concept at the boundaries of LPZ 0-1 (according to IEC 62305). KZ01.*.ds-1/1 can be used in industrial installations such as substations, main switchboards of 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.



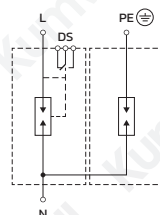
Spark gap / Class I / Single-Phase for TN-S and TT System

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 μ s) L/N	I_{imp}	50 kA	50 kA
- charge	Q	25 As	25 As
- specific energy	W/R	600 kJ/ Ω	600 kJ/ Ω
Lightning impulse current (10/350 μ s) N/PE	I_{imp}	100 kA	100 kA
- charge	Q	50 As	50 As
- specific energy	W/R	2500 kJ/ Ω	2500 kJ/ Ω
Total lightning impulse current (10/350 μ s) L+N \rightarrow PE	I_{total}	100 kA	100 kA
Nominal discharge current (8/20 μ s)	I_n	50 kA	50 kA
Voltage protection level at I_{imp} (L/N)	U_p	< 2 kV	< 2.5 kV
Voltage protection level at I_{imp} (N/PE)		< 1.3 kV	< 1.5 kV
Sparkover voltage 1.2/50 μ s (N-PE)		< 1.5 kV	< 1.5 kV
Temporary overvoltage (TOV) L/N	U_T	462 V/5 s	690 V/5 s
Temporary overvoltage (TOV) N/PE		1200 V / 0.2 s	1200 V / 0.2 s
Response time	t_A	< 100 ns	< 100 ns
Follow current interrupting rating at U_C (L/N)	I_n	3 kA _{rms}	3 kA _{rms}
Follow current interrupting rating at U_C (N/PE)		100 A _{rms}	100 A _{rms}
Max. back-up fuse		500 A gL/gG	500 A gL/gG
Short-circuit withstand capability at max. back-up fuse	I_p	25 kA _{rms}	25 kA _{rms}
LPZ		0-1	0-1
Protection type		IP20	IP20
Operating temperature range	ϑ	-40°C to +80°C	
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)	
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)	
Mounting on		DIN rail 35 mm	
Failure signalisation		green - ok / red - failure	

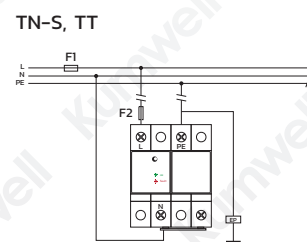
Dimensions



Internal configuration



Network connections



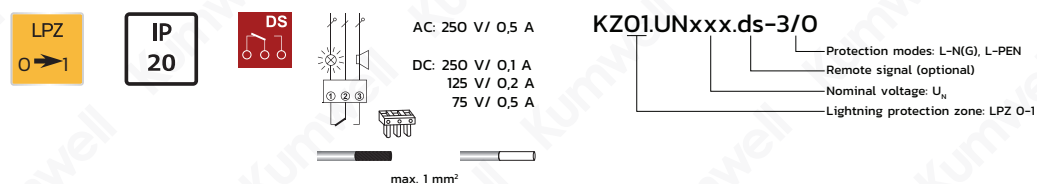
CLASS I (TYPE 1) LIGHTNING ARRESTER 3-PHASE TN-C SYSTEM

Kumwell KZ01.*.ds-3/O 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/O 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.

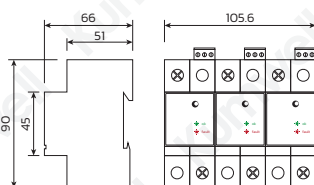
These arresters are intended for use in TN-C power supply system.



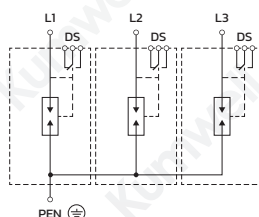
Spark gap / Class I / Three-Phase for TN-C System

Technical data		KZ01.UN230.ds-3/O	KZ01.UN400.ds-3/O
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 μ s)	I_{imp}	50 kA	
- charge	Q	25 As	
- specific energy	W/R	600 kJ/ Ω	
Total lightning impulse current (10/350 μ s) L1+L2+L3 \rightarrow PEN	I_{total}	150 kA	
Nominal discharge current (8/20 μ s)	I_n	50 kA	
Voltage protection level at I_{imp}	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 _{rms}	
Max. back-up fuse		500 A gL/gG	
Short-circuit withstand capability at max. back-up fuse	I_p	25 kA _{rms}	
LPZ		0-1	
Protection type		IP20	
Operating temperature range	ϑ	-40°C to +80°C	
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)	
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)	
Mounting on		DIN rail 35 mm	
Failure signalisation		green - ok / red - failure	

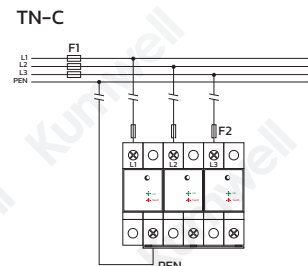
Dimensions



Internal configuration



Network connections

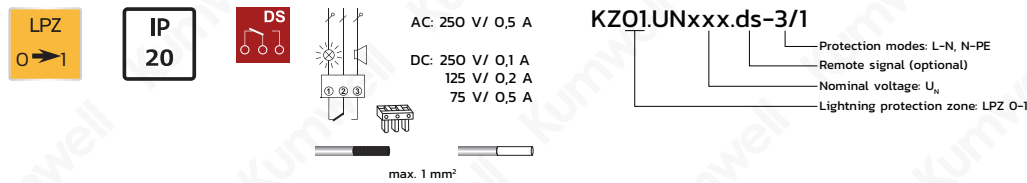


CLASS I (TYPE 1) LIGHTNING ARRESTERS 3-PHASE TN-S AND TT SYSTEM

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.

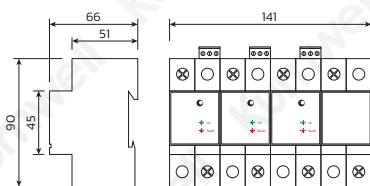
These arresters are combine with KZ01.*NPE which is recommended to install between N and PE for TN-S and TT systems.



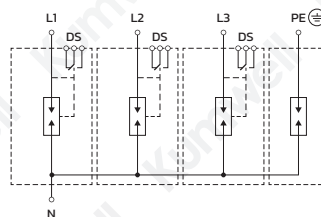
Spark gap / Class I / Three-Phase for TN-S and TT System

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 μ s) L/N	I_{imp}	50 kA	50 kA
- charge	Q	25 As	25 As
- specific energy	W/R	600 kJ/ Ω	600 kJ/ Ω
Lightning impulse current (10/350 μ s) N/PE	I_{imp}	100 kA	100 kA
- charge	Q	50 As	50 As
- specific energy	W/R	2500 kJ/ Ω	2500 kJ/ Ω
Total lightning impulse current (10/350) L1+L2+L3+N \rightarrow PE	I_{total}	100 kA	100 kA
Nominal discharge current (8/20 μ s)	I_n	50 kA	50 kA
Voltage protection level at I_{imp} (L/N)	U_p	< 2 kV	< 2.5 kV
Voltage protection level at I_{imp} (N/PE)		< 1.3 kV	< 1.5 kV
Sparkover voltage 1.2/50 μ s (N-PE)		< 1.5 kV	< 1.5 kV
Temporary overvoltage (TOV) L/N	U_T	462 V/5 s	690 V/5 s
Temporary overvoltage (TOV) N/PE		1200 V/ 0.2 s	1200 V/ 0.2 s
Response time	t_A	< 100 ns	< 100 ns
Follow current interrupting rating at U_C (L/N)	I_n	3 kA	3 kA
Follow current interrupting rating at U_C (N/PE)		100 A _{rms}	100 A _{rms}
Max. back-up fuse		500 A gL/gG	500 A gL/gG
Short-circuit withstand capability at max. back-up fuse	I_p	25 kA _{rms}	25 kA _{rms}
LPZ		0-1	0-1
Protection type		IP20	IP20
Operating temperature range	ϑ	-40°C to +80°C	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)	16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)	16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm	DIN rail 35 mm
Failure signalisation		green - ok / red - failure	green - ok / red - failure

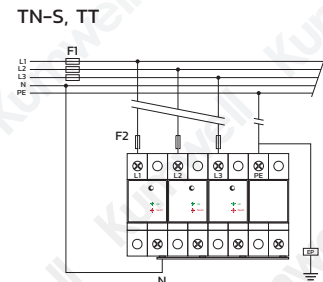
Dimensions



Internal configuration

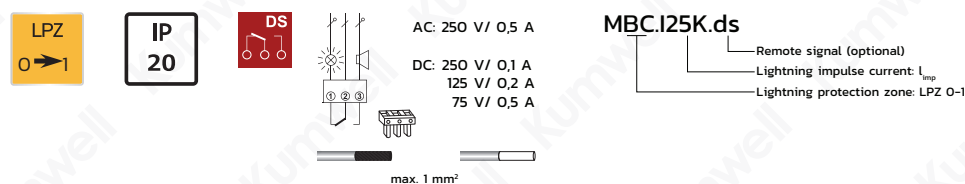


Network connections



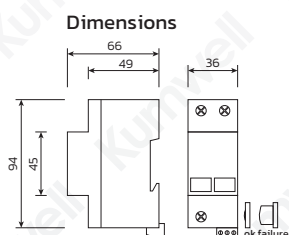
CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER VARISTOR

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.

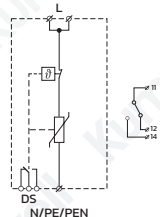


Varistor/ Class I+II

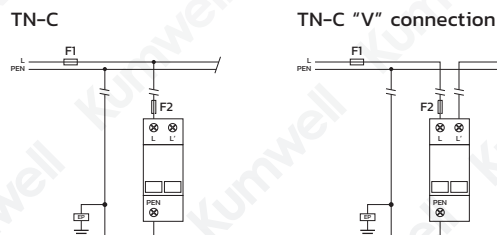
Technical data		MBC.I25K.ds
Test class according to IEC 61643-11		CLASS I+II
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	275 V AC
Max. discharge current (8/20 μ s)	I_{max}	50 kA
Lightning impulse current (10/350 μ s)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/ Ω
Nominal discharge current (8/20 μ s)	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 _{rms}
LPZ		0-1
Protection type		IP20
Operating temperature range	ϑ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure



Internal configuration

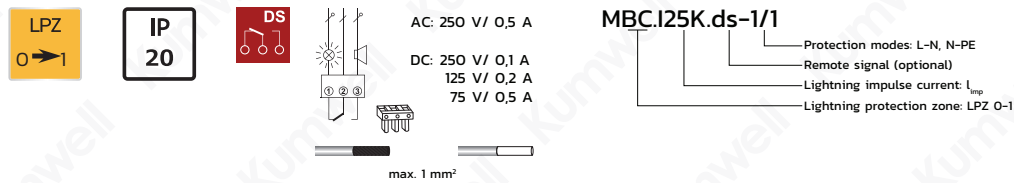


Network connections



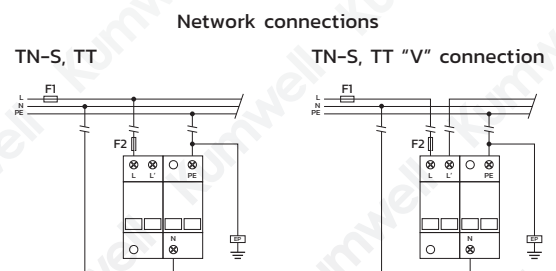
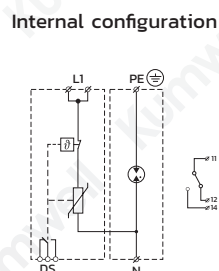
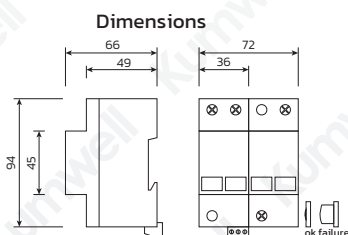
CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER 1-PHASE TN-S AND TT SYSTEM

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-II. 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.



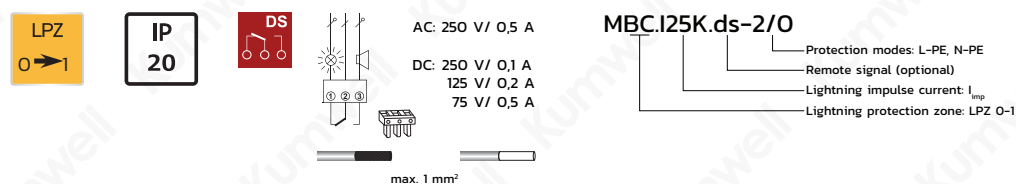
Varistor/ Class I+II / Single-Phase for TN-S and TT System

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 (L-N/N-PE)	275 V AC / 255 V AC
Max. discharge current (8/20 μ s)	I_{max}	50 kA
Total discharge current (8/20 μ s) L1+N → PE	I_{total}	100 kA
Lightning impulse current (10/350 μ s) L/N	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/ Ω
Lightning impulse current (10/350 μ s) N/PE	I_{imp}	50 kA
- charge	Q	25 As
- specific energy	W/R	625 kJ/ Ω
Total lightning impulse current (10/350 μ s) L1+N → PE	I_{total}	50 kA
Nominal discharge current (8/20 μ s)	I_n	25 kA
Voltage protection level	U_p (L-N/N-PE)	< 1.2 kV / < 1.3 kV
Temporary overvoltage (TOV) L/N		335 V/5 s
Temporary overvoltage (TOV) N/PE	U_T	1200 V/0.2 s
Response time L/N		< 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 _{rms}
LPZ		0-1
Protection type		IP20
Operating temperature range	ϑ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Failure signalisation		pushed in - ok / pushed out - failure



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

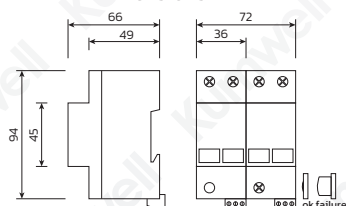
Kumwell MBC.I25K.ds-2/0 is a metal oxide varistor lightning and surge arrester class I+II according to IEC 61643-11. These are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 0-1 (according to IEC 62305), where they provide the equipotential bonding and discharge 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.



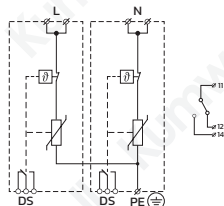
Varistor/ Class I+II / Single-Phase for TN-S System

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 μ s)	I_{max}	50 kA
Total discharge current (8/20 μ s) L1+N \rightarrow PE	I_{total}	100 kA
Lightning impulse current (10/350 μ s)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/ Ω
Total lightning impulse current (10/350 μ s) L1+N \rightarrow PE	I_{total}	50 kA
Nominal discharge current (8/20 μ s)	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 _{rms}
LPZ		0-1
Protection type		IP20
Operating temperature range	θ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

Dimensions

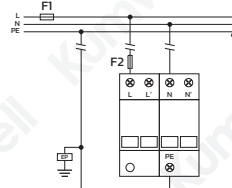


Internal configuration

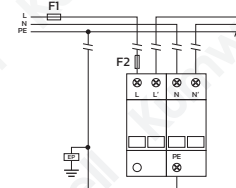


Network connections

TN-S

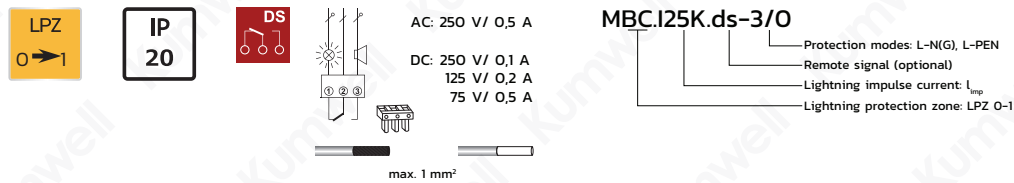


TN-S "V" connection



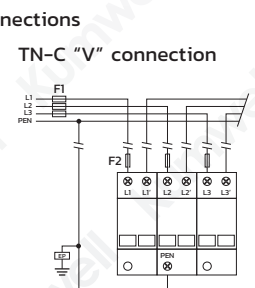
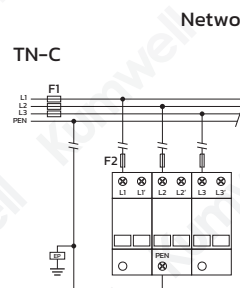
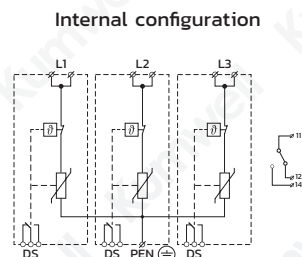
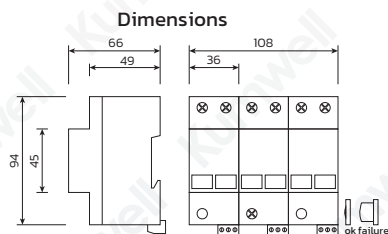
CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER 3-PHASE TN-C SYSTEM

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.



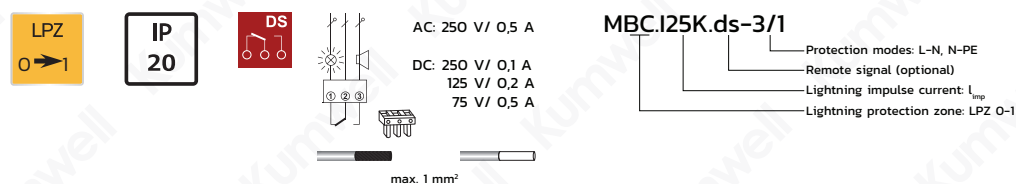
Varistor/ Class I+II / Three-Phase for TN-C System

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 μ s)	I_{max}	50 kA
Total discharge current (8/20 μ s) L1+L2+L3 \rightarrow PEN	I_{total}	150 kA
Lightning impulse current (10/350 μ s)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/ Ω
Total lightning impulse current (10/350 μ s) L1+L2+L3 \rightarrow PEN	I_{total}	75 kA
Nominal discharge current (8/20 μ s)	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 _{rms}
LPZ		0-1
Protection type		IP20
Operating temperature range	θ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure



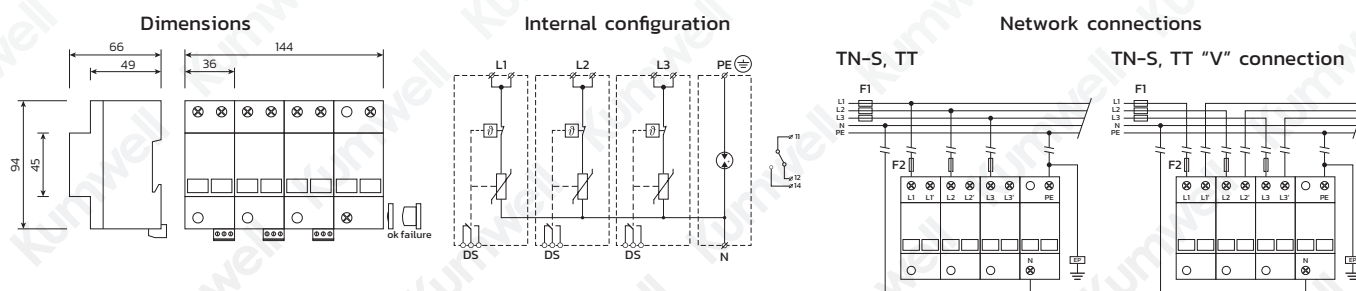
CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER 3-PHASE TN-S AND TT SYSTEM

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.



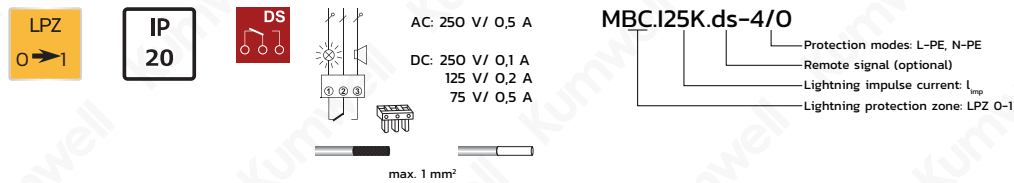
Varistor/ Class I+II / Three-Phase for TN-S and TT System

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 (L-N/N-PE)	275 V AC / 255 V AC
Max. discharge current (8/20 μ s)	I_{max}	50 kA
Total discharge current (8/20 μ s) L1+L2+L3+N \rightarrow PE	I_{total}	200 kA
Lightning impulse current (10/350 μ s) L/N	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Q
Lightning impulse current (10/350 μ s) N/PE	I_{imp}	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/Q
Total lightning impulse current (10/350 μ s) L1+L2+L3+N \rightarrow PE	I_{total}	100 kA
Nominal discharge current (8/20 μ s)	I_n	25 kA
Voltage protection level	U_p (L-N/N-PE)	< 1.2 kV / <1.3 kV
Temporary overvoltage (TOV) L/N	U_T	335 V/5 s
Temporary overvoltage (TOV) N/PE		1200 V/0.2 s
Response time L/N		< 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 _{rms}
LPZ		0-1
Protection type		IP20
Operating temperature range	ϑ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure



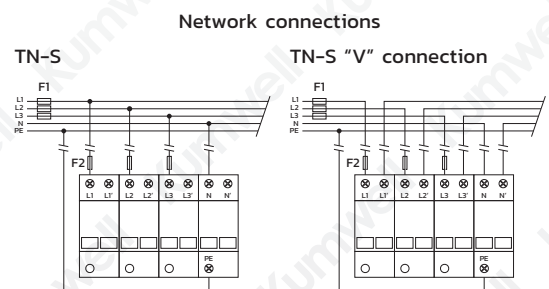
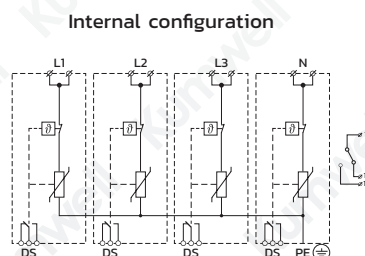
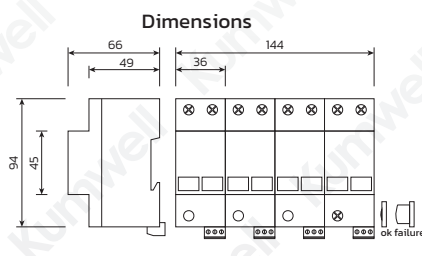
CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER 3-PHASE TN-S SYSTEM

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
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 μ s)	I_{max}	50 kA
Total discharge current (8/20 μ s) L1+L2+L3+N \rightarrow PE	I_{total}	200 kA
Lightning impulse current (10/350 μ s)	I_{imp}	25 kA
- charge	Q	12,5 As
- specific energy	W/R	156 kJ/Q
Total lightning impulse current (10/350 μ s) L1+L2+L3+N \rightarrow PE	I_{total}	100 kA
Nominal discharge current (8/20 μ s)	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 _{rms}
LPZ		0-1
Protection type		IP20
Operating temperature range	ϑ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		pushed in - ok / pushed out - failure

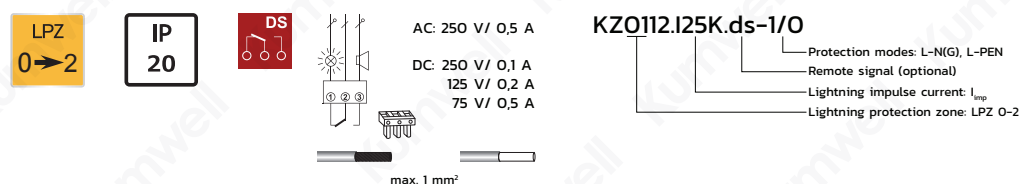


CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR 1-PHASE TN-C SYSTEM

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.

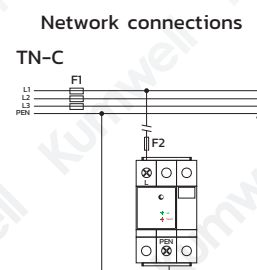
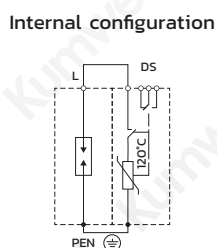
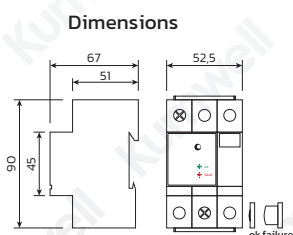
Kumwell Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using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

KZ0112.I25K.ds-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.I25K.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 μ s)	I_{imp}	25 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	< 1.3 kV
Follow current interrupt rating at U_C	I_f	3 kA _{rms}
Short circuit withstand capability	I_p	50 kA _{rms}
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	ϑ	-40°C to +80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure green - ok / red - failure

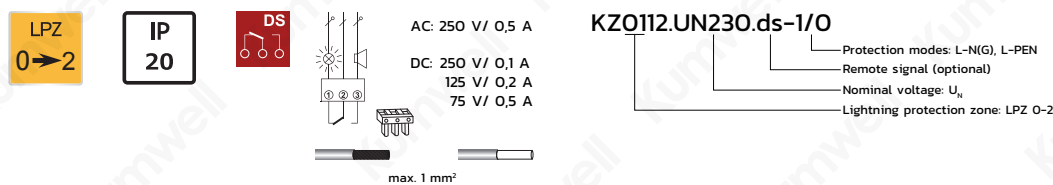


CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR 1-PHASE TN-C SYSTEM

Kumwell Combine set is lightning and surge arrester class I+II according to IEC 61643-II. 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.

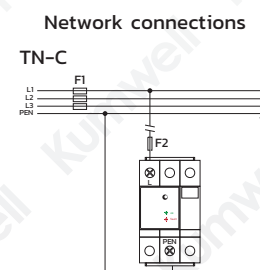
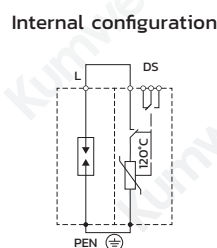
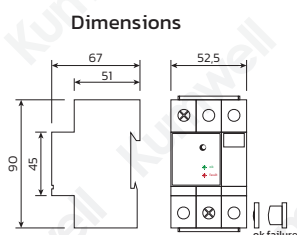
Kumwell Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using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

KZ0112.UN230.ds-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-II		CLASS I+II
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	255 V AC
Lightning impulse current (10/350 μ s)	I_{imp}	50 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	< 1.3 kV
Follow current interrupt rating at U_C	I_f	3 kA _{rms}
Short circuit withstand capability	I_p	50 kA _{rms}
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	ϑ	-40°C to + 80°C
Cross-section of the connected conductors (solid)		16 mm ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure green - ok / red - failure

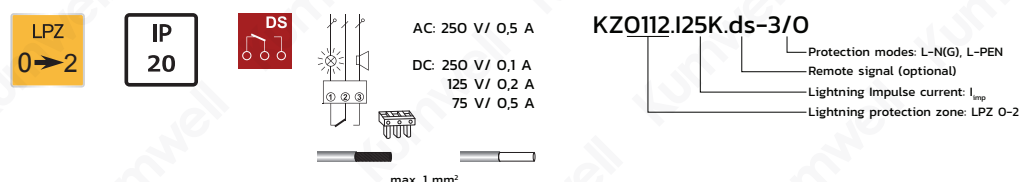


CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR 3-PHASE TN-C SYSTEM

Kumwell Combine set is lightning and surge arrester class I+II according to IEC 61643-II. 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.

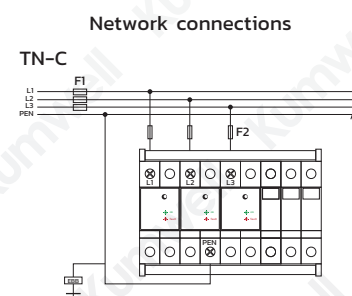
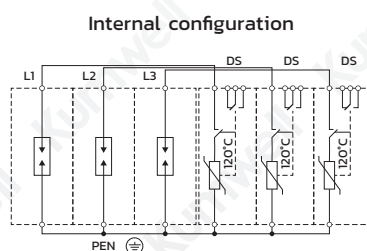
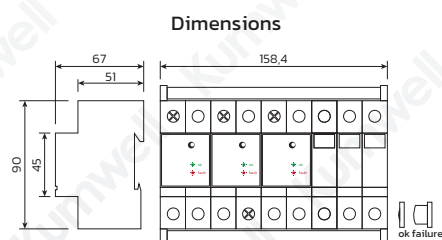
Kumwell Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZI2 series. KZ01I2 series can be installed in every common switchboards and its special construction is intended for using in non-measurable part of electrical systems.

KZ01I2.125K.ds-3/O 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		KZ01I2.125K.ds-3/O
Test class according to IEC 61643-II		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 μ s)	I_{imp}	25 kA
Total Lightning impulse current (10/350 μ s) L1+L2+L3 → PEN	I_{total}	75 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Voltage protection level	U_p	< 1.5 kV
Follow current interrupt rating at U_C	I_{fi}	3 kA _{rms}
Short circuit withstand capability	I_p	50 kA _{rms}
Response time	t_A	< 25 ns
TOV overvoltage (TOV) L/N	U_T	462 V/5 s
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 mm²(min.) - 35 mm²(max.)
Cross-section of the connected conductors (wire)		16 mm²(min.) - 25 mm²(max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure green - ok / red - failure

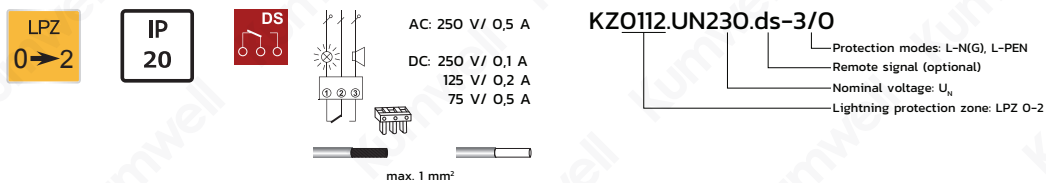


CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR 3-PHASE TN-C SYSTEM

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.

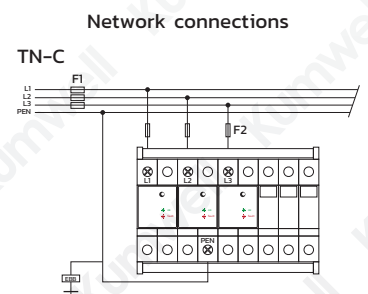
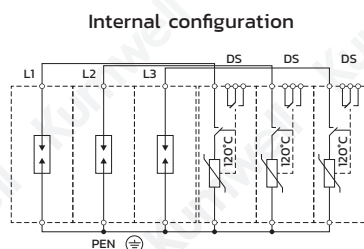
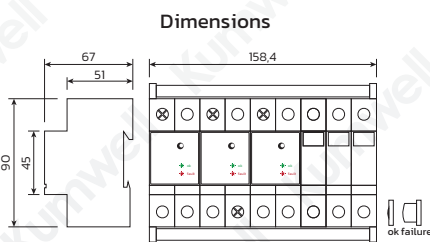
Kumwell Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using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

KZ0112.UN230.ds-3/O 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/O
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 μ s)	I_{imp}	50 kA
Total Lightning impulse current (10/350 μ s) L1+L2+L3 → PEN	I_{total}	150 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Voltage protection level	U_p	< 1.5 kV
Follow current interrupt rating at U_C	I_{fi}	3 kA _{rms}
Short circuit withstand capability	I_p	50 kA _{rms}
Response time	t_A	< 25 ns
TOV overvoltage (TOV) L/N	U_T	462 V/5 s
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 ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure green - ok / red - failure

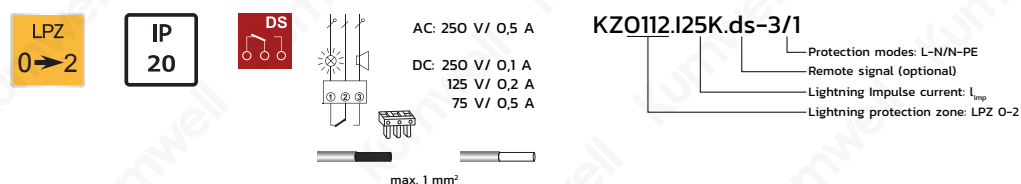


CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR 3-PHASE TN-S AND TT SYSTEM

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.

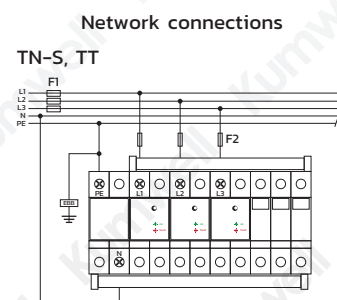
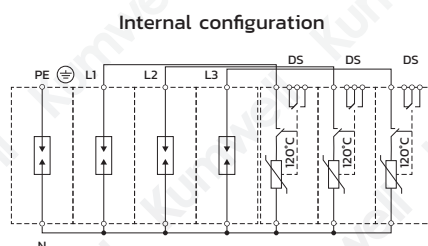
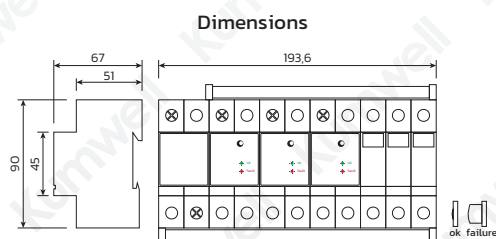
Kumwell Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZ12 series. KZ0112 series can be installed in every common switchboards and its special construction is intended for using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

KZ0112.125K.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		KZ0112.125K.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 μ s) L/N	I_{imp}	25 kA
Lightning impulse current (10/350 μ s) N/PE	I_{imp}	110 kA
Total Lightning impulse current (10/350 μ s) L1+L2+L3+N → PE	I_{total}	110 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Voltage protection level	U_p	< 1.5 kV
Follow current interrupt rating at U_C	I_b	3 kA
Short circuit withstand capability	I_p	50 kA _{rms}
Response time	t_A	< 25 ns
TOV overvoltage (TOV) L/N	U_T	462 V/5 s
TOV overvoltage (TOV) N/PE	U_T	1200 V/0.2 s
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 ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure green - ok / red - failure

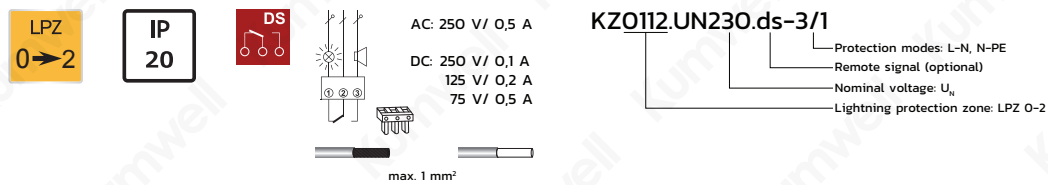


CLASS I+II (TYPE 1+2) LIGHTNING AND SURGE ARRESTER SPARK GAP + VARISTOR 3-PHASE TN-S AND TT SYSTEM

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.

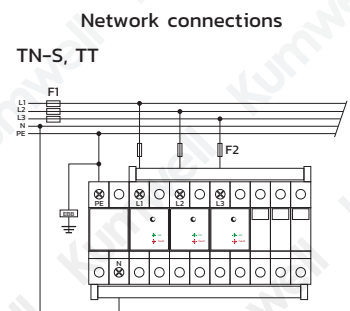
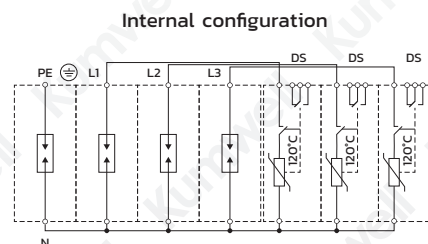
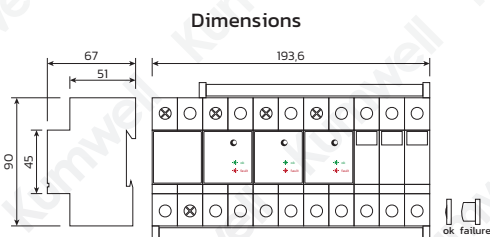
Kumwell Combine set is a combination of the latest technologies where the spark gap combines the varistor. The set contains lightning arresters of KZ01 series and surge arresters of KZI2 series. KZ01I2 series can be installed in every common switchboards and its special construction is intended for use in non-measurable part of electrical systems.

KZ01I2.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		KZ01I2.UN230.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 μ s) L/N	I_{imp}	50 kA
Lightning impulse current (10/350 μ s) N/PE	I_{imp}	110 kA
Total Lightning impulse current (10/350 μ s) L1+L2+L3+N → PE	I_{total}	110 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Voltage protection level	U_p	< 1.5 kV
Follow current interrupt rating at U_C	I_f	3 kA _{rms}
Short circuit withstand capability	I_p	50 kA _{rms}
Response time	t_A	< 25 ns
TOV overvoltage (TOV) L/N	U_T	462 V/5 s
TOV overvoltage (TOV) N/PE	U_T	1200 V/0.2 s
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 ² (min.) - 35 mm ² (max.)
Cross-section of the connected conductors (wire)		16 mm ² (min.) - 25 mm ² (max.)
Mounting on		DIN rail 35 mm
Type of remote signalling		Changeover contact
Failure signalisation		pushed in - ok / pushed out - failure green - ok / red - failure



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

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 O_A-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

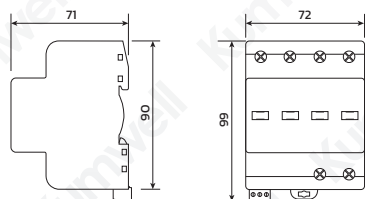
Complies with: IEC/EN 61643-11



High energy MOV and GDT

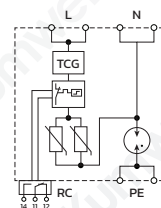
Technical data		KSB.BR25-U275.ds-1/1	KSB.BR25-U440.ds-1/1
Max. continuous operating voltage	U _C (L-N) U _C (N-PE)	275 V AC	440 V AC
Nominal discharge current (8/20 μs)	I _n (L-N/N-PE)	25 kA/50 kA	
Max. discharge current (8/20 μs)	I _{max} (L-N/N-PE)	100 kA/100 kA	
Lightning impulse current (10/350 μs)	I _{imp} (L-N/N-PE)	25 kA/50 kA	
Total lightning impulse current (10/350 μs)	I _{total}	50 kA	
Specific Energy	W/R(L-N/N-PE)	156 kJ/Ω / 625 kJ/Ω	
Charge	Q(L-N/N-PE)	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 _f (N-PE)	100 A _{rms}	
Response time	t _A (L-N/N-PE)	< 25 ns/< 100 ns	
Back-Up Fuse (if mains > 250 A)		250 A gL/gG	
Short-Circuit Current Rating (AC)	I _{SCCR}	50 kA	
TOV withstand 5 s	U _T (L-N)	438 V AC	585 V AC
TOV withstand 200 ms	U _T (N-PE)	1200 V / 300 A	
Temperature range	θ	-40°C to +85°C	
Conductor Cross Section (max)		35mm ² (Solid, Stranded) / 25mm ² (Flexible)	
Mounting		DIN rail 35mm	
Degree of protection		IP20	
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0	
Thermal Protection	(L-N)/(N-PE)	Yes/No	
Fault Indication	(L-N)/(N-PE)	Red flag/No	
Remote contact		Yes	

Dimensions



INDICATION
■ GREEN - OK
■ RED - FAILURE

Internal configuration



**CLASS I, II (TYPE 1, 2)
HIGH TOV IMMUNITY HIGH ENERGY MOV
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 O_A-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

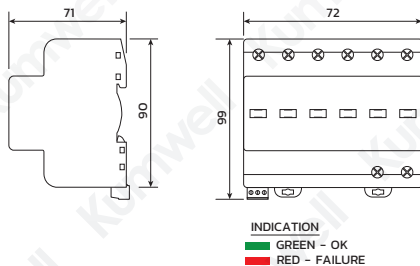
- Network System: TN-C
- Protection mode: L-PEN
- Feature: High TOV Immunity
- Leakage current: No leakage current
- Complies with: IEC/EN 61643-11



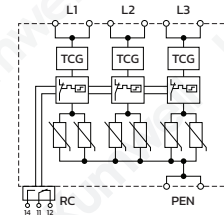
High Energy MOV and GDT

Technical data		KSB.BR25-U275.ds-3/O	KSB.BR25-U440.ds-3/O
Max. continuous operating voltage	U_C	275 V AC	440 V AC
Nominal discharge current (8/20 μ s)	I_n		25 kA
Max. discharge current (8/20 μ s)	I_{max}		100 kA
Lightning impulse current (10/350 μ s)	I_{imp}		25 kA
Total lightning impulse current (10/350 μ s)	I_{total}		75 kA
Specific Energy	W/R		156 kJ/ Ω
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 5 s	U_T	438 V	585 V
Temperature range	θ		-40°C to +85°C
Conductor Cross Section (max)		35mm ² (Solid, Stranded) / 25mm ² (Flexible)	
Mounting		DIN rail 35mm	
Degree of protection		IP20	
Housing material		Thermoplastic: Extinguishing Degree UL 94 V-0	
Thermal Protection		Yes	
Fault Indication		Red flag	
Remote contact		Yes	

Dimensions



Internal configuration



CLASS I, II (TYPE 1, 2) HIGH TOV IMMUNITY HIGH ENERGY MOV 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 O_A-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

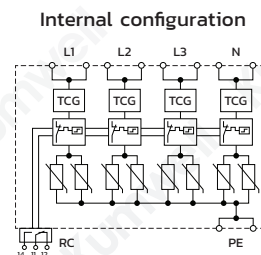
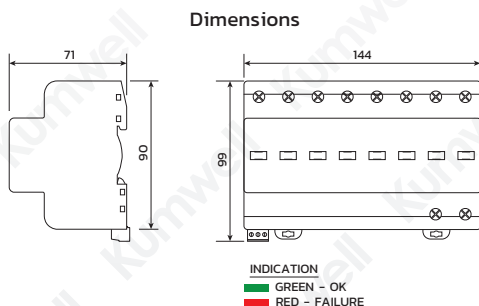
Leakage current: No leakage current

Complies with: IEC/EN 61643-11



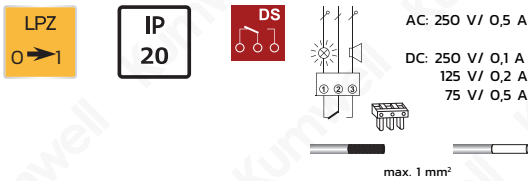
High Energy MOV and GDT

Technical data		KSB.BR25-U275.ds-4/O	KSB.BR25-U440.ds-4/O
Max. continuous operating voltage	U_C	275 V AC	440 V AC
Nominal discharge current (8/20 μ s)	I_n		25 kA
Max. discharge current (8/20 μ s)	I_{max}		100 kA
Lightning impulse current (10/350 μ s)	I_{imp}		25 kA
Total lightning impulse current (10/350 μ s)	I_{total}		100 kA
Specific Energy	W/R		156 kJ/ Ω
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 5 s	U_T	438 V	585 V
Temperature range	θ		-40°C to +85°C
Conductor Cross Section (max)		35mm ² (Solid, Stranded) / 25mm ² (Flexible)	
Mounting		DIN rail 35mm	
Degree of protection		IP20	
Housing material		Thermoplastic: Extinguishing Degree UL 94 V-0	
Thermal Protection		Yes	
Fault Indication		Red flag	
Remote contact		Yes	



CLASS I+II (TYPE 1+2) SURGE ARRESTER-VARISTOR 1-PHASE TN-S AND TN-C SYSTEM

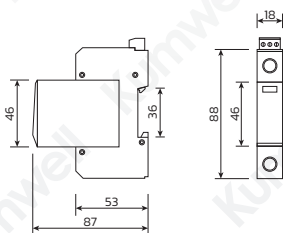
Kumwell KLSA-12R5-U48V is a lightning and surge arrester according to EN 61643-11 ed. 2 (IEC 61643-11:2011) consisting of high energy varistor. Its parameters enable usage in buildings with considerable levels of protection LPL III and LPL IV, such as small administration complexes, residential buildings, family houses or properties and halls without the incidence of persons and indoor equipment. The device is to be installed on the interface of LPZ 0 – LPZ 1 and higher zones according to standard EN 62305 ed.2 (IEC 62305:2010), closest to where overhead line enters the building i.e. in the main distribution boards.



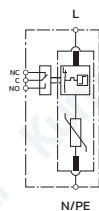
Varistor/ Class I+II / Single-Phase for TN-S and TN-C System

Technical data		KLSA-12R5-U48V
Test class according to IEC 61643-11		CLASS I+II
Nominal Voltage	U_n	60 V AC / 48 V DC
Max. continuous operating voltage	U_c	75 V AC / 100 V DC
Max. discharge current (8/20)	I_{max}	80 kA
Lightning impulse current (10/350)	I_{imp}	12.5 kA
Nominal discharge current (8/20)	I_n	25 kA
Voltage protection level	U_p	< 0.6 kV
Voltage protection level @ 20 kA (8/20)	U_p	< 550 V
Temporary overvoltage (TOV) withstand mode	U_T	90 V/5 s
Response time	t_A	< 25 ns
Max. back-up fuse		160 A gL/gG
Short-circuit withstand capability	I_{SCCR}	50 kA _{rms}
LPZ		0-1 and higher
Protection type		IP20
Operating temperature range	ϑ	-40°C to +85°C
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - normal, red-replace

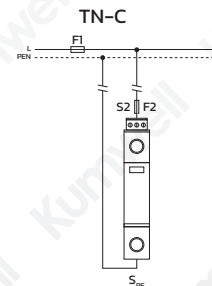
Dimensions



Internal configuration



Network connections



2 Surge Protection Class II for AC/DC Power Systems

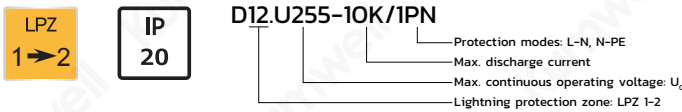
CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S AND TT SYSTEM

Kumwell D12.U255-10K/IPN 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.U255-10K/IPN 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.

Protection mode : L-N, N-PE

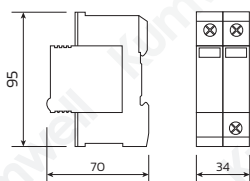
Complied with : IEC/EN 61643-11



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

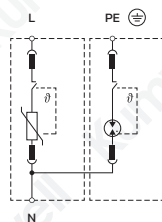
Technical data		D12.U255-10K/IPN
Test class according to IEC 61643-11		CLASS II
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	255 V AC
Max. discharge current (8/20 μ s)	I_{max}	10 kA
Nominal discharge current (8/20 μ s)	I_n	5 kA
Voltage protection level	U_p	≤ 2 kV
Max. Temporary overvoltage withstand, 5s	$U_T(L-N)$	345 V AC
Response time	t_A	< 25 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	0°C to +70°C
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

Dimensions

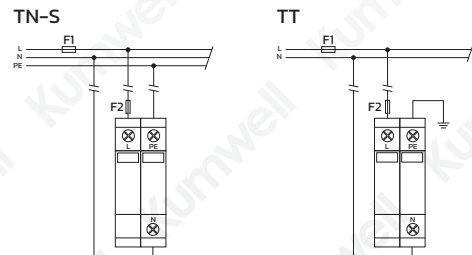


INDICATION
■ GREEN - OK
■ RED - FAILURE

Internal configuration



Network connections

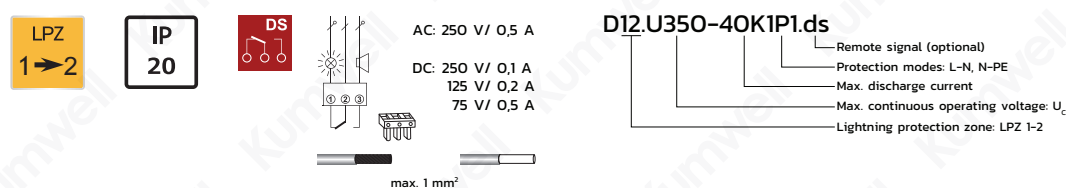


CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S AND TT SYSTEM

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 switch-boards or onto the control box by connected parallel in the power line.

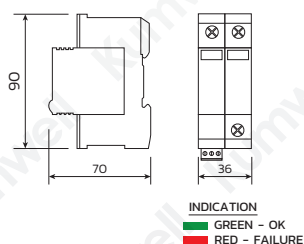
These SPD consist of D12.U350-40K.ds installed between L-N and D12.U264-I020.NPE install between N-PE applied for TN-S and TT system.



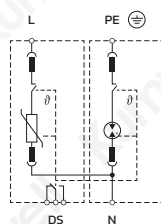
Varistor / Class II / Single-Phase for TN-S and TT System

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) U_c (N-PE)	350 V AC 264 V AC
Max. discharge current (8/20 μ s)	I_{max} (L-N) I_{max} (N-PE)	40 kA 40 kA
Nominal discharge current (8/20 μ s)	I_n (L-N) I_n (N-PE)	20 kA 20 kA
Voltage protection level	U_p (L-N) U_p (N-PE)	≤ 1.5 kV ≤ 1.5 kV
Response time	t_A (L-N) t_A (N-PE)	< 25 ns < 100 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	-40°C to +70°C
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

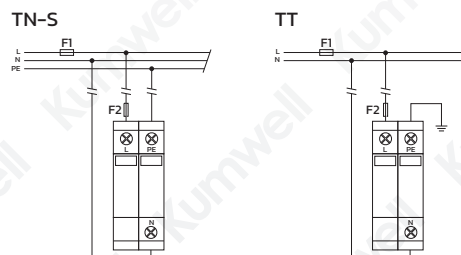
Dimensions



Internal configuration



Network connections

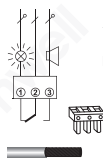


CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S SYSTEM

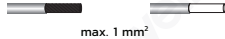
Kumwell KZ12.U275-40K.ds series surge arrester Class II (Type 2) according to IEC 61643-11. These arresters are recommended for use in the Lightning Protection Zones Concept at the boundaries of LPZ 1-2 (according to IEC 62305) for equipotential bonding and elimination of transient overvoltage that originate during atmospheric discharge or switching process.

The main use of KZ12.U275-40K.ds series 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)

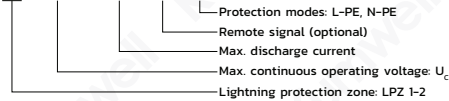


AC: 250 V / 0,5 A
DC: 250 V / 0,1 A
125 V / 0,2 A
75 V / 0,5 A



max. 1 mm²

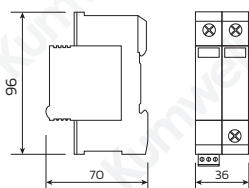
KZ12.U275-40K.ds/2P



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

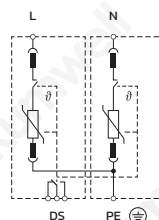
Technical data		KZ12.U275-40K.ds/2P
Test class according to IEC 61643-11		CLASS II
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_C	275 V AC
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	≤ 1.5 kV
Response time	t_A	< 25 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	-40°C to $+85^\circ\text{C}$
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

Dimensions

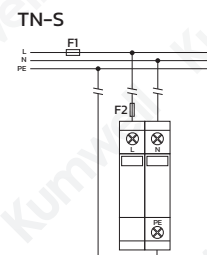


INDICATION
■ GREEN - OK
■ RED - FAILURE

Internal configuration



Network connections



CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S SYSTEM

Kumwell SC40K-U320/2P 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 SC40K-U320/2P 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)



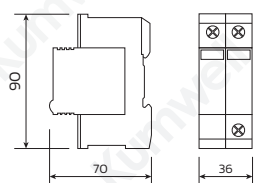
SC40K-U320/2P

Protection modes: L-PE, N-PE
Max. continuous operating voltage: U_c
Max. discharge current

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

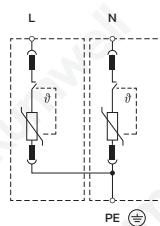
Technical data		SC40K-U320/2P
Test class according to IEC 61643-11		CLASS II
Nominal voltage	U_N	220 V AC
Max. continuous operating voltage	U_c	320 V AC
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	≤ 1.5 kV
Response time	t_A	< 25 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	-40°C to $+80^\circ\text{C}$
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

Dimensions

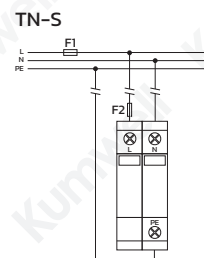


INDICATION
GREEN - OK
RED - FAILURE

Internal configuration



Network connections

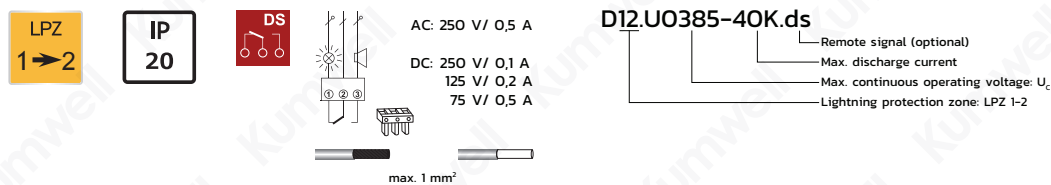


CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S SYSTEM

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.

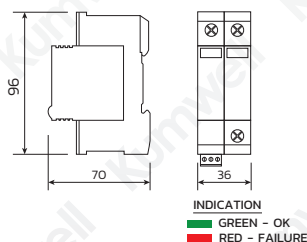
Protected Mode: L-PE, N-PE (2P)



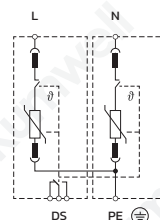
Varistor / Class II / Single-Phase for TN-S System

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 μ s)	I_{max}	40 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	≤ 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	ϑ	-40°C to $+85^\circ\text{C}$
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

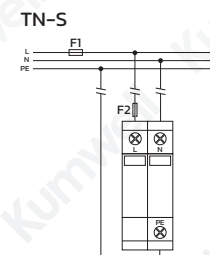
Dimensions



Internal configuration



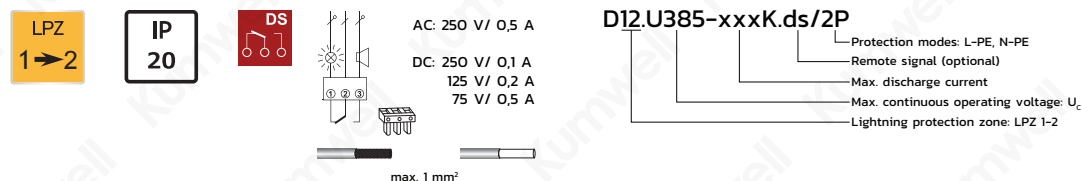
Network connections



CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S SYSTEM

Kumwell D12.U385-xxxK.DS/2P 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 μ s) of each line could be 80-160 kA. It is applicable for 230 V AC Power Distribution Systems lightning protection in all classes.

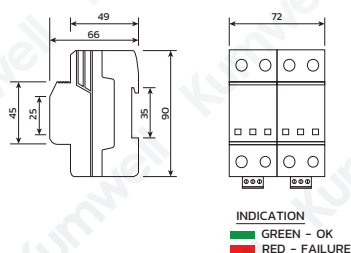
It is suitable for the low voltage main power distribution cabinet/box of buildings, and the equipments connected between three phase AC power supply and system in parallel, with advantage of extremely low residual voltage, quick respond, large intake capacity, long work life and simple maintenance.



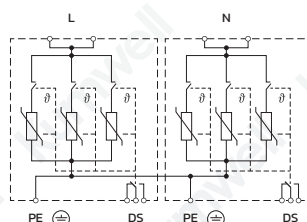
Varistor/ Class II / Three-Phase for TN-S System

Technical data		D12.U385-80K.DS/2P	D12.U385-100K.DS/2P	D12.U385-120K.DS/2P	D12.U385-160K.DS/2P
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			
Nominal discharge current (8/20 μ s)	I_n	40 kA	50 kA	60 kA	80 kA
Max. discharge current (8/20 μ s)	I_{max}	80 kA	100 kA	120 kA	160 kA
Voltage protection level at 10 kA (8/20 μ s)	U_p	< 1.5 kV	< 1.5 kV	< 1.5 kV	< 1.5 kV
Voltage protection level at I_n (8/20 μ s)	U_p	< 2.0 kV	< 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	ϑ	-25°C to +70°C			
Relative Humidity		≤ 95%			
Cross-section of the connected conductors (solid)		6 mm²(min.) - 25 mm²(max.)			
Cross-section of the connected conductors (wire)		6 mm²(min.) - 16 mm²(max.)			
Mounting		Din rail 35 mm			
Indication Method		Indication Window, Turn Red When Malfunction			
Dimension (L x H x W) (mm)		72 x 90 x 66			

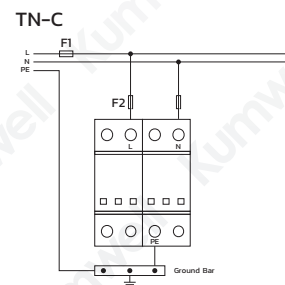
Dimensions



Internal configuration



Network connections

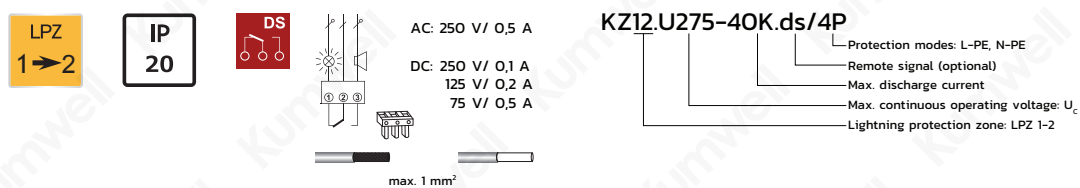


CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 3-PHASE TN-S SYSTEM

Kumwell KZ12.U275-40K.ds series 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 KZ12.U275-40K.ds series 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.

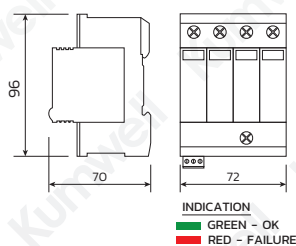
Protected Mode: L-PE, N-PE (4P)



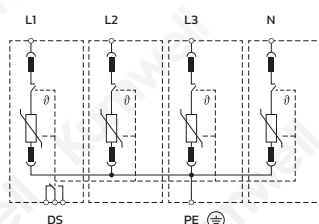
Varistor / Class II / Three-Phase for TN-S System

Technical data		KZ12.U275-40K.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		275 V AC
Max. discharge current (8/20 μ s)	I_{max}		40 kA
Nominal discharge current (8/20 μ s)	I_n		20 kA
Voltage protection level	U_p		≤ 1.5 kV
Response time	t_A		< 25 ns
Max. back-up fuse			125 A gL/gG
LPZ			1-2
Protection type			IP20
Operating temperature range	ϑ		-40°C to +85°C
Cross-section of the connected conductors (solid)			6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)			6 mm ² (min.) - 16 mm ² (max.)
Mounting on			DIN rail 35 mm
Failure signalisation			green - ok / red - failure

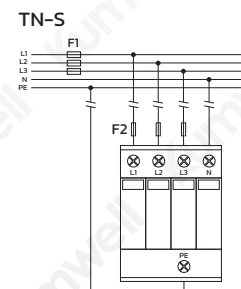
Dimensions



Internal configuration



Network connections

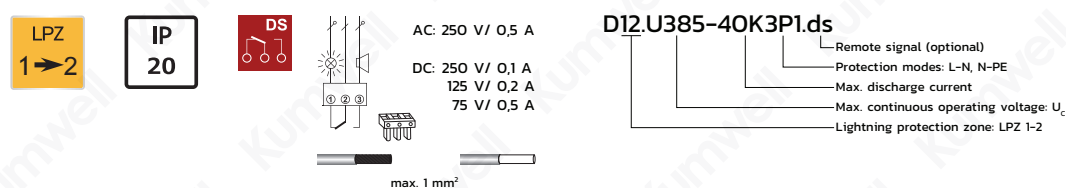


CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 3-PHASE TN-S AND TT SYSTEM

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 switch-boards or onto the control box by connected parallel in the power line.

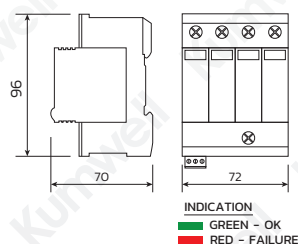
These SPD consist of D12.U385-40K3P1.ds installed between L-N and D12.I040.NPE installed between N-PE applied for TN-S and TT systems.



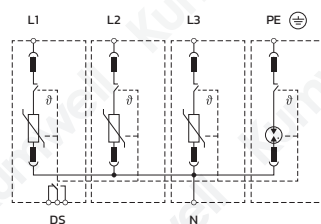
Varistor / Class II / Three-Phase for TN-S and TT System

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) U _C (N-PE)	385 V AC 385 V AC
Max. discharge current (8/20 μs)	I _{max} (L-N) I _{max} (N-PE)	40 kA 40 kA
Nominal discharge current (8/20 μs)	I _n (L-N) I _n (N-PE)	20 kA 20 kA
Voltage protection level	U _p (L-N) U _p (N-PE)	≤ 1.8 kV ≤ 1.8 kV
Response time	t _A (L-N) t _A (N-PE)	< 25 ns < 25 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	-40°C to +70°C
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

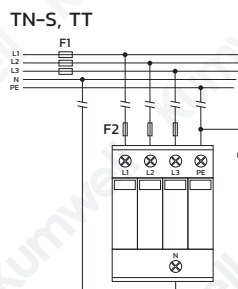
Dimensions



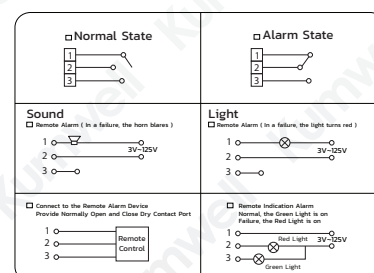
Internal configuration



Network connections

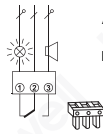


Wiring Diagram (Remote Alarm)

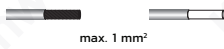


CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 3-PHASE TN-C SYSTEM

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 μ 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 respond, large intake capacity, long work life and simple maintenance.



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



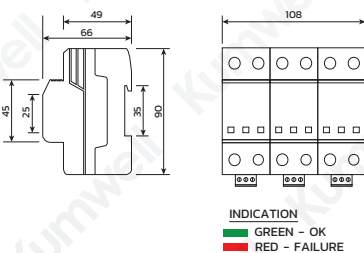
D12.U385-xxxK.ds/3P

- Protection modes: L-PEN
- Remote signal (optional)
- Max. discharge current
- Max. continuous operating voltage: U_c
- Lightning protection zone: LPZ 1-2

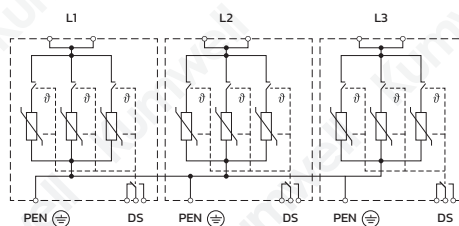
Varistor/ Class II / Three-Phase for TN-C System

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 μ s)	I_n	50 kA	60 kA	80 kA
Max. discharge current (8/20 μ s)	I_{max}	100 kA	120 kA	160 kA
Voltage protection level at 10 kA (8/20 μ s)	U_p	< 1.5 kV	< 1.5 kV	< 1.5 kV
Voltage protection level at I_n (8/20 μ 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	ϑ	-25°C to +70°C		
Relative Humidity		≤ 95%		
Cross-section of the connected conductors (solid)		6 mm²(min.) - 25 mm²(max.)		
Cross-section of the connected conductors (wire)		6 mm²(min.) - 16 mm²(max.)		
Mounting		Din rail 35 mm		
Indication Method		Indication Window, Turn Red When Malfunction		
Dimension (L x H x W) (mm)		108 x 90 x 66		

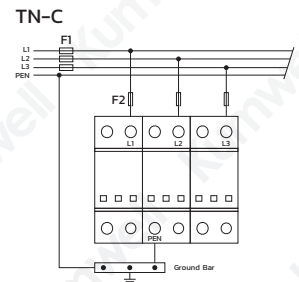
Dimensions



Internal configuration



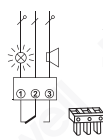
Network connections



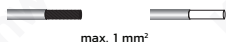
CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 3-PHASE TN-S SYSTEM

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 μ s) of each line could be 80-160 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 respond, large intake capacity, long work life and simple maintenance.



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



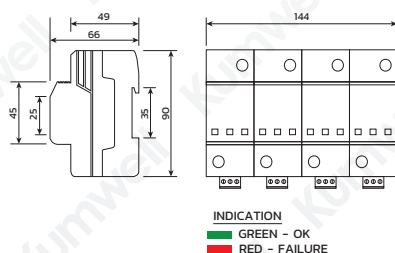
D12.U385-xxxK.ds/4P

- Protection modes: L-PE, N-PE
- Remote signal (optional)
- Max. discharge current
- Max. continuous operating voltage: U_c
- Lightning protection zone: LPZ 1-2

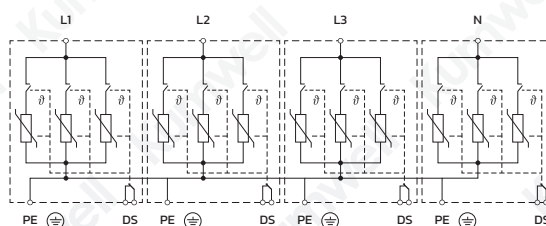
Varistor/ Class II / Three-Phase for TN-S System

Technical data		D12.U385-80K.DS/4P	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 μ s)	I_n	40 kA	50 kA	60 kA	80 kA
Max. discharge current (8/20 μ s)	I_{max}	80 kA	100 kA	120 kA	160 kA
Voltage protection level at 10 kA (8/20 μ s)	U_p	< 1.5 kV	< 1.5 kV	< 1.5 kV	< 1.5 kV
Voltage protection level at I_n (8/20 μ s)	U_p	< 2.0 kV	< 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	ϑ	-25°C to +70°C			
Relative Humidity		$\leq 95\%$			
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)			
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (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 66			

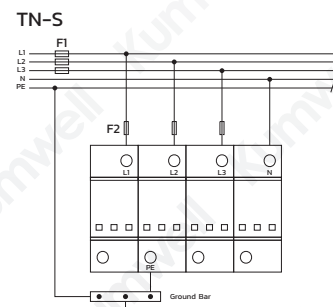
Dimensions



Internal configuration

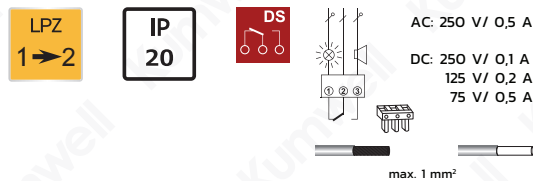


Network connections



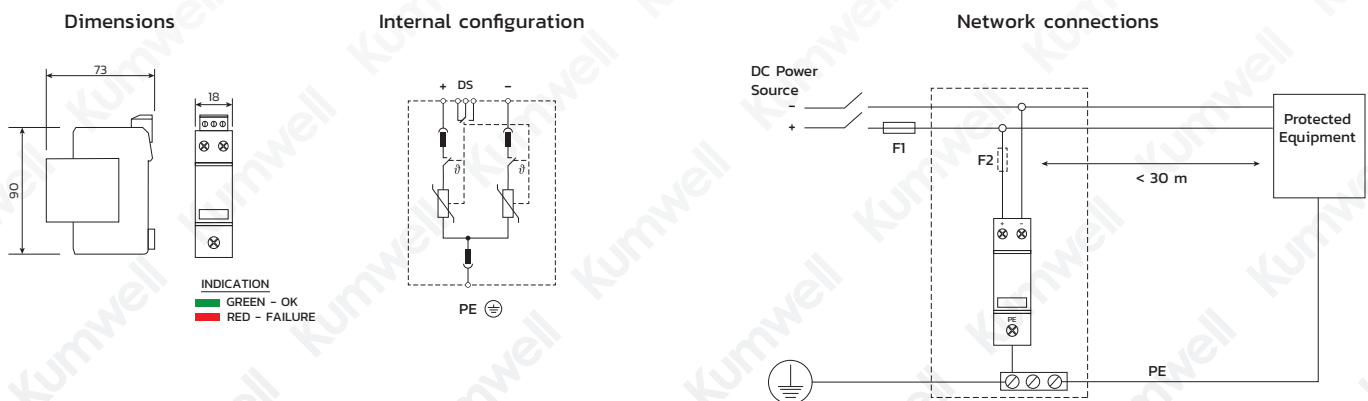
CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR MODULAR SPD FOR DC POWER SYSTEMS

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.



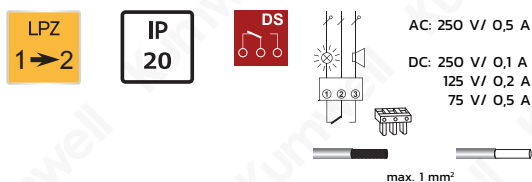
Varistor / Class II / Modular SPD for DC Power System

Technical data		KZ12.DC20K-U24V.ds	KZ12.DC20K-U48V.ds	KZ12.DC20K-U110V.ds
Test class according to IEC 61643-11			CLASS II	
Nominal voltage	U_N	24 V DC	48 V DC	110 V DC
Max. continuous operating voltage	U_C	38 V DC	56 V DC	150 V DC
Nominal discharge current (8/20 μ s)	I_n		10 kA	
Max. discharge current (8/20 μ s)	I_{max}		20 kA	
Voltage protection level at I_n	U_p	< 400 V	< 500 V	< 600 V
Response time	t_A		< 25 ns	
Fuse (if required)			20 A gL/gG	
Temperature range	ϑ		-40°C to +70°C	
Connection type			Screw Terminal	
Conductor size			1.5-2.5 mm ²	
Mounting			DIN rail 35mm	
Degree of protection			IP20	
Indication of disconnector operation			Red flag	



CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR MODULAR SPD FOR DC POWER SYSTEMS

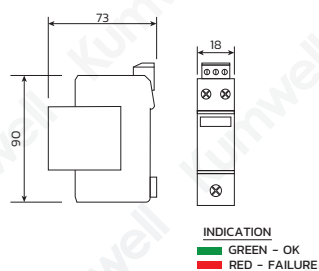
Kumwell KZ12.DC40K series surge arresters Class II (Type 2) for DC power systems have been designed to meet the unique requirements of protection of DC power systems and complied with IEC 61643-1 and IEC 61643-11, achieve surge suppression, discharge current and amplitude limiting. To protect the power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



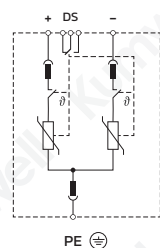
Varistor / Class II / Modular SPD for DC Power System

Technical data		KZ12.DC40K-U24V.ds	KZ12.DC40K-U48V.ds	KZ12.DC40K-U110V.ds
Test class according to IEC 61643-11			CLASS II	
Nominal voltage	U_N	24 V DC	48 V DC	110 V DC
Max. continuous operating voltage	U_C	38 V DC	64 V DC	150 V DC
Nominal discharge current (8/20 μ s)	I_n		20 kA	
Max. discharge current (8/20 μ s)	I_{max}		40 kA	
Voltage protection level at I_n	U_p	< 800 V	< 800 V	< 1.5 kV
Response time	t_A		< 25 ns	
Fuse (if required)			50 A gL/gG	
Temperature range	ϑ		-40°C to +70°C	
Connection type			Screw Terminal	
Conductor size			1.5-2.5 mm ²	
Mounting			DIN rail 35mm	
Degree of protection			IP20	
Indication of disconnector operation			Red flag	

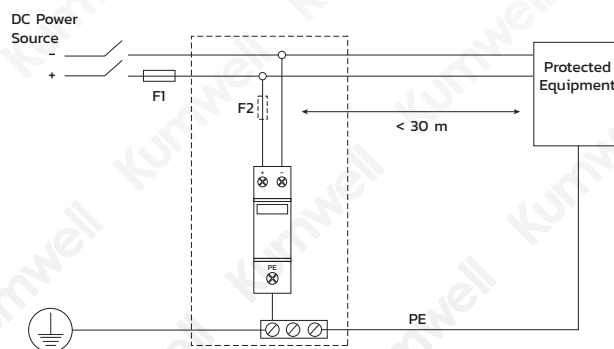
Dimensions



Internal configuration



Network connections



3 Surge Protection for Photovoltaic Systems (PV Systems)

CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 1-PHASE TN-S SYSTEM

Kumwell SL12.Uxxx-40K-2P series is a two poles, metal oxide varistor surge arrester class II according to IEC 61643-11. These arresters are recommended for use 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 SL12.Uxxx-40K-2P series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



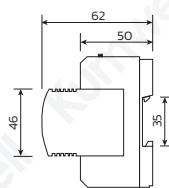
SL12.Uxxx.40K-2P

- Protection modes: L-PE, N-PE
- Max. discharge current (8/20 μ s)
- Max. continuous operating voltage: U_c
- Lightning protection zone: LPZ 1-2

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

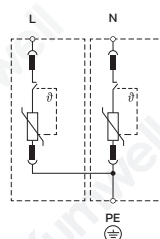
Technical data		SL12.U275-40K-2P
Test class according to IEC 61643-11		CLASS II
Nominal voltage	U_N	230 V AC
Max. continuous operating voltage	U_c	275 V AC
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	≤ 2.0 kV
Response time	t_A	< 25 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	-40°C to $+85^\circ\text{C}$
Cross-section of the connected conductors (solid)		6 mm ² (min.) – 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) – 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

Dimensions

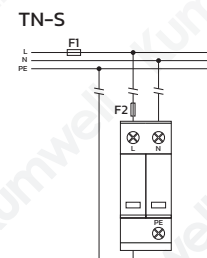


INDICATION
■ GREEN - OK
■ RED - FAILURE

Internal configuration



Network connections



CLASS II (TYPE 2) SURGE ARRESTER/VARISTOR 3-PHASE TN-S SYSTEM

Kumwell SL12.Uxxx-40K-4P series is a four poles, metal oxide varistor surge arrester class II according to IEC 61643-11. These arresters are recommended for use 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 SL12.Uxxx-40K-4P series arresters is in all kinds of industry, resident and administration buildings. They are to be placed into the subsidiary switchboards or control boxes.



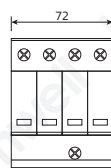
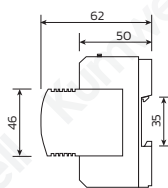
SL12.Uxxx.40K-2P

- Protection modes: L-PE, N-PE
- Max. discharge current (8/20 μ s)
- Max. continuous operating voltage: U_c
- Lightning protection zone: LPZ 1-2

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

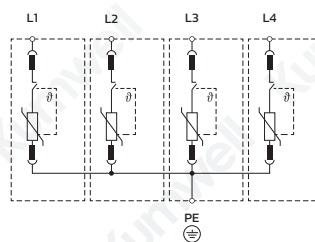
Technical data		SL12.U385-40K-4P
Test class according to IEC 61643-11		CLASS II
Nominal voltage	U_N	230/400 V AC
Max. continuous operating voltage	U_c	385 V AC
Max. discharge current (8/20 μ s)	I_{max}	40 kA
Nominal discharge current (8/20 μ s)	I_n	20 kA
Voltage protection level	U_p	≤ 2.0 kV
Response time	t_A	< 25 ns
Max. back-up fuse		125 A gL/gG
LPZ		1-2
Protection type		IP20
Operating temperature range	ϑ	-40°C to $+85^\circ\text{C}$
Cross-section of the connected conductors (solid)		6 mm ² (min.) - 25 mm ² (max.)
Cross-section of the connected conductors (wire)		6 mm ² (min.) - 16 mm ² (max.)
Mounting on		DIN rail 35 mm
Failure signalisation		green - ok / red - failure

Dimensions

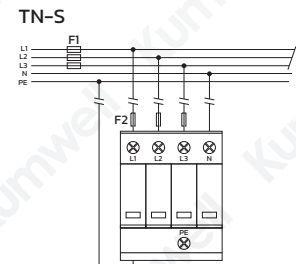


INDICATION
■ GREEN - OK
■ RED - FAILURE

Internal configuration

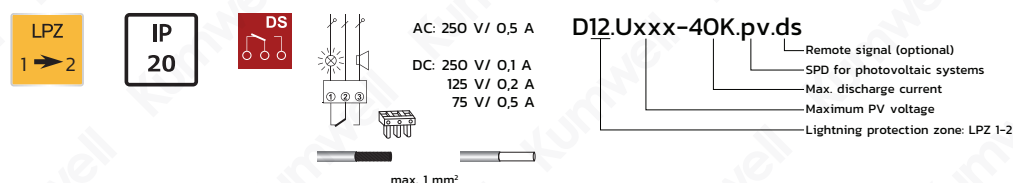


Network connections



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

Kumwell D12*.pv.ds is a lightning and surge arrester class II complied with IEC 61643-II and IEC 61643-31 standard. Thus, the products are suited for the LPZ 1-2 protection zones concept (according to IEC 62305) for equipotential bonding of positive and negative photovoltaic systems bus bars. Also, it can eliminate temporary overvoltage originating during the switching process of atmosphere discharge. The varistor can be disconnected when overheating by using the equipped internal disconnectors. The disconnecter status indicator is a mix between remote monitoring (free change over contacts-only DS types) and mechanical (red signal).

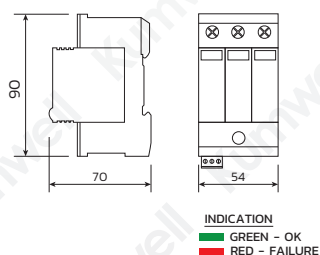


Varistor/ Class II / Photovoltaic System

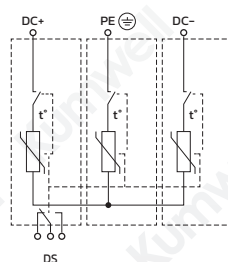
Technical data		D12.U0600-40K.pv.ds	D12.U1000-40K.pv.ds	D12.U1500-40K.pv.ds
Test class according to IEC 61643-II and IEC 61643-31		CLASS II		
Max. continuous operating voltage	U_{cpv}	600 V DC	1000 V DC	1500 V DC
Application		(+)/(-) , (+)/PE, (-)/PE		
Max. discharge current (8/20 μ s)	I_{max}	40 kA		
Nominal discharge current (8/20 μ s)	I_n	20 kA		
Voltage protection level	U_p	≤ 2.0 kV	≤ 3.5 kV	≤ 4.5 kV
Leakage current		20 μ A	20 μ A	30 μ A
Response time	t_A	≤ 25 ns		
Status indication		Indicates windows faults is red		
Remote alarm function		Optional		
LPZ		1-2		
Protection type		IP20		
Operating temperature range	ϑ	-25°C to +70°C		
Cross-section of the connected conductors (stranded)		6 mm ² (min.) - 25 mm ² (max.)		
Relative humidity		≤ 95%RH		
Mounting on		DIN rail 35 mm		
Dimensions		54 x 90 x 70 mm		

Order Options	
Model	Type
D12.U0600-40K.pv / D12.U1000-40K.pv	Without remote signal contact
D12.U0600-40K.pv.ds / D12.U1000-40K.pv.ds	With remote signal contact

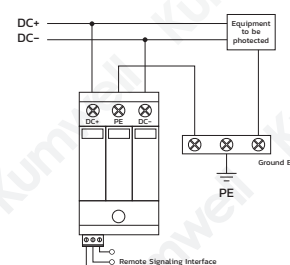
Dimensions



Internal configuration



Network connections



4 Surge Protection for Information Technology Systems and Equipment

INFORMATION TECHNOLOGY SYSTEM SIGNAL AND DATA LINE PROTECTION LAN PROTECTION – SPD FOR CAT 6 NETWORKS

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.



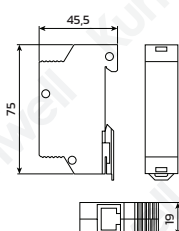
IEC/EN Category	: D1/C1/C2/C3
Protection	: All 4 Pairs
Nominal operating voltage	: 48 V DC
Maximum Operating Voltage	: 50 V DC
Frequency Range	: 250 MHz, up to Cat6, PoE Compatible
Surge Discharge Ratings	: I_n 10 kA , I_{imp} 1 kA
Enclosure	: UTB In-line Patch, Din Rail Mount
Terminals	: RJ45, Shielded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

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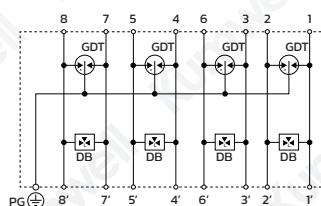
LAN Protection

Technical data		KLZ.NET-CAT6
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)	50 V
	U_C (Pair-Pair)	72 V
Rated load current at 25 °C	I_L	1 A
Nominal discharge current (8/20 μ s)	I_n (Line-Line)	150 A
C2 Total discharge current (8/20 μ s)	I_n (Line-Ground)	10 kA
D1 Lightning impulse current (10/350 μ s)	I_{imp}	1 kA
Voltage protection level at I_n	U_p (Line-Line)	150 V
	U_p (Line-Ground)	550 V
Response time overvoltage protection	t_A	< 1 ns
Cut-off Frequency	F_G	250 MHz
Connection type		Input/Output: RJ45 sockets
Temperature range		-40°C to +80°C
Degree of protection		IP20
Housing Material		Metal
Mounting		DIN rail 35 mm

Dimensions



Internal configuration



Legend :

- GDT gas discharge tube
- DB diode block
- PG protective grounding

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

Kumwell D01.LAN-RJ45/*D series LAN 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 μ s) is 10 kA/line., quick response time. It is suitable for the network lightning surge protection.

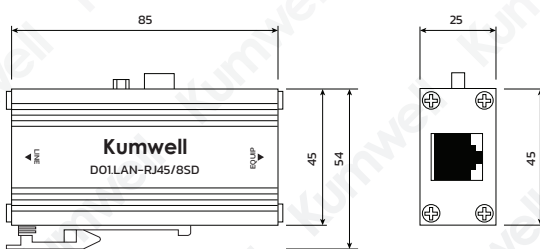


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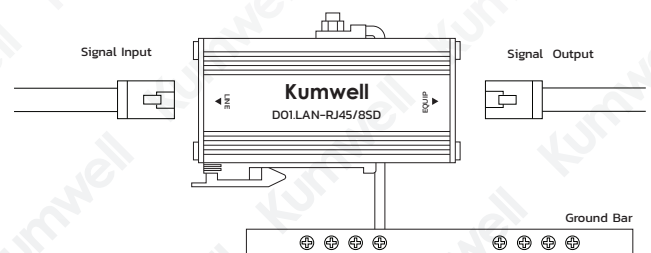
10/100/1000M LAN Network Surge Protection

Technical data		D01.LAN-RJ45/8SGD
Rated working voltage	U_N	5 V
Max. continuous operating voltage	U_C	8 V
Nominal discharge current (8/20 μ s)	I_n	5 kA
Max. discharge current (8/20 μ s)	I_{max}	10 kA
Voltage protection level at 8/20 μ s	U_p	≤ 10 V (Line-Line) ≤ 90 V (Line-PE)
Voltage protection level at 10/700 μ s	U_p	≤ 40 V
Response time	t_A	< 1 ns
Transmission Rate		1000 Mbps
Insertion Loss		≤ 0.5 dB
Series impedance per line	R	0.5 Ω
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
Mounting		DIN rail 35 mm
Test Standards		IEC 61643-21

Dimensions



Installation



INFORMATION TECHNOLOGY SYSTEM SIGNAL AND DATA LINE PROTECTION PoE SURGE PROTECTION

Kumwell D01.POE-RJ45/D PoE Surge Protection 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.

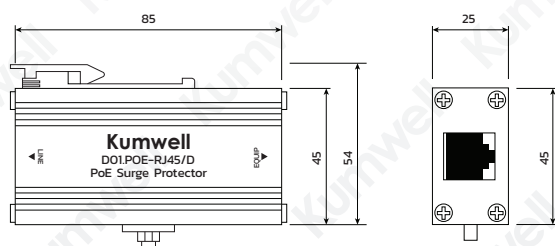


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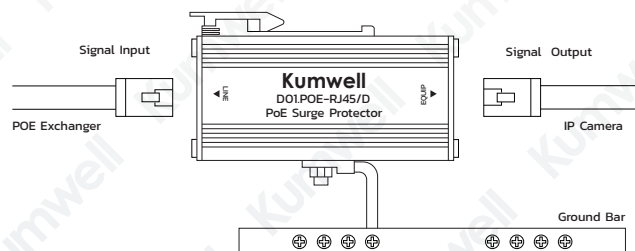
10/100M Network Surge Protection

Technical data		D01.POE-RJ45/D
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 μ s	U_p	≤ 40 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 μ s)	U_p	≤ 200 V
Nominal discharge current (8/20 μ s)	I_n	5 kA
Max. discharge current (8/20 μ s)	I_{max}	10 kA
Insertion Loss		≤ 0.5 dB
Response time		≤ 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
Mounting		DIN rail 35 mm
Test Standards		IEC 61643-21

Dimensions



Installation



INFORMATION TECHNOLOGY SYSTEM POWER AND DATA LINE PROTECTION IP CAMERA SURGE PROTECTION

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.

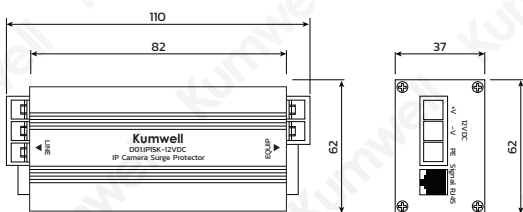


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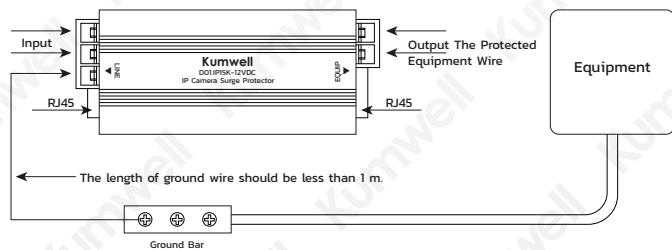
IP Camera Surge Protection

Number of protected pairs		D01.IP15K-12VDC	D01.IP15K-24VAC	D01.IP15K-U275
Power Line				
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 μ s)	I_n		5 kA	
Max. discharge current (8/20 μ s)	I_{max}		15 kA	
Voltage protection level at I_n (8/20 μ s)	U_p	≤ 100 V	≤ 200 V	≤ 1000 V
Rated load current	I_L		5 A	
Response time	t_A		≤ 10 ns	
Connector type			Terminal Block	
Signal Line				
Nominal voltage	U_N		5 V DC	
Max. Continuous operating voltage	U_C		8 V DC	
Transmission rate			100 Mbps	
Nominal discharge current (8/20 μ s)	I_n		1 kA	
Max. discharge current (8/20 μ s)	I_{max}		2 kA	
Voltage protection level at 10/700 μ s	U_p		≤ 30 V	
Insertion Loss			≤ 0.5 dB	
Response time	t_A		≤ 1 ns	
Connector type			RJ45 Socket	
Mechanical data				
Housing material			Aluminum	
Protection type			IP20	
Working temperature			-25°C to +70°C	
Working humidity			$\leq 95\%$ RH	
Test Standards			IEC 61643-21	

Dimensions



Installation



INFORMATION TECHNOLOGY SYSTEM TELEPHONE SURGE PROTECTION

Kumwell DO1.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.

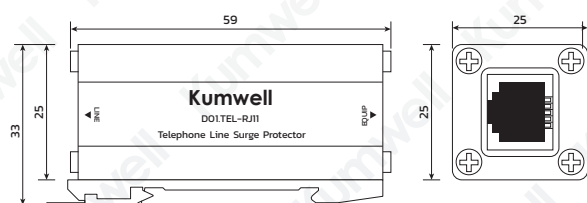


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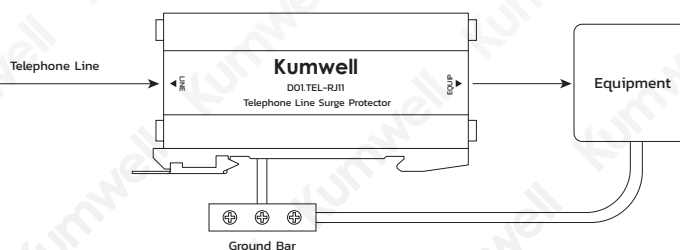
Telephone Surge Protection

Technical data		DO1.TEL-RJ11
Max. continuous operating voltage	U_c	200 V
Nominal discharge current (8/20 μ s)	I_n	5 kA
Max. discharge current (8/20 μ s)	I_{max}	10 kA
Voltage protection level at 10/700 μ s	U_p	≤ 300 V
Response time	t_A	≤ 1 ns
Impedance		10 Ω
Insertion Loss		≤ 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
Test Standards		IEC 61643-21

Dimensions



Installation



5 Surge Protection for Data/Signal Line Protection

DATA/SIGNAL LINES PROTECTION SPD FOR SHIELDED CABLES

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.

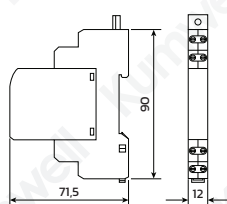
Coarse protection is provided by a three terminal GDT while fine protection is provided using a high speed silicon avalanche diodes or metal oxide varistor stage. Care is taken to ensure coordination between these two stages without voltage or surge current blind spots occurring.



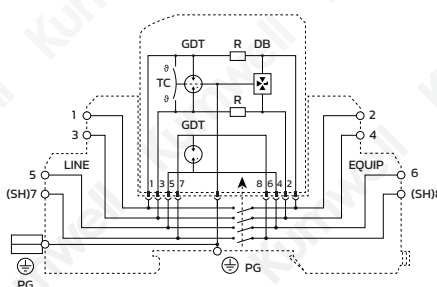
**IP
20**

Type	KSMH.SH Series								
Technical Data	5V	12V	15V	24V	30V	48V	60V	110V	
Electrical Data									
Lines protected	1 (2 conductors)								
Nominal operating voltage (DC)	U_N	5 V	12 V	15 V	24 V	30 V	48 V	60 V	110 V
Max. continuous operating voltage (DC)	U_C	6 V	15 V	18 V	28 V	33 V	52 V	64 V	170 V
Rated load current at 25°C	I_L	1 A							
C2 Nominal discharge current (8/20 μ s)	I_n	10 kA							
Max. discharge current (8/20 μ s)	I_{max}	20 kA							
D1 Lightning impulse current (10/350 μ s)	I_{imp}	2.5 kA							
Residual voltage at 5 kA (8/20 μ s)	U_{res} (Line-Line) (SH-GND)	< 22 V	< 42 V	< 48 V	< 70 V	< 80 V	< 140 V	< 160 V	< 450 V
Rated spark overvoltage	(Line-Line), (Line-GND)	7-10 V	16-21 V	20-24 V	30-36 V	35-43 V	55-68 V	67-85 V	184-264 V
Response time of overvoltage protection	t_A (SH-GND) (Line-Line), (Line-GND)	< 100 ns							
Insulation resistance of the protection	R_{iso} (SH-GND) (Line-Line), (Line-GND)	>1G Ω /100V							
Serial resistance per path	R	1.6-2.0 Ω							
Transverse capacitance	C (SH-GND) (Line-Line), (Line-GND)	5 pF							
Cut-off frequency	F_G	30 MHz							
Mechanical data									
Temperature range	-40°C to +80°C								
Terminal cross section	Stranded to 4 mm ²								
Mounting	DIN rail 35mm								
Degree of protection	IP20								
Test Standards	IEC 61643-21								

Dimensions



Internal configuration



Legend :

- TC Thermo-clip
- GDT Gas Discharge Tube
- R Resistor
- DB Diode Block
- PG Protective Grounding
- SH Shielded

DATA/SIGNAL LINES PROTECTION MODULAR SPD FOR SINGLE-PAIR SIGNAL LINES

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.

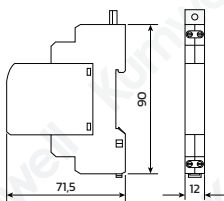
To protect against the hazards of electric shock and fire which often results when power frequency contact occurs between power and communication lines (often called main incursion), a thermo-clip is included on the primary protection stage to divert the power frequency current to ground.



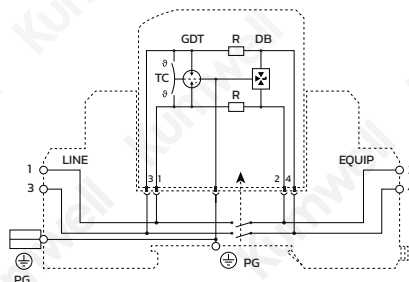
**IP
20**

Type Technical Data	KSMH.TC Series								
	5V	12V	15V	24V	30V	48V	60V	110V	
Electrical Data									
Lines protected	1 (2 conductors)								
Nominal operating voltage (DC)	U_N	5 V	12 V	15 V	24 V	30 V	48 V	60 V	110 V
Max. continuous operating voltage (DC)	U_C	6 V	15 V	18 V	28 V	33 V	52 V	64 V	170 V
Rated load current at 25°C	I_L	1 A							
C2 Nominal discharge current (8/20 µs)	I_n	10 kA							
Max. discharge current (8/20 µs)	I_{max}	20 kA							
D1 Lightning impulse current (10/350 µs)	I_{imp}	2.5 kA							
Residual voltage at 5 kA (8/20 µs)	U_{res}	< 22 V	< 42 V	< 48 V	< 70 V	< 80 V	< 140 V	< 160 V	< 450 V
Rated spark overvoltage	(Line-GND) (Line-Line)	7-10 V	16-21 V	21-25 V	31-37 V	36-44 V	57-69 V	68-84 V	184-264 V
Response time of overvoltage protection	t_A	< 1 ns							
Thermal protection		Yes							
Insulation resistance of the protection	R_{iso}	≥6 MΩ	≥15 MΩ	≥18 MΩ	≥28 MΩ	≥33 MΩ	≥52 MΩ	≥64 MΩ	≥170 MΩ
Serial resistance per path	R	1.6-2.0Ω							
Transverse capacitance	C	50 pF							
Cut-off frequency	f_G	30 MHz							
Mechanical data									
Temperature range		-40°C to +80°C							
Terminal cross section		Stranded to 4 mm ²							
Mounting		DIN rail 35mm							
Degree of protection		IP20							
Test Standards		IEC 61643-21							

Dimensions



Internal configuration



Legend :

- TC Thermo-clip
- GDT Gas Discharge Tube
- R Resistor
- DB Diode Block
- PG Protective Grounding

DATA/SIGNAL LINES PROTECTION MODULAR SPD FOR 2-PAIRS SIGNAL LINES

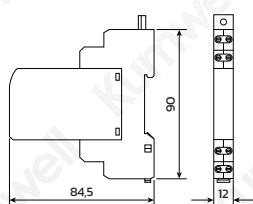
Kumwell KSMH2.TC series of surge protective devices has been developed to protect against the effects of induced voltages onto data, signal and communication circuits. Like the KSMH.TC series, the KSMH2.TC provides the same level of protection to two independent circuits (pairs). A number of protection voltages are available to ensure the user is able to select the closest clamp in voltage to the normal signal operation of the equipment being protected.



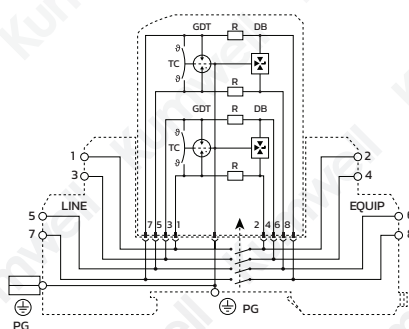
IP
20

Type	KSMH2.TC Series								
Technical Data	5V	12V	15V	24V	30V	48V	60V	110V	
Electrical Data									
Lines protected	2 (4 conductors)								
Nominal operating voltage (DC)	U_N	5 V	12 V	15 V	24 V	30 V	48 V	60 V	110 V
Max. continuous operating voltage (DC)	U_C	6 V	15 V	18 V	28 V	33 V	52 V	64 V	170 V
Rated load current at 25°C	I_L	1 A							
C2 Nominal discharge current (8/20 μ s)	I_n	10 kA							
Max. discharge current (8/20 μ s)	I_{max}	20 kA							
D1 Lightning impulse current (10/350 μ s)	I_{imp}	5 kA							
Residual voltage at 5 kA (8/20 μ s)	U_{res}	< 22 V	< 42 V	< 48 V	< 70 V	< 80 V	< 140 V	< 160 V	< 450 V
Rated spark overvoltage	(Line-GND)	7-10 V	17-21 V	21-25 V	31-37 V	36-44 V	57-69 V	68-84 V	184-264 V
	(Line-Line)	7-10 V	17-21 V	21-25 V	31-37 V	36-44 V	57-69 V	68-84 V	184-264 V
Response time of overvoltage protection	t_A	< 1 ns							
Thermal protection		Yes							
Insulation resistance of the protection	R_{iso}	$\geq 6 M\Omega$	$\geq 15 M\Omega$	$\geq 18 M\Omega$	$\geq 28 M\Omega$	$\geq 33 M\Omega$	$\geq 52 M\Omega$	$\geq 64 M\Omega$	$\geq 170 M\Omega$
Serial resistance per path	R	1.6-2.0 Ω							
Transverse capacitance	C	50 pF							
Cut-off frequency	f_G	30 MHz							
Mechanical data									
Temperature range		-40°C to +80°C							
Terminal cross section		Stranded to 4 mm ²							
Mounting		DIN rail 35mm							
Degree of protection		IP20							
Test Standards		IEC 61643-21							

Dimensions



Internal configuration



Legend :

- TC Thermo-clip
- GDT Gas Discharge Tube
- R Resistor
- DB Diode Block
- PG Protective Grounding

DATA/SIGNAL LINES PROTECTION SPD WITH SEPARATED SIGNAL GROUND (RS232)

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.

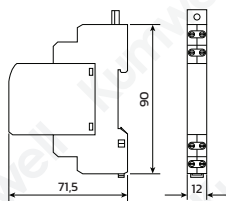
The circuit topology consists of a multi-stage protector providing both common (longitudinal) mode and differential (transverse) mode protection. Coarse protection is provided by a three terminal GDT while fine protection is provided using a high speed silicon avalanche diodes or metal oxide varistor stage.



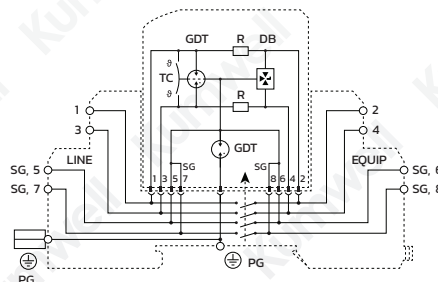
IP
20

Type	KSMH.SG Series								
Technical Data	5V	12V	15V	24V	30V	48V	60V	110V	
Electrical Data									
Lines protected	1 (2 conductors)								
Nominal operating voltage (DC)	U_N	5 V	12 V	15 V	24 V	30 V	48 V	60 V	110 V
Max. continuous operating voltage (DC)	U_C	6 V	15 V	18 V	28 V	33 V	52 V	64 V	170 V
Rated load current at 25°C	I_L	1 A							
C2 Nominal discharge current (8/20 μ s)	I_n	10 kA							
Max. discharge current (8/20 μ s)	I_{max}	20 kA							
D1 Lightning impulse current (10/350 μ s)	I_{imp}	2.5 kA							
Residual voltage at 5 kA (8/20 μ s)	U_{res} (Line-Line)	< 22 V	< 42 V	< 48 V	< 70 V	< 80 V	< 140 V	< 160 V	< 450 V
Rated spark overvoltage	(SG-GND)	184-276V							
	(Line-Line), (Line-SG)	7-10 V	16-19 V	20-24 V	30-36 V	35-43 V	55-68 V	67-85 V	184-264 V
Response time of overvoltage protection	t_A (Line-Line)	< 1 ns							
	(Line-GND)	< 100 ns							
Insulation resistance of the protection	R_{iso} (Line-Line)	>1G Ω /100V							
	(Line-GND)	≥ 6 M Ω	≥ 15 M Ω	≥ 18 M Ω	≥ 28 M Ω	≥ 33 M Ω	≥ 52 M Ω	≥ 64 M Ω	≥ 170 M Ω
Serial resistance per path	R	1.6-2.0 Ω							
Transverse capacitance	C (Line-Line)	50 pF							
	(Line-GND)	5 pF							
Cut-off frequency	f_G	30 MHz							
Mechanical data									
Temperature range	-40°C to +80°C								
Terminal cross section	Stranded to 4 mm ²								
Mounting	DIN rail 35mm								
Degree of protection	IP20								
Test Standards	IEC 61643-21								

Dimensions



Internal configuration



- Legend :
- TC Thermo-clip
 - GDT Gas Discharge Tube
 - R Resistor
 - DB Diode Block
 - PG Protective Grounding
 - SG Signal Grounding

DATA/SIGNAL LINES PROTECTION MODULAR SPD FOR 2-PAIRS SIGNAL LINES

Kumwell KSM12 Series provides electrical environments where higher exposure to the effects of direct or partially direct lightning currents may be experienced. These include wind turbines and PV installations where lightning exposures are more severe, but where protection of sensitive electronics, such as environmental sensors, is just as crucial. These barriers provide both coarse and fine protection stages and offer longitudinal and transverse 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 implemented using fast bi-directional silicon avalanche diodes. Series line impedance is used to ensure energy coordination between the coarse and fine protection stages irrespective of the magnitude of the incident surge. When power frequency contact occurs between power and communication lines, the hazard of electric shock and fire is increased.

To prevent such risk, a thermo-clip is included in the primary protection stage of this device to divert the power frequency current to ground.

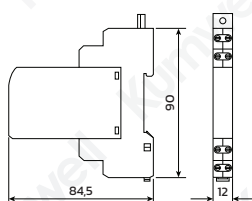
The plug-in module/base design facilitates replacement of a failed module without the need to remove system wiring.



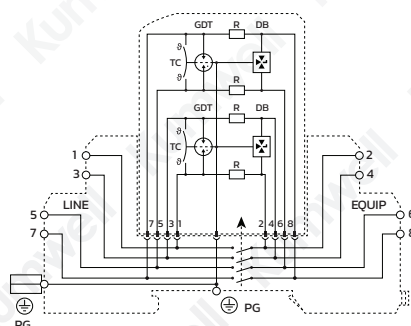
**IP
20**

Type	KSM12 Series								
Technical Data	5V	12V	15V	24V	30V	48V	60V	110V	
Electrical Data									
Lines protected	2 (4 conductors)								
Nominal operating voltage (DC)	U_N	5 V	12 V	15 V	24 V	30 V	48 V	60 V	110 V
Max. continuous operating voltage (DC)	U_C	6 V	15 V	18 V	28 V	33 V	52 V	64 V	170 V
Rated load current at 25°C	I_L	1 A							
C2 Nominal discharge current (8/20 μs)	I_n	20 kA							
Max. discharge current (8/20 μs)	I_{max}	30 kA							
D1 Lightning impulse current (10/350 μs)	I_{imp}	5 kA							
Residual voltage at 5 kA (8/20 μs)	U_{res}	< 22 V	< 42 V	< 48 V	< 70 V	< 80 V	< 140 V	< 160 V	< 450 V
Rated spark overvoltage	(Line-GND) (Line-Line)	7-10 V	16-21 V	21-25 V	31-37 V	36-44 V	57-69 V	68-84 V	184-264 V
Response time of overvoltage protection	t_A	< 1 ns							
Thermal protection		Yes							
Insulation resistance of the protection	R_{iso}	≥6 MΩ	≥15 MΩ	≥18 MΩ	≥28 MΩ	≥33 MΩ	≥52 MΩ	≥64 MΩ	≥170 MΩ
Serial resistance per path	R	1.6-2.0Ω							
Transverse capacitance	C	50 pF							
Cut-off frequency	f_G	30 MHz							
Mechanical data									
Temperature range		-40°C to +80°C							
Terminal cross section		Stranded to 4 mm ²							
Mounting		DIN rail 35mm							
Degree of protection		IP20							
Test Standards		IEC 61643-21							

Dimensions



Internal configuration



- Legend :**
- TC Thermo-clip
 - GDT Gas Discharge Tube
 - R Resistor
 - DB Diode Block
 - PG Protective Grounding

DATA/SIGNAL LINES PROTECTION MODULAR SPD FOR 2-PAIRS SIGNAL LINES

Kumwell KSPH2 series of surge protective devices has been developed to protect two pair loops, which could be ungrounded onto data, signal and communication circuits. It is intended for those applications where high ground potential rises may frequently occur, such as in locations 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 gas discharge tube while fine protection is provided using a high speed silicon avalanche diode or metal oxide varistor stage. Care is taken to ensure coordination between these two stages without voltage or surge current blind spots occurring.

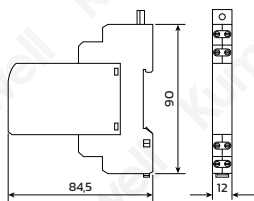
Thermal protection is provided to reduce the hazards of thermal runaway should there be an inadvertent mains incursion fault. Both common (longitudinal) mode and differential (transverse) mode protection is provided. If the module is unplugged out of the base, the connection lines remain enabled.



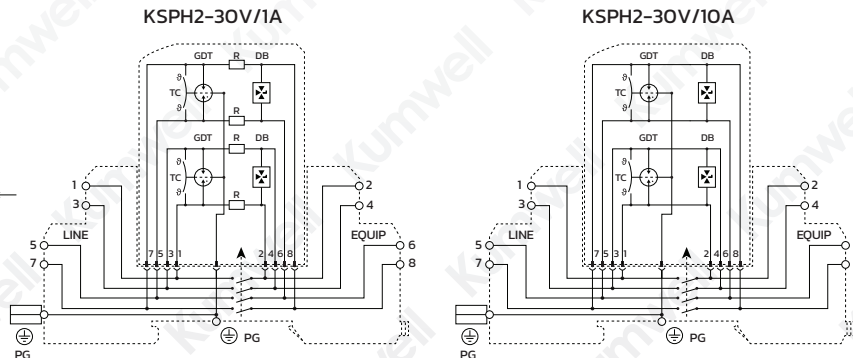
**IP
20**

Type	KSPH2 Series		
Technical Data	KSPH2-30V/1A	KSPH2-30V/10A	
Electrical Data			
Lines protected		2 (4 conductors)	
Nominal operating voltage (DC)	U_N	30 V	
Max. continuous operating voltage (DC)	U_C	33 V	
Rated load current at 25°C	I_L	1 A	10 A
C2 Nominal discharge current (8/20 μ s)	I_n	10 kA	
Max. discharge current (8/20 μ s)	I_{max}	20 kA	
D1 Lightning impulse current (10/350 μ s)	I_{imp}	5 kA	
Residual voltage at 5 kA (8/20 μ s)	U_{res} (Line-Line)	< 80 V	
Rated spark overvoltage	(Line-GND)	184-276V	
	(Line-Line)	36-44 V	
Response time of overvoltage protection	t_A (Line-Line)	< 1 ns	
	(Line-GND)	< 100 ns	
Insulation resistance of the protection	R_{iso} (Line-GND)	>1G Ω /100V	
	(Line-Line)	$\geq 33 M\Omega$	
Serial resistance per path	R	16-2.0 Ω	0.1 Ω
Transverse capacitance	C (Line-Line)	50 pF	
	(Line-GND)	5 pF	
Cut-off frequency	f_G	30 MHz	
Mechanical data			
Temperature range		-40°C to +80°C	
Terminal cross section		Stranded to 4 mm ²	
Mounting		DIN rail 35mm	
Degree of protection		IP20	
Test Standards		IEC 61643-21	

Dimensions



Internal configuration



- Legend :**
- TC Thermo-clip
 - GDT Gas Discharge Tube
 - R Resistor
 - DB Diode Block
 - PG Protective Grounding

6 Surge Protection for Coaxial Cables & RF Systems

COAXIAL HIGH-FREQUENCY PROTECTION N TYPE ANTENNA SURGE PROTECTION

Kumwell KZO1.N* series 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 μ s) = 10 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 O_{A(B)} -1 and higher according to IEC 62305.



KZO1.N50W-10.FM(FF)

- Female to male connector
- Max. discharge current (8/20)=10 kA
- Max. transmission power capacity
- N-type connector
- Lightning protection zone: LPZ 0-1

KZO1.N400W-10.FM(FF)

- Female to male connector
- Max. discharge current (8/20)=10 kA
- Max. transmission power capacity
- N-type connector
- Lightning protection zone: LPZ 0-1

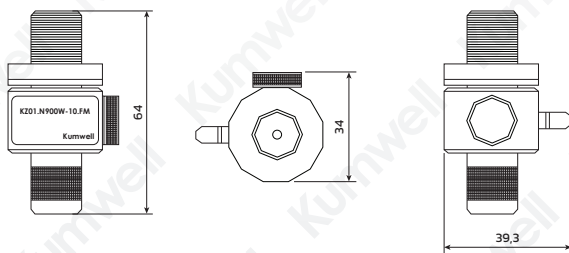
KZO1.N900W-10.FM(FF)

- Female to male connector
- Max. discharge current (8/20)=10 kA
- Max. transmission power capacity
- N-type connector
- Lightning protection zone: LPZ 0-1

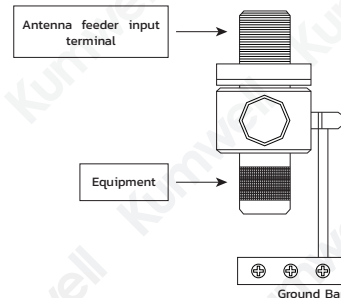
N Type Antenna Surge Protection

Technical data		KZO1.N50W-10.FM (FF)	KZO1.N400W-10.FM (FF)	KZO1.N900W-10.FM (FF)
Connector type		Series N-Type		
Max. continuous operating voltage	U_c	90 V DC	350 V DC	600 V DC
Rated load current	I_L		5 A	
D1 Max. lightning impulse current (10/350 μ s)	I_{imp}		2 kA	
C2 Max. discharge current (8/20 μ s)	I_{max}		10 kA	
C2 Nominal discharge current (8/20 μ s)	I_n		5 kA	
C3 Voltage protection level at 1 kV/ μ s	U_p	< 600 V	< 850 V	< 950 V
Frequency range			0-3 GHz	
Max. transmission power capacity		50 W	400 W	900 W
Voltage Standing Wave Ratio (VSWR)			≤ 1.2	
Insertion loss			< 0.65 dB	
Return loss			> 20 dB	
Characteristic impedance			50 Ω	
Degree of protection			IP65	
Test Standards			IEC 61643-21	

Dimensions



Installation



COAXIAL HIGH-FREQUENCY PROTECTION SMA TYPE ANTENNA SURGE PROTECTION

Kumwell KZ01.DK-S.FM Antenna feeder signal SPD and produced according to the IEC standard. Adopted the integration of metal structure, this product is suitable for antenna and microwave signal transmission lightning protection with feature of high discharge capacity and quick response, it can effectively ensure the equipment to work properly.

Application

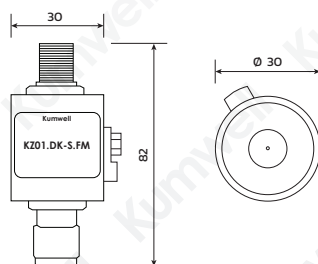
- Antenna feeder of mobile base stations.
- Satellite receiving antenna.
- Short wave (SW) or ultra-short wave antenna feeder.
- CATV amplifier.
- Microwave antenna feeder.
- Radio transmission and receiving equipment.



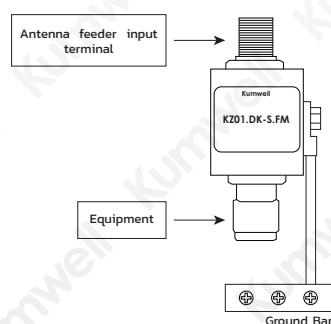
Feeder Signal Surge Protection

Technical data		KZ01.DK-S.FM
Connector type		SMA male to SMA female
Max. continuous operating voltage	U_c	90 V DC
Nominal discharge current (8/20 μ s)	I_n	10 kA
Max. discharge current (8/20 μ s)	I_{max}	20 kA
Voltage protection level	U_p	< 700 V
Response time	t_A	≤ 1 ns
Working Frequency range	f_G	0-3 GHz
Max. Transmission power capacity		200 W
Insertion loss		≤ 0.5 dB
Voltage Standing Wave Ratio (VSWR)		$\leq 1.2:1$
Impedance	Z	50 Ω
Operating temperature	ϑ	-25°C to + 70°C
Operating relative humidity		≤ 95 %RH
Degree of protection		IP20
Test Standards		IEC 61643-21

Dimensions



Installation



7 Surge Protection for Equipotential Bonding (Isolating Spark Gaps)

ISOLATING SPARK GAPS HIGH POWER GAS DISCHARGE TUBE FOR EQUIPOTENTIAL BONDING

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 Ω)

Recommended installation is inside the buildings, outdoors in the damp rooms as well as in the subterraneous areas.

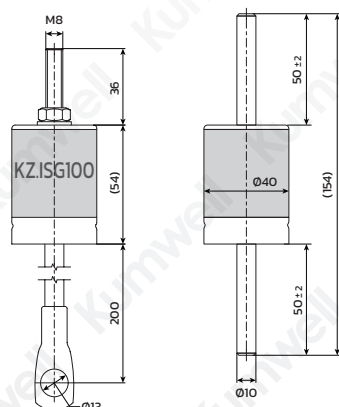
For lightning protection equipotential bonding in accordance with IEC 61024-1 and IEC 62561-3



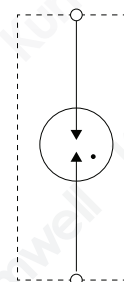
Isolating Spark Gaps

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
AC-Sparkover voltage		275 – 450 V AC
Max. discharge current (8/20 μ s)	I_{max}	100 kA
Nominal discharge current (8/20 μ 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	$U_{r imp}$	< 1400 V
Max. lightning impulse current (10/350 μ s)	I_{imp}	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/ Ω
Voltage protection level at I_{imp}	U_p	< 1 kV
Capacitance at 1 MHz	C	25 pF
Casing		corundum/binary resin with an external steel coat, resistant to climatic effects
Protection type		IP66
Operating temperature range	ϑ	-40°C to +90°C

Dimensions



Internal configuration



ISOLATING SPARK GAPS HIGH POWER GAS DISCHARGE TUBE FOR USE IN EXPLOSION HAZARDS AREAS

Kumwell KZISG100-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 Ω) 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.

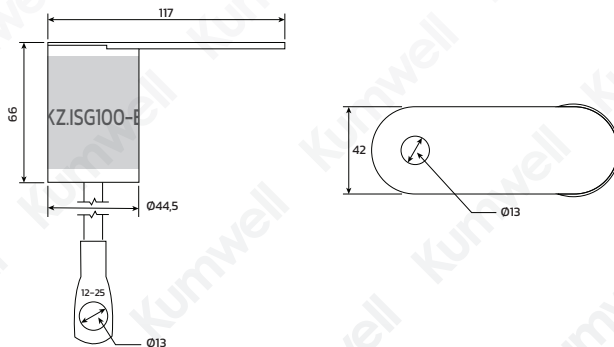
It is recommended for insulated flanges and insulated screw joints bridging in cathodic protected parts of industrial technology.



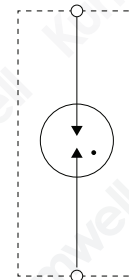
High Power GDT For Use In Explosion Hazards Areas

Technical data		KZ.ISG100-EX
EC-Type examination certificate		II 2G Ex mb IIC T6 Gb, II 2D Ex mb IIIC T80°C Db
Approvals, certification		FTZU 04 ATEX 0255X
DC-Sparkover voltage		400 – 750 V DC
Max. discharge current (8/20 μ s)	I_{max}	100 kA
Nominal discharge current (8/20 μ s)	I_n	75 kA
Max. lightning impulse current (10/350 μ s)	I_{imp}	100 kA
- charge	Q	50 As
- specific energy	W/R	2500 kJ/ Ω
Voltage protection level at I_{imp}	U_p	< 1 kV
Insulation resistance at 100 V DC	R_i	< 1 G Ω
Capacitance at 1 MHz	C	25 pF
Casing		corundum/binary resin with an external steel coat, resistant to climatic effects
Protection type		IP67
Operating temperature range	ϑ	-40°C to +90°C

Dimensions



Internal configuration



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

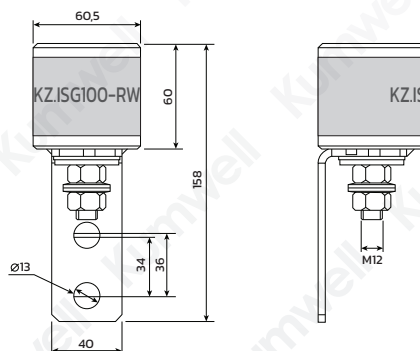
Kumwell KZ.ISG100-RW is a voltage limiter designed for overvoltage protection of personnel and equipment in DC and AC rail traction systems. It is recommended to install this limiter between the current return path and non-electrified parts of structures laying adjacent to the rails. In case of overvoltage, 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 _{rms}
Voltage protection level at U _{oc} 6 kV		< 1200 V
Maximum discharge current (8/20 μs)	I _{max}	200 kA
Nominal discharge current for class II test (8/20)	I _n	150 kA
Impulse discharge current for class I test (10/350 μs)	I _{imp}	150 kA
- Charge	Q	75 As
- Specific energy	W/R	5625 kJ/Q
Rated withstand current		up to 8 kArms / 100 ms (AC-mode) up to 20 kArms / 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	< 35 pF
Casing		stainless steel
Protection type		IP66
Operating temperature range	ϑ	-40°C to + 90°C

Dimensions



*Special KZ.ISG100-RW for 200-300 VDC is available on demand.

8 Lightning Strike Counter and Surge Counter

DIGITAL LIGHTNING STRIKE COUNTER

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 displays number of lightning strikes, hour and date of lightning event
- Buttons enable TIME/DATE setting and log viewing
- Replaceable battery, lifetime up to 4 years
- Contactless sensors—easy to install, no change in existing installation needed
- Complies with: IEC/EN 62561-6



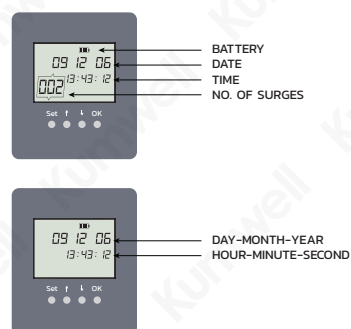
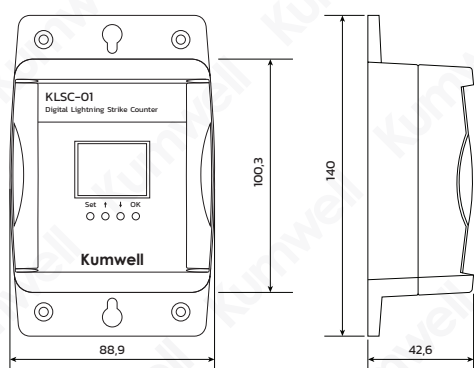
IP65



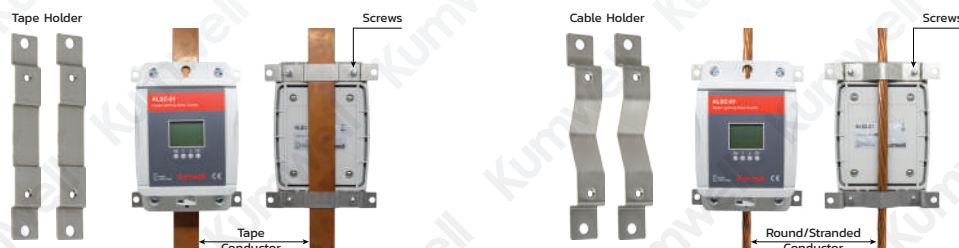
Lightning Strike Counter

Technical data		KLSC-01
Threshold Current (8/20 μ s)	I_{tc}	1 kA
Maximum withstand current (10/350 μ s)	I_{MCW}	100 kA
Maximum Events Logged		999
Temperature range		-20°C to +60°C
Degree of protection		IP65
Enclosure material		Polycarbonate: UL 94V-0
Mounting		Direct on down conductor
Power Supply		2 Replaceable CR17335 lithium batteries
Test Standards		IEC 62561-6

Dimensions



Installation



LIGHTNING STRIKE COUNTER

Kumwell KLSC-SK1 water-proof lightning strike counter is an universal type lightning counter. The lightning counter will detect lightning when the lightning current is discharged to the ground, the lightning counter can induce it and counts correctly.

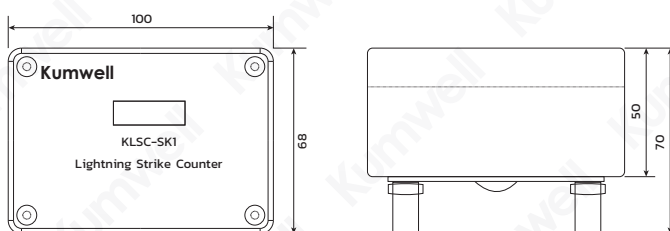


IP65

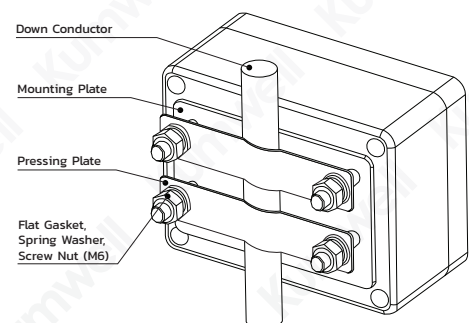
Lightning Strike Counter

Technical data	KLSC-SK1
Minimum Counting Current (8/20 μ s)	≥ 500 A
Count Number	0-9999 times
Sampling Pattern	Induction sampling
Down Conductor Maximum Diameter	$D \leq 20$ mm
Measure L x W x H	100 x 68 x 70 mm
Working Humidity	$\leq 95\%RH$
Operating Temperature	$-40^{\circ}C$ to $+85^{\circ}C$
Test Standards	IEC 61643-11, IEC 62561-6

Dimensions



Installation



SURGE COUNTER COUNT OF SURGE EVENT

Kumwell KSC-150A50 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 displays number of surges, hour and date of surge event
- Buttons enable TIME/DATE setting and log viewing
- Replaceable battery, lifetime up to 2 years
- Easy to install, Snap-on surge current sensor
- Complies with: IEC/EN 62561-6

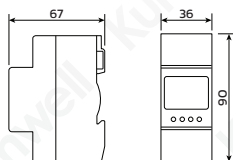


Surge Counter

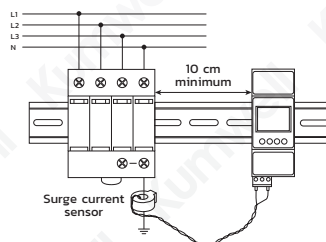


Technical data		KSC-150A50
Threshold Current (8/20 μ s)	I_{tc}	50 A
Max. counting discharge current (8/20 μ s)	I_{MCW}	50 kA
Maximum events logged		999
Operating temperature range		-20°C to +70°C
Degree of protection		IP20
Enclosure material		Thermoplastic; extinguishing degree UL 94 V-0
Mounting		DIN rail 35mm, EN 60715
Max.wired diameter through the current sensor		14 mm
Sensor cable		0.5 m
Power Supply		Replaceable CR17335 lithium battery
Test Standards		IEC 62561-6

Dimensions



Installation



SURGE COUNTER

Kumwell KSC-KS2 surge counter is designed for counts accurately and displays clearly the quantity of lightning stroke, avoiding the discharge number of MOV component exceeds the regulated requirements, so that the SPD can be replaced easily.

- Standard 35mm DIN rail installation.
- Can be used to match with all kinds of lightning protection devices.
- High-temperature resistance plastics shell.
- Modular installation, reliable sealing, nice appearance.
- Easy installation and wiring, dust prevention, anticorrosion and antiflaming.

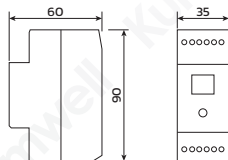
IP
20



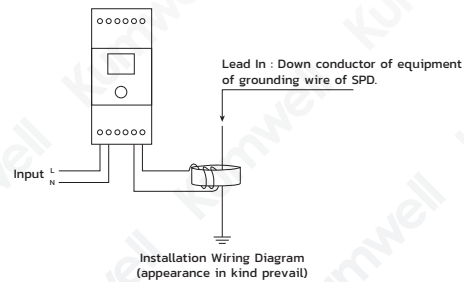
Surge Counter

Technical data		KSC-KS2
Rated operating voltage		230 V AC
Threshold current (8/20 μ s)	I_{tc}	1 kA
Max. counting discharge current (8/20 μ s)	I_{MCW}	100 kA
Indicator		2-Digit 7-Segment Display Counter (0-99)
Operating temperature range		-25°C to +70°C
Storage Temperature		-40°C to +85°C
Working Humidity		\leq 95%RH
Operational Environment		Indoor, or place without rain and snow
Degree of protection		IP20
Sampling Pattern		Induction sampling
Mounting		DIN rail 35mm
Test Standards		IEC 61643-11, IEC 62561-6

Dimensions



Installation



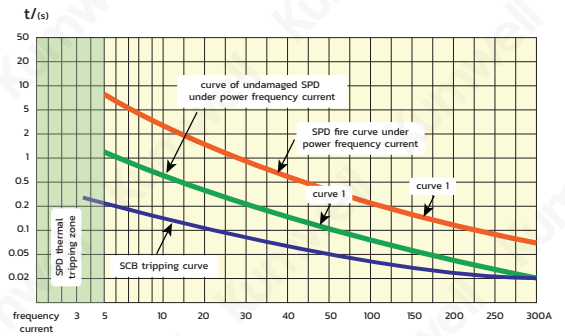
9 Smart SPD IoT Monitoring Systems

SCB - SPD CIRCUIT BREAKER

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:

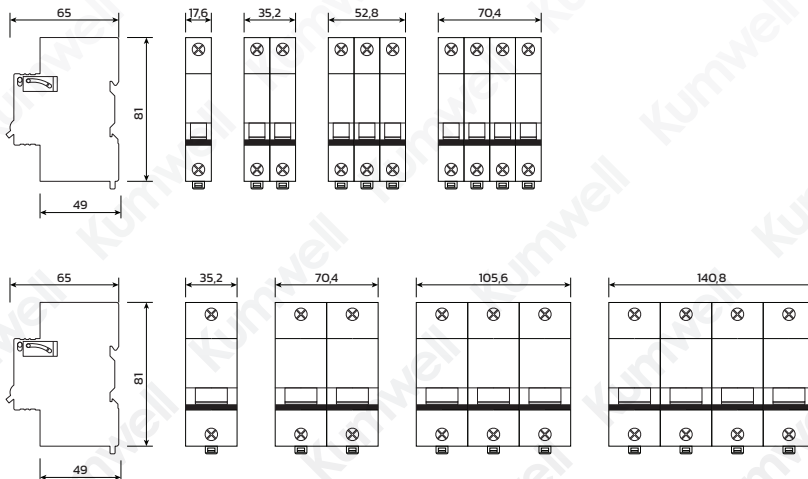
- Trip under 3 A power frequency current
- No tripping and damage under surge current to guarantee continuous lightning protection
- Low residual voltage (Up value of SCB is very low, almost equal to fuse)
- Rated short circuit current up to 100 kA (I_{cs})



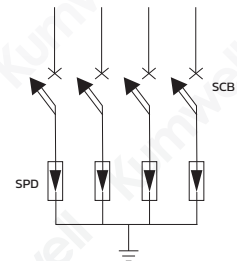
Specifications

Product Series	Product model	Surge withstanding	Short circuit breaking capacity	Tripping value under power frequency	Pole
SCB	SCB-C15K1	15 kA (10/350μs)	65 kA	3 ±1A	1P 2P 3P 4P
	SCB-C15K2	60 kA (8/20μs)	100 kA		
	SCB-C25K1	25 kA (10/350μs)	65 kA		
	SCB-C25K2	80 kA (8/20μs)	100 kA		
	SCB-80K1	80 kA (8/20μs)	65 kA		
	SCB-80K2		100 kA		
	SCB-60K1	60 kA (8/20μs)	65 kA		
SCB-60K2	100 kA				

Dimensions



Design Application



SCB WITH AUTOMATIC RECLOSER

When SPD external disconnector 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



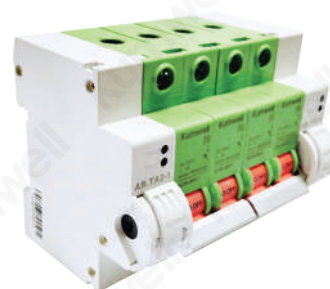
ARTA2 & SCB (1P)



ARTA2 & SCB (2P)



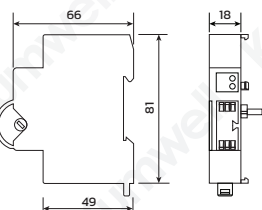
ARTA3 & SCB (3P)



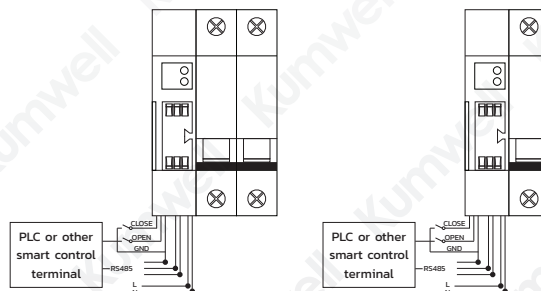
ARTA2 & SCB (4P)

Specifications		
Model	ARTA2	ARTA3
Width	18 mm	36 mm
Operating voltage	100/230VAC, 50/60 Hz	100/230VAC, 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
Product Series		
Remote dry contact communication distance cable	≤ 500m@1.5mm ² RVPP communication cable	≤ 500m@1.5mm ² RVPP communication cable
RS485 bus control length cable	≤ 1000m@1.5mm ² RVPP communication cable	≤ 1000m@1.5mm ² RVPP communication cable

Dimensions



Installation



CENTRALIZED CONTROLLER

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 : 1000 m)
- Master-slave communication with quick data transmission
- Report actively in the real-time



RS485, TCP/IP
Centralized Controller

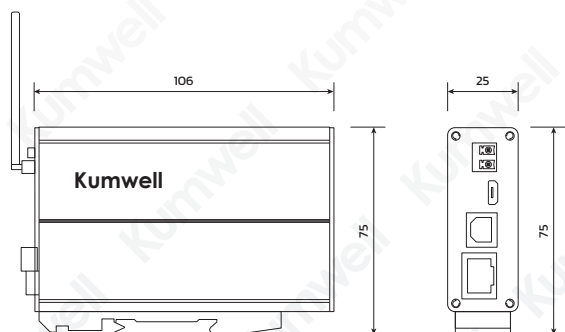
Product Structure



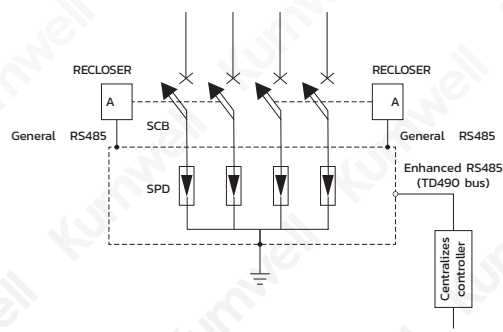
GPRS
Centralized Controller

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

Dimensions



Installation



10 Surge Filter

POWER SUPPLY SYSTEM

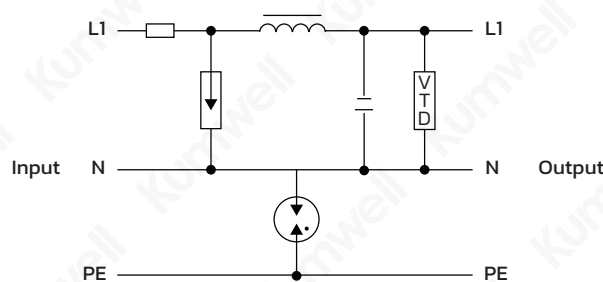
Single Phase 63A Power Surge Filter KSF100-U320-63A-1PN

Kumwell KSF100 series surge filter is two-port Surge Protective Device with LC Filter designed to protect single phase electrical distribution systems especially sensitive electronics against the harmful effects of transient surges.

These surges are the result of:

- Direct and indirect lightning strikes
- Power company load switching
- Upstream load switching at other facilities

It's found that electronic equipment is sensitive to both the absolute magnitude of the impulse voltage and the rate of rise of this impulse, much of the damage which occurs in sensitive electronic circuits using power semiconductor components is the result of these steep changes in dv/dt and di/dt rather than simply the peak voltage. Therefore, KSF100 is designed as a 3-stage protection system which consist of primary Trigger spark gap (TSG) protection & secondary VTD is special technology MOV and GDT series to eliminate follow current and leakage current for prolong the service life in conjunction with series well-designed LC filter. The LC filter used to slow down the inherently fast rates of voltage and current rise, and TSG module to deflect high pulsed lightning current (10/350 μs) up to 25 kA per mode or surge current (8/20 μs) up to 100 kA per mode. Further, the secondary MOV module & LC filter will limit the surge voltage (the let-through voltage) to very low level. KSF100 Series are fully enclosed in wall mounting IP20 steel enclosures, with a LED light to demonstrate the working status of the surge filter. KSF100 surge filter should be installed in series with the supply powering the equipment. It can be used in lightning protection zones (LPZ) 0 to 1 (IEC 62305-4) at building entrances, or point-of-entry (Category C) & sub-circuit protection (Category B) (ANSI/IEEE C62.41).



Basic circuit diagram

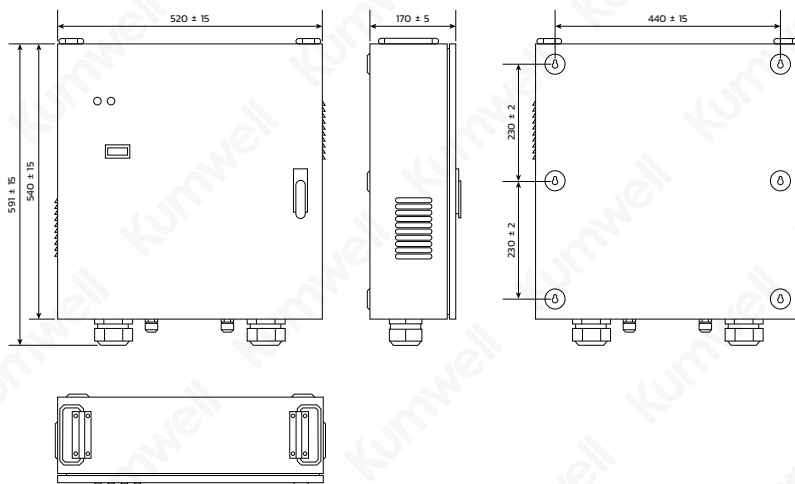
Technical Data Model		KSF100-U320-63A-1PN
In accordance with		IEC 61643-11:2011; UL1449-4 th ; IEC 61000-6; ANSI/IEEE C62.41; AS1768-1991; AS3100
Category IEC/EN/UL		Class I-II / Type 1+2 / Type 2
Ports/Protection Mode		All mode protection
Application		any single phase system with grounded neutral
Protection Technology		TSG (primary)+VTD (Secondary) and GDT technology for N-PE mode LC filter, Thermal disconnect, Built-in overcurrent protection
Power system, U_n		220 – 277 VAC single phase
Max. continuous operating voltage (AC/DC), U_c		320 V/420 V
Rated load Current, I_L		63 A
Nominal discharge current (8/20 μs), I_n		25 kA
Primary surge protection rating	L-N	I_{imp} :25 kA (10/350 μs), I_{max} :100 kA (8/20 μs)
	N-PE	I_{imp} :100 kA (10/350 μs), I_{max} :200 kA (8/20 μs)

POWER SUPPLY SYSTEM

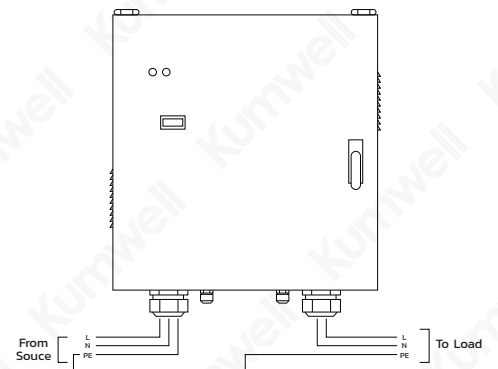
Single Phase 63A Power Surge Filter KSF100-U320-63A-1PN

Technical Data Model		KSF100-U320-63A-1PN
Secondary surge protection rating	L-N	I_{max} : 50 kA (8/20 μ s)
Total surge capacity per phase		I_{total} : 150 kA (8/20 μ s)
Voltage protection level, U_p	L-N @ 6 kV/3 kA	< 0.5 kV
	L-N @ I_n	< 0.85 kV
	N-PE @ 1.2/50 μ s	< 1.5 kV
Residual current, I_{PE}		< 0.1 mA
Voltage drop		< 2 V at 63 A load
Temporary overvoltage – TOV withstand mode, U_{tov}		440 V AC/120 min
Response time, t_A		\leq 1 ns
Filter attenuation		> 48 dB @ 1 MHz
Built in overload / overcurrent protection in series		63 A (optional)
Lightning counter Threshold Current, I_{tc}		\leq 3 kA (8/20 μ s)
Protect Status Indication		2 LED display, Normal (Blue), Protection fault (Off)
Remote alarm		Dry contact alarm relay – 250 V AC/ 32 V DC, 5A
Connecting cable		Power 6–8 AWG (50 A/63 A); Alarm: 14 –22 AWG
Environment		-40 to 70 °C, 0 to 95% RH, Altitude \leq 2 km
Mounting		Wall mounting
Location Category		Indoor
Degree of protection		IP20
Dimension (L x W x H)		520 x 540 x 170 mm approx
Approvals, Certification		CE

Dimensions



Connection



POWER SUPPLY SYSTEM

Three Phase 63A Power Surge Filter KSF100-U320-63A-3PN

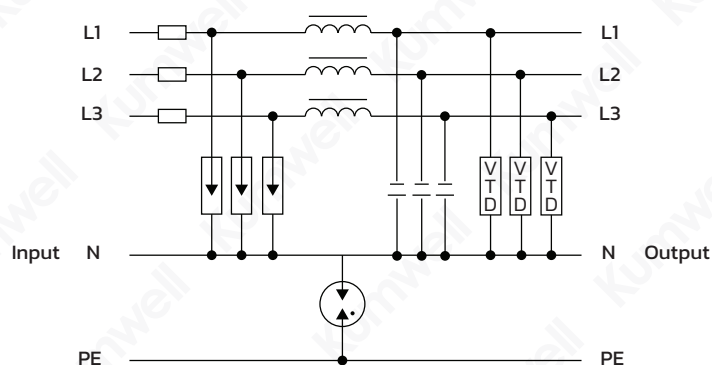
Kumwell KSF100 series surge filter is two-port Surge Protective Device with LC Filter designed to protect Three phase electrical distribution systems especially sensitive electronics against the harmful effects of transient surges.

These surges are the result of:

- Direct and indirect lightning strikes
- Power company load switching
- Upstream load switching at other facilities

Application

- Telecommunications systems
- Medical equipment
- Industrial equipment
- Data centers
- Control systems
- Switch boards



Basic circuit diagram

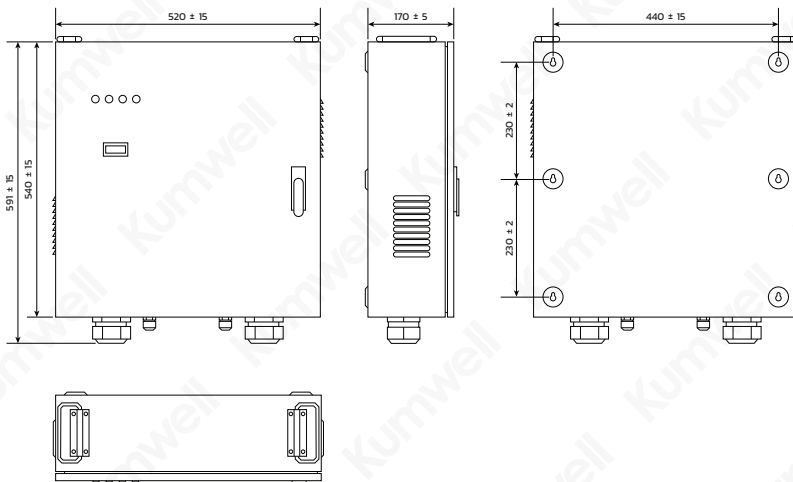
Technical Data Model		KSF100-U320-63A-3PN
Compliance		IEC 61643-11:2011; UL1449-4 th ; IEC 61000-6; ANSI/IEEE C62.41; AS1768-1991; AS3100
Category IEC/EN/UL		Class I-II / Type I+2 / Type 2
Ports/Protection Mode		All mode protection
Application		any three phase system with grounded neutral
Protection Technology		TSG (primary)+VTD (Secondary) for L-N and GDT technology for N-PE mode, LC filter, Thermal disconnect, Built-in overcurrent protection
Power system, U _n		220/380 to 277/480 VAC Three phase (TN/TT)
Max. continuous operating voltage (AC/DC), U _c		320 V/420 V
Rated load Current, I _L		63 A
Nominal discharge current (8/20 μs), I _n		25 kA
Primary surge protection rating	L-N	I _{imp} :25 kA (10/350 μs), I _{max} :100 kA (8/20 μs)
	N-PE	I _{imp} :100 kA (10/350 μs), I _{max} :200 kA (8/20 μs)

POWER SUPPLY SYSTEM

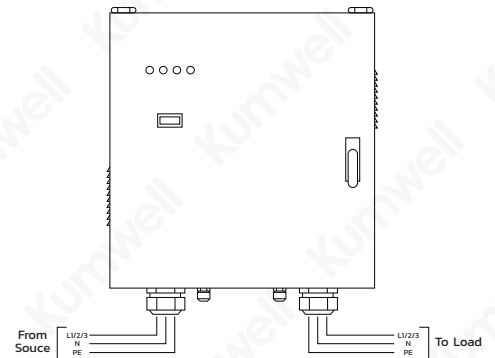
Three Phase 63A Power Surge Filter KSF100-U320-63A-3PN

Technical Data Model		KSF100-U320-63A-3PN
Secondary surge protection rating	L-N	I_{max} : 50 kA (8/20 μ s)
Total surge capacity per phase		I_{total} : 150 kA (8/20 μ s)
Voltage protection level, U_p	L-N @ 6 kV/3 kA	< 0.5 kV
	L-N @ I_n	< 0.85 kV
	N-PE @ 1.2/50 μ s	< 1.5 kV
Residual current, I_{PE}		< 0.1 mA
Voltage drop		< 2 V at 63 A load
Temporary overvoltage – TOV withstand mode, U_{tov}		440 V AC/120 min
Response time, t_A		\leq 1 ns
Filter attenuation		> 48 dB @ 1 MHz
Built in overload / overcurrent protection in series		63 A (optional)
Lightning counter Threshold Current, I_{tc}		\leq 3 kA (8/20 μ s)
Protect Status Indication		4 LED display, Normal (Blue), Protection fault (Off)
Remote alarm		Dry contact alarm relay – 250 V AC/32 V DC, 5 A
Connecting cable		Power 6–8 AWG (50 A/63 A); Alarm: 14 –22 AWG
Environment		-40 to +70 °C, 0 to \leq 95%, Altitude: \leq 2 km
Mounting		Wall mounting
Location Category		Indoor
Degree of protection		IP20
Dimension (L x W x H)		520 x 540 x 170 mm approx
Approvals, Certification		CE

Dimensions



Connection



POWER SUPPLY SYSTEM

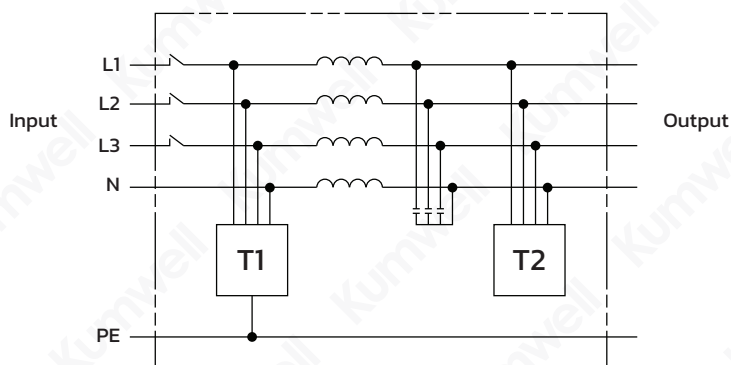
Three Phase 125A Surge Power Filter KSF200-3/350-125A-3PN

Kumwell KSF200 series surge filter is two-port Surge Protective Device with LC Filter designed to protect three phase electrical distribution systems especially sensitive electronics against the harmful effects of transient surges.

These surges are the result of:

- Direct and indirect lightning strikes
- Power company load switching
- Upstream load switching at other facilities

It's found that electronic equipment is sensitive to both the absolute magnitude of the impulse voltage and the rate of rise of this impulse, much of the damage which occurs in sensitive electronic circuits using power semiconductor components is the result of these steep changes in dv/dt and di/dt rather than simply the peak voltage. Therefore, KSF is designed as a 3-stage protection system which consists of primary TSG (Trigger Spark Gap) protection & secondary MOV protection in conjunction with series well-designed LC filter. The LC filter used to slow down the inherently fast rates of voltage and current rise, and TSG module to deflect high pulsed lightning current (10/350 μs) up to 50 kA per mode or surge current (8/20 μs) up to 150 kA per mode. Further, the secondary MOV module & LC filter will limit the surge voltage (the let-through voltage) to very low level. KSF Series are fully enclosed in wall mounting IP55 steel enclosures, with a LED light to demonstrate the working status of the surge filter. KSF surge filter should be installed in series with the supply powering the equipment. It can be used in lightning protection zones (LPZ) 0 to 1 (IEC 62305-4) at building entrances, or point-of-entry (Category C) & sub-circuit protection (Category B) (ANSI/IEEE C62.41).



Basic circuit diagram

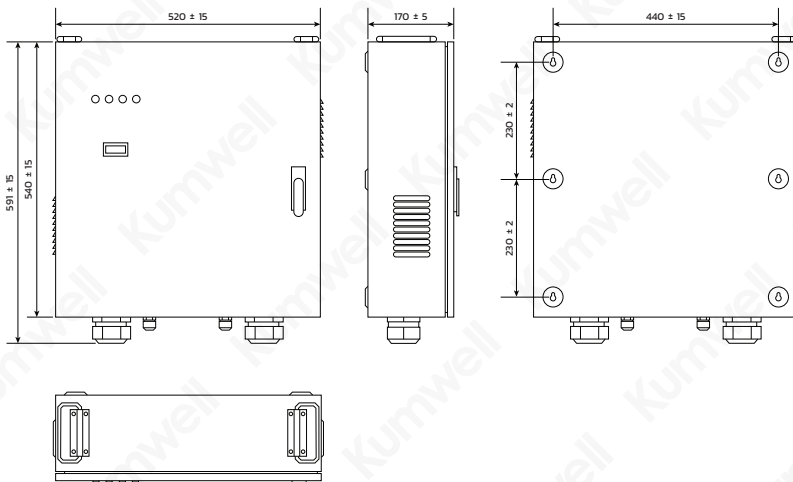
Technical Data Model		KSF200-3/350-125A-3PN
In accordance with		IEC 61643-11:2011; UL1449-4 th ; IEC 61000-6; ANSI/IEEE C62.41; AS1768-1991; AS3100
Category IEC/EN/UL		Class I+II / Type I+2 / Type 2
SPD Type		2 Port SPD
Power system, U_n		220/380 to 277/480 V AC Three phase (TN/TT)
Max. continuous operating voltage (AC/DC), U_c		350 V/460 V
Rated load Current, I_n		125 A
Protection modes		Common mode and Differential mode protection
Protection technology		TSG (primary)+MOV (Secondary) for L-N, GDT for N-PE; LC filter
Nominal discharge current (8/20 μs), I_n		50 kA
Primary surge protection rating	L-N	I_{imp} :50 kA (10/350 μs), I_{max} :150 kA (8/20 μs)
	N-PE	I_{imp} :100 kA (10/350 μs), I_{max} :200 kA (8/20 μs)
Secondary surge protection rating	L-N	I_{max} :50 kA (8/20 μs)

POWER SUPPLY SYSTEM

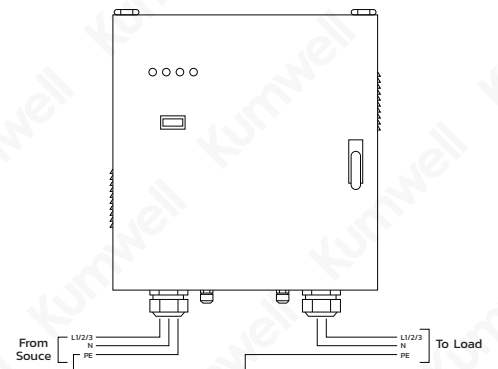
Three Phase 125A Surge Power Filter KSF200-3/350-125A-3PN

Technical Data Model		KSF200-3/350-125A-3PN
Total surge capacity per phase		200 kA (8/20 μ s)
Voltage protection level, U_p	L-N @ 6 kV/3 kA	< 500 V (VPR per UL1449 4 th)
	L-N @ 20 kA	< 800 V
	L-N @ I_n	< 1100 V (U_p per IEC 61643 -11)
	N-PE @ 1.2/50 μ s	< 1500 V (U_p per IEC 61643 -11)
Residual current		< 1 mA
Voltage drop		< 2 V at 125 A load
Temporary overvoltage – TOV, U_T		415 V AC/ 5 s
Response time		\leq 5 ns
Filter attenuation		> 48 dB @ 1 MHz
Short circuit withstand (1 sec)		50 kA
Built in over load/over-current protection in series		125 A
Lightning counter Current		\leq 3 kA
Protect Status Indication		4 LED display, Normal (Blue), Protection fault (Off)
Remote alarm		Dry contact alarm relay – 250VAC/32VDC, 5A
Connecting cable		Power 6-8 AWG (50 A/63 A), 2-3 AWG (100 A/125 A), Alarm 14-22 AWG
Environment		-40 to 70 °C, 0 to 95%, Altitude \leq 2 km
Mounting		Wall mounting
Location Category		Indoor
Degree of protection		IP20
Dimension (L x W x H)		520 x 540 x 170 mm approx
Approvals, Certification		CE

Dimensions



Connection



11

Earth Resistance Tester

IMPULSE EATHING TESTER WG-507

Atmor WG-507 was designed to measure ground impedance in conditions similar to those that occur naturally during lightning discharges. Current surges that were applied reaching a peak value of approx. 1A, and their front times, depending on the choice, are 4 or 8 μ s, and also meet the requirements of the following standards: PN-EN 60060-2: 2000 and PN-EN 62305-1: 2008. The device has been adapted to control all lightning protection installations, especially in facilities that are subject to stricter and special lightning protection, required by the Construction Law, e.g. gas stations, gas stations, plants and warehouses in the chemical, wood industry, etc. It is not necessary to disconnect the control terminals of the earthing cables during measurements. The WG-507 device is especially useful when measuring the earthing of power poles, because, unlike classic tester, it is not necessary to disconnect the earthing from the tower structure during the measurements. So the inspection work can continue with the line on. The applied method of measurement complies with the definition of equivalent earth resistance presented in the PN-EN 62305 standard



Impulse Eathing Tester

Technical data	WG-507
Two selectable measuring ranges	0 - 19.9 Ω ; 20 - 199 Ω ;
Measurement accuracy: - basic error not greater than - total error of indications not greater than	2.5 % 5.0 %
Power Supply	4 Ni-MH (AA) batteries located in the housing of the tester. Total: 4.8 V, 1500... 2000 mAh
Number of measurements with single battery charging	no less 1000
Graphical display with back lighting	64 x 128 pixels
Dimensions	100 x 210 x 40 mm
Weight (without probes and cables)	0.4 kg
Weight with probes and cables	3.7 kg
Accessories	
The standard set of the Atmor WG-507 tester with accessories includes:	
- WG-507 earthing tester	
- Transport bag	
- 3 test leads (40 m, 30 m, 2 m) on 2 reels	
- 2 probes standard test probes in a special cover	
- 3 crocodile clips with large jaw opening	
- Steel pin - for removing the probes from the ground	
- User manual	
- Battery charger	
- WG-507 Calibration Certificate	



CLAMP EARTH RESISTANCE TESTER KIGM-EC2

- Ground loop resistance testing without any disconnection, Non-contact, Safe and Fast.
- Easy Earth/Ground resistance measurement just clamp-on earth conductor.
- Measures Ground resistance from 0.01Ω to 1200Ω.
- Measures true RMS Ground leakage current from 0.00mA rms to 20.0A rms.

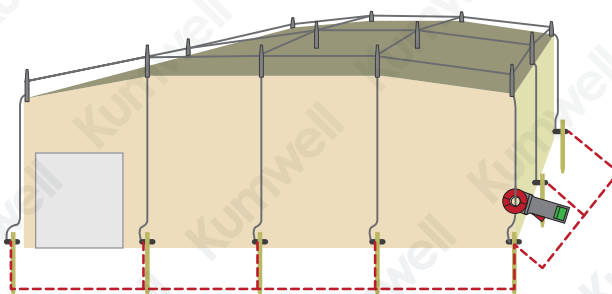
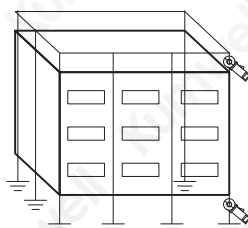
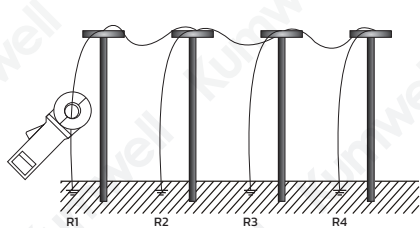


Clamp Earth Resistance Tester

Technical data	KIGM-EC2
Range of Resistance	0.01 Ω – 1200 Ω
Range of Current	0.00 mA – 20.0 A
Instrument safety	IEC/EN 61010-1, IEC/EN 6010-2-032
Pollution degree	class II
Overvoltage category	CAT III 150V to ground, max 20A
Dimension (L x W x H)	260 mm x 90 mm x 66 mm (10x4x3 inches)
Span of Jaw	Ø 32 mm
Weight (including batteries)	1,120 g
Internal consumption	<50 mA
Display	4 LCD, sign, decimal point and backlight
Memory size	99 Units of Reading
Environment (Temperature & Relative Humidity)	Working: -10°C to 55°C, 10%RH-90%RH Storage: -20°C to 60°C, below 70%RH
Data upload interface	RS232 (optional)
Accessories	
Tester: 1 piece	
Test Ring: 1 piece	
Tester Suitcase: 1 piece	
Battery(LR6): 4 pieces	
KIGM-EC2 Calibration Certificate	



Field Application



Multi-ground loop measurement

EARTH RESISTANCE AND SOIL RESISTIVITY TESTER KIGM-EM1

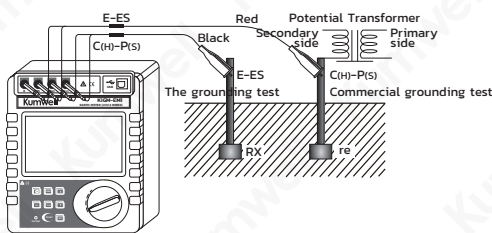
Making your earth resistance testing quicker and easier the KIGM-EM1 offers these advanced features :

- 3 - Wires method for earth resistance measurement
- 2 - Wires method for earth resistance measurement
- Soil Resistivity Precise 4 wires measurement (wenner method)
- Line Voltage measurement up to 600V
- Large display, Backlight
- Alarm function of maximum parameter
- 600V CAT III safety standard

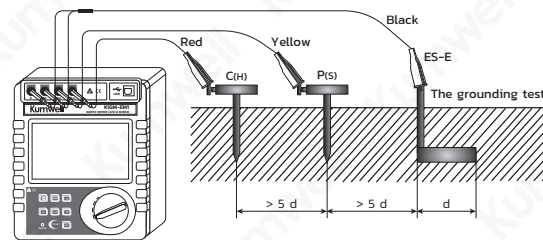


KIGM-EM1 Earth Resistance and Soil Resistivity Tester is specially designed and manufactured for measuring earth resistance, soil resistivity, earth voltage, AC voltage. Adopting the latest digital and micro-processing technology, precise 4-wires, 3-wires and simple 2-wires method for earth resistance measurement, importing FFT and AFC technology, with a unique function of anti-interference capability and the ability to adapt to the environment, consistency of repeat testing, to ensure high precision, high stability and reliability for prolonged measure, which is widely used in electric power, telecommunications, meteorology, oil field, construction, lightning protection, industrial electrical equipment and other earth resistance, soil resistivity, earth voltage, AC voltage measurement.

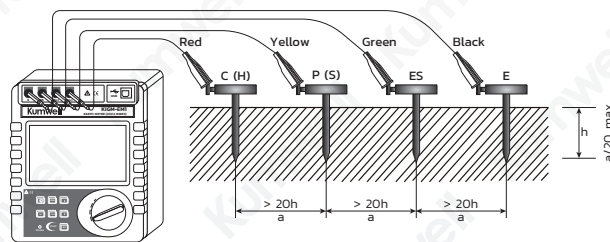
KIGM-EM1 Earth Resistance and Soil Resistivity Tester is composed of host machine, monitoring software, testing wires, auxiliary ground pillars, communication wires and others. The large LCD display of host machine is with blue backlight and bar graph indicating that can be seen clearly. At the same time it can store 300 sets of data, fulfilling historical inquiry and online real-time monitoring through monitoring software, dynamic display, alarm indicator, and with the functions like historical data access, reading, preservation, report forms, printing and so on.



2-Wires simple measurement



3-Wires earth resistance measurement



Soil resistivity measurement

EARTH RESISTANCE AND SOIL RESISTIVITY TESTER KIGM-EM1

Technical Specifications

1. Base Conditions and Working Conditions

Influence Quantity	Base Conditions	Working Conditions	Remarks
Ambient Temp	23°C±1°C	-10°C -40°C	-
Ambient Humidity	40%-60%	<80%	-
Working Voltage ¹	9V±0.1V	9V±1.5V	rC, rP
Auxiliary Earth Resistance	<100Ω	<30kΩ	-
Interference Voltage ²	None	<20V	-
Interference Current	None	<2A	-
Electrode Distance when measuring R	a>5d	a>5d	-
Electrode Distance when measuring ρ	a>20h	a>20h	-

2. General Specification

Function	Measurement of 2/3/4-pole earth resistance, soil resistivity, earth voltage, AC voltage
Power Supply	DC 9V(Zi-Mn dry battery R14S 1.5V 6 PCS, continuous standby for 300 hours)
Measurement Range	Earth Resistance: 0.00Ω - 30.00kΩ Soil Resistivity: 0.00Ωm - 9000kΩm
Measuring Mode	Precise 4-pole measurement, 3-pole measurement, simple 2-pole measurement
Measuring Method	Earth Resistance : rated current change-pole method, measurement current 20mA Max Soil Resistivity : 4-pole measurement (wenner method) Earth Voltage : average rectification(between P(S)-ES)
Test Voltage Wave	Sine wave
Test Frequency	128Hz / 111Hz / 105Hz / 94Hz(AFC)
Short-circuit Test Current	AC 20mA max
Open-circuit Test Voltage	AC 40V max
Electrode Distance Range	Can be set 1m-100m
Shift	Earth resistance: 0.00Ω - 30.00kΩ, automatic shift Soil Resistivity: 0.00Ωm - 9000kΩm, automatic shift
Backlight	Blue screen backlight, suitable for dim places
Display Mode	4 - digital super- large LCD display, blue screen backlight
Measuring Indicator	During measurement, LED flash indicator, LCD count down display, progress bar indicator
LCD Frame Dimension	128mm×75mm
LCD Window Dimension	124mm×67mm
Dimension	L×W×H: 215mm×190mm×95mm
Standard Test Wire	4 wires: each for red 20m, black 20m, yellow 10m, and green 10m
Simple Test Wire	2 wires: each for red 1.6m and black 1.6m
Auxiliary Earthing Rod	4 wires: Φ10mm×150mm
Measuring Rate	Voltage to ground: about 3 times/second Earth resistance, soil resistivity: about 5 seconds/time
Measuring Times	Over 5000 times (Short-circuit test, interval time should be at least 30 seconds)
Circuit Voltage	Below AC 600V
RS232 Interface	RS232 interface, software supervision, storage data can be uploaded to computer, saved or printed.

EARTH RESISTANCE AND SOIL RESISTIVITY TESTER KIGM-EM1

2. General Specification

Communication Wire	One piece of RS232 communication wire, with length 1.5m
Data Storage	300 sets, "MEM" icon storage indicator, flash display "FULL" icon to indicate storage is full
Data Hold	Data hold function: "HOLD" icon display
Data Read	Data read function: "READ" icon display
Overflow Display	Exceeding measuring range overflow function: "OL" icon display
Interference Test	Recognize interference signal automatically, "NOISE" icon display when interference voltage exceed 5V
Auxiliary Earthing Test	Can measure auxiliary earth resistance, 0.00kΩ - 30kΩ (100R+rC<50kΩ, 100R+rP<50kΩ)
Alarm Function	When measuring value exceeds alarm setting value, there is "Toot-toot-toot" alarm hint
Battery Voltage	When battery voltage  decreases to about 7.5V, battery voltage low icon will display, reminding to replace battery
Power Consumption	Standby: about 20mA (Backlight shut off) Boot and with backlight: about 45mA (25mA without backlight) Measurement: about 100mA (Backlight shut off)
Weight	Total weight: 4.5kg (including package) Tester: 1443g (including battery) Testing wires: 1560g Auxiliary earthing rods: 935g (4pcs)
Working Temperature & Humidity	-10°C - 40°C, below 80%RH
Storage temperature & humidity	-20°C - 60°C, below 70%RH
Overload Protection	Measuring earth resistance: between each interfaces of C(H)-E, P(S)-ES, AC 280V/3 seconds
Insulation Resistance	Over 20MΩ (between circuit and enclosure it is 500V)
Withstanding Voltage	AC 3700V/rms (Between circuit and enclosure)
Electromagnetic Features	IEC61326(EMC)
Protection Type	IEC 61010-1 (CAT III 300V, CAT IV 150V, Pollution 2), IEC 61010-031, IEC 61557-1 (Earth resistance) IEC 61557-5 (Soil resistivity), JJG 366-2004

3. Intrinsic error and performance indicators under base conditions

Category	Measurement Range	Intrinsic Error	Resolution
Earth Resistance (R)	0.00Ω - 30.00Ω	±2%rdg±3dgt	0.01Ω
	30.0Ω - 300.0Ω	±2%rdg±3dgt	0.1Ω
	300Ω - 3000Ω	±2%rdg±3dgt	1Ω
	3.00kΩ - 30.00kΩ	±4%rdg±3dgt	10Ω
Soil Resistivity (ρ)	0.00Ωm - 99.99Ωm	According to the precision of R (ρ=2 ρaR a:1m - 100m, ρ=3.14)	0.01Ωm
	100.0Ωm - 999.9Ωm		0.1Ωm
	1000Ωm - 9999Ωm		1Ωm
	10.00kΩm - 99.99kΩm		10Ωm
	100.0kΩm - 999.9kΩm		100Ωm
	1000kΩm - 9000kΩm		1kΩm
Earth Voltage (V)	AC 0.0 - 600V	±2%rdg±3dgt	0.1V

Note : 1. When rC max or rP max, additional error $\leq \pm 3\%rdg \pm 5dgt$. (rC max: 4kΩ+100R<50kΩ, rP max: 4kΩ+100R<50kΩ)

2. When 5V interference voltage, additional error $\leq \pm 5\%rdg \pm 5dgt$.

DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER KIGM-EM2C

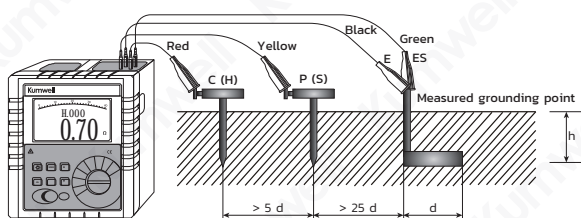
Making your earth resistance testing safer, faster and easier the KIGM-EM2C offers these advanced features:

- 4-Wires Precise Earth Resistance Measurement and Soil Resistivity Measurement
- 3-Wires Earth Resistance Measurement
- 2-Wires Simple Measurement
- 3 Wires & 4 Wires selection method to measure the grounding resistance
- Also use to measure leakage current of grounding line, AC current, DC resistance
- Size of clamp: $\Phi 68\text{mm}$
- Earth Voltage measurement up to 100V
- Super-Large LCD display 4 digits with backlight
- Alarm function of maximum parameter
- IEC61010-1 (CAT III 300 V, CAT IV 150V, Pollution2); IEC61010-031; IEC61557-1 (Earth resistance); IEC61557-5 (Soil resistivity); JIG 366-2004 (Grounding resistance meter); JIG 1054-2009 (Clamp grounding resistance meter)



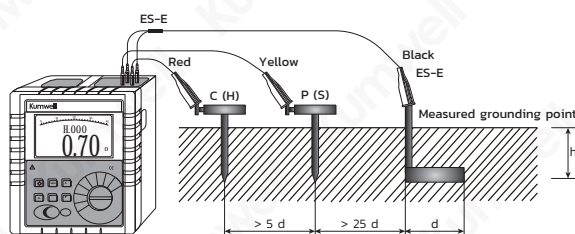
KIGM-EM2C Double Clamp Earth And Soil Resistivity Tester is specially design for the measurement of earth resistance, soil resistivity, earth voltage, leakage current of grounding line, AC current, DC resistance. Adopting the latest digital technology, precise 4-pole, 3-pole and simple 2-pole method, selection method, double clamp method to measure grounding resistance, for earth resistance measurement, consistency of repeat testing, to ensure high precision, high stability and reliability for prolonged measure, which is widely used in electric power, telecommunications, meteorology, oil field, construction, lightning protection, industrial electrical equipment

KIGM-EM2C Double Clamp Earth And Soil Resistivity Tester is composed of host machine, monitoring software, testing wires, auxiliary ground pillars, communication wires and others. The large LCD display of host machine is with blue backlight and bar graph indicating that can be seen clearly. At the same time it can store 100 sets of data, fulfilling historical inquiry and online real-time monitoring through monitoring software, dynamic display, and alarm indicator, auto-shut down and with the functions like historical data access, reading, preservation, report forms, printing and so on.

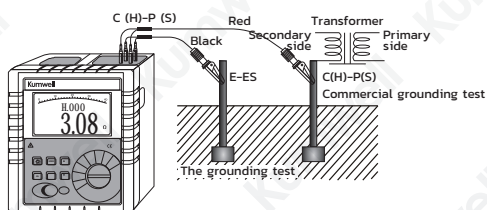


4-Wires Precise Earth Resistance Measurement

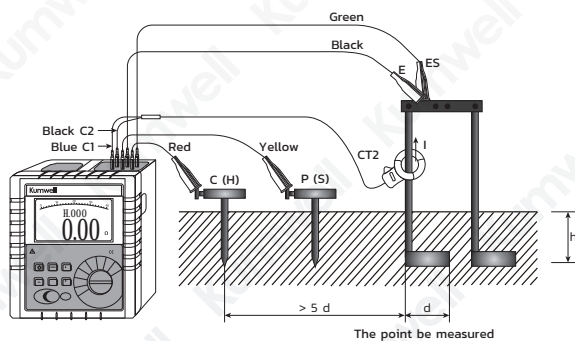
The 4-wires method can also eliminate influence of line resistance. So it is better than 3-wires measurement.



3-Wires Earth Resistance Measurement

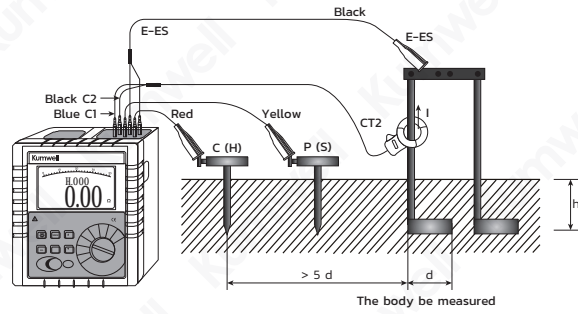


2-Wires Simple Measurement

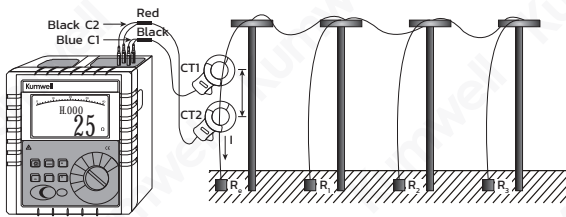


4-Wires selection method to measure the grounding resistance

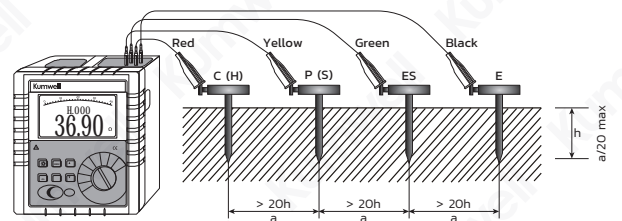
DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER KIGM-EM2C



3-Wires selection method to measure the grounding resistance



Double clamp method to measure grounding resistance
Clamp the circuit with two current clamp, the two clamp have to clamp the circuit like the graph shows and keep a distance above 30cm, the position of these two clamp can't be change with each other, otherwise, there is an error exist.



Soil Resistivity Measurement

Soil resistivity ρ is a determining factor of grounding resistance of grounding body. Different nature of the soil, there is a different soil resistivity

Technical Specifications

1. Base Conditions and Working Conditions

Influence Quantity	Base Conditions	Working Conditions	Remarks
Ambient Temp	23°C±1°C	-10°C -40°C	-
Ambient Humidity	40%-60%	<80%	-
Working Voltage ¹	9V±0.1V	9V±1.5V	rC, rP
Auxiliary Earth Resistance	<100Ω	<30kΩ	-
Interference Voltage ²	None	<20V	-
Interference Current	None	<2A	-
Electrode Distance when measuring R	a>5d	a>5d	-
Electrode Distance when measuring ρ	a>20h	a>20h	-


DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER KIGM-EM2C

2. General Specification

Function	Measure grounding resistance, soil resistivity; Measurement of earth voltage, AC voltage, leakage current of AC current
Power Supply	DC 9V(Zn-Mn dry battery R145 1.5V 6 PCS, continuous standby for 300 hours)
Measurement Range	Earth Resistance: 0.00Ω - 30.00kΩ
	Soil Resistivity: 0.00Ωm - 9000kΩm
Measuring Mode	Precise 4-pole measurement, 3-pole measurement, simple 2-pole measurement, selection method, double clamp method measure grounding resistance
Measuring Method	2/3/4 pole method: change-pole method, measurement current 20mA Max
	Selection method: change-pole method, measurement current 20mA Max
	Double clamp method: disconnect mutual inductance method, measurement current 1mA Max
	Soil Resistivity: 4-pole measurement (Wenner method)
	DC resistance: change-pole method
	AC current: mutual inductance method
	Earth Voltage: average rectification(between P(S)-ES)
Test Voltage Wave	Sine wave
Test Frequency	128Hz / 111Hz / 105Hz / 94Hz (AFC)
Short-circuit Test Current	AC 20mA max
Open-circuit Test Voltage	AC 40V max
Electrode Distance Range	Can be set 1m-100m
Shift	Earth resistance: 0.00Ω - 30.00kΩ, automatic shift
	Soil Resistivity: 0.00Ωm - 9000kΩm, automatic shift
Backlight	Blue screen backlight, suitable for dim places
Display Mode	4 - digital super- large LCD display, blue screen backlight
Measuring Indicator	During measurement, LED flash indicator, LCD count down display, progress bar indicator
LCD Frame Dimension	128mm×75mm
LCD Window Dimension	124mm×67mm
Dimension	L×W×H: 215mm×190mm×95mm
Standard Test Wire	4 wires: each for red 20m, black 20m, yellow 10m, and green 10m
Simple Test Wire	2 wires: each for red 1.6m and black 1.6m
Auxiliary Earthing Rod	4 wires: Φ10mm×150mm
Clamp	2pc :1 blue-black plug and 1 red-black.
Caliber of clamp	Φ68mm
Measuring Rate	AC current: about 2 times/second
	Voltage to ground: about 2 times/second
	Earth resistance, soil resistivity: about 7 seconds/time
Measuring Times	Over 5000 times
Circuit Voltage	Below AC 600V
RS232 Interface	RS232 interface, software supervision, storage data can be uploaded to computer, saved or printed.
Communication Wire	One piece of RS232 communication wire, with length 1.5m
Data Storage	2000 sets, "MEM" storage indicator, flash display "FULL" icon to indicate
Data Hold	Data hold function: "HOLD" icon display
Data Read	Data read function: "READ" icon display
Overflow Display	Exceeding measuring range overflow function: "OL" icon display
Interference Test	Recognize interference signal automatically, "NOISE" icon display when interference voltage exceed 5V

DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER KIGM-EM2C

2. General Specification

Auxiliary Earthing Test	Can measure auxiliary earth resistance, 0.00kΩ - 30kΩ (100R+rC<50kΩ, 100R+rP<50kΩ)
Alarm Function	When measuring value exceeds alarm setting value, there is "Toot-toot-toot" alarm hint
Battery Voltage	When battery voltage  decreases to about 7.5V, battery voltage low icon will display, reminding to replace battery
Power Consumption	Standby: about 20mA (Backlight shut off)
	Boot and with backlight: about 45mA (25mA without backlight)
	Measurement: about 150mA (Backlight shut off)
Weight	Total weight: 8.05kg (including package)
	Tester: 1653g (including battery)
	Testing wires: 1560g
	Auxiliary earthing rods: 935g (4pcs)
Working Temperature & Humidity	-10°C - 40°C, below 80%rh
Storage temperature & humidity	-20°C - 60°C, below 70%rh
Overload Protection	Measuring earth resistance: between each interfaces of C(H)-E, P(S)-ES, AC 280V/3 seconds
Insulation Resistance	Over 20MΩ (between circuit and enclosure it is 500V)
Withstanding Voltage	AC 3700V/rms (Between circuit and enclosure)
Electromagnetic Features	IEC61326(EMC)
Protection Type	IEC61010-1 (CAT III 300V, CAT IV 150V, Pollution 2), IEC61010-031, IEC61557-1 (Earth resistance), IEC61557-5 (Soil resistivity), JJG 366-2004 (Grounding resistance meter) JJG 1054-2009 (Clamp grounding resistance meter)

3. Intrinsic error and performance indicators under base conditions

Category	Measurement Range	Intrinsic Error	Resolution
2/3/4 pole method measure earth resistance (R)	0.00Ω-29.99Ω	±2%rdg±5dgt	0.01Ω
	30.0Ω-299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω-2999Ω	±2%rdg±3dgt	1Ω
	3.00kΩ-30.00kΩ	±2%rdg±3dgt	10Ω
Selection method to measure grounding resistance (R)	0.00Ω-29.99Ω	±2%rdg±5dgt	0.01Ω
	30.0Ω-299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω-3000Ω	±2%rdg±3dgt	1Ω
Double clamp method to measure grounding resistance (R)	0.01Ω-0.99Ω	±10% rdg ±5 dgt	0.01Ω
	1.0Ω-29.9Ω		0.1Ω
	30Ω-100Ω		1Ω
Soil Resistivity (ρ)	0.00Ωm - 99.99Ωm	According to the precision of R (ρ=2 ρaR a:1m - 100m, ρ=3.14)	0.01Ωm
	100.0Ωm - 999.9Ωm		0.1Ωm
	1000Ωm - 9999Ωm		1Ωm
	10.00kΩm - 99.99kΩm		10Ωm
	100.0kΩm - 999.9kΩm		100Ωm
	1000kΩm - 9000kΩm		1kΩm
Earth Voltage (50Hz/60Hz)	AC 0.0 - 600V	±2%rdg±3dgt	0.1V
AC Current (50Hz/60Hz)	0.0mA-600.0A	±2%rdg±3dgt	0.01mA

Note: 1. When rC max or rP max, additional error ≤±5%rdg±5dgt. (rC max: 4kΩ+100R<50kΩ, rP max: 4kΩ+100R<50kΩ)

2. When 5V interference voltage, additional error≤±5%rdg±5dgt.

EARTH RESISTANCE AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EMI-H

Product function

Test mode: precise 4-pole, 3-pole and simple 2-pole method, selection method, double clamp method for the measurement of earth resistance, soil resistivity, grounding voltage, ground lead leakage current, AC current, DC resistance.

Product feature

- Import FFT (Fast Fourier Transform Algorithm) and AFC (Automatic Frequency Control) technology. Unique antijamming capability and environmental adaptability, high consistency of retest.
- Pack with waterproof protection box, waterproof, crash proof, anti-drop and durable, large-capacity rechargeable lithium battery pack, especially suitable for use at outdoor construction site
- The large LCD display of host machine with white backlight and bar graph indication that can be seen clearly. Sound-light alarm, overload protection, auto power-off and data upload function.



Technical Specifications

1. Base Conditions and Working Conditions


Influence Quantity	Base Conditions	Working Conditions	Remarks
Ambient Temp	23°C±1°C	-10°C -40°C	-
Ambient Humidity	40%~60%	<80%	-
Working Voltage	DC 7.8V±0.1V	DC 7.8V±0.6V	-
Auxiliary Earth Resistance	<100Ω	<30kΩ	-
Interference Voltage	None	<20V	-
Interference Current	None	<2A	-
Electrode Distance of measuring R	a>5d	a>5d	-
Electrode Distance of measuring ρ	a>20h	a>20h	-

2. General Specification

Function	2/3/4-pole measurement for earth resistance, soil resistivity, earth voltage, AC voltage
Power Supply	DC 7.4V 2600mAh rechargeable lithium battery, full of about 8.4V
Measurement Range	Earth Resistance: 0.00Ω-30.00kΩ
	Soil Resistivity: 0.00Ωm-9000kΩm
	Earth Voltage: 0V~600V
Measuring Mode	Precise 4-pole measurement, 3-pole measurement, simple 2-pole measurement of earth resistance
Measuring Method	Earth Resistance: rated current change-pole method, test current 20mA Max
	Soil Resistivity: 4-pole method (Wenner method) Earth Voltage: average rectification(between P(S)-ES)
Test Frequency	128Hz/111Hz/105Hz/94Hz(AFC)
Short-circuit Test Current	AC 20mA max
Short-circuit Test Current	AC 40V max
Test Voltage Wave	Sine wave
Electrode Distance Range	1m-100m
Shift	Earth resistance: 0.00Ω-30.00kΩ automatic shift
	Soil Resistivity: 0.00Ωm-9000kΩm automatic shift
Backlight	Controllable white screen backlight, suitable for dim places
Display Mode	4-digital super-large LCD display, white screen backlight
Measurement Indicator	During measurement, LED flash indicator, LCD count down display, progress bar indicator

EARTH RESISTANCE AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM1-H

2. General Specification

LCD Frame Dimension	128mmx75mm
LCD Window Dimension	124mmx67mm
Tester Dimension	280mm(L)x260mm(W)x160mm(H)
Standard Test Wire	4 wires: each for red 20m, black 20m, yellow 10m, and green 10m
Simple Test Wire	2 wires: each for red 1.6m and black 1.6m
Auxiliary Ground Rod	4 wires: Φ 10mmx150mm
Measurement Rate	Voltage to earth: about 3 times/second
	Earth resistance, soil resistivity: about 5 seconds/time
Measuring Times	Over 5000 times (Short-circuit test, interval time should be at least 30 seconds)
Circuit Voltage	below AC 600V
Communication Interface	USB interface, software monitoring, storage data can be uploaded to computer, saved or printed.
Communication Wire	One piece USB communication wire, length 1.5m
Data Storage	300 sets, "MEM" symbol storage indicator, flash display "FULL" symbol indicate storage full
Data Hold	Data hold function: "HOLD" symbol display
Data Read	Data read function: "READ" symbol display
Overflow Display	Over range overflow function: "OL" symbol display
Interference Test	Recognize interference signal automatically, "NOISE" symbol display when interference voltage exceed 5V
Auxiliary Ground Test	With auxiliary earth resistance test function, 0.00K Ω -30k Ω (100R+rC<50k Ω , 100R+rP<50k Ω)
Alarm Function	Measurement value exceeds alarm setting value, will "Toot-toot-toot" alarm hint
Auto-shut off	Automatically shut down after 10 minutes of power on
Battery Voltage	While battery voltage decreases to around 7.5V, will display battery voltage low symbol "  ", and reminding to charge
Working Power	Standby: about 20mA (Backlight shut off)
	Boot up and with backlight: about 45mA (25mA without backlight)
	Measurement: about 100mA (Backlight shut off)
Weight	Tester: 2290g
	Tester bag:915g
	Test wires: 1560g
	Auxiliary ground rods: 935g (4pcs)
Working Temperature & Humidity	-10°C-40°C, below 80%rh
Storage temperature & humidity	-20°C-60°C, below 70%rh
Overload Protection	Measuring earth resistance: between each interfaces of C(H)-E, P(S)-ES, AC 280V/3 seconds
Protection Level	IP65 (close the case)
Insulation Resistance	Over 20M Ω (between circuit and enclosure it is 500V)
Withstand Voltage	AC 3700V/rms (Between circuit and enclosure)
Electromagnetic Features	IEC61326 (EMC)
Protection Type	IEC61010-1 (CAT III 300V,CAT IV 150V,Pollution 2), IEC61010-031, IEC61557-1 (Earth resistance), IEC61557-5 (Soil resistivity), JJG 366-2004

EARTH RESISTANCE AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM1-H

3. Intrinsic error and performance indicators under base conditions

Measurement Function	Measurement Range	Intrinsic Error	Resolution
Earth Resistance (R)	0.00Ω-30.00Ω	±2%rdg±3dgt	0.01Ω
	30.0Ω-300.0Ω	±2%rdg±3dgt	0.1Ω
	300Ω-3000Ω	±2%rdg±3dgt	1Ω
	3.00kΩ-30.00kΩ	±4%rdg±3dgt	10Ω
Soil Resistivity(ρ)	0.00Ωm-99.99Ωm	(ρ=2πaR a:1 m~100m ; π=3.14)	0.01Ωm
	100.0Ωm-999.9Ωm		0.1Ωm
	1000Ωm-9999Ωm		1Ωm
	10.00kΩm-99.99kΩm		10Ωm
	100.0kΩm-999.9kΩm		100Ωm
1000kΩm-9000kΩm	1kΩm		
Earth Voltage	AC 0.0-600V	±2%rdg±3dgt	0.1V

Note : 1. rC max or rP max, additional error≤±3%rdg±5dgt. (rC max: 4kΩ+100R<50kΩ, rP max: 4kΩ+100R<50kΩ)

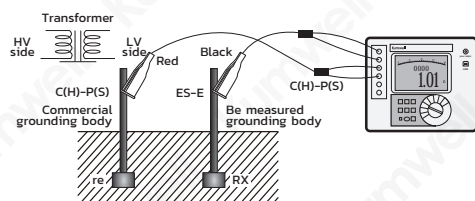
2. Interference voltage with 5V, additional error≤±5%rdg±5dgt.

Warning: Voltage measurement is strictly prohibited when the instrument is charged, connected to a computer, or supplied with external power

Accessories
Tester: 1 piece
Grounding Rod: 4 pieces
Testing Wire: 6 pieces
USB data transmission line: 1 piece
Software disk: 1 piece
Tester bag: 1 piece

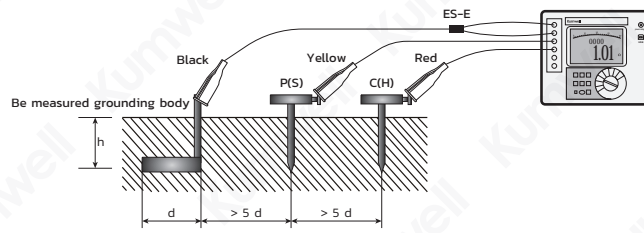


Field Application

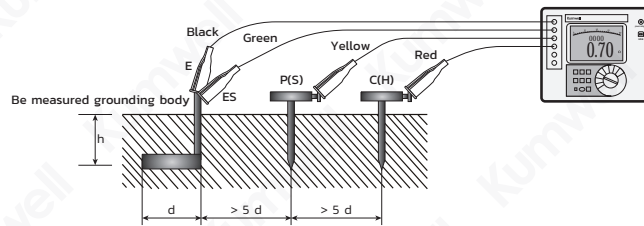


2-wire simple earth resistance measurement

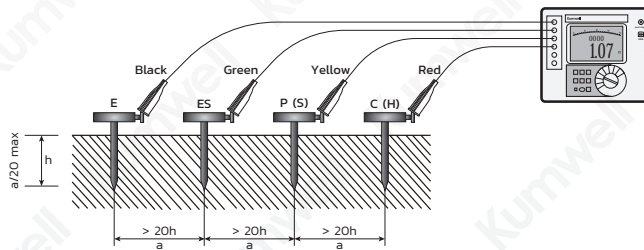
EARTH RESISTANCE AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM1-H



3-wires earth resistance measurement



4-wires precise earth resistance measurement



Soil resistivity measurement

DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM2C-H

Product function

Precise 3/4-wire, simple 2-wire measurement of earth resistance, soil resistivity, earth voltage, AC voltage.

Product feature

- Import FFT (Fast Fourier Transform Algorithm) and AFC (Automatic Frequency Control) technology. Unique antijamming capability and environmental adaptability, high consistency of retest.
- Pack with waterproof protection box, waterproof, crash proof, anti-drop and durable, large-capacity rechargeable lithium battery pack, especially suitable for use at outdoor construction site
- The large LCD display of host machine with white backlight and bar graph indication that can be seen clearly. Sound-light alarm, overload protection, auto power-off and data upload function.



Technical Specifications

1. Base Conditions and Working Conditions

Influence Quantity	Base Conditions	Working Conditions	Remarks
Ambient Temp	23°C±1°C	-10°C -40°C	-
Ambient Humidity	40%~60%	<80%	-
Working Voltage	7.8V±0.1V	7V±1.5V	-
Auxiliary Earth Resistance	<100Ω	<5kΩ	-
Interference Voltage	Should avoid	<20V	-
Interference Current	Should avoid	<2A	-
Electrode Distance when measuring R	a>5d	a>5d	-
Electrode Distance when measuring ρ	a>20h	a>20h	-

2. General Specification

Function	Measure grounding resistance, soil resistivity; DC resistance, earth voltage, alternating current, leakage current
Power Supply	DC 7.4V 2600mAh rechargeable lithium battery, full of about 8.4V
Backlight	Controllable screen backlight, suitable for dim places
Measurement Range	Precise 4-pole measurement, 3 pole measurement, simple 2 pole measurement, selection method, double clamp method measure grounding resistance
Measuring Mode	2/3/4 pole measurement method: Change-pole method, measurement current 20mA Max Selection measurement method: Change-pole method, measurement current 20mA Max Double clamp measurement method: Non-connect mutual inductance method, measurement current 1mA Max Soil Resistivity: 4-pole measurement (Wenner method) DC resistance: Change-pole method AC current : Mutual inductance method (clamp) Earth Voltage: Average rectification (between P(S) ES)
Test Voltage Wave	Sine wave
Test Frequency	128Hz/111Hz/105Hz/94Hz(AFC)
Short-circuit Test Current	AC 20mA max
Open-circuit Test Voltage	AC 40V max

DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM2C-H

2. General Specification

Electrode Distance Range	1m-100m
Display Mode	4 digital large LCD display, with screen backlight
Measuring Indicator	During measurement, LED flash indicator, LCD countdown display
LCD Frame Dimension	128mmx75mm
LCD Window Dimension	124mmx67mm
Dimension	280 mm(L) x 260 mm(W) x 160 mm(H)
Size of clamp	185 mm(L) x 115 mm(W) x 43 mm(H)
Test Wire	4 wires: each for red 20m, black 20m, yellow 10m, and green 10 m
Simple Test Wire	2 wires: each for red 1.6m and black 1.6 m
Auxiliary Grounding Rod	4 PCS : Φ 10mmx150mm
Current Clamp	2 PCS : 1 blue black plug and 1 red black plug
Clamp Caliber	Φ 68mm
Clamp Turn Ratio	1000 : 1
Clamp Lead Wire	2m
Measuring Rate	AC current : about 2 times/second
	Earth Voltage : about 2 times/second
	Earth resistance: about 7 seconds/time
Measuring Times	Over 5000 times (Short-circuit test , interval time should be at least 30seconds)
Circuit Voltage	AC 600V
Communication Interface	RS232 interface, storage data can be uploaded to computer, saved or printed.
Communication Wire	One piece of RS232 communication wire, with length 1.5m
Data Hold	Data hold function: "HOLD" symbol display
Data Storage	2000 sets, "MEM" storage indicator, "FULL" symbol flash display storage is full
Data Read	Data read function: "READ" symbol display
Overflow Display	Exceed measuring range overflow function: "OL" symbol display
Low current direction of clamp	Measurement with select method or double clamp, the current signal received by CT2 is lower than 0.5mA, will display "Ø", and should check the clamping direction of the CT2 current clamp
Interference Test	Automatic identification of interference signals , "NOISE" symbol indication when the interference voltage is higher than 5V
Auxiliary Grounding Test	With auxiliary grounding resistance test function, 0.00k Ω 30k Ω (100R+rC <50k Ω , 100 R+rP <50k Ω)
Alarm Function	Measuring value exceeds alarm setting value, will "Toot toot toot" alarm hint
Battery Voltage	While battery voltage decreases to around 7.2 V, will display battery voltage low symbol "■", and reminding to replace the battery
Auto shut off	Automatically shut down after 15 minutes of power on
Power Consumption	Backlight : 25mA Max (only backlight power consumption)
	Standby : 25mA Max (Backlight off after power on)
	Measurement 150mA Max (Backlight shut off)
Weight	Tester: 2.23kg
	Testerpackage: 0.915kg
	Current Clamp:1.05kg(2pcs)
	Test wires:1.56kg (include the simple test wires)
	Auxiliary grounding rods: 0.935kg (4pcs)
Working Temperature & Humidity	-10°C-40 °C, below 80%rh
Storage temperature & humidity	-20°C-60 °C, below 70%rh

DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM2C-H

2. General Specification

Protection Level	IP65 (close the case)
Overload Protection	Measure earth resistance: between each interfaces of C(H)-E、P(S)-ES, AC 280V/3 seconds
Insulation Resistance	Over 20 MΩ (between circuit and outside shell is 500V)
Withstanding Voltage	AC 3700V/rms. (Between circuit and outside shell)
Electromagnetic Features	IEC61326 (EMC)
Protection Type	IEC61010-1(CAT 300V, CAT IV 150V, Pollution 2); IEC61010-031; IEC61557-1 (Earth resistance); IEC61557-5 (Soil resistivity); JJG 366-2004 (Grounding resistance meter) JJG 1054-2009 (Clamp grounding resistance meter)

3. Intrinsic error and performance indicators under base conditions

Measurement Function	Measurement Range	Intrinsic Error	Resolution
2/3/4 pole method measure earth resistance (Re) DC resistance(R--)	0.00Ω-29.99Ω	±2%rdg±5dgt	0.01Ω
	30.0Ω-299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω-2999Ω	±2%rdg±3dgt	1Ω
	3.00kΩ-30.00kΩ	±4%rdg±3dgt	10Ω
Selection method measure grounding resistance(Re)	0.00Ω-29.99Ω	±2%rdg±5dgt	0.01Ω
	30.0Ω-299.9Ω	±2%rdg±3dgt	0.1Ω
	300Ω-3000Ω	±2%rdg±3dgt	1Ω
Double clamp method measure grounding resistance(Re)	0.01Ω-0.99 Ω	±10%rdg±5dgt	0.01Ω
Soil Resistivity(ρ)	1.0Ω-29.9Ω		0.1Ω
	30Ω-100Ω		1Ω
	0.00Ωm-99.99Ωm	Accuracy : According to the precision of R ($\rho=2\pi aR$, $a=1\text{ m}-100\text{m}$, $\pi=3.14$)	0.01Ωm
	100.0Ωm-999.9Ωm		0.1Ωm
	1000Ωm-9999Ωm		1Ωm
	10.00kΩm-99.99kΩm		10Ωm
100.0kΩm-999.9kΩm	100Ωm		
1000kΩm-9000kΩm	1kΩm		
Earth Voltage(50Hz/60Hz)	AC 0.0-100V	±2%rdg±3dgt	0.1V
Alternatingcurrent(50Hz/60Hz)	0.0mA-600.0A	±2%rdg±3dgt	0.01mA

Note : 1. rC max or rP max: additive error $\leq\pm 5\%rdg\pm 5dgt$ (rC max: $4k\Omega+100R<50k\Omega$, rP max: $4k\Omega+100R<50k\Omega$)

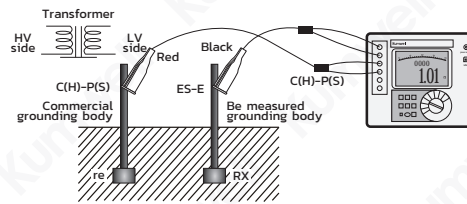
2. when interference by 5V voltage, the additive error $\leq\pm 5\%rdg\pm 5dgt$

DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM2C-H

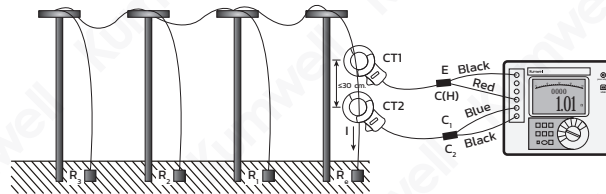
Accessories	
Tester:	1 piece
Current Clamp Sensor:	2 pieces
Grounding Rod:	4 pieces
Testing Wire:	6 pieces
USB data transmission line:	1 piece
Current clamp :	2 pieces
Software disk:	1 piece
Tester bag:	1 piece
Special charger:	1 piece



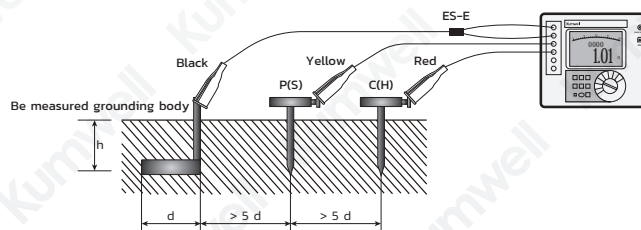
Field Application



2-wire simple earth resistance measurement

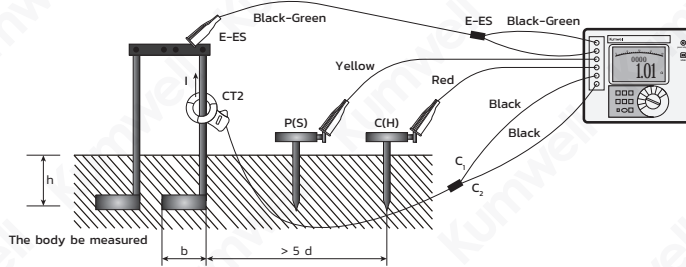


Double clamp method to measure earth resistance

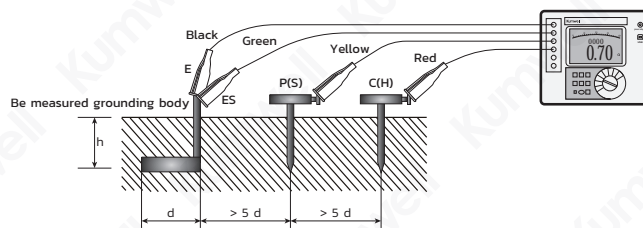


3-wires earth resistance measurement

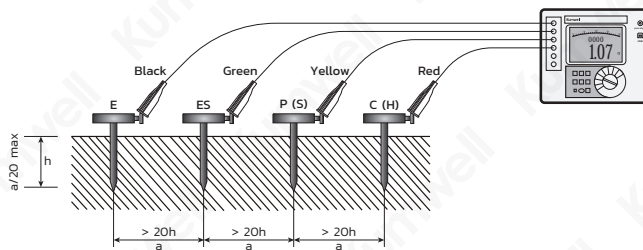
DOUBLE CLAMP EARTH AND SOIL RESISTIVITY TESTER PACKAGE WITH THE DUTY AND WATERPROOF BOX KIGM-EM2C-H



Selective method to measure earth resistance



4-wires precise earth resistance measurement



Soil resistivity measurement

References

Owner	Project Name	Period
Precise System and Project Co., Ltd.	• MEA	2015-2021
Taveesin 189 Engineering Co., Ltd	• สหกรณ์ออมทรัพย์ จ.ระยอง	2015-2021
Asefa Public Company limited	• สนามบินเบตง , ปตท , เซนทรัลชลบุรี , กรมชลประทาน	2015-2022
CPT Drives and Power Public Co., Ltd.	• โรงไฟฟ้า, Solar ไฟร์ท อัลเทอเนทีฟ, Double A, Power Plant Pichit, อาคารเฉลิมพระเกียรติสมเด็จพระเจ้าอยู่หัว, NEO CLEAN ENERGY, MWA	2015-2022
P&S Design Co.,Ltd.	• บ่อบำบัดน้ำเสีย จ.กำแพงเพชร , PLC จ.อำนาจเจริญ	2015-2022
Royaltec International Co., Ltd.	• กองบัญชาการทหารพัฒนา, Big C, โรงงานมิตรผล จ.ขอนแก่น, วัดป่าธรรมพนมวันชัย	2015-2022
Asset Performance Solutions Co., Ltd.	• ปิ๊ม ESSO	2016-2018
E.C.T.Professional Co.,Ltd.	• The Lumpini Sukumvit 24	2016-2021
K.T.Technical Supply Co., Ltd.	• ทำอากาศยานพิษณุโลก	2016-2021
T I C Modular System Co., Ltd.	• ทำเรือภูเก็ต , การไฟฟ้าส่วนภูมิภาค จ.นครนายก , กล้องวงจรปิดสนามบิน, Solar Rooftop Puunphin	2016-2021
J.T.N.Energy Co., Ltd.	• บ.เบทาโกร, Solar, แมคโคร, JTN Solar Rooftop	2016-2022
EA Solar Lampang Co.,Ltd.	• โซลาร์ลำปาง	2017-2018
JSK Group Company Limited	• Koh Chang, Radar Station (Naval Public Works Department)	2017-2021
PTT Exploration and Production Plc	• PTT	2017-2021
Power Insulators Co., Ltd.	• PEA	2017-2022
Precise Electro-mechanical Works Co., Ltd.	• MEA	2017-2022
I G N Supply Co., Ltd.	• ทหารเรือ	2018
Win Thai Engineering Co., Ltd.	• โครงการสูบน้ำทองเนียม	2018
AN Plus Engineering Co., Ltd.	• ปิ๊ม ESSO จ.นครปฐม / ปิ๊ม Shell เขตหนองแขม จ.กรุงเทพฯ	2018-2019
P&C Intersupply Co.,Ltd.	• ปิ๊ม ปตท สมุทรโพธิ์	2018-2021
SCI Electric Public Company Limited	• Solar Rooftop, Internet VSE 1504.44	2018-2021
Somchai Electric Part., Ltd.	• กรมสรรพากรทหารบก	2018-2021
Thai Maxwell Electric Co., Ltd.	• โรงงานผลิตหม้อแปลง	2018-2021
S.T.Electrical Products Co.,Ltd.	• PWA , โรงกรองน้ำ PWA จ.เพชรบุรี	2018-2022
V Synap Technology Co., Ltd.	• สถาบันพัฒนาฝีมือแรงงาน จ.ปทุมธานี	2019
วัฒนาทิจฉิมชา จำกัด	• กรีนเทคโอโทร	2019
All Tech 19 Co., Ltd.	• เทศบาลนครยะลา	2019-2021
B.E.C.Electric Co., Ltd.	• Toyota Solar Roof	2019-2021
KDSS Trading and Service Co., Ltd	• โรงพยาบาลสร้างคอม	2019-2021
Eica Company Limited	• PTT	2020-2021
Iyara Intertrade Company Limited	• Office of the Narcotics Control Board (Royal Thai Police)	2020-2021
Scada Automation Co., Ltd.	• Solar วัจจันทร์ จ.ระยอง, อาคารเบญจจินดา, IBC LNG, ไลต์สว่างกระด้, EGAT	2020-2021
SPP Five Company Limited	• โรงพลังงานแสงอาทิตย์ SPP5	2020-2021
SPP Two Company Limited	• โรงพลังงานแสงอาทิตย์ SPP2	2020-2021
Super Energy Public Co., Ltd.	• Solar Power House3 โครงการคลองปูน	2020-2021
Total Instrument Solution Co., Ltd.	• การประปา	2020-2021
Tronical Systems Co., Ltd.	• Naval Public Works Department Rayong Province	2020-2021
API Advance Integrate 2019 Co., Ltd.	• Solar Triumph / SURIN SUGAR / THIP SUGAR SUKHOTHAI	2020-2022
Frigate Technology Co.,Ltd.	• CCTV PTT GC3	2020-2022
Sangchai Equipment Co., Ltd.	• การประปา จ.ตราวิวาส,Southern Major City Stadium	2020-2022

References

Owner	Project Name	Period
CHAROEN POKPHAND ENGINEERING CO., LTD.	• Government Solar Roof	2022
EXUS GROUP COMPANY LIMITED	• PTTGC 3, Fire pump replacement	2022
HYDROZONE COMPANY LIMITED	• Water Treatment :PA-2001-ESM	2022
INTERLINK TELECOM PUBLIC COMPANY LIMITED	• AIS SOLAR	2022
IYARA SOLAR COMPANY LIMITED	• Solar Roof	2022
MAXEL ELECTRIC COMPANY LIMITED	• Rangsit University	2022
METRO UNITEDD COMPANY LIMITED	• Administrative Court of Thailand	2022
NESIC (THAILAND) CO., LTD.	• Suvarnabhumi Airport (GBAS)	2022
NP.ELECTRIC ENGINEERING COMPANY LIMITED	• Solar Roof จ.ชลบุรี	2022
SCG Autogas Co., Ltd.	• Solar Roof จ.ปทุมธานี	2022
SITE PREPARATION MANAGEMENT COMPANY LIMITED	• Data Center (Symphony Communication Amata Nakorn)	2022
THANACHA CO., LTD.	• วัดป่าธรรมพนมวันชัย	2022
THE EXPERT ICT COMPANY LIMITED	• CCTV Systems	2022
TRANSPower TECHNOLOGY COMPANY LIMITED	• AIS SOLAR	2022

THAILAND : EGCO Solar Farm



THAILAND : Gheco One



THAILAND : HPC Power Plant



THAILAND : PTT Stadium



THAILAND : Super Energy Solar Farm



THAILAND : เสาค้ำ Wind Turbine



THAILAND : โรงงานวัดพระเปิดทวาร นครสวรรค์



THAILAND : GLOW IPP CO., LTD. ต.บ่ออิน จ.ชลบุรี



THAILAND : คลังเชื้อเพลิง ทหารอากาศ



THAILAND : เขื่อนศรีนครินทร์ (เขื่อนท่าทุ่งนา)



THAILAND : Thai PBS Phase 3



THAILAND : Solar Farm EGCO SPP5 ร้อยเอ็ด



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