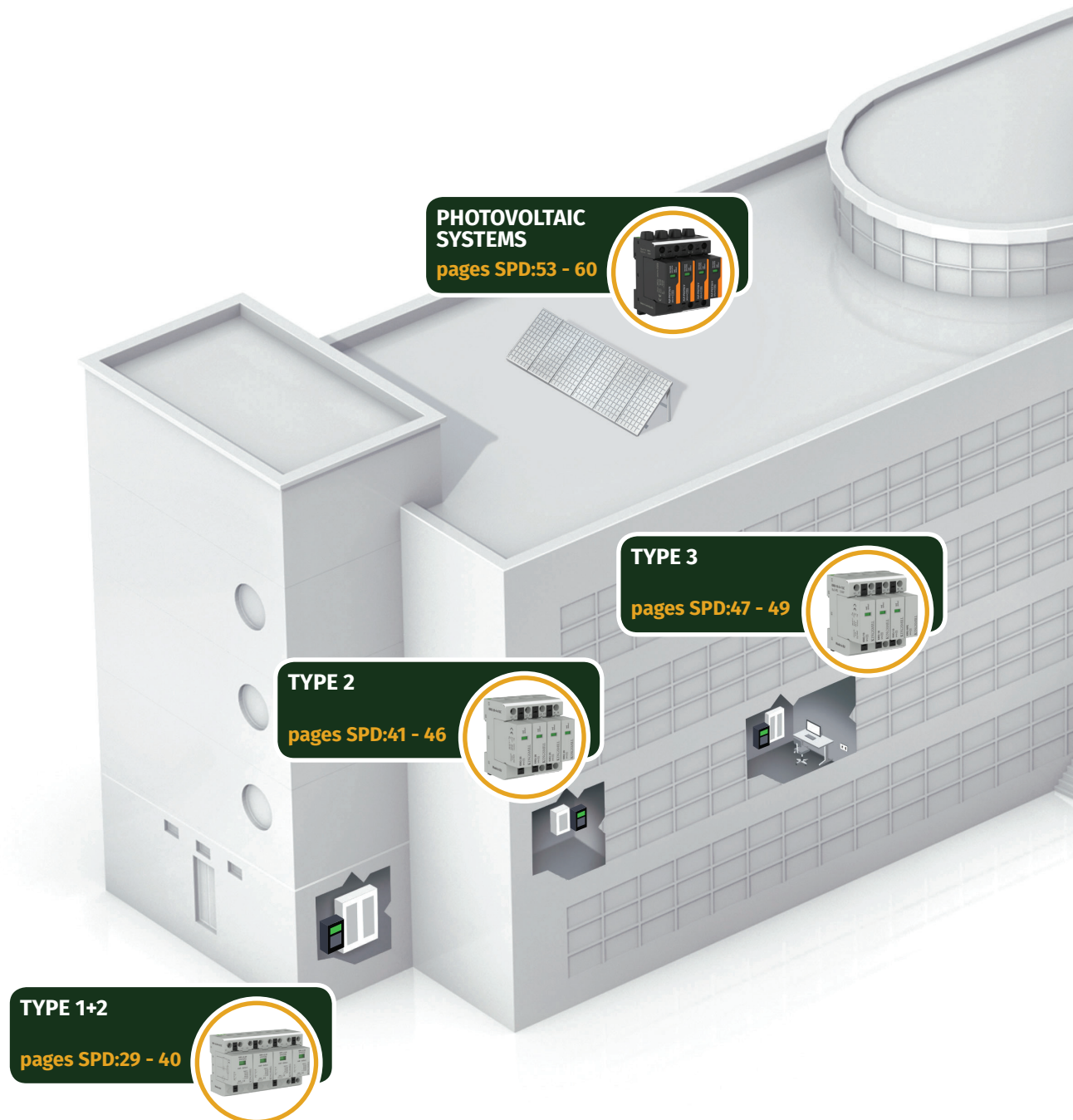
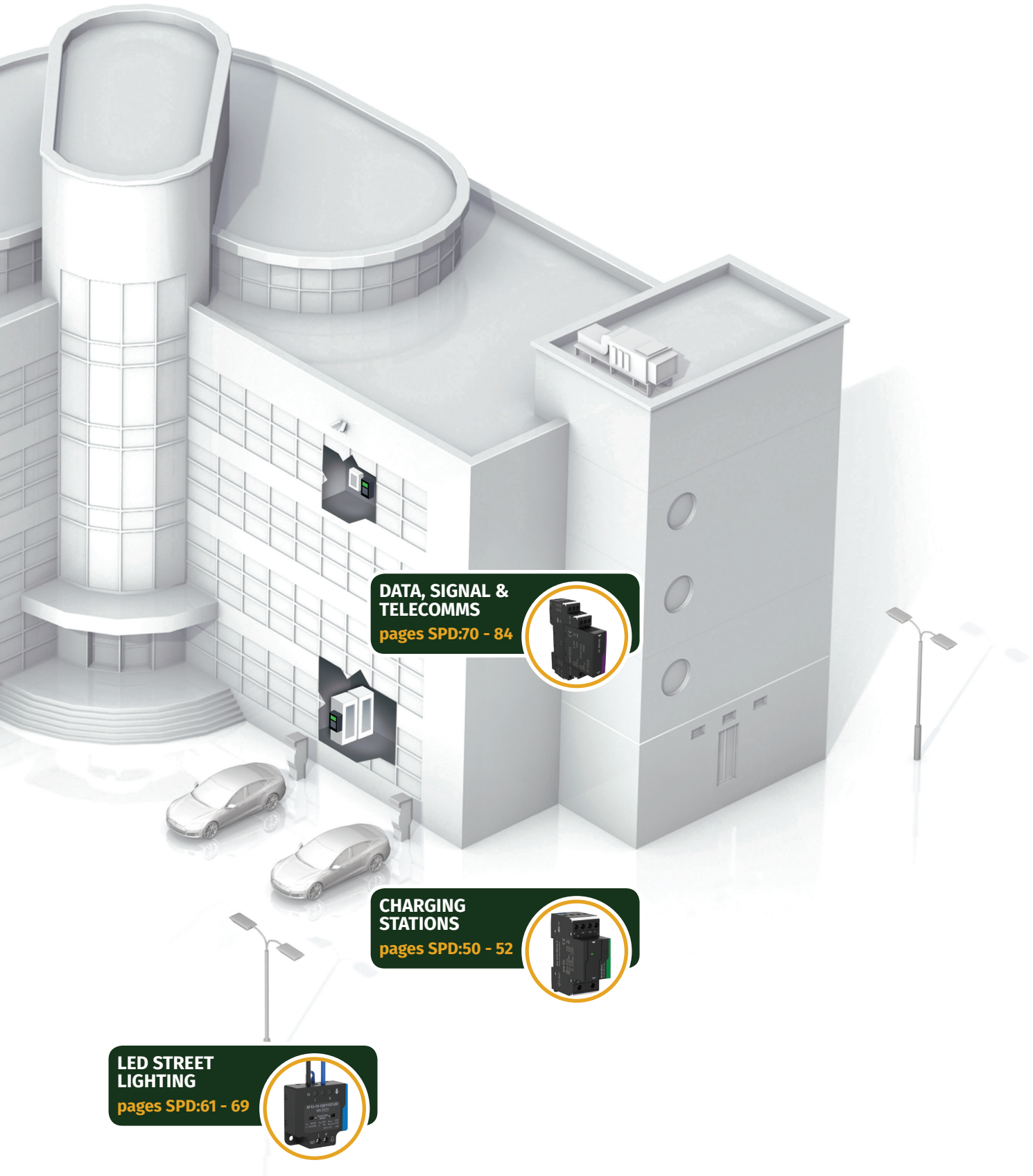


Overview	SPD:2 - 3
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Photovoltaic Protection Guide for the protection of Photovoltaic Systems (with protector details)	SPD:53 - 60
LED Street, Industrial and Security Lighting Protection Guide for the protection of Street Lighting and LED Lighting (with protector details)	SPD:61 - 69
Low Voltage, Telephone and Data Lines Protection Range of Low Voltage, Data and Telephone Line SPDs	SPD:70 - 84
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Kingsmill offer a range of Surge Protection Devices to protect electronic equipment from the damage caused by the secondary effects of lightning.





DATA, SIGNAL & TELECOMMS
pages SPD:70 - 84



CHARGING STATIONS
pages SPD:50 - 52



LED STREET LIGHTING
pages SPD:61 - 69



The need for Surge Protection

The protection of electronic systems is often ignored, yet the damage to such systems, caused by lightning, can be catastrophic.



The probability of electronic systems being damaged by lightning is many times greater than that of the building itself being struck by lightning!

Why?

Imagine a building. It's a relatively small target for lightning to hit, yet we will spend money on installing structural protection and have it tested annually, but ignore the dangers posed by lightning induced transients or surges.

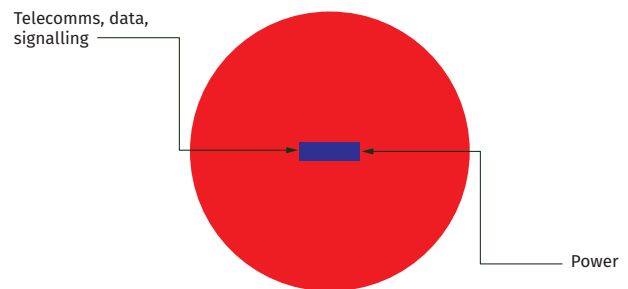
Our homes, places of work, factories, offices, hospitals, airports, etc are all interconnected by overhead and buried cables forming a huge spider's web, that is easily affected by lightning.

Fact

Lightning up to 1km away can damage electronic systems. Now, draw a 2km diameter circle around your building - that is a large target area for lightning to hit, compared to the size of the building itself.

The resultant mains borne transients from the secondary effects of lightning can be as high as 6,000 volts and have the capacity to destroy electronic systems. Smaller transients may cause degradation to electronic components and disruption of system performance.

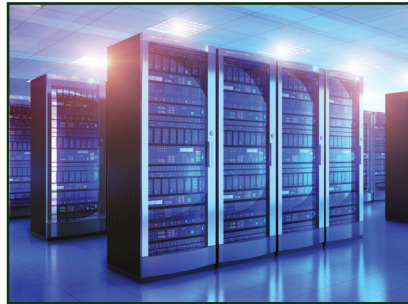
But the threat to electronic systems does not end there. Transient voltages caused by electrical switching are common.



Dependency

Electronic systems have invaded our everyday lives and we now depend on them to a huge extent:

- Business (where such systems control administration and manufacturing operations),
- Hospitals (where our lives can depend on the functioning of electronic equipment),
- Security services (police, fire and ambulance),
- Leisure (when we go shopping or even to the cinema or entertainment complex)
- Personal communications (email and phone).



Susceptibility

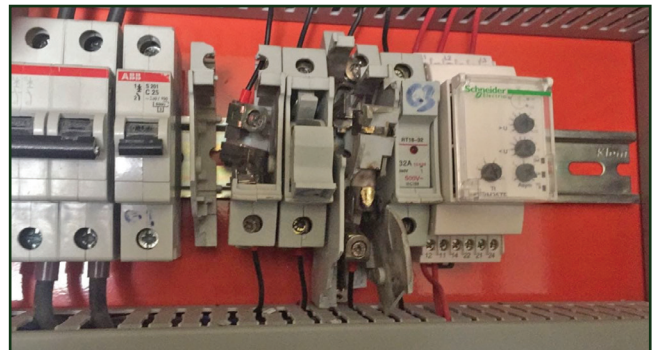
We can also see that the electronics supporting our everyday lives have become increasingly sophisticated and miniaturised. So much so that they are now more susceptible to damage or degradation.

Put this in the context of a 2km diameter target area for lightning - a spiders web of power and data cables - then we have a recipe for disaster!

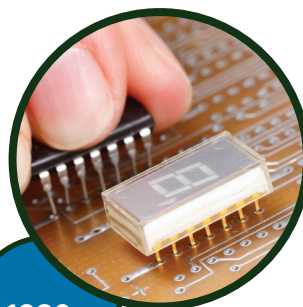
Imagine what would happen if we didn't have these systems - inconvenience, lack of service, perhaps even life threatening situations.

The consequences to operators of such systems are damage, degradation, and disruption.

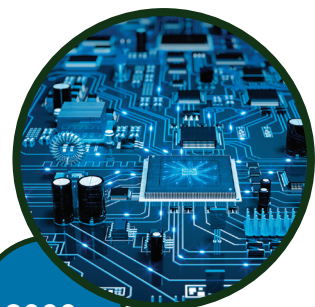
All of this can be costly but the good news is that it can be prevented!



1960s



1980s



2000s

How do lightning and electrical switching events affect my electronic systems?

1 - Resistive Coupling

Lightning simply striking the ground injects a huge current of up to 200,000A into the ground.

This current flows away from its point of entry into the ground. It does this through the most readily available conductive medium, the ground itself (soil, rock etc). However, the earth terminations and electrical cables of electronic installations are often better conductors of current than the ground itself.

This resulting current flows through the earth, neutral and phase conductors, as well as data lines which are connected to buildings further away. It flows through the electronics and electrical systems of the buildings closest to the strike point. As it does so, devastating transient voltages appear, causing damage to sensitive electronic equipment.

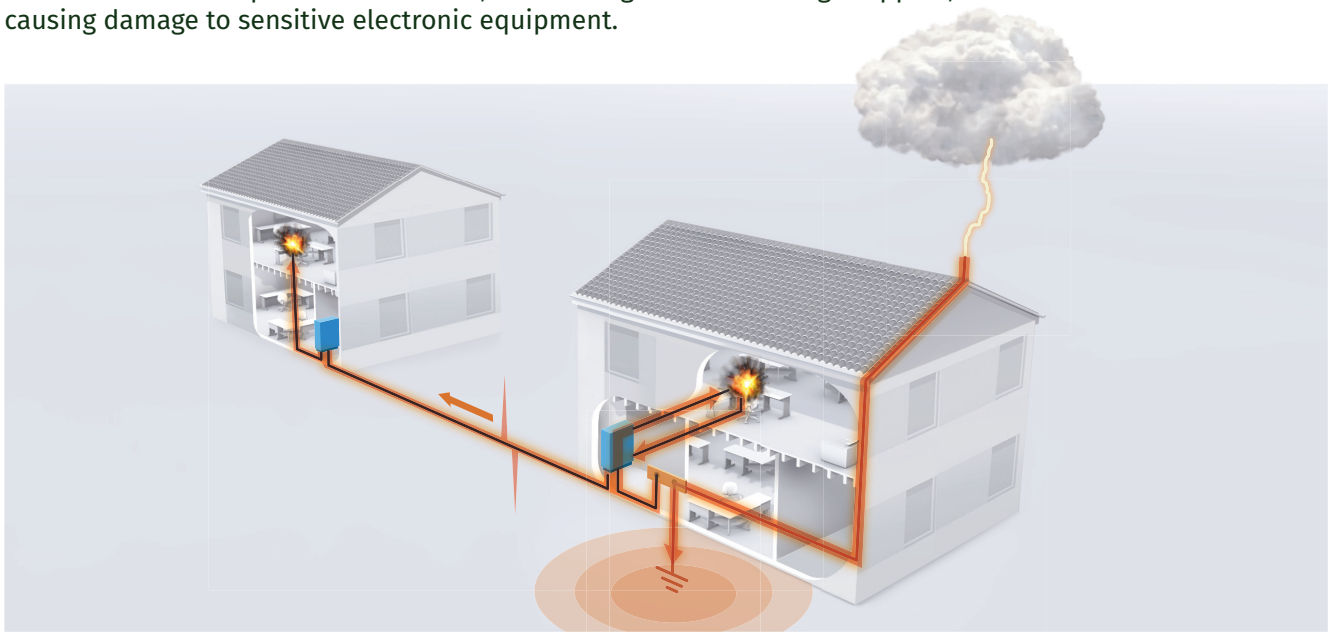


Figure SPD:1. Resistive Coupling - Example 1 (striking a structure)

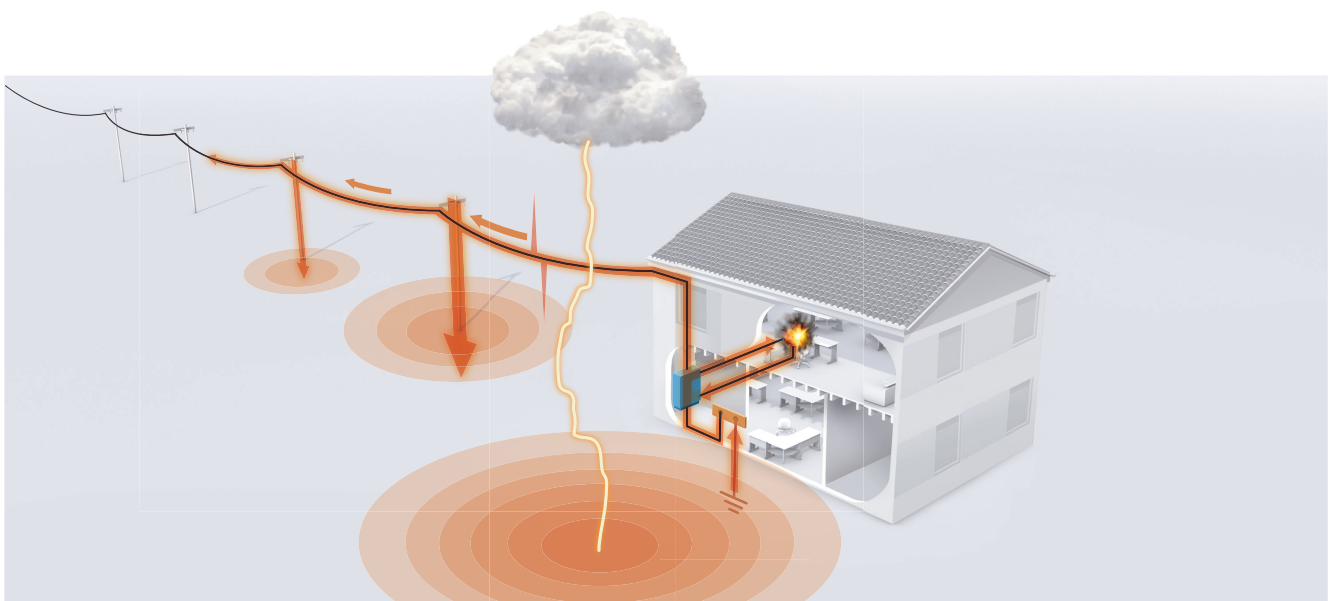


Figure SPD:2. Resistive Coupling - Example 2 (striking the ground near to a structure)

2 - Inductive (Magnetic) Coupling

The building may have structural lightning protection, but if data and power cables inside the building are routed close to a lightning down conductor, any lightning strike to the building will cause current to flow through the down conductors, resulting in an electromagnetic field that will induce transient voltages in the buildings internal power and data cables (*figure SPD:3*). The same can happen in an unprotected building too, the lightning current from a direct strike now finds its path to earth through the building's structure (reinforcing bars, steel columns etc) as well as internal pipework, cables and conduits.

Similarly, cloud to cloud lightning discharges (*figure SPD:4*) can induce transients in overhead power, data and telephone lines. This is because lightning is a massive discharge of current. When a current flows it creates an electromagnetic field and cables passing through this field have a voltage induced on them.



Figure SPD:3. Inductive Coupling - Example 1
(induced electro-magnetic field)

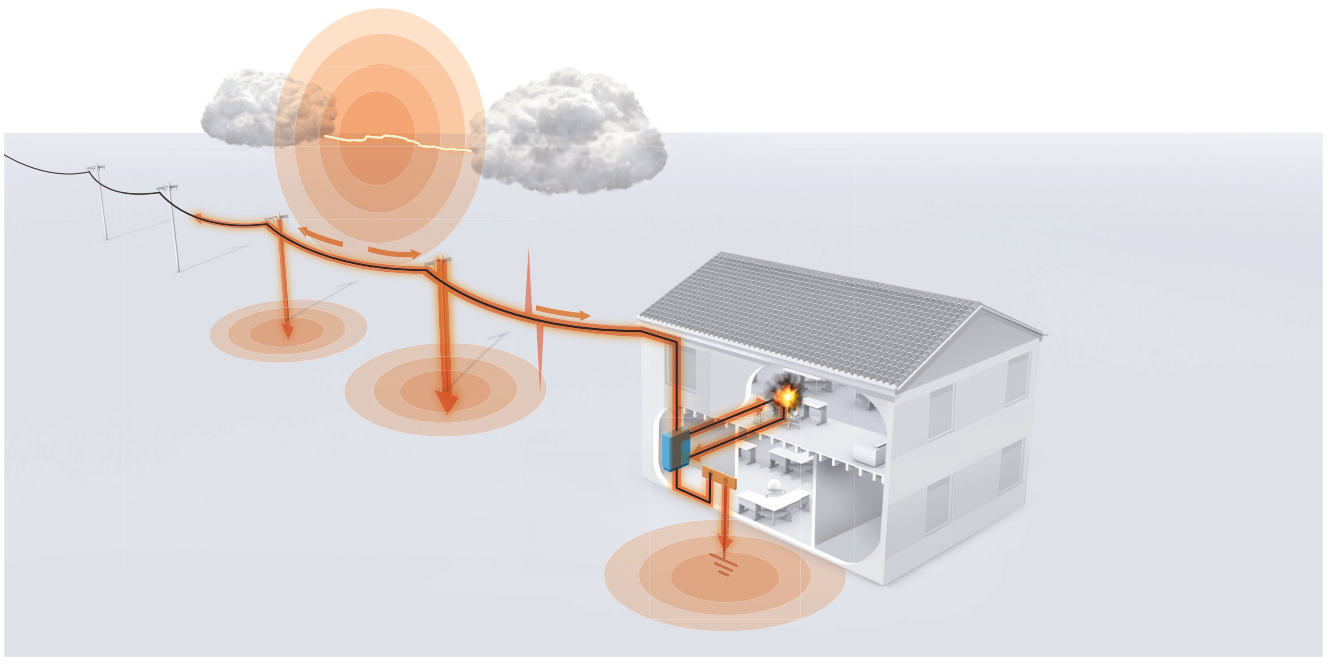


Figure SPD:4. Inductive Coupling - Example 2 (cloud to cloud lightning)

3 - Direct Strike

If an HV power line is struck directly by lightning, it will flashover to earth with one line flashing over before the others, creating a line to line transient that easily passes through supply transformers to reach electronic systems.

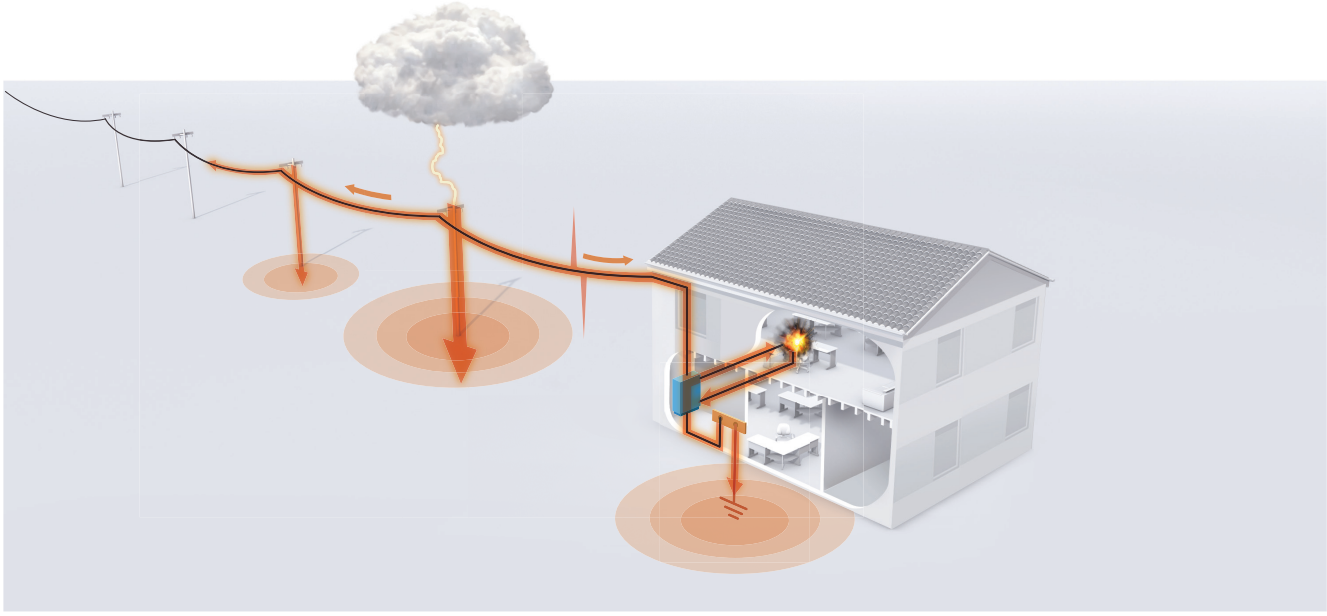


Figure SPD:5. Direct strike to an overhead HV power line

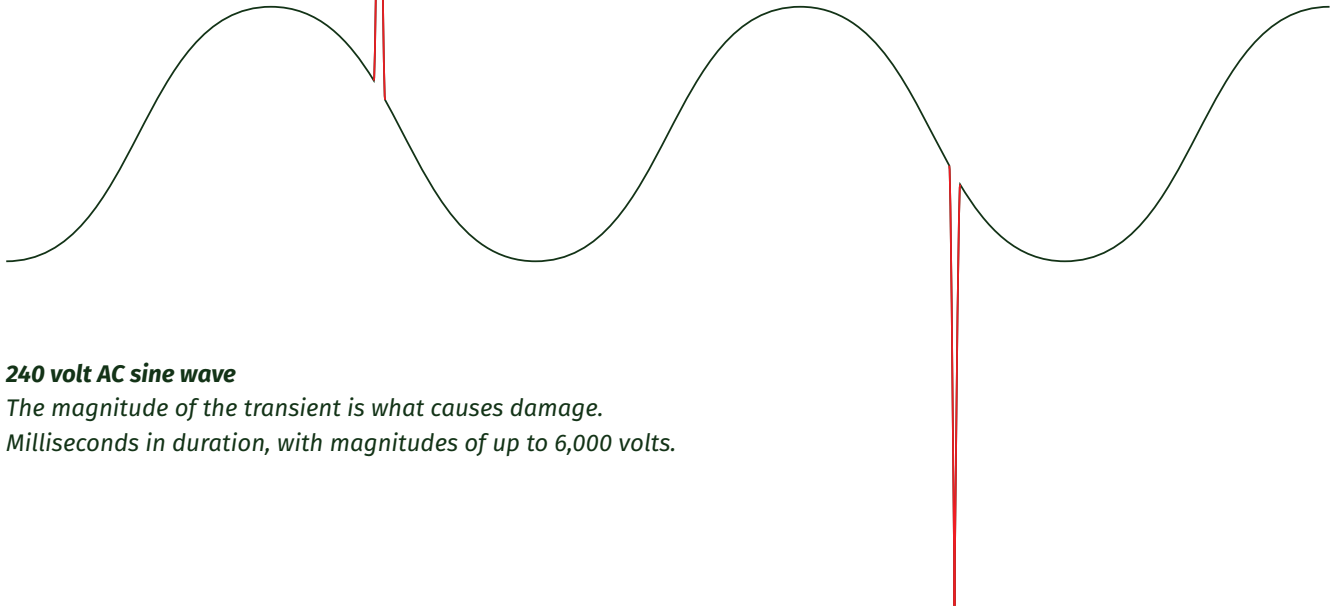
4 - Electrical Switching



We have already established that when a current flows through a conductor it creates a magnetic field. This field stores energy, higher currents and long lengths of conductor create more stored energy. When the current flowing along a conductor (the power supply) is switched off, the energy in the magnetic field is released in the form of a transient which can then flow through unprotected electronic equipment.

Switching events are commonplace. Inductive loads such as motors, transformers, electrical drives, large banks of lighting, industrial process equipment and so on are all sources of switching events.

What does a lightning induced transient look like?



240 volt AC sine wave

The magnitude of the transient is what causes damage.

Milliseconds in duration, with magnitudes of up to 6,000 volts.

What problems will a lightning induced or electrical switching transient cause?

Damage

Depending upon the severity of the transient, damage can range from burnt-out circuit boards, to impaired operation of components on the circuit board. This latter damage is harder to pinpoint, but is often caused by lightning induced transients. IEC 60664 places this level at 15,400 volts for electronic equipment.

Disruption

Here there is no physical damage, but the logic levels of the electronic system are disrupted. This can cause such things as data loss, corruption of software, loss of data, unexplained computer crashes and so forth.

The type of damage is very much influenced by a number of factors - equipment susceptibility (EN60664-1 states 1,500V as the minimum withstand voltage for electronic equipment). As the components of systems become smaller, susceptibility to damage and degradation worsen.

Degradation

Long term exposure to transients, which can be from electrical switching (quite common) or the secondary effects of lightning are often unknown to the operator of the electronic systems. But these transients degrade electronic componentry, reducing the lifetime of those systems and equipment. Almost like a silent killer creeping up on you.

Downtime

... (or the ability to use the system) is caused through inoperative systems.

Consequential loss

Consequential loss is the inability to use the electronic system - this can be extremely expensive and includes, but is not limited to:

- Replacement hardware
- Replacement software
- Loss of service
- Loss of revenue from suspended sales or manufacturing/process activity
- Cost of labour

The loss (or cost) varies from organisation to organisation, but it is not only inconvenient to have these problems, they can be prevented.



It is vitally important to reduce the size of lightning induced transients from 6,000 volts, to below the withstand voltage of the equipment to be protected (often cited as 1,500 volts).

This is the performance of European type units and the new Kingsmill range.

Applying Surge Protection

In a well-designed system, it is important that for each building, both the incoming and outgoing circuits are protected by surge protection devices (where the cables enter and exit the building).

This includes:

- Mains power supplies – including UPS
- Telephone lines
- Data communication lines
- Instrumentation, control, signalling lines
- Coaxial lines for CCTV, TV, & antenna cables

Field based electronic equipment also need to be protected.

All power, data and telephone lines should be bonded to the main earthing bar in the structure. The live conductors of these services must be equipotentially bonded by an SPD, at the point where the service enters the structure.

Should the BS:EN 62305-2 risk assessment dictate that a Structural Lightning Protection System (LPS) is required, the system designer should always fit equipotential bonding Surge Protection Devices (SPDs). These are referred to as Lightning Current Arresters in our product selection pages.

If the assessment dictates that structural lightning protection is not required, but there is an indirect risk that electrical services entering the structure could be affected, then the designer should always fit Surge Protection Devices.

A lightning protection system that employs the use of “equipotential bonding SPDs or lightning current arrestors” alone, does not effectively protect electronic systems.

Additional protection is also required if equipment is located more than 10m away from the location of the first upstream SPD. The purpose of this is to protect electronic systems from internally generated transients, as well as from transients that have become magnified (through oscillation), due to travelling long distances (over 10m) from the upstream SPDs. See section on Recommended Protective Distances (pages SPD:20 - 22) and figures SPD:10 - 12.

Effective protection is only achieved through the use of “coordinated SPDs” – in other words, a set of SPDs installed in a cascade, such that service entrance/lightning current SPDs and equipment protection/surge arrester SPDs compliment each other. The combination of both lightning current and surge arrester products, in different locations is what provides effective protection. Coordination becomes vital where transient overvoltages need to be controlled downstream of the service entrance position.

Protector coordination is detailed on page SPD:92.

There are three types of SPD. They are classified according to the location in which they are installed:

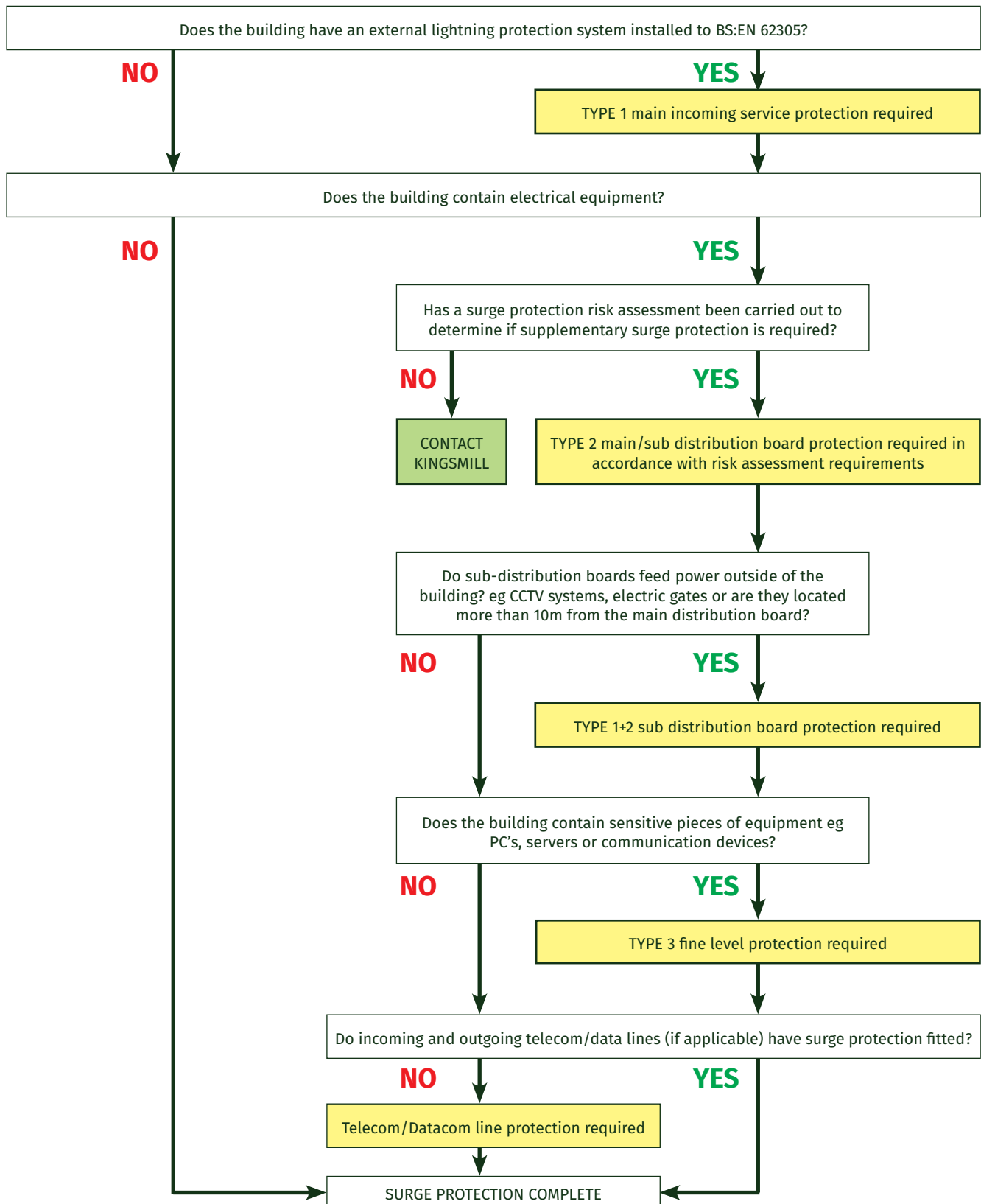
Location: Boundary of LPZ0 and LPZ1 - where lightning current could enter a building or structure
Power: Type 1 - lightning current arresters (*tested with a 10/350 μ s waveform*)
Data: Category D

Location: Boundary of LPZ1 and LPZ2 - protecting from internally induced transients (switching and the effects of oscillation over 10m) as well as the indirect effects of lightning
Power: Type 2 - surge arresters (*tested with an 8/20 μ s waveform*)
Data: Category C1

Location: Boundary of LPZ2 and LPZ3 - typically installed next to the equipment being protected, serving as “fine protection”
Power: Type 3 - surge arresters - fine protection (*tested with an 8/20 μ s waveform*)
Data: Category C2

Device Selection - basic overview

The following flow chart will assist in determining the products to be selected:



Protector Selection - detailed requirements

In order to select a protector, the following information has to be determined:

- STEP 1:** Carry out a risk assessment to determine the Lightning Protection Level (LPL)
- STEP 2:** Assign the Lightning Protection Zones (LPZ x)
This will involve determining the locations of distribution boards and equipment to be protected
- STEP 3:** Determine the voltage protection level (U_p)
- STEP 4:** Determine the number of metallic services entering the building and establish the kA rating of the device
- STEP 5:** Determine the earthing system type into which the SPD will be connected
- STEP 6:** Establish the positioning of each device
(taking into account protective distances)
- STEP 7:** Assess cable routeing and other considerations

STEPS 1 & 2 . . .

From BS:EN 62305 . . .

Lightning Protection Zones

BS:EN 62305-4 employs a principle of using Lightning Protection Zones (LPZ) to progressively reduce a potential 6,000 volt transient overvoltage to a safe voltage.

This voltage must be below that of the withstand voltage of the equipment to be protected.

SPD's are located at the boundaries of these zones.

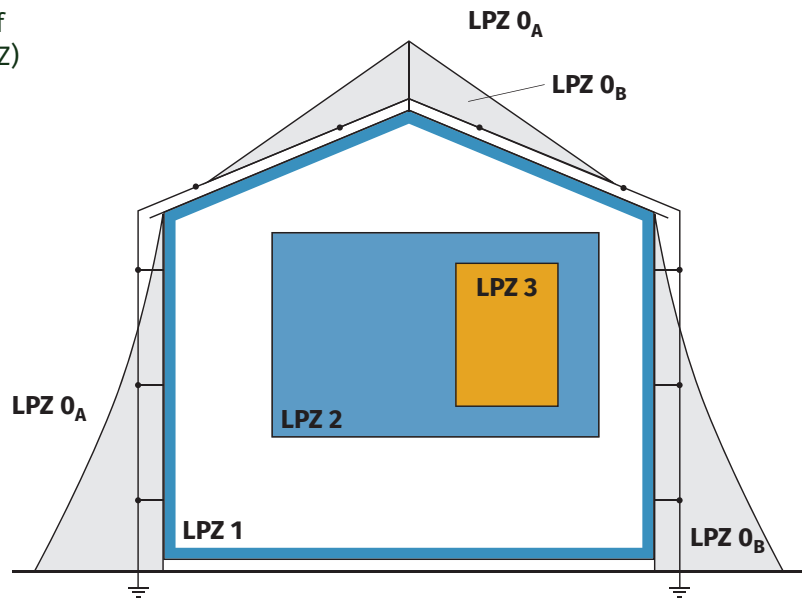


Figure SPD:6. Lightning Protection Zones

STEP 3 . . .

Determine the voltage protection level

It is important that a protector does not 'let through' harmful voltages to the equipment that it is protecting. In the table below, "withstand level" equates to U_p or voltage protection level. In the case of everyday electronic equipment, this is 1,500 volts.

Withstand voltage of the equipment being protected

Not only is it important to select an SPD that can withstand the current associated with the location in which it is to be placed, BUT It is also important that an SPD does not let-through to the equipment, a transient that is larger than the equipment's withstand voltage.

EN 60664-1 classifies the low voltage distribution system into "impulse withstand categories".

These categories also include the definition of the maximum allowed overvoltage that a piece of equipment can withstand (withstand voltage).

Impulse withstand category	Withstand level	Type and location of equipment
I	1.5kV	Electronic equipment/outlet
II	2.5kV	Sub-distribution board/electrical equipment
III	4.0kV	Main distribution board
IV	6.0kV	Electricity supply meter

Table SPD:1. Withstand impulse categories

Kingsmill mains protection devices have a let-through voltage of less than 1,500 volts therefore protecting Type I, II, III and IV electrical equipment (as defined above).

STEP 4 . . .

Selection of mains Surge Protection Devices

Once we have determined:

- The Lightning Protection Level (LPL) and Lightning Protection System (LPS), see *Risk Assessment*
- Whether a structural Lightning Protection System is required or not, and
- The Lightning Protection Zones in which to locate the SPDs, together with the purpose of the SPD . . .
- The number of metallic services entering the structure

When evaluating the existence of a metallic service, it is important to establish whether it is continuous and provides a solid path to earth.

NOTE: some metallic services connect to non-metallic or insulating material close to the structure (ie water pipes, gas pipes, fibre optics etc).

Determine the size or kA rating of the required SPDs

Service entrance protection/equipotential bonding - Type 1 SPDs - lightning current arresters (mains supply)

Only Type 1 SPDs are selected using the LPL and LPS calculated from BS:EN 62305.

When lightning (200kA) strikes a building with structural lightning protection, it is assumed that 50% of the current (100kA) flows directly to earth through the building's lightning protection conductors. The rest is assumed to flow through the metallic services. So, if there was only one metallic service supplying the building, 50% of the current (100kA) would be assumed to flow through it. If that metallic service was a three phase electricity supply, then the 100kA would be equally split between each of the modes (lightning current flows to earth so, in a three phase system, there are four modes (or ways) in which lightning will flow - L1 to E; L2 to E; L3 to E and N to E - known as "common mode").

If there is more than one metallic service entering a building, the 100kA is split equally between each service. If that second service happens to be a power supply, then it is further split by mode, as illustrated below:

Lightning Protection Level (LPL)	Maximum current kA (10/350 waveform)	Class of Lightning Protection System (LPS)	ONE METALLIC SERVICE			TWO METALLIC SERVICES		
			Maximum current (50% of current)	Maximum current per mode - 3 phase (L1, L2, L3, N, E) 4 wires + earth	Maximum current per mode - single phase (L, N) 2 wires + earth	Maximum current (25% of current on each service)	Maximum current per mode - 3 phase (L1, L2, L3, N, E) 4 wires + earth	Maximum current per mode - single phase (L, N) 2 wires + earth
I	200	I	100	25	50	50	12.5	25
II	150	II	75	18.75	37.5	37.5	9.37	18.75
III & IV	100	III & IV	50	12.5	25	25	6.25	12.5

Table SPD:2. Illustration of the principle of division of current

Cautionary note - when taking water and gas pipes into account, it may be that at the point of entry to the building, they are metallic, BUT a short distance away they may be of non-conducting material, and therefore not reliable earths.

Only points where power, data and telecom cables enter or exit the building are sized in accordance with BS:EN 62305-4.

This includes the power supplies of roof mounted plant, external lighting, etc. In these cases the SPD should be placed as close as possible to the equipment or at the sub-distribution board supplying the equipment.

SPD's at these locations are known as Type 1 protectors and are tested with a 10/350µs waveform.

Lightning Protection Level (LPL)	Maximum current kA (10/350µs waveform)	Class of Lightning Protection System (LPS)	Maximum current one metallic service (50% of current)	Maximum current per mode - 3 phase (L1, L2, L3, N, E) 4 wires + earth	Maximum current per mode - single phase (L, N) 2 wires + earth	3 phase	Structure type
I	200	I	100	25	50	KM1+2-25- series	Housing, commercial, industrial
II	150	II	75	18.75	37.5	-	-
III & IV	100	III & IV	50	12.5	25	KM1+2-12.5- series	Housing with no LPS fitted, class III & IV buildings, between buildings

Table SPD:3. Protector selection by LPL, LPS and current division

We offer a range of **Combined Type 1+2 protectors**, utilising the combined benefits of fast acting switching from the GDT (spark gap) and voltage limiting from varistors. This ensures that the voltage protection level is below the “withstand voltage for electrical/electronic equipment” (defined in EN 60664-1).

It can also be noted that where the risk assessment from BS:EN 62305-2 says SPDs are required but structural protection is not, then the SPD selection can be modified such that:

If connected by overhead service	Type 1 SPD	Rated at 12.5kA per mode, we recommend the use of a combined Type 1+2 device , to ensure that electronic equipment is properly protected.
If connected by underground cable	Type 2 SPD	Since underground cables are not subject to direct lightning and thus see only partial lightning current. <i>However, if the building has an aerial, satellite dish, A/C unit or PV array, which might act as a Lightning Conductor, we recommend using a Type 1+2 protector.</i>

Protection between buildings

Where services exit one building and re-enter another building, Type 1+2 protectors should be used at the distribution board supplying the out-going circuit and again at the incoming distribution board of the next building.

The same would apply to data and telecommunication lines.

Our combined Type 1+2 SPDs are tested using both 10/350µs and 8/20µs waveforms.

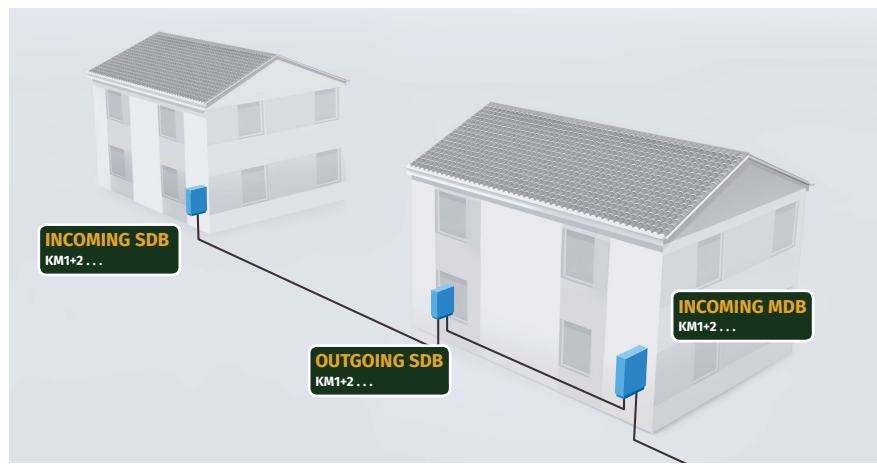


Figure SPD:7. SPD protection between electrically connected buildings

Internal protection - Type 2 SPDs – surge arresters (mains supply)

Type 2 SPDs are used where the sub-distribution board (SDB) is between 10m and 50m from the main distribution board (MDB) - due to the transient being magnified by the effect of oscillation on cable lengths of over 10m. They are also used in cases where a Spark Gap is used as a Type 1 protector.

Type 2 protectors are also used to safeguard internally generated transient overvoltages, for example, from electrical switching events.

Type 2 SPDs are tested with an 8/20µs waveform.

Internal protection - Type 3 SPDs – surge arresters – fine protection (mains supply)

Type 3 SPDs are located at socket outlets or switches supplying sensitive electronic equipment and are used to further reduce the size of transients that may affect electronic systems. Such devices are installed within 5m of the equipment to be protected.

Type 3 SPDs are tested with an 8/20µs waveform.

The Kingsmill range of mains power Surge Protection Devices is coordinated to allow ease of installation without the need for considering minimum cable inductance requirements.

STEP 5 . . .

The next task before a final SPD part number can be selected, is to determine the earthing system used in the building. This will be either TN-S, TN-C-S, TN-C or TT.

The differences between the various systems are in how the Neutral and Earth conductors enter the building, and whether, as in the case of TN-C-S, A combined Neutral and Earth, is separated out in the Main Distribution Board.

Determine the installation's Earthing System

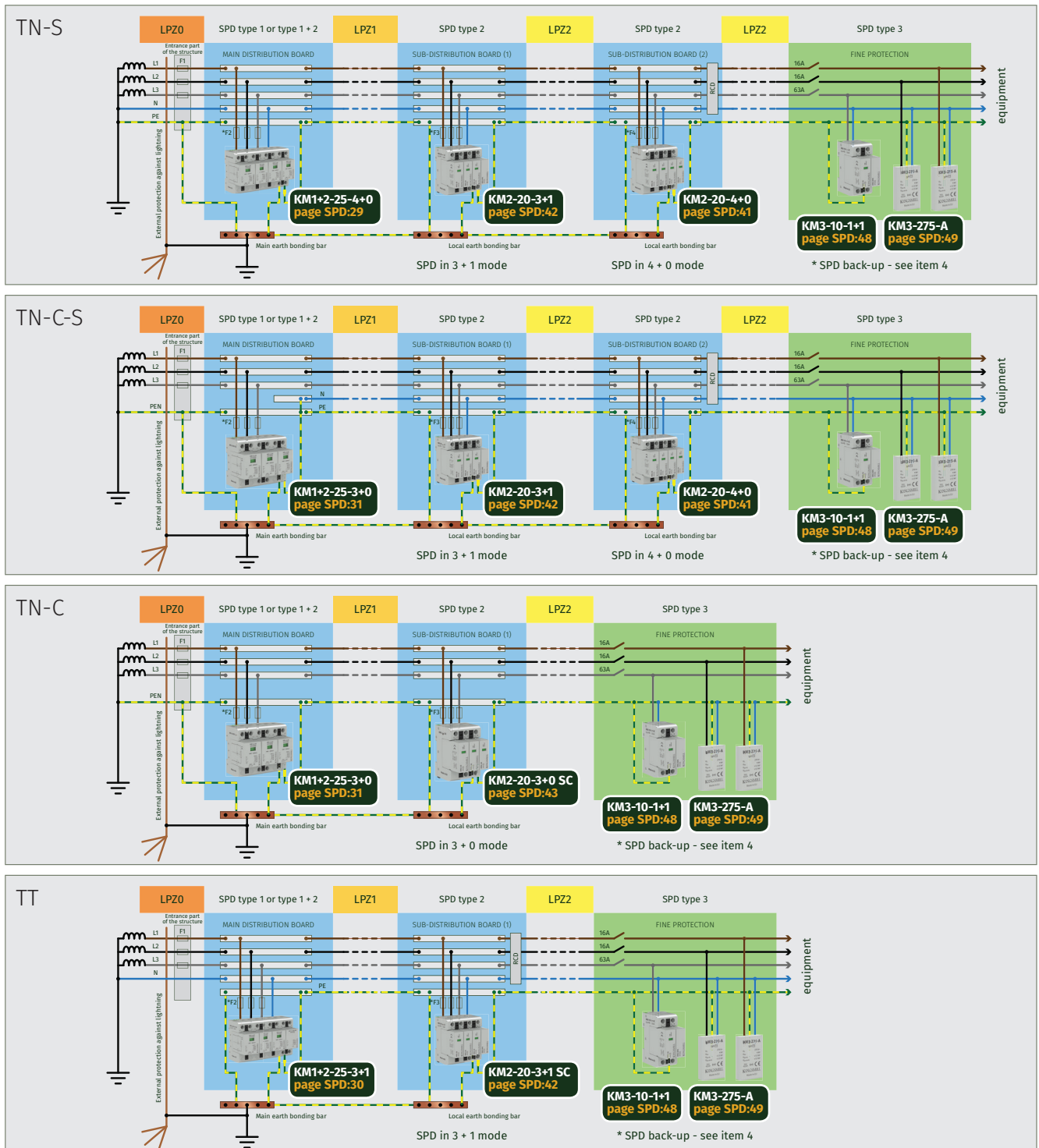


Figure SPD:8. Illustration of TN-S, TN-C-S, TN-C and TT earthing systems

Connection Type - *definition*

It is important to select the correct SPD for both its location as well as purpose. Kingsmill mains protector part numbers are made from a number of elements:

- KM** = Kingsmill
- 1+2, 2+3** = Lightning Protection Level (see page SPD:14)
- 25, 12.5 & 10** = kA per mode (see page SPD:15)
- x + 0 and x + 1** = connection format for the modes (see the explanation, below)
- SC** = remote contacts for signalling (included as a standard feature)

eg = KM1+2-25-4+0 SC

SPDs are factory configured in two connection formats, CT1 (x+0) and CT2 (x+1). These are shown below:

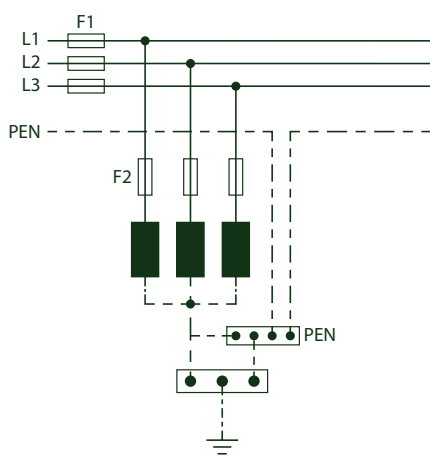


Figure SPD:9a. CT-1-X+0 - TN-C

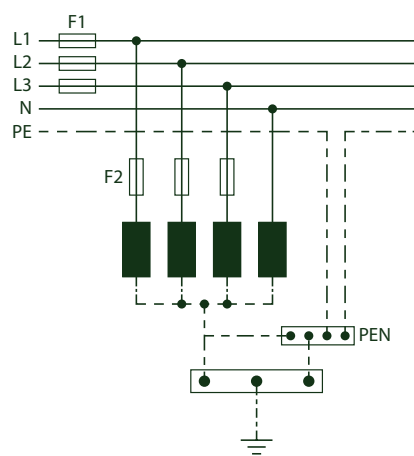


Figure SPD:9b. CT-1-X+0 - TN-S

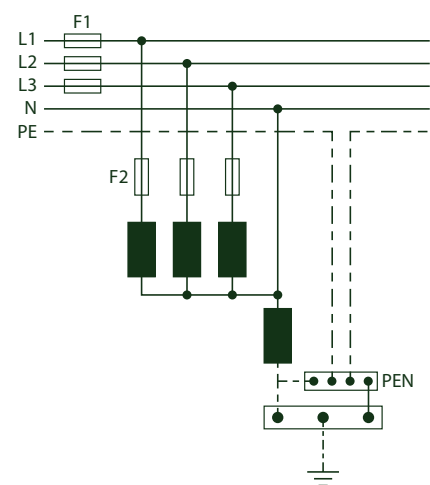


Figure SPD:9c. CT-2-X+1 - TN-S/TT

In the case of the x + 0 or CT1 connection the phase L1, L2, L3 and neutral conductors are connected to earth via the SPD. These are lightning current or equipotential bonding SPDs, whose primary purpose is to guard against the effects of lightning surges. Such surges appear as phase conductor and neutral conductor to earth, known as “common mode”.

Common mode surges are larger in magnitude than differential mode (switching) and can result in flashover and insulation break-down if the voltage withstand voltage (see Table 1) is exceeded.

Hence, lightning equipotential bonding SPD's protect in common mode.

In the case of the x + 1 or CT 2 connection the phase conductors (L1, L2 & L3) are connected to earth via the SPD module connecting the neutral to earth. These devices are associated with switching and appear as line to line or line to neutral surges, known as “differential mode”. The neutral conductor module is rated for the full kA rating ie for LPLI that's 100kA.

It can be seen from the earthing system diagrams (on page SPD:17) that different connection types are used in different applications.

Connection Type - *selection*

TN-S/TN-C-S systems

Type 1 or combined Type 1+2 SPDs are placed at the service entrance for the incoming supply (main distribution board). These devices protect against the effect of lightning electromagnetic impulses. The devices are ALWAYS connected in the x+0 (or CT1 format), with phase and neutral conductors connected to earth via the SPD.

In the case of Type 2 protectors located at downstream sub-distribution boards, a choice can be made:

- The SPD can be in the x+0 (CT1 connection type) – to further reduce the effects of lightning electromagnetic impulses, *or it can be*
- Connected in the x+1 (CT2 connection type) to restrict transient overvoltage generated internally, for example, from switching overvoltages.

In commercial and residential buildings it is better to select Type 2 SPDs in the x+0 mode, but in industrial complexes, due to switching overvoltages, it is better to select the x+1 (CT2 type).

Devices installed before the neutralising point in TN-C-S (4 wire) would require 3+0. Devices to be installed after the neutralising point (5 wire) would require 4+0.

TN-C system

In TN-C systems, Type 1, combined Type 1+2 and Type 2 protectors can only be connected in the x+0 format.

TT system

TT supply networks, in which only neutral conductors - L1, L2, L3 - are routed from the power source.

All protector types should ALWAYS be connected in the x+1 format.

STEP 6 . . .

Protective Distances

We learnt from pages SPD:15 and 16 and figure 7, that protectors need to be installed at the service entrance position and as close as possible to the equipment being protected.

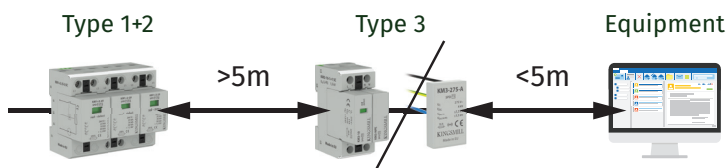
If the distances between SPDs or the SPD and the equipment being protected are too long, reflected voltages may appear on the line which could destroy the connected equipment or cause breakdown of the cable insulation. Such reflections can cause the up-stream SPD “let-through voltage” or U_p (voltage protection level) to double. This effect occurs if the equipment is disconnected inside or its input impedance is high.

If the distance between the SPD and the equipment being protected is less than 10m, such reflections can be ignored. However, if the distance is greater than 10m additional SPDs must be installed.

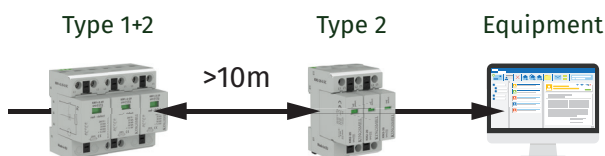
Type 1+2 devices:

Kingsmill offer “Combined Type 1+2” devices for use at service entrance positions. These devices have a let-through voltage (or U_p) of <1.5kV (below the withstand voltage for electrical equipment in EN 60664-1 page SPD:14).

A If the distance between the Type 1+2 SPD and the terminal equipment is <10m, additional protection is not required. If additional fine protection is required and the terminal equipment is >5m away, a Type 3 device should be fitted as close as possible to the terminal equipment.



B If the distance between the Type 1+2 SPD and the SDB or terminal equipment being protected is >10m away, a Type 2 device must be installed downstream of the Type 1+2 device.



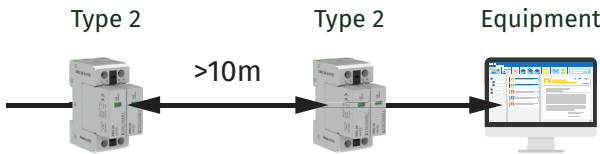
C If the distance between the SPD and the SDB or terminal equipment being protected is >50m, it is recommended that a Type 1+2 device with $I_n = 30kA$ (8/20 μs) is fitted. This will work as a strong Type 2 SPD protector, coping with transient overvoltages and different earth potentials that might occur (particularly if the equipotential bonding of earths is not continuous).



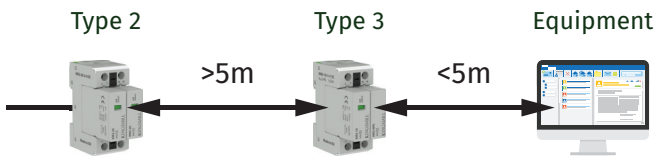
Figure SPD:10. Type 1+2 devices protective distances

Type 2 devices:

D If the distance between the Type 2 SPD and the next downstream SDB or the terminal equipment being protected is <10m, additional protection is not required.



E If fine protection is required and the terminal equipment is >5m away, a Type 3 device should be fitted as close as possible to the terminal equipment.



F If the distance between the Type 2 SPD and the SDB or terminal equipment being protected is >10m, an additional Type 3 device should be fitted downstream.

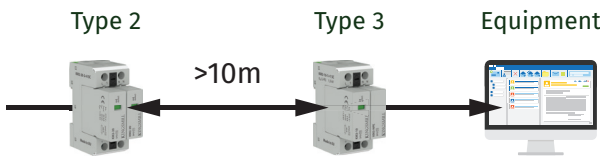
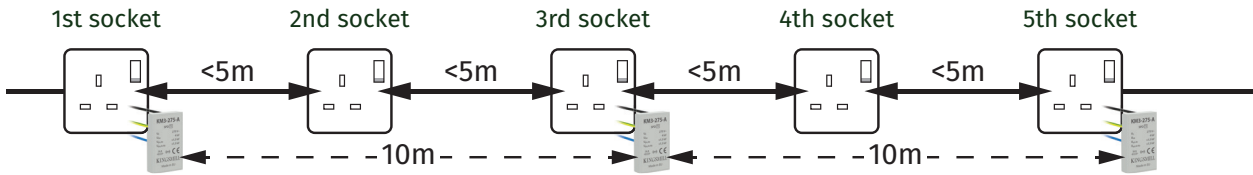


Figure SPD:11. Type 2 devices protective distances

Type 3 devices:

G When using the Type 3 socket outlet protector (KM3-275-A, page SPD:49), the protector should always be installed at the first socket outlet downstream of the distribution board supplying it and thereafter every 10m of circuit length.



H However, if the socket outlet circuit is running on the inside of a wall that has a down conductor fitted to the outside, each socket outlet within 5m of the down conductor position should be protected individually with KM3-275-A protectors.

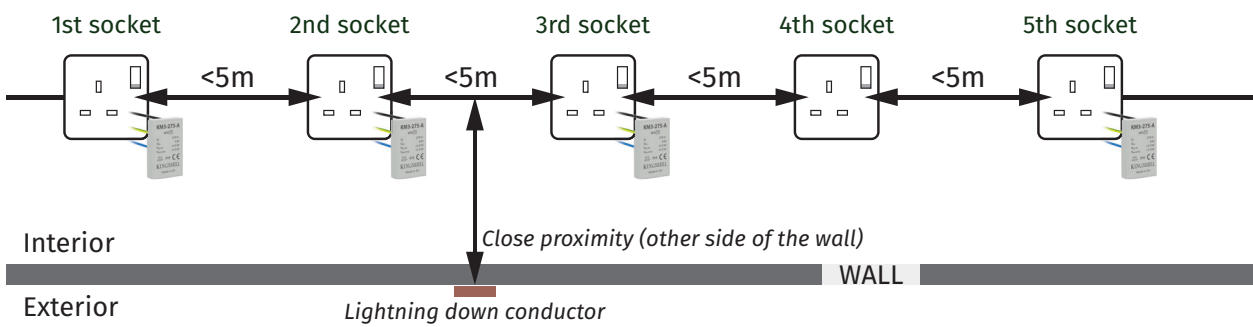


Figure SPD:12. Type 3 devices protective distances

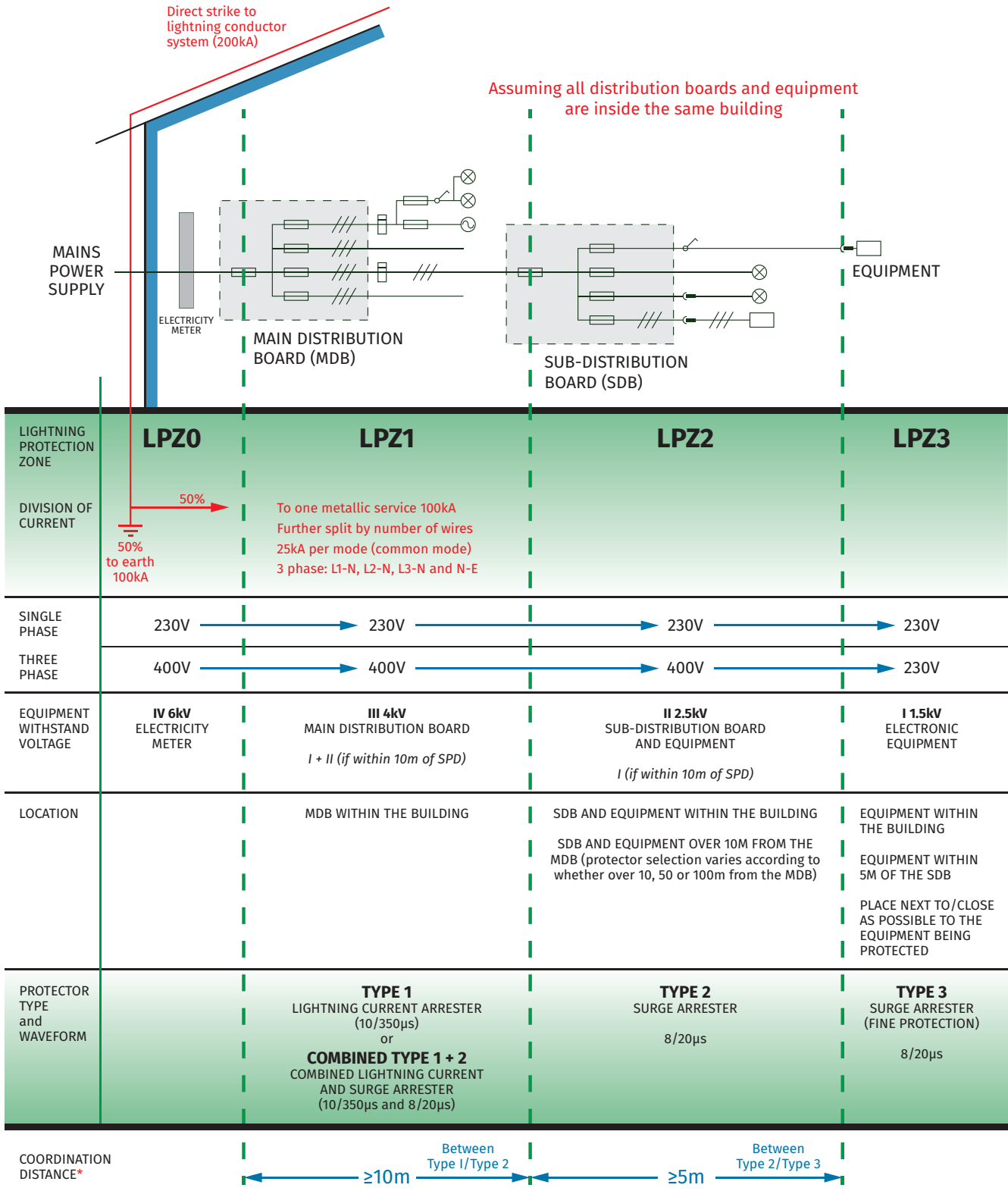
STEP 7 . . .

Assess cable routeing and other considerations

Cable routeing and the connection of SPD's can affect the performance of the SPD and the level of protection that it can provide:

- Cable routeing should avoid proximity to lightning protection down conductors
- Large inductive loops between communication and power cabling should be avoided
- Cable screening should be considered
- Connecting leads must be as short as possible
- Avoid long distances (over 10m) between the SPD and the equipment being protected to avoid oscillations
- Examine use of electromagnetic shielding on cables
- Determine locations of distribution boards and the connected equipment to be protected
- Determine length of circuit cables

Summary of criteria for applying protectors



*We only supply combined Type 1+2 protectors thus removing the issue of coordination distance

PROTECTOR PROTECTIVE DISTANCES - refer to pages SPD:20 - 22

Figure SPD:13. Summary of criteria for applying protectors

Simplifying the selection of mains SPDs

The following tables simplify product selection (where distribution boards and equipment to be protected are located inside the same building). For installation in houses, commercial and industrial buildings.

In all TN-C cases, the Type 1+2 SPD is placed before the neutralising point.

Earthing System	Lightning Protection Level (LPL)	Main Distribution Board	Sub-Distribution Board		Electronic Equipment (>5m from MDB)
		BOUNDARY OF LPZ 0 AND LPZ 1 TYPE 1/COMBINED TYPE 1+2	BOUNDARY OF LPZ 1 AND LPZ 2 TYPE 2 (unless feeding outside circuits)		BOUNDARY OF LPZ 2 AND LPZ 3 TYPE 3 AND FINE PROTECTION
TN-C	I & II	KM1+2-25-3+0 SC (pSPD:31)	>10m from MDB	KM2-20-3+0 SC (pSPD:43)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-3+0 SC (pSPD:37)	
			>100m from MDB	KM1+2-25-3+0 SC (pSPD:31)	
TN-C	III & IV	KM1+2-12.5-3+0 SC (pSPD:37)	>10m from MDB	KM2-20-3+0 SC (pSPD:43)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-3+0 SC (pSPD:37)	
TN-S	I & II	KM1+2-25-4+0 SC (pSPD:29)	>10m from MDB	KM2-20-4+0 SC (pSPD:41)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-4+0 SC (pSPD:35)	
			>100m from MDB	KM1+2-25-4+0 SC (pSPD:29)	
TN-S	III & IV	KM1+2-12.5-4+0 SC (pSPD:35)	>10m from MDB	KM2-20-4+0 SC (pSPD:41)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-4+0 SC (pSPD:35)	
TN-C-S	I & II	KM1+2-25-3+0 SC (pSPD:31)	>10m from MDB	KM2-20-4+0 SC (pSPD:41)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-4+0 SC (pSPD:35)	
			>100m from MDB	KM1+2-25-4+0 SC (pSPD:29)	
TN-C-S	III & IV	KM1+2-12.5-3+0 SC (pSPD:37)	>10m from MDB	KM2-20-4+0 SC (pSPD:41)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-4+0 SC (pSPD:35)	
TT	I & II	KM1+2-25-3+1 SC (pSPD:30)	>10m from MDB	KM2-20-3+1 SC (pSPD:42)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-3+1 SC (pSPD:36)	
			>100m from MDB	KM1+2-25-3+1 SC (pSPD:30)	
TT	III & IV	KM1+2-12.5-3+1 SC (pSPD:36)	>10m from MDB	KM2-20-3+1 SC (pSPD:42)	KM3-10-3+1 SC (pSPD:47)
			>50m from MDB	KM1+2-12.5-3+1 SC (pSPD:36)	

Table SPD:4. Application of Surge Protection Devices on three phase electrical systems

In table SPD:5 (below) it is assumed that in a single phase installation, such as a house, there are always two metallic services. Therefore, the table reflects 25% via a water main or other metallic service and 25% of current shared equally by the modes of a single phase supply (L1, N).

Earthing System	Lightning Protection Level (LPL)	Main Distribution Board (MDB)	Sub-Distribution Board (SDB)		Electronic Equipment (>5m from MDB)
		BOUNDARY OF LPZ 0 AND LPZ 1 TYPE 1/COMBINED TYPE 1+2	BOUNDARY OF LPZ 1 AND LPZ 2 TYPE 2 (unless feeding outside circuits)		BOUNDARY OF LPZ 2 AND LPZ 3 TYPE 3 AND FINE PROTECTION
TN-C	I & II	KM1+2-25-1+0 SC (pSPD:34)	>10m from MDB	KM2-20-1+0 SC (pSPD:46)	KM3-10-1+1 SC (pSPD:48) KM3-275-A (pSPD:49)
			>50m from MDB	KM1+2-12.5-1+0 SC (pSPD:40)	
			>100m from MDB	KM1+2-25-1+0 SC (pSPD:34)	
TN-C	III & IV	KM1+2-12.5-1+0 SC (pSPD:40)	>10m from MDB	KM2-20-1+0 SC (pSPD:46)	KM3-10-1+1 SC (pSPD:48) KM3-275-A (pSPD:49)
			>50m from MDB	KM1+2-12.5-1+0 SC (pSPD:40)	
TN-S	I & II	KM1+2-25-2+0 SC (pSPD:32)	>10m from MDB	KM2-20-2+0 SC (pSPD:44)	KM3-10-1+1 SC (pSPD:48) KM3-275-A (pSPD:49)
			>50m from MDB	KM1+2-12.5-2+0 SC (pSPD:38)	
			>100m from MDB	KM1+2-25-2+0 SC (pSPD:32)	
TN-S	III & IV	KM1+2-12.5-2+0 SC (pSPD:38)	>10m from MDB	KM2-20-2+0 SC (pSPD:44)	KM3-10-1+1 SC (pSPD:48) KM3-275-A (pSPD:49)
			>50m from MDB	KM1+2-12.5-2+0 SC (pSPD:38)	
TN-C-S	I & II	KM1+2-25-1+0 SC (pSPD:34)	>10m from MDB	KM2-20-2+0 SC (pSPD:44)	KM3-10-1+1 SC (pSPD:48) KM3-275-A (pSPD:49)
			>50m from MDB	KM1+2-12.5-2+0 SC (pSPD:38)	
			>100m from MDB	KM1+2-25-2+0 SC (pSPD:32)	
TN-C-S	III & IV	KM1+2-12.5-1+0 SC (pSPD:40)	>10m from MDB	KM2-20-2+0 SC (pSPD:44)	KM3-10-1+1 SC (pSPD:48) KM3-275-A (pSPD:49)
			>50m from MDB	KM1+2-12.5-2+0 SC (pSPD:38)	
TT	I & II	KM1+2-25-1+1 SC (pSPD:33)	>10m from MDB	KM2-20-1+1 SC (pSPD:45)	KM3-10-1+1 SC (pSPD:48)
			>50m from MDB	KM1+2-12.5-1+1 SC (pSPD:39)	
			>100m from MDB	KM1+2-25-1+1 SC (pSPD:33)	
TT	III & IV	KM1+2-12.5-1+1 SC (pSPD:39)	>10m from MDB	KM2-20-1+1 SC (pSPD:45)	KM3-10-1+1 SC (pSPD:48)
			>50m from MDB	KM1+2-12.5-1+1 SC (pSPD:39)	

Table SPD:5. Application of Surge Protection Devices on single phase electrical systems

Example of protector placement

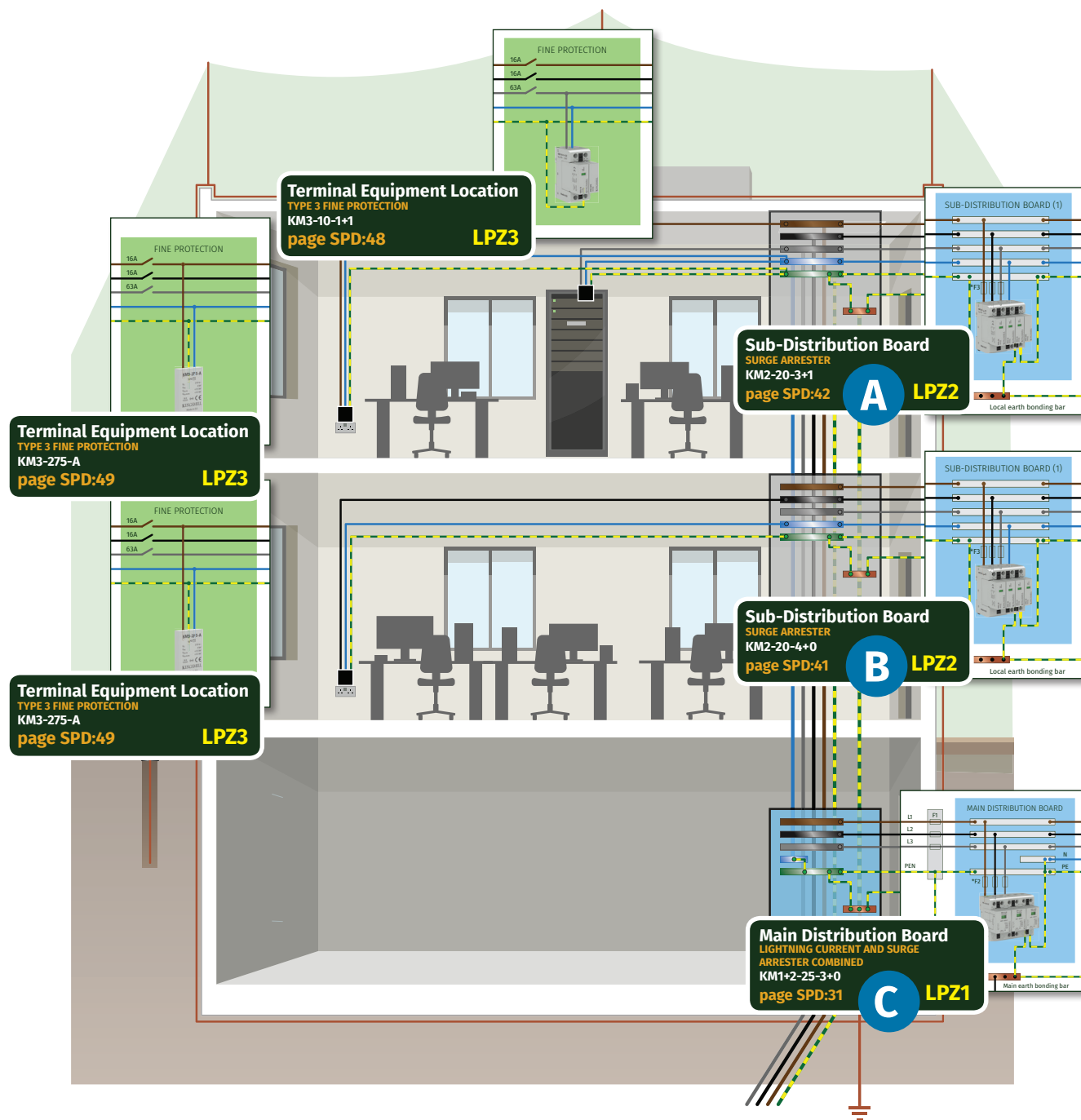


Figure SPD:14. Example of TN-C-S SPD product placement

- A** Differential mode - switching transients
- B** Common mode - equipotential bonding
- C** Equipotential bonding lightning current and surge arrester

Mains Surge Protection Products

25kA combined Type 1 & 2 lightning current and surge arresters

Part number	Discharge current	Earthing system	Number of poles	Phase	Page
KM1+2-25-4+0 SC	25kA	TNS (MDB) / TN-C-S (SDB)	4	Three	SPD:29
KM1+2-25-3+1 SC	25kA	TT	4	Three	SPD:30
KM1+2-25-3+0 SC	25kA	TN-C / TN-C-S	3	Three	SPD:31
KM1+2-25-2+0 SC	25kA	TNS (MDB) / TN-C-S (SDB)	2	Single	SPD:32
KM1+2-25-1+1 SC	25kA	TT	2	Single	SPD:33
KM1+2-25-1+0 SC	25kA	TN-C	1	Single	SPD:34



12.5kA combined Type 1 & 2 lightning current and surge arresters

Part number	Discharge current	Earthing system	Number of poles	Phase	Page
KM1+2-12.5-4+0 SC	12.5kA	TNS (MDB) / TN-C-S (SDB)	4	Three	SPD:35
KM1+2-12.5-3+1 SC	12.5kA	TT	4	Three	SPD:36
KM1+2-12.5-3+0 SC	12.5kA	TN-C / TN-C-S	3	Three	SPD:37
KM1+2-12.5-2+0 SC	12.5kA	TNS (MDB) / TN-C-S (SDB)	2	Single	SPD:38
KM1+2-12.5-1+1 SC	12.5kA	TT	2	Single	SPD:39
KM1+2-12.5-1+0 SC	12.5kA	TN-C	1	Single	SPD:40



20kA Type 2 surge arresters

Part number	Discharge current	Earthing system	Number of poles	Phase	Page
KM2-20-4+0 SC	20kA	TNS / TN-C-S	4	Three	SPD:41
KM2-20-3+1 SC	20kA	TT	4	Three	SPD:42
KM2-20-3+0 SC	20kA	TN-C	3	Three	SPD:43
KM2-20-2+0 SC	20kA	TNS / TN-C-S	2	Single	SPD:44
KM2-20-1+1 SC	20kA	TT	2	Single	SPD:45
KM2-20-1+0 SC	20kA	TN-C / TN-S / TT	1	Single	SPD:46



10kA Type 3 surge arresters

Part number	Discharge current	Earthing system	Number of poles	Phase	Page
KM3-10-3+1 SC	10kA	TN-C / TN-S / TN-C-S / TT	4	Three	SPD:47
KM3-10-1+1 SC	10kA	TN-C / TN-S / TN-C-S / TT	2	Single	SPD:48



2kA Type 3 surge protection module

Part number	Earthing system	Number of poles	Phase	Page
KM3-275-A	TN-C / TN-S / TN-C-S / TT	N/A	Single	SPD:49



Product Features

Remote signalling

Biconnect terminals

Reversible installation

Optical lifetime status indication

DIN rail mountable

Lock system for fixing of modules

Pluggable modules

Mechanical coding

Safety thermodynamic disconnecter

All Kingsmill mains SPDs have pluggable modules and remote status signalling as standard

Type 1+2 lightning current and surge arrester

High performance four-pole Type 1+2 surge arrester. Use in TN-S and TN-C-S system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >100m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- High performance lightning current arrester
- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.



LPL I + II

SYSTEM: THREE PHASE TN-S

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 (if >100m away from MDB)

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM1+2-25-4+0 SC	
System	Three phase TN-S & TN-C-S/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	260V AC
Nominal load current for "V" connection	I_L	125A
Lightning impulse current (10/350 μ s)	I_{imp}	25kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		250A gL/gG
Maximum overcurrent protection for "V" connection		125A gL/gG
Response time	t_a	100ns
Cross-section of connected conductors solid (min - max)		2.5mm ² - 50mm ²
Cross-section of connected conductors stranded (min - max)		2.5mm ² - 35mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		1300g (nett), 1365g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-25

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:86

Type 1+2 lightning current and surge arrester



Heavy duty varistor and spark gap based Type 1+2 surge arresters. Use in TT system main distribution boards on the boundary of LPZ0 and LPZ1. Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: THREE PHASE TT / TN-S

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 (if >100m away from MDB)

Electrical specification

Order number	KM1+2-25-3+1 SC	
System	Three phase TT/TN-S/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	260V AC
Maximum operating voltage N-PE	U_c	255V AC
Nominal load current for "V" connection	I_L	125A
Lightning impulse current (10/350 μ s) L-N	I_{imp}	25kA
Lightning impulse current (10/350 μ s) N-PE	I_{imp}	100kA
Nominal discharge current (8/20 μ s) L-N	I_n	30kA
Nominal discharge current (8/20 μ s) N-PE	I_n	100kA
Maximum discharge current (8/20 μ s) L-N	I_{max}	60kA
Maximum discharge current (8/20 μ s) N-PE	I_{max}	100kA
Voltage protection level L-N/N-PE	U_p	1.5kV
Voltage protection level L-PE	U_p	2.2kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		250A gL/gG
Maximum overcurrent protection for "V" connection		125A gL/gG
Response time L-N/N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		2.5mm ² - 50mm ²
Cross-section of connected conductors stranded (min - max)		2.5mm ² - 35mm ²
Fault indication L-N		Red indication field
Fault indication N-PE		no
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		1295g (nett), 1355g (gross)

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:86

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-25
Spare Module N-PE	KM1+2-25-NPE

Type 1+2 lightning current and surge arrester

Heavy duty varistor and spark gap based Type 1+2 surge arrester. Use in TN-C and TN-C-S system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (see distance criteria, below).

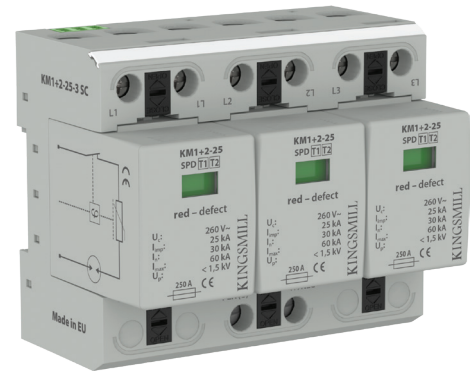
Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- High performance lightning current arrester
- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)



Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

LPL I + II

SYSTEM: THREE PHASE TN-C & TN-C-S

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 (if >100m away from MDB)

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM1+2-25-3+0 SC	
System	Three phase TN-C & TN-C-S/3 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	260V AC
Nominal load current for "V" connection	I_L	125A
Lightning impulse current (10/350 μ s)	I_{imp}	25kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		250A gL/gG
Maximum overcurrent protection for "V" connection		125A gL/gG
Response time	t_a	100ns
Cross-section of connected conductors solid (min - max)		2.5mm ² - 50mm ²
Cross-section of connected conductors stranded (min - max)		2.5mm ² - 35mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		975g (nett), 1025g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-25

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:86

Type 1+2 lightning current and surge arrester



High performance two pole Type 1+2 surge arrester. Use in TN-S and TN-C-S system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >100m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: SINGLE PHASE TN-S & TN-C-S

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 (if >100m away from MDB)

Electrical specification

Order number	KM1+2-25-2+0 SC	
System	Single phase TN-S/TN-C-S 2 pole	
Nominal voltage	U _n	230V AC
Nominal voltage	U _o	230V/400V AC ± 10%
Maximum operating voltage	U _c	260V AC
Nominal load current for "V" connection	I _L	125A
Lightning impulse current (10/350µs)	I _{imp}	25kA
Nominal discharge current (8/20µs)	I _n	30kA
Maximum discharge current (8/20µs)	I _{max}	60kA
Voltage protection level	U _p	1.5kV
Short-circuit current rating	I _{sCCR}	50kA
Maximum overcurrent protection		250A gL/gG
Maximum overcurrent protection for "V" connection		125A gL/gG
Response time	t _a	100ns
Cross-section of connected conductors solid (min - max)		2.5mm ² - 50mm ²
Cross-section of connected conductors stranded (min - max)		2.5mm ² - 35mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		700g (nett), 755g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:86

Type 1+2 lightning current and surge arrester

Heavy duty varistor and spark gap based Type 1+2 surge arrester.
Use in TT system main distribution boards on the boundary of LPZ0 and LPZ1. Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.



LPL I + II

SYSTEM: SINGLE PHASE TT

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 (if >100m away from MDB)

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM1+2-25-1+1 SC	
System	Single phase TT/2 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	260V AC
Maximum operating voltage N-PE	U_c	255V AC
Nominal load current for "V" connection	I_L	125A
Lightning impulse current (10/350 μ s) L-N	I_{imp}	25kA
Lightning impulse current (10/350 μ s) N-PE	I_{imp}	50kA
Nominal discharge current (8/20 μ s) L-N	I_n	30kA
Nominal discharge current (8/20 μ s) N-PE	I_n	50kA
Maximum discharge current (8/20 μ s) L-N	I_{max}	60kA
Maximum discharge current (8/20 μ s) N-PE	I_{max}	100kA
Voltage protection level L-N/N-PE	U_p	1.5kV
Voltage protection level L-PE	U_p	2.2kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		250A gL/gG
Maximum overcurrent protection for "V" connection		125A gL/gG
Response time L-N/N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		2.5mm ² - 50mm ²
Cross-section of connected conductors stranded (min - max)		2.5mm ² - 35mm ²
Fault indication L-N		Red indication field
Fault indication N-PE		no
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		650g (nett), 690g (gross)

Accessories

Spare modules are available.

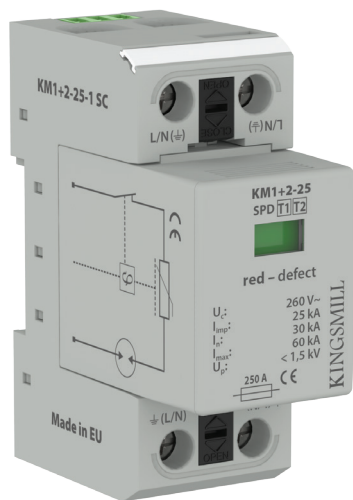
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-25

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:86

Type 1+2 lightning current and surge arrester



High performance single pole Type 1+2 surge arrester. Use in TN-C system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >100m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: SINGLE PHASE TN-C

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 (if >100m away from MDB)

Electrical specification

Order number	KM1+2-25-1+0 SC	
System	Single phase TN-C/1 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	260V AC
Nominal load current for "V" connection	I_L	125A
Lightning impulse current (10/350 μ s)	I_{imp}	25kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		250A gL/gG
Maximum overcurrent protection for "V" connection		125A gL/gG
Response time	t_a	100ns
Cross-section of connected conductors solid (min - max)		2.5mm ² - 50mm ²
Cross-section of connected conductors stranded (min - max)		2.5mm ² - 35mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		335g (nett), 365g (gross)

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:86

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5

Type 1+2 lightning current and surge arrester

Varistor based Type 1+2 surge arrester. Use in TN-S and TN-C-S system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >50m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)



Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

LPL I + II

SYSTEM: THREE PHASE TN-S & TN-C-S
MDB: -
SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: THREE PHASE TN-S & TN-C-S
MDB: BOUNDARY of LPZ0 & LPZ1
SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM1+2-12.5-4+0 SC	
System	Three phase TN-S/TN-C-S/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Lightning impulse current (10/350 μ s)	I_{imp}	12.5kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		560g (nett), 605g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:87

Type 1+2 lightning current and surge arrester



Combination of varistor SPD and encapsulated spark gap connected in the 3 + 1 mode. Use in TT system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >100m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: THREE PHASE TT

MDB: -

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: THREE PHASE TT

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Electrical specification

Order number	KM1+2-12.5-3+1 SC	
System	3 phase TT/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	275V AC
Maximum operating voltage N-PE	U_c	255V AC
Lightning impulse current (10/350 μ s) L-N	I_{imp}	12.5kA
Lightning impulse current (10/350 μ s) N-PE	I_{imp}	50kA
Nominal discharge current (8/20 μ s) L-N	I_n	30kA
Nominal discharge current (8/20 μ s) N-PE	I_n	50kA
Maximum discharge current (8/20 μ s) L-N	I_{max}	60kA
Maximum discharge current (8/20 μ s) N-PE	I_{max}	100kA
Voltage protection level at 5kA L-N	U_p	0.9kV
Voltage protection level L-N/N-PE/L-PE	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication L-N		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		545g (nett), 595g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5
Spare Module N-PE	KM1+2-12.5-NPE

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:87

Type 1+2 lightning current and surge arrester

Varistor based Type 1+2 surge arrester. Use in TN-C system sub-distribution boards on the boundary of LPZ0 and LPZ1 and main distribution boards on the boundary of LPZ1 and LPZ2 (if >50m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)



Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

LPL I + II

SYSTEM: THREE PHASE TN-C

MDB: -

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: THREE PHASE TN-C & TN-C-S

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM1+2-12.5-3+0 SC	
System	Three phase TN-C & TN-C-S/3 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Lightning impulse current (10/350 μ s)	I_{imp}	12.5kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		435g (nett), 480g (gross)

Accessories

Spare modules are available.

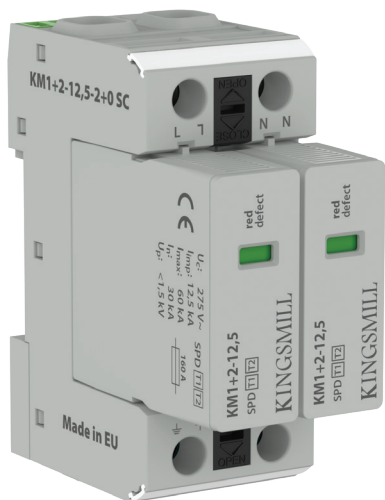
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:87

Type 1+2 lightning current and surge arrester



Varistor based two pole Type 1+2 surge arrester. Use in TN-S and TN-C-S system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >50m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: SINGLE PHASE TN-S & TN-C-S
MDB: -
SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: SINGLE PHASE TN-S & TN-C-S
MDB: BOUNDARY of LPZ0 & LPZ1
SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Electrical specification

Order number	KM1+2-12.5-2+0 SC	
System	Single phase TN-S & TN-C-S/2 pole	
Nominal voltage	U _n	230V AC
Nominal voltage	U _o	230V/400V AC ± 10%
Maximum operating voltage	U _c	275V AC/350V DC
Lightning impulse current (10/350µs)	I _{imp}	12.5kA
Nominal discharge current (8/20µs)	I _n	30kA
Maximum discharge current (8/20µs)	I _{max}	60kA
Voltage protection level at 5kA	U _p	0.9kV
Voltage protection level	U _p	1.5kV
Short-circuit current rating	I _{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t _a	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		310g (nett), 330g (gross)

DIMENSIONS & WIRING DIAGRAMS:
 SEE PAGE SPD:87

Accessories

Spare modules are available.
 Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5

Type 1+2 lightning current and surge arrester

Combination of varistor SPD and encapsulated spark gap connected in the 1 + 1 mode. Use in TT system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >100m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)



Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

LPL I + II

SYSTEM: SINGLE PHASE TT

MDB: -

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: SINGLE PHASE TT

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM1+2-12.5-1+1 SC	
System	1 phase TT/2 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	275V AC
Maximum operating voltage N-PE	U_c	255V AC
Lightning impulse current (10/350 μ s) L-N	I_{imp}	12.5kA
Lightning impulse current (10/350 μ s) N-PE	I_{imp}	25kA
Nominal discharge current (8/20 μ s) L-N/N-PE	I_n	30kA
Maximum discharge current (8/20 μ s) L-N/N-PE	I_{max}	60kA
Voltage protection level at 5kA L-N	U_p	0.9kV
Voltage protection level L-N/N-PE/L-PE	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication L-N		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		250g (nett), 290g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5
Spare Module N-PE	KM1+2-12.5-NPE

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:87

Type 1+2 lightning current and surge arrester



Varistor based single pole Type 1+2 surge arrester. Use in TN-C system main distribution boards on the boundary of LPZ0 and LPZ1 and sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >50m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: SINGLE PHASE TN-C

MDB: -

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: SINGLE PHASE TN-C

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Electrical specification

Order number	KM1+2-12.5-1+0 SC	
System	Single phase TNC/1 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Lightning impulse current (10/350 μ s)	I_{imp}	12.5kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T1, T2
Weight		160g (nett), 185g (gross)

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:87

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM1+2-12.5

Type 2 surge arrester

Varistor based four-pole Type 2 surge arrester. Use in TN-S and TN-C-S system sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >10m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication



Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

LPL I + II

SYSTEM: THREE PHASE TN-S & TN-C-S
SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

LPL III + IV

SYSTEM: THREE PHASE TN-S & TN-C-S
SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM2-20-4+0 SC	
System	Three phase TN-S & TN-C-S/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_O	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Nominal discharge current (8/20 μ s)	I_n	20kA
Maximum discharge current (8/20 μ s)	I_{max}	40kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.35kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid		1/35mm ²
Cross-section of connected conductors stranded		1/25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2
Weight		410g (nett), 435g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM2-20

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:88

Type 2 surge arrester



Combination of varistor SPD and encapsulated spark gap connected in the 3 + 1 mode. Use in TT systems on the boundary of LPZ1 and LPZ2.

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: THREE PHASE TT
MDB: -
SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

LPL III + IV

SYSTEM: THREE PHASE TT
MDB: BOUNDARY of LPZ0 & LPZ1
SDB: BOUNDARY of LPZ1 & LPZ2 if >50m away from MDB

Electrical specification

Order number	KM2-20-3+1 SC	
System	Three phase TT/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	275V AC
Maximum operating voltage N-PE	U_c	255V AC
Nominal discharge current (8/20 μ s) L-N/N-PE	I_n	20kA
Maximum discharge current (8/20 μ s) L-N/N-PE	I_{max}	40kA
Voltage protection level at 5kA L-N	U_p	0.9kV
Voltage protection level mode L-N	U_p	1.35kV
Voltage protection level mode N-PE/L-PE	U_p	1.5kV
Ability to independently switch off the following current N-PE	I_{f1}	0.1kA
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication L-N		Red indication field
Fault indication N-PE		no
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2
Weight		405g (nett), 450g (gross)

DIMENSIONS & WIRING DIAGRAMS:
 SEE PAGE SPD:88

Accessories

Spare modules are available.
 Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM2-20
Spare Module N-PE	KM2-NPE

Type 2 surge arrester

Varistor based three-pole Type 2 surge arrester. Use in TN-C system sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >10m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.



LPL I + II

SYSTEM: THREE PHASE TN-C

SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

LPL III + IV

SYSTEM: THREE PHASE TN-C

SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM2-20-3+0 SC	
System	TN-C/3 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_O	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Nominal discharge current (8/20 μ s)	I_n	20kA
Maximum discharge current (8/20 μ s)	I_{max}	40kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.35kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)		1/35mm ²
Cross-section of connected conductors stranded (min - max)		1/25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2
Weight		325g (nett), 365g (gross)

Accessories

Spare modules are available.

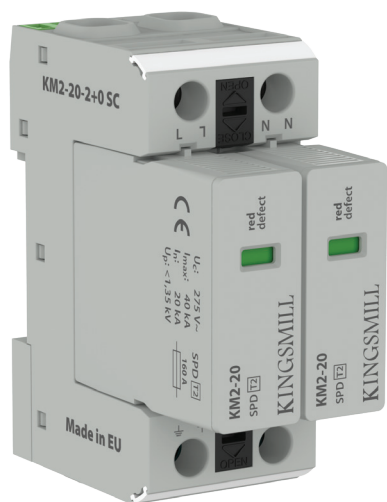
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM2-20

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:88

Type 2 surge arrester



Single pole Type 2 surge arrester. Use in TN-S and TN-C-S system sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >10m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: SINGLE PHASE TN-S & TN-C-S
SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

LPL III + IV

SYSTEM: SINGLE PHASE TN-S & TN-C-S
SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

Electrical specification

Order number	KM2-20-2+0 SC	
System	TN-S & TN-C-S/2 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Nominal discharge current (8/20 μ s)	I_n	20kA
Maximum discharge current (8/20 μ s)	I_{max}	40kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.35kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2
Weight		230g (nett), 265g (gross)

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:88

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM2-20

Type 2 surge arrester

Combination of varistor SPD and encapsulated spark gap connected in the 1 + 1 mode. Use in TT systems on the boundary of LPZ1 and LPZ2.

Suitable for houses, commercial and industrial buildings.

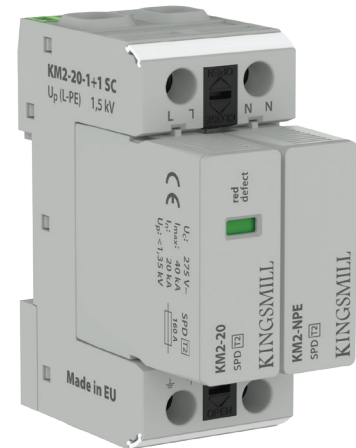
Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)



LPL I + II

SYSTEM: SINGLE PHASE TT

MDB: BOUNDARY of LPZ0 & LPZ1

SDB: BOUNDARY of LPZ1 & LPZ2 if >100m away from MDB

LPL III + IV

SYSTEM: SINGLE PHASE TT

MDB: -

SDB: BOUNDARY of LPZ1 & LPZ2 if >100m away from MDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM2-20-1+1 SC	
System	Single phase TT/2 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	275V AC
Maximum operating voltage N-PE	U_c	255V AC
Nominal discharge current (8/20 μ s) L-N/N-PE	I_n	20kA
Maximum discharge current (8/20 μ s) L-N/N-PE	I_{max}	40kA
Voltage protection level at 5kA L-N	U_p	0.9kV
Voltage protection level mode L-N	U_p	1.35kV
Voltage protection level mode N-PE/L-PE	U_p	1.5kV
Ability to independently switch off the following current N-PE	I_{fi}	0.1kA
Short-circuit current rating	I_{sCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication L-N		Red indication field
Fault indication N-PE		no
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2
Weight		225g (nett), 255g (gross)

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM2-20
Spare Module N-PE	KM2-NPE

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:88

Type 2 surge arrester



Single pole Type 2 surge arrester. Use in TN-C (L-PEN), TN-S (L-PE) and TT (L-N) system sub-distribution boards on the boundary of LPZ1 and LPZ2 (if >10m away from the MDB).

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II

SYSTEM: SINGLE PHASE TN-C
SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

LPL III + IV

SYSTEM: SINGLE PHASE TN-C
SDB: BOUNDARY of LPZ1 & LPZ2 if >10m away from MDB

Electrical specification

Order number	KM2-20-1+0 SC	
System	Single phase TN-C/1 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC/350V DC
Nominal discharge current (8/20 μ s)	I_n	20kA
Maximum discharge current (8/20 μ s)	I_{max}	40kA
Voltage protection level at 5kA	U_p	0.9kV
Voltage protection level	U_p	1.35kV
Short-circuit current rating	I_{SCCR}	50kA
Maximum overcurrent protection		160A gL/gG
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2
Weight		120g (nett), 140g (gross)

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:89

Accessories

Spare modules are available.
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N (L-PE)	KM2-20

Type 3 surge arrester

Combination of varistor SPD and encapsulated spark gap connected in the 3 + 1 mode. Use in TN-C, TN-S, TN-C-S and TT systems on the boundary of LPZ2 and LPZ3. Locate as close as possible to the equipment to be protected.

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

LPL I + II and LPL III + IV

SYSTEM: THREE PHASE TN-C, TN-S, TN-C-S and TT

LOCATION: BOUNDARY of LPZ2 & LPZ3 if the electronic equipment is >5m away from SDB



Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM3-10-3+1 SC	
System	Three phase TN-C, TN-S, TN-C-S, TT/4 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	275V AC
Maximum operating voltage N-PE	U_c	255V AC
Nominal discharge current (8/20 μ s) L-N	I_n	5kA
Nominal discharge current (8/20 μ s) N-PE	I_n	10kA
Test voltage L-N	U_{oc}	10kV
Test voltage N-PE	U_{oc}	20kV
Voltage protection level	U_p	1kV
Voltage protection level mode L-N/N-PE	U_p	1.5kV
Maximum overcurrent protection		63A gL/gG or C 63A
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		1/35mm ²
Cross-section of connected conductors stranded (min - max)		1/25mm ²
Fault indication L-N		Red indication field
Fault indication N-PE		no
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T3
Weight		395g (nett), 440g (gross)

Accessories

Spare modules are available.

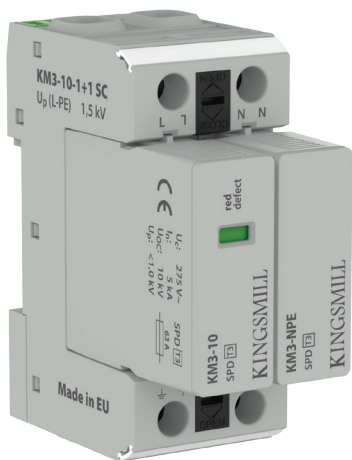
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N	KM3-10
Spare Module N-PE	KM3-NPE

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:89

Type 3 surge arrester



Combination of varistor SPD and encapsulated spark gap connected in the 1 + 1 mode. Use in TN-C, TN-S, TN-C-S and TT systems on the boundary of LPZ2 and LPZ3. Locate as close as possible to the equipment to be protected.

Suitable for houses, commercial and industrial buildings.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

- No follow-through current
- No leakage current
- Coordinated range (install in close proximity to each other)

Kingsmill fully coordinated mains devices provide complete protection from entry point to equipment.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

LPL I + II and LPL III + IV

SYSTEM: SINGLE PHASE TN-C, TN-S, TN-C-S and TT

LOCATION: BOUNDARY of LPZ2 & LPZ3 if the electronic equipment is >5m away from SDB

Electrical specification

Order number	KM3-10-1+1 SC	
System	Single phase TN-C, TN-S, TN-C-S, TT /2 pole	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage L-N	U_c	275V AC
Maximum operating voltage N-PE	U_c	255V AC
Nominal discharge current (8/20 μ s) L-N	I_n	5kA
Nominal discharge current (8/20 μ s) N-PE	I_n	10kA
Test voltage L-N	U_{oc}	10kV
Test voltage N-PE	U_{oc}	20kV
Voltage protection level	U_p	1kV
Voltage protection level mode L-N/N-PE	U_p	1.5kV
Maximum overcurrent protection		63A gL/gG or C 63A
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²
Fault indication L-N		Red indication field
Fault indication N-PE		no
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T3
Weight		215g (nett), 250g (gross)

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:89

Accessories

Spare modules are available. Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module L-N	KM3-10
Spare Module N-PE	KM3-NPE

Type 3 surge protection module

Compact type 3 surge arrester for final circuit protection.

Install close to low voltage equipment for additional protection. Use with single phase power supply systems.

Provides audible fault indication.

Features

- Compact design
- Fits in a wall socket
- Simple installation
- Audible fault indication
- Equipment protection up to 5m of device on connected circuit
- Suitable up to 16A circuits

Benefits

- Can be fitted in ducts, trunking or flush type wiring boxes
- Provides "fine" protection to individual sockets or circuits



LPL I + II and LPL III + IV

SYSTEM: SINGLE PHASE TN-C, TN-S, TN-C-S and TT

LOCATION: BOUNDARY of LPZ2 & LPZ3 if the electronic equipment is >5m away from SDB

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Electrical specification

Order number	KM3-275-A	
System	TN-C / TN-S / TN-C-S / TT	
Nominal voltage	U_n	230V AC
Maximum operating voltage	U_c	275V AC
Nominal discharge current (8/20 μ s) L-N/N-PE	I_n	2kA
Test voltage L-N/N-PE/L-PE	U_{oc}	4kV
Voltage protection level L-N/N-PE/L-PE	U_p	1.5kV
Short-circuit current rating	I_{sCCR}	1.5kA
Maximum overcurrent protection		B 16A
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Fault indication		acoustic signalling
Degree of protection		IP20
Range of operating temperatures (min - max)		-20°C - +70°C
Mounting		installation box
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T3
Weight		20g (nett), 40g (gross)

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:89

Charging Stations Protection

Why protect?

As we learnt from the introduction (page SPD:4), electronic systems are susceptible to damage resulting from lightning activity (direct and indirect). Failure to protect can lead to costly hardware replacement as well as lost revenue.

What to protect?

- Rectifier for the DC charging output
- Rectifier for powering the control unit
- Battery - in case of charging station with energy accumulation
- Communication between the control unit and the charging connector (eg RS485)
- Signal from the charging connector (eg temperature measurement)
- Communication between antenna and control unit (eg Ethernet) for data cable longer than 1 metre

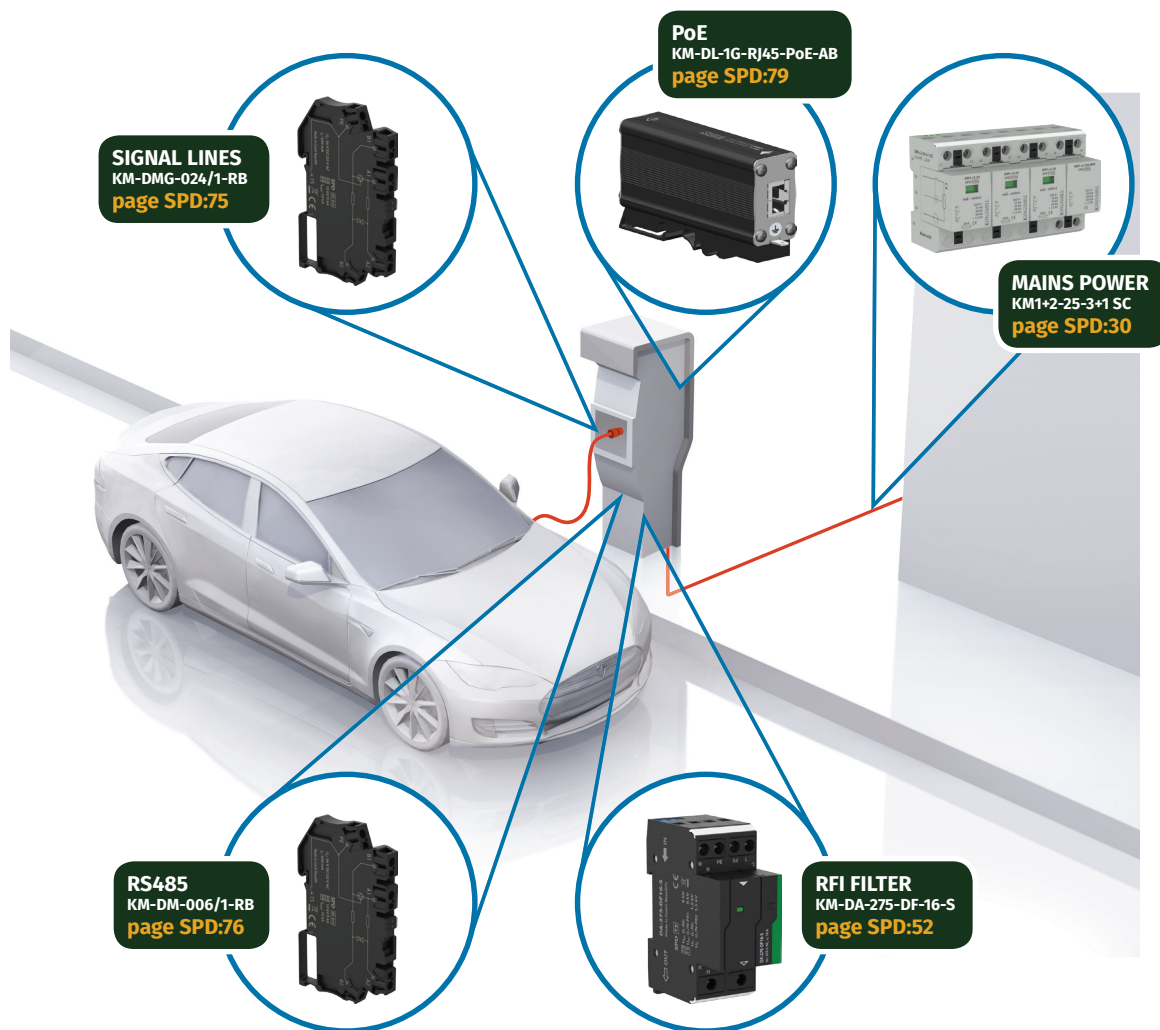
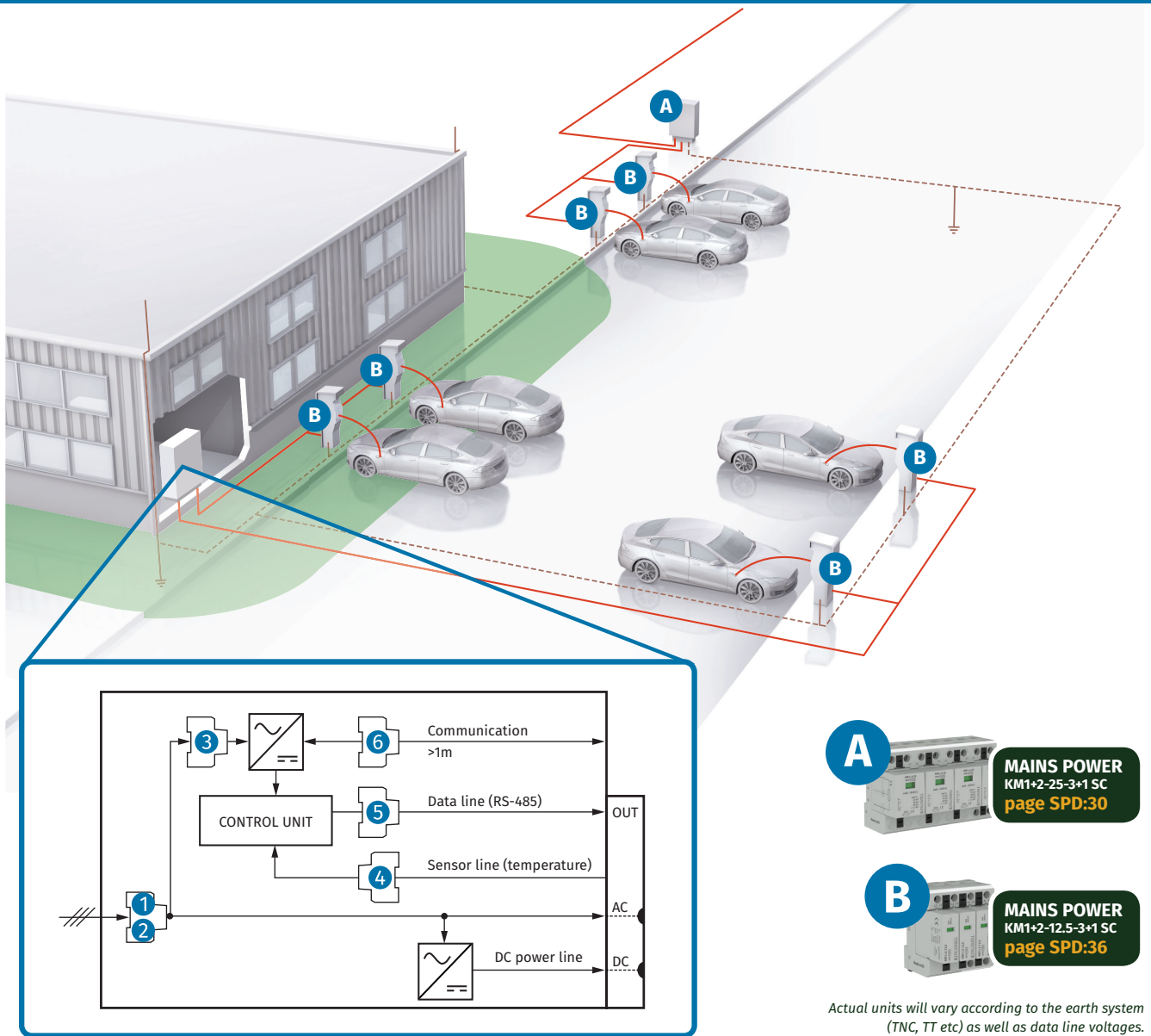


Figure SPD:15. Placement of SPDs at an electric vehicle charging station



Example of types of SPDs for the protection of charging stations

- 1 Three-pole combined high performance lightning current arrester. Actual units will vary according to the earth system (TNC, TT etc) as well as data line voltages.
- 2 Three-pole combined high performance lightning current arrester. Install on cabling in the ground.
- 3 Type 3 surge protection with integrated noise-suppressing RF filter.
- 4 Two-stage overvoltage protection of signal lines.
- 5 Two-stage overvoltage protection of RS-485 signal lines.
- 6 Two-stage overvoltage protection of Power over Ethernet lines. For cable longer than 1 metre.

Figure SPD:16. Placement of SPDs in a car park situation

Type 3 surge arrester with RFI filter



Protect low voltage power lines against the impact of surge voltage and RF disturbance. Locate as close as possible to the equipment to be protected.

Suitable for charging stations.

Features

- Remote signalling
- Reversible installation
- Biconnect terminals
- Locking pluggable modules
- Optical lifetime status indication

Benefits

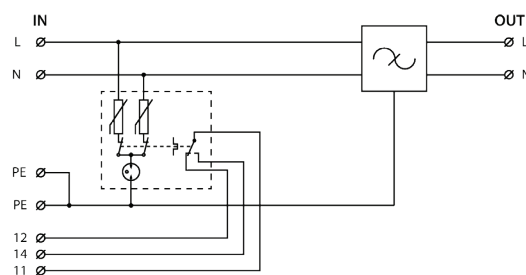
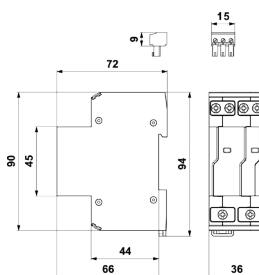
- No follow-through current
- No leakage current

Electrical specification

Order number	KM-DA-275-DF-16-S	
System	TN-C / TN-C-S / TN-S / TT	
Nominal voltage	U_n	230V AC
Nominal voltage	U_o	230V/400V AC \pm 10%
Maximum operating voltage	U_c	275V AC
Nominal load current	I_L	16A
Nominal discharge current (8/20 μ s) L-N / N-PE	I_n	3kA
Nominal discharge current (8/20 μ s) L+N-PE	I_n	5kA
Test voltage L-N / N-PE	U_{oc}	6kV
Test voltage L+N-PE	U_{oc}	10kV
Voltage protection level mode L-N	U_p	1.2kV
Voltage protection level mode N-PE/L-PE	U_p	1.5kV
Short-circuit current rating	I_{sCCR}	6kA
Maximum overcurrent protection		16A gL/gG or C 16A
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Filter attenuation at 1MHz (50 Ω /50 Ω) unsymmetrical		30dB
Cross-section of connected conductors solid/stranded (max)		6mm ²
Fault indication		Red indication field
Remote indication		Potential-free change-over contact
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC
Cross-section of remote indication conductors solid/stranded (max)		1.5mm ²
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T3
Weight		175g (nett), 205g (gross)

Dimensions and wiring diagram

KM-DA-275-DF-16-S



Photovoltaic Protection



The need to protect

Photovoltaic (PV) arrays and their associated equipment are expensive assets to purchase and so the need to protect them from the effects of lightning is of paramount importance.

Kingsmill have a range of Earthing, Structural Lightning Protection and Surge Protection products that can be used to provide protection against both the direct and indirect effects of lightning. Products relating to Earthing and Structural Lightning Protection are dealt with in their respective sections.

Application of Surge Protection Devices

A solar photovoltaic system (solar power) is made up of a number of key elements:

- photovoltaic array (solar panel)
- battery charger
- bank of batteries
- inverter to convert DC voltage to AC voltage.

Panels may be protected by a structural lightning protection system, the metallic supports of the arrays should be connected to earth and the heart of the system, the inverter, requires to be protected by Surge Protection Devices.

The inverter should be protected on both the DC side and the AC side, additionally, if the PV arrays are over 10m away from the inverter, an SPD must be installed at the junction box that is local to that PV array.

The system should comply with HD 60364 covering the installation of solar photovoltaic systems, CLC/TS 50539-12 SPD's for PV application, as well as the BS:EN 62305 series for Lightning Protection.

Basic Principle

The core (key device) of the whole photovoltaic system is the inverter, therefore lightning and transient overvoltage protection should be focused here and it should be incorporated into the whole Lightning Protection System. Additionally, photovoltaic units and their support structures should be integrated into the earthing design.

SPD selection for DC side:

- U_{CPV} maximum continuous operating voltage
- U_{OCSTC} standardised test circuit voltage of the string of PV arrays

$$U_{CPV} \geq 1.2 \times U_{OCSTC}$$

Where the PV arrays are separated from the lightning protection system, by the “separation distance” calculated in BS:EN 62305-3 and this distance is maintained, OR in the case of no external structural protection, then **fit a Type 2 PV surge arrester**.

- If the distance between the PV arrays and the inverter is over 10m, a PV SPD has to be fitted to both ends of the DC cable (PV array junction box and DC inverter side).

Where the distance between the PV arrays and the external lightning protection system is not maintained, then **fit a combined Type 1 and 2 PV lightning current and surge arrester**.

- Always install a PV SPD at both ends of the DC cable (PV array junction box and DC inverter side).

The DC side of the PV system can be either unearthed (insulated) in which case **A** (*below*) shows how SPD's should be connected OR with one pole earthed, **B** (*below*) shows how SPD's should be connected.

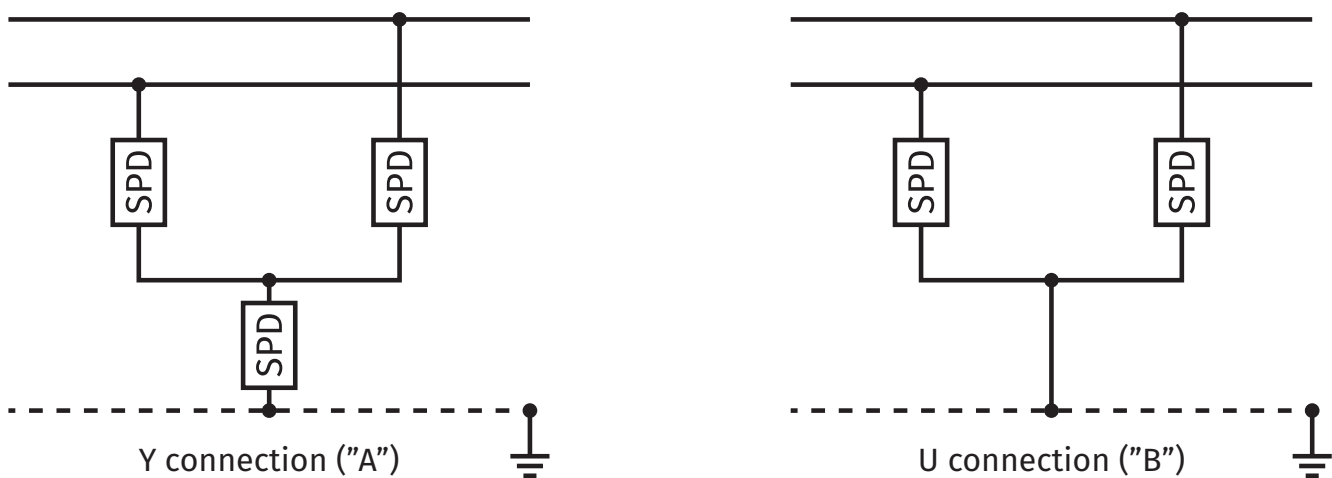


Figure SPD:17. Difference between Y and U connections

All Kingsmill surge protection products for photovoltaic systems are tested in accordance with EN 50539-11.

The main distribution board (AC mains) would have a combined Type 1 & 2 protector fitted. In addition, any communication lines also require protection.

Examples of SPD locations are provided in the following diagrams (units will vary according to site conditions).

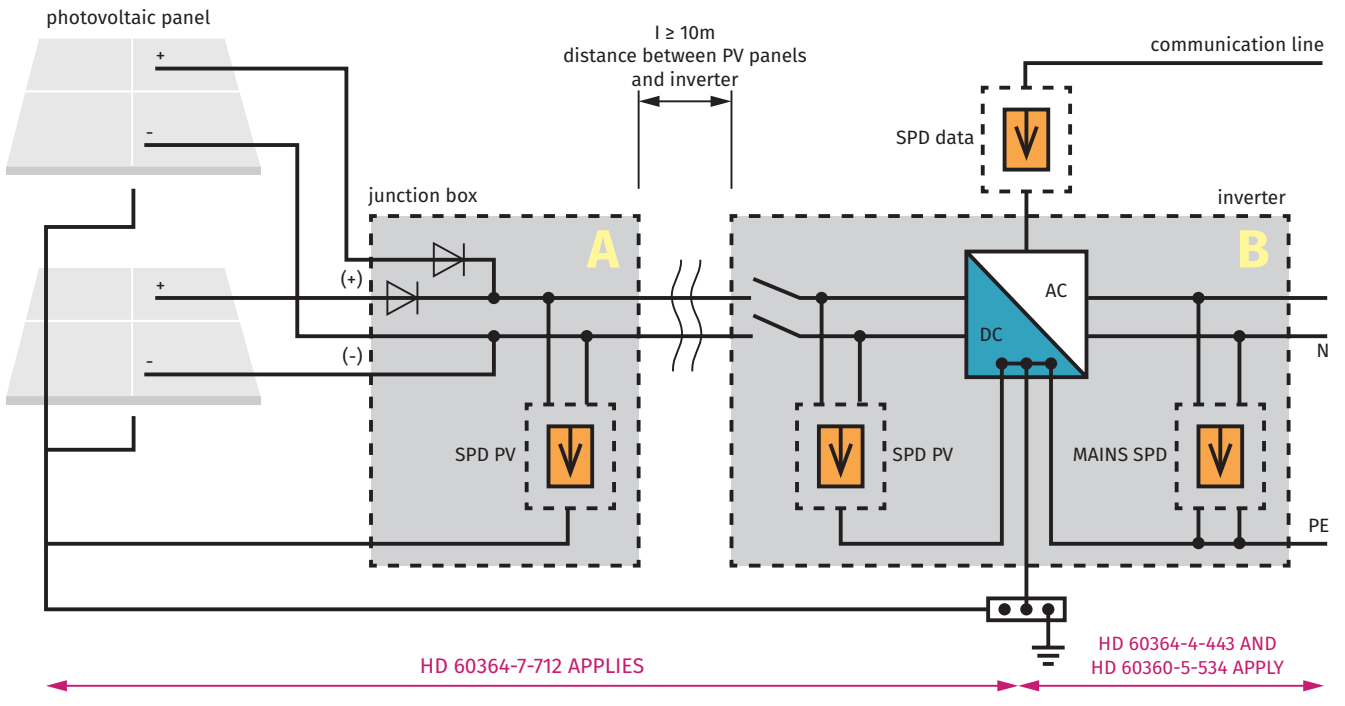
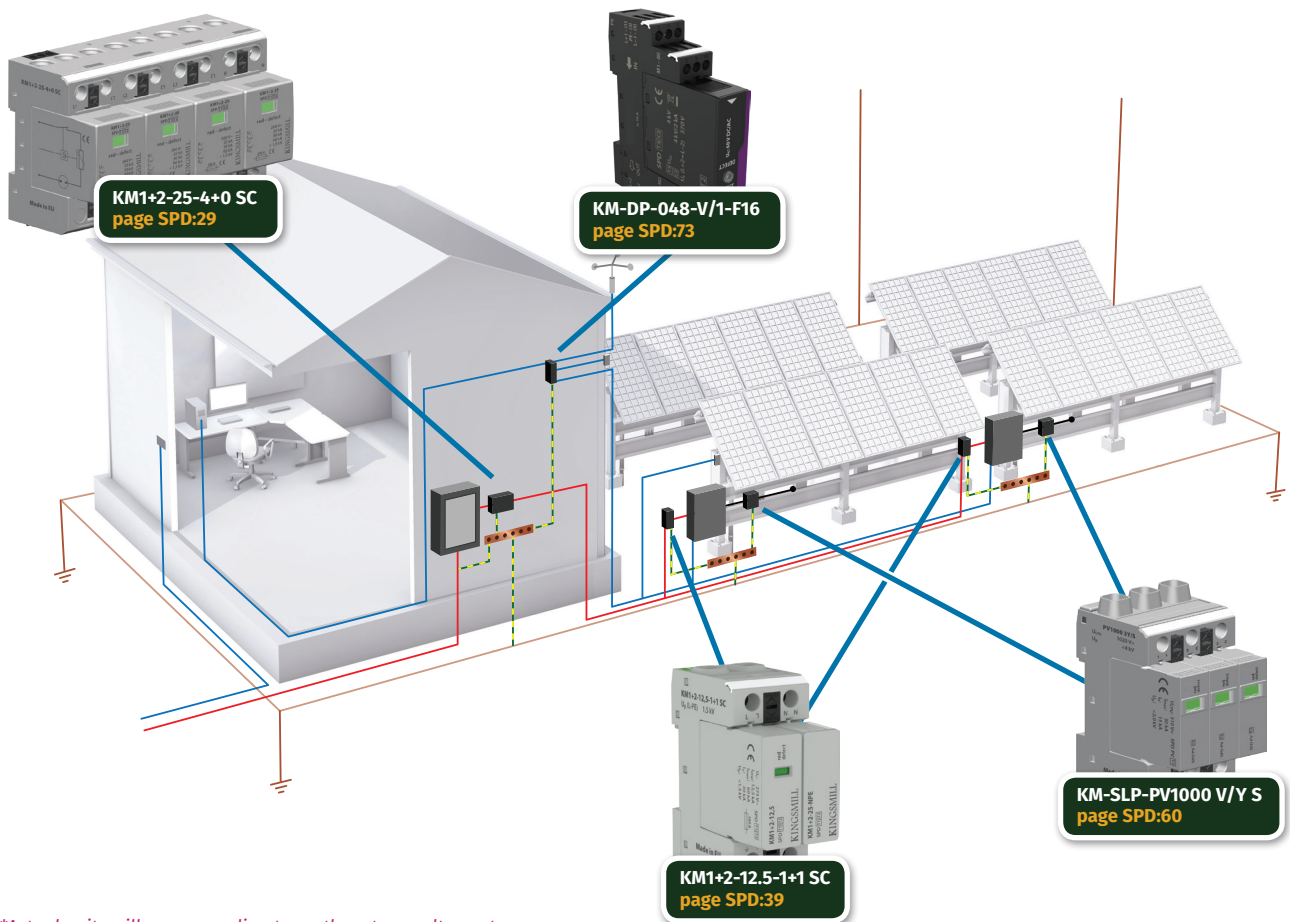
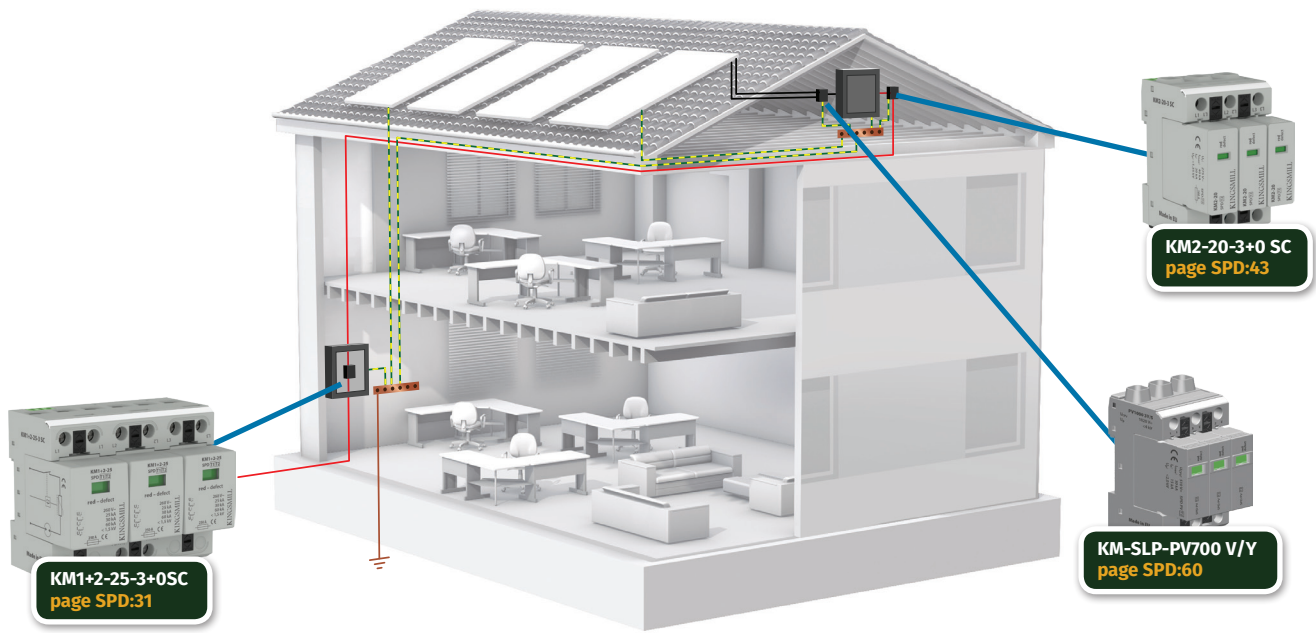


Figure SPD:18. General circuit diagram for SPD protection of solar photovoltaic systems



*Actual units will vary according to earth system, voltage etc

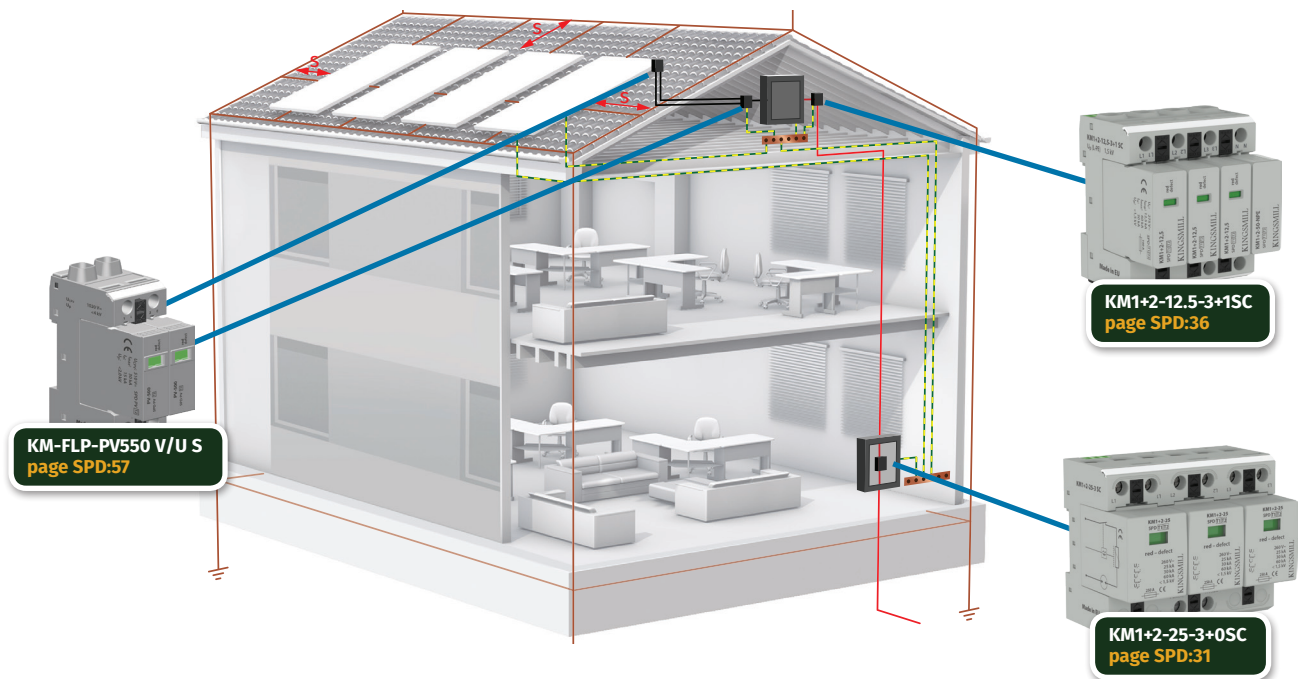
Figure SPD:19. Example - photovoltaic array with a decentralised inverter



**Actual units will vary according to earth system, voltage etc*

Figure SPD:20. Example - roof mounted solar panels
(without external LPS or where the separation distance "s" between PV panels and external LPS is maintained)

If no external Lightning Protection System is installed than a Type 2 PV SPD is sufficient. If the separation distance between the PV panel and the LPS is \geq "s" then a Type 2 PV SPD is sufficient. If the separation distance between the PV panel and the external Lightning Protection System is $<$ "s" then the PV panel should be connected to the LPS and a Type 1 PV SPD is recommended.



Separation distance "s" = distance between two conductive parts at which no dangerous sparking can occur

**Actual units will vary according to earth system, voltage etc*

Figure SPD:21. Example - roof mounted solar panels
(where the separation distance "s" between PV panels and external LPS is not maintained)

Type 1+2 surge arrester - 'U' connection

Surge arresters for use in photovoltaic systems with 'U' connection.

Protects both poles.

Features

- Pluggable module
- Visual fault signalling
- Module locking
- Remote fault signalling

Application

Use on photovoltaic systems up to 560 volts.

Benefits

Ideal for use with photovoltaic systems where the separating spark-over distance is without a Lightning Protection system.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).



Electrical specification

Order number	KM-FLP-PV550 V/U S	
Type of SPD	PVT1, PVT2	
Maximum operating voltage mode 1/2 l-connection	U_{CPV}	1120V DC
Maximum operating voltage mode 1/3, 2/3	U_{CPV}	560V DC
Lightning impulse current (10/350 μ s)	I_{imp}	12.5kA
Total discharge current (10/350 μ s)	$I_{Total(10/350)\mu}$	25kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level mode 1/2	U_p	4.8kV
Voltage protection level mode 1/3, 2/3	U_p	2.4kV
Short-circuit current rating	I_{SCPV}	1000A DC
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)	1mm ² - 35mm ²	
Cross-section of connected conductors stranded (min - max)	1mm ² - 25mm ²	
Fault indication	Red indication field	
Remote indication	Potential-free changeover contact	
Remote indication contacts	250V/0.5A AC, 250V/0.1A DC	
Cross-section of remote indication conductors	1.5mm ²	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +80°C	
Mounting	DIN rail 35mm	
According to standard	EN 50539-11:2013	
ETIM Class	EC001457	
Weight	250g (nett), 280g (gross)	

Accessories

Spare modules are available.

Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module	KM-FLP-PV275U V/0

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:90

Type 1+2 surge arrester - 'Y' connection



Lightning current and surge arrester for use in photovoltaic systems with 'Y' connection. Protects both poles.

Benefits

Ideal for use with photovoltaic systems where the separating spark-over distance is without a Lightning Protection system.

Features

- Pluggable module
- Visual fault signalling
- Module locking
- Remote fault signalling

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).

Application

Use on systems up to 1000 volts.

Electrical specification

Order number	KM-FLP-PV1000 VS/Y	
Type of SPD	PVT1, PV T2	
Maximum operating voltage mode 1/3, 2/3	U_{CPV}	1000V DC
Total discharge current (10/350 μ s)	$I_{Total(10/350)\mu}$	12.5kA
Nominal discharge current (8/20 μ s)	I_n	30kA
Maximum discharge current (8/20 μ s)	I_{max}	60kA
Voltage protection level mode 1/2	U_p	3.6kV
Voltage protection level mode 1/3, 2/3	U_p	3.6kV
Short-circuit current rating	I_{SCPV}	1000A DC
Response time	t_a	25ns
Cross-section of connected conductors solid (min - max)	2.5mm ² - 50mm ²	
Cross-section of connected conductors stranded (min - max)	2.5mm ² - 35mm ²	
Fault indication	Red indication field	
Remote indication	Potential-free changeover contact	
Remote indication contacts	250V/0.5A AC, 250V/0.1A DC	
Cross-section of remote indication conductors	1.5mm ²	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +80°C	
Mounting	DIN rail 35mm	
According to standard	EN 50539-11:2013 / PV T2	
ETIM Class	EC001457	
Weight	325g (nett), 365g (gross)	

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:90

Accessories

Spare modules are available. Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module	KM-FLP-PV500Y V/0

Type 2 surge arrester - 'U' connection

Surge arresters for use in photovoltaic systems with 'U' connection.

Protects both poles.

Features

- Pluggable module
- Visual fault signalling
- Module locking
- Remote fault signalling

Application

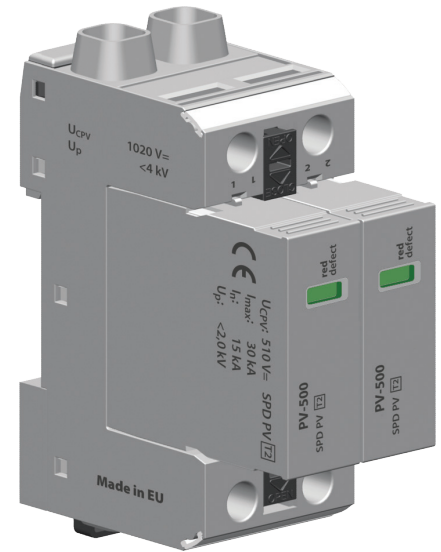
Use on photovoltaic systems up to 170 volts and 510 volts.

Benefits

Ideal for use with photovoltaic systems where the separating spark-over distance is without a Lightning Protection system.

Standards

BS:EN 62305 (lightning protection) and EN 61643-11 (surge protection devices).



Electrical specification

Order number		KM-SLP-PV170 V/U S	KM-SLP-PV500 V/U S
Type of SPD		PVT2	
Maximum operating voltage mode 1/2 l-connection	U_{CPV}	340V DC	1020V DC
Maximum operating voltage mode 1/3, 2/3	U_{CPV}	170V DC	510V DC
Nominal discharge current (8/20 μ s)	I_n	15kA	15kA
Maximum discharge current (8/20 μ s)	I_{max}	40kA	40kA
Voltage protection level mode 1/2	U_p	1.2kV	4kV
Voltage protection level mode 1/3, 2/3	U_p	0.6kV	2kV
Short-circuit current rating	I_{SCPV}	1000A DC	1000A DC
Response time	t_a	25ns	25ns
Cross-section of connected conductors solid (min - max)		1mm ² - 35mm ²	
Cross-section of connected conductors stranded (min - max)		1mm ² - 25mm ²	
Fault indication		Red indication field	
Remote indication		Potential-free changeover contact	
Remote indication contacts		250V/0.5A AC, 250V/0.1A DC	
Cross-section of remote indication conductors		1.5mm ²	
Degree of protection		IP20	
Range of operating temperatures (min - max)		-40°C - +80°C	
Mounting		DIN rail 35mm	
According to standard		EN 50539-11:2013	
ETIM Class		EC000941	
Weight		230g (nett), 260g (gross)	250g (nett), 280g (gross)

Accessories

Spare modules are available.
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module (170V DC)	KM-SLP-PV170U V/O
Spare Module (510V DC)	KM-SLP-PV500U V/O

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:90

LED Street, Industrial and Security Lighting Protection

Public lighting systems, street lighting for example, as well as lighting for large industrial premises, can be extensive, with cable lengths running into hundreds of metres.

Such systems are exposed to risks of overvoltages induced by lightning strikes, as well as switching events. Transient overvoltages in extensive installations may reach values that are higher than the specified withstand voltage of the light source (luminaire), thus leading to damage.

As we saw from the introduction section, page INT:9, BS:EN 62305-2 sets out the sources of damage to installations:

S1 Direct lightning strike to the installation.

S2 Lightning strike within the proximity of the installed equipment, switching phenomena in MV and HV grids near to the installation.

S3 Direct lightning strike to the connected mains supply.

S4 Lightning strike near to the connected mains supply.

The standards IEC 60364-5-53 Chapter S34 and IEEE C62.41.2 also recommend the fitting of SPDs at the power input of an electrical installation.

Application of Surge Protection Devices in lighting installations

LOCATION: connection of street lighting cables to the mains supply distribution board

A Combined Type 1 & 2 lightning current and surge arrester is connected to the main distribution board (MDB). Where the supply to the MDB is via an overhead line, it is advisable to use the KM1+2-25- series (for the maximum expected kA per mode of 25kA). Where the MDB is supplied by underground cables it is possible to use the KM1+2-12.5- series. The table on page SPD:15 defines the maximum kA that would be expected to appear per mode on a 3 phase system, resulting from lightning activity.

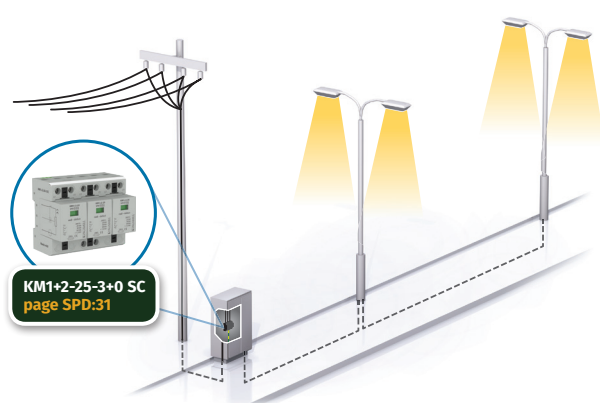


Figure SPD:22. SPD at the connection point of street lighting system to the distribution mains - overhead power line

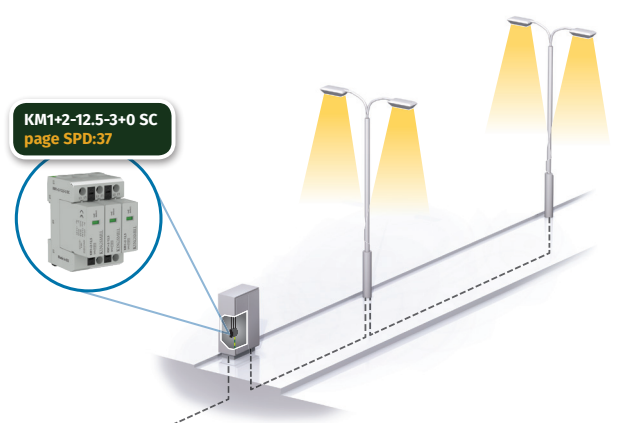


Figure SPD:23. SPD at the connection point of street lighting system to the distribution mains - cable connection

Where fluctuating voltages exist, or where the voltage might exceed the normally specified tolerance, and in places where the disconnection of load causes a voltage increase (ie during the night), it is advisable to use an SPD with a higher U_c (maximum operating voltage) or SPD's where the switching and limiting elements are connected in series – MOV & GDT technology. In this latter case the Kingsmill products are the KM1+2-25-series and the KM1+2-20... VB series.

LOCATION: where the lighting system is prone to the effects of direct lightning strikes

Where the height of the lighting column exceeds that of the surrounding buildings the luminaire is, in effect, situated in lightning protection zone LPZ0_A, where the risk of direct lightning strike (S1) is present. Similarly, if the Lighting Column is outside the protective area afforded by a building's Lightning Protection System, the luminaire is effectively in zone LPZ0_A. In both cases the application of Surge Protection Devices are recommended.

Lighting at sports stadiums requires a higher Lightning Protection Level (LPL) to be considered, in addition to the installation of lightning conductors.

Street lighting in urban locations may be considered to be of Lightning Protection Levels III or IV, where the maximum current per mode on a three-phase system would be 12.5kA.

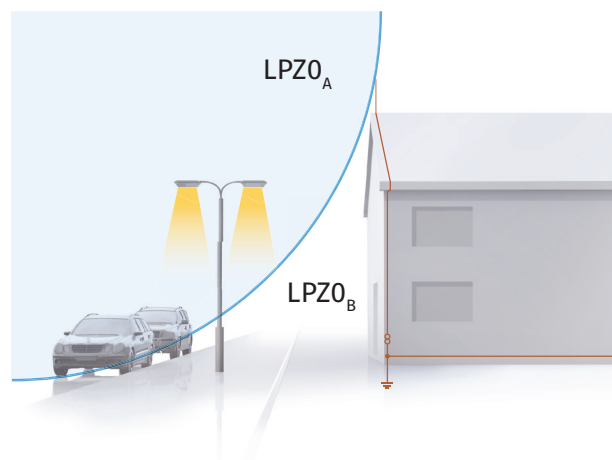


Figure SPD:24. Street lighting in the LPZ0A zone

From BS:EN 62305 . . .

Lightning Protection Level (LPL)	Maximum current kA (10/350 waveform)	Class of Lightning Protection System (LPS)	Maximum current one metallic service (50% of current)	Maximum current per mode – 3 phase (L1, L2, L3, N, E) 4 wires + earth	3 phase
I	200	I	100	25	KM1+2-25- series
II	150	II	75	18.75	-
III & IV	100	III & IV	50	12.5	KM1+2-12.5- series

BS:EN 62305 assumes that 50% of the current in a direct lightning strike will be diverted to earth.

The remaining 50% will be split equally across connected conductive metallic pathways - in this case, the cables supplying the street lighting. Lightning seeks a path to earth (common mode) and the current, is further sub-divided by the number of modes (in a three phase supply, these are L1 to E; L2 to E; L3 to E and N to E).

KM1+2-12.5- protectors can be found on pages SPD:35 - 40.

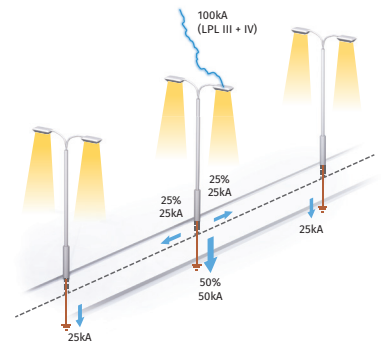


Figure SPD:25. Distribution of a lightning current which has struck a street lighting lamppost

In many cases, street lighting is supplied from a three-phase cable. However, at the individual lighting column only one phase is connected to the luminaire and its control gear.

The street lighting distribution board would be fitted with a three-phase SPD and the individual lighting column with a single phase, 12.5kA per mode (25kA total discharge) SPD - our KM1+2-12.5-1+1 SC. (The diameter of most lighting column bases is usually large enough to accommodate the size of the SPD.)

Where the cable length from the SPD mounted in the lighting column base, to the luminaire, exceeds 10m in height, then IEC 61643-12 dictates that an additional SPD is installed at the luminaire.

Our KM-SP-T2+T3-320/Y-CLT-LED (where the distance is less than 10m use the KM-DA-320-LED) is suitable.

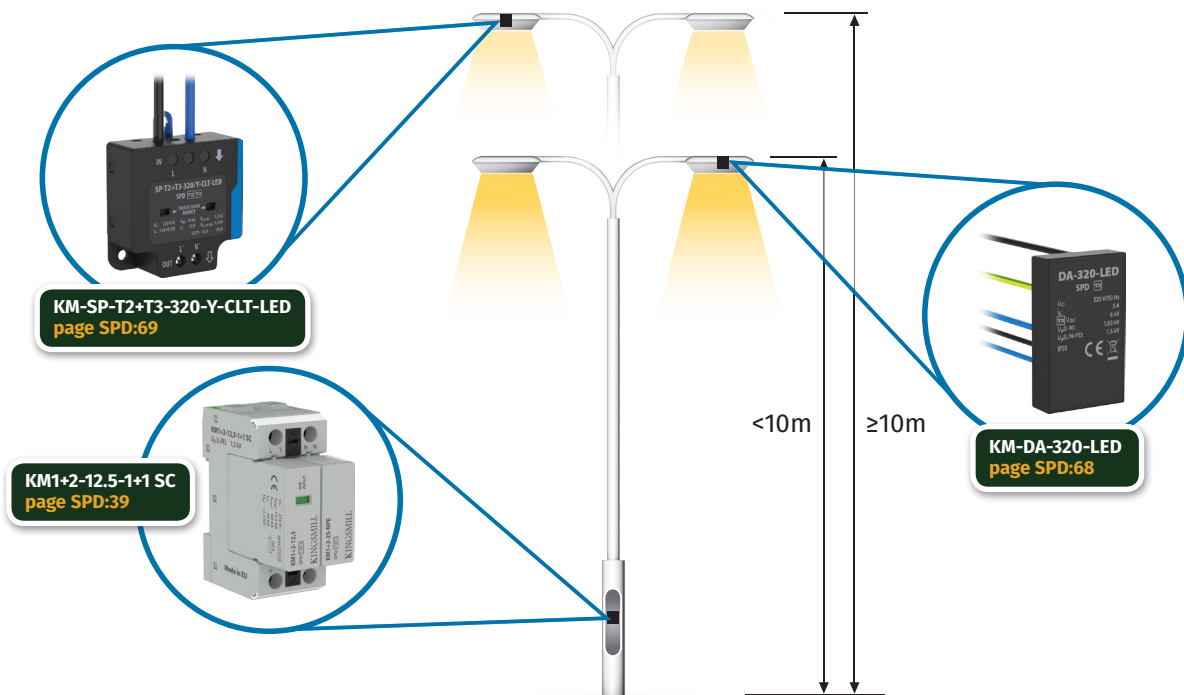


Figure SPD:26. Using the SPD on street lighting posts of up to and above 10m height

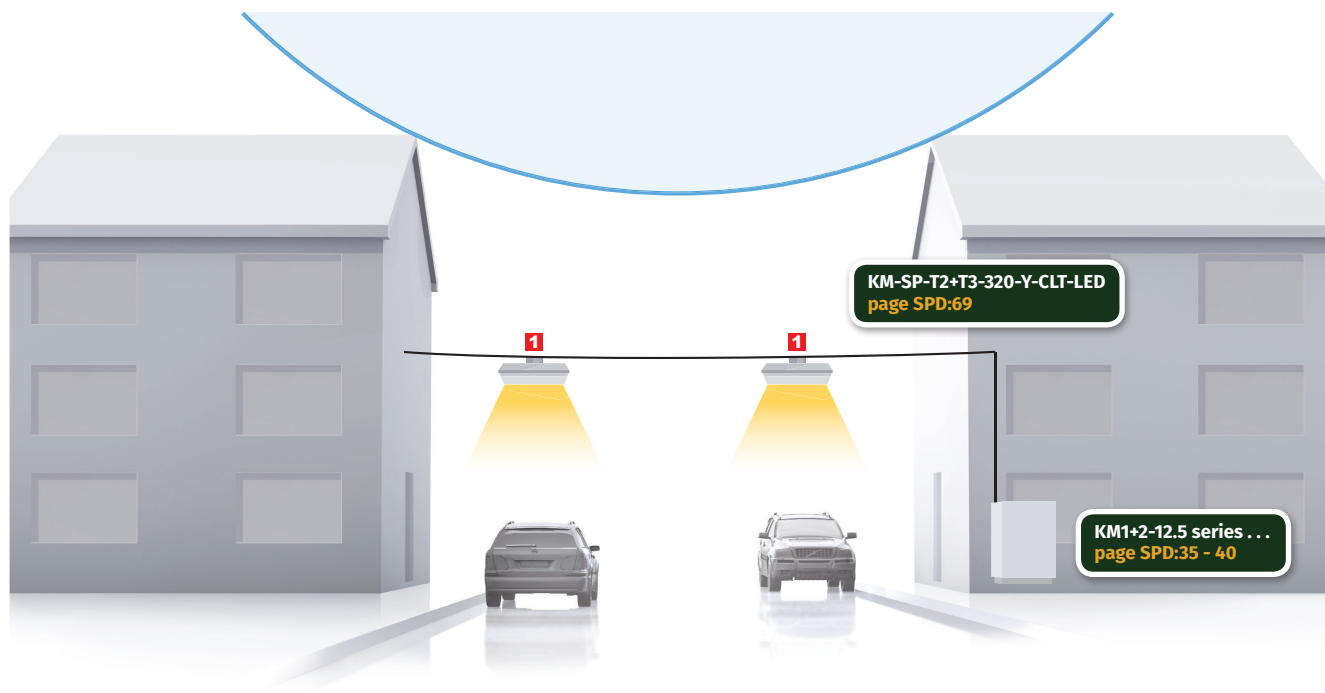


Figure SPD:27. KM-SP-T2+T3-320/Y-CLT-LED [1] with light fittings in the LPZ0_B zone, fixed onto a cross-wire suspension line (suspension cable) between two buildings.

LED systems can also be affected by induced voltages if the street lighting circuit is in close proximity to MV and HV cables. SPDs are also required in such applications. In addition, the installation of a buried earth conductor, earthed at both ends, can also help reduce the effect of voltages induced in this way.

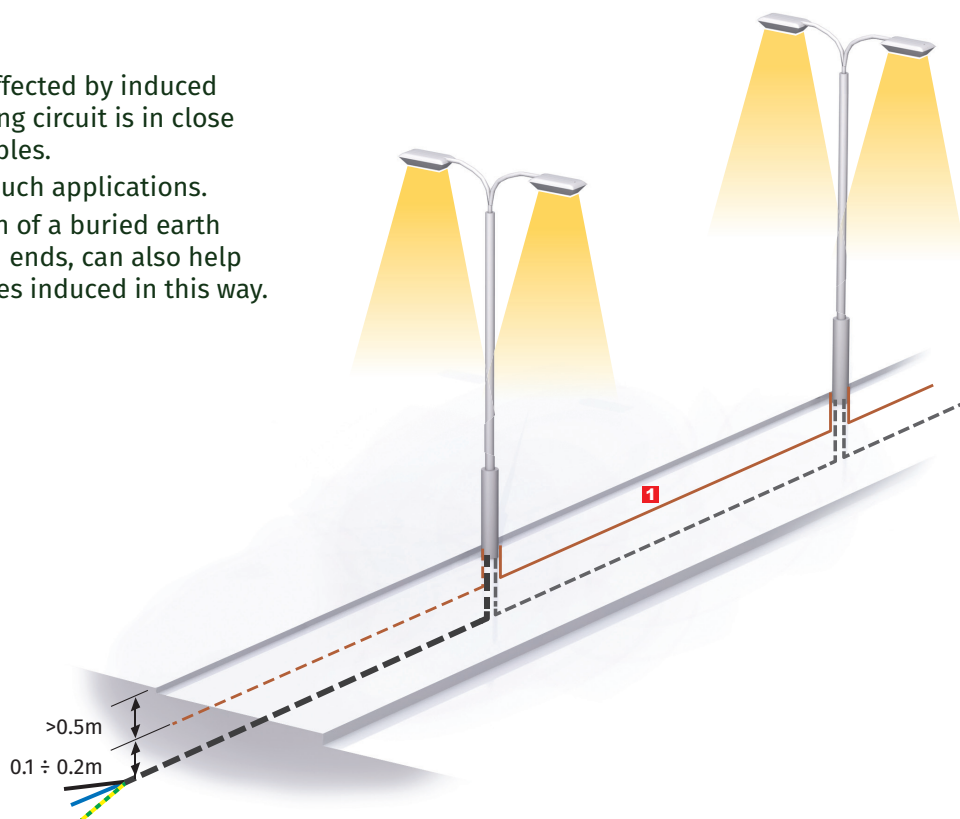


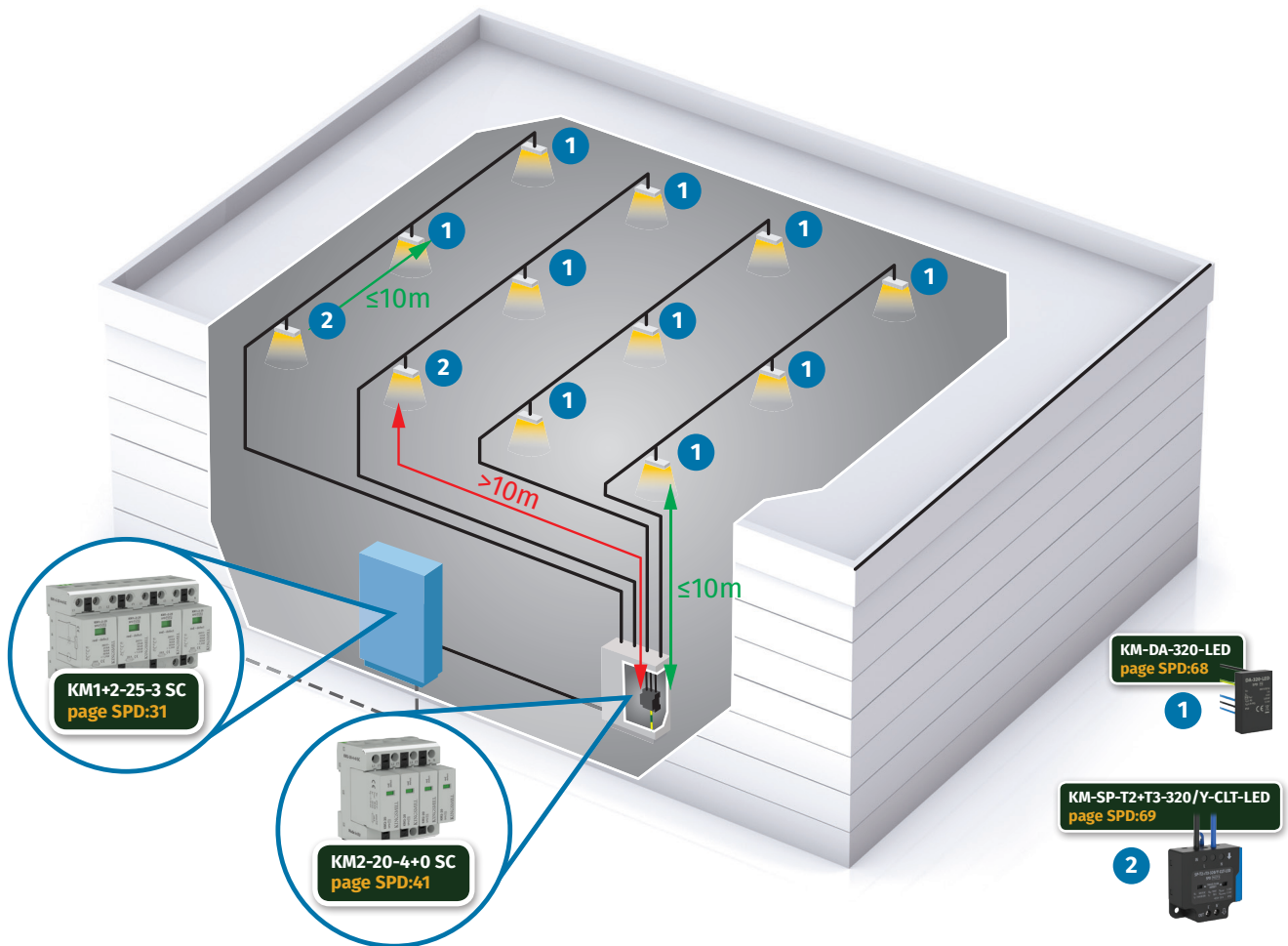
Figure SPD:28. Compensation conductor [1] for the limitation of induction effects

LOCATION: protecting an industrial lighting system from induced voltages, resulting from lightning

Transient overvoltages can be induced on the cables supplying lighting through resistive coupling, inductive coupling and electrical switching (see pages SPD:6 - 8).

Such overvoltages might harm the sensitive electronics used in controlling modern day LED luminaires. SPDs are installed at the MDB and SDB locations as previously described in addition to the individual lighting circuits.

In the case of lighting installed under the roof of an industrial complex, eg high bay lighting, it is advisable to avoid parallel routing of cables with lightning conductors. If such routing is not possible, then it is recommended to fit an SPD at each luminaire (our KM-SP-T2+T3-320/Y-CLT-LED).



In the case of large industrial buildings, the sub-distribution board (SDB) supplying the lighting circuits should be fitted with a Type 2 SPD (our KM2-20- series). The MDB should be fitted with a combined Type 1 & 2 SPD (our KM1+2-25- series).

Figure SPD:29. Protection of luminaires installed in an extensive building object: KM-DA-320-LED [1] for $\leq 10\text{m}$ distance from the upstream SPD connected to the same phase conductor; KM-SP-T2+T3-320/Y-CLT-LED [2] for distances $>10\text{m}$.

- The KM-DA320-LED is used where the first LED luminaire is $\leq 10\text{m}$ from the SPD in the distribution board supplying that circuit. Additionally, a KM-DA-320-LED is fitted for every 10m of lighting circuit thereafter.
- In the case that the first LED luminaire is located $\geq 10\text{m}$ away from the SPD protecting the distribution board supplying that circuit, a KM-SP-T2+T3/320/Y-CLT-LED is installed. Thereafter, for every 10m of lighting circuit a KM-DA-320-LED would be fitted.

KM-SP-T1+T2-320/Y-CLT-LED SPDs are primarily intended for use in locations with a high degree of risk. For example, luminaires in the LPZ0A zone (*figure SPD:24*). They are also used where the lighting column height exceeds 10m, or where the first luminaire on a lighting circuit is more than 10m away from an MDB/SDB fitted with surge protection.

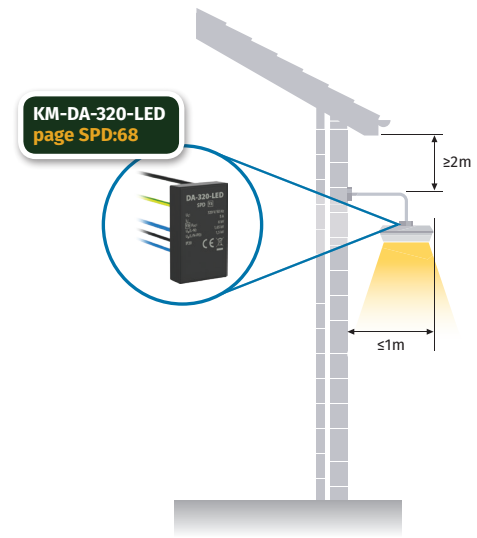


Figure SPD:30. Light fitting mounted on the external wall of a building (of up to maximum 45m), conforming to EN 60728-11 ed.2.

Features and Benefits

The KM-DA-320-LED and KM-SP-T2+T3-320/Y-CLT-LED are designed as in-line products, suitable for mounting inside light fittings.

The SPDs can also be fitted in parallel and the SPD output is used for the indication of the status of the SPD.

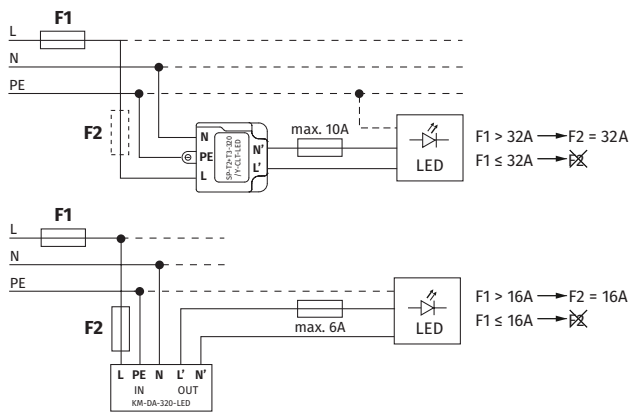


Figure SPD:31. Series (in-line) SPD connection to protected equipment

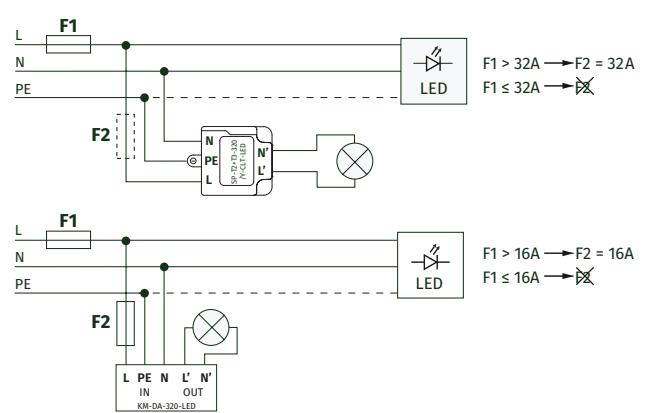


Figure SPD:32. SPD wired in parallel to protected equipment

If an SPD fails, it fails safe, disconnecting the luminaire.

Failure of the KM-SP-T2+T3-320/Y-CLT-LED is also indicated by darkened display openings, to identify the failure in the case of disconnected power supply.

The SPD should be fitted as close as possible to the luminaire.

Comply with the requirements of IEEE (ANSI) C62.41.2 - C location - located externally.

The internal connections of the KM-DA-320-LED and KM-SP-T2+T3-320/Y-CLT-LED are symmetrical, meaning that if phase and neutral is crossed, this does not affect the SPD.

The SPD's can also be used where luminaires are connected between phases, provided that the U_c maximum operating voltage is not exceeded.

The KM-SP-T2+T3-320/Y-CLT-LED earth terminal is a lug. The screw connecting the lug to the PE conductor, could also be used to secure the SPD to the luminaire.

An auxiliary plastic adapter makes it possible to the SPD to a 35mm DIN rail (TH 35), provided that the latter is not equipped with a lug to connect to the PE conductor.

Using SPDs for light fittings designed in accordance with class I and II equipment

Class I luminaires have the SPD connected as shown below. If the light fitting is part of the TN-C earthing system, the SPD may be inserted into the point where the PEN conductor is dis severed (the PEN conductor at the input is connected both to the N and PE terminals. Illustrated in figure SPD:33.

Class II luminaires have the SPD installed at the interface between the installation and the protected electrical equipment, while connecting the SPD to the protective earth conductor (PE). Illustrated in figure SPD:34.

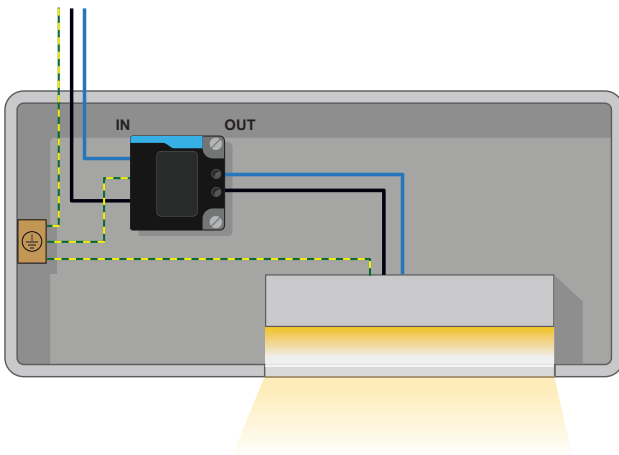


Figure SPD:33. SPD connected to equipment in protection class I

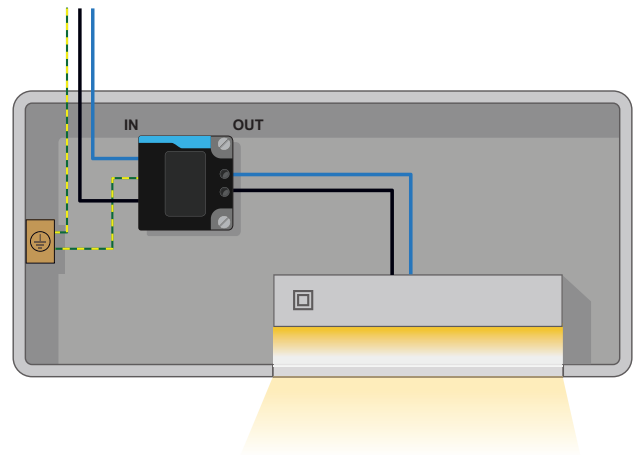


Figure SPD:34. SPD connected to equipment in protection class II

Type 3 surge arrester - LED lighting



Surge arrester for protection of LED lights.

Install close to protected equipment in low voltage power circuits.

Features

- Compact size
- Fault signalling by supply interruption

Benefits

Simple installation in applications with limited space.

Application

Install close to protected LED lighting equipment in low voltage power circuits.

Standards

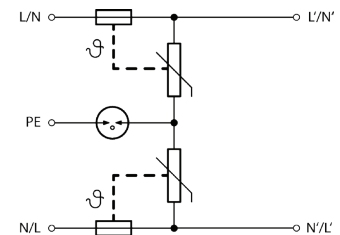
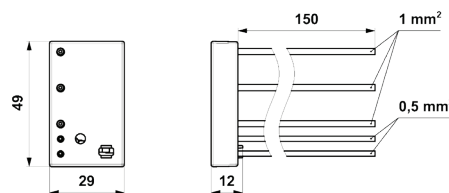
EN 61643-11 (for surge protection devices).

Electrical specification

Order number	KM-DA-320-LED	
Nominal voltage	U_n	230V AC
Maximum operating voltage	U_c	320V AC
Nominal load current	I_L	5A
Nominal discharge current (8/20 μ s) L-N/N-PE	I_n	3kA
Nominal discharge current (8/20 μ s) L+N-PE	I_n	5kA
Test voltage L-N/N-PE	U_{oc}	6kV
Test voltage L+N-PE	U_{oc}	10kV
Test voltage L-PE	U_{oc}	6kV
Voltage protection level L-N	U_p	1.65kV
Voltage protection level mode N-PE/L-PE	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	1.5kA
Maximum overcurrent protection		16A gL/gG or B 16A
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Fault indication		loss of voltage
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		installation box
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T3
Weight		30g (nett), 45g (gross)

Dimensions and wiring diagram

KM-DA-320-LED



Type 2 + 3 surge arrester - LED lighting

Type 2 + 3 surge arrester for protection of LED lights.

Install close to protected equipment in low voltage power circuits.

Benefits

Simple installation in applications with limited space.

Standards

EN 61643-11 (for surge protection devices).

Features

- Compact size
- Fault signalling by supply interruption

Application

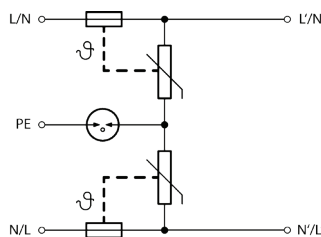
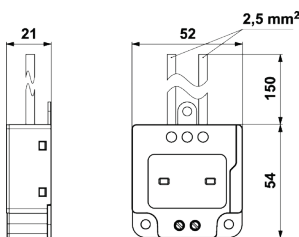
Install close to protected equipment in low voltage power circuits.



Electrical specification

Order number	KM-SP-T2+T3-320/Y-CLT-LED	
Nominal voltage	U_n	230V AC
Maximum operating voltage	U_c	320V AC
Nominal load current	I_L	10A
Nominal discharge current (8/20 μ s) L-N/N-PE	I_n	5kA
Maximum discharge current (8/20 μ s) L-N/N-PE	I_{max}	10kA
Test voltage L-N/N-PE/L-PE	U_{oc}	10kV
Voltage protection level mode L-N	U_p	1.3kV
Voltage protection level mode N-PE	U_p	1.5kV
Voltage protection level mode L-PE	U_p	1.5kV
Short-circuit current rating	I_{SCCR}	3kA
Maximum overcurrent protection		32A gL/gG or C 32A
Response time L-N	t_a	25ns
Response time N-PE	t_a	100ns
Cross-section of connected conductors solid (max)		2.5mm ²
Cross-section of connected conductors stranded (max)		1.5mm ²
Fault indication		loss of voltage, dark grey indication field
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
According to standard		EN 61643-11:2012, IEC 61643-11:2011 / T2, T3
Weight		55g (nett), 105g (gross)

Dimensions and wiring diagram



KM-SP-T2+T3-320/Y-CLT-LED

Low voltage, telecom and data lines protection

Where low voltage, data and telecom lines enter and exit the building, they must also be included in the Lightning Protection System. These include:

- Electromagnetic shielding
- Telephone lines
- Data communication lines
- Instrumentation, control, signalling lines
- Coaxial lines for CCTV, TV, & antenna cables

Field based electronic equipment also needs to be protected.

By their nature, low voltage, data and telecom lines are not as robust as mains power cables and as such do not carry the same magnitude of lightning current. However, the size of that voltage/current is large in comparison to the system operating voltage and, as such, these lightning induced transients can still cause irreparable and expensive damage.

Since transients can be induced from the large electro-magnetic field created during a lightning strike, care needs to be taken over the routing of such cables.

When selecting a data, telephone or low voltage protector, extra care must be taken to ensure that clamping performance of the SPD does not impede the data/signal transmission voltage.

SPD's in this category are normally installed "in-line" and they have "dirty" (voltage in) and "clean" (voltage out) terminals, thus extra care must be taken to ensure that input conductors are not connected to the wrong terminal.

Positioning is important too, they should be installed within the cabinet supplying the equipment, and the "clean output" cables should be routed away from the "dirty input" cables.

Shielding of cables can also assist in reducing the impact of lightning currents.

Similarly, the use of fibre-optic cables will reduce the impact of lightning currents. Although, bonding to earth should take place at both ends of the cable if the fibre-optic cable has a metallic shield.

The parameters for low voltage and telecommunication SPD's are outlined in the tables following:

LPL	Boundary of LPZ 0 and 1	Boundary of LPZ 1 and 2	Boundary of LPZ 2 and 3
Peak test current per mode	25kA	40kA	3kA (with 6kV)
Telecom & signalling test category B2 10/700 V waveform	D1	C2	C3
Surge test waveform	10/350 current	Combined 8/20 current and 1.2/50 voltage	Combined 8/20 current and 1.2/50 voltage
Peak test current per mode	2.5kA	2kA (with 4kV)	0.5kA (with 1kV)

Table SPD:6. Application of SPDs in a low voltage situation along with associated test parameters.

From BS:EN 62305 . . .

Low voltage - surge currents associated with Lightning Protection Levels

Source of damage	Current waveform	LPL I	LPL II	LPL III & IV
Flashes to the structure (S1)	10/350	10kA	7.5kA	5kA
Flashes near the structure (S2)	8/20	0.2kA	0.15kA	0.1kA
Flashes to lines connected to the structure (S3)	8/20	10kA	7.5kA	5kA
Flashes near to lines connected to the structure (S4)	8/20	5kA	3.75kA	2.5kA

Telecommunication - surge currents associated with Lightning Protection Levels

Source of damage	Current waveform	LPL I	LPL II	LPL III & IV
Flashes to the structure (S1)	10/350	10kA	7.5kA	5kA
Flashes near the structure (S2)	8/20	0.2kA	0.15kA	0.1kA
Flashes to lines connected to the structure (S3)	8/20	2kA	1.5kA	1kA
Flashes near to lines connected to the structure (S4)	8/20	0.16kA	0.085kA	0.035kA

It is important to select an SPD such that its operation does not block signal voltages and that it can withstand the expected surge currents as shown above by Lightning Protection locations.

Figure SPD:35. Surge currents associated with low voltage networks.

The Kingsmill range of protectors is outlined on pages SPD:72 to 84. If you do not see the protector that you require, please ask our sales team, as the range is continuously growing.

Protectors for use in the different Lightning Protection zones are denoted as follows (in the product data tables following this introduction).

LPZ transition	Marking
LPZ0 - LPZ1	ST 1
LPZ1 - LPZ2	ST 2
LPZ2 - LPZ3	ST 3

Protectors are installed at the position of the equipment being protected, but in the case of our Krone LSA-Plus configuration SPDs, at the rack itself.

Table SPD:7. SPD marking by LPZ.

Surge arrester for data, signal and telecomms



Type: D1, C2
Location: ST 1+2+3

Lightning current arrester with coarse and fine surge protection for the protection of 2 core signalling lines.

Benefits

- Can be installed at line entry into the building as well as close to protected devices
- Coarse and fine surge protection (core - core) in differential mode
- Coarse surge protection in common mode (line - PE)

Features

- Pluggable module
- Line separated from protective earth via GDT
- Coupling resistance (R - resistance)

Standards

EN 61643-11 (for surge protection devices).

Application

Install at the boundary of LPZ0 and LPZ1 zones at the line entry into the building.

Electrical specification

Order number	KM-BDG-230-V/1-FR1	
Connection (input - output)	terminals - terminals	
Nominal voltage	U_n	230V DC
Maximum operating voltage	U_c	177V AC/250V DC
Nominal load current	I_L	0.5A
C2 Nominal discharge current (8/20 μ s) per core/GND-PE	I_n	10kA
C2 Total discharge current (8/20 μ s) cores-PE	I_{total}	20kA
D1 Impulse discharge current (10/350 μ s) core-core	I_{imp}	2.5kA
D1 Total discharge current (10/350 μ s) cores-PE	I_{total}	5kA
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	350V
C3 Voltage protection level mode GND-PE/core-GND at 1kV/ μ s	U_p	550V
Response time core-core	t_a	1ns
Response time core-PE/core-GND	t_a	100ns
Serial resistance per core	R	3.3 Ω
Threshold frequency core-core	f	16MHz
Cross-section of connected conductors (solid) (min - max)	0.14mm ² - 4mm ²	
Cross-section of connected conductors (stranded) (min - max)	0.14mm ² - 2.5mm ²	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +70°C	
Mounting	DIN rail 35mm	
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / D1, C2	
ETIM Class	EC 001625	
Weight	90g (nett), 115g (gross)	

DIMENSIONS & WIRING DIAGRAMS:
SEE PAGE SPD:91

Accessories

Spare modules are available.
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module	KM-BDG-230-V/1-0

Surge arrester for low voltage AC/DC power supplies

Surge protection device for all types of low voltage electric and electronic equipment rated up to 48 volts (nominal).

Features

- Pluggable module
- Visual fault signalling
- Use on systems up to 48 volts

Application

Install close to protected equipment in low voltage power circuits.

Benefits

Middle conductor separated from protective earth via GDT.

Standards

EN 61643-11 (for surge protection devices).



Type: T3, C2

Location: ST 2

Electrical specification

Order number	KM-DP-048-V/1-F16	
Connection (input - output)	terminals - terminals	
Nominal voltage	U_n	48V AC
Maximum operating voltage (AC/DC)	U_c	60V AC / 60V DC
Nominal load current	I_L	16A
C2 Nominal discharge current (8/20 μ s) per core	I_n	2kA
C2 Voltage protection level mode core-core at In	U_p	370V
C2 Voltage protection level mode core-PE at In	U_p	750V
Test voltage L+ - L- / L+ (L-) - PE / M - PE		4kV
Voltage protection level L+ - L-		0.37kV
Voltage protection level L+ (L-) - PE / M-PE		0.75kV
Maximum overcurrent protection		16A gL/gG or B 16A
Response time L+ - L-		25ns
Response time L+ (L-) - PE / M-PE		100ns
Cross-section of connected conductors (solid) (min - max)		0.14mm ² - 4mm ²
Cross-section of connected conductors (stranded) (min - max)		0.14mm ² - 2.5mm ²
Fault indication		Red indicator
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +70°C
Mounting		DIN rail 35mm
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012, EN 61643-11:2012, IEC 61643-11:2011 / T3, C2	
ETIM Class	EC000942	
Weight	95g (nett), 120g (gross)	

Accessories

Spare modules are available.

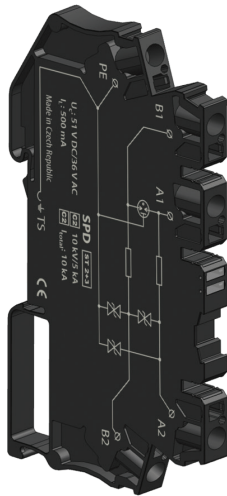
Replace when fault indication indicator turns from green to red.

DESCRIPTION	ORDER NUMBER
Spare Module	KM-DP-048-V/1-0

DIMENSIONS & WIRING DIAGRAMS:

SEE PAGE SPD:91

Surge current arrester for data, signal and telecomms



Coarse and fine surge protection for 2 core telecommunications and signalling networks.

Use to protect RS-485 instrumentation and control lines, electronic security and fire detection systems.

Features

- Screwless terminals
- Coupling impedance (resistance)
- Use on systems up to 48 volts

Benefits

Coarse and fine surge protection in differential mode (core - core) and common mode (core - PE).

Application

Install close to equipment for protection of communication interfaces.

Standards

EN 61643-11 (for surge protection devices).

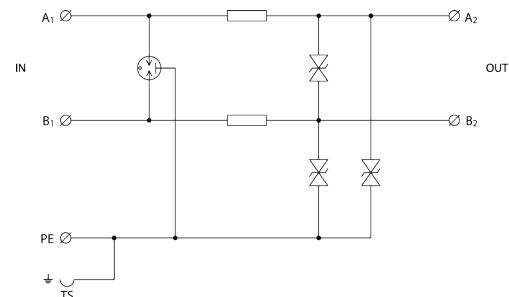
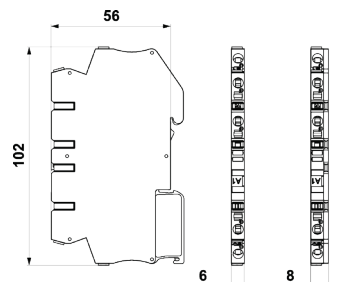
Type: C2, C3
Location: ST 2+3

Electrical specification

Order number	KM-DM-048/1-RB	
Connection (input - output)	screwless terminals - screwless terminals	
Nominal voltage	U_n	48V DC
Maximum operating voltage (AC/DC)	U_c	36V AC/51V DC
Nominal load current	I_L	0.5A
C2 Nominal discharge current (8/20 μ s) per core	I_n	5kA
C2 Nominal discharge current (8/20 μ s) cores-PE	I_{Total}	10kA
C2 Voltage protection level mode core-core at I_n	U_p	80V
C2 Voltage protection level mode core-PE at I_n	U_p	95V
C3 Voltage protection level mode core-core/core-PE at 1kV/ μ s	U_p	65V
Response time core-core/core-PE	t_a	1ns
Serial resistance per core	R	1.6 Ω
Threshold frequency core-core	f	5MHz
Cross-section of connected conductors (solid) (min - max)	0.08mm ² - 4mm ²	
Cross-section of connected conductors (stranded) (min - max)	0.08mm ² - 2.5mm ²	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +70°C	
Mounting	DIN rail 35mm	
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / C2, C3	
ETIM Class	EC 001625	
Weight	35g (nett), 60g (gross)	

Dimensions and wiring diagram

KM-DM-048/1-RB



Two-stage surge current arrester for signal lines

Coarse and fine surge protection for 2 core signalling networks.

Features

- Screwless terminals
- Coupling impedance (resistance)
- Use on systems up to 24 volts

Application

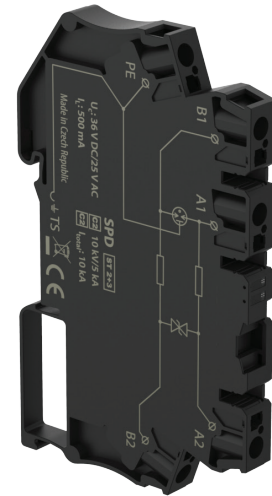
Install close to equipment for protection of communication interfaces.

Benefits

Coarse and fine surge protection in differential mode (core - core) and coarse protection in common mode (core - PE).

Standards

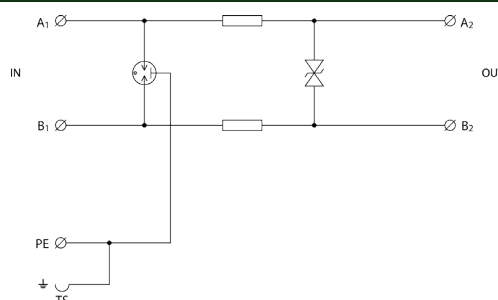
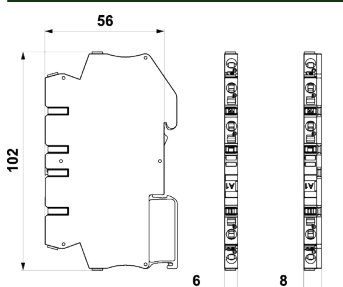
EN 61643-11 (for surge protection devices).



Electrical specification

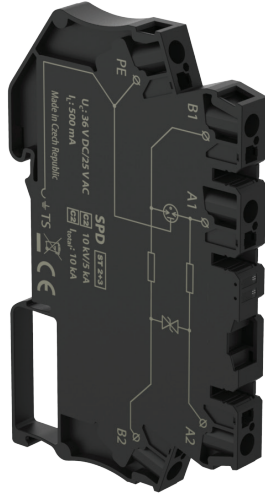
Order number	KM-DMG-024/1-RB	
Connection (input - output)	screwless terminals - screwless terminals	
Nominal voltage	U_n	24V DC
Maximum operating voltage (AC/DC)	U_c	25V AC/36V DC
Nominal load current	I_L	0.5A
C2 Nominal discharge current (8/20 μ s) per core	I_n	5kA
C2 Nominal discharge current (8/20 μ s) cores-PE	I_{Total}	10kA
C2 Voltage protection level mode core-core at I_n	U_p	50V
C2 Voltage protection level mode core-PE at I_n	U_p	350V
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	45V
C3 Voltage protection level mode core-PE at 1kV/ μ s	U_p	500V
Response time core-core	t_a	1ns
Response time core-PE	t_a	100ns
Serial resistance per core	R	1.6 Ω
Threshold frequency core-core	f	4MHz
Cross-section of connected conductors (solid) (min - max)	0.08mm ² - 4mm ²	
Cross-section of connected conductors (stranded) (min - max)	0.08mm ² - 2.5mm ²	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +70°C	
Mounting	DIN rail 35mm	
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / C2, C3	
ETIM Class	EC 001625	
Weight	35g (nett), 60g (gross)	

Dimensions and wiring diagram



KM-DMG-024/1-RB

Two-stage surge current arrester for RS485 signal lines



Coarse and fine surge protection for 2 core signalling networks.

Features

- Screwless terminals
- Coupling impedance (resistance)
- Use on systems up to 24 volts

Benefits

Coarse and fine surge protection in differential mode (core - core) and common mode (core - PE).

Application

Install close to equipment for protection of communication interfaces.

Standards

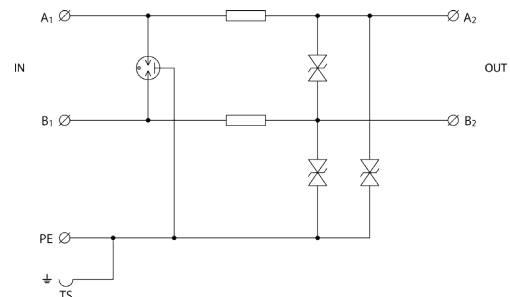
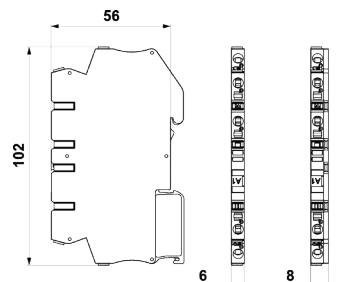
EN 61643-11 (for surge protection devices).

Electrical specification

Order number	KM-DM-006/1-RB	
Location	ST 2+3	
Connection (input - output)	screwless terminals - screwless terminals	
Nominal voltage	U_n	6V DC
Maximum operating voltage (AC/DC)	U_c	6V AC/8.5V DC
Nominal load current	I_L	0.5A
C2 Nominal discharge current (8/20 μ s) per core	I_n	5kA
C2 Nominal discharge current (8/20 μ s) cores-PE	I_{Total}	10kA
C2 Voltage protection level mode core-core at I_n	U_p	18V
C2 Voltage protection level mode core-PE at I_n	U_p	30V
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	12V
C3 Voltage protection level mode core-PE at 1kV/ μ s	U_p	15V
Response time core-core/core-PE	t_a	1ns
Serial resistance per core	R	1.6 Ω
Threshold frequency core-core	f	1MHz
Cross-section of connected conductors (solid) (min - max)	0.08mm ² - 4mm ²	
Cross-section of connected conductors (stranded) (min - max)	0.08mm ² - 2.5mm ²	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +70°C	
Mounting	DIN rail 35mm	
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / C2, C3	
ETIM Class	EC 001625	
Weight	35g (nett), 60g (gross)	

Dimensions and wiring diagram

KM-DM-006/1-RB



KRONE™ LSA-Plus® Telephone Signal Protection

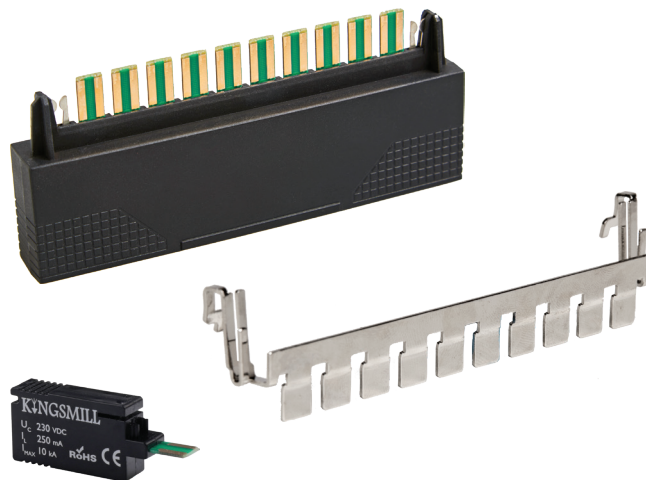
Use the Kingsmill KP series of products for telephone and signal line protection for signals utilising the KRONE™ LSA-PLUS® 10-way connection blocks.

Two stages of protection

Standard KRONE™ surge arresters only provide a single stage of protection which cannot prevent equipment from being exposed to excessive voltages during a surge event. The KP series of products utilise a two stage protection approach that keeps the voltage let through to an absolute minimum.

Telephone and Signal protection

The KMKP-10 devices are designed for protecting PSTN and digital PABX signals with a maximum line voltage of up to 200V. They protect all common signalling systems.



Ordering Information

Model	Signal Type		Ordering Codes	
KMKP-x	PSTN	PABX	KMKP-1 (1 pair)	KMKP-10 (10 pairs)

The KMKP-1 must be used in conjunction with the Earth Bar KM-KP-EB.

Electrical specification

Order number	KMKP-1		KMKP-10
Connection type	in series		
Modes of protection	transverse and common mode		
Number of lines	1 pair	10 pairs	
Maximum continuous voltage (AC/DC)	U_c	140V AC/200V DC	
Maximum discharge current (8/20µs)	I_{max}	5kA per line (10kA common mode)	
Impulse durability	C2 10 x 5kA 8/20µs		
Maximum load current	I_L	250mA	
L-L Voltage protection level at 1kV/µs	U_p	220V	
L-L Voltage protection level at 100V/s		235V	
L-PE Voltage protection level at 1kV/µs	U_p	350V	
L-PE Voltage protection level at 3kA 8/20µs	U_p	600V	
L-PE Voltage protection level at 100V/s		230V	
AC durability	5 x 1s, 1A rms		
Overstressed fault mode	Mode 3 (open circuit)		
Response time	t_a	<5ns	
Line resistance	2.7Ω		
L-L capacitance	18pF		
L-PE capacitance	4.5pF		
Insertion loss @ 150Ω	<0.5dB (<1MHz)		
3dB frequency @ 150Ω	70MHz		

KRONE™ LSA-Plus® Telephone Signal Protection

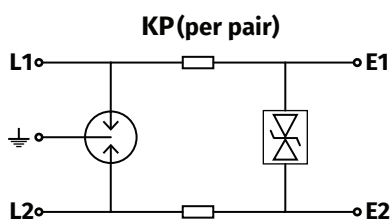
Mechanical specification

Order number	KMKP-1	KMKP-10
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +85°C	
Humidity range	5% to 95% non-condensing	
Mounting	KRONE LSA-PLUS®	
Earthing	Additional earth bar for KMKP-1 (KM-KP-EB)	-
According to standard	EN 61643-21:2012, AS/NZS 1768:2007, UL 1449 3rd edition & UL 497B, ITU-T K.44:2012, AS/CA S008:2010, AS/NZS 4117:1999	
Weight	6.5g	150g

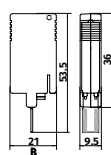
Standards

Order number	KMKP-1	KMKP-10
EN 61643-21:2012	SPD connected to telecommunications and signalling networks - Cat C2, D1	
AS/NZS 1768:2007	Signalling/telecommunications surge protection	
UL 1449 3rd edition & UL 497B	Protectors for data communications and fire-alarm circuits	
ITU-T K.44:2012	Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents	
AS/CA S008:2010	Requirements for Customer Cabling Products	
AS/NZS 4117:1999	Surge Protective Devices for Telecommunications Applications	

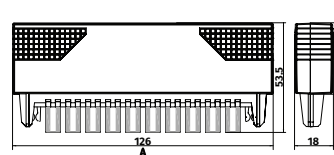
Dimensions and wiring diagram



KMKP-1



KMKP-10



Surge arrester for Power over Ethernet

Combination of coarse and fine protection of ethernet lines with Power over Ethernet (PoE). For protection of ethernet line Cat 6 with PoE Mode A, B against surge voltages.

Features

- RJ45 sockets
- Suitable for use on 10 Gbits/s Ethernet (Cat 6A) lines

Benefits

- Simple installation
- Universal plastic adapter for mounting on DIN rail and GND2 holder



Application

Install at the entry into the building and close to protected equipment, at the boundary of LPZ0 and LPZ1 or higher.

Standards

EN 61643-11 (for surge protection devices).

Type: D1, C2, C3

Location: ST 1+2+3

Electrical specification

Order number	KM-DL-1G-RJ45-PoE-AB
Degree of protection	IP20
Range of operating temperatures (min - max)	-40°C - +80°C
Mounting	DIN rail 35mm and GND2 holder
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / D1, C2, C3
ETIM Class	EC 001473
Weight	135g (nett), 155g (gross)

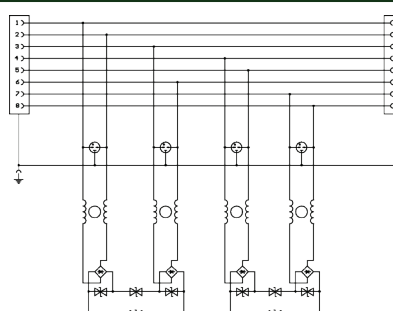
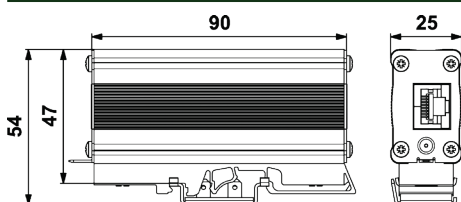
Line part

Maximum operating voltage	U_c	8.5V DC
Nominal load current	I_L	0.5A
C2 Nominal discharge current (8/20 μ s) per core	I_n	0.15kA
C2 Nominal discharge current (8/20 μ s) cores-PE	I_{Total}	10kA
C2 Voltage protection level mode core-core at I_n	U_p	60V
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	22V
C3 Voltage protection level mode core-PE at 1kV/ μ s	U_p	500V
D1 total discharge current (10/350 μ s) cores P-E	I_{Total}	2kA
Response time core-core	t_a	1ns
Response time core-PE	t_a	100ns
Insert attenuation at 250MHz		1.20dB
Connection (input - output)		RJ45/RJ45

Power part

Maximum operating voltage	U_c	58V DC
Nominal load current	I_L	1.5A
C2 Nominal discharge current (8/20 μ s) per core	I_n	0.15kA
C2 Nominal discharge current (8/20 μ s) cores-PE	I_{Total}	10kA
C2 Voltage protection level mode (POE) at I_n		90V
C3 Voltage protection level mode (POE) at 1kV/ μ s		80V
C3 Voltage protection level mode core-PE at 1kV/ μ s	U_p	500V
Response time core-core	t_a	1ns
Response time core-PE	t_a	100ns

Dimensions and wiring diagram



KM-DL-1G-RJ45-PoE-AB

Surge arrester for Ethernet



Type: C2, C3
Location: ST 3

Combination of coarse and fine protection of ethernet lines with Power over Ethernet (PoE). For protection of ethernet line Cat 6 with PoE Mode A, B against surge voltages.

Benefits

- Simple installation
- Universal plastic adapter for mounting on DIN rail and GND 2 holder

Features

- RJ45 sockets
- Suitable for use on 10 Gbits/s Ethernet (Cat 6A) lines

Standards

EN 61643-11 (for surge protection devices).

Application

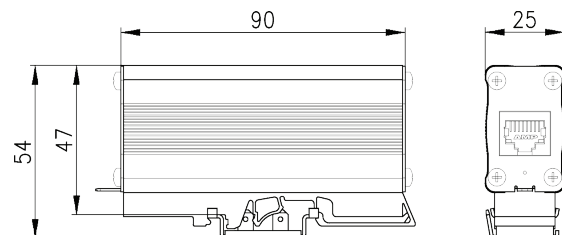
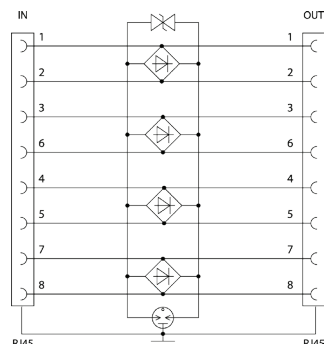
Install close to protected equipment.

Electrical specification

Order number	KM-DL-CAT.6-60V	
Maximum operating voltage	U_c	60V DC
Nominal load current	I_L	0.5A
C2 Nominal discharge current (8/20 μ s) per core	I_n	0.2kA
C2 Nominal discharge current (8/20 μ s) cores-PE	I_{Total}	1.6kA
C2 Voltage protection level mode core-core at I_n	U_p	130V
C3 Voltage protection level mode core-PE at I_n	U_p	350V
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	130V
Response time core-core	t_a	1ns
Insert attenuation at 250MHz		2dB
Connection (input - output)		RJ45/RJ45
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm and GND2 holder
According to standard		EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / C2, C3
Weight		125g (nett), 150g (gross)

Dimensions and wiring diagram

KM-DL-CAT.6-60V



Surge arrester for telephone lines - RJ11 sockets

Protect a single pair of high-speed analogue lines in telecommunication equipment (eg VDSL2).

Features

- Provides “coarse” and “fine” protection
- Simple installation
- Protect AC and DC systems

Application

Install inline for protection of telecommunication equipment on high-speed analogue lines.

Benefits

- Simple installation
- Universal plastic adapter for mounting on DIN rail and GND 2 holder

Standards

EN 61643-11 (for surge protection devices).

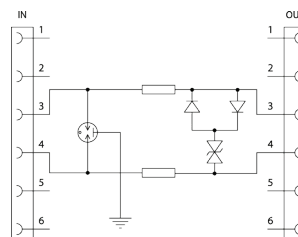
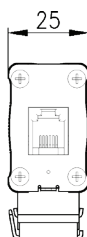
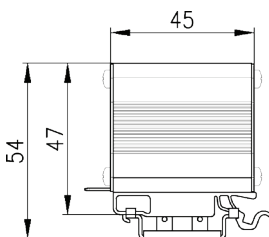


Type: C2, C3
Location: ST 2+3

Electrical specification

Order number	KM-DL-TLF-HF	
Maximum operating voltage (AC/DC)	U_c	114V AC/162V DC
Nominal load current	I_L	0.06A
C2 Nominal discharge current (8/20 μ s) per core	I_n	2.5kA
C2 Voltage protection level mode core-core at I_n	U_p	260V
C2 Voltage protection level mode core-PE at I_n	U_p	300V
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	240V
C3 Voltage protection level mode core-PE at 1kV/ μ s	U_p	400V
Response time core-core	t_a	1ns
Response time core-PE	t_a	100ns
Serial resistance per core	R	6.8 Ω
Threshold frequency core-core	f	40MHz
Connection (input - output)	RJ11 sockets	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +80°C	
Mounting	DIN rail 35mm and GND2 holder	
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / C2, C3	
ETIM Class	EC001625	
Weight	85g (nett), 100g (gross)	

Dimensions and wiring diagram



KM-DL-TLF-HF

Surge arrester for telephone lines - RJ45 sockets



Protect a single pair of ISDN lines in telecommunication equipment.

Benefits

- Simple installation
- Universal plastic adapter for mounting on DIN rail and GND 2 holder

Features

- Provides “coarse” and “fine” protection
- Protect AC and DC systems

Standards

EN 61643-11 (for surge protection devices).

Application

Install in front of NT for protection of telecommunication equipment on ISDN lines.

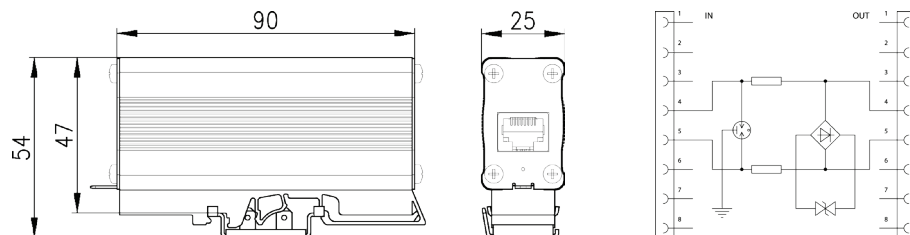
Type: C2, C3
Location: ST 2+3

Electrical specification

Order number	KM-DL-ISDN-RJ45	
Maximum operating voltage (AC/DC)	U_c	86V AC/121V DC
Nominal load current	I_L	0.06A
C2 Nominal discharge current (8/20 μ s) per core	I_n	2.5kA
C2 Voltage protection level mode core-core at I_n	U_p	270V
C2 Voltage protection level mode core-PE at I_n	U_p	300V
C3 Voltage protection level mode core-core at 1kV/ μ s	U_p	180V
C3 Voltage protection level mode core-PE at 1kV/ μ s	U_p	400V
Response time core-core	t_a	1ns
Response time core-PE	t_a	100ns
Serial resistance per core	R	6.8 Ω
Threshold frequency core-core	f	80MHz
Connection (input - output)	RJ45 sockets	
Degree of protection	IP20	
Range of operating temperatures (min - max)	-40°C - +80°C	
Mounting	DIN rail 35mm and GND2 holder	
According to standard	EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / C2, C3	
ETIM Class	EC000943	
Weight	125g (nett), 150g (gross)	

Dimensions and wiring diagram

KM-DL-ISDN-RJ45



Lightning current arrester for coaxial lines (F Connector)

Lightning current arrester with floating shielding (separated with GDT) for TV and CCTV coaxial line systems.

Features

- F Connectors
- Use on systems up to 70 volts

Benefits

- Simple installation
- Universal plastic adapter for mounting on DIN rail and GND 2 holder

Application

Install at the boundary of LPZ0 and LPZ1 zones at the line entry into the building.

Standards

EN 61643-11 (for surge protection devices).

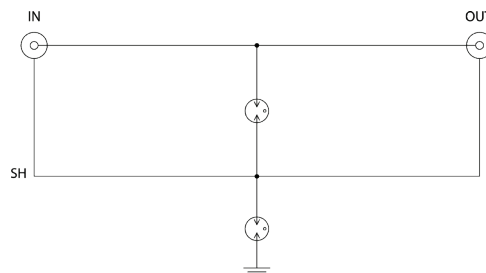
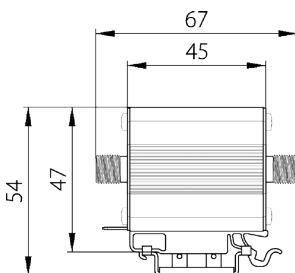


Type: D1, C2
Location: ST 1

Electrical specification

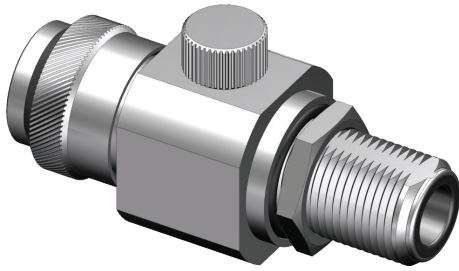
Order number	KM-FX-090 F75 T F/F	
Maximum operating voltage	U_c	70V DC
Nominal load current	I_L	4A
C2 Nominal discharge current (8/20 μ s) core-SH/SH-PE	I_n	10kA
D1 Impulse discharge current (10/350 μ s) core-SH/SH-PE	I_{imp}	2.5kA
C3 Voltage protection level mode core-SH/SH-PE at 1kV/ μ s	U_p	600V
Wave impedance	Z	75 Ω
Insertion attenuation		0.2dB
SWR	SWR	1.3
Bandwidth (min - max)	f	0MHz - 2150MHz
Response time core-SH/SH-PE	t_a	100ns
Connection (input - output)		F75
Degree of protection		IP20
Range of operating temperatures (min - max)		-40°C - +80°C
Mounting		DIN rail 35mm and GND2 holder
According to standard		EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / D1, C2
ETIM Class		EC001466
Weight		120g (nett), 140g (gross)

Dimensions and wiring diagram



KM-FX-090 F75 T F/F

Lightning current arrester for coaxial lines (N Connector)



Lightning current arrester for the protection of coaxial lines and telecommunication equipment against the impact of direct or indirect lightning strikes. Suitable for combined and power supply installations.

Benefits

- Simple installation
- Universal plastic adapter for mounting on DIN rail and GND 2 holder

Features

- N Connectors
- Use on systems up to 70 volts
- 50Ω wave impedance

Standards

EN 61643-11 (for surge protection devices).

Application

Install at the boundary of LPZ0 and LPZ1 zones at the line entry into the building.

Type: D1, C2

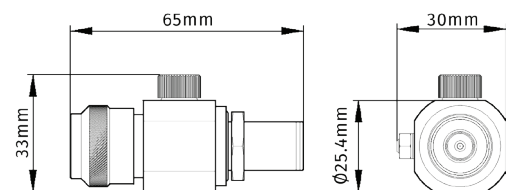
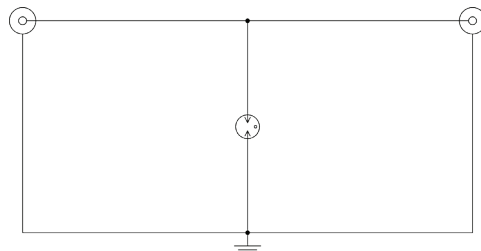
Location: ST 1+2

Electrical specification

Order number	KM-HX-090 N50 F/M	
Maximum operating voltage	U_c	70V DC
Nominal load current	I_L	6A
C2 Nominal discharge current (8/20μs) core-PE	I_n	10kA
D1 Impulse discharge current (10/350μs) core-PE	I_{imp}	2.5kA
C3 Voltage protection level mode core-PE at 1kV/μs	U_p	600V
Response time core-PE	t_a	100ns
Power	P	95W
Wave impedance	Z	50Ω
Bandwidth (min - max)	f	0MHz - 3500MHz
Insertion attenuation		0.1dB
SWR	SWR	1.2
Connection (input - output)		N50
Degree of protection		IP66
Range of operating temperatures (min - max)		-40°C - +80°C
According to standard		EN 61643-21+A1,A2:2013, IEC 61643-21+A1,A2:2012 / D1, C2
ETIM Class		EC001466
Weight		155g (nett), 175g (gross)

Dimensions and wiring diagram

KM-HX-090 N50 F/M



Enclosures

IP65 rated insulated distribution enclosures for use with Kingsmill Surge Protection Devices.

ABS enclosures with a polycarbonate window. Includes DIN rail. Complete with earth and neutral terminal blocks.

Fixings

Fixings for attaching the enclosure to the wall (not included) - 4 x stainless steel countersunk screws No.12 x 1.5" (A2RHSLT1.5-12) plus plastic plug (PP12).



Modules for use with enclosures

SPD-ENC		SPD-ENC-LARGE
25kA Type 1+2	Type 1+2 PV	25kA Type 1+2
KM1+2-25-1+0 SC	KM-FLP-PV550 V/U S	KM1+2-25-3+0 SC
KM1+2-25-1+1 SC	Type 2 PV	KM1+2-25-3+1 SC
KM1+2-25-2+0 SC	KM-SLP-PV170 V/U S	KM1+2-25-4+0 SC
12.5kA Type 1+2	KM-SLP-PV500 V/U S	Type 1+2 PV
KM1+2-12.5-1+0 SC	KM-SLP-PV700 V/Y S	KM-FLP-PV550 V/U S
KM1+2-12.5-1+1 SC	KM-SLP-PV1000 V/Y S	KM-FLP-PV1000 VS/Y
KM1+2-12.5-2+0 SC	KM- SLP-PV1500 V/Y S	
KM1+2-12.5-3+0 SC	Type 3 RFI	
KM1+2-12.5-3+1 SC	KM-DA-275-DF-16-S	
KM1+2-12.5-4+0 SC	Screw Terminals	
20kA Type 2	KM-DP-048-V/1-F16	
KM2-20-1+0 SC	KM-BDG-230-V/1-FR1	
KM2-20-1+1 SC		
KM2-20-2+0 SC		
KM2-20-3+0 SC		
KM2-20-3+1 SC		
KM2-20-4+0 SC		
10kA Type 3		
KM3-10-1+1 SC		
KM3-10-3+1 SC		

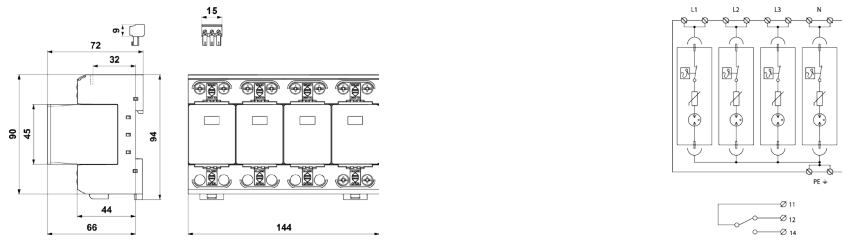
Specification

Order number	SPD-ENC	SPD-ENC-LARGE
DIN rail length (mm)	70	160
Useable window opening (mm)	70 x 45	160 x 45
Suitable for maximum product width (mm)	70	160
Height (mm)	215	210
Width (mm)	125	215
Maximum depth (to top of window) (mm)	110	100
Minimum depth (mm)	80	94
Cable knockouts (total all sides)	8	10
Fixing centres (mm)	145 x 52	145 x 143
Weight (kg)	0.51	0.69

25kA combined Type 1 & 2 lightning current and surge arresters

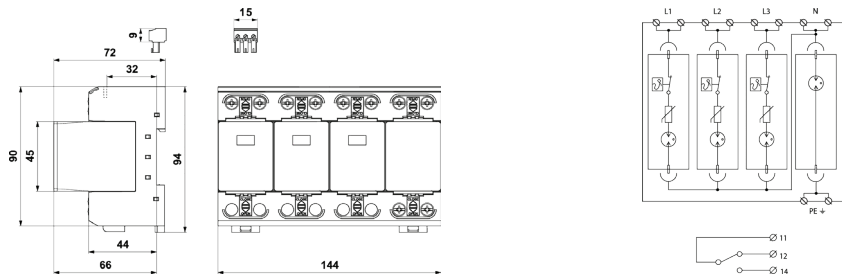
KM1+2-25-4+0 SC

PAGE SPD:29

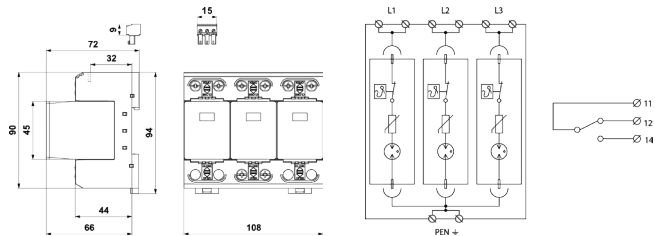


KM1+2-25-3+1 SC

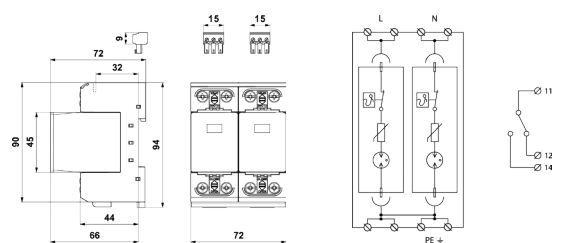
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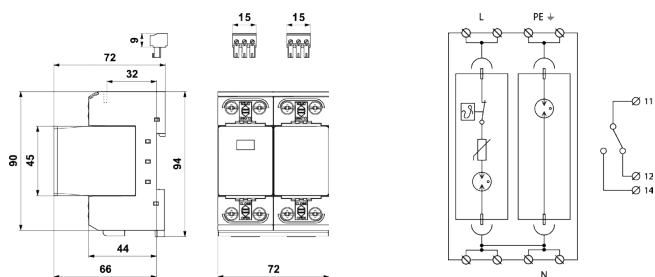
KM1+2-25-3+0 SC PAGE SPD:31



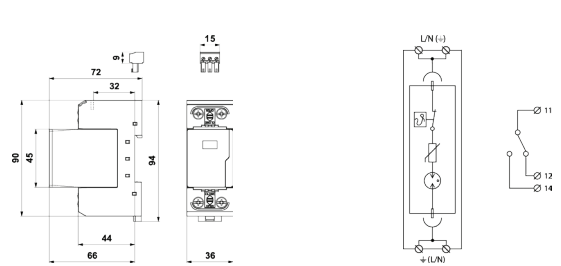
KM1+2-25-2+0 SC PAGE SPD:32



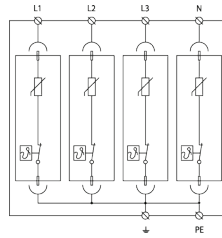
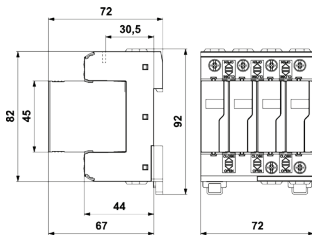
KM1+2-25-1+1 SC PAGE SPD:33



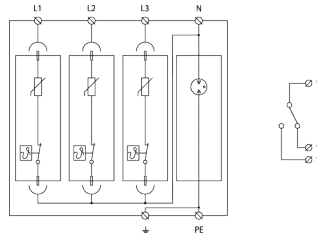
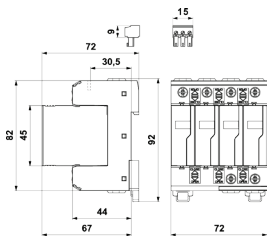
KM1+2-25-1+0 SC PAGE SPD:34



12.5kA combined Type 1 & 2 lightning current and surge arresters

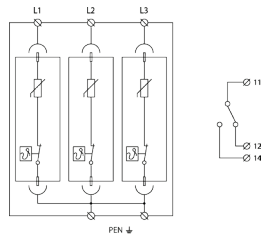
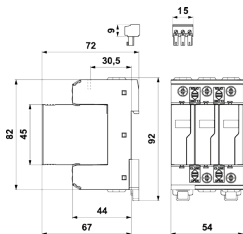


KM1+2-12.5-4+0 SC
PAGE SPD:35

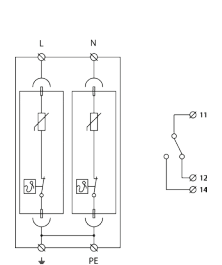
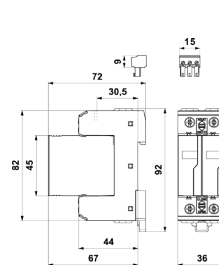


KM1+2-12.5-3+1 SC
PAGE SPD:36

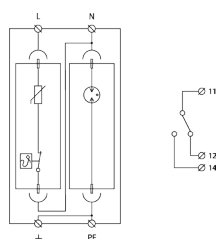
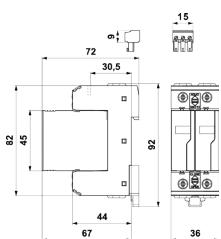
KM1+2-12.5-3+0 SC PAGE SPD:37



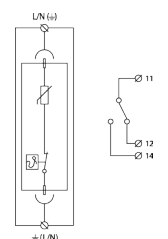
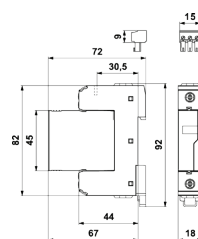
KM1+2-12.5-2+0 SC PAGE SPD:38



KM1+2-12.5-1+1 SC PAGE SPD:39



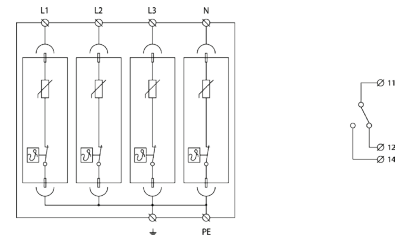
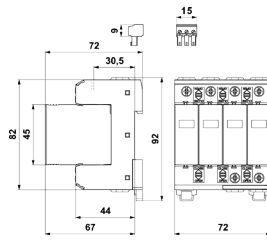
KM1+2-12.5-1+0 SC PAGE SPD:40



20kA Type 2 surge arresters

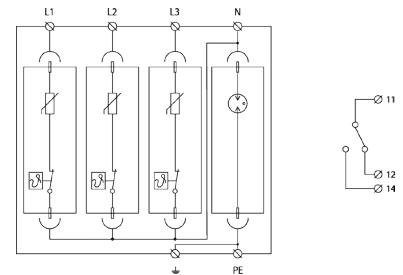
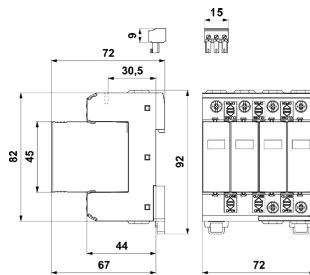
KM2-20-4+0 SC

PAGE SPD:41



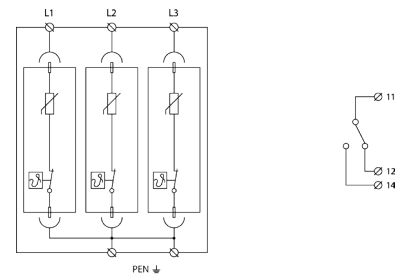
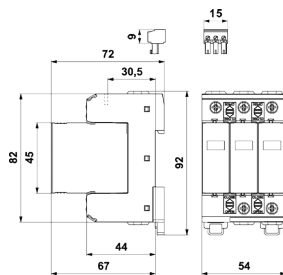
KM2-20-3+1 SC

PAGE SPD:42



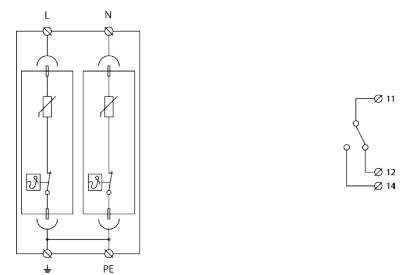
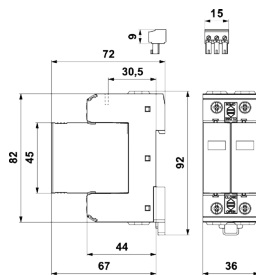
KM2-20-3+0 SC

PAGE SPD:43



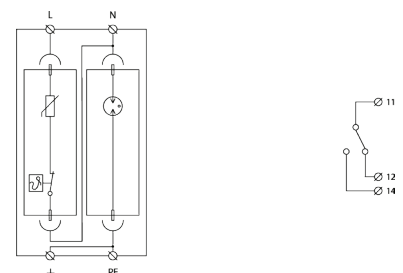
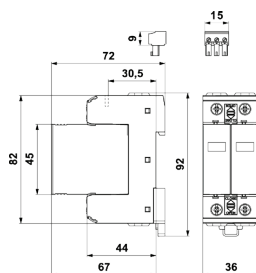
KM2-20-2+0 SC

PAGE SPD:44

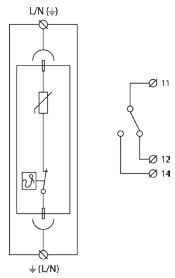
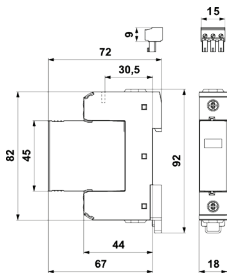


KM2-20-1+1 SC

PAGE SPD:45

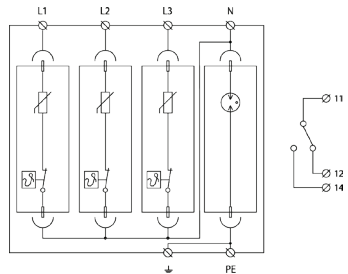
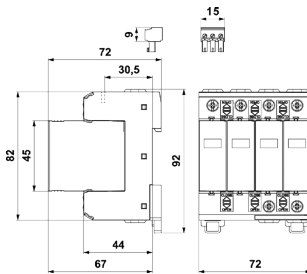


20kA Type 2 surge arresters

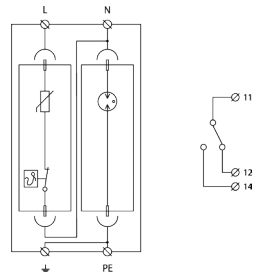
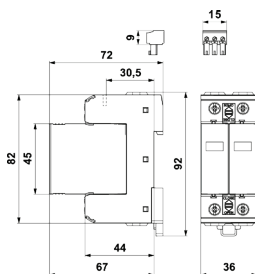


KM2-20-1+0 SC
PAGE SPD:46

10kA Type 3 surge arresters

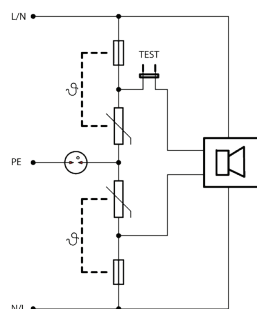
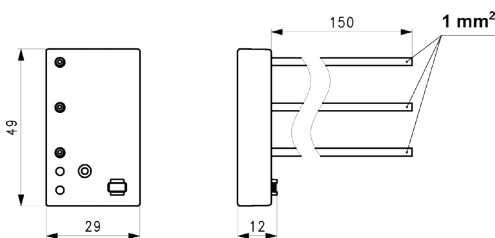


KM3-10-3+1 SC
PAGE SPD:47



KM3-10-1+1 SC
PAGE SPD:48

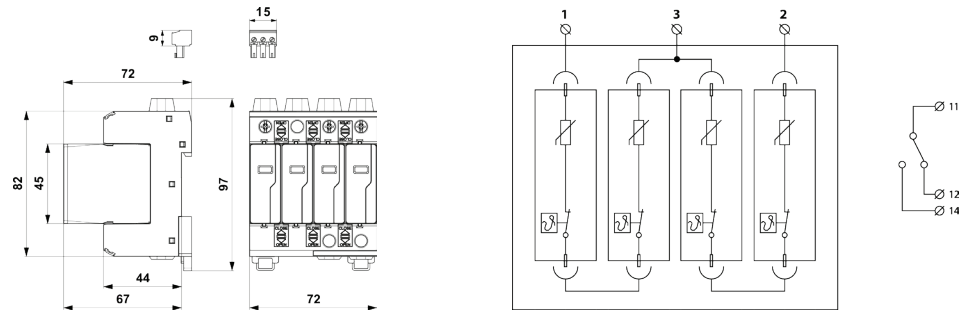
2kA Type 3 surge protection module



KM3-275-A
PAGE SPD:49

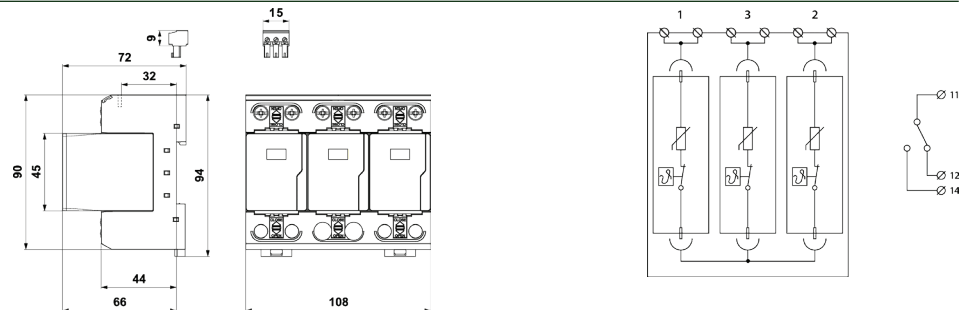
Type 1+2 surge arrester - 'U' connection

KM-FLP-PV500 V/U S
PAGE SPD:57



Type 1+2 surge arrester - 'Y' connection

KM-FLP-PV1000 VS/Y
PAGE SPD:58



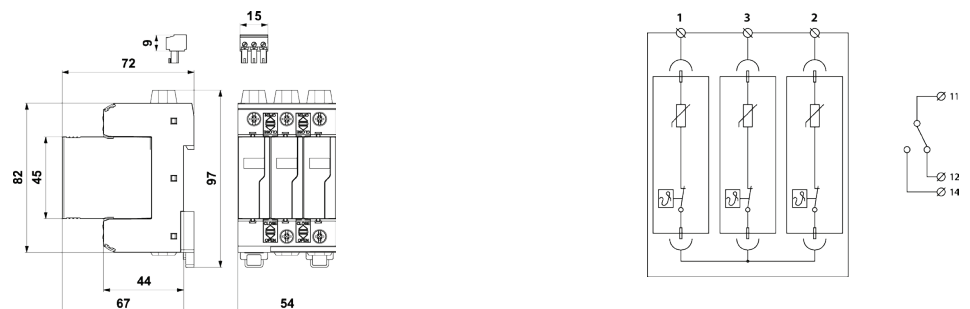
Type 2 surge arrester 'U' connection

KM-SLP-PV170 V/U S
KM-SLP-PV500 V/U S
PAGE SPD:59

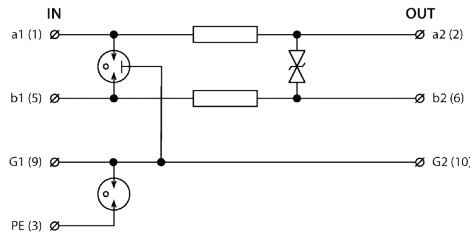
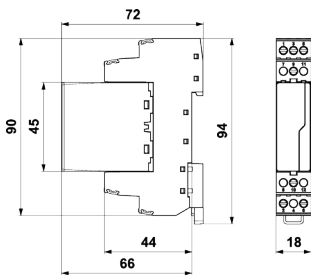


Type 2 surge arrester 'Y' connection

KM-SLP-PV700 V/Y S
KM-SLP-PV1000 V/Y S
KM-SLP-PV1500 V/Y S
PAGE SPD:60

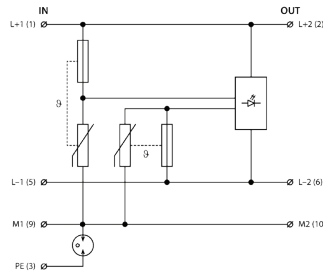
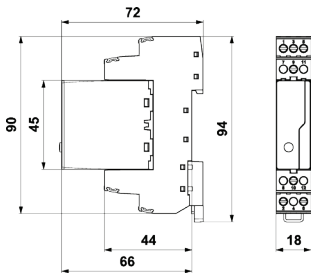


Surge arrester for data, signal and telecoms (screw terminals)



KM-BDG-230-V/1-FR1
PAGE SPD:72

Surge arrester for low voltage AC/DC power supplies (screw terminals)



KM-DP-048-V/1-F16
PAGE SPD:73

Declaration of SPDs coordination

Type 1+2	co-ordinated with	Type 2	co-ordinated with	Type 3
KM1+2-25-1 SC		KM2-20-1 SC		KM3-10-1+1 SC
KM1+2-25-3 SC		KM2-20-3 SC		KM3-10-1+1 SC
KM1+2-25-1 SC				KM3-10-1+1 SC
KM1+2-25-3 SC				KM3-10-1+1 SC
KM1+2-25-1 SC		KM2-20-2+0 SC		KM3-10-1+1 SC
KM1+2-25-3 SC		KM2-20-4+0 SC		KM3-10-3+1 SC
KM1+2-25-1 SC		KM2-20-1+1 SC		KM3-10-1+1 SC
KM1+2-25-3 SC		KM2-20-4+0 SC		KM3-10-3+1 SC
KM1+2-25-2+0 SC		KM2-20-2+0 SC		KM3-10-1+1 SC
KM1+2-25-4+0 SC		KM2-20-4+0 SC		KM3-10-3+1 SC
KM1+2-25-1+1 SC				KM3-10-1+1 SC
KM1+2-25-3+1 SC				KM3-10-3+1 SC
KM1+2-25-1+1 SC		KM2-20-2+0 SC		KM3-10-1+1 SC
KM1+2-25-3+1 SC		KM2-20-4+0 SC		KM3-10-3+1 SC
KM1+2-25-1+1 SC		KM2-20-1+1 SC		KM3-10-1+1 SC
KM1+2-25-3+1 SC		KM2-20-3+1 SC		KM3-10-3+1 SC
KM1+2-25-1 SC		KM2-20-1 SC		
KM1+2-25-3 SC		KM2-20-3 SC		
		KM2-20-1 SC		KM3-10-1+1 SC
		KM2-20-3 SC		KM3-10-1+1 SC
		KM2-20-2+0 SC		KM3-10-1+1 SC
		KM2-20-4+0 SC		KM3-10-3+1 SC
KM1+2-25-1+1 SC		KM2-20-2+0 SC		
KM1+2-25-3+1 SC		KM2-20-4+0 SC		
KM1+2-25-1+1 SC		KM2-20-1+1 SC		
KM1+2-25-3+1 SC		KM2-20-3+1 SC		
		KM2-20-1+1 SC		KM3-10-1+1 SC
		KM2-20-4+0 SC		KM3-10-3+1 SC