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Lightning & Surge Protection arrangements in Integrated Power Supply for Signalling Installations

CAMTECH/S/PROJ/SP1A/2022-23 April 2022

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End User – SSE/JE (Signal) & Signal Maintainers of Indian Railways

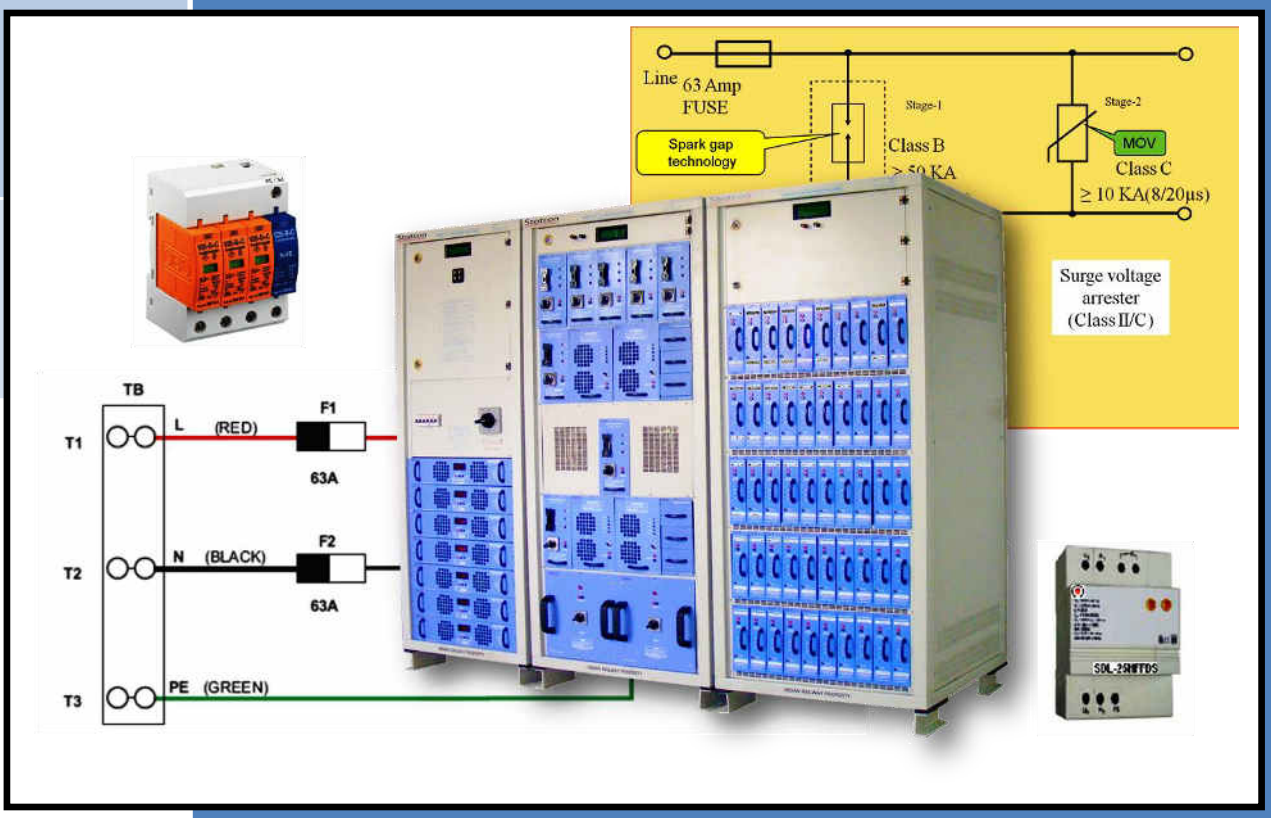

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Table of Contents

Table of Figures

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Lightning & Surge Protection arrangements in Integrated Power Supply for Signalling installations

1.1 Introduction

Lightning occurs throughout the world, but some areas receive far more lightning than others.

A single direct strike can result in physical damage to the structure which may result fire, loss of product, damage to infrastructure, communications downtime and loss of life. Lightning also poses unacceptable risks for electronics and communication systems.

A **surge** is a very short burst of voltage, which if not suppressed, can cause equipment failure or lockup. The duration of surge is less than 1/1000 of a second.

Surges are induced in nearby AC power lines due to cloud to cloud and cloud to ground strikes.

Surges are also generated due to self-inductance whenever power is switched on or off during a non-zero crossing point of the sine wave.

1.2 Protection of S&T equipments

Nowadays almost all equipments/systems used in S&T department include the electronic devices which operate on low voltages. **Integrated Power Supply (IPS)** used for Signalling is one such system The low voltage equipments e g. UPS, Battery Charger, Inverter, control systems, etc are provided with surge components like MOVRs avalanche diodes, gas discharge tubes etc. inside the equipments. The internally used surge protection components prove to be inadequate towards the surge protection solution. Hence to protect these devices from transient over voltages produced due to lightning, switching of inductive loads, ignition and interruption of electronic arcs etc., suitable surge protection arrangement is required to be done at different levels.

1.3 Surge protection devices (SPDs)

Surge Protection Devices can protect the electronic equipment from the potentially destructive effects of high-voltage transients.The Surge Protection Devices have following features:

1. Rapid operation,
2. Accurate voltage control and
3. Automatic resetting once the over-voltage has ceased.

1.3.1 Function of SPD

Surge protection devices should ideally operate instantaneously to divert a surge current to ground with no residual common-mode voltage presented at the equipment terminals.

Once the surge current has subsided, the SPD should automatically restore normal operation and reset to a state ready to receive the next surge.

1.3.2 Types of SPDs

There are a number of Surge Protection Devices of which the most commonly used are:

- Air or Carbon Sparks Gaps
- Gas discharge tubes (GDTs),
- Voltage-clamping diodes or Zener Diodes
- Metal-oxide varistors (MOVs)
- Fuses
- Ciruit breakars

A comparative table is given below for above protection devices

Component	Speed of response	Level of protection	Energy handling capability	Stability
GD tube	Fast (Micro-secs)	Fair	High	Fair
Air gap	Fast	Poor	High	Poor
Surge relay	Slow (Milli-secs)	Good	High	Good
Carbon gap	Fast	Poor	High	Poor
Zener diode	Very Fast	Very good	Low	Very good
Circuit breakers	Slow	Fair	High	Fair
Fuses	Very slow	Good	High	Fair
Metal oxide varistors	Very Fast	Fair	High	Poor

As can be seen from the table no single device can offer all the best requirements of the lightning protections. It is generally necessary to use more than one type of the above components in a protective network to obtain the best possible combination of desirable characteristics.

1.3.4 SPD parameters

Following parameters are taken into consideration for the performance of SPDs:

Nominal voltage (U_n)
It corresponds to the nominal voltage of the system to be protected. The nominal voltage is indicated in case of surge protective devices for IT installations for type designation purposes. For AC voltages it is indicated as RMS value.

Max. Continuous Voltage (U_c)
It is the Root Mean Square (RMS) value of maximum voltage which may be applied to the correspondingly marked terminals of the surge protective device during operation. It is the maximum voltage on the SPD in the defined non-conductive state which ensures that this state is regained after response and discharge.

Nominal Load Current (Nominal Current) (I_L)
It is the highest permissible operating current which may be permanently conducted via the correspondingly marked terminals.

Nominal Discharge Current (I_n)
It is the peak value of an impulse current, waveform 8/20 micro-sec (μs), which the surge protective device rated for, according to a certain test programme.

Max. Discharge Current (I_{max})
It is the max. peak value of the impulse current 8/20 micro-sec (μs), which can be safely discharged by the device.

Lightning Impulse Current (I_{imp})
It is the standardized impulse current curve, with a waveform 10/350 micro-sec (μs). Its parameters (peak value, charge, specific power) simulate the loads of natural lightning currents and combined lightning current and surge protectors must be capable of discharging such lightning impulse currents several times without consequential damage to the equipment.

Voltage Protection Level (U_p)
The voltage protection level of a surge protective device is the max. instantaneous value of the voltage on the terminals of a surge protective devices.

N-PE Surge Arrestors
These are surge protective devices exclusively designed for installation between the N and PE conductor.

Operating Temperature Range
This indicates the range where the devices can be used. In case of devices without self-heating, it is equal to the ambient temperature range. The temperature rise at devices with self-heating, must not exceed the max. value indicated.

Response time t_A
Response times generally characterize the response performance of the individual protection elements used in surge protective devices.

Swell
A momentary voltage increase of the power line voltage, lasting up to several seconds.

Transient
An abnormal over voltage of micro-second duration. Also called a surge or spike.

1.4 Lightning protection levels

1.4.1 Protection against the lightning on the structure housing the equipment

This type of protection is classified under Class 'A' protection.

Class 'A' protection

- This is provided with an external lightning conductor on top of the building connected through a down conductor to ground (EARTH). This is known as class 'A' protection.

- By this arrangement 50% of lightning energy is connected to ground. Depending on the area, size of the structure to be protected and the type of protection varies.

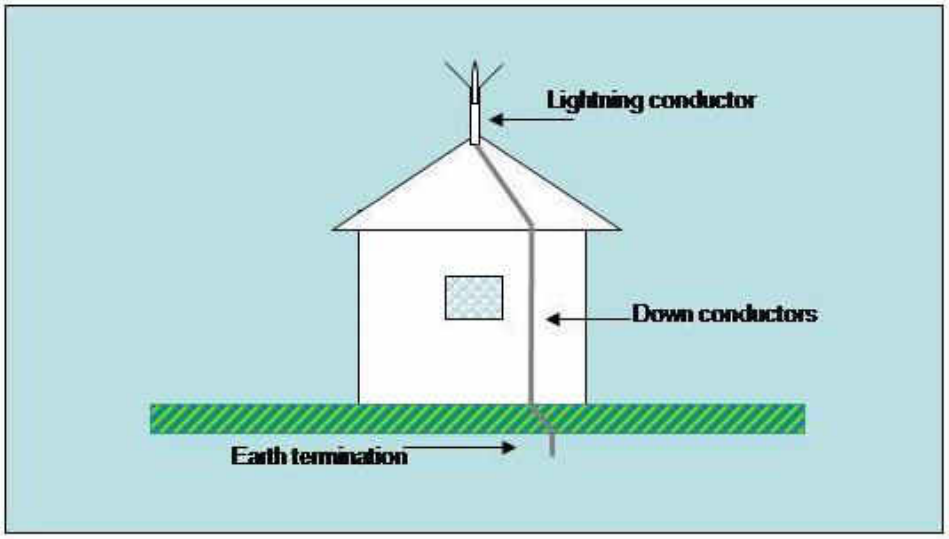

Figure 1 : Class A protection

1.4.2 Power line protection

The power line of electronic signalling equipment shall have Class B & C type 2-stage protection. Stage 3 protection is also required for protection of power/signaling/data lines. Class 'B' and class 'C' type protection devices shall preferably be pluggable type to facilitate easy replacement.

(A) Stage 1 (Power Line Protection at Distribution level)
Class 'B' protection

- The first stage of protection provided before the equipment at mains distribution panel is called class 'B' type.
- This type of protection shall be provided against Lightning Electromagnetic Pulse (LEMP) and other high surges at the power distribution panel.
- The modules shall have an indication function to indicate the life and failure mode to facilitate the replacement of failed SPDs
- The device is a Spark gap type and operate on arc chopping principle and designed to handle lightning current pulses of 10/350 µs.

Figure 2 : A Class B SPD

(B) Stage 2 (Power Line Protection at Equipment level)
Class-'C' Protection

This type of protection is provided against low voltage surges at the equipment input level connected between line and neutral.

The device is a single compact varistor (MOV) which have following additional features:

- Indication (shows red) when device failed.
- Thermal disconnection of device when it starts having heavy leakage current due to ageing / handling several surges.
- Potential free contact for remote monitoring.

A number of MOVs shall in no case be provided in parallel.

Figure 3 : A Class C SPD

(C) Stage 3 (Protection for Power/Signalling/data lines)

All external Power/Signalling/data lines (AC/DC) shall be protected by using preferably pluggable stage 3 surge protection devices which consists of a combination of varistors/suppressor diodes and GD tube with voltage and current limiting facilities.

(D) Protection of Power line

Class 'D' protection

The device for power line protection shall be of Class D type.

This has an indication function to indicate the prospective life and failure mode to facilitate the replacement of failed SPDs.

The device is thermal disconnecting type and equipped with potential free contact for remote monitoring.

It consists of a combination of MOVs and GD tube. This should have all the features as mentioned above for Class 'C' device.

All external data/signaling (AC/DC) lines connected to electronic equipment should be protected by this arrangement.

One exception where Class "D" device should not be provided is the cable conductors carrying signal lighting feed as leakage in MOVs due to ageing will have adverse effect on working of Lamp Proving Relays (ECRs).

Figure 4 : A Class D SPD

(E) Signalling/Data line protection

These devices shall preferably have an indication function to indicate the prospective life and failure mode to facilitate the replacement of failed SPDs.

If the device has any component which comes in series with data/signaling lines, the module shall have "make before break" feature so that taking out of pluggable module does not disconnect the line.

If power supply/data/signalling lines (AC/DC) are carried through overhead wires or cables above ground to any nearby building or any location outside the equipment room, additional protection of Stage 2 (Class C) type shall be used at such locations for power supply lines and Stage 3 protection for signal/data lines.

1.5 Lightning & Surge Protection of IPS installation

(Ref.: RDSO Specification no. RDSO/SPN/165/2012)

- IPS system is provided with Class B and Class C type two stage protection.
- Co-ordinated type B & C arrestor shall be provided in a separate enclosure in IPS room adjacent to each other. This enclosure should be wall-mounting type.
- Class B protection devices (LPD) protect the IPS against lightning. This is separate module of wall mounting type, which is to provided at the power-input point in the IPS room. These devices are of encapsulated type and have self-arc quenching facility.
- Class C protection devices (SPD) are also provided in the LPD Module of wall mounting type. Potential free contacts are provided for failure monitoring of the devices.
- Potential free contacts are provided for health monitoring of SPD and the same can be wired to ASM room or any other place required for monitoring the healthiness of SPDs.

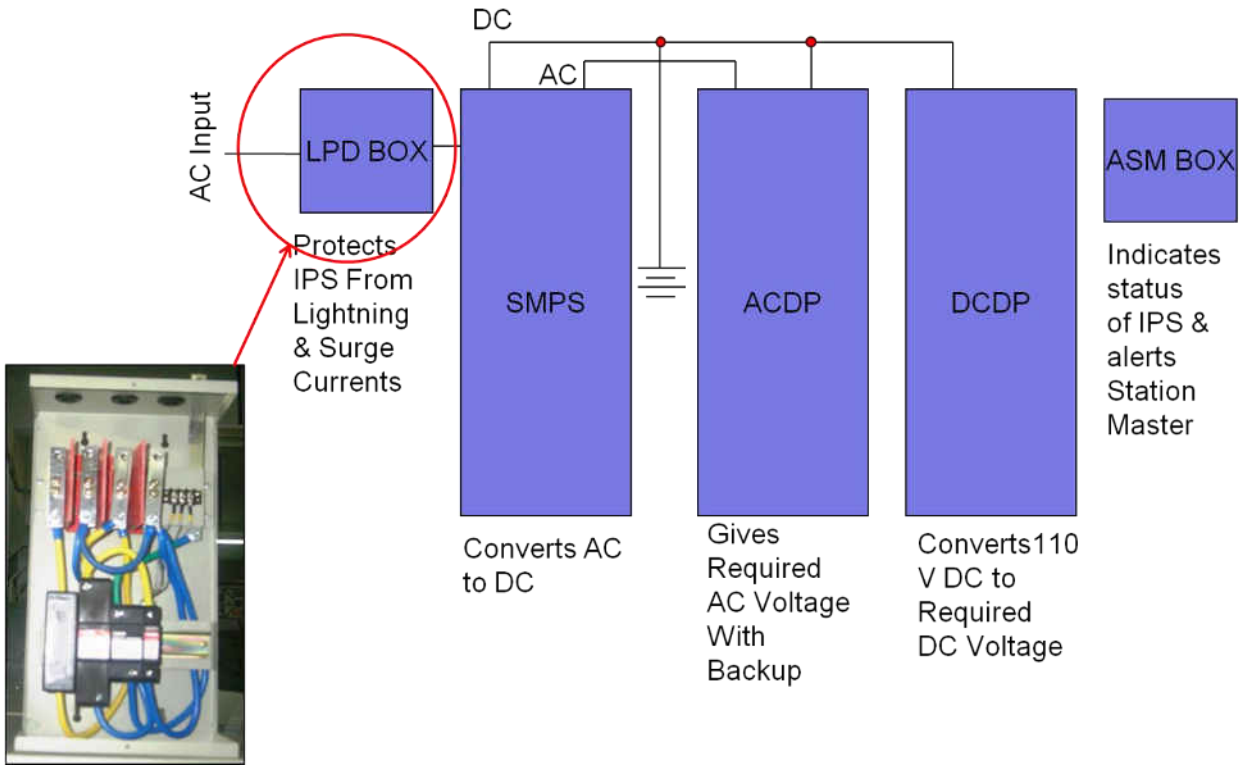

Figure 5 : Connection of LPD box to IPS

- Length of all cable connection from input supply and earth busbar to SPDs shall be minimum possible. This shall be ensured at installation time. The connections shall be as shown in *Figure 6* & *Figure 7*.

- Stage 1 and stage 2 (Class B & C) protection should be from the same manufacturer/supplier. IPS manufacturer shall provide Stage 1 & stage 2 protection along with IPS. Stage 3 protection shall be provided by Railways.
- The cross sectional area of the conductor for first stage protection shall not be less than 16 sq mm and for second stage shall not be less than 10 sq mm.

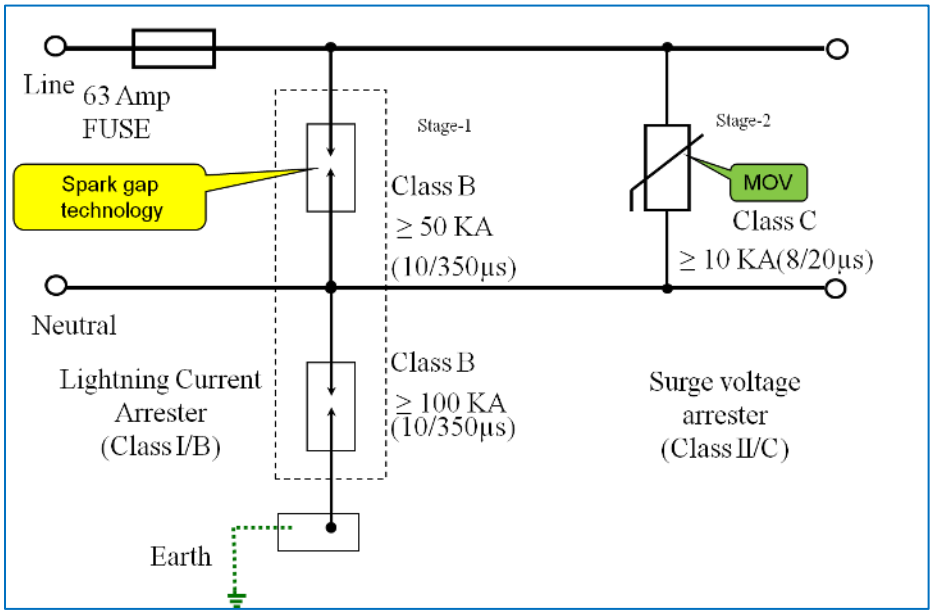

Figure 6 : Functional Block diagram of LPD & SPD

10/350µs means a transient that rises in 10 micro seconds and decays to a 50% value in 350 micro seconds (same applies to 8/10 µs)

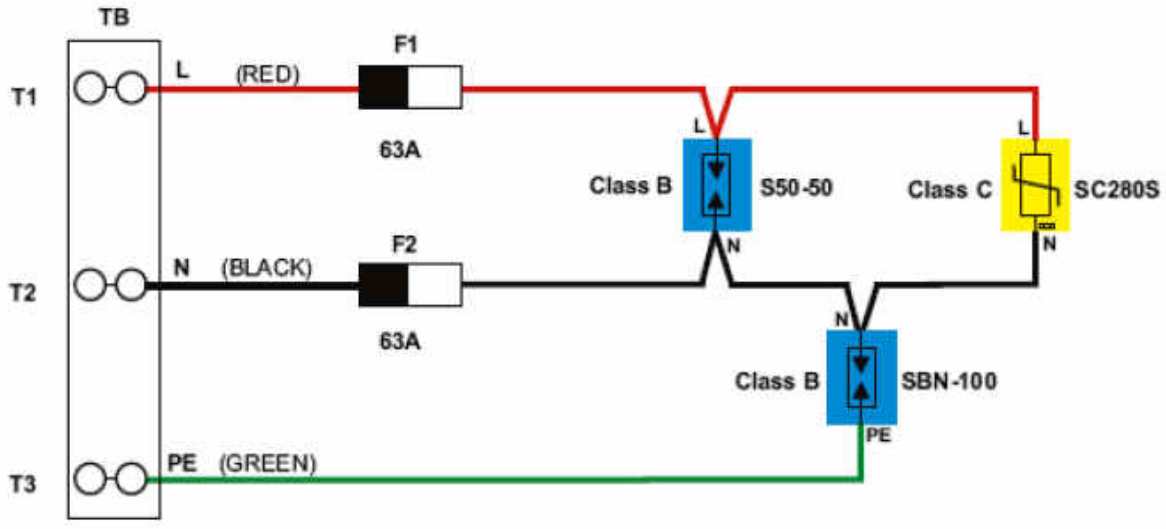

Figure 7 : Connection of LPD & SPD at distribution and equipment level of IPS

Figure 8 : Inside view of LPD box

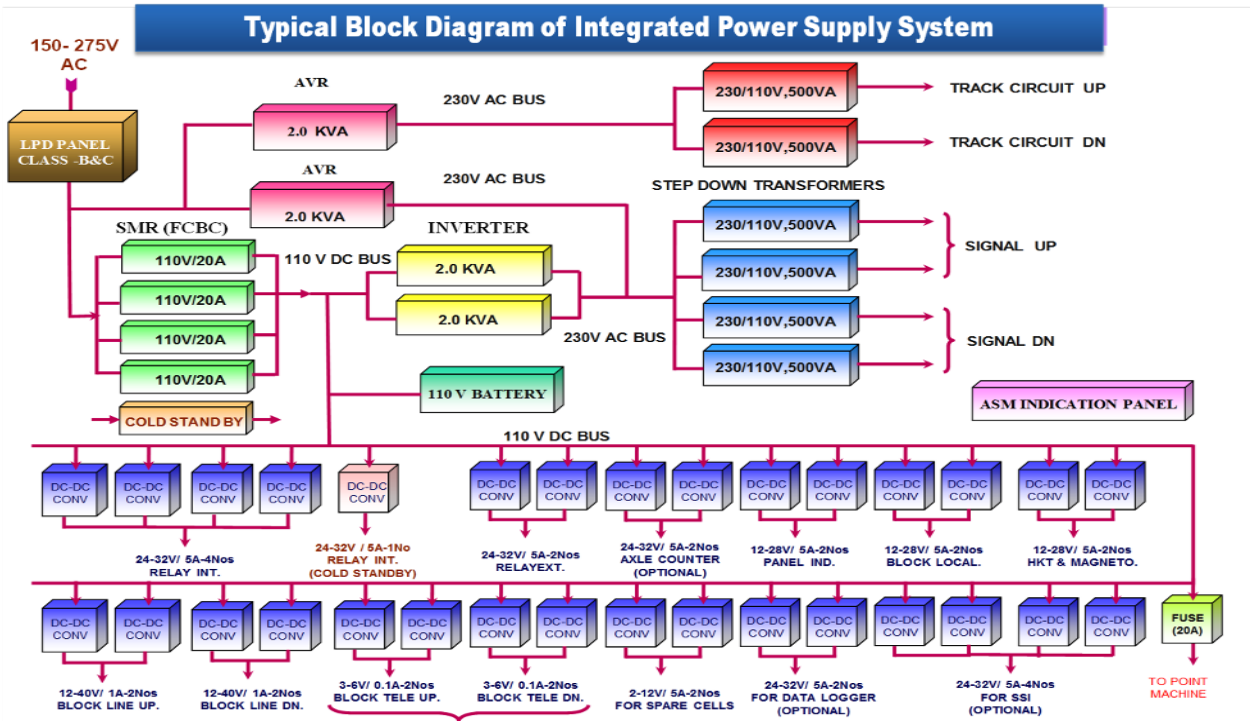

Figure 9 : A typical block diagram of IPS system

1.5.1 Stage 1 Protection (at the entry point of input 230V AC supply in the power/ equipment room)

(a) The Stage 1 protection shall consist of coordinated Class I/ B & II/ C type SPDs at the entry point of input 230V AC supply in Power /Equipment room in TT configuration in a separate wall mountable box. The Class I/B SPD shall be provided between Line to Neutral & Neutral to Earth. They shall be spark gap type voltage switching device and tested as per IEC 61643 with the following characteristics and features

Sr. No.	Parameter	Value/Limit	
		Line & Neutral	**Neutral & Earth**
1.	Nominal voltage (U0)	230 V	230 V
2.	Maximum continuous operating voltage (Uc)	≥255 V	≥255 V
3.	Lightning impulse current between 10/350ms (Imp)	≥25 kA	≥50 kA
4.	Response time (Tr)	≤ 100 n sec.	≤ 100 n sec
5.	Voltage protection level (Up)	≤ 2.5 kV	≤ 2.5 kV
6.	Short circuit withstand and follow up current extinguishing capacity without back-up fuse (Isc & Ifi)	≥ 3 kA	≥ 100 kA
7.	Temporary Over Voltage (UT)	334V min. for 05 secs.	1200V min. for 200ms
8.	Operating temperature / RH	-25ºC to +80°C/ 95%	-25ºC to +80°C/ 95%
9.	Mounted on	DIN rail	DIN rail
10.	Indication	Mandatory	Optional
11.	Pluggability	Optional	Optional
12.	Potential free contact for remote monitoring	Optional	Optional
13.	Encapsulation	Encapsulated	Encapsulated
14.	Degree of protection	IP20	IP20
15.	Housing	Fire retardant as per UL 94	Fire retardant as per UL 94

(b) The Class I/ B SPD will be followed by Class II/ C SPD adjacent to it and connected between Line & Neutral. The device shall be a single compact varistor of proper rating and in no case a number of varistors shall be provided in parallel. It shall be voltage clamping device, thermal disconnecting type and shall be tested as per IEC 61643 with the following characteristics and features:

Sr. No.	Parameter	Limits (Between Line & Neutral)
1.	Nominal voltage (U0)	230 V
2.	Maximum continuous operating voltage (Uc)	≥ 300 V
3.	Nominal discharge current 8/20 µs (In)	≥ 10 kA
4.	Maximum discharge current 8/20 µs (Imax)	≥ 40 kA
5.	Response time (Tr)	≤ 25 n sec.
6.	Voltage protection level (Up)	≤ 1.5 kV
7.	Operating temperature / RH	-25ºC to +80°C/ 95%
8.	Mounted on	DIN rail
9.	Indication	Mandatory
10.	Pluggability	Mandatory
11.	Potential free contact for remote monitoring	Mandatory
12.	Degree of protection	IP20
13.	Housing	Fire retardant as per UL 94

(c) Class I/B and class II/C SPDs of Stage I shall be so coordinated that the voltage protection level of the coordinated devices is ≤ 1.5 KV. As such, these devices shall be from the same manufacturer and necessary test certificate in this regard shall be submitted by the manufacturer/ supplier.

This arrangement will provide least resistance path from line to neutral and neutral to earth when surges & lightning spikes hits the line there by bypassing the system. Earth pit resistance should be <2Ω.

1.5.2 Additional Requirement as per RDSO SPN/165/2012

Stage 2 protection (at the output side inside the distribution panel)

The Stage 2 protection shall consist of Class II/ C type SPDs for ≥24V-110V AC/DC supplies at the output side inside the rack of IPS. These shall be provided for External circuits i.e. Relay external circuit, Axle counter circuit, point machine circuit and at Inverter output. The Class II/C type SPD shall be a single compact varistor of proper rating and in no case a number of varistors shall be provided in parallel. It shall be voltage clamping device and thermal disconnecting type. They shall be tested as per IEC 61643 with the following characteristics and features:

Sr. No.	Parameter	Limits (between L1 & L2, L1 & E, L2 & E)	
		Line & Neutral	Neutral & Earth
1.	Nominal voltage (U0)	60 V-110V AC/DC	24V-60V AC/DC
2.	Maximum continuous operating voltage (Uc)	≥150 V (AC) ≥ 200V (DC)	≥75 V (AC) ≥ 100V (DC)
3.	Nominal discharge current 8/20 µs (In)	≥10 KA	≥10 KA
4.	Maximum discharge current 8/20 µs (Imax)	≥40 KA	≥40 KA
5.	Response time (Tr)	≤ 25 n sec.	≤ 25 n sec.
6.	Voltage protection level (Up)	≤ 1.0 KV	≤ 0.5 KV
7.	Operating temperature/RH	-25ºC to +80°C/ 95%	-25ºC to +80°C/ 95%
8.	Mounted on	DIN rail	DIN rail
9.	Indication	Mandatory	Mandatory
10.	Pluggability	Mandatory	Mandatory
11.	Potential free contact for remote monitoring	Mandatory	Mandatory
12.	Degree of protection	IP20	IP20
13.	Housing	Fire retardant as per UL 94	Fire retardant as per UL 94

Length of all cable connection from SPDs to earth equi-potential busbar shall be kept less than 0.5 mtrs. For this, a sub earth equi-potential busbar shall be installed at approx. 20 cm from the SPD box

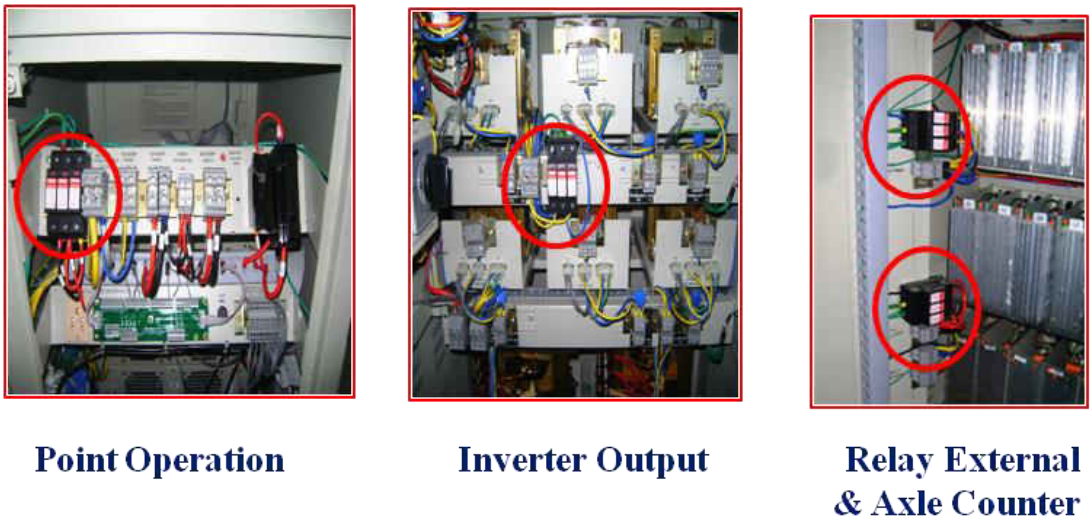

Figure 10 : Provision of Class C SPDs in common and differential mode of Point Machine circuit, Inverter output, Relay External & Axle Counter

1.6 How to identify that SPD has gone defective?

Class B SPDs work on spark gap technology. Whenever a heavy lightning surge occurs, class B SPD passes this to the earth. If the SPD is gone defective due to surges, a short circuit occurs in line & neutral. The 63 Amp fuse will be blown and this is the only indication that SPD has gone defective. Another identification is burning of SPD. Hence if lightning/surges have suspected to be occurred, check for any burning smell near LPD Box.

Class C SPD passes the lighter surges and do not affect the circuit. Through the potential free contacts, the status of SPD can be extended to the ASM Panel. In latest versions, indications are also provided on the SPD. Green indication shows SDP healthy and Red indication shows SPD is defective.

Figure 11 : Indicative type SPD

Figure 12 : Non-indicative type SPD

1.7 Checks during periodical maintenance

Ref.: Annexure 16-MS1, Appendix –I of Signal Engineering Manual July 2021 (Maintenance Schedules)

Visual checking of the indication of SPD box/checking of non-indicative type SPD with SPD life tester (where ever available). Ensure that Potential free contact (if provided) is connected to Datalogger.

Periodicity:

Technician (Signal): Monthly

Sectional SSE/JE (Signal): Bi-Monthly

SSE (Signal)/Incharge: : Quarterly

In addition to above, SPDs should be visually checked after occurrence of each lightning strike.

1.8 References

- RDSO Specification no. RDSO/SPN/165/2012 (Ver. 3.0) for SMPS based Integrated Power Supply
- Indian Railways Signal Engineering Manual, Appendix –I Maintenance Schedules, July 2021.
- IRISET Secunderabad Presentation slides on S9 –Power Supply for Signalling
- Information on Surge Protection Devices –M/s Pentair Engineered Electrical & Fastening Solutions ERICO.
- Information on Sureg Protection Devices – M/s OBO Bettermann India Pvt. Ltd., New Delhi

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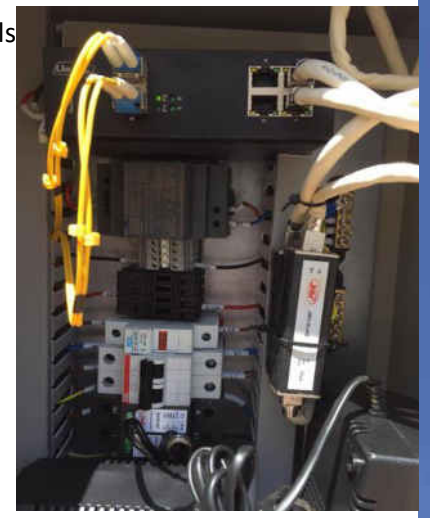

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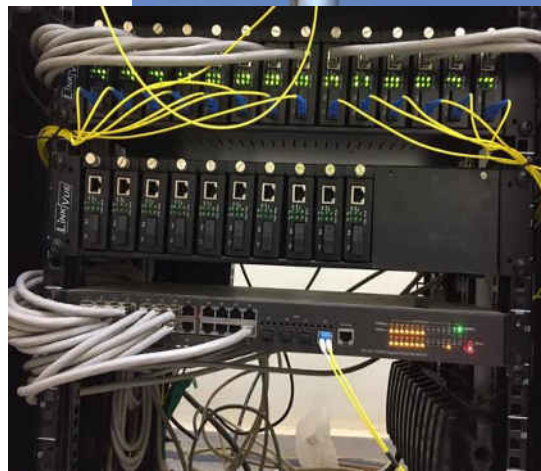

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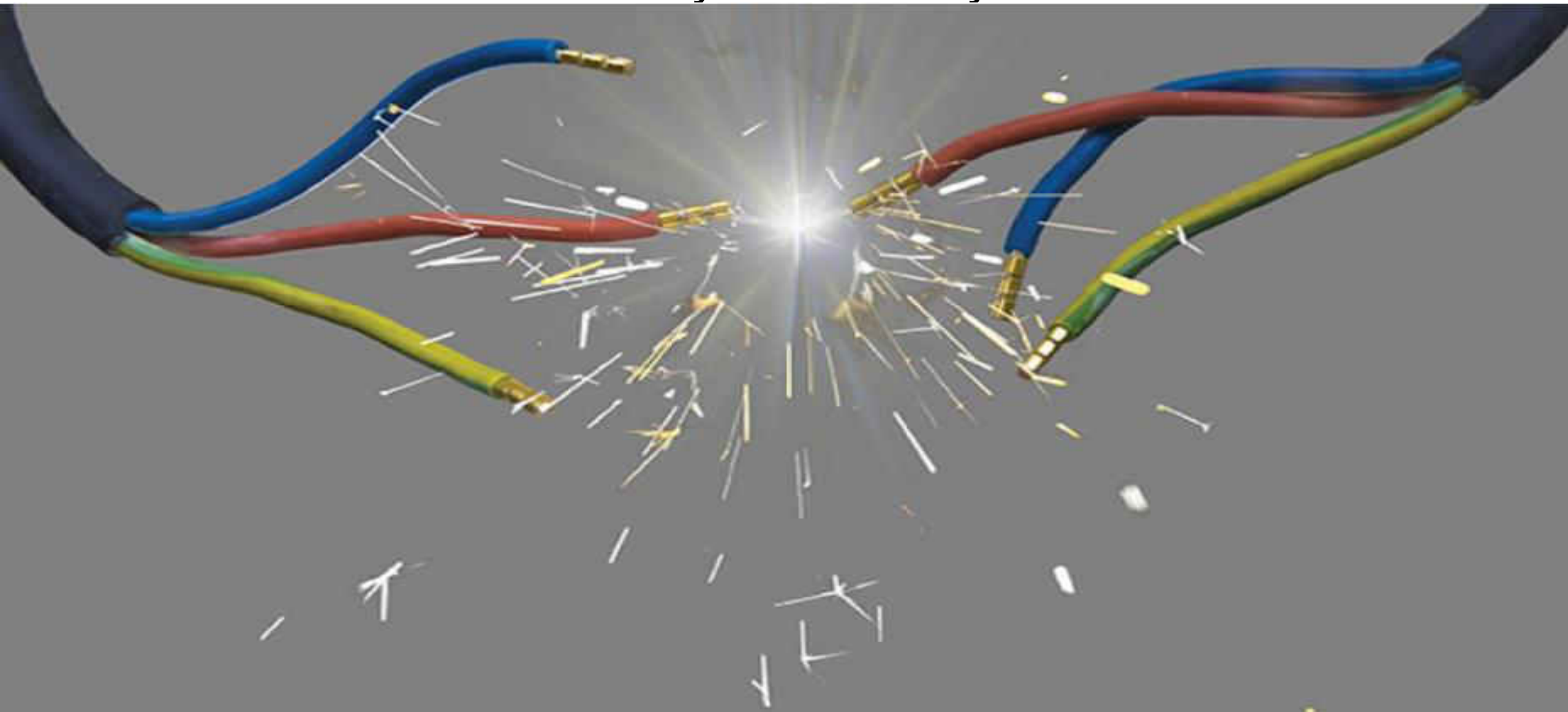

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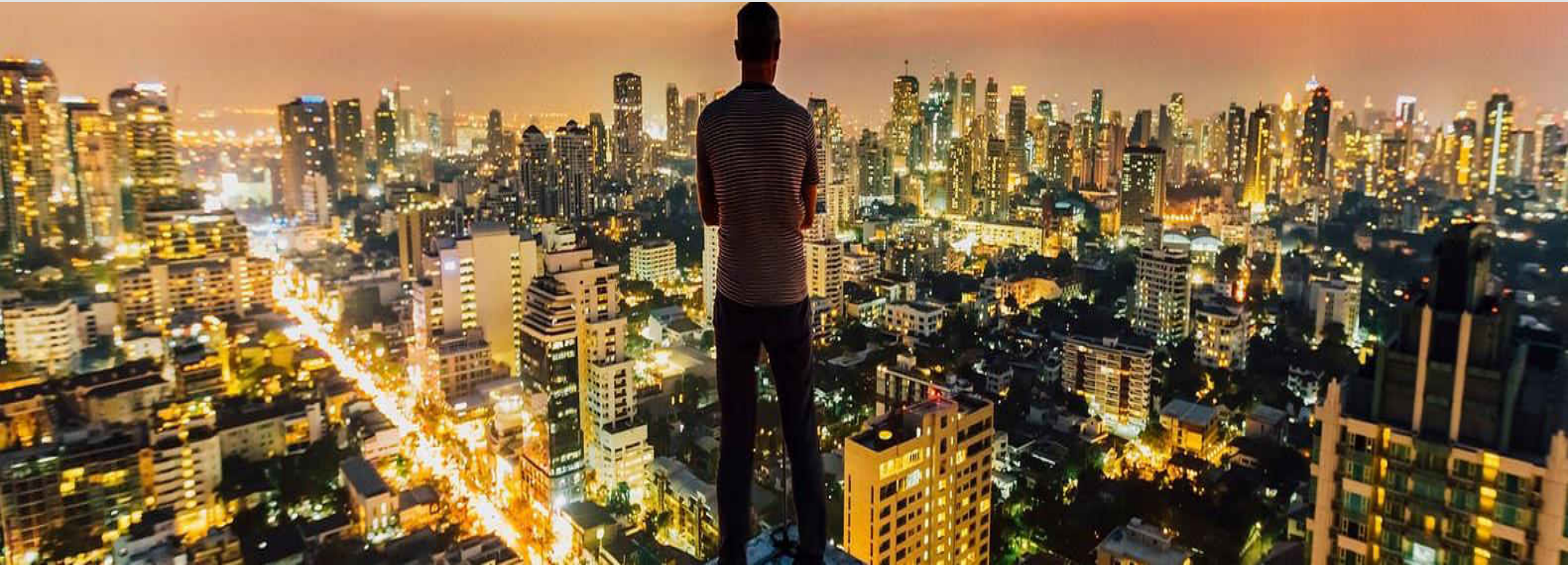

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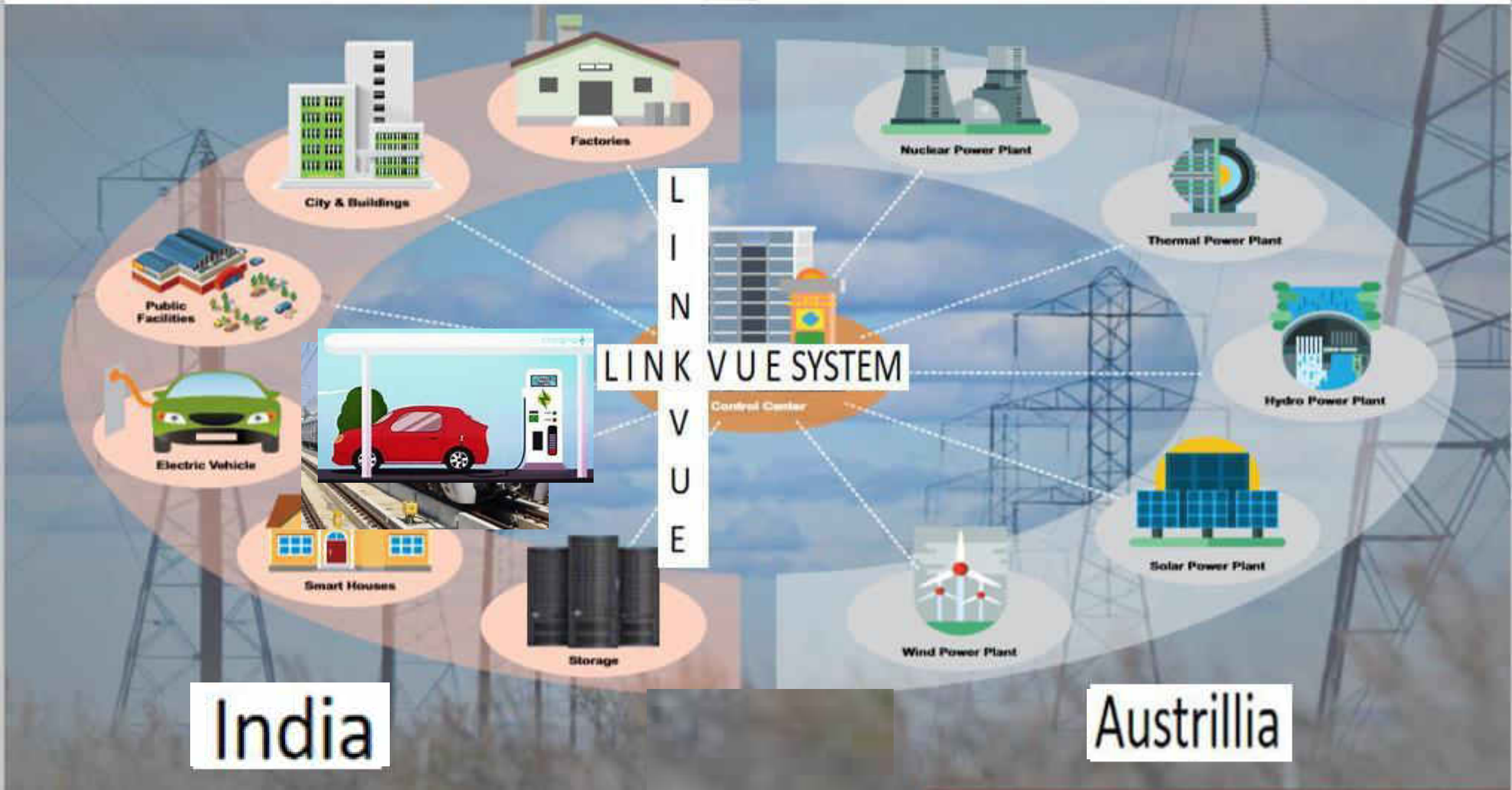

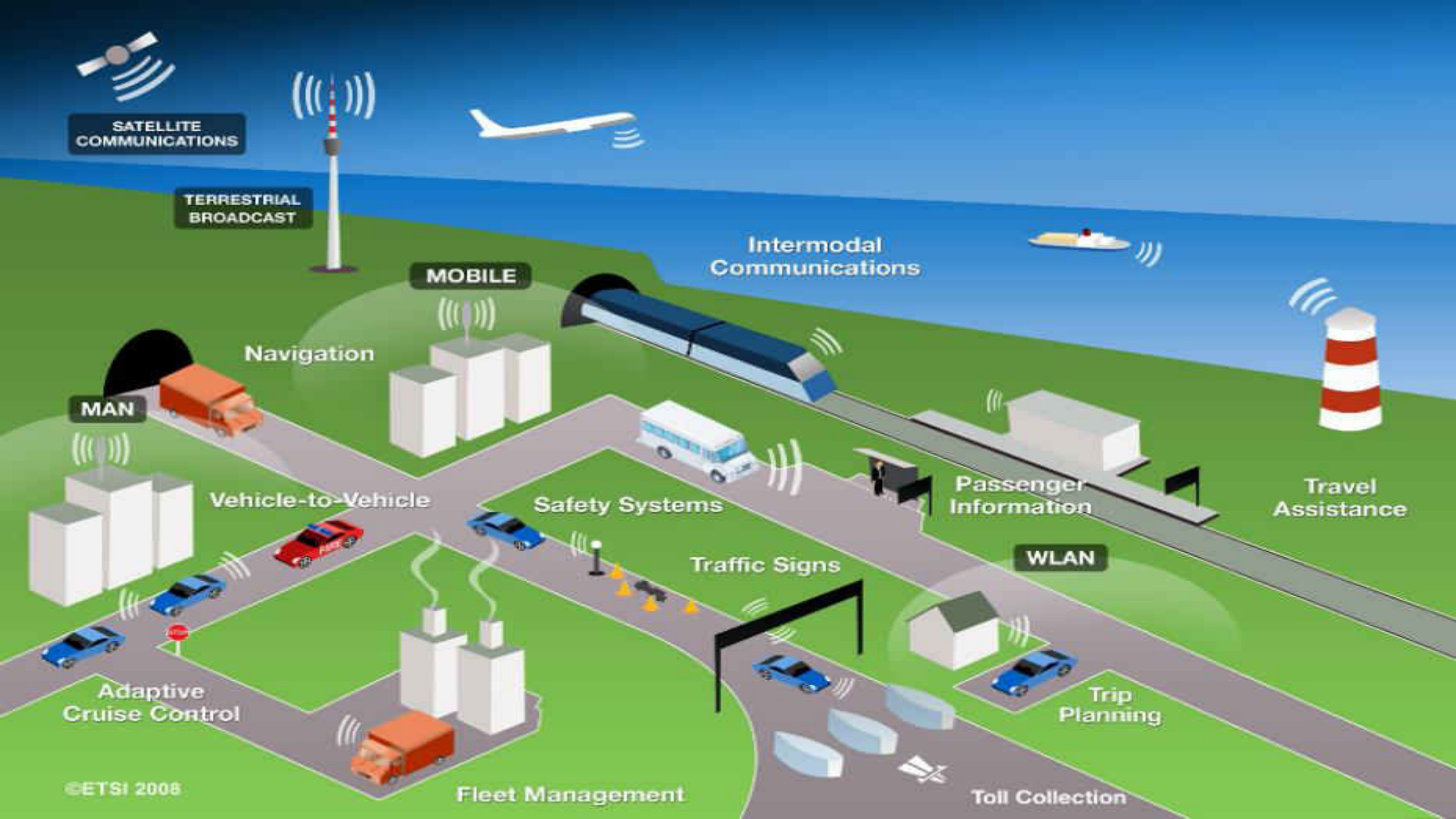
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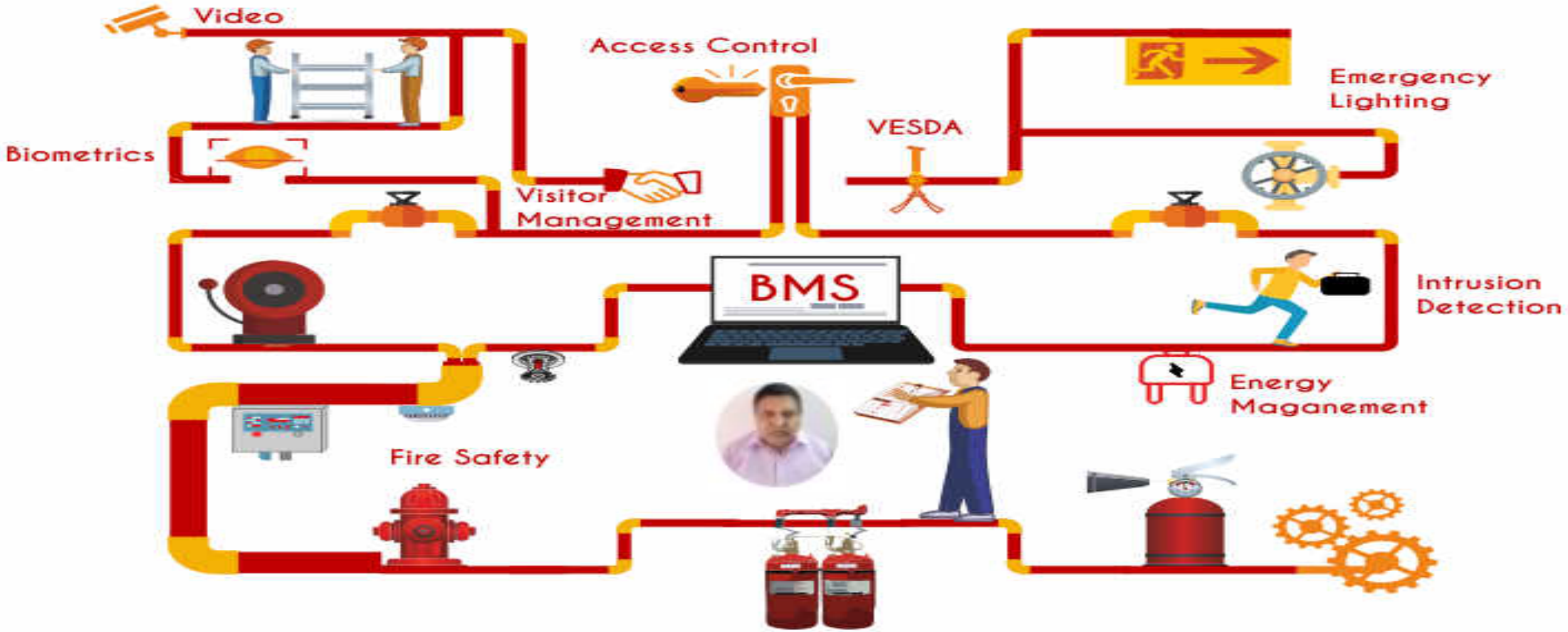

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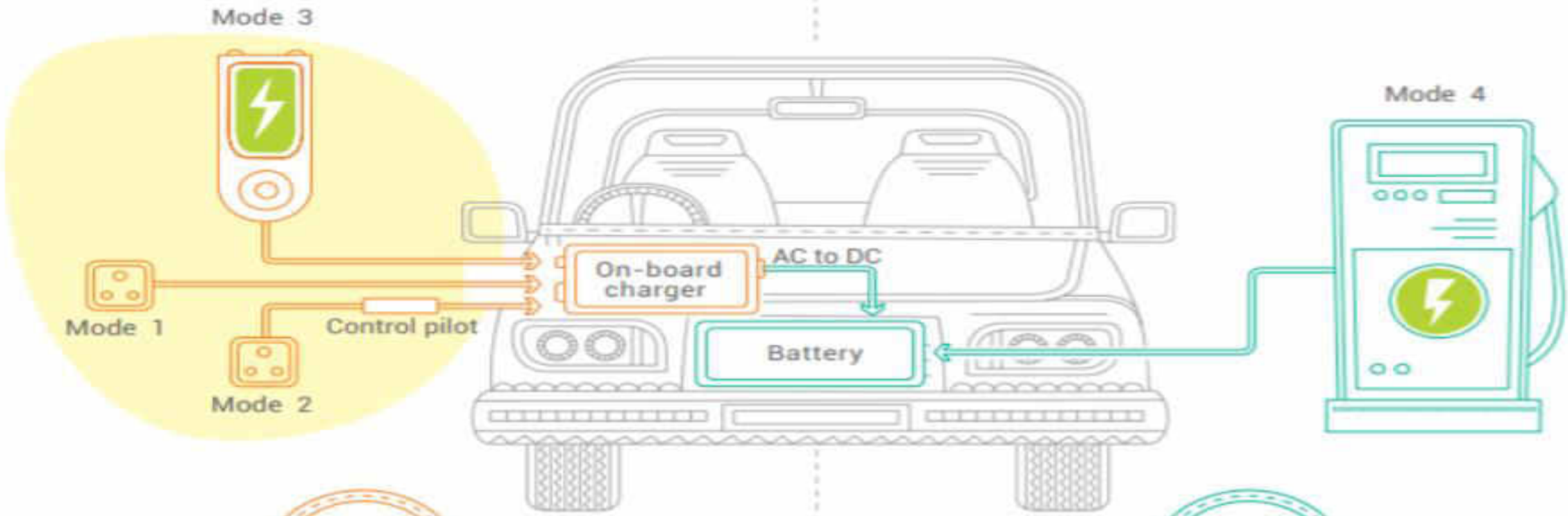

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CHAdeMo Combo 2 Type 2

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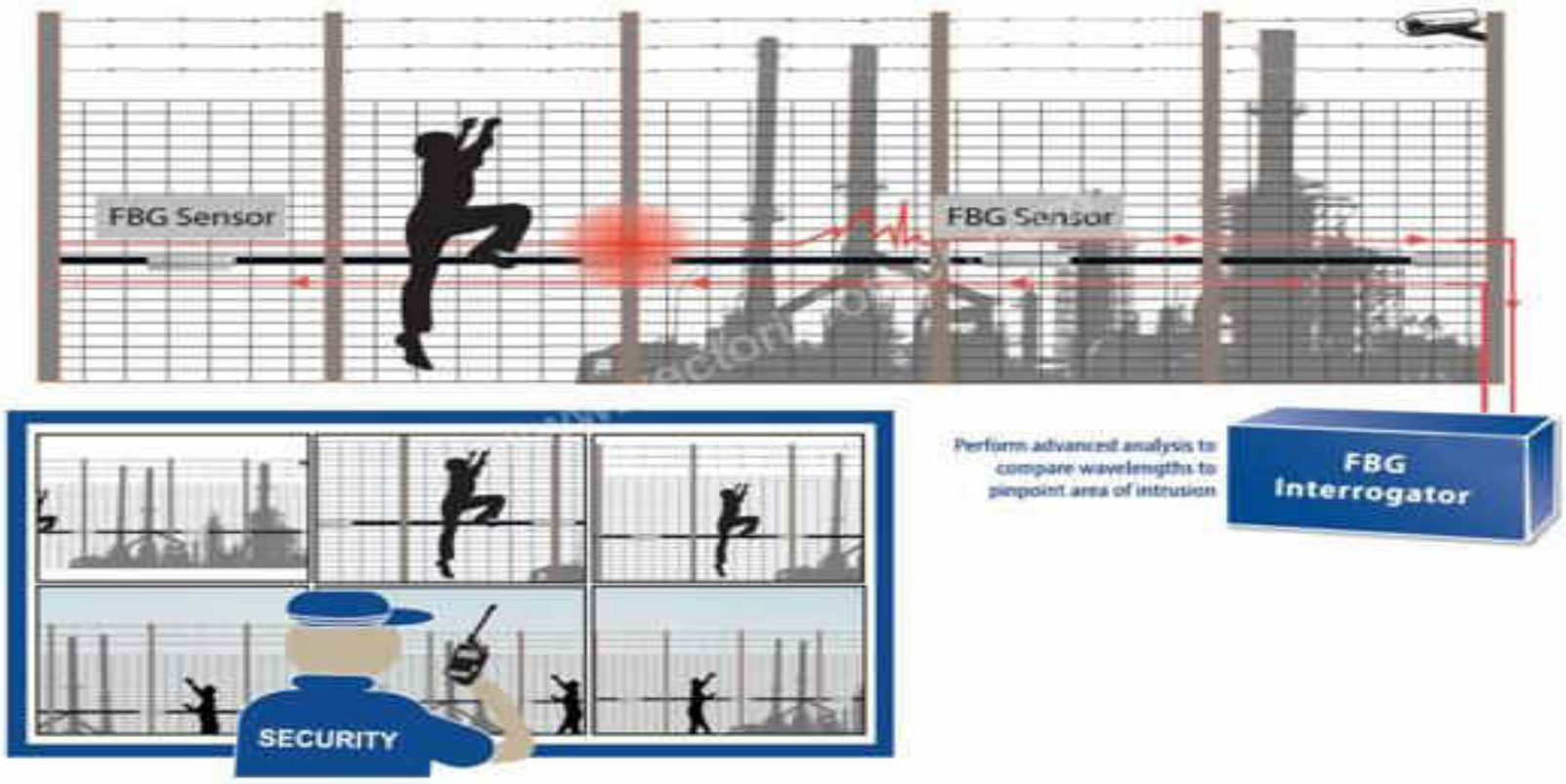
Perimeter·Intrusion·Detection·System·(PIDS)·is·designed·to·protect·assets·within·a·perimeter·by·detecting·intruders·attempting·to·gain·access·and·blocking·such·access·using·the·control·station.°Blue·Star·E&E·offers·robust·and·reliable·solutions·for·accurate·detection·of·such·unauthorised·entry·and·protection·of·assets·against·these·threats.·The·company's·turnkey·solutions·can·detect·any·unauthorised·physical·intrusions·across·the·perimeter,·assess·the·situation·and·track·intruders·for·future·actions.·Features·such·as·instant·alarm·generation·and·control·by·reporting·to·central·monitoring·station·make·it·easier·to·manage·such·situations.¶

PIDS·solutions·from°Link·vue·Systems·Pvt·Ltd···are·based·on·microwave·technology,·Optical·Fibre·Cable·(OFC)·or·video·cameras.·These·can·be·fence·mounted,·buried·underground·or·can·be·tailored·for·specific·needs,·based·on·customer·requirements.·Seamless·integration·of·PIDS·with·other·security·systems·adds·one·more·layer·of·comfort·for·the·customer.·This·security·system·is·well·suited·for·military·bases,·government·facilities,·oil·refineries,·petrochemical·plants,·power·plants,·sea·ports,·airports,·VIP·residences,·storage·yards·and·so·on.¶



Safe Your Plant use **Perimeter Intruder Detection System**

- **TECHNICAL SPECIFICATIONS: PERIMETER INTRUDER DETECTION SYSTEM**
- **Introduction**
- The Perimeters in the main consist of a Perimeter wall 8 ft high with a concertina coil
- overhang of 1 and ½ ft.
- The existing perceived threat is that the Intruder will scale the wall to gain access to the
- Airport facility; therefore specific Electronic systems need to be designed to provide a stable
- Perimeter Intruder Detection System with a low false alarm rate
- The existing Perimeter Walls present some challenges as follows:
- 1. Built Up areas
- 2. General Public direct access to the Perimeter
- 3. Condition and application of the Physical Barrier protection
- 4. Environmental conditions
- 5. Broken perimeter wall and with gaps at places
- To address the Security Requirement taking into consideration the existing parameters, it is
- proposed to install the following Perimeter Intruder Detection solution:
- 1. A Covert **Radio Frequency Intruder Detection System** to be buried between the
- Perimeter Wall and the Inner Access Perimeter Road.
- 2. A **Secondary Active Infra Red Intruder Detection system** to be located on the Airport
- side of the Inner Perimeter Access Road.
- 3. The Perimeter Intruder Detection System will be interfaced with a **comprehensive CCTV**
- **surveillance system** (each Perimeter Detection Zone will have a dedicated CCTV camera
- associated with it).
- The total CCTV/PIDS solution will be connected to a Main Control Room within the Airport.
- **Primary Detection System**
- **Radio Frequency Intruder Detection System**
- The Radio Frequency Intruder Detection system is a dual cable system, the cables are to be
- buried in the areas between the Perimeter Wall and the Airport Perimeter Access road. The cables
- are to be installed adjacent to each other with 2 meter spacing parallel to the Perimeter wall. Each
- detection zone should be associated with a CCTV camera view.

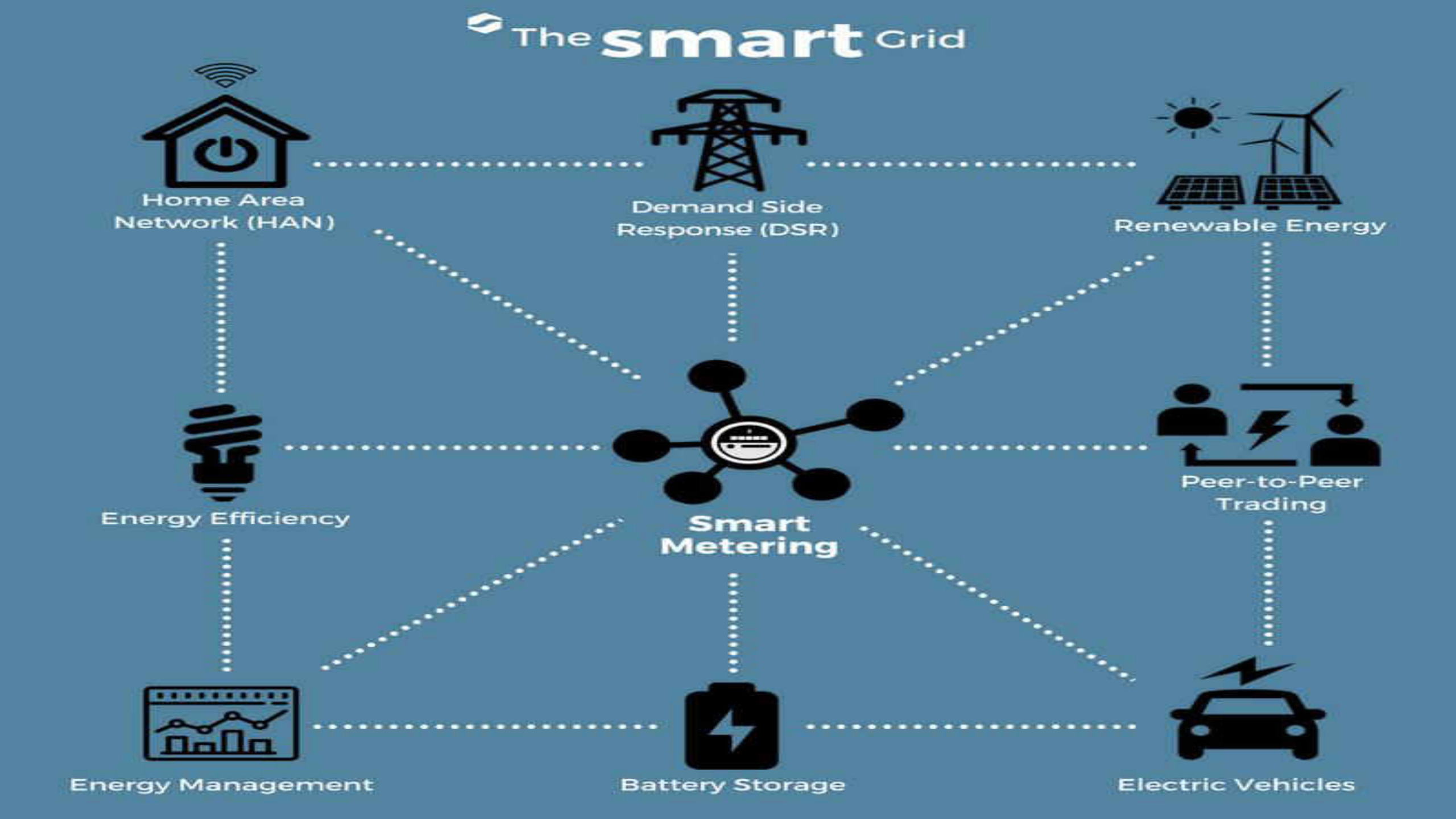
Safe Your Plant use **Perimeter Intruder Detection System**

- **Detection Principle**
- The Radio Frequency Intruder Detection system will comprise of two radiating cables
- which are positioned in parallel, one connected to an RF transmitter module and the other
- connected to an RF receiver module. A radio frequency electromagnetic field is set up around the
- transmitter cable and disturbances in this field, caused by the presence of a human being, are
- detected by the adjacent receiver cable. The transmitter cable radiates an RF field, which is
- detected by the receiver cable and the resulting signal is fed to the analyzer.
- An intruder moving through the electromagnetic field causes changes in the phase and
- amplitude of the received signal which are detected by the receiver module and passed to the signal
- processing system within the receiver unit. This change in signal is detected by the analyzer, which
- then ‘decides’ if an alarm should be triggered.
- **Zone Length:** Maximum upto 150m
- **Area of Detection:** 3m X zone length (+/-0.5m)
- **Configuration:** Each zone requires the following minimum equipment:
- 1. One analyzer / receiver unit
- 2. One transmitter module
- 3. One end of the line module
- 4. Two leaky feeder cables
- 5. 12v - 15v dc power supply @ 650mA
- **Radiating Cable**
- The radiating cables will be specially constructed and comprise an inner conductor
- separated and insulated from the outer screen by a di-electric sheath. The outer screen comprises a
- series of helically wound copper wires designed to allow RF energy to be radiated from the
- transmitter cable and detected by the receiver cable.
- **Analyzer Housing**
- Standard cast aluminum of dimension: 330 x 230 x 102mm. This unit may be customized
- as per on the site requirements.
- **Transmitter Housing**
- Standard cast aluminum of dimension: 260 x 160 x 90mm. This unit may be customized as
- per on site requirements
- **End of line module**
- Potted module of dimension: 30 x 20mm diameter.
- **Operating Temperature**
- -20° to +50°C or as defined by user
- **Operating Frequency**
- 40 to 41MHz (16 possible options)
- **Outputs**
- Solid state Alarm and Tamper relays 250v, 120mA AC or DC
- **Dead Feeder Cable**
- Both the analyzer and transmitter units can be located up to 50m away from the two main sensor
- cables by using standard non-radiating co-axial cable.
- **Controls**
- Sensitivity adjusted by local on-board push buttons with LCD Display.
- **Connectors**
- Specially adapted CW20 brass coupling with built in UHF male connector fitted

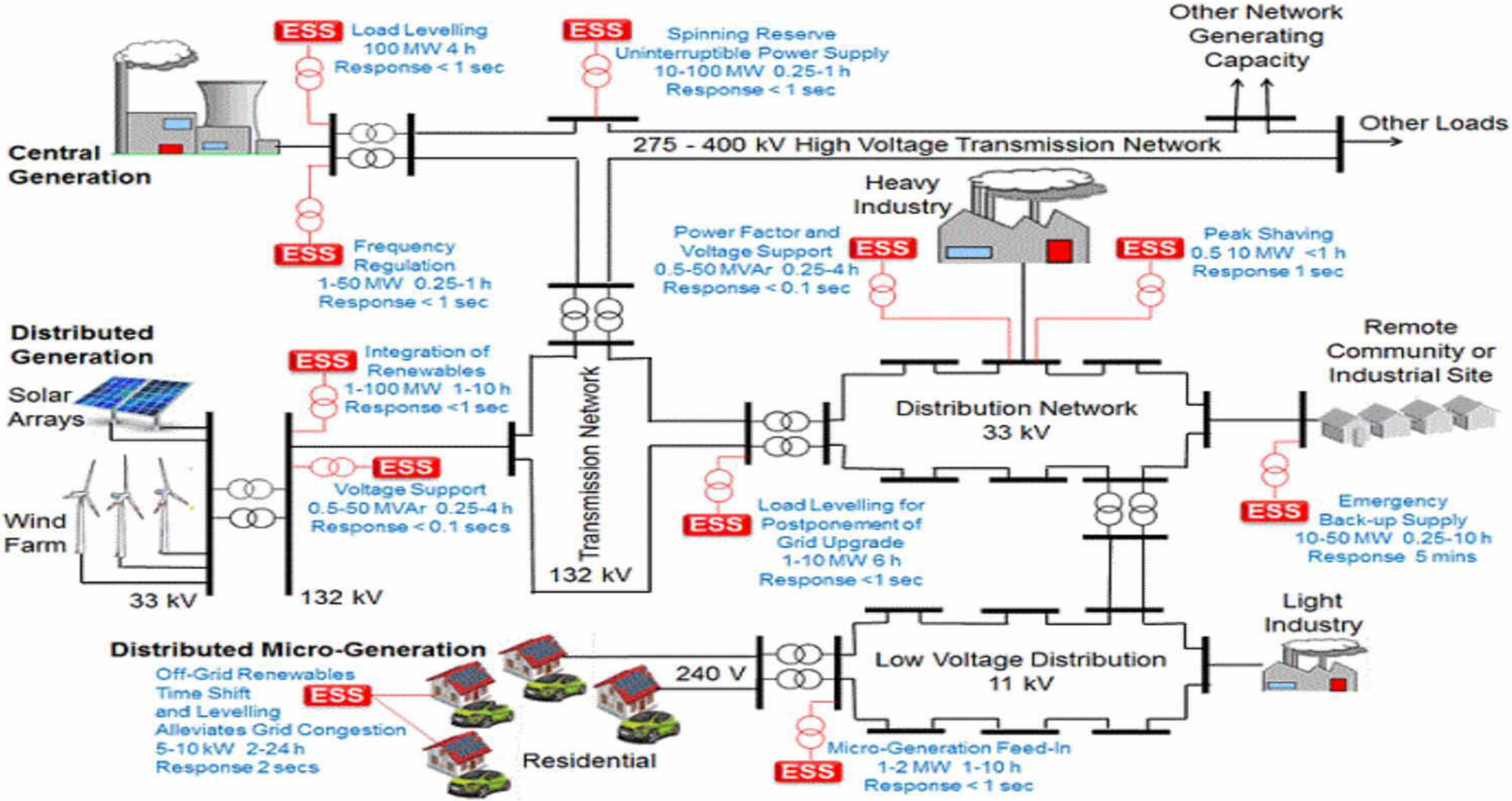
Safe Your Plant use **Perimeter Intruder Detection System**

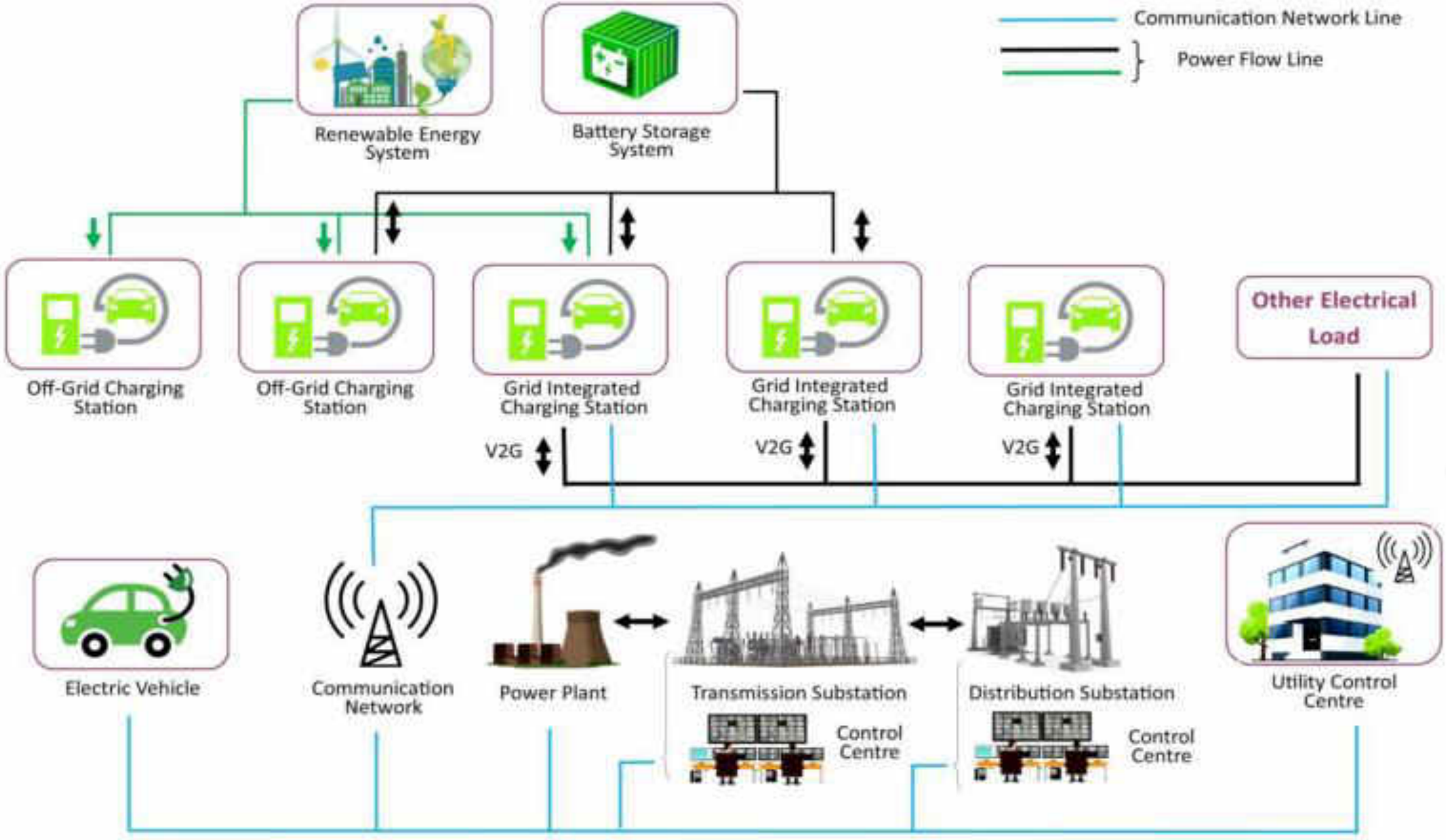
- **Active Infra Red Beam Detection**
- The Active Infra Red Beam Detection System is a series to Transmit and Receive multi
- beam sets enclosed in a 2m external free standing beam tower. Each Tower is to be located in
- parallel to each Radio Frequency Intruder Alarm Detection zone and is to be interfaced with the
- Primary detection zone to provide a secondary verification detection zone. Each detection zone
- should be associated with a CCTV camera view.
- **Detection Principle**
- The Active Infra Red Beam Intruder Detection System operates by the use of Multi Active
- Infra Red Beams enclosed in an External Beam Tower, these Beam Towers transmit and receive
- Infra red signals and generate an invisible Infra Red Beam fence.
- If the invisible 'Fence' is crossed and the Transmit and Receive beams are interrupted the
- system generates an alarm condition. The infra red external beam system will be immune to
- masking and offer a high level of external detection.
- Each Beam tower is to be synchronized to the next by the use of a Synchronized Cable link
- and Sync line monitor. If the Synchronized line is interrupted this will generate an alarm condition.
- Each individual receiver will only respond to its own transmitter to avoid interference between
- units allowing for closer beam spacing.
- The System is to also allow a transmitter at the bottom of a tower to be directed at a receiver
- at the top of another tower to overcome the effects of undulating ground and is to be capable of
- working effectively with uneven ground and unusually shaped compounds.
- **Beam Tower Configuration**
- • Beam Tower Height – 2m
- • Number of TX Units – 6
- • Number of RX Units – 6
- **Zone Length**
- External range: 0.5 to 150 metres
- Internal range: 0.5 to 200 metres
- **Beam Characteristics**
- Beam transmitted and received angle: 5°
- Horizontal adjustment: 200°
- Vertical adjustment: 90°
- Beam width: 40mm
- **Electrical Requirements**
- 230V AC/ 50 Hz
- **Infra Red:** IR wavelength: 880nm
- **Weatherproof Rated**
- IP 54 rated
- Temperature range -20°C to + 55° (with heaters)
- Relative humidity: 10% to 90%
- 4
- **Detection Criteria**
- Response time: > 20mS - <40mS
- Alarm dwell: 800mS
- Beam width: 40mm
- **Outputs**
- Potential free contact
- **Power supplies**
- 230V AC/50Hz AC Single Phase

The smart Grid



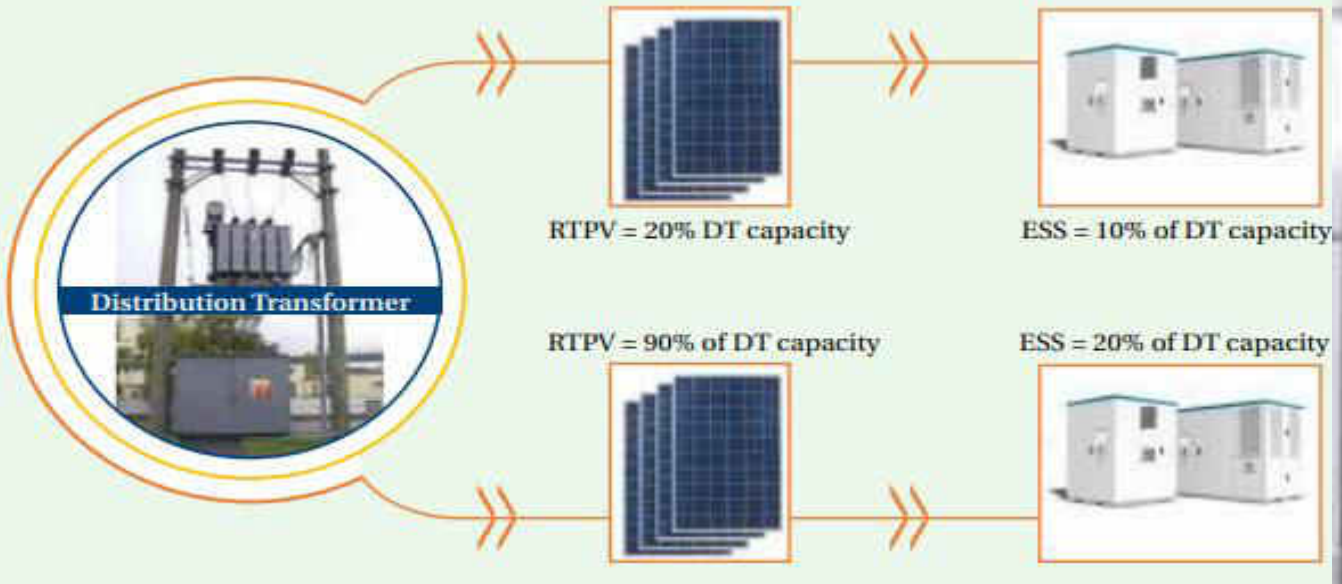
Power Generation and Utilities(Industries + Domestic Purpose)



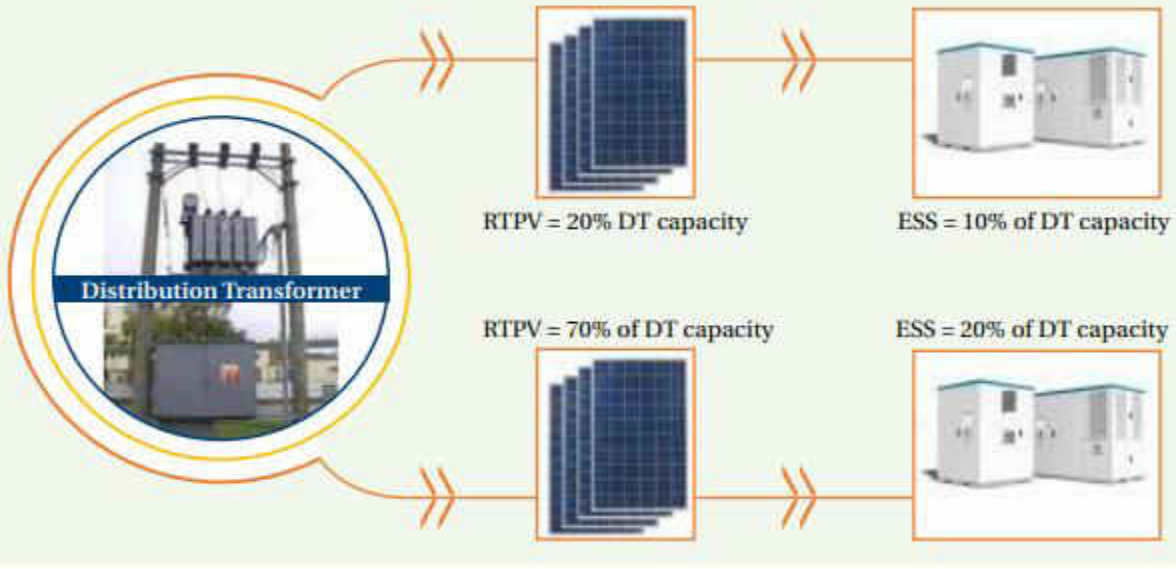

Communication Network Line
Power Flow Line
Renewable Energy System
Battery Storage System
Off-Grid Charging Station
Off-Grid Charging Station
Grid Integrated Charging Station
Grid Integrated Charging Station
Grid Integrated Charging Station
Other Electrical Load
V2G
V2G
V2G
Electric Vehicle
Communication Network
Power Plant
Transmission Substation
Control Centre
Distribution Substation
Control Centre
Utility Control Centre

High Energy StorageBattery Offer Long Duration Power Supply(DEMAND)

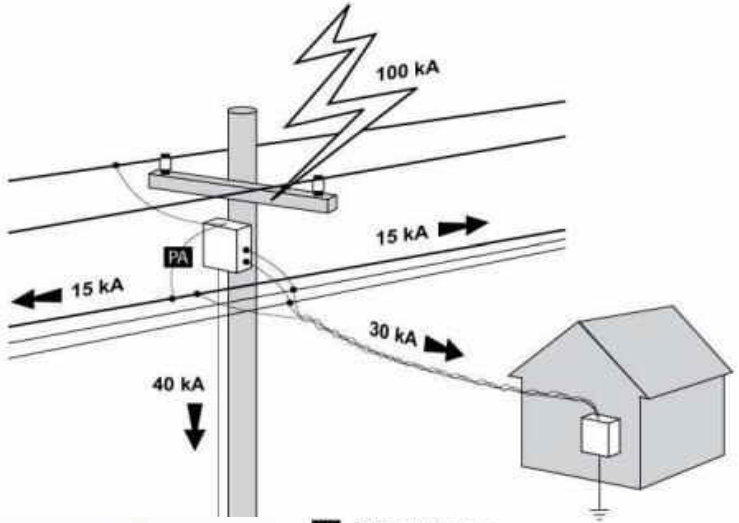
ESS requirement (as percentage of DT capacity) in Metro Growing Scenario with different solar PV penetration (IESA Analysis)



ESS requirement (as percentage of DT capacity) in Metro Saturated Scenario with different solar PV penetration (IESA Analysis)[33]

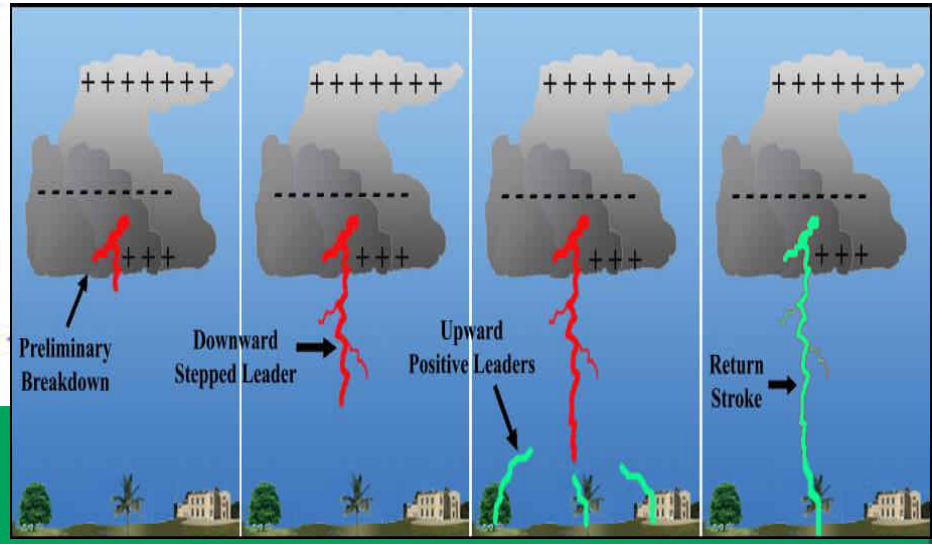


Link Vue System Electrical Safety (SurgeProtection,Lightning Protection& Earthing)



SURGEPROTEC

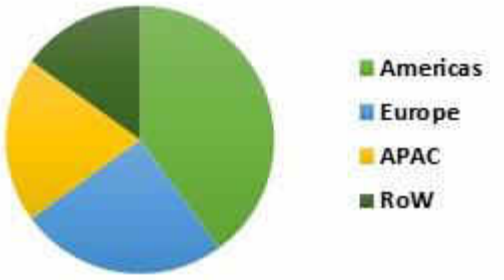
SPT



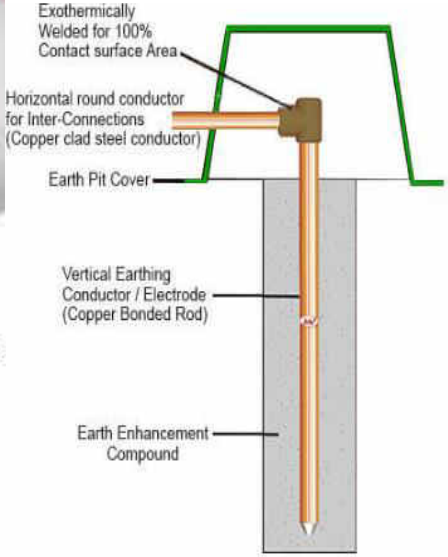
Lightning Equipotential Bonding Isolating Spark Gaps

Surge protection devices (SPDs) shall be provided for the main electrical distribution system including sub-switch boards and distribution boards, computers, electronic equipment, fire alarm panel, PABX equipment, UPS equipment, CCTV equipment, MATV equipment, card access equipment etc which are susceptible to lightning and switching surges.

Surge Protection Device Market



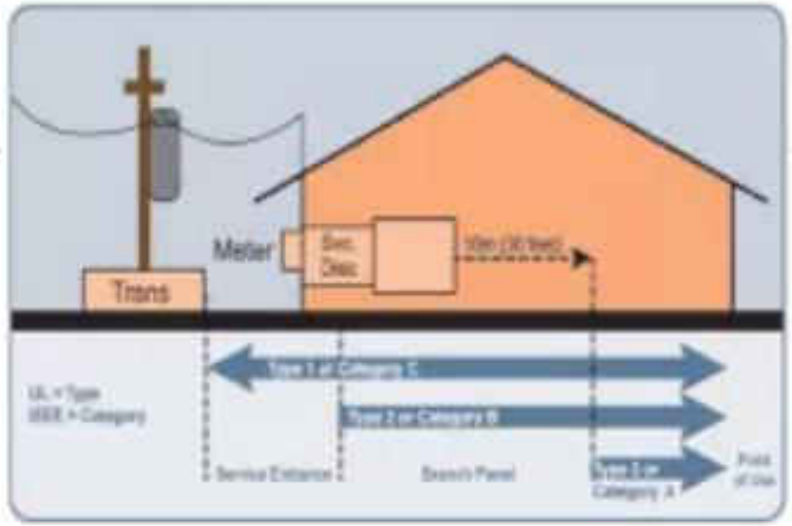
Maintenance Free Earthing

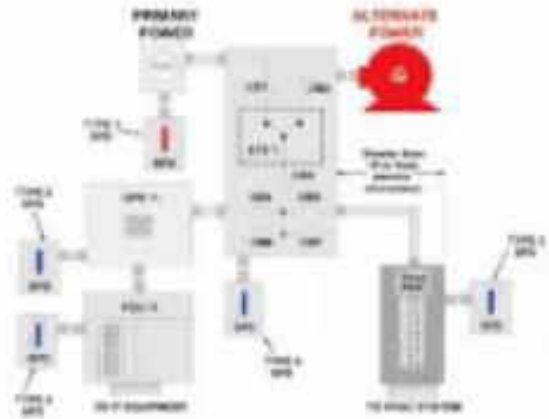


Types by Location – UL1449

Type 1	• **Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of service equipment** • **Installed without use of external overcurrent protective device**
Type 2	• Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device
Type 3	• Point-of-utilization SPDs • Installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel
Type 4	• The component assembly consisting of one or more Type 5 components (typically MOV or SASD) • Must comply with limited current tests and in • Not tested as standalone devices to intermediate and high current faults

Note Type 5 – Discrete component SPD (*MOV or SASD*)

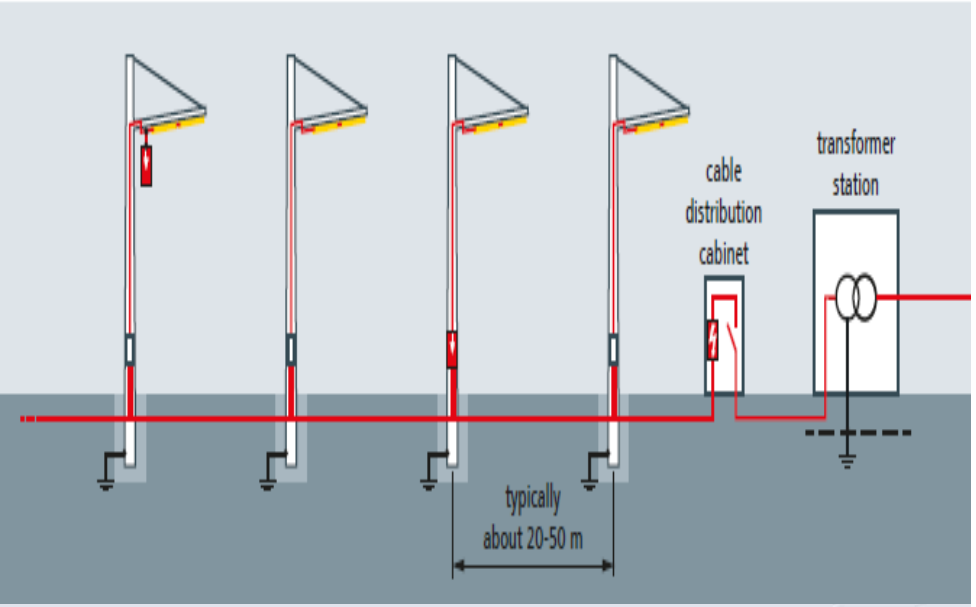


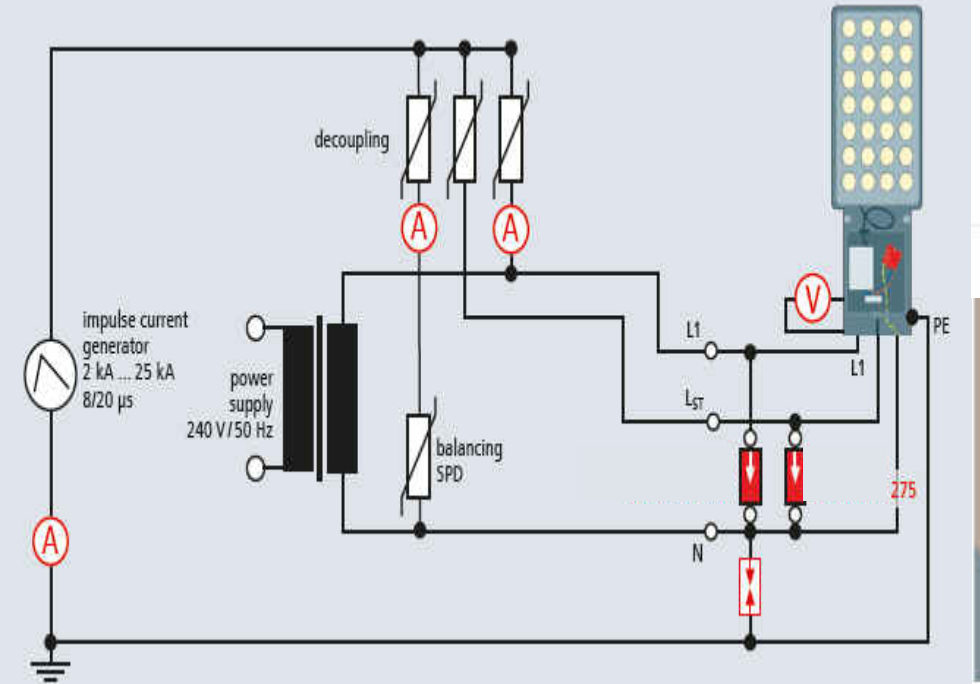


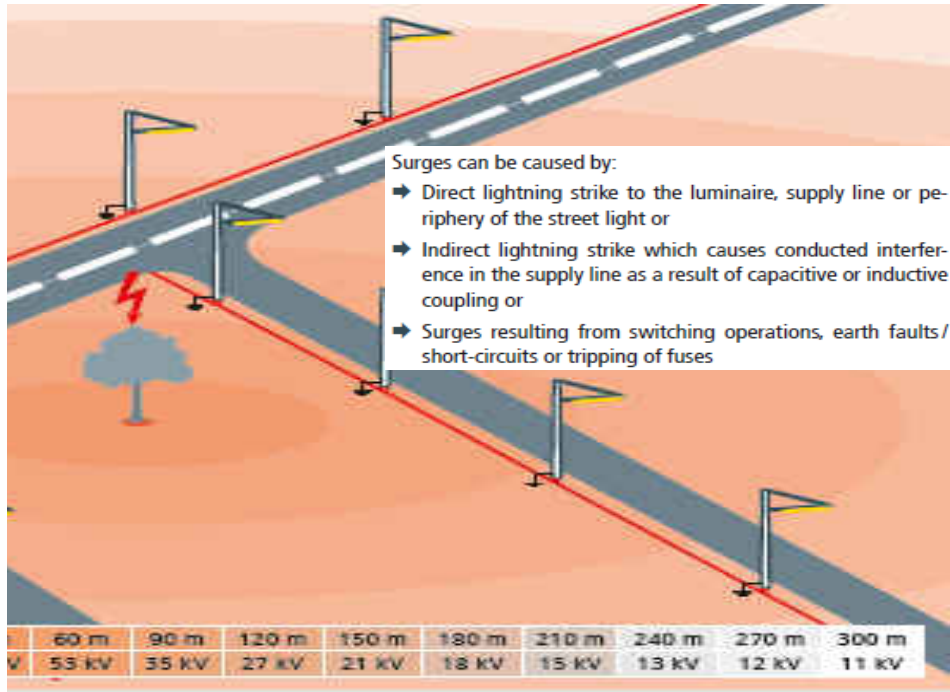
UL / ANSI 1449 – Types by location

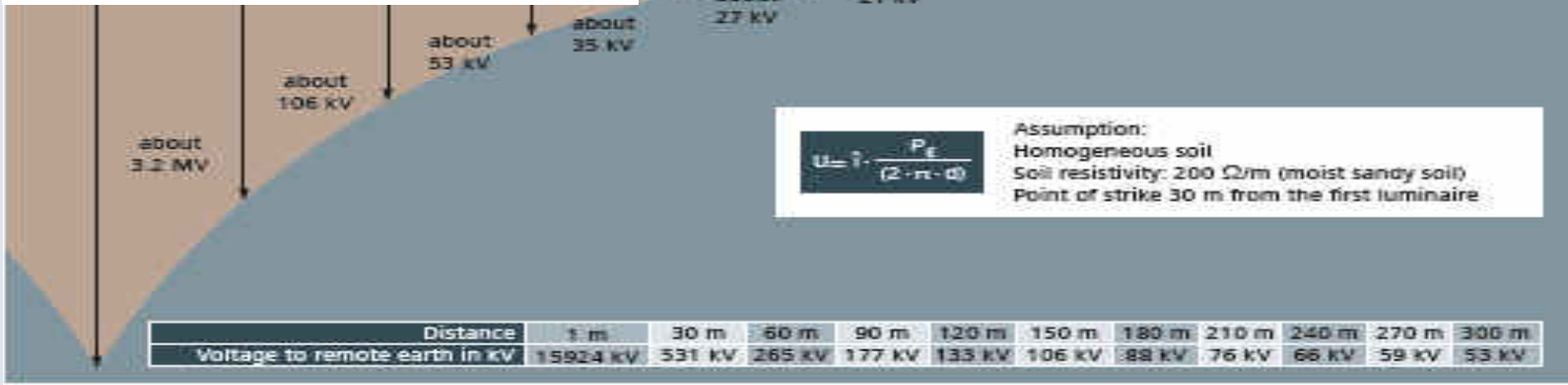
- When an electrical surge occurs, voltage greatly exceeding accepted peak voltage levels could pass through building circuits to electrical equipment. Without proper protection, this equipment is susceptible to damage or failure. A surge protective device (SPD) can negate these spikes.
- Specifying the SPD requires identifying and understanding the ratings associated with its application. Performance values and ratings associated with an SPD include maximum continuous operating voltage (MCOV), voltage protection rating (VPR), nominal discharge current (In), and short circuit current rating (SCCR). The most misunderstood rating is the surge current rating, typically quantified in kilo-Ampere (kA).
- The UL1449 standard was developed to ensure proper protection with a level playing field. However, it installed in your facility or equipment
- SPDs should be installed at all levels of the electrical distribution system. This is known in the electrical industry as cascading or layering. IEEE refers to it "protection in depth."Cascaded surge protection provides additional suppression from large transients, that step their way through from the service entrance, by further reducing the let-through voltages. Also suppressed are more frequently generated internal transients.Let-through voltage is the voltage appearing on the equipment side (load side) of an SPD when an impulse voltage/current of a defined wave-shape and amplitude is applied to the line side of an SPD. It can be used to compare different SPD's abilities to lower the surge voltage to the equipment requiring protection.
- IEEE Standard 1100 recommends cascading levels of protection from the service entrance to distribution and branch panels, and even protection for individual critical loads. The closer to the service entrance, the more robust the device should be rated. This protection in-depth strategy protects the facility and critical loads. In recommending a kA per phase rating a general rule of thumb – "the 3-2-1 rule of thumb" applies: .
- Types of SPD locations
- Panel size does not play a major role in the selection of a kA rating. What is much more important is the location of the panel within the facility. UL1449 defines the location types within a facility as:
- Type 1 is intended for permanent application at the service entrance. It can even be before the main disconnect. A UL1449 Type 1 device can be installed on the primary of buildings or the 1st disconnect.
- Type 2 is intended for installation on the load side of the main entrance panel.
- Type 3 is for specific devices, referred to as "point of utilization" in the standard.
- Type 4 would be a component device that is intended to be part of a larger assembly and is not approved for standalone use without additional safety evaluation. Be careful if you are offered a Type 4 device to be installed into a control panel. The panel builder would be responsible to submit for 3rd party safety approval otherwise it wouldn't be covered in a catastrophic failure.
- Type 5, which is the basic component, such as a metal oxide varistor, silicon avalanche diode or gas discharge tube. These clearly can't be directly installed into a facility
- The purpose of a surge protective device is to shunt and suppress transient voltages being introduced into an electrical distribution system from either an external or internal source. Selecting the proper surge current-rated SPD throughout the electrical distribution system provides the best performance life for equipment. When selecting SPDs, keep these key points in mind:
- Providing proper surge suppression to a facility and its equipment requires more than a single SPD located at the service entrance. We recommend cascaded SPDs with a proper surge current rating for each location. This provides superior suppression for a service panel or critical load. A single SPD, no matter how big or expensive, will not provide the same level of system protection.
- Over-sizing an SPD for its application cannot hurt a system, but under-sizing the SPD can result in premature SPD failure

Street Light and Impact from Lightning (do Installation Surge Protection)









Products

Surge Protector

Type 1 SPD-lightning current arresters

Combined, spark gap and MOV
Iimp 25 kA / 100 kA Up ≤ 1.5 kV
No follow current, zero leakage current
Full coordination with Type 2 SPD

Type 2 SPD – surge arresters

Combined, spark gap and MOV
U c 75 to 760 V AC
In 20 kA / Imax 40 kA
Up ≤ 1.35 kV

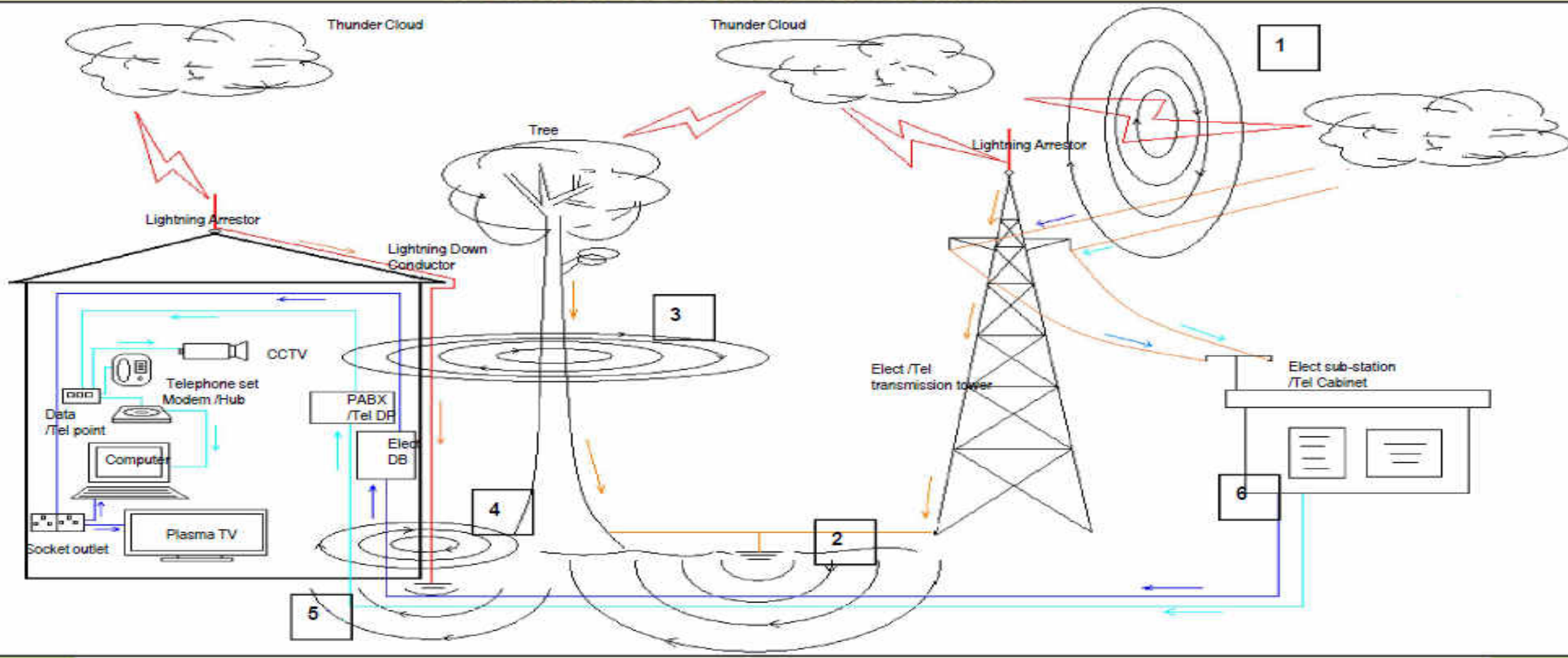
Type 1 and 2 SPD -combined arresters B+C

Combined, spark gap and MOV
Iimp 12.5 kA / 50 kA
Up ≤ 1.5 kV
No follow current, zero leakage current

SPD PV - surge arrester

Combination of MOV and spark gap
PV Type 2 SPD
MOV surge arrester
UCPV 170 to 1500 V DC
In 15 to 20 kA
Imax 40 kA

POSSIBLE SOURCES OF SURGES



Lightning Strike

Lightning Current

Telephone/Data Line

Power Line

Surge Current in Telephone/Data Line

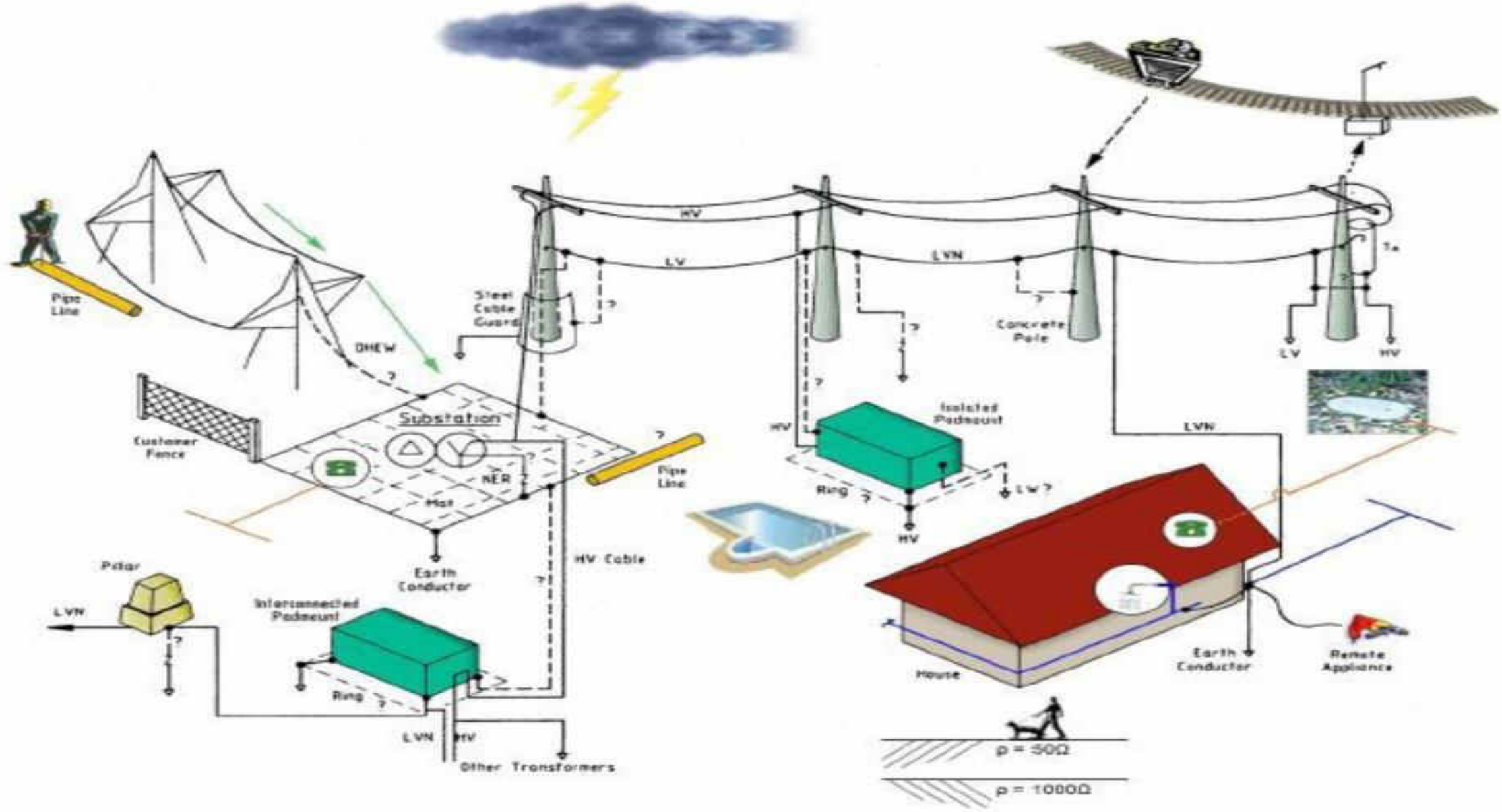
Surge Current In Power LIne

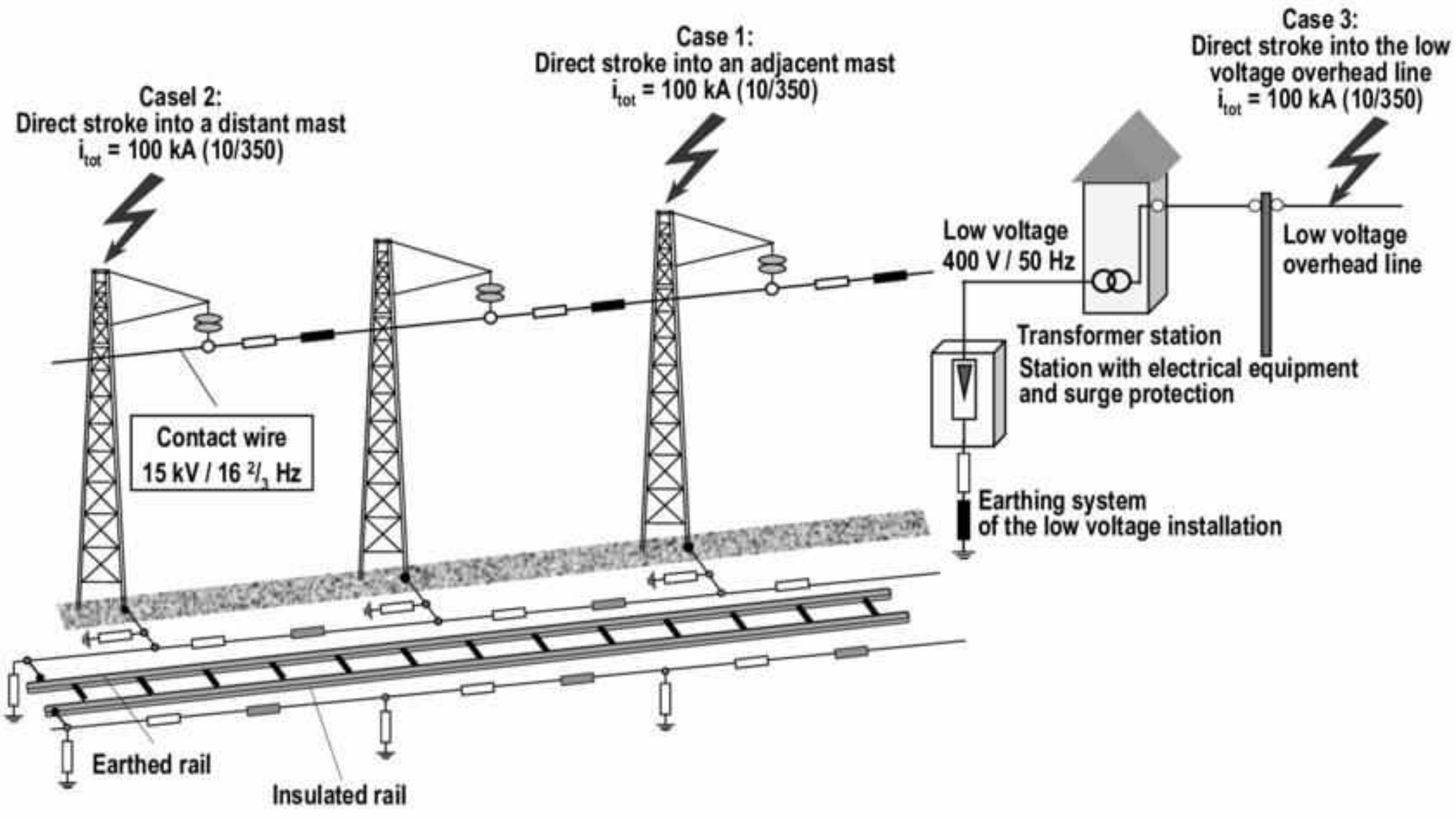
Ground Potential

Inductive Coupling

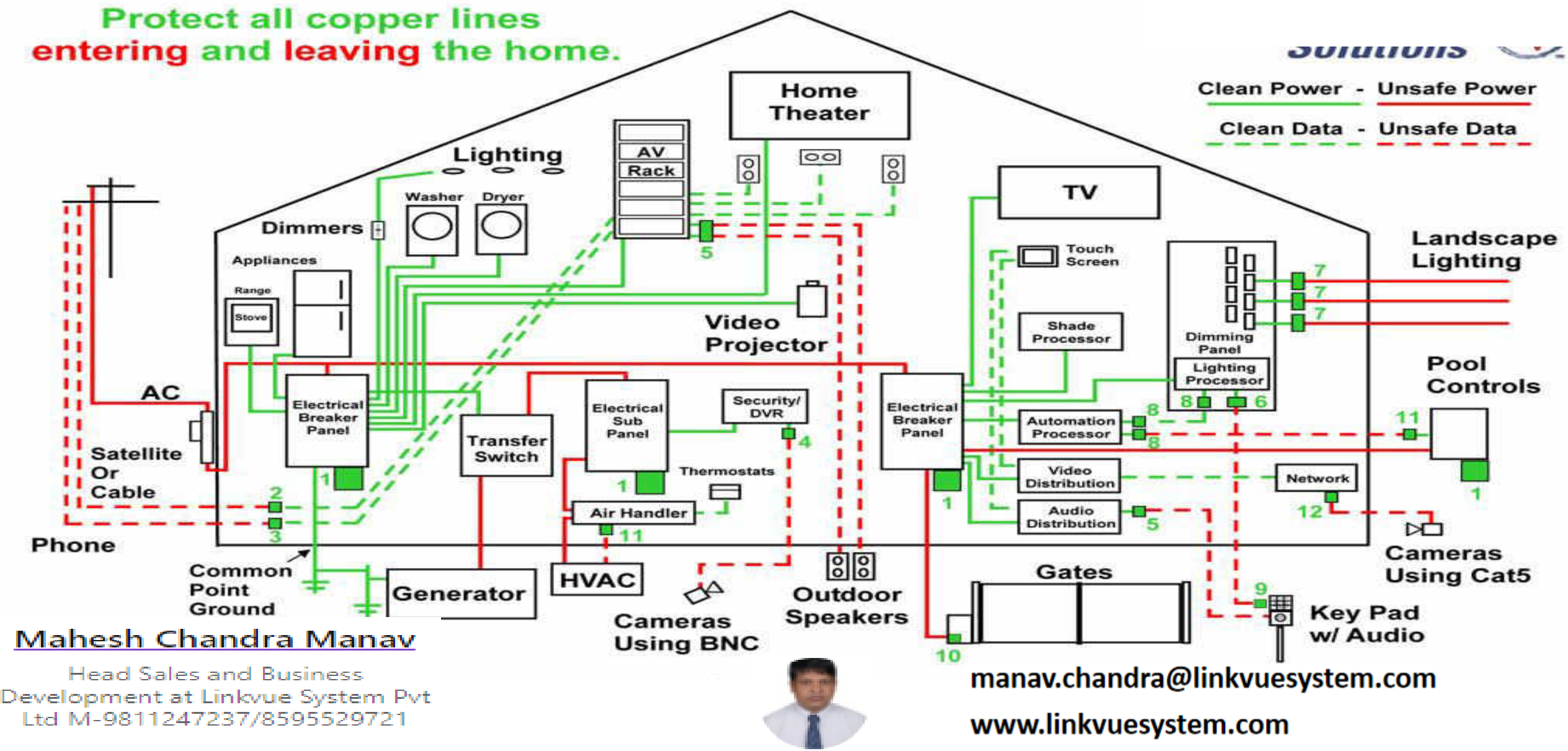
VLP ENGINEERING SDN BHD

Lightning Charges Travel in KM & Enter (Systems) from many medium




Case 1:
Direct stroke into an adjacent mast
i_{tot} = 100 kA (10/350)
Casel 2:
Direct stroke into a distant mast
i_{tot} = 100 kA (10/350)
Case 3:
Direct stroke into the low voltage overhead line
i_{tot} = 100 kA (10/350)
Low voltage
400 V / 50 Hz
Low voltage overhead line
Transformer station
Station with electrical equipment and surge protection
Contact wire
15 kV / 16 2/3 Hz
Earthing system
of the low voltage installation
Earthed rail
Insulated rail

Installation & Health Check of Electrical Installation is very Important(Safety First)



Mahesh Chandra Manav

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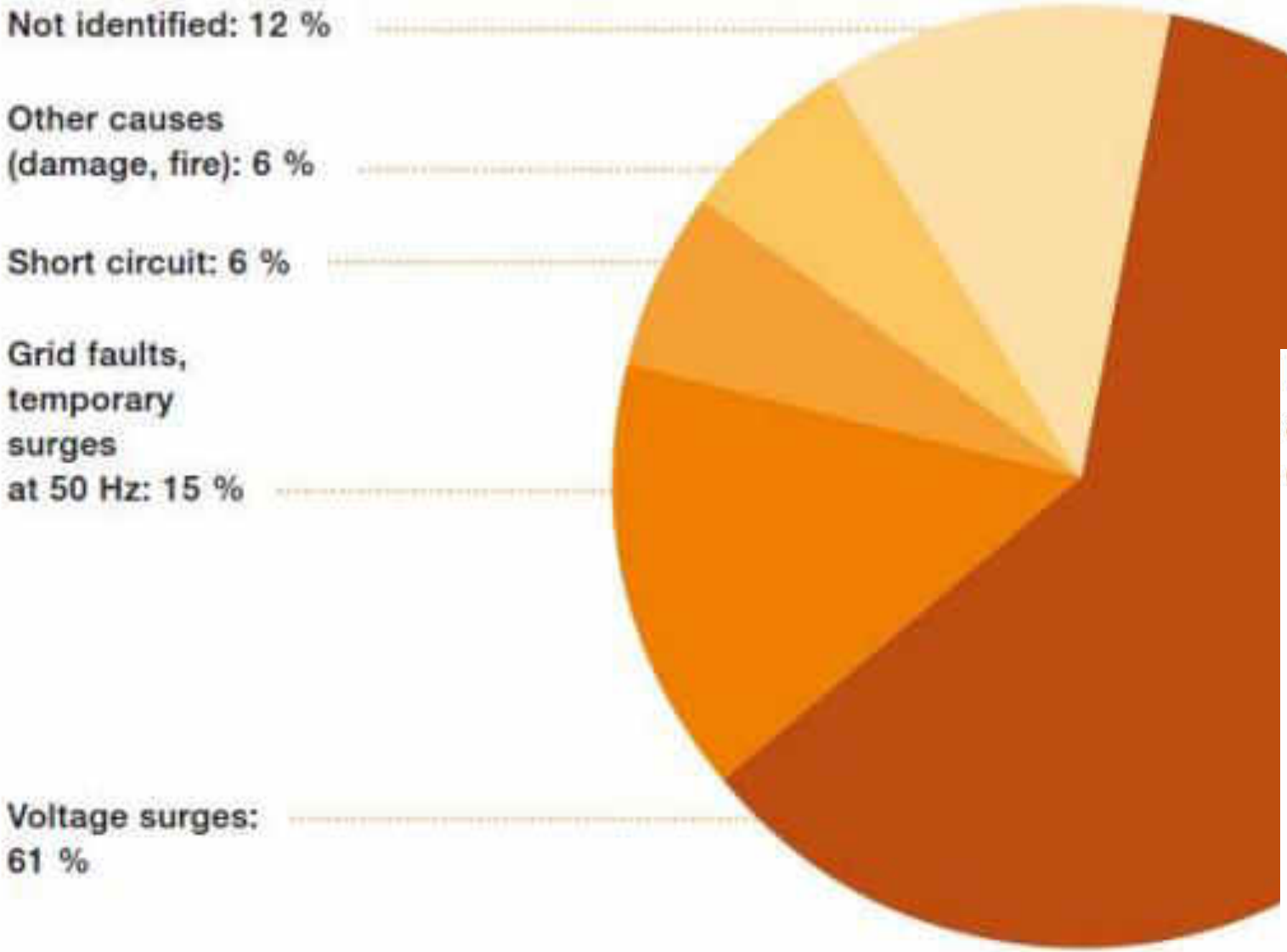
manav.chandra@linkvuesystem.com

www.linkvuesystem.com

Earthing ,Connectors&Surge Protection for Power & Communication Ports

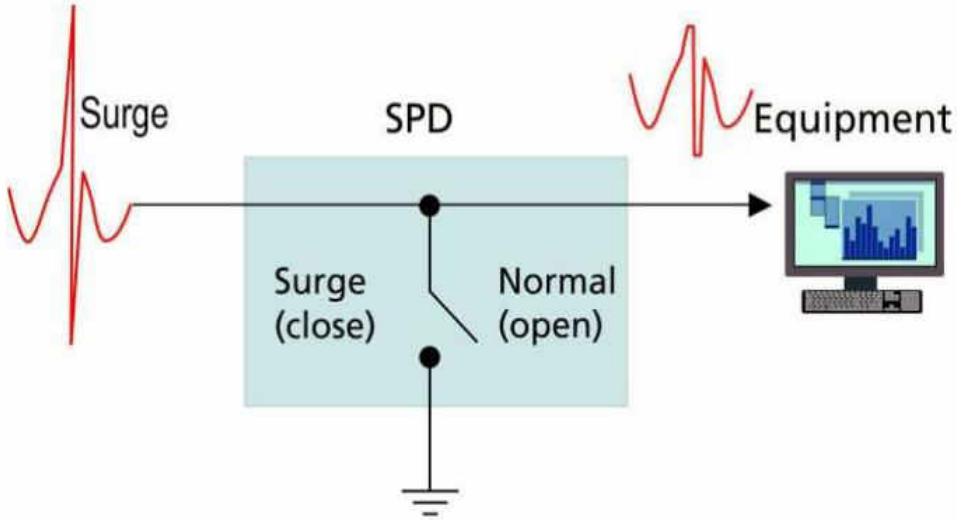
RS 232,RS422,RS485,RJ11,RJ45 , POE and BNC Type N& Type F

Surge Damage Your Systems It's Serious Topic Let Understand

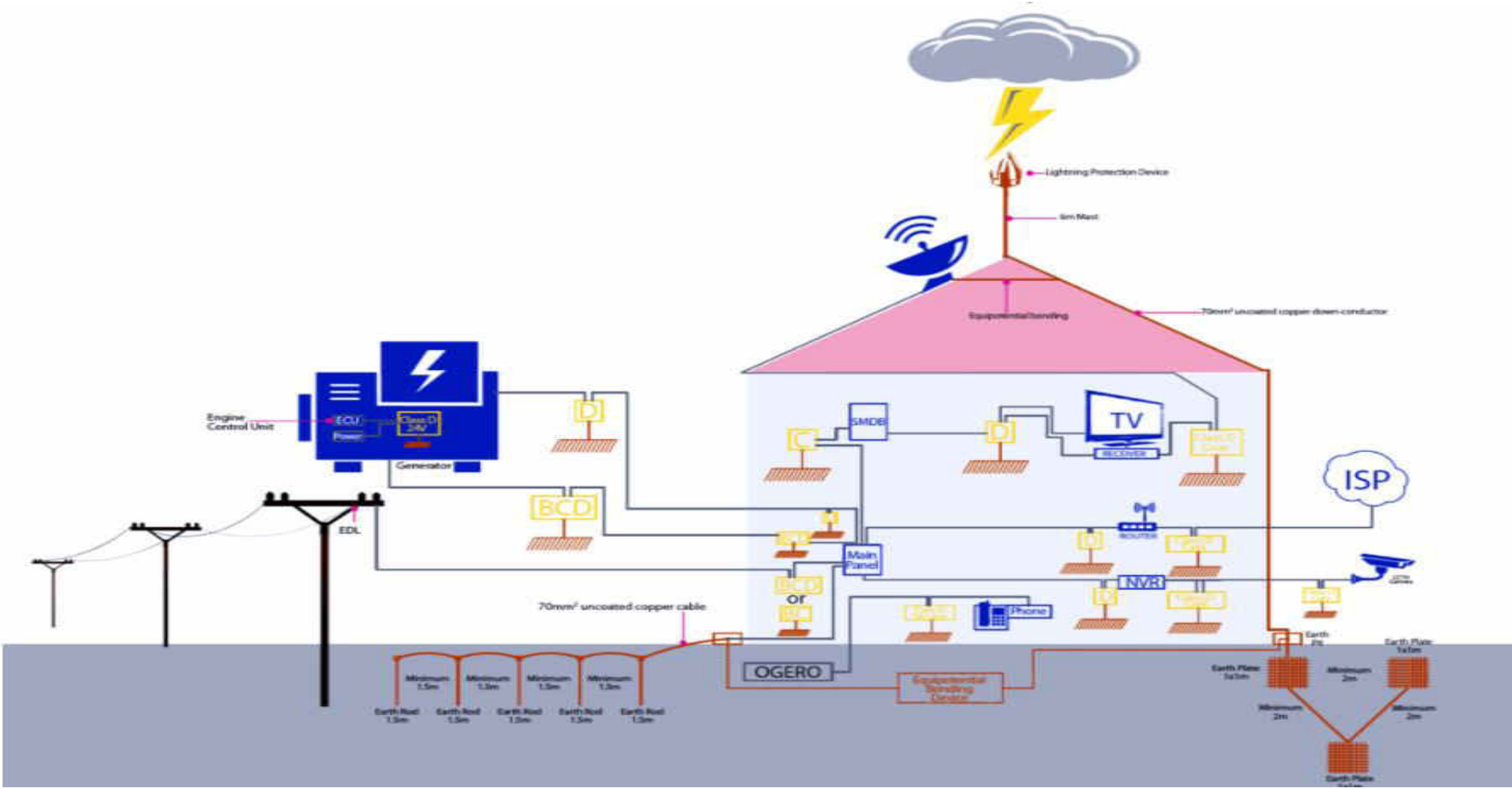


Damage to electronic equipment. Analysis conducted in France for the residential segment by AVIVA, the sixth largest insurance company in the world (www.aviva.com)

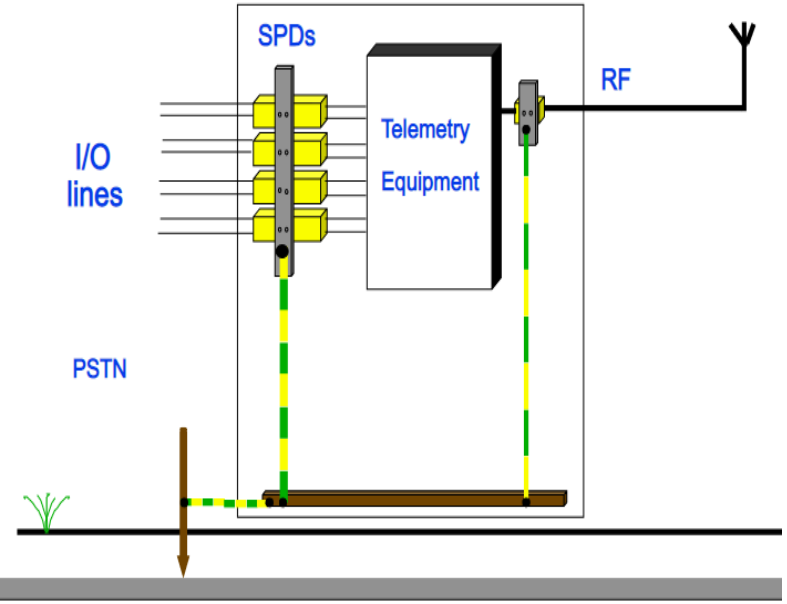
Divert surge currents and limit over-voltages, survive and repeatedly protect personnel, buildings and equipment



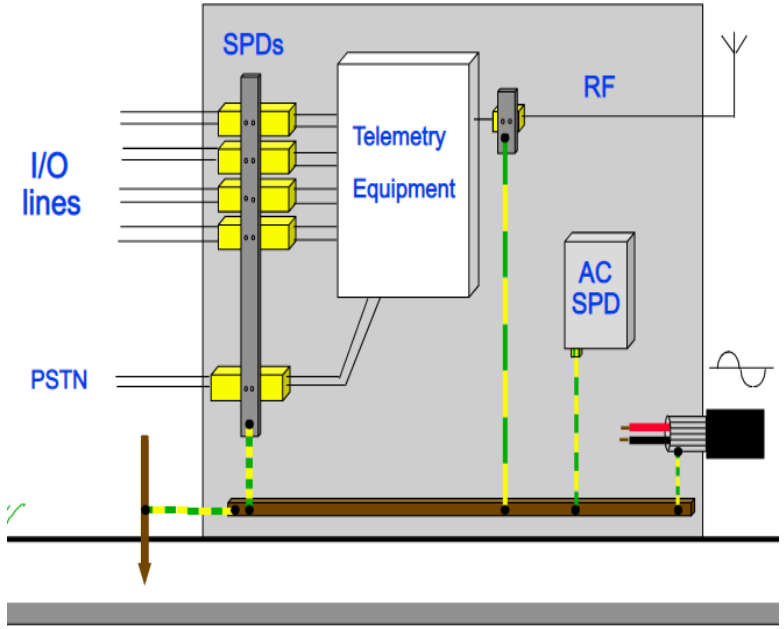
Surge Protection Class B C and D as per Equipment Category



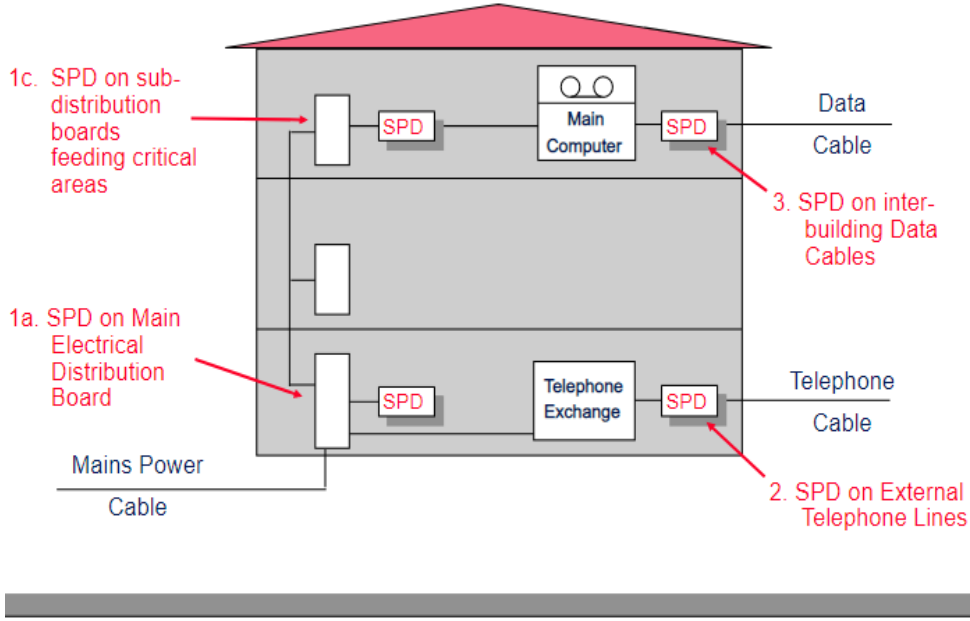
Surge Protection Applications Selected by Voltage



RTU Protection



Telemetry Outstation



Building Protection

Main distribution board

Subdistribution board
(feeding critical equipment)

Location of critical equipment, e.g. office
>> 10 m from subdistribution board

Incoming supply
fused F_S

ESP 415 TNS
Type 1 Surge
Protector

HRC switch fuse
or MCCB F_{SPD},
where $F_{SPD} \leq 0.5F_S$

F2

>> 10 m

Critical equipment
e.g. computer room

Fspd ≤ 0.5 F2

Risk of switching
surges from
lift motor etc

ESP MC Series
Microconditioner

ESP 415 D1/LCD Combined
Type 1, 2, 3 Surge Protector

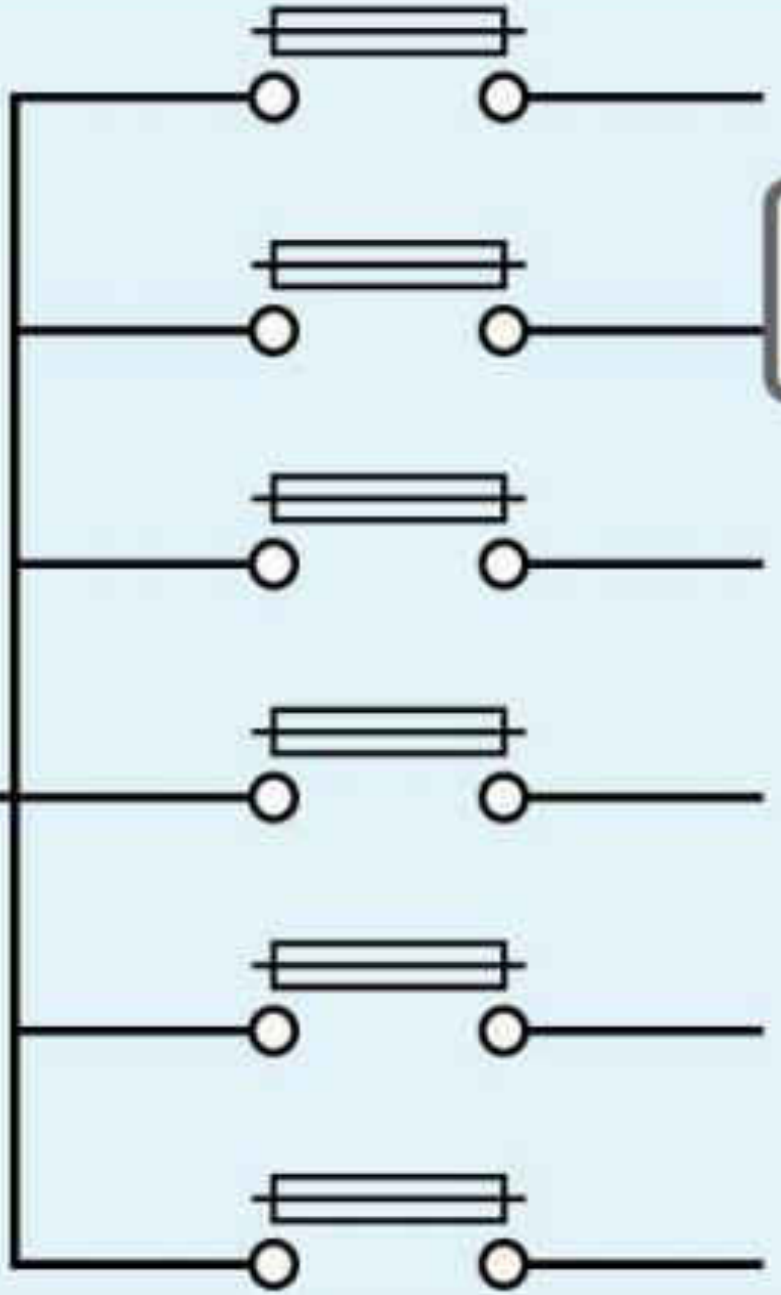
Critical equipment
e.g. server

Main distribution board

ESP 415 M2 Combined Type 1, 2, 3 Surge Protector at mains distribution board directly protects critical equipment

HRC switch fuse or MCCB F_{SPD} where $F_{SPD} \leq 0.5F_S$

Incoming supply fused F_S



Critical equipment e.g. computer room

Surge Protection Installation Guide Line

SPD for power lines

7 module full mode protection

Monoblock type

Not interrupt the system

kA rating determine by the weakest link

Enclosed in rugged,safe, all metal enclosure

Provided with solid state indicators (LED)

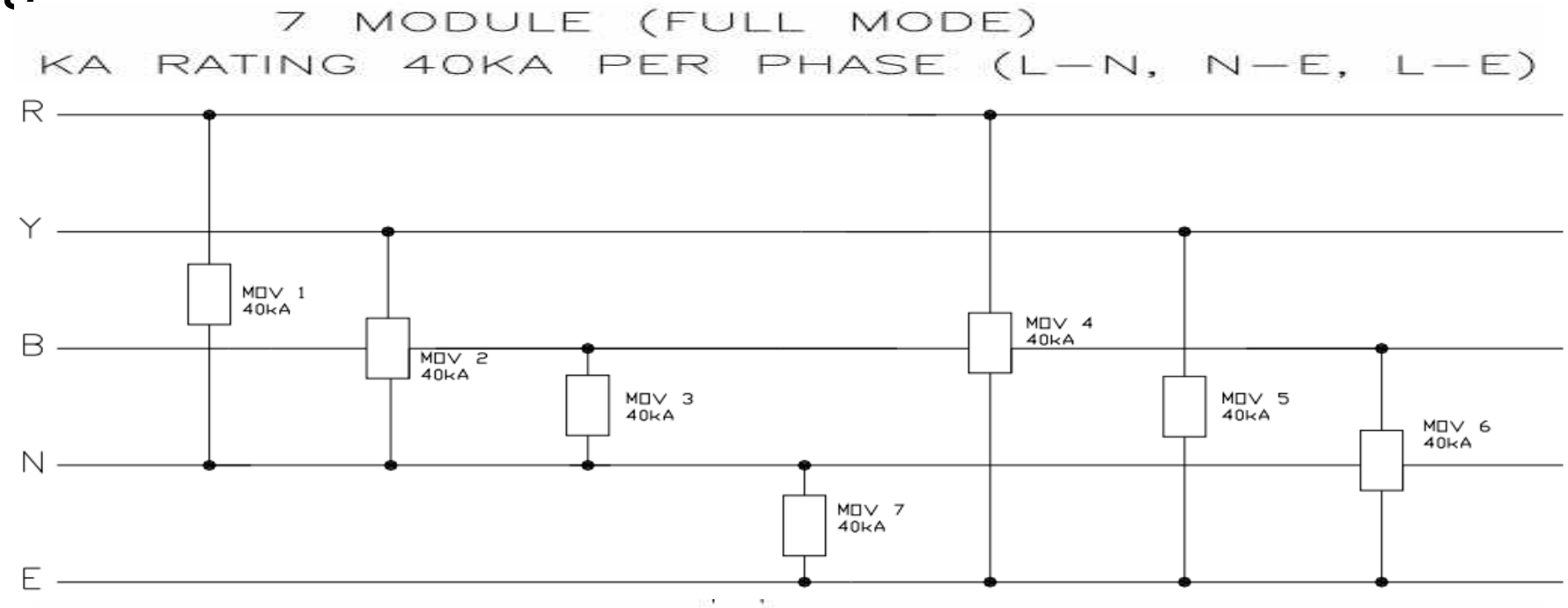
Installed in parallel

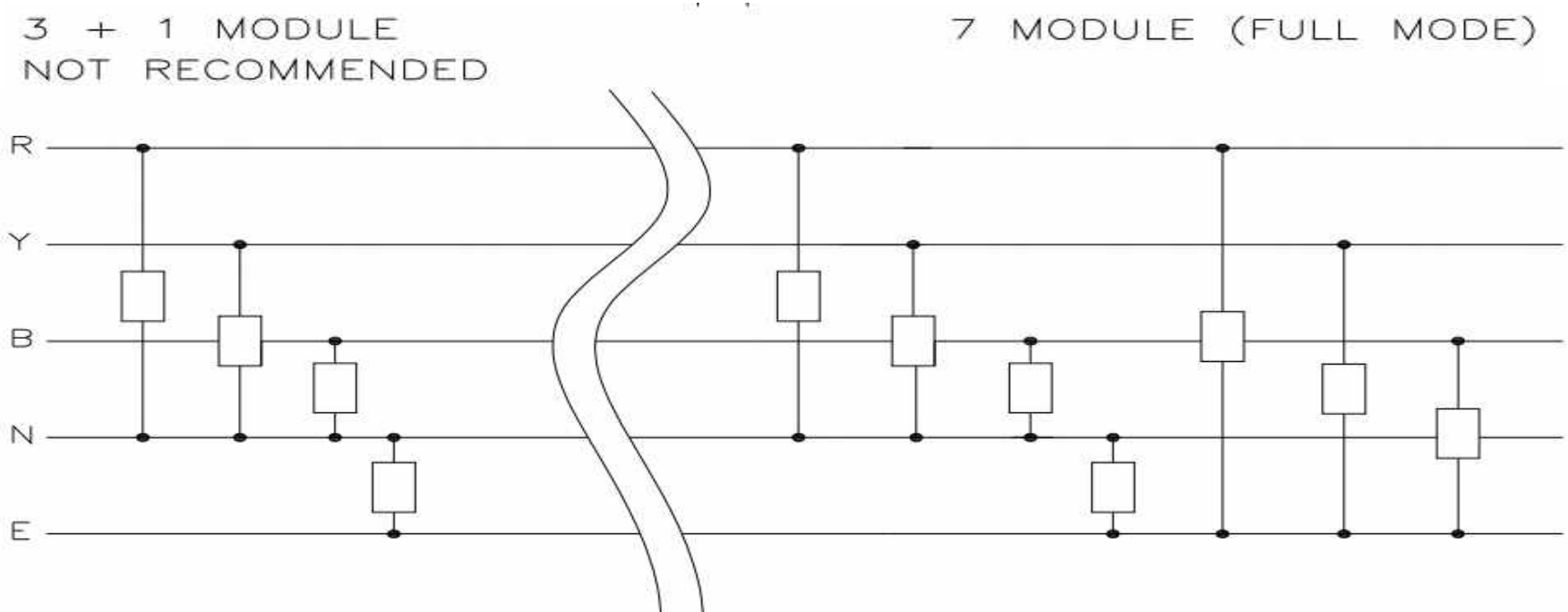
Design to withstand multiple strikes

SPD for data/signal

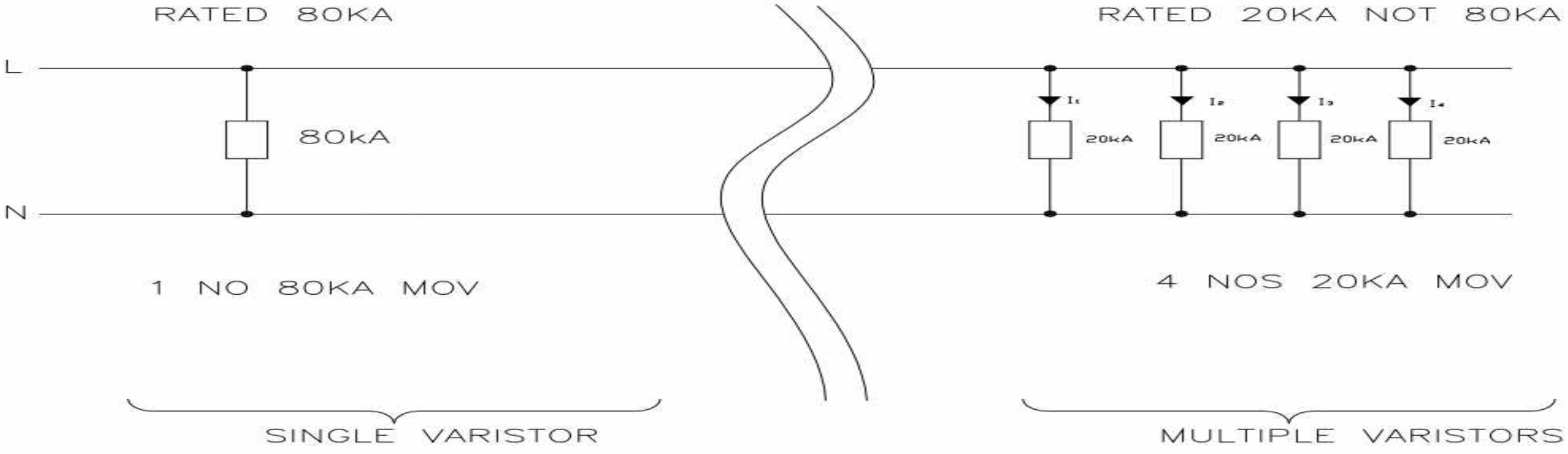
Compatible & transparent to existing system

Not interrupt operation system

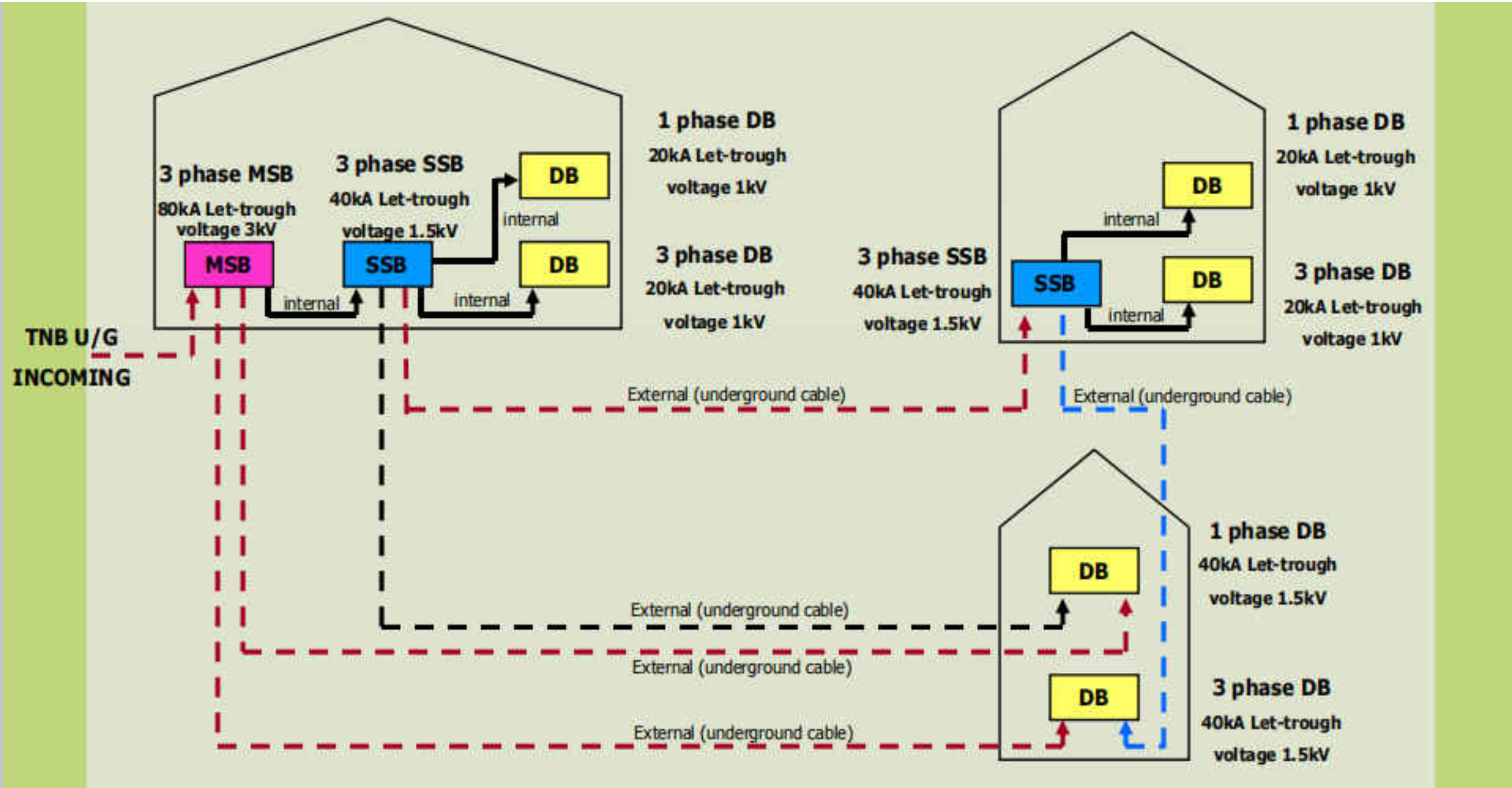




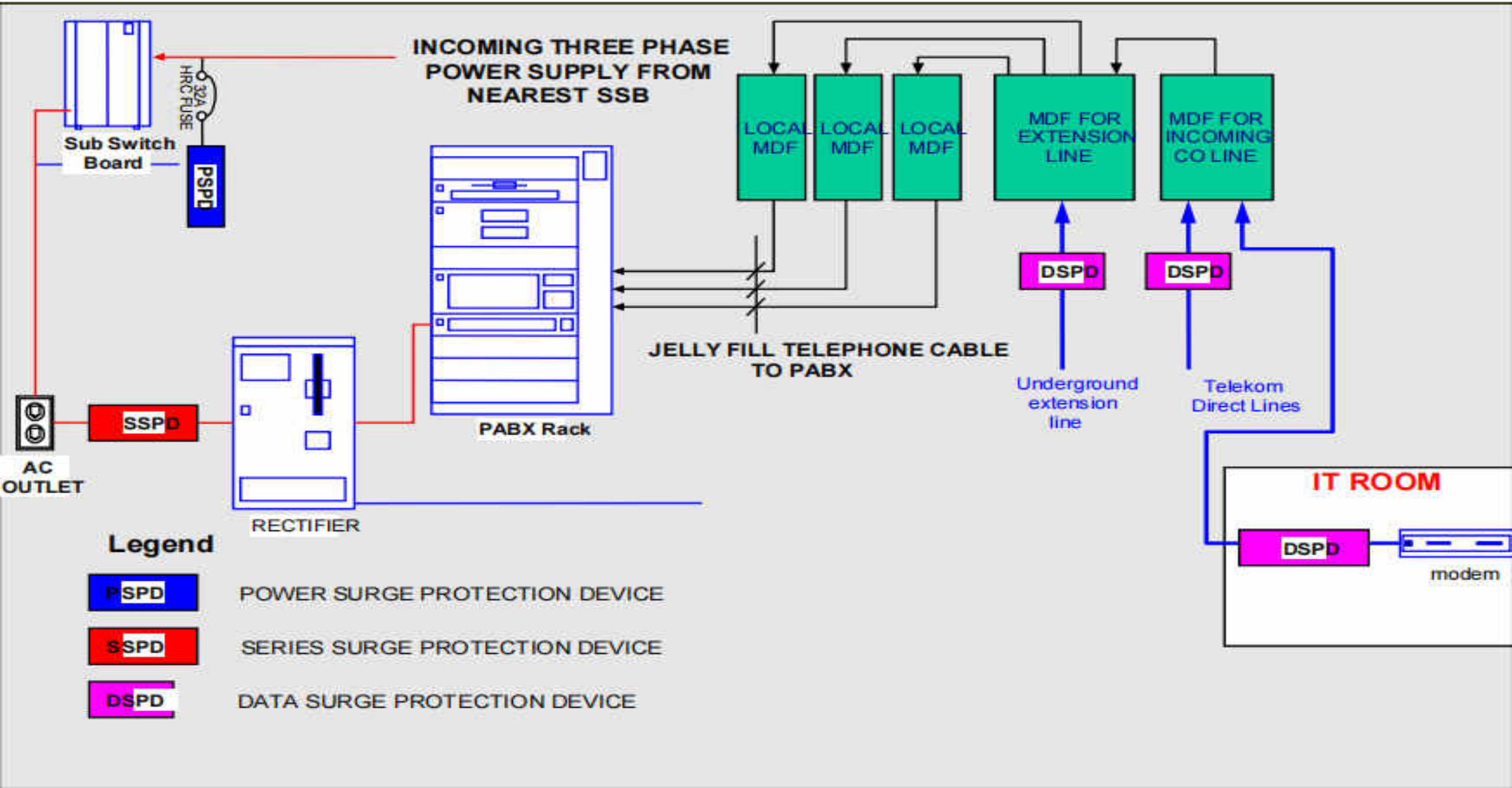
7 Modules		3 + 1 Modules	
1)	Protection between Live - Neutral, Live – Earth & Neutral – Earth	1)	Protection only between Live – Neutral & Neutral – Earth Only
2)	All MOV operates on its own rating	2)	The neutral to earth protection have more burden as all current will pass through this MOV irrespective of surge entrance and may damage faster
3)	Longer life cycle since more path for surge to travel to earth	3)	Less path for discharge current and weakest point at Neutral to Earth makes it life cycle shorter



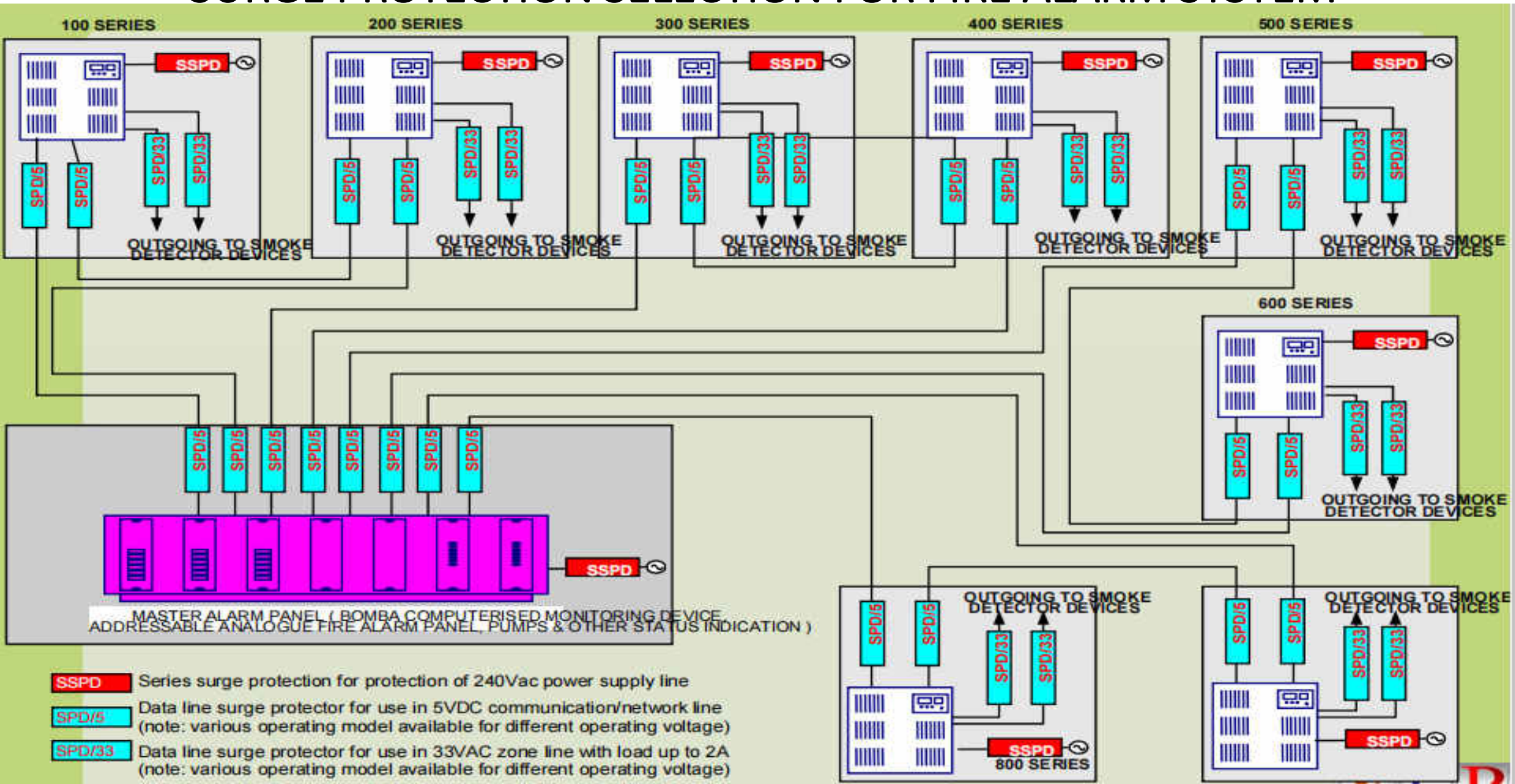
SURGE PROTECTION SELECTION FOR POWER SYSTEM



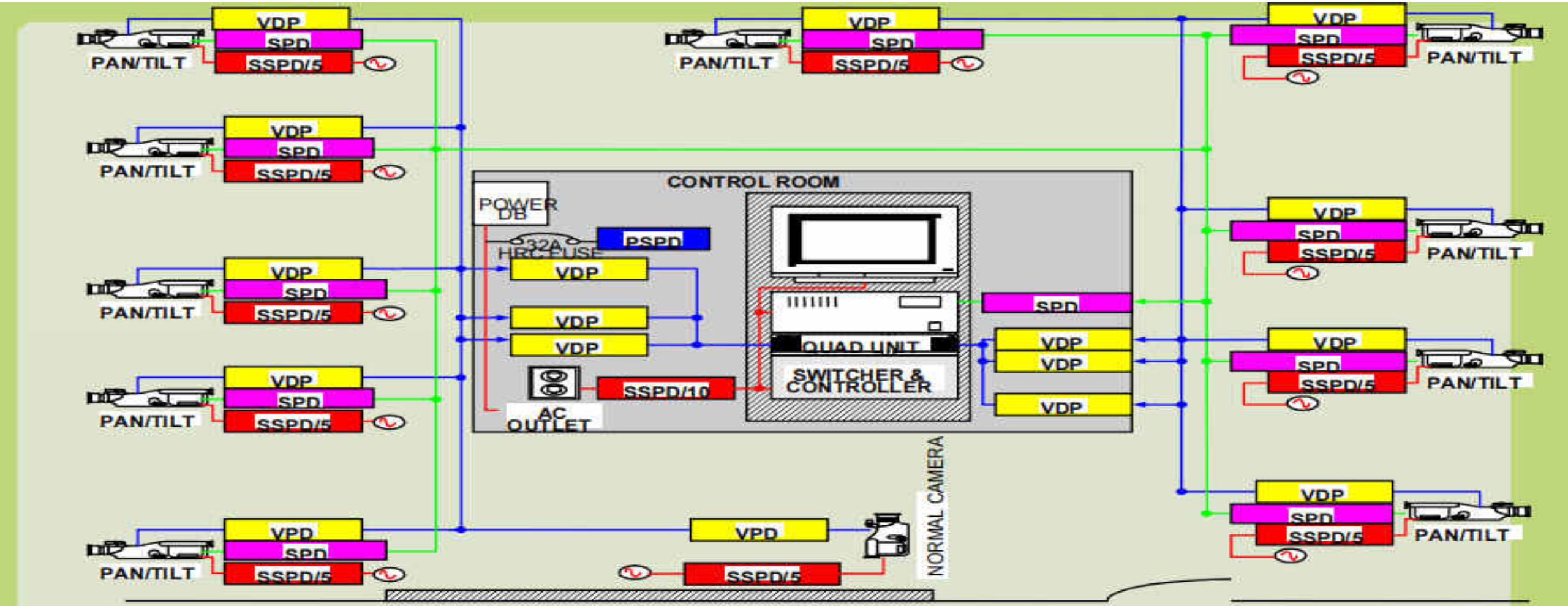
SURGE PROTECTION SELECTION FOR PABX SYSTEM



SURGE PROTECTION SELECTION FOR FIRE ALARM SYSTEM



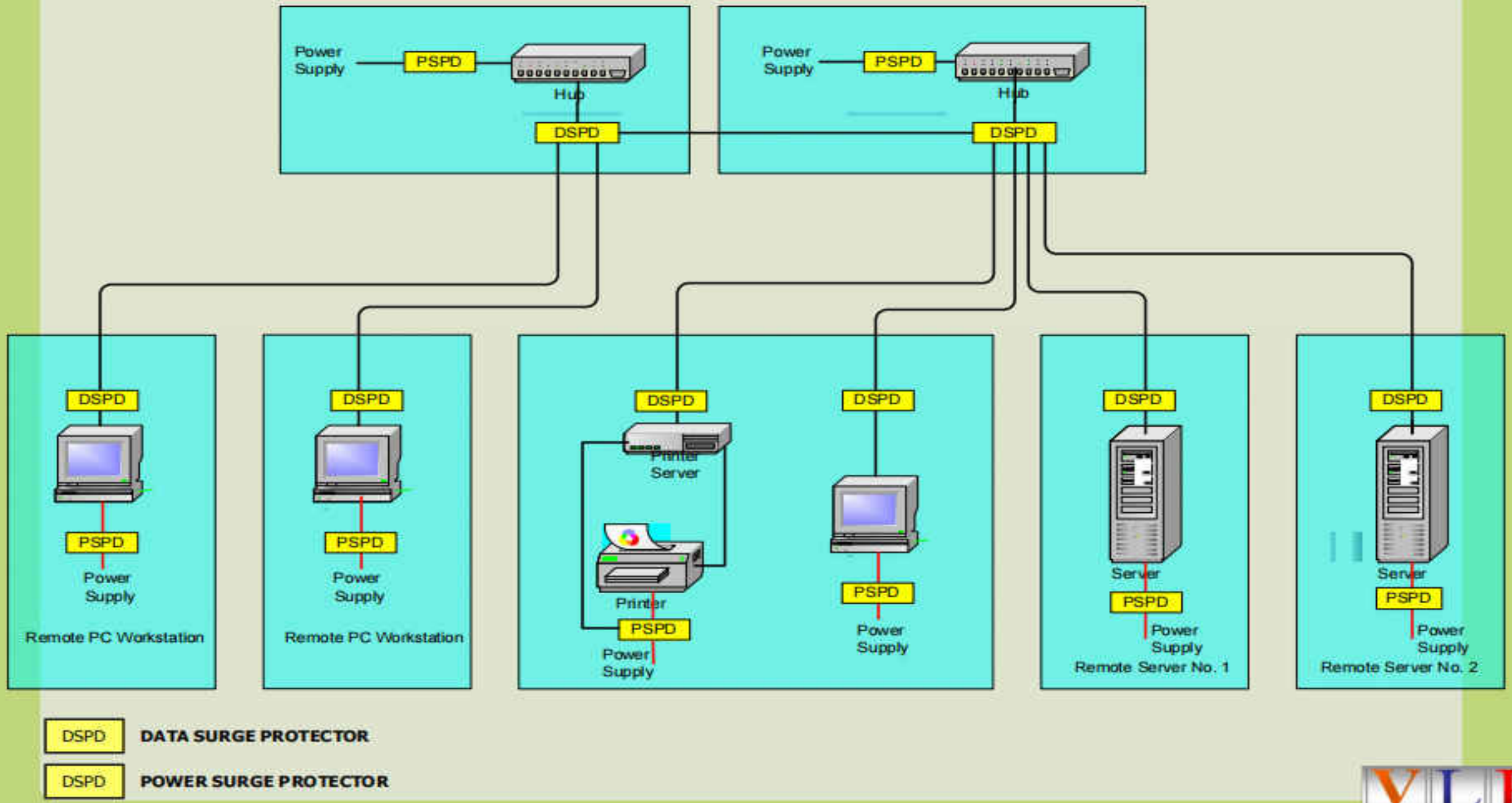
SURGE PROTECTION SELECTION FOR CCTV SYSTEM



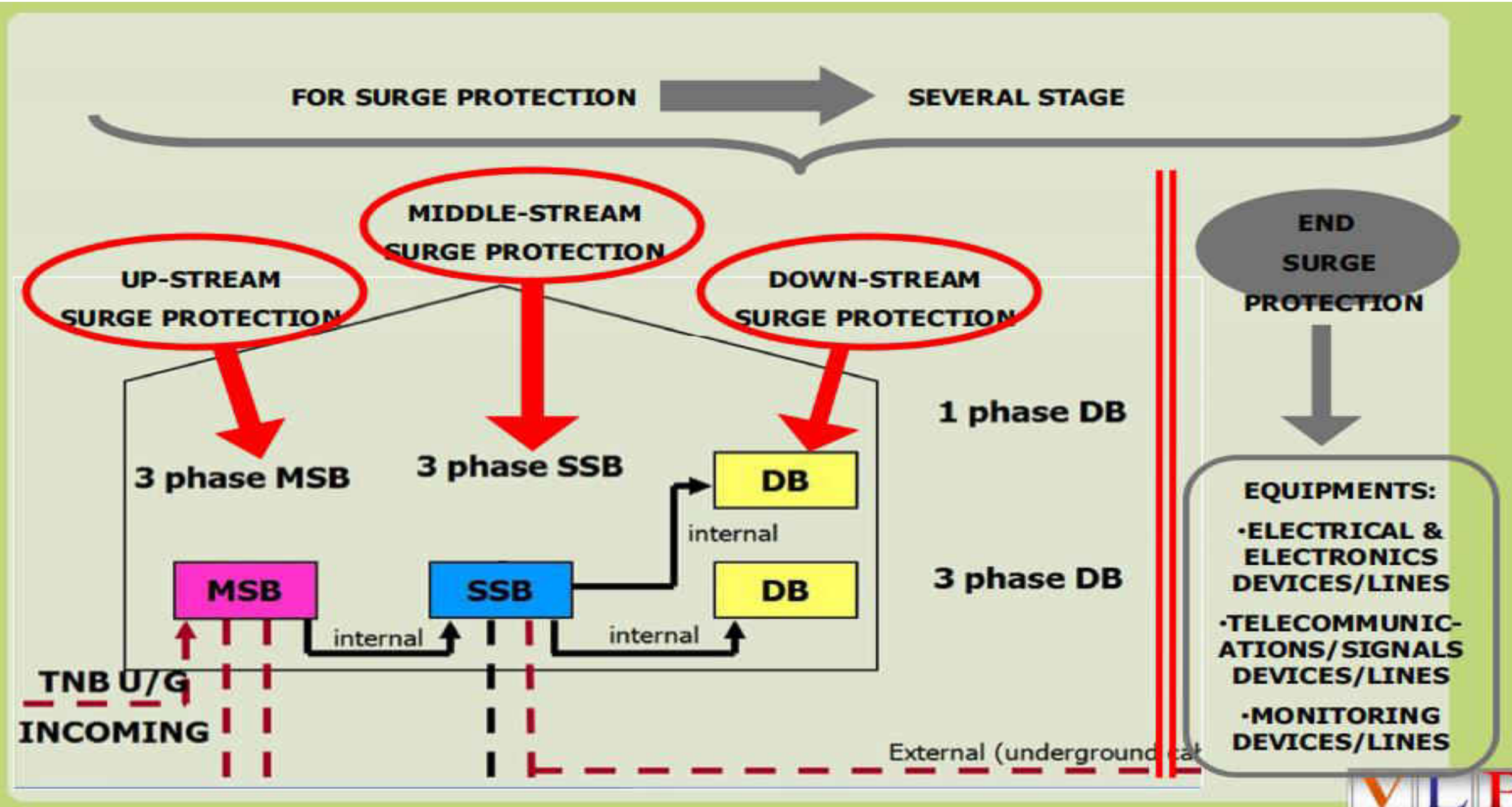
Legend

PSPD	POWER SURGE PROTECTION DEVICE
SSPD/10	SERIES SURGE PROTECTION DEVICE FOR LOAD RATED 10A,
SSPD/5	SERIES SURGE PROTECTION DEVICE LOAD RATED 5A,
VDP	VIDEO LINE SURGE PROTECTOR,
SPD	SIGNAL LINE PROTECTOR

SURGE PROTECTION SELECTION FOR NETWORKING SYSTEM



SURGE PROTECTION SELECTION



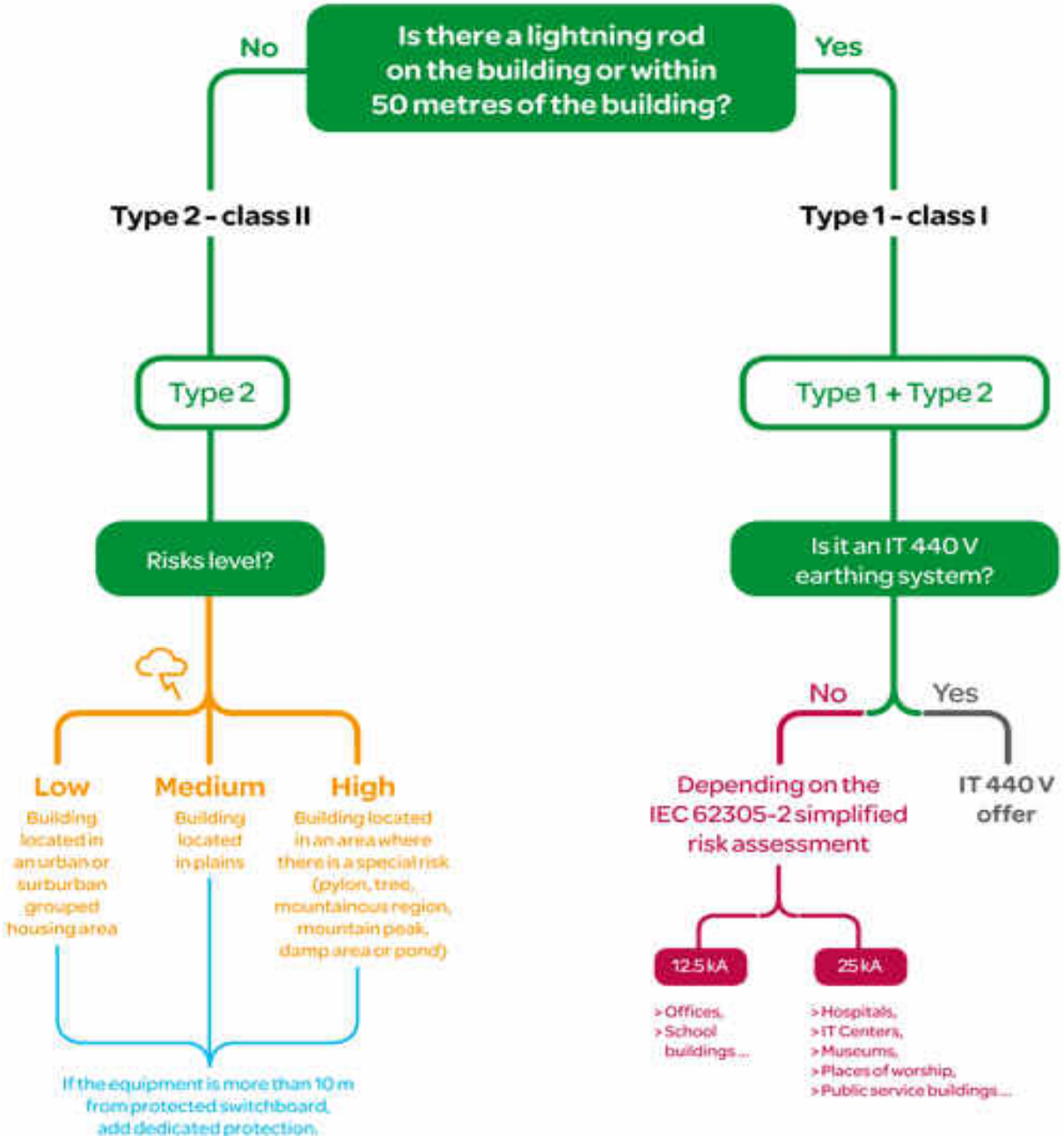
Surge is Danger Threat It's Pick-up and Travel to System Pulse/MicroSec (10/350,8/20&1.2/50) as per UL 1449 and IEC 61643-11

Surge protection devices suppress the excess voltage, divert it safely to the ground and prevents it from causing any harm. Surge or Lightening Protector is designed to provide Line to Line protection and Line to Ground protection.

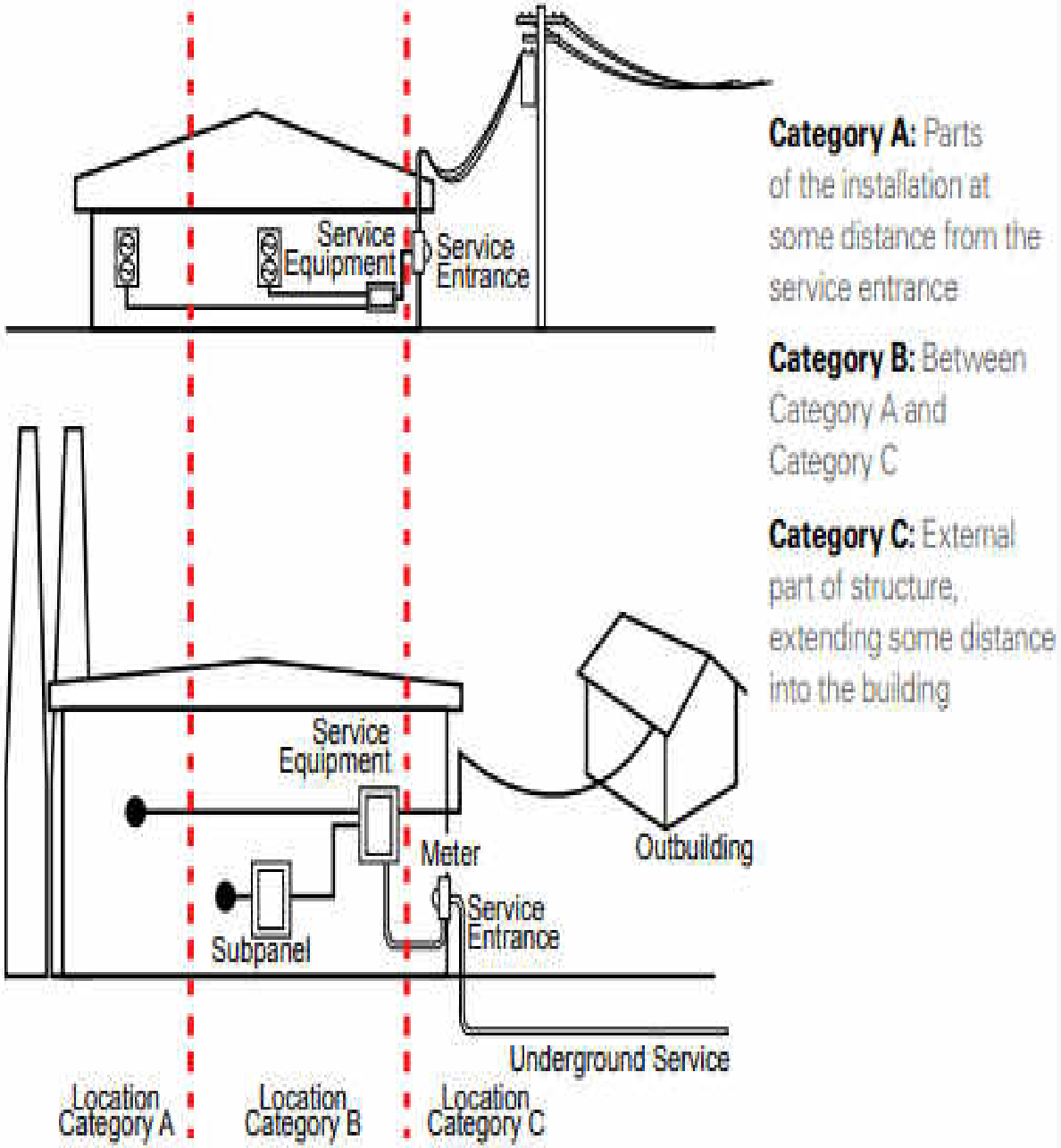
Operating Voltage of the Surge or Lightening protector is greater than the normal operating voltage of the device or system to be protected.

Parameter	Test Level/ Configuration
1.2/50µs Open Circuit Voltage Peak	Low: 6 kV. High: 10kV*
8/20µs Short Circuit Current Peak	Low: 3 kA. High: 10kA
Coupling Modes	L1 toPE, L2 to PE, L1 to 72
Polarity and Phase Angle	Positive at 90° and Negative at 270°
Test Strikes	5 for each Coupling Mode and Polarity/Phase Angle combination
Time Between Strikes	1 minute
Total Number of Strikes	= 5 strikes × 3 coupling modes × 2 polarity/phase angles = 30 total strikes

	IEC/EN 61643	UL1449
Type 1	Lightning current arrester, combined lightning current and surge arrester	Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and intended to be installed without an external overcurrent protective device.
Type 2	Surge arrester for distribution boards, sub distribution boards, fixed installations	Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device; including SPDs located at the branch panel.
Type 3	Surge arrester for socket outlets / terminal units	Point of utilization SPDs, installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel to the point of utilization, for example cord connected, direct plug-in, receptacle type and SPDs installed at the utilization equipment being protected. The distance (10 meters) is exclusive of conductors provided with or used to attach SPDs.



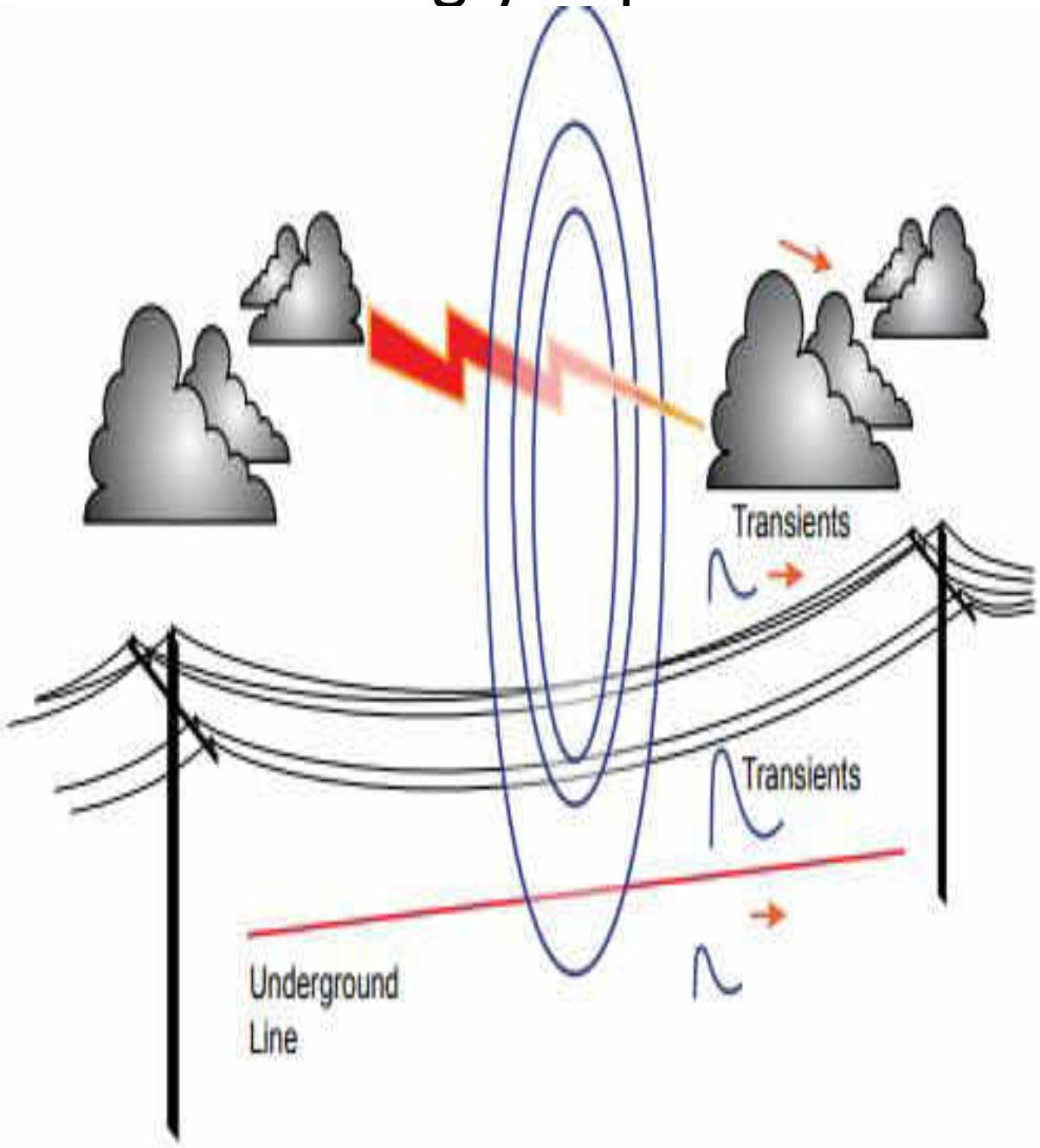
Reason for Surge and Electrical Entrance Cataugry as per IEC



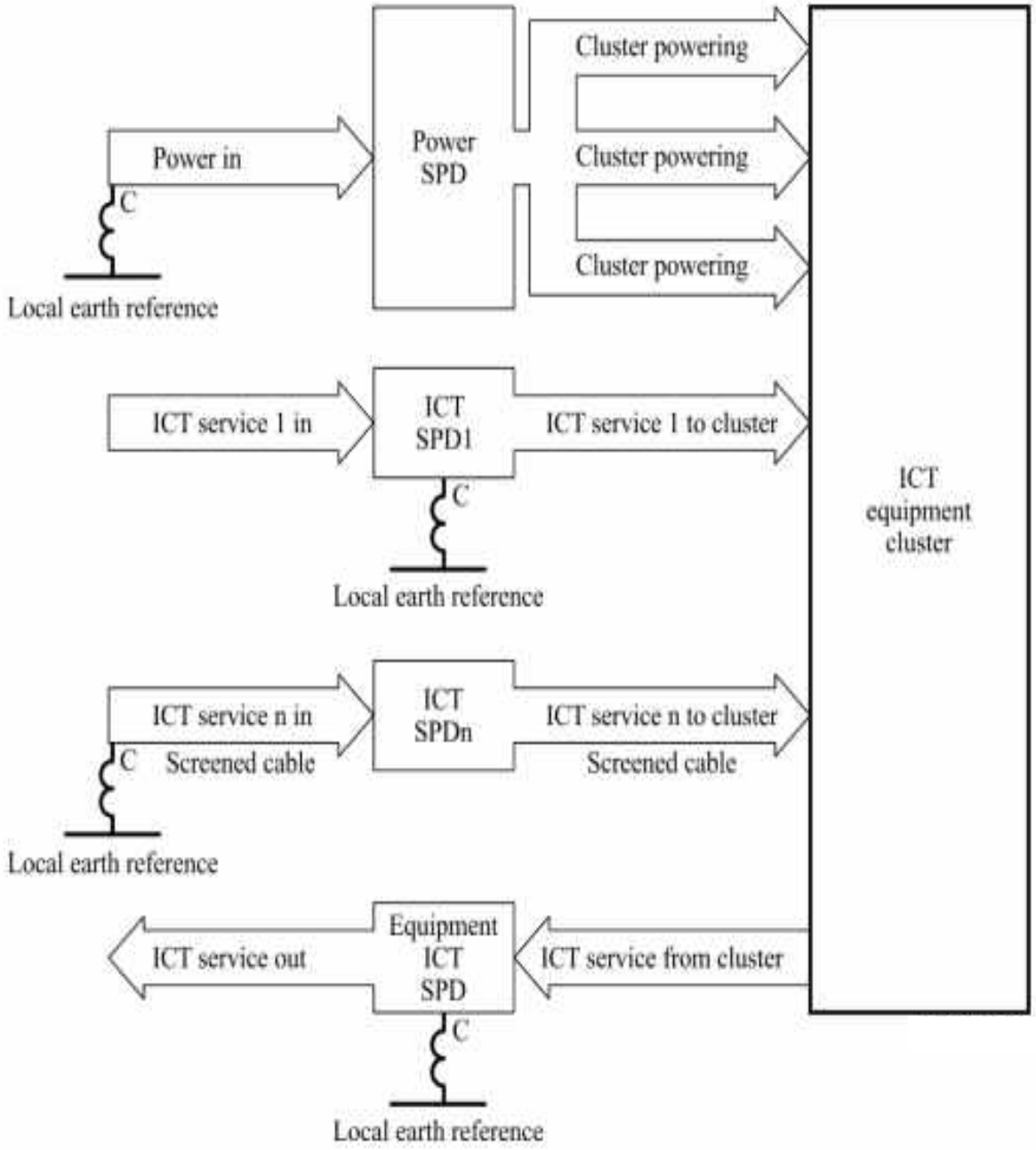
Category A: Parts of the installation at some distance from the service entrance

Category B: Between Category A and Category C

Category C: External part of structure, extending some distance into the building



Surge Protection Installation for Individuall Equipments Safety



When SPDs are individually applied to services, as the common mode surge

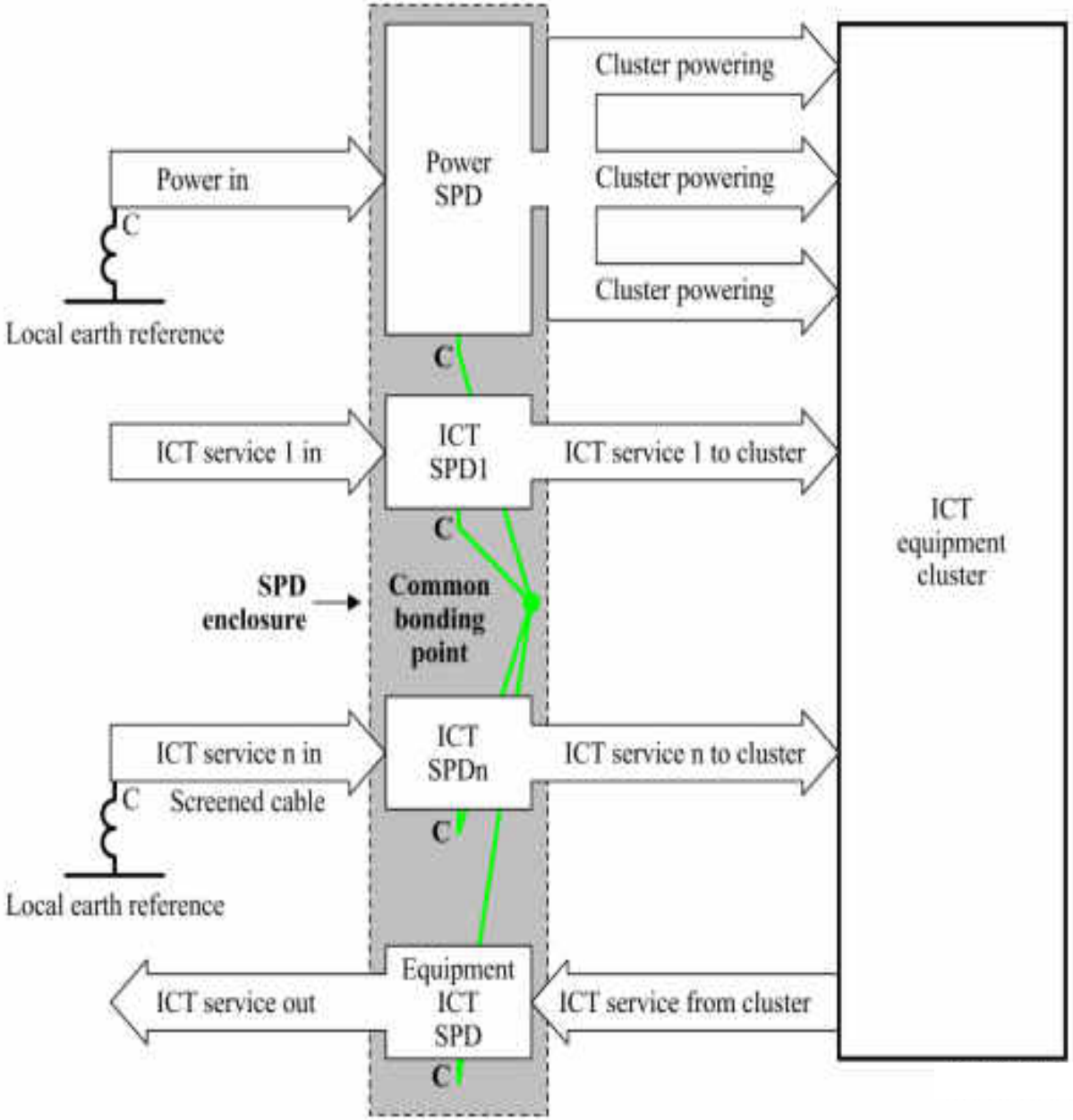
Current from the SPD "C" terminal to the local earth reference via the earthing cable can create a potential difference from the true earth potential. Further the local earth references themselves may be at different potentials.

1.5 µH/m. A diverted surge current of 50 A/µs would create an inductive voltage of 75 V/m. This inductive voltage adds to the SPD limiting voltage

The power SPD will be connected to the mains plug/socket local earth reference. The incomingservice SPD1 and outgoing service equipment SPD will be connected to whatever local earth reference is provided. For the screened cable SPDn the earth reference could be applied to the cable

originating end.

Surge Protection Installation for Multiple Equipments Safety



A surge reference equaliser does two things; it brings together all the service SPDs by locating themin a single enclosure and provides a local earth reference for all the SPD "C" terminals to directly connect the common bonding point, or "star" connection has two external earth reference

One from the power SPD mains plug/socket local earth reference and the other from the screened cable remote earth reference. This means that the diverted surge current can split between the power and screened cable earth references.to avoid earth loops in normal operation, one SPDn option is to make the screened cable "C"connection to the common bonding point via an SPD with a switching function, which maintains isolation during normal conditions but provides a bond during the occurrence of a surge.

The surge reference equaliser is now called an MSPD, although there may not be any SPDs in it,only SPCs giving the equivalent surge functionality of the replaced SPDs.

MSPD for protecting power, antenna, telephone and Ethernet services with warning lights for protection failure and missing earth connection.

Surge Protection for Serial and Co-Axial Communication Port

All data, control and telephone cables entering and leaving the communications building require protection. The protection must be placed at the protection boundary and the protective earth connected to station earth. The aim is to divert energy at the boundary.

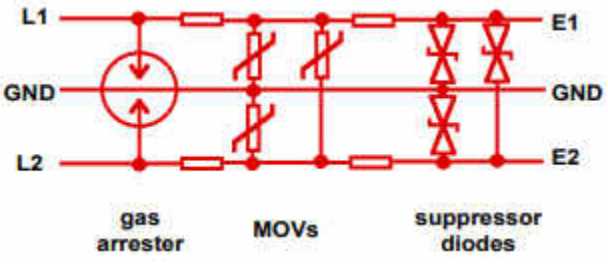
Data circuits require protection dependent upon their operating voltages and currents. Multistage series connected transient barriers should be employed. Figure 21 shows a typical schematic of Surge rating should be 20KA for an 8/20us impulse and the clamping voltage greater than the peak operating voltage.

Telephone lines require protection at the MDF. The protection should be multistage, when used with digital solid state telephone switches. Configuration will depend upon the termination method, eg KRONE®*, ADC, Reiche etc. Protect all incoming lines and external extensions. Generally internal extensions require no protection.

LAN systems require specialised protection specific to the LAN configuration. LAN line cards are particularly sensitive to transient overvoltage's and MUST be protected. Specialised protectors are available for the following protocols:

- RS232 in both DB9 and DB25 connector types
- RS485 and RS422 in DIN rail and DB9 configuration
- Thin Ethernet with in line and protected T BNC configuration
- Thick Ethernet with in line N type and DB15 AUI configuration
- RJ45 for UTP with hub protectors and individual terminal protectors

Ensure all LAN type protectors do not inhibit LAN performance. Only choose CAT5 UTP protectors.



As well as the outer conductors of coaxial feeders the inner conductors must also have protection applied to divert energy on the inner conductor to ground. The application of surge protection to UHF and microwave circuits is limited by frequency, return loss and insertion loss considerations. Typical coaxial surge protectors consist of a fast acting gas filled arrester connected between line and ground. Figure 19 shows a typical coaxial surge protector for type N connectors. This is a bulkhead mounting type.

Arrester flashover voltage should equal twice the peak line voltage. Example in a 50 ohm line with 50W transmitter, peak voltage = 70.7V. Minimum recommended gas arrester BV = 140V. Nearest value = 230V. Surge rating should be 20KA for an 8/20us impulse.

Gas filled arresters are unsuitable for high power HF and VHF transmitters (>= 1KW) unless the transmitters incorporate return power shutdown circuitry. A gas filled arrester once fired will remain in the conducting state by the presence of RF energy. This will destroy the arrester unless the transmitter has shutdown circuitry which detects the impedance discontinuity.

Alternatively utilise spark gap arresters with arc detection and shutdown circuitry.

For microwave link equipment an alternative and more effective solution is the quarter wave stub protector. These units must be tuned to the frequency in use but are capable of reasonably large bandwidth. For example a quarter wave stub protector centred on 2.4GHz has a usable bandwidth of +-100MHz. Figure 20 shows a typical unit.

Let's STUDY Jointly reason of Surge and use of Surge Protection including Installation GuideLine with Wiring Rules

UL SPD Types - Per 1449 4th Edition

Type 1- One port. permanently connected SPDs, except for watt- hour meter socket enclosure, intended for installation between the secondary of the service transformer and the line side of the service equpment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and Molded Case SPDs intended to be installed without an extemal overcurrent protective device. Type 1 SPDs for use in PV systems can be connected between the PV aarry and the main service disconnect.

DIN-RAIL SPDs are open Type 1.

Type 2- Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device, including SPDs located at the branch panel and Model Case SPDs.

Type 3 - Point of utilization SPDs, installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel to the point of utilization, for example cord connected, direct plug-in receptacle type and SPDs installed at the utilization equipment being protected. See marking in 80.3. The distance (10 meters) is exclusive of conductors provided with or used to attach SPDs.

Note: type 2 and 3 SPDs ware previously known as TVSSs,

Type 4 - Component Assemblies - Component assembly consisting of one or more Type 5 components together with a disconnect (integral or external) or a means of complying with the limited current tests in 44.4.

Type 1, 2, 3 Component Assemblies - Consists of a Type 4 component assembly with internal or external short circuitprotection.

Type 5 - Discrete component surge suppressors such as MOVS that may be mounted on a PVVB connected by its leads or provided within an enciosure with mounting means and wiring terminations. V/Uπ----nominal system voltage.

A nominal value assigned to designate a system of a given voltage class in accordance w ANSI CB4,1. Typical voltages include 120 208, 240, 277, 347, 480,600O Vac.

V --- Voltage Protection RatingA ring selected from a list of preferred values as given inToble 63. 1 of UL 1449 4th Edition andassigned to each mode of protection. The value of V is determined as the nearest highest value taken from Table 63.1 to the measured limiting voltage determined during the surge test using the compination wave generator at a setting of 6 kV, 3kA. It is also known as let-through voltage.

Guide to Surge Protection Devices (SPDs): selection, application and theory

The following common terminologies, as recognised by BS EN 61643/IEC 62305 are used throughout SPD specifications in order to aid correct selection and aredefined as follows:

Nominal Voltage UO is the line voltage to Earth a.c. voltage of the mains system (derived from the nominal system voltage) for which the SPD is designed to is the voltage by which the power system is designated -e g. 230V.

Maximum Continuous Operating Voltage Uc is the maximum RMS voltage that may be continuously applied to the SPD's mode of protection e.g. phase to neutralmode. This is equivalent to the SPD's rated peak voltage.

Temporary Overvoltage UT is the stated test value of momentary voltage increaseor overvoltage that the power SPD must withstand safely for a defined time.Temporary overvoltages, typically lasting up to several seconds, usually originate from switching operations or wiring faults (for example, sudden load rejection, single phase faults) as well as mains abnormalities such as ferro-resonance effects and harmonics.

Impulse Current Amp is defined by three parameters, a current peak with a chargeand a specific energy typically simulated with the 10/350us waveform to represent partial lightning currents. This waveform is used with peak Imp current value stated. for the mains Type 1 SPD Class I test and typically for data telecom SPD TestCategory D.

Nominal Discharge Current /nspdis a defined nominal peak current value through the SPD, with an 8/20µs current waveshape. This is used for classification of mains SPDs(Class Il test) and also for preconditioning of SPDs In Class I and Class IItests.

Maximum Discharge Current /maxis the peak current value through the SPD, with an B/20us waveshape. Imax is declared for mains Type 2 SPDs in accordance to the test sequence of the Class Il operating duty test. In general, max is greater than /nspd.

Surge protective devices (SPDs)Surge protective devices mainly consist of voltage-dependent resistors (varistors, suppressor diodes) and / or spark gaps (discharge paths). Surge protective devices are used to protect other electrical equipment and installations against inadmissibly high surges and / or to establish equipotential bonding. Surge protective devices are categorised:

Surge protective devices for power supply installations and devices
for nominal voltage ranges up to 1000 V
– according to EN 61643-11:2012 into type 1 / 2 / 3 SPDs
– according to IEC 61643-11:2011 into class I / II / III SPDs

Surge protective devices for information technology installations and devices
for protecting modern electronic equipment in telecommunications and signalling networks with nominal voltages up to 1000 V AC effective value) and 1500 V DC. against the indirect and direct effects of lightning strikes and other transients.
– according to IEC 61643-21:2009 and EN 61643-21: 2010.

Isolating spark gaps for earth-termination systems or equipotential bonding

Surge protective devices for use in photovoltaic systems
for nominal voltage ranges up to 1500 V
– according to EN 50539-11:2013 into type 1 / 2 SPDs

impulse current discharge capacity and protective effect into:

Lightning current arresters / coordinated lightning current arresters
for protecting installations and equipment against interference resulting from direct or nearby lightning strikes

Surge arresters
for protecting installations, equipment and terminal devices against remote lightning strikes, switching over-voltages as well as electrostatic discharges (installed at the boundaries downstream .

Combined arresters

for protecting installations, equipment and terminal devices against interference resulting from direct or nearby lightning strikes (installed at the boundaries between LPZ 0A and 1 as well as 0A and 2).

Technical data of surge protective devices

The technical data of surge protective devices include information on their conditions of use according to their:

Application (e.g. installation, mains conditions, temperature)

Performance in case of interference (e.g. impulse current discharge capacity, follow current extinguishing capability, voltage protection level, response time)

Performance during operation (e.g. nominal current, attenuation, insulation resistance)

Performance in case of failure (e.g. backup fuse, disconnector, failsafe, remote signalling option)

Short-circuit withstand capability

The short-circuit withstand capability is the value of the prospective power-frequency short-circuit current handled by the surge protective device when the relevant maximum backup fuse is connected upstream.

Short-circuit rating ISCPV of an SPD in a photovoltaic (PV) system

Maximum uninfluenced short-circuit current which the SPD, alone or in conjunction with its disconnection devices, is able to withstand.

Temporary overvoltage (TOV)

Temporary overvoltage may be present at the surge protective device for a short period of time due to a fault in the high-voltage system. This must be clearly distinguished from a transient caused by a lightning strike or a switching operation, which last no longer than about 1 ms. The amplitude UT and the duration of this temporary overvoltage are specified in EN 61643-11 (200 ms, 5 s or 120 min.) and are individually tested for the relevant SPDs according to the system configuration (TN, TT, etc.). The SPD can either a) reliably fail (TOV safety) or b) be TOV-resistant (TOV withstand), meaning that it is completely operational during and following

temporary over-voltages.

Thermal disconnector

Surge protective devices for use in power supply systems equipped with voltage-controlled resistors (varistors) mostly feature an integrated thermal disconnector that disconnects the surge protective device from the mains in case of overload and indicates this operating state. The disconnector responds to the “current heat“ generated by an overloaded varistor and disconnects the surge protective device from the mains if a certain temperature is exceeded.

The disconnector is designed to disconnect the overloaded surge protective device in time to prevent a fire. It is not intended to ensure protection against indirect contact. The function of

these thermal disconnectors can be tested by means of a simulated overload / ageing of the arresters.

Total discharge current I total

Current which flows through the PE, PEN or earth connection of a multipole SPD during the total discharge current test. This test is used to determine the total load if current simultaneously flows through several protective paths of a multipole SPD. This parameter is decisive for the total discharge capacity which is reliably handled by the sum of the individual

paths of an SPD.

Voltage protection level Up

The voltage protection level of a surge protective device is the maximum instantaneous value of the voltage at the terminals of a surge protective device, determined from the standardised individual tests:

– Lightning impulse sparkover voltage 1.2/50 µs (100%)

– Sparkover voltage with a rate of rise of 1kV/µs

– Measured limit voltage at a nominal discharge current In

The voltage protection level characterises the capability of a surge protective device to limit surges to a residual level. The voltage protection level defines the installation location with regard to the overvoltage category according to IEC 60664-1 in power supply systems. For surge protective devices to be used in information technology systems, the voltage protection level must be adapted to the immunity level of the equipment to be protected (IEC 61000-4-5: 2001).

Planning of internal lightning protection and surge protection

Special Connectors for Low Voltage Electrical Cable FreeDOM Connection

FC426
2 into 6 out, plug-in

FC436
3 into 6 out, plug-in

FC439
3 into 9 out, plug-in

FC-224-101
plug-in

FC773-102
2 Lines Direct insertion

FC-773-104
4 Lines Direct insert

FC773-106
6 Lines Direct insert

FC773-108
8 Lines Direct insert

FC-773-173
3 Lines Direct insert

FC-773-174
4 digits insert directly

FC-773-252
2 lines pluggable

FC773-253
3 Lines, pluggable

FC773-254
4 Lines, pluggable

FC773-255
5 Lines, pluggable

FC773-202
2 digits, insert directly

FC-773-203
3 digits insert directly

FC-773-204
4 digits, insert directly

FC-773-205
5 digits insert directly

FC773-206
6 digits, insert directly

FC-773-208
8 digits insert directly

FC-221-412
2 Lines plug-in

FC-221-413
3 Lines plug-in

FC-221-414
4 Lines plug-in

FC-221-415
5 Lines plug-in

IP68 Waterproof connector

2.4.2 IP68 connector & block

SF-XY22-W01
No.:3P; OD6.5mm,OD9mm,OD11mm

Wire to Wire: No.2P & 3P; OD<=7 & OD<=8; Wire dia:0.5-1.5mm²

SF-XY12-W01

Wire to wire; wire dia:0.5-1.5mm; current:16/24A

SF-XY16-W01
OD<=9 & OD<=11

SF-XYT21-W01
OD<=9 & OD<=11

IP 68 Out doorPlug&Sockets/Building Internal Electrical Cable Freedom Connectorts

1.4.1 IP66 Waterproof Box for 45*45mm modules

2) B Verison


SA66-S


SA66-2S


SA66-SS


SA66-S2S


SA66-S3S

1.4.2 IP55 Waterproof Box

S/N	Picture	Item & Feature	S/N	Picture	Item & Feature
1		SF-QB-200 IP55 1 way 45*45mm modules switch control IP55 waterproof box,dimension of 85*70mm;	2		SF-QB-201 IP55 3 way 45*45mm modules one switch and one socket outlet IP55 waterproof box,dimension of 85*95mm;
3		SF-QB-202 IP55 4 way 45*45mm modules of 2* socket outlet IP55 waterproof box, dimension of 85*120mm;	4		SF-QB-41 3 ways VIMAR modules flush-mounting IP55 waterproof box
5		SF-QB-42 4 ways VIMAR modules flush-mounting IP55 waterproof box			

1.4.3 BS standard one gang/two gang waterproof box

S/N	Picture	Item & Feature	S/N	Picture	Item & Feature
1		913SPF 1 Gang 13A waterproof switch socket	2		923SPF 2 Gang 13A waterproof switch socket
3		901ALF 1 gang switch waterproof box	4		902ALF 2 gang switch waterproof box
5		WP14 BS EN 60669-1 singie pole 20A,250V			

2.4 Wiring Connectors

2.4.1 Quick Wire Connectors


FC-222-412
2 digits plug-in


FC222-413
3 digits, plug-in


FC222-414
4 digits, plug-in


FC222-415
5 digits, plug-in


FC-222-418
8 digits plug-in


FC-221
1 Line plug-in


FC-212
2 Lines plug-in


FC-313
3 Lines plug-in


FC121
1 bit, plug-in


FC-223-2P
2 Lines plug-in


FC-223-3P
3 lines, plug-in


FC-223-4P
4 Lines plug-in


FC-223-5P
5 Lines plug-in


FC-223-6P
6 Lines plug-in


FC-223-8P
8 Lines plug-in


FC-223-10P
10 Lines plug-in


FC-223-12P
12 lines, plug-in


FC-424
2into and 4 out plug-in

Out DooR IP 68 CEE Compliance Plug &Socket forSpecial Electrical Equipment's

2.7 CEE Plug,Socket & Coupler

2.7.1 Panel Mounted CEE Socket


3 pole


4 pole


5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1331	SF1431	SF1531
	IP67	SF1332	SF1432	SF1532
32A	IP44	SF3331	SF3431	SF3531
	IP67	SF3332	SF3432	SF3532
63A	IP44	SF6331	SF6431	SF6531
	IP67	SF6332	SF6432	SF6532
125A	IP67	SF5332	SF5432	SF5532

2.7.2 Panel side-mounted CEE Socket


3 pole


4 pole


5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1341	SF1441	SF1541
	IP67	SF1342	SF1442	SF1542
32A	IP44	SF3341	SF3441	SF3541
	IP67	SF3342	SF3442	SF3542
63A	IP44	SF6341	SF6441	SF6541
	IP67	SF6342	SF6442	SF6542
125A	IP67	SF5342	SF5442	SF5542

2.7.3 Wall mounted CEE Socket


3 pole


4 pole


5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1311	SF1411	SF1511
	IP67	SF1312	SF1412	SF1512
32A	IP44	SF3311	SF3411	SF3511
	IP67	SF3312	SF3412	SF3512
63A	IP44	SF6311	SF6411	SF6511
	IP67	SF6312	SF6412	SF6512
125A	IP67	SF5312	SF5412	SF5512

2.7.4 CEE Interlock Switch Socket


3 pole


4 pole


5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP67	SF1372	SF1472	SF1572
32A	IP67	SF3372	SF3472	SF3572
63A	IP67	SF6372	SF6472	SF6572

Out DooR IP 68 CEE Compliance Plug &Socket forSpecial Electrical Equipment's

Cable 2 Cable Plug &Sockets

2.7.5 CEE Coupler



3 pole 4 pole 5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1321	SF1421	SF1521
	IP67	SF1322	SF1422	SF1522
32A	IP44	SF3321	SF3421	SF3521
	IP67	SF3322	SF3422	SF3522
63A	IP44	SF6321	SF6421	SF6521
	IP67	SF6322	SF6422	SF6522
125A	IP67	SF5322	SF5422	SF5522

2.7.6 CEE plug



3 pole 4 pole 5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1301	SF1401	SF1501
	IP67	SF1302	SF1402	SF1502
32A	IP44	SF3301	SF3401	SF3501
	IP67	SF3302	SF3402	SF3502
63A	IP44	SF6301	SF6401	SF6501
	IP67	SF6302	SF6402	SF6502
125A	IP67	SF5302	SF5402	SF5502

2.7.7 CEE Concealed plug



3 pole 4 pole 5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1351	SF1451	SF1551
	IP67	SF1352	SF1452	SF1552
32A	IP44	SF3351	SF3451	SF3551
	IP67	SF3352	SF3452	SF3552
63A	IP44	SF6351	SF6451	SF6551
	IP67	SF6352	SF6452	SF6552
125A	IP67	SF5352	SF5452	SF5552

2.7.8 CEE Wall mounted plug



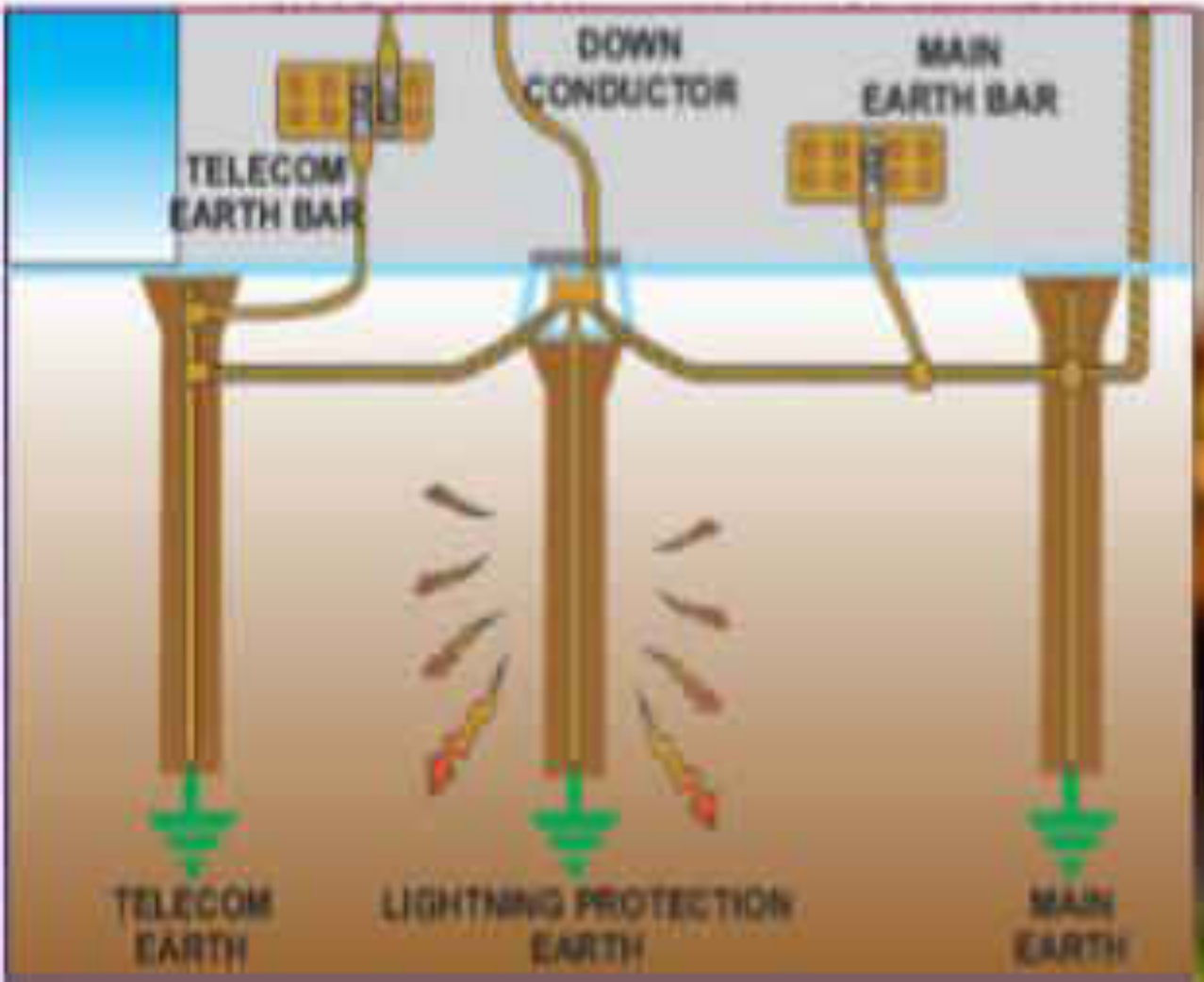
3 pole 4 pole 5 pole

Ampere		3 pole	4 pole	5 pole
16A	IP44	SF1361	SF1461	SF1561
	IP67	SF1362	SF1462	SF1562
32A	IP44	SF3361	SF3461	SF3561
	IP67	SF3362	SF3462	SF3562
63A	IP44	SF6361	SF6461	SF6561
	IP67	SF6362	SF6462	SF6562

Earthing is Nothing less than Engineering Follow IS3043(2018),IEEE80,IEC62305

Earthing Distance Maximum 500mtr allowed for Electrical and
300mtrs allowed for Low Voltage Equipment's.

Shortest Discharge Path , Less Joints No Sharp Bend ,Round Conductor for routing Earthing up to Equipment's, all buried Joint should be Exothermic Weld



Maintenance Free Earthing Value Calcullation & Costing Per PIT

Thumb Rule for Calculate Number of Earthing Rod

The approximate earth resistance of the Rod/Pipe electrodes can be calculated by:

Earth Resistance of the Rod/Pipe electrodes:

R= K x ρ/L

Where:

ρ = Resistivity of earth in Ohm-Meter
L = Length of the electrode in Meter.
d = Diameter of the electrode in Meter.
K = 0.75 if 26< L/d < 100
K = 1 if 100 < L/d < 600
K = 1.2 ρ/L if 600 < L/d < 300

Number of Electrode if find out by Equation of R(d) = (1.5/N) x R

Where:

R(d) = Desired earth resistance
R = Resistance of single electrode
N = No. of electrodes installed in parallel at a distance of 3 to 4 Meter interval.

Example: Calculate Earthing Pipe Resistance and Number of Electrode for getting Earthing Resistance of 1 Ω ,Soil Resistivity of ρ=40, Length=2.5 Meter, Diameter of Pipe = *38 mm*.

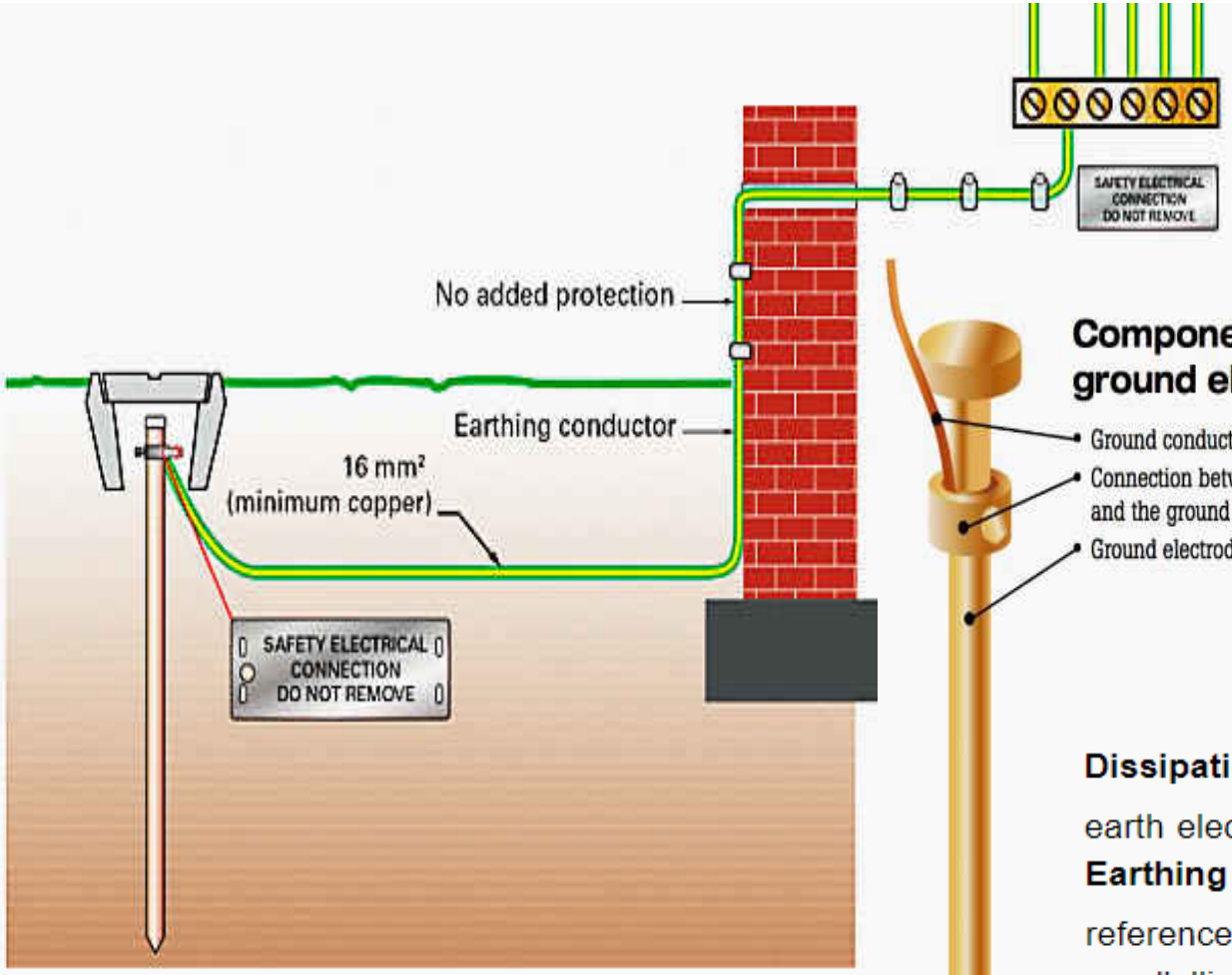
Here:

L/d = 2.5/0.038=65.78 so ***K = 0.75***

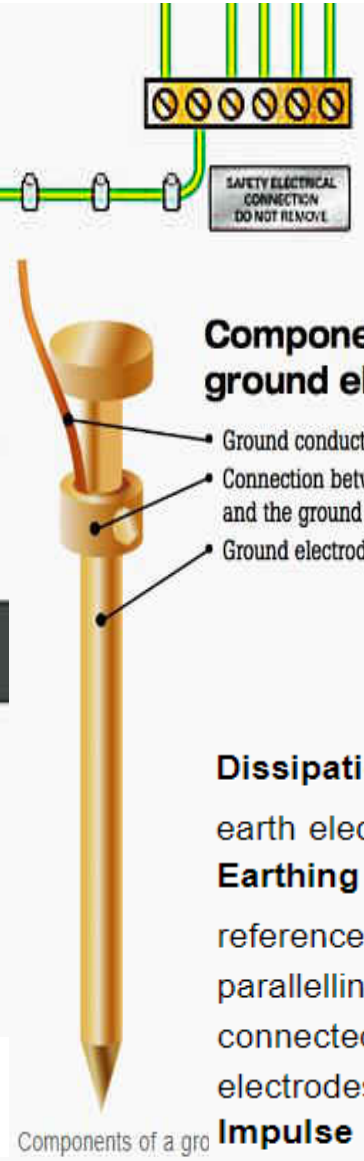
- The Earth Resistance of the Pipe electrodes R= K x ρ/L = 0.75×65.78 = ***12 Ω***
- One electrode the earth resistance is ***12 Ω***
- To get Earth resistance of 1 Ω the total Number of electrodes required = (1.5×12)/1 = ***18 No***

- BOQ Per Earthing PIT
- 17.2mm Copper Bonded 3 Mtr ROD=1
- Earth Enhance Compound(Value 0.012 Ohm) Qty -30 KG
- Earthing Clamp Connector for Connecting FLAT STRIP/Conductor - 01
- Earthing Strip /Conductor as per Equipment Load /Fault Current -10 Mtrs
- High Quality Industrial Plastic PIT Cover

Earthing and Conductor Installation



Earthing conductor connection



Components of a gro

To earth means **to connect an electrically conductive part to the ground via an earthing system**. Earthing is the total of all measures used for earthing.

Specific earth resistivity ρ_E is the specific electrical resistivity of the ground. It is generally stated in **$\Omega\ m^2/m = \Omega\ m$** and indicates the resistance between two opposite cube faces of a cube of soil with sides of 1 m.

Dissipation resistance R_A of an earth electrode is the resistance of the earth between the earth electrode and the reference earth. R_A is in practice a real resistance.

Earthing impedance Z_E is the AC impedance between an earthing system and the reference earth at operating frequency. The value of the earthing impedance is derived from parallelling the dissipation resistances of the earth electrodes and the impedances of connected conductor strings, e.g. the overhead earth wire and cables acting as earth electrodes.

Impulse earthing resistance R_{st} is the resistance presented to the passage of lightning currents between a point of an earthing system and the reference earth.

Protective earthing is the earthing of a conductive component that is not part of the main circuit for the protection of persons **against unacceptable touch voltages**.

Earthing systems have the following general purpose: Protection of life and property in the events of 50-Hz-faults (short circuits and earth faults) and transient phenomena (lightning, switching operations).

Recommdation for Joints or Tapping any Metal ,Cables or Conductor's Open or in Burried Environments to Avoid Rusting , Corosen Result Loose Contact ,Spark,Disconnect of Fire Accidents

<u>below information abstarct from NBC2016,IEEE80,IEC62305 and other International Electrical Safety Installation Guide Line</u>

Any metals ,Conductors use for extention mostly for Earthing only recommended same material for Tapping or Jointing Nut Bolt , brazing for burried connection is BAN advise to use Exothermic.

if we do with nout and Bolting , Brazing the surface contact of both material will not be 100% Result Heat when load and Sink when connection Cool later experinced Loose Contact result Spark ,Disconnect or may be Fire Accidents.

If you use different Metal for Extention and Tapping it's very difficult to ensure 100% Surface Contact over period of Life becuase of diffirent behavior of Temperature and develop gelvanis between two Joints.

another failure rusting Conductors not capable to handle load

for Long Distance Connection we should use Soft Round Conductor advantage less Joints, angle bend while routing maintain low contact resistance result long life and high productivity.

Copper Claded Steel

Copper Claded Aluminium

Steel Round Conductors

These Conductors now recommended for Earthing Extention and Down Conductor for Lighting Discharge from Building ot Structure allow routing and bending avoid Sharp Corner Develope (which we facing with Flat Strip GI or Copper Via routing) another benifit of round conductor over Flat Strip under burried condition is long Life and faster handling any Surge or Ligthing to protect our equipment's.

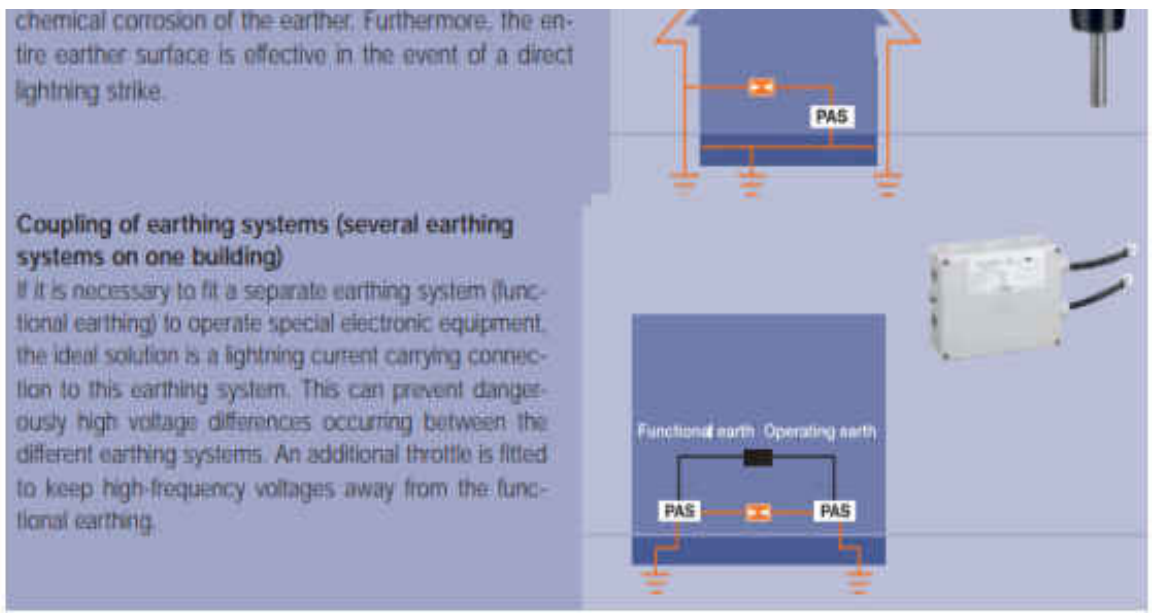
Sparkgap Protection

Spark gaps are intend to provide galvanic isolation between electrical installation parts where direct connections are not permitted. The galvanic isolation prevents not only electrochemical corrosion but provides also a connection capable of carrying lightning current. For connecting different earthing systems, the aim being to make optimum use of all earthers for lightning protection equipotential bonding.

Earthing Distance Maximum 500mtr allowed for Electrical and

300mtrs allowed for Low Voltage Equipment's.

Shortest Discharge Path , Less Joints No Sharp Bend ,Round Conductor for routing Earthing up to Equipment's, all buried Joint should be Exothermic Weld



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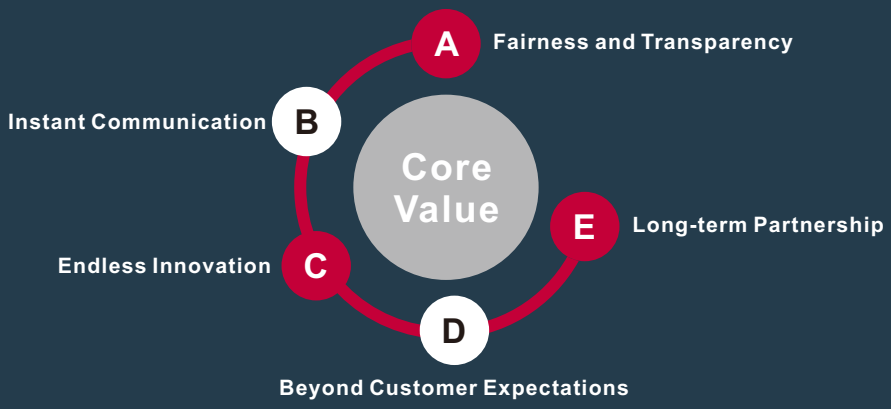
SURGEPROTEC

PRODUCT CATALOG

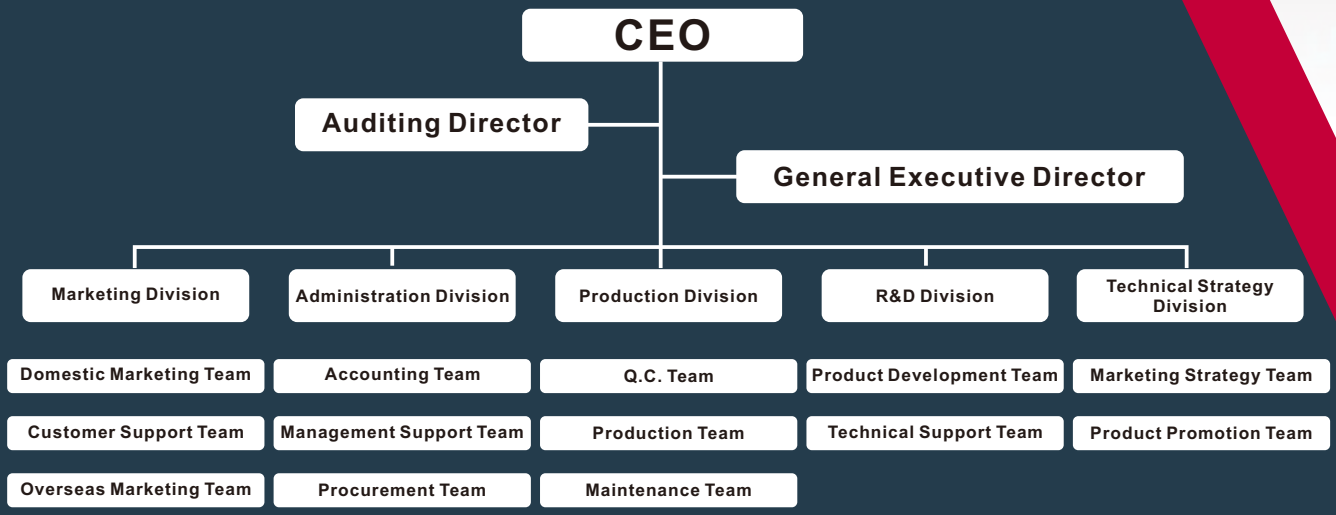
About our Company

COMPANY PROFILE

SPT (Surgeprotec Co., Ltd.) is a pioneering Korean company specialising in the development and production of surge protection devices. It offers a complex range of surge arresters, pursuant to EN 61643-11 standard and surge arresters for information technology, measurement and control, and telecommunications.
From the technical expertise to the operational deployment, we are passionate about all aspects and topics related to SPDs. Our teams are composed of engineers and SPD specialists who can bring forward the best insights and solutions. We support distributors, contractors and consultants with Sales Application Specialists.
We provide free A/S for 10 years for all surge protectors.



Organization Chart



About our
Services

SPT products provide complex solutions for surge protection devices for various applications.

Products

Surge Protector

Type 1 SPD-lightning current arresters

Combined, spark gap and MOV
Iimp 25 kA / 100 kA Up ≤ 1.5 kV
No follow current, zero leakage current
Full coordination with Type 2 SPD

SPD PV - surge arrester

Combination of MOV and spark gap
PV Type 2 SPD
MOV surge arrester
UCPV 170 to 1500 V DC
In 15 to 20 kA
Imax 40 kA

Type 2 SPD – surge arresters

Combined, spark gap and MOV
U c 75 to 760 V AC
In 20 kA / Imax 40 kA
Up ≤ 1.35 kV

Type 1 and 2 SPD -combined arresters B+C

Combined, spark gap and MOV
Iimp 12.5 kA / 50 kA
Up ≤ 1.5 kV
No follow current, zero leakage current

>>>>>> Product Development <<<<<<

Quality	**Flexibility and Speed**	**R&D Department**	**Customers Requirements**
Safety, reliability and top quality of our products	**Flexible approach to the implementation of special solutions and products**	**Continuous innovation is the foundation of our further development**	**Customers are our everlasting inspiration**

1.SURGE PROTECTORS PARAMETERS

Uc (Maximum continuous operating Voltage)

Maximum effective voltage that can be applied permanently to the terminals of the protection device.

In (Nominal current)

Peak current in 8/20 μs waveform the protection device can withstand 20 times without reaching end of life.

Imax (Maximum discharge current)

Peak current with 8/20 μs waveform which the protection device can withstand.

Iimp (Impulse current)

Peak current with 10/350 μs waveform which the protection device can withstand without reaching end of life.

Up (Voltage protection level)

Maximum residual voltage between the terminals of the protection device during the application of a peak current.

Ures (Residual voltage)

Residual voltage of the surge protector during an 8/20μs current waveform injection at a determined rating.

TOV (Temporary Overvoltage)

The temporary overvoltage is the maximum AC voltage the surge protector can withstand during defined durations (5 seconds and 120 mn), without failure or with controlled disconnection. This parameter U T is greater to Uc. An additional test is required for TT AC system, to simulate a temporary ≪high voltage≫ overvoltages (TOV) between Neutral and PE (application of 1200 Vac, 300 A for 200 ms): the compliance with this test requires the use of the CT2 diagram (specific gas tube between N and PE)

2.CLASSIFICATION OF SURGE PROTECTORS

Protection devices are classified into types according to discharge capacity:

Type 1:

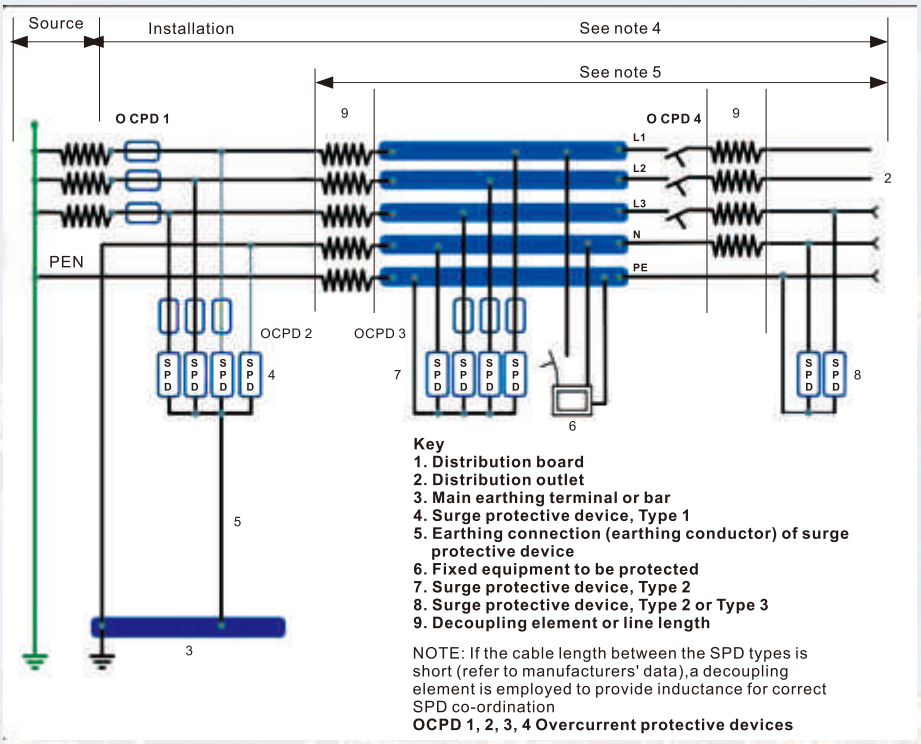
Tested with a 10/350 μs waveform (Class I test), which simulates the current produced by a direct lightning strike. Ability to discharge very high currents to earth, providing a high Up - voltage protection level. Must be accompanied by downstream Type 2 protectors. Designed for use in incoming power supply panels where the risk of lightning strike is high, for example in buildings with an external protection system.

Type 2:

Tested with a 8/20 μs waveform (Class II test), which simulates the current produced in the event of a switching or lightning strike on the distribution line or its vicinity. Ability to discharge high currents to earth, providing a medium Up - voltage protection level. Designed for use in distribution panels located downstream of Type 1 protectors or in incoming power supply panels in areas with low exposure to lightning strikes.

Type 3:

Tested with a combined 1.2/50 μs - 8/20 μs waveform (Class III test), which simulates the current and voltage that can reach the equipment to be protected. Ability to discharge medium currents to earth, providing a low Up - voltage protection level. Always installed downstream of a Type 2 protection, it is designed to protect sensitive equipment or equipment located more than 20m downstream of the Type 2 device.



Key

1. Distribution board
2. Distribution outlet
3. Main earthing terminal or bar
4. Surge protective device, Type 1
5. Earthing connection (earthing conductor) of surge protective device
6. Fixed equipment to be protected
7. Surge protective device, Type 2
8. Surge protective device, Type 2 or Type 3
9. Decoupling element or line length

NOTE: If the cable length between the SPD types is short (refer to manufacturers' data),a decoupling element is employed to provide inductance for correct SPD co-ordination

OCPD 1, 2, 3, 4 Overcurrent protective devices

3.SELECTION AND INSTALLATION OF SPDs

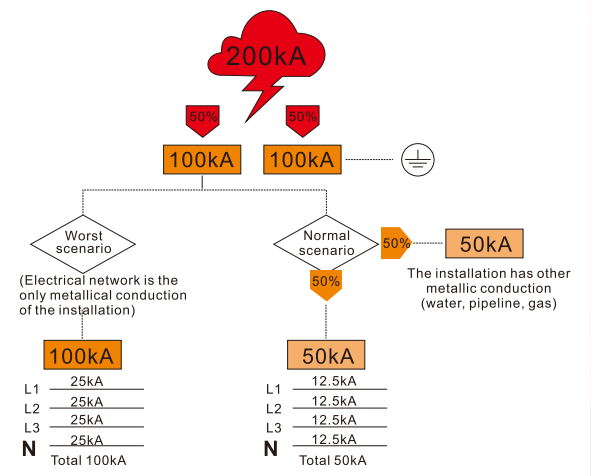
Type 1, Type 2 which one has to be selected?

The SPD protection design does not depend on the fault ratings given by the transformer, it only depends on the level of exposure in front of a surge. So, which SPD do we have to install in the main switchboard?

See the diagram below from IEC 63205-1 standard which displays the dispersion of the highest lightning considered: 200kA @ 10/350µs. In the worst case scenario, 50% of this energy is conducted away to earth leaving 100kA potential across the networks 3 phase and neutral. Here a 25kA @ 10/350µs (Iimp) Type 1 SPD is recommended for insulated installations in extreme exposed locations to lightning.

In the "Normal Scenario" it is assumed any direct lightning strike to the network will be at such a distance from the installation that another 50% of the energy is dispersed to earth via other conductors before entering your point of connection. In this scenario a device with 12.5kA @ 10/350µs (Iimp) Type 1 is recommended. Furthermore, based on the IEC 61643-12 standard, 12.5kA is the minimum kA rate when a Type 1 is needed. If the level of exposure of the installation is lower than above described scenarios

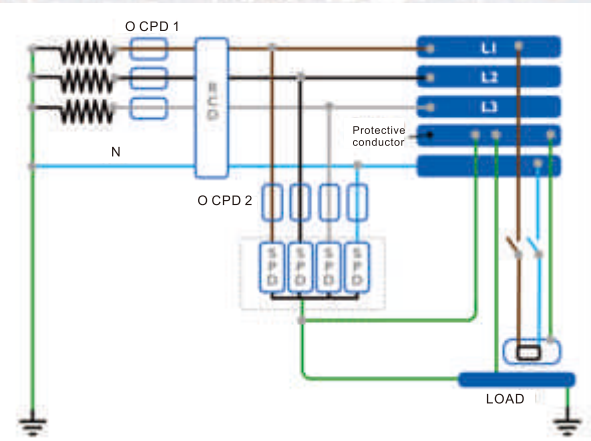
Type 2 SPD (Imax) may be considered along with risk and cost of equipment and downtime.



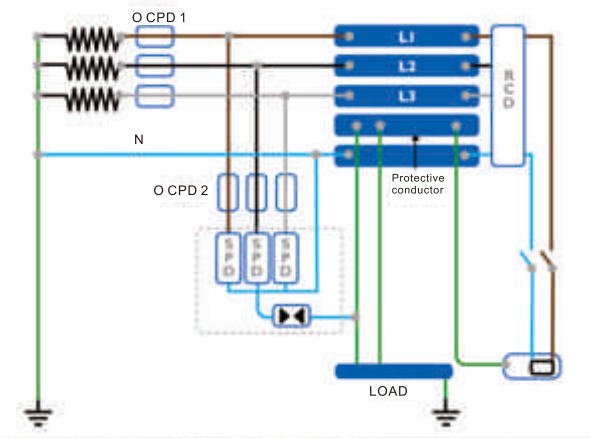
4.POWER SUPPLY NETWORKS

An SPD in power supply networks should be connected in two connection modes – mode x+0 (CT1) and mode x+1 (CT2).

The x+0 (CT1) connection mode is designated 3+0 (TN-C) or 4+0 (TN-S) for three-phase power supply and 1+0 (TN-C) or 2+0 (TN-S) for single-phase power supply. Such mode is beneficial in eliminating common mode of overvoltage.



The x+1 (CT2) connection mode is designated 3+1 for three -phase power supply and 1+1 for single-phase power supply. It cannot be used in the TN-C supply network. It is advantageous to use it to eliminate the differential mode of overvoltage.



Application

Smart Buildings

Construction & IDC
Telecommunication

Power Industries

Wind Power
Solar Power
Power Grid

Transportation Systems

EV Charging Station
Harbor Facilities
Expressway
Railway.

Monoblock Single-Pole SPD

SPT25-XXX/1(S)

Class I•Class II • Type 1•Type 2

Location of Use: Main Distribution Boards
Network Systems: TN-S, TN-C, TT
Mode of Protection: L-PE / N-PE
Surge Ratings: I_{imp} = 25 kA (10/350 µs)
I_n = 25 kA (8/20 µs)
IEC/EN Category: Class I+II / Type 1+2
Protective Elements: High Energy MOV
Housing: Monoblock Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012

Technical Data

SPT25-XXX/1(S)		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/ U_n	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 µs)	I_n			25 kA		
Maximum Discharge Current (8/20 µs)	I_{max}			100 kA		
Impulse Discharge Current (10/350 µs)	I_{imp}			25 kA		
Specific Energy	W/R			156 kJ / Ω		
Charge	Q			12.5 As		
Voltage Protection Level	U_p	1000 V	1500 V	1600 V	1800 V	2000 V
Response Time	t_A			< 25 ns		
Back-Up Fuse (max)				315 A gL / gG		
Short-Circuit Current Rating (AC)	I_{SCCR}			50 kA		
TOV Withstand 5s	U_T	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	230V	440V	440V	440V	765 V
Number of Ports				1		
Mechanical & Environmental						
Operating Temperature Range	T_a			-40 ºF to +158 ºF [-40 ºC to +70 ºC]		
Permissible Operating Humidity	RH			5%...95%		
Atmospheric pressure and altitude				80k Pa ... 106k Pa / -500 m ... 2000 m		
Terminal Screw Torque	M_{max}			26.5 lbf·in [3.0 Nm]		
Conductor Cross Section (max)				2 AWG (Solid, Stranded) / 4 AWG (Flexible)		
				35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)		
Mounting				35 mm DIN Rail, EN 60715		
Degree of Protection				IP 20 (built-in)		
Housing Material				Thermoplastic: Extinguishing Degree UL 94 V-0		
Thermal Protection				Yes		
Operating State / Fault Indication				Green ok / Red defect		
Remote Contacts (RC)				Optional		
RC Switching Capacity				AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A		
RC Conductor Cross Section (max)				16 AWG (Solid) / 1.5 mm^2(Solid)		

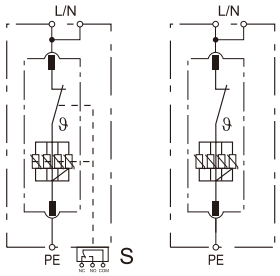
Order Information

Order Code	150	275	320	385	440
SPT25-XXX/1	2515011	2527511	2532011	2538511	2544011
SPT25-XXX/1S (with remote contacts)	2515012	2527512	2532012	2538512	2544012

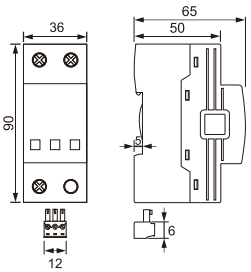
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional



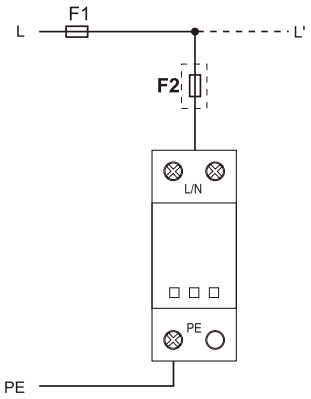
Dimensions & Packaging



Dimensions & Packaging					
SPT25-XXX/1(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[260 × 230 × 320 mm]				
Minimum Order Quantity	42 Units				

Connection Diagram

TN-S, TN-C, TT (Single-phase, 1+0)



Monoblock Multi-Pole SPD

SPT25-XXX/2(S)

Class I•Class II • Type 1•Type 2

Location of Use: Main Distribution Boards
Network Systems: TN-S
Mode of Protection: L-PE / L-PE, N-PE / N-PE
Surge Ratings: I_{imp} = 25 kA (10/350 µs)
I_n = 25 kA (8/20 µs)
IEC/EN Category: Class I+II / Type 1+2
Protective Elements: High Energy MOV
Housing: Monoblock Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012

Technical Data

SPT25-XXX/2(S)		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/ U_n	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 µs)	I_n			25 kA		
Maximum Discharge Current (8/20 µs)	I_{max}			100 kA		
Impulse Discharge Current (10/350 µs)	I_{imp}			25 kA		
Total Discharge Current (10/350 µs)	I_{total}			50 kA		
Specific Energy	W/R			156 kJ / Ω		
Charge	Q			12.5 As		
Voltage Protection Level	U_p	1000 V	1500 V	1600 V	1800 V	2000 V
Response Time	t_A			< 25 ns		
Back-Up Fuse (max)				315 A gL / gG		
Short-Circuit Current Rating (AC)	I_{SCCR}			50 kA		
TOV Withstand 5s	U_T	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	230 V	440 V	440 V	440 V	765 V
Number of Ports				1		
Mechanical & Environmental						
Operating Temperature Range	T_a			-40 °F to +158 °F [-40 °C to +70 °C]		
Permissible Operating Humidity	RH			5%...95%		
Atmospheric pressure and altitude				80k Pa ... 106k Pa / -500 m ... 2000 m		
Terminal Screw Torque	M_{max}			26.5 lbf·in [3.0 Nm]		
Conductor Cross Section (max)				2 AWG (Solid, Stranded) / 4 AWG (Flexible)		
				35 mm² (Solid, Stranded) / 25 mm² (Flexible)		
Mounting				35 mm DIN Rail, EN 60715		
Degree of Protection				IP 20 (built-in)		
Housing Material				Thermoplastic: Extinguishing Degree UL 94 V-0		
Thermal Protection				Yes		
Operating State / Fault Indication				Green ok / Red defect		
Remote Contacts (RC)				Optional		
RC Switching Capacity				AC: 250V / 0.5 A;DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A		
RC Conductor Cross Section (max)				16 AWG (Solid) / 1.5 mm²(Solid)		

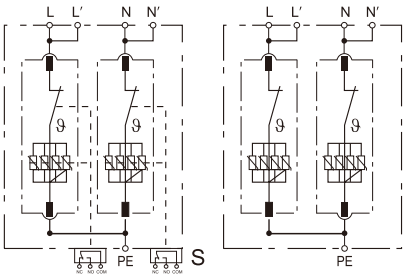
Order Information

Order Code	150	275	320	385	440
SPT25-XXX/2	2515021	2527521	2532021	2538521	2544021
SPT25-XXX/2S(with remote contacts)	2515022	2527522	2532022	2538522	2544022

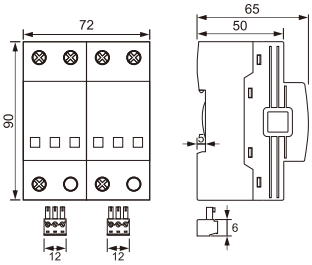
Internal Configuration

Legend

L/L′ Line
N/N′ Neutral
PE Protective Earth
S Signalling Contacts Optional



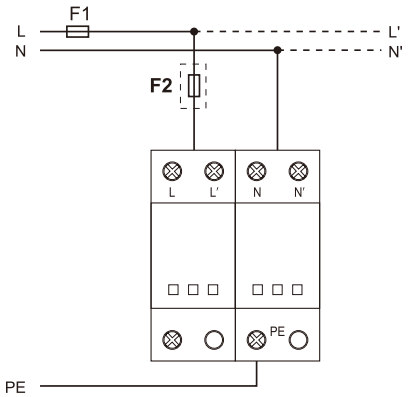
Dimensions & Packaging



Dimensions & Packaging					
SPT25-XXX/2(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[260 × 230 × 320 mm]				
Minimum Order Quantity	24 Units				

Connection Diagram

TN-S (Single-phase, 2+0)



Monoblock Multi-Pole SPD

SPT25-XXX/3(S)

Class I•Class II • Type 1•Type 2

Location of Use: Main Distribution Boards
Network Systems: TN-C
Mode of Protection: L-PE / L'-PE
Surge Ratings: I_{imp} = 25 kA (10/350 µs)
I_n = 25 kA (8/20 µs)
IEC/EN Category: Class I+II / Type 1+2
Protective Elements: High Energy MOV
Housing: Monoblock Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012

Technical Data

SPT25-XXX/3(S)		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/ U_n	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 µs)	I_n			25 kA		
Maximum Discharge Current (8/20 µs)	I_{max}			100 kA		
Impulse Discharge Current (10/350 µs)	I_{imp}			25 kA		
Total Discharge Current (10/350 µs)	I_{total}			75 kA		
Specific Energy	W/R			156 kJ / Ω		
Charge	Q			12.5 As		
Voltage Protection Level	U_p	1000 V	1500 V	1600 V	1800 V	2000 V
Response Time	t_A			< 25 ns		
Back-Up Fuse (max)				315 A gL / gG		
Short-Circuit Current Rating (AC)	I_{SCCR}			50 kA		
TOV Withstand 5s	U_T	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	230 V	440 V	440 V	440 V	765 V
Number of Ports				1		
Mechanical & Environmental						
Operating Temperature Range	T_a			-40 ºF to +158 ºF [-40 ºC to +70 ºC]		
Permissible Operating Humidity	RH			5%...95%		
Atmospheric pressure and altitude				80k Pa ... 106k Pa / -500 m ... 2000 m		
Terminal Screw Torque	M_{max}			26.5 lbf·in [3.0 Nm]		
Conductor Cross Section (max)				2 AWG (Solid, Stranded) / 4 AWG (Flexible)		
				35 mm² (Solid, Stranded) / 25 mm² (Flexible)		
Mounting				35 mm DIN Rail, EN 60715		
Degree of Protection				IP 20 (built-in)		
Housing Material				Thermoplastic: Extinguishing Degree UL 94 V-0		
Thermal Protection				Yes		
Operating State / Fault Indication				Green ok / Red defect		
Remote Contacts (RC)				Optional		
RC Switching Capacity				AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A		
RC Conductor Cross Section (max)				16 AWG (Solid) / 1.5 mm²(Solid)		

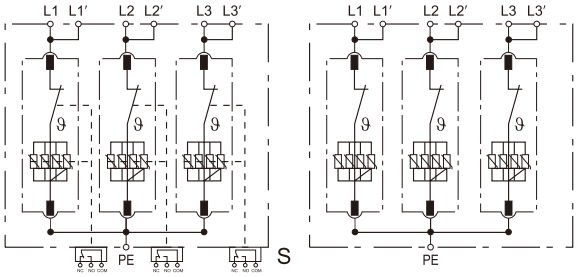
Order Information

Order Code	150	275	320	385	440
SPT25-XXX/3	2515031	2527531	2532031	2538531	2544031
SPT25-XXX/3S(with remote contacts)	2515032	2527532	2532032	2538532	2544032

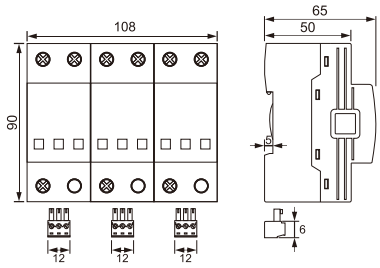
Internal Configuration

Legend

L / L′	Line
N / N′	Neutral
PE	Protective Earth
S	Signalling Contacts Optional

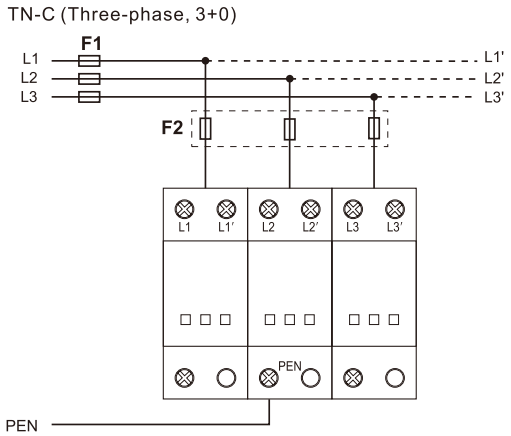


Dimensions & Packaging



Dimensions & Packaging					
SPT25-XXX/3(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[260 × 230 × 320 mm]				
Minimum Order Quantity	12 Units				

Connection Diagram



Monoblock Multi-Pole SPD

SPT25-XXX/4(S)

Class I•Class II • Type 1•Type 2

Location of Use: Main Distribution Boards
Network Systems: TN-S
Mode of Protection: L-PE / L-PE, NPE / N-PE
Surge Ratings: I_{imp} = 25 kA (10/350 µs)
I_n = 25 kA (8/20 µs)
IEC/EN Category: Class I+II / Type 1+2
Protective Elements: High Energy MOV
Housing: Monoblock Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012

Technical Data

SPT25-XXX/4(S)		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/ U_n	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 µs)	I_n			25 kA		
Maximum Discharge Current (8/20 µs)	I_{max}			100 kA		
Impulse Discharge Current (10/350 µs)	I_{imp}			25 kA		
Total Discharge Current (10/350 µs)	I_{total}			100 kA		
Specific Energy	W/R			156 kJ / Ω		
Charge	Q			12.5 As		
Voltage Protection Level	U_p	1000 V	1500 V	1600 V	1800 V	2000 V
Response Time	t_A			< 25 ns		
Back-Up Fuse (max)				315 A gL / gG		
Short-Circuit Current Rating (AC)	I_{SCCR}			50 kA		
TOV Withstand 5s	U_T	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	230 V	440 V	440 V	440 V	765 V
Number of Ports				1		
Mechanical & Environmental						
Operating Temperature Range	T_a			-40 °F to +158 °F [-40 °C to +70 °C]		
Permissible Operating Humidity	RH			5%...95%		
Atmospheric pressure and altitude				80k Pa ... 106k Pa / -500 m ... 2000 m		
Terminal Screw Torque	M_{max}			26.5 lbf·in [3.0 Nm]		
Conductor Cross Section (max)				2 AWG (Solid, Stranded) / 4 AWG (Flexible)		
				35 mm²(Solid, Stranded) / 25 mm²(Flexible)		
Mounting				35 mm DIN Rail, EN 60715		
Degree of Protection				IP 20 (built-in)		
Housing Material				Thermoplastic: Extinguishing Degree UL 94 V-0		
Thermal Protection				Yes		
Operating State / Fault Indication				Green ok / Red defect		
Remote Contacts (RC)				Optional		
RC Switching Capacity				AC: 250V / 0.5 A;DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A		
RC Conductor Cross Section (max)				16 AWG (Solid) / 1.5 mm²(Solid)		

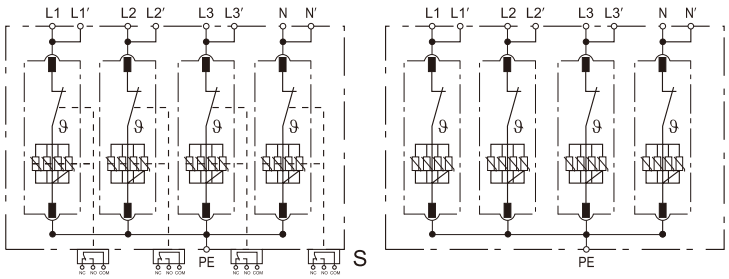
Order Information

Order Code	150	275	320	385	440
SPT25-XXX/4	2515041	2527541	2532041	2538541	2544041
SPT25-XXX/4S(with remote contacts)	2515042	2527542	2532042	2538542	2544042

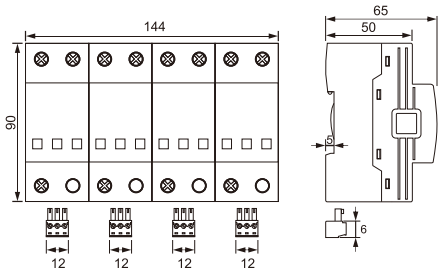
Internal Configuration

Legend

L / L′	Line
N / N′	Neutral
PE	Protective Earth
S	Signalling Contacts Optional

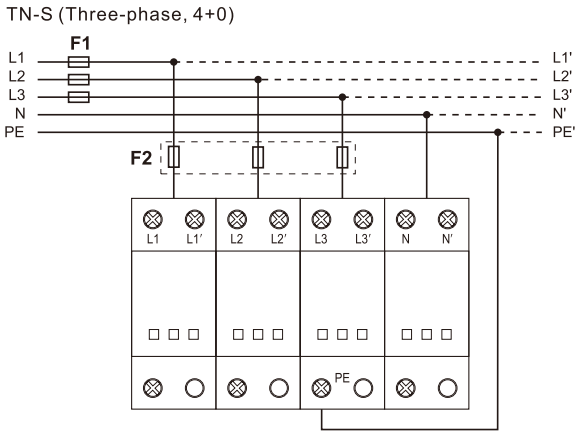


Dimensions & Packaging



Dimensions & Packaging					
SPT25-XXX/4(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[260 × 230 × 320 mm]				
Minimum Order Quantity	12 Units				

Connection Diagram



Monoblock Multi-Pole SPD

SPT25-XXX/1(S)+1

Class I•Class II • Type 1•Type 2

Location of Use: Main Distribution Boards
Network Systems: TT, TN-S
Mode of Protection: L-N / L-N, N-PE
Surge Ratings: I_{imp} = 25 kA / 50 kA (10/350 µs)
I_n = 25 kA / 50 kA (8/20 µs)
IEC/EN Category: Class I+II / Type 1+2
Protective Elements: High Energy MOV and GDT
Housing: Monoblock Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012

Technical Data

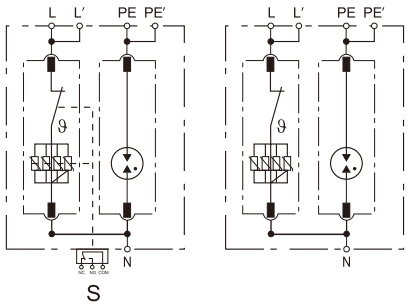
SPT25-XXX/1(S)+1			150	275	320	385
IEC Electrical						
Nominal AC Voltage (50/60Hz)			120 V	230 V	230 V	230 V
Maximum Continuous Operating Voltage	(L - N)	U_c	150 V	275 V	320 V	385 V
	(N - PE)	U_c	255 V	255 V	255 V	255 V
Nominal Discharge Current (8/20 µs)	(L - N) / (N - PE)	I_n	25 kA / 50 kA			
Maximum Discharge Current (8/20 µs)	(L - N) / (N - PE)	I_{max}	100 kA			
Impulse Discharge Current (10/350 µs)	(L - N) / (N - PE)	I_{imp}	25 kA / 50 kA			
Total Discharge Current (10/350 µs)		I_{total}	50 kA			
Specific Energy	(L - N) / (N - PE)	W/R	156 kJ / Ω / 625 kJ / Ω			
Charge	(L - N) / (N - PE)	Q	12.5 As / 25 As			
Voltage Protection Level	(L - N) / (N - PE)	U_p	1000 V/ 1500 V	1500 V/ 1500 V	1600 V/ 1500 V	1800 V/ 1500 V
Follow Current Interrupt Rating	(N-PE)	I_{fi}	100 A $_{RMS}$			
Response Time	(L - N) / (N - PE)	t_A	< 25 ns / < 100 ns			
Back-Up Fuse (max)			315 A gL / gG			
Short-Circuit Current Rating (AC)	(L - N)	I_{SCCR}	50 kA			
TOV Withstand 5s	(L - N)	U_T	180 V	335 V	335 V	335 V
TOV 120min	(L - N)	U_T	230 V	440 V	440 V	440 V
TOV Withstand 200ms	(N - PE)	U_T	1200 V			
Number of Ports			1			
Mechanical & Environmental						
Operating Temperature Range		T_a	-40 ºF to +158 ºF [-40 ºC to +70 ºC]			
Permissible Operating Humidity		RH	5%...95%			
Atmospheric pressure and altitude			80k Pa ... 106k Pa / -500 m ... 2000 m			
Terminal Screw Torque		M_{max}	26.5 lbf·in [3.0 Nm]			
Conductor Cross Section (max)			2 AWG (Solid, Stranded) / 4 AWG (Flexible)			
			35 mm² (Solid, Stranded) / 25 mm² (Flexible)			
Mounting			35 mm DIN Rail, EN 60715			
Degree of Protection			IP 20 (built-in)			
Housing Material			Thermoplastic: Extinguishing Degree UL 94 V-0			
Thermal Protection			Yes			
Operating State / Fault Indication			Green ok / Red defect			
Remote Contacts (RC)			Optional			
RC Switching Capacity			AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A			
RC Conductor Cross Section (max)			16 AWG (Solid) / 1.5 mm²(Solid)			

Order Information				
Order Code	**150**	**275**	**320**	**385**
SPT25-XXX/1+1	2515013	2527513	2532013	2538513
SPT25-XXX/1S+1(with remote contacts)	2515014	2527514	2532014	2538514

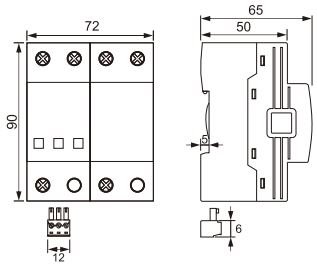
Internal Configuration

Legend

L / L′ Line
N Neutral
PE / PE′ Protective Earth
S Signalling Contacts Optional



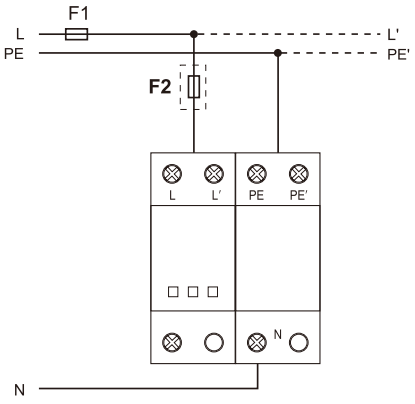
Dimensions & Packaging



Dimensions & Packaging					
SPT25-XXX/1(S)+1	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[260 × 230 × 320 mm]				
Minimum Order Quantity	24 Units				

Connection Diagram

TN-S,TT (Single-phase, 1+1)



Monoblock Multi-Pole SPD

SPT25-XXX/3(S)+1

Class I•Class II • Type 1•Type 2

Location of Use: Main Distribution Boards
Network Systems: TT, TN-S
Mode of Protection: L-N / L-N, N-PE
Surge Ratings: I_{imp} = 25 kA / 100 kA (10/350 µs)
I_n = 25 kA / 100 kA (8/20 µs)
IEC/EN Category: Class I+II / Type 1+2
Protective Elements: High Energy MOV and GDT
Housing: Monoblock Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012

Technical Data

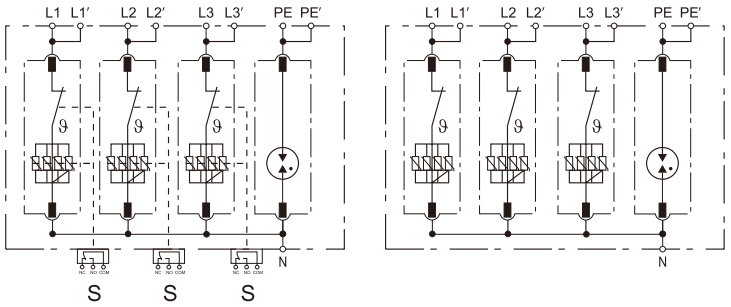
SPT25-XXX/3(S)+1			150	275	320	385
IEC Electrical						
Nominal AC Voltage (50/60Hz)			120 V	230 V	230 V	230 V
Maximum Continuous Operating Voltage	(L - N)	U_c	150 V	275 V	320 V	385 V
	(N - PE)	U_c	255 V	255 V	255 V	255 V
Nominal Discharge Current (8/20 µs)	(L - N) / (N - PE)	I_n	25 kA / 100 kA			
Maximum Discharge Current (8/20 µs)	(L - N) / (N - PE)	I_{max}	100 kA			
Impulse Discharge Current (10/350 µs)	(L - N) / (N - PE)	I_{imp}	25 kA / 100 kA			
Total Discharge Current (10/350 µs)		I_{total}	100 kA			
Specific Energy	(L - N) / (N - PE)	W/R	156 kJ / Ω / 2.5 M kJ / Ω			
Charge	(L - N) / (N - PE)	Q	12.5 As / 50 As			
Voltage Protection Level	(L - N) / (N - PE)	U_p	1000 V/ 1500 V	1500 V/ 1500 V	1600 V/ 1500 V	1800 V/ 1500 V
Follow Current Interrupt Rating	(N-PE)	I_{fi}	100 A_{RMS}			
Response Time	(L - N) / (N - PE)	t_A	< 25 ns / < 100 ns			
Back-Up Fuse (max)			315 A gL / gG			
Short-Circuit Current Rating (AC)	(L - N)	I_{SCCR}	50 kA			
TOV Withstand 5s	(L - N)	U_T	180 V	335 V	335 V	335 V
TOV 120min	(L - N)	U_T	230 V	440 V	440 V	440 V
TOV Withstand 200ms	(N - PE)	U_T	1200 V			
Number of Ports			1			
Mechanical & Environmental						
Operating Temperature Range		T_a	-40 ºF to +158 ºF [-40 ºC to +70 ºC]			
Permissible Operating Humidity		RH	5%...95%			
Atmospheric pressure and altitude			80k Pa ... 106k Pa / -500 m ... 2000 m			
Terminal Screw Torque		M_{max}	26.5 lbf·in [3.0 Nm]			
Conductor Cross Section (max)			2 AWG (Solid, Stranded) / 4 AWG (Flexible)			
			35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)			
Mounting			35 mm DIN Rail, EN 60715			
Degree of Protection			IP 20 (built-in)			
Housing Material			Thermoplastic: Extinguishing Degree UL 94 V-0			
Thermal Protection			Yes			
Operating State / Fault Indication			Green ok / Red defect			
Remote Contacts (RC)			Optional			
RC Switching Capacity			AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A			
RC Conductor Cross Section (max)			16 AWG (Solid) / 1.5 mm^2 (Solid)			

Order Information				
Order Code	**150**	**275**	**320**	**385**
SPT25-XXX/3+1	2515033	2527533	2532033	2538533
SPT25-XXX/3S+1(with remote contacts)	2515034	2527534	2532034	2538534

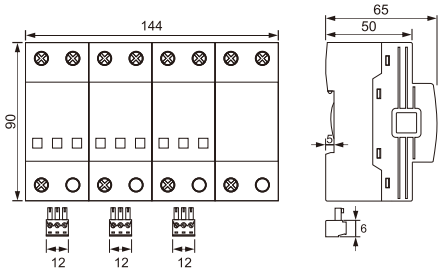
Internal Configuration

Legend

L / L′ Line
N Neutral
PE / PE′ Protective Earth
S Signalling Contacts Optional



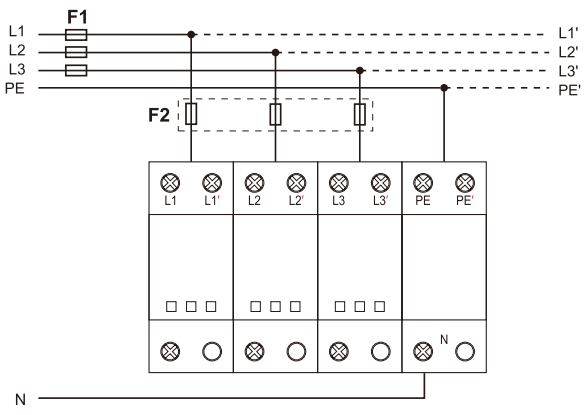
Dimensions & Packaging



Dimensions & Packaging					
SPT25-XXX/3(S)+1	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[260 × 230 × 320 mm]				
Minimum Order Quantity	12 Units				

Connection Diagram

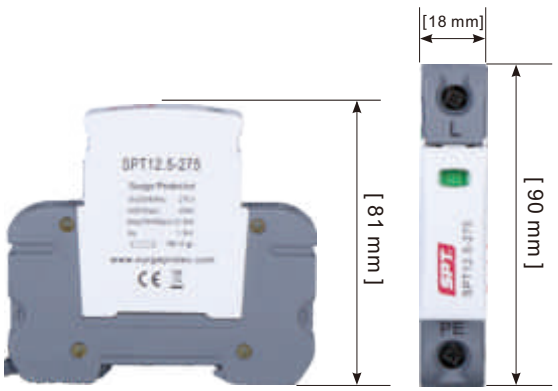
TN-S, TT (Three-phase, 3+1)



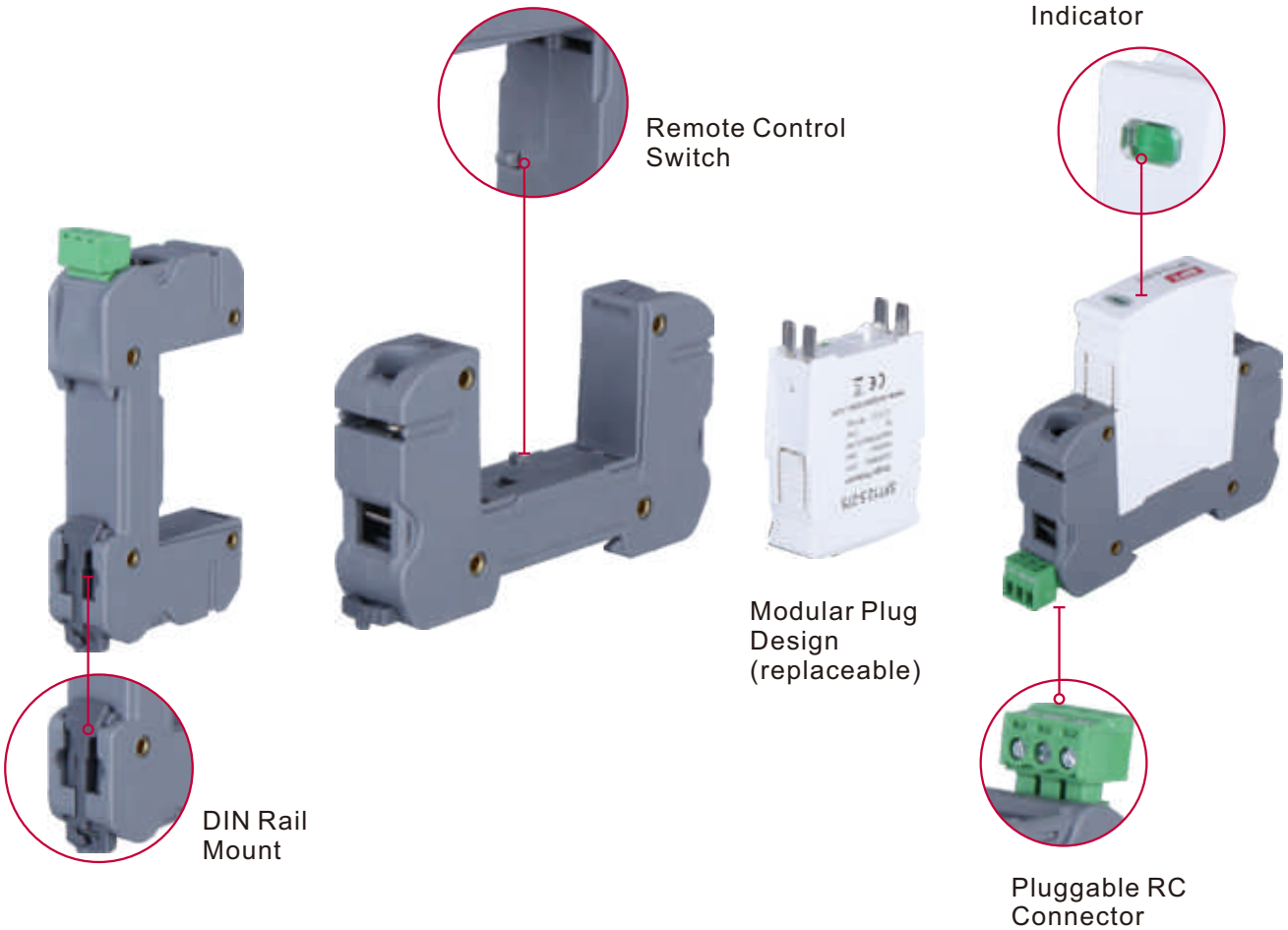
New Modular Single Pole & Multi-pole Surge Protective Devices

New Housing Design Features

- Contemporary design
- Low residual protection level
- Lifetime indicators
- Redesigned thermal disconnection
- Patented protection technologies
- No external back-up fuse required up to 315 A
- Vibration and shock withstand capability
- Space-saving design
- Easy replacement
- Patented module locking mechanism
- Meets IEC/EN and UL 1449 4th Edition



SPT12.5-XXX/1



Type 1/Type 2 SPD

SPT12.5-XXX/1(S)

SPT12.5-XXX/2(S)

SPT12.5-XXX/3(S)

SPT12.5-XXX/4(S)

SPT12.5-XXX/1(S)+1

SPT12.5-XXX/3(S)+1

SPT12.5-PVXXX-(S)

Type 2 SPD

SPT40-XXX/1(S)

SPT40-XXX/2(S)

SPT40-XXX/3(S)

SPT40-XXX/4(S)

SPT40-XXX/1(S)+1

SPT40-XXX/3(S)+1

SPT40-PVXXX-(S)

Pluggable Single-Pole SPD

SPT12.5-XXX/1(S)

Class I•Class II • Type 1•Type 2•Type 1CA

Location of Use: Main Distribution Boards
Network Systems: TN-S, TN-C, TT (only L-N)
Mode of Protection: L-PE, N-PE (only TN-S), L-PEN, L-N
Surge Ratings: Iimp = up to 12.5 kA (10/350 µs)
In = up to 20 kA (8/20 µs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

SPT12.5-XXX/1(S)		75	150	275	320	385	440
IEC Electrical							
Nominal AC Voltage (50/60Hz)	U_o/U_n	60V	120V	230V	230V	230V	400V
Maximum Continuous Operating Voltage (AC)	U_c	75V	150V	275V	320V	385V	440V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	20kA	10kA	10kA
Maximum Discharge Current (8/20 µs)	I_{max}	50kA	50kA	50kA	50kA	50kA	50kA
Impulse Discharge Current (10/350 µs)	I_{imp}	12.5kA	12.5kA	12.5kA	12.5kA	10kA	10kA
Specific Energy	W/R	39kJ/Ω	39kJ/Ω	39kJ/Ω	39kJ/Ω	25 kJ/Ω	25kJ/Ω
Charge	Q	6.25 As	6.25As	6.25As	6.25As	5As	5As
Voltage Protection Level	U_p	700V	1000V	1500V	1600V	1800V	2000 V
Response Time	t_A	<25 ns					
Back-Up Fuse (max)		315 A / 250 A gG					
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA					
TOV Withstand 5s	U_T	114V	180	335V	335V	335V	580V
TOV 120min	U_T	180V	230V	440V	440V	440V	765V
	Mode	Withstand	Safe Fail	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1					
UL Electrical							
Maximum Continuous Operating Voltage (AC)	MCOV	75V	150V	275V	320V	385V	440V
Voltage Protection Rating	VPR	330V	600V	900V	1200V	1350V	1500V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	20kA	20kA	20kA
Short-Circuit Current Rating (AC)	SCCR	100kA	200kA	150kA	150kA	150kA	200kA
Mechanical & Environmental							
Operating Temperature Range	T_a	-40 °F to +158 °F [-40 °C to +70 °C]					
Permissible Operating Humidity	RH	5%...95%					
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m					
Terminal Screw Torque	M_{max}	39.9 lbf·in [4.5 Nm]					
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)					
		35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)					
Mounting		35 mm DIN Rail, EN 60715					
Degree of Protection		IP 20 (built-in)					
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0					
Thermal Protection		Yes					
Operating State / Fault Indication		Green ok / Red defect					
Remote Contacts (RC)		Optional					
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A					
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm^2 (Solid)					

Order Information						
Order Code	**75**	**150**	**275**	**320**	**385**	**440**
SPT12.5-XXX/1	1207511	1215011	1227511	1232011	1238511	1244011
SPT12.5-XXX/1S(with remote contacts)	1207512	1215012	1227512	1232012	1238512	1244012
SPT12.5-XXX/0(spare modules)	1207501	1215001	1227501	1232001	1238501	1244001

Internal Configuration

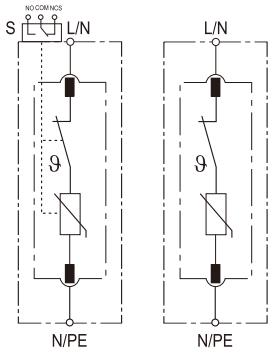
Legend

L Line

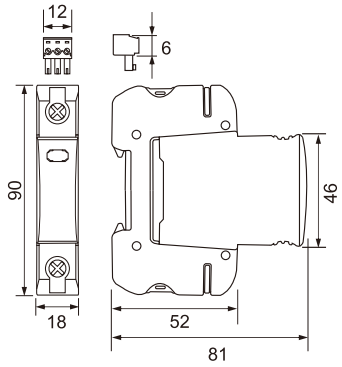
N Neutral

PE Protective Earth

S Signalling Contacts Optional

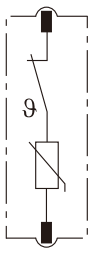


Dimensions & Packaging



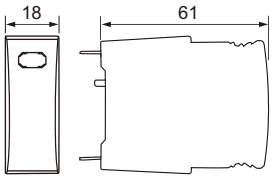
Dimensions & Packaging						
SPT12.5-XXX/1(S)	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]					
Minimum Order Quantity	64 Units					

SPT12.5-XXX/0



Plug Internal Configuration

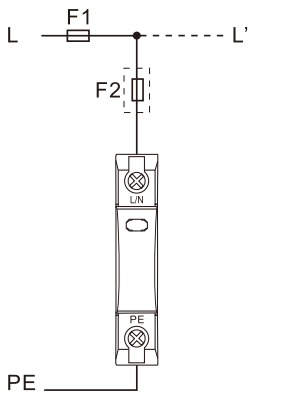
Dimensions & Packaging



Dimensions & Packaging						
SPT12.5-XXX/0	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]					
Minimum Order Quantity	64 Units					

Connection Diagram

TN-S, TN-C, TT (Single-phase, 1+0)



Pluggable Multi-Pole SPD

SPT12.5-XXX/2(S)

Class I•Class II • Type 1•Type 2•Type 1CA

Location of Use: Main Distribution Boards
Network Systems: TN-S
Mode of Protection: L-PE, N-PE
Surge Ratings: I_{imp} = up to 12.5 kA (10/350 µs)
I_n = up to 20 kA (8/20 µs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

SPT12.5-XXX/2(S)		75	150	275	320	385	440
IEC Electrical							
Nominal AC Voltage (50/60Hz)	U_o/U_n	60V	120V	230V	230V	230V	400V
Maximum Continuous Operating Voltage (AC)	U_c	75V	150V	275V	320V	385V	440V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	20kA	10kA	10kA
Maximum Discharge Current (8/20 µs)	I_{max}	50kA	50kA	50kA	50kA	50kA	50kA
Impulse Discharge Current (10/350 µs)	I_{imp}	12.5kA	12.5kA	12.5kA	12.5kA	10kA	10kA
Specific Energy	W/R	39kJ/Ω	39kJ/Ω	39kJ/Ω	39kJ/Ω	25 kJ/Ω	25kJ/Ω
Charge	Q	6.25 As	6.25As	6.25As	6.25As	5As	5As
Voltage Protection Level	U_p	700V	1000V	1500V	1600V	1800V	2000 V
Response Time	t_A	<25 ns					
Back-Up Fuse (max)		315 A / 250 A gG					
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA					
TOV Withstand 5s	U_T	114V	180V	335V	335V	335V	580V
TOV 120min	U_T	114V	230V	440V	440V	440V	765V
	Mode	Withstand	Safe Fail	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1					
UL Electrical							
Maximum Continuous Operating Voltage (AC)	MCOV	75V	150V	275V	320V	385V	440V
Voltage Protection Rating	VPR	330V	600V	900V	1200V	1350V	1500V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	20kA	20kA	20kA
Short-Circuit Current Rating (AC)	SCCR	100kA	200kA	150kA	150kA	150kA	200kA
Mechanical & Environmental							
Operating Temperature Range	T_a	-40 °F to +158 °F [-40 °C to +70 °C]					
Permissible Operating Humidity	RH	5%...95%					
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m					
Terminal Screw Torque	M max	39.9 lbf·in [4.5 Nm]					
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)					
		35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)					
Mounting		35 mm DIN Rail, EN 60715					
Degree of Protection		IP 20 (built-in)					
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0					
Thermal Protection		Yes					
Operating State / Fault Indication		Green ok / Red defect					
Remote Contacts (RC)		Optional					
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A					
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm^2 (Solid)					

Order Information						
Order Code	**75**	**150**	**275**	**320**	**385**	**440**
SPT12.5-XXX/2	1207521	1215021	1227521	1232021	1238521	1244021
SPT12.5-XXX/2S(with remote contacts)	1207522	1215022	1227522	1232022	1238522	1244022
SPT12.5-XXX/0(spare modules)	1207501	1215001	1227501	1232001	1238501	1244001

Internal Configuration

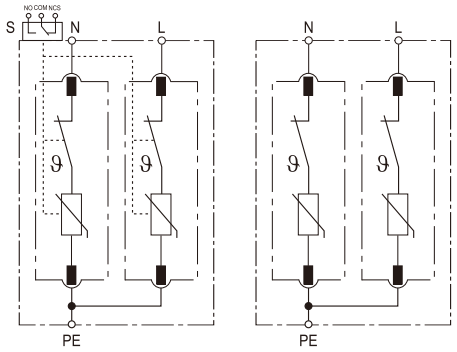
Legend

L Line

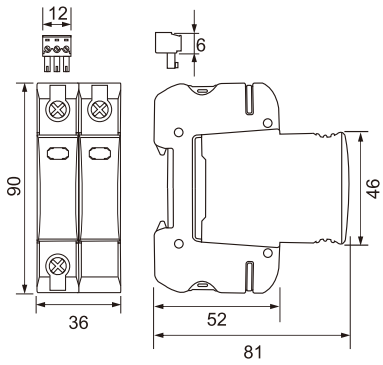
N Neutral

PE Protective Earth

S Signalling Contacts Optional



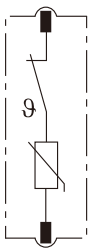
Dimensions & Packaging



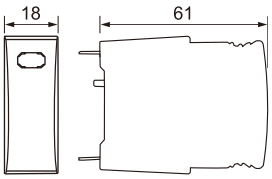
Plug Internal Configuration

Dimensions & Packaging						
SPT12.5-XXX/2(S)	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]					
Minimum Order Quantity	32 Units					

SPT12.5-XXX/0



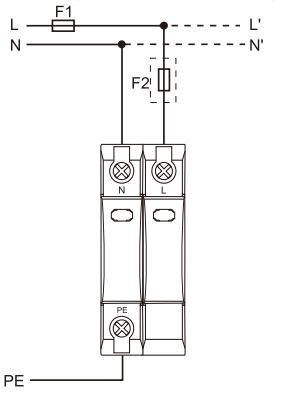
Dimensions & Packaging



Dimensions & Packaging						
SPT12.5-XXX/0	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]					
Minimum Order Quantity	64 Units					

Connection Diagram

TN-S (Single-phase, 2+0)



Pluggable Multi-Pole SPD

SPT12.5-XXX/3(S)

Class I•Class II • Type 1•Type 2•Type 1CA

Location of Use: Main Distribution Boards
Network Systems: TN-C
Mode of Protection: L-PEN
Surge Ratings: I_{imp} = up to 12.5 kA (10/350 µs)
I_n = up to 20 kA (8/20 µs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

SPT12.5-XXX/3(S)

		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/U_n	120V	230V	230V	230V	400V
Maximum Continuous Operating Voltage (AC)	U_c	150V	275V	320V	385V	440V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	10kA	10kA
Maximum Discharge Current (8/20 µs)	I_{max}	50kA	50kA	50kA	50kA	50kA
Impulse Discharge Current (10/350 µs)	I_{imp}	12.5kA	12.5kA	12.5kA	10kA	10kA
Specific Energy	W/R	39kJ/Ω	39kJ/Ω	39kJ/Ω	25 kJ/Ω	25kJ/Ω
Charge	Q	6.25As	6.25As	6.25As	5As	5As
Voltage Protection Level	U_p	1000V	1500V	1600V	1800V	2000 V
Response Time	t_A	<25 ns				
Back-Up Fuse (max)		315 A / 250 A gG				
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA				
TOV Withstand 5s	U_T	180V	335V	335V	335V	580V
TOV 120min	U_T	230V	440V	440V	440V	765V
	Mode	Safe Fail	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1				
UL Electrical						
Maximum Continuous Operating Voltage (AC)	MCOV	150V	275V	320V	385V	440V
Voltage Protection Rating	VPR	600V	900V	1200V	1350V	1500V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	20kA	20kA
Short-Circuit Current Rating (AC)	SCCR	200kA	150kA	150kA	150kA	200kA
Mechanical & Environmental						
Operating Temperature Range	T_a	-40 °F to +158 °F [-40 °C to +70 °C]				
Permissible Operating Humidity	RH	5%...95%				
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m				
Terminal Screw Torque	M max	39.9 lbf·in [4.5 Nm]				
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)				
		35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)				
Mounting		35 mm DIN Rail, EN 60715				
Degree of Protection		IP 20 (built-in)				
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0				
Thermal Protection		Yes				
Operating State / Fault Indication		Green ok / Red defect				
Remote Contacts (RC)		Optional				
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A				
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm^2 (Solid)				

Order Information					
Order Code	**150**	**275**	**320**	**385**	**440**
SPT12.5-XXX/3	1215031	1227531	1232031	1238531	1244031
SPT12.5-XXX/3S(with remote contacts)	1215032	1227532	1232032	1238532	1244032
SPT12.5-XXX/0(spare modules)	1215001	1227501	1232001	1238501	1244001

Internal Configuration

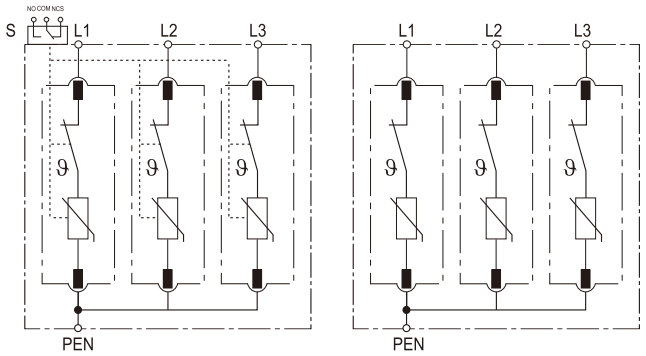
Legend

L Line

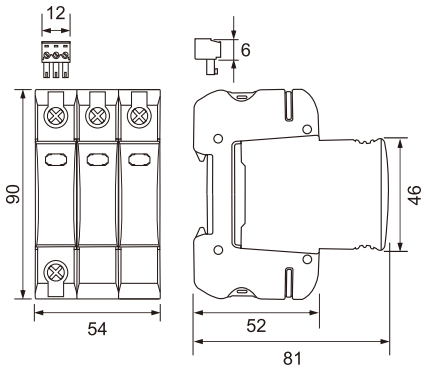
N Neutral

PE Protective Earth

S Signalling Contacts Optional

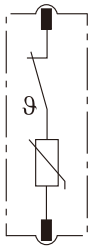


Dimensions & Packaging



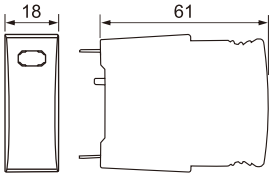
Dimensions & Packaging					
SPT12.5-XXX/3(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]				
Minimum Order Quantity	16 Units				

SPT12.5-XXX/0



Plug Internal Configuration

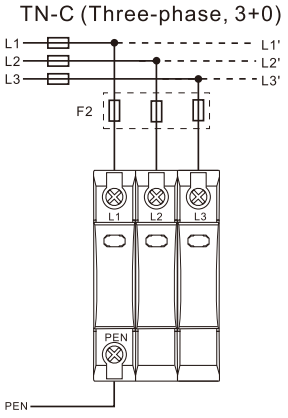
Dimensions & Packaging



Dimensions & Packaging					
SPT12.5-XXX/0	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]				
Minimum Order Quantity	64 Units				

Connection Diagram

TN-C (Three-phase, 3+0)



Pluggable Multi-Pole SPD

SPT12.5-XXX/4(S)

Class I•Class II • Type 1•Type 2•Type 1CA

Location of Use: Main Distribution Boards
Network Systems: TN-S
Mode of Protection: L-PE, N-PE
Surge Ratings: I_{imp} = up to 12.5 kA (10/350 µs)
I_n = up to 20 kA (8/20 µs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

SPT12.5-XXX/4(S)

		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/U_n	120V	230V	230V	230V	400V
Maximum Continuous Operating Voltage (AC)	U_c	150V	275V	320V	385V	440V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	10kA	10kA
Maximum Discharge Current (8/20 µs)	I_{max}	50kA	50kA	50kA	50kA	50kA
Impulse Discharge Current (10/350 µs)	I_{imp}	12.5kA	12.5kA	12.5kA	10kA	10kA
Specific Energy	W/R	39kJ/Ω	39kJ/Ω	39kJ/Ω	25 kJ/Ω	25kJ/Ω
Charge	Q	6.25As	6.25As	6.25As	5As	5As
Voltage Protection Level	U_p	1000V	1500V	1600V	1800V	2000 V
Response Time	t_A	<25 ns				
Back-Up Fuse (max)		315 A / 250 A gG				
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA				
TOV Withstand 5s	U_T	180V	335V	335V	335V	580V
TOV 120min	U_T	230V	440V	440V	440V	765V
	Mode	Safe Fail	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1				
UL Electrical						
Maximum Continuous Operating Voltage (AC)	MCOV	150V	275V	320V	385V	440V
Voltage Protection Rating	VPR	600V	900V	1200V	1350V	1500V
Nominal Discharge Current (8/20 µs)	I_n	20kA	20kA	20kA	20kA	20kA
Short-Circuit Current Rating (AC)	SCCR	200kA	150kA	150kA	150kA	200kA
Mechanical & Environmental						
Operating Temperature Range	T_a	-40 °F to +158 °F [-40 °C to +70 °C]				
Permissible Operating Humidity	RH	5%...95%				
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m				
Terminal Screw Torque	M_{max}	39.9 lbf·in [4.5 Nm]				
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)				
		35 mm² (Solid, Stranded) / 25 mm² (Flexible)				
Mounting		35 mm DIN Rail, EN 60715				
Degree of Protection		IP 20 (built-in)				
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0				
Thermal Protection		Yes				
Operating State / Fault Indication		Green ok / Red defect				
Remote Contacts (RC)		Optional				
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A				
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm² (Solid)				

Order Information					
Order Code	**150**	**275**	**320**	**385**	**440**
SPT12.5-XXX/4	1215041	1227541	1232041	1238541	1244041
SPT12.5-XXX/4S(with remote contacts)	1215042	1227542	1232042	1238542	1244042
SPT12.5-XXX/0(spare modules)	1215001	1227501	1232001	1238501	1244001

Internal Configuration

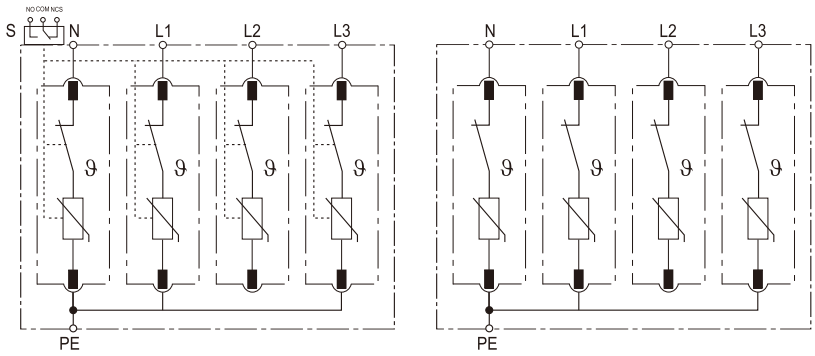
Legend

L Line

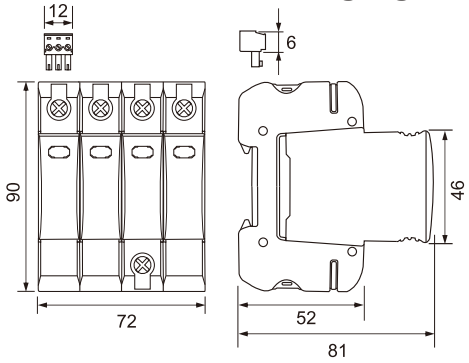
N Neutral

PE Protective Earth

S Signalling Contacts Optional

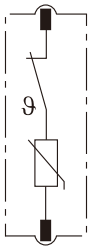


Dimensions & Packaging



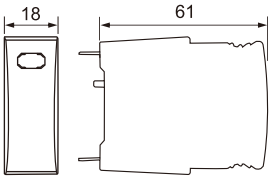
Dimensions & Packaging					
SPT12.5-XXX/4(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]				
Minimum Order Quantity	16 Units				

SPT12.5-XXX/0



Plug Internal Configuration

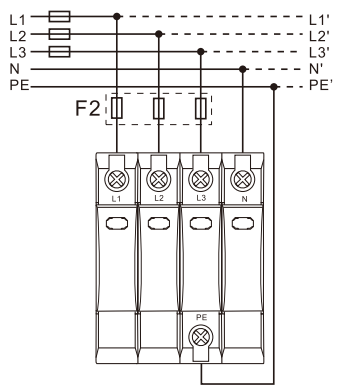
Dimensions & Packaging



Dimensions & Packaging					
SPT12.5-XXX/0	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]				
Minimum Order Quantity	64 Units				

Connection Diagram

TN-S (Three-phase, 4+0)



Pluggable Multi-Pole SPD

SPT12.5-XXX/1(S)+1

Class I•Class II • Type 1•Type 2 •Type 1CA

Location of Use: Main Distribution Boards
Network Systems: TT, TN-S
Mode of Protection: L-N,N-PE
Surge Ratings: I_{imp} =12.5 kA (10/350 μs)
I_n = 20 kA (8/20 μs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV and GDT
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

SPT12.5-XXX/1(S)+1			75	150	275	320
IEC Electrical						
Nominal AC Voltage (50/60Hz)			60V	120V	230V	230V
Maximum Continuous Operating Voltage	(L- N)	U_c	75V	150V	275V	320V
	(N- PE)	U_c	255V	255V	255V	255V
Nominal Discharge Current (8/20 μs)	(L-N)/(N– PE)	I_n	20kA/ 25kA			
Maximum Discharge Current (8/20 μs)	(L-N)/(N- PE)	I_{max}	50kA/50kA			
Impulse Discharge Current (10/350 μs)	(L-N)/(N- PE)	I_{imp}	12.5 kA/25 kA			
Specific Energy	(L- N)/(N- PE)	W/R	39kJ/Ω/156kJ/Ω			
Charge	(L-N)/(N-PE)	Q	6.25As/12.5As			
Voltage Protection Level	(L-N)/(N– PE)	U_p	700V/1500V	1000V/1500V	1500V/1500V	1600V/1500V
Follow Current Interrupt Rating	(N-PE)	I_{fi}	100A_{RMS}			
Response Time	(L-N)/(N-PE)	t_A	<25ns/<100ns			
Back-Up Fuse (max)			315A/250AgG			
Short-Circuit Current Rating (AC)	(L- N)	I_{SCCR}	25kA/ 50kA			
TOV Withstand 5s	(L- N)	U_T	114V	180V	335V	335V
TOV 120min	(L- N)	U_T	114V	230V	440V	440V
		Mode	Withstand	Safe Fail	Safe Fail	Safe Fail
TOV Withstand 200ms	(N-PE)	U_T	1200V			
Number of Ports			1			
UL Electrical						
Maximum Continuous Operating Voltage (AC)	(L-N)/(N– PE)	MCOV	75V/255V	150V/255V	275V/255V	320V/255V
Voltage Protection Rating	(L-N)/(N- PE)	VPR	330V/1200V	600V/1200V	900V/1200V	1200V/1200V
Nominal Discharge Current (8/20 μs)	(L-N)/(– PE)	I_n	20kA /20kA	20kA /20kA	20kA /20kA	20kA /20kA
Short-Circuit Current Rating (AC)	(L- N)	SCCR	100kA	200kA	150kA	150kA
Mechanical & Environmental						
Operating Temperature Range	T_a		-40 °F to +158 °F [-40 °C to +70 °C]			
Permissible Operating Humidity	RH		5%...95%			
Atmospheric pressure and altitude			80k Pa ... 106k Pa / -500 m ... 2000 m			
Terminal Screw Torque	M_{max}		39.9 lbf·in [4.5 Nm]			
Conductor Cross Section (max)			2 AWG (Solid, Stranded) / 4 AWG (Flexible)			
			35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)			
Mounting			35 mm DIN Rail, EN 60715			
Degree of Protection			IP 20 (built-in)			
Housing Material			Thermoplastic: Extinguishing Degree UL 94 V-0			
Thermal Protection			Yes			
Operating State / Fault Indication			Green ok / Red defect			
Remote Contacts (RC)			Optional			
RC Switching Capacity			AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A			
RC Conductor Cross Section (max)			16 AWG (Solid) / 1.5 mm^2 (Solid)			

Order Information				
Order Code	**75**	**150**	**275**	**320**
SPT12.5-XXX/1+1	1207513	1215013	1227513	1232013
SPT12.5-XXX/1S+1(with remote contacts)	1207514	1215014	1227514	1232014
SPT12.5-XXX/0(spare modules)	1207501	1215001	1227501	1232001
SPT12.5-NPE/0(spare modules)	1225501	1225501	1225501	1225501

Internal Configuration

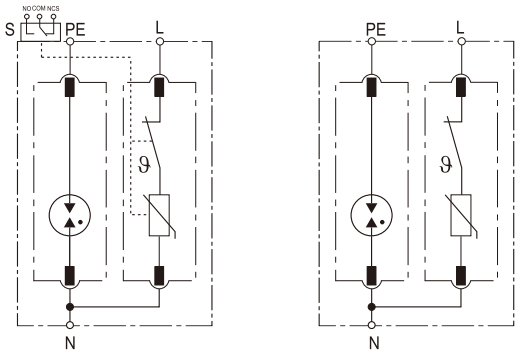
Legend

L Line

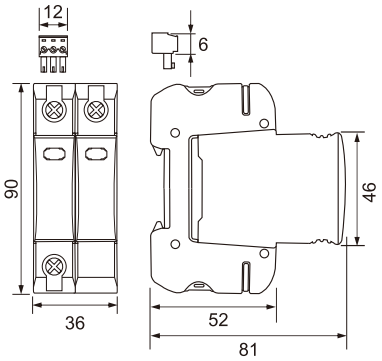
N Neutral

PE Protective Earth

S Signalling Contacts Optional

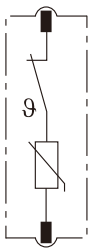


Dimensions & Packaging

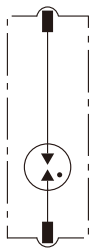


Dimensions & Packaging				
SPT12.5-XXX/1(S)+1	**75**	**150**	**275**	**320**
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]			
Minimum Order Quantity	32 Units			

SPT12.5-XXX/0

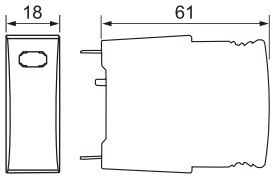


SPT12.5-NPE/0



Plug Internal Configuration

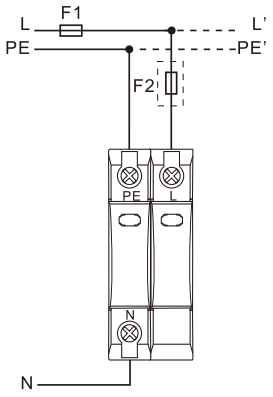
Dimensions & Packaging



Dimensions & Packaging				
SPT12.5-XXX/0	**75**	**150**	**275**	**320**
SPT12.5-NPE/0	**25**			
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]			
Minimum Order Quantity	64 Units			

Connection Diagram

TN-S,TT (Single-phase, 1+1)



Pluggable Multi-Pole SPD

SPT12.5-XXX/3(S)+1

Class I•Class II • Type 1•Type 2 •Type 1CA

Location of Use: Main Distribution Boards
Network Systems: TT, TN-S
Mode of Protection: N-PE, L-N
Surge Ratings: I_{imp} = 12.5 kA (10/350 µs)
I_n = 20 kA (8/20 µs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV and GDT
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

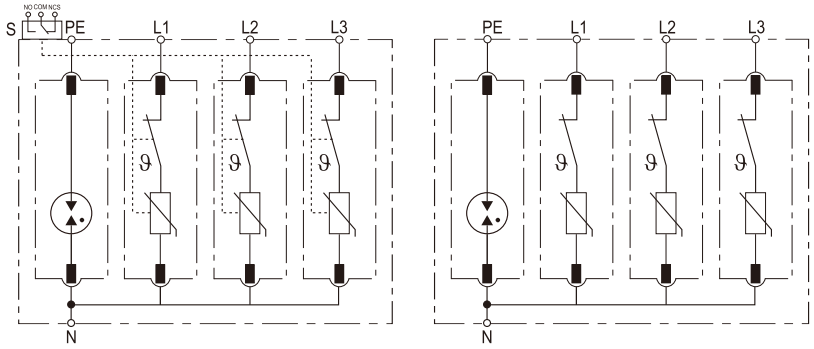
SPT12.5-XXX/2(S)+1			150	275	320
IEC Electrical					
Nominal AC Voltage (50/60Hz)			120V	230V	230V
Maximum Continuous Operating Voltage	(L- N)	U_c	150V	275V	320V
	(N– PE)	U_c	255V	255V	255V
Nominal Discharge Current (8/20 µs)	(L-N)/(N– PE)	I_n		20kA/50kA	
Maximum Discharge Current (8/20 µs)	(L-N)/(N– PE)	I_{max}		50kA/100kA	
Impulse Discharge Current (10/350 µs)	(L-N)/(N– PE)	I_{imp}		12.5kA/50kA	
Specific Energy	(L-N)/(N– PE)	W/R		39kJ/Ω/625kJ/Ω	
Charge	(L-N)/(N-PE)	Q		6.25As/25As	
Voltage Protection Level	(L-N)/(N– PE)	U_p	1000V/1500V	1500V/1500V	1600V/1500V
Follow Current Interrupt Rating	(N-PE)	I_{fi}		100A RMS	
Response Time	(L-N)/(N-PE)	t_A		< 25 ns / < 100 ns	
Back-Up Fuse (max)				315 A / 250 A gG	
Short-Circuit Current Rating (AC)	(L- N)	I_{SCCR}		25 kA / 50 kA	
TOV Withstand 5s	(L- N)	U_T	180V	335V	335V
TOV 120min	(L- N)	U_T	230V	440V	440V
		Mode	Safe Fail	Safe Fail	Safe Fail
TOV Withstand 200s	(N-PE)	U_T		1200V	
Number of Ports				1	
UL Electrical					
Maximum Continuous Operating Voltage (AC)	(L-N)/(N-PE)	MCOV	150V/255V	275V/255V	320V/255V
Voltage Protection Rating	(L-N)/(N-PE)	VPR	600V/1200V	900V/1200V	1200V/1200V
Nominal Discharge Current (8/20 µs)	(L-N)/(N-PE)	I_n	20kA/20kA	20kA/20kA	20kA/20kA
Short-Circuit Current Rating (AC)	(L- N)	SCCR	200kA	150kA	150kA
Mechanical & Environmental					
Operating Temperature Range	T_a	-40 °F to +158 °F [-40 °C to +70 °C]			
Permissible Operating Humidity	RH	5%...95%			
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m			
Terminal Screw Torque	M max	39.9 lbf·in [4.5 Nm]			
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)			
		35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)			
Mounting		35 mm DIN Rail, EN 60715			
Degree of Protection		IP 20 (built-in)			
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0			
Thermal Protection		Yes			
Operating State / Fault Indication		Green ok / Red defect			
Remote Contacts (RC)		Optional			
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A			
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm^2 (Solid)			

Order Information			
Order Code	**150**	**275**	**320**
SPT12.5-XXX/3+1	1215033	1227533	1232033
SPT12.5-XXX/3S+1 (with remote contacts)	1215034	1227534	1232034
SPT12.5-XXX/0 (spare modules)	121 5001	1227501	1232001
SPT12.5-NPE/0 (spare modules)	1225502	1225502	1225502

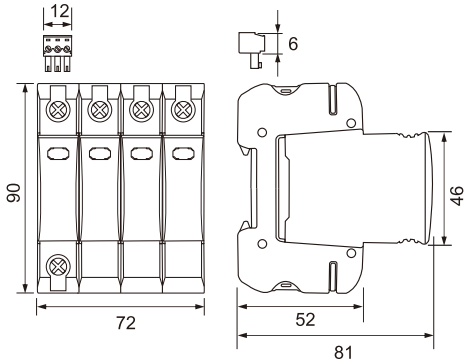
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional

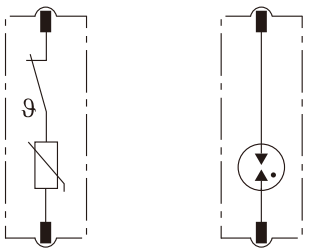


Dimensions & Packaging

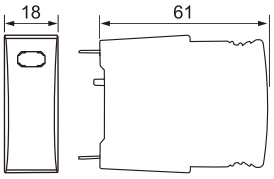


Dimensions & Packaging			
SPT12.5-XXX/3(S)+1	**150**	**275**	**320**
Single Unit DIN 43880 Dimension	1 CTN		
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]		
Minimum Order Quantity	16 Units		

SPT12.5-XXX/0 SPT12.5-NPE/0

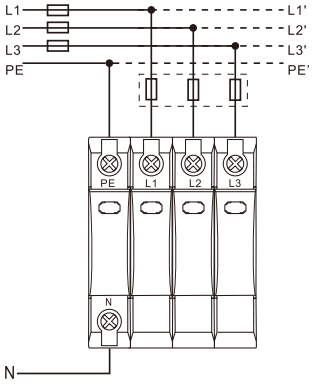


Plug Internal Configuration



Dimensions & Packaging			
SPT12.5-XXX/0	**150**	**275**	**320**
SPT12.5-NPE/0	**50**		
Single Unit DIN 43880 Dimension	1 CTN		
Packaging Dimensions (H x W x L)	[200 × 230 × 330 mm]		
Minimum Order Quantity	64 Units		

Connection Diagram



Pluggable Multi-Pole SPD for Photovoltaic Systems

SPT12.5-PVXXX-(S)

Class I Class II • Type 1 Type 2 • Type 1CA

Location of Use: String box, Inverter
Mode of Protection: (DC+)- PE, (DC-)- PE, (DC+)- (DC-)
Surge Ratings: I_{total} = up to 12.5 kA (10/350 µs)
I_{total} = up to 40 kA (8/20 µs)
IEC/EN/UL Category: Class I+II / Type 1+2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-31:2018
EN 50539-11:2013+A1:2014
UL 1449 4th Edition

Technical Data

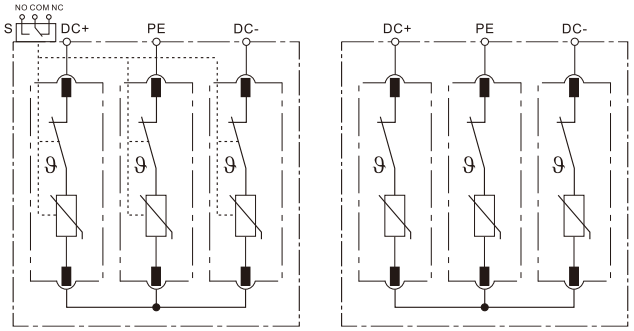
SPT12.5-PVXXX-(S)			600	1000	1200	1500
IEC Electrical						
Maximum Continuous Operating DC Voltage	(DC+) - PE, (DC-) - PE	U_{CPV}	600 V	1000 V	1200 V	1500 V
	(DC+) - (DC-)	U_{CPV}	600 V	1000 V	1200 V	1500 V
Nominal Discharge Current (8/20 µs)		I_n		20KA		
Impulse Discharge Current (10/350 µs)		I_{imp}		6.25kA		
Total Discharge Current (10/350 µs)		I_{Total}		12.5kA		
Total Discharge Current (8/20 µs)		I_{Total}		40kA		
Maximum Discharge Current (8/20 µs)		I_{max}		40kA		
Voltage Protection Level	(DC+) - PE, (DC-) - PE	U_p	2200 V	4000 V	4400 V	5200 V
	(DC+) - (DC-)	U_p	2200 V	4000 V	4400 V	5200 V
Response Time		t_A		< 25 ns		
Short-Circuit Current Rating		I_{SCPV}		2000A		
Number of Ports				1		
UL Electrical						
Maximum Permitted DC Voltage		V_{pvdc}	600 V	1000 V	1200 V	1500 V
Voltage Protection Rating	(DC+) - PE, (DC-) - PE	V_{PR}	1600 V	2500 V	3000 V	4000 V
	(DC+) - (DC-)	V_{PR}	1600 V	2500 V	3000 V	4000 V
Nominal Discharge Current (8/20 µs)		I_n		20 kA		
Short-Circuit Current Rating		SCCR	35 kA	50 kA	55 kA	65 kA
Mechanical & Environmental						
Operating Temperature Range		T_a		-40 °F to +158 °F [-40 °C to +70 °C]		
Permissible Operating Humidity		RH		5%...95%		
Atmospheric pressure and altitude				80k Pa ... 106k Pa / -500 m ... 2000 m		
Terminal Screw Torque		M_{max}		39.9 lbf·in [4.5 Nm]		
Conductor Cross Section (max)				2 AWG (Solid, Stranded) / 4 AWG (Flexible)		
				35mm² (Solid, Stranded) / 25mm² (Flexible)		
Mounting				35 mm DIN Rail, EN 60715		
Degree of Protection				IP 20 (built-in)		
Housing Material				Thermoplastic: Extinguishing Degree UL 94 V-0		
Thermal Protection				Yes		
Operating State / Fault Indication				Green ok / Red defect		
Remote Contacts (RC)				Optional		
RC Switching Capacity				AC: 250V / 0.5 A;DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A		
RC Conductor Cross Section (max)				16 AWG(Solid)/1.5 mm² (Solid)		

Order Information				
Order Code	600	1000	1200	1500
SPT12.5- PVXXX	0760025	0710235	0712231	0715231
SPT12.5- PVXXX-(S) (with remote contacts)	0760026	0710236	0712232	0715232
SPT12.5- PVXXX/0 (spare modules)	0760002	0710202	0712202	0715202

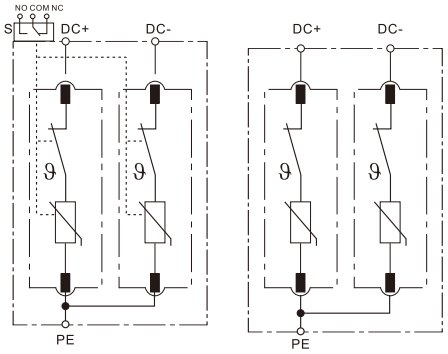
Internal Configuration

Legend
PE Protective Earth
S Signalling Contacts Optional

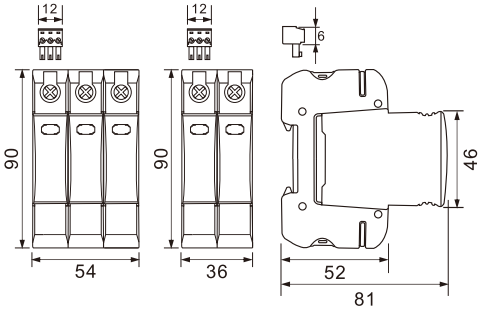
SPT12.5-PV1000-(S), SPT12.5-PV1200-(S), SPT12.5-PV1500-(S)



SPT12.5-PV600-(S)



Dimensions & Packaging

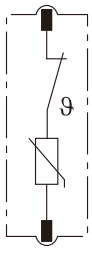


SPT12.5-PV1500-(S)
SPT12.5-PV1200-(S)
SPT12.5-PV1000-(S)

SPT12.5-PV600-(S)

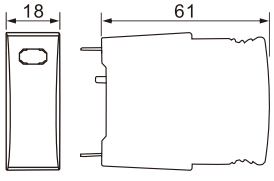
Dimensions & Packaging				
SPT12.5-PVXXX-(S)	600	1000	1200	1500
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[220 × 230 × 330 mm]			
Minimum Order Quantity	32 Units	16 Units	16 Units	16 Units

SPT12.5-PVXXX/0



Plug Internal Configuration

Dimensions & Packaging



Dimensions & Packaging				
SPT12.5-PVXXX/0	600	1000	1200	1500
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[220 × 230 × 330 mm]			
Minimum Order Quantity	64 Units			

Pluggable Single-Pole SPD

SPT40-XXX/1(S)

Class II • Type 2•Type 1CA

Location of Use: Sub-Distribution Boards
Network Systems: TN-S, TN-C, TT (only L-N)
Mode of Protection: L-PE, N-PE (only TN-S), L-PEN, L-N
Surge Ratings: I_n = 20 kA(8/20 µs)
IEC/EN/UL Category: Class II / Type 2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

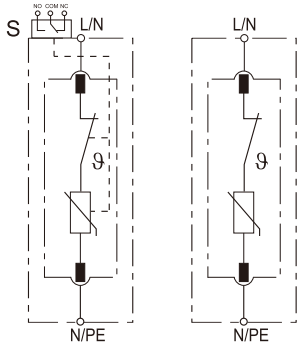
SPT40-XXX/1(S)		75	150	275	320	385	440
IEC Electrical							
Nominal AC Voltage (50/60Hz)	U_o/ U_n	60 V	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	75 V	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 µs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Maximum Discharge Current (8/20 µs)	I_{max}	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA
Voltage Protection Level	U_p	400 V	1000 V	1500 V	1600 V	1750 V	2000 V
Response Time	t_A	< 25 ns					
Back-Up Fuse (max)		125 A gL / gG					
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA					
TOV Withstand 5s	U_T	90 V	180 V	335 V	335 V	335 V	580 V
	U_T	115 V	230 V	440 V	440 V	440 V	765 V
TOV 120min	mode	Withstand	Withstand	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1					
UL Electrical							
Maximum Continuous Operating Voltage (AC)	MCOV	75 V	150 V	275 V	320 V	385 V	440 V
Voltage Protection Rating	VPR	330 V	600 V	900 V	1000 V	1200 V	1500 V
Nominal Discharge Current (8/20 µs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Short-Circuit Current Rating (AC)	SCCR	100 kA	200 kA	150 kA	150 kA	150 kA	200 kA
Mechanical & Environmental							
Operating Temperature Range	T_a	-40 °F to +158 °F [-40 °C to +70 °C]					
Permissible Operating Humidity	RH	5%...95%					
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m					
Terminal Screw Torque	M_{max}	39.9 lbf·in [4.5 Nm]					
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)					
		35 mm² (Solid, Stranded) / 25 mm² (Flexible)					
Mounting		35 mm DIN Rail, EN 60715					
Degree of Protection		IP 20 (built-in)					
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0					
Thermal Protection		Yes					
Operating State / Fault Indication		Green ok / Red defect					
Remote Contacts (RC)		Optional					
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A					
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm²(Solid)					

Order Information						
Order Code	**75**	**150**	**275**	**320**	**385**	**440**
SPT40-XXX/1	4007511	4015011	4027511	4032011	4038511	4044011
SPT40-XXX/1S (with remote contacts)	4007512	4015012	4027512	4032012	4038512	4044012
SPT40-XXX/0 (spare modules)	4007501	4015001	4027501	4032001	4038501	4044001

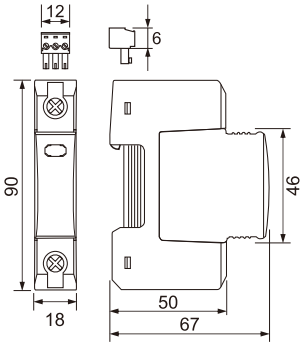
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional

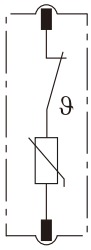


Dimensions & Packaging

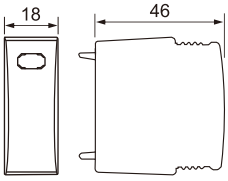


Dimensions & Packaging						
SPT40-XXX/1(S)	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]					
Minimum Order Quantity	72 Units					

SPT40-XXX/0



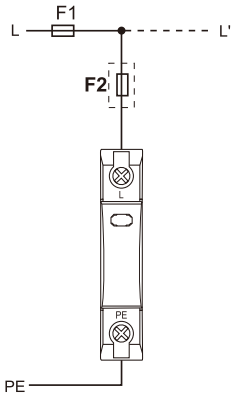
Dimensions & Packaging



Dimensions & Packaging						
SPT40-XXX/0	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]					
Minimum Order Quantity	96 Units					

Connection Diagram

TN-S, TN-C, TT (Single-phase, 1+0)



Pluggable Multi-Pole SPD

SPT40-XXX/2(S)

Class II • Type 2•Type 1CA

Location of Use: Sub-Distribution Boards
Network Systems: TN-S
Mode of Protection: L-PE, N-PE
Surge Ratings: I_n = 20 kA(8/20 μs)
IEC/EN/UL Category: Class II / Type 2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

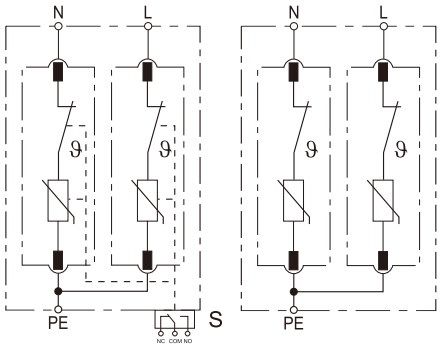
SPT40-XXX/2(S)		75	150	275	320	385	440
IEC Electrical							
Nominal AC Voltage (50/60Hz)	U_o/ U_n	60 V	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	75 V	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 μs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Maximum Discharge Current (8/20 μs)	I_{max}	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA
Voltage Protection Level	U_p	400 V	1000 V	1500 V	1600 V	1750 V	2000 V
Response Time	t_A	< 25 ns					
Back-Up Fuse (max)		125 A gL / gG					
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA					
TOV Withstand 5s	U_T	90 V	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	115 V	230 V	440 V	440 V	440 V	765 V
	mode	Withstand	Withstand	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1					
UL Electrical							
Maximum Continuous Operating Voltage (AC)	MCOV	75 V	150 V	275 V	320 V	385 V	440 V
Voltage Protection Rating	VPR	330 V	600 V	900 V	1000 V	1200 V	1500 V
Nominal Discharge Current (8/20 μs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Short-Circuit Current Rating (AC)	SCCR	100 kA	200 kA	150 kA	150 kA	150 kA	200 kA
Mechanical & Environmental							
Operating Temperature Range	T_a	-40 ºF to +158 ºF [-40 ºC to +70 ºC]					
Permissible Operating Humidity	RH	5%...95%					
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m					
Terminal Screw Torque	M_{max}	39.9 lbf·in [4.5 Nm]					
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)					
		35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)					
Mounting		35 mm DIN Rail, EN 60715					
Degree of Protection		IP 20 (built-in)					
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0					
Thermal Protection		Yes					
Operating State / Fault Indication		Green ok / Red defect					
Remote Contacts (RC)		Optional					
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A					
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm^2(Solid)					

Order Information						
Order Code	**75**	**150**	**275**	**320**	**385**	**440**
SPT40-XXX/2	4007521	4015021	4027521	4032021	4038521	4044021
SPT40-XXX/2S(with remote contacts)	4007522	4015022	4027522	4032022	4038522	4044022
SPT40-XXX/0 (spare modules)	4007501	4015001	4027501	4032001	4038501	4044001

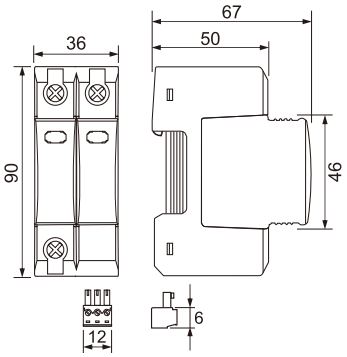
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional

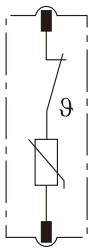


Dimensions & Packaging

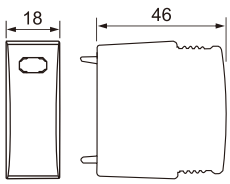


Dimensions & Packaging						
SPT40-XXX/2(S)	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]					
Minimum Order Quantity	42 Units					

SPT40-XXX/0



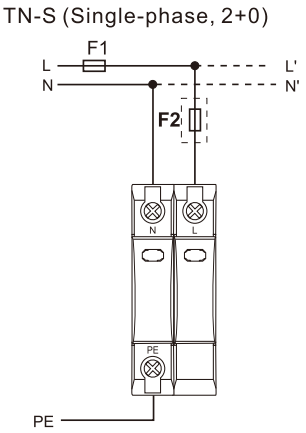
Dimensions & Packaging



Dimensions & Packaging						
SPT40-XXX/0	**75**	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN					
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]					
Minimum Order Quantity	96 Units					

Connection Diagram

TN-S (Single-phase, 2+0)



Pluggable Multi-Pole SPD

SPT40-XXX/3(S)

Class II • Type 2•Type 1CA

Location of Use: Sub-Distribution Boards
Network Systems: TN-C
Mode of Protection: L-PEN
Surge Ratings: I_n = 20 kA(8/20 μs)
IEC/EN/UL Category: Class II / Type 2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

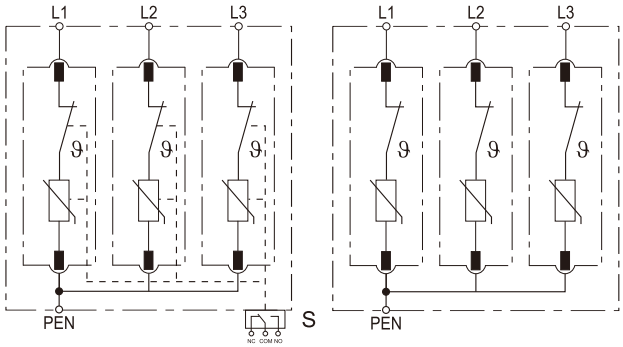
SPT40-XXX/3(S)		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/ U_n	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 μs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA
Maximum Discharge Current (8/20 μs)	I_{max}	40 kA	40 kA	40 kA	40 kA	40 kA
Voltage Protection Level	U_p	1000 V	1500 V	1600 V	1750 V	2000 V
Response Time	t_A			< 25 ns		
Back-Up Fuse (max)				125 A gL / gG		
Short-Circuit Current Rating (AC)	I_{SCCR}			25 kA / 50 kA		
TOV Withstand 5s	U_T	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	230 V	440 V	440 V	440 V	765 V
	mode	Withstand	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports				1		
UL Electrical						
Maximum Continuous Operating Voltage (AC)	MCOV	150 V	275 V	320 V	385 V	440 V
Voltage Protection Rating	VPR	600 V	900 V	1000 V	1200 V	1500 V
Nominal Discharge Current (8/20 μs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA
Short-Circuit Current Rating (AC)	SCCR	200 kA	150 kA	150 kA	150 kA	200 kA
Mechanical & Environmental						
Operating Temperature Range	T_a	-40 ºF to +158 ºF [-40 ºC to +70 ºC]				
Permissible Operating Humidity	RH	5%...95%				
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m				
Terminal Screw Torque	M_{max}	39.9 lbf·in [4.5 Nm]				
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)				
		35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)				
Mounting		35 mm DIN Rail, EN 60715				
Degree of Protection		IP 20 (built-in)				
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0				
Thermal Protection		Yes				
Operating State / Fault Indication		Green ok / Red defect				
Remote Contacts (RC)		Optional				
RC Switching Capacity		AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A				
RC Conductor Cross Section (max)		16 AWG (Solid) / 1.5 mm^2 (Solid)				

Order Information					
Order Code	**150**	**275**	**320**	**385**	**440**
SPT40-XXX/3	4015031	4027531	4032031	4038531	4044031
SPT40-XXX/3S (with remote contacts)	4015032	4027532	4032032	4038532	4044032
SPT40-XXX/0 (spare modules)	4015001	4027501	4032001	4038501	4044001

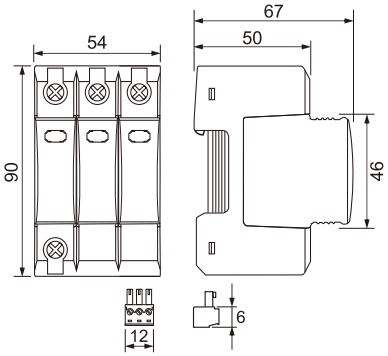
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional

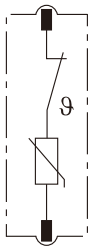


Dimensions & Packaging

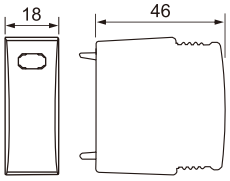


Dimensions & Packaging					
SPT40-XXX/3(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]				
Minimum Order Quantity	30 Units				

SPT40-XXX/0



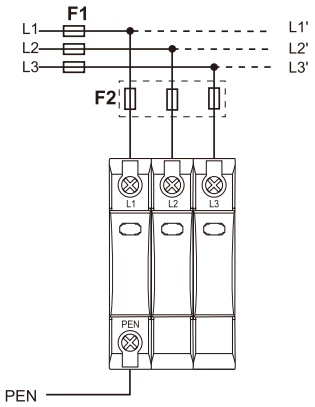
Dimensions & Packaging



Dimensions & Packaging					
SPT40-XXX/0	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]				
Minimum Order Quantity	96 Units				

Connection Diagram

TN-C (Three-phase, 3+0)



Pluggable Multi-Pole SPD

SPT40-XXX/4(S)

Class II • Type 2•Type 1CA

Location of Use: Sub-Distribution Boards
Network Systems: TN-S
Mode of Protection: L-PE, N-PE
Surge Ratings: I_n = 20 kA(8/20 μs)
IEC/EN/UL Category: Class II / Type 2 / Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

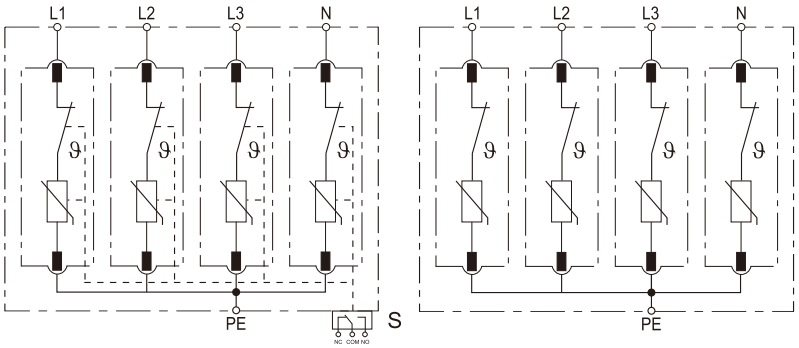
SPT40-XXX/4(S)		150	275	320	385	440
IEC Electrical						
Nominal AC Voltage (50/60Hz)	U_o/ U_n	120 V	230 V	230 V	230 V	400 V
Maximum Continuous Operating Voltage (AC)	U_c	150 V	275 V	320 V	385 V	440 V
Nominal Discharge Current (8/20 μs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA
Maximum Discharge Current (8/20 μs)	I_{max}	40 kA	40 kA	40 kA	40 kA	40 kA
Voltage Protection Level	U_p	1000 V	1500 V	1600 V	1750 V	2000 V
Response Time	t_A	< 25 ns				
Back-Up Fuse (max)		125 A gL / gG				
Short-Circuit Current Rating (AC)	I_{SCCR}	25 kA / 50 kA				
TOV Withstand 5s	U_T	180 V	335 V	335 V	335 V	580 V
TOV 120min	U_T	230 V	440 V	440 V	440 V	765 V
	mode	Withstand	Safe Fail	Safe Fail	Safe Fail	Safe Fail
Number of Ports		1				
UL Electrical						
Maximum Continuous Operating Voltage (AC)	MCOV	150 V	275 V	320 V	385 V	440 V
Voltage Protection Rating	VPR	600 V	900 V	1000 V	1200 V	1500 V
Nominal Discharge Current (8/20 μs)	I_n	20 kA	20 kA	20 kA	20 kA	20 kA
Short-Circuit Current Rating (AC)	SCCR	200 kA	150 kA	150 kA	150 kA	200 kA
Mechanical & Environmental						
Operating Temperature Range	T_a	-40 ºF to +158 ºF [-40 ºC to +70 ºC]				
Permissible Operating Humidity	RH	5%...95%				
Atmospheric pressure and altitude		80k Pa ... 106k Pa / -500 m ... 2000 m				
Terminal Screw Torque	M_{max}	39.9 lbf·in [4.5 Nm]				
Conductor Cross Section (max)		2 AWG (Solid, Stranded) / 4 AWG (Flexible)				
		35 mm² (Solid, Stranded) / 25 mm² (Flexible)				
Mounting		35 mm DIN Rail, EN 60715				
Degree of Protection		IP 20 (built-in)				
Housing Material		Thermoplastic: Extinguishing Degree UL 94 V-0				
Thermal Protection		Yes				
Operating State / Fault Indication		Green ok / Red defect				
Remote Contacts (RC)		Optional				
RC Switching Capacity		AC: 250V / 0.5 A;DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A				
RC Conductor Cross Section		16 AWG (Solid) / 1.5 mm²(Solid)				

Order Information					
Order Code	**150**	**275**	**320**	**385**	**440**
SPT40-XXX/4	4015041	4027541	4032041	4038541	4044041
SPT40-XXX/4S(with remote contacts)	4015042	4027542	4032042	4038542	4044042
SPT40-XXX/0 (spare modules)	4015001	4027501	4032001	4038501	4044001

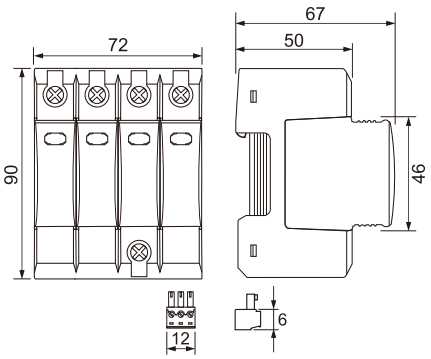
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional

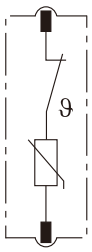


Dimensions & Packaging

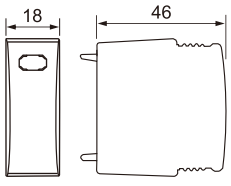


Dimensions & Packaging					
SPT40-XXX/4(S)	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]				
Minimum Order Quantity	24 Units				

SPT40-XXX/0



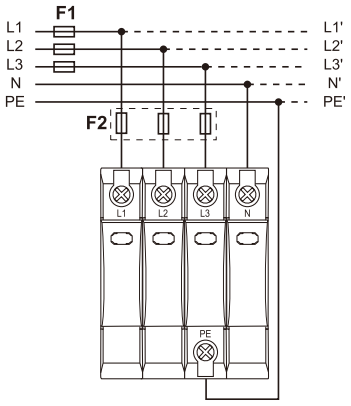
Dimensions & Packaging



Dimensions & Packaging					
SPT40-XXX/0	**150**	**275**	**320**	**385**	**440**
Single Unit DIN 43880 Dimension	1 CTN				
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]				
Minimum Order Quantity	96 Units				

Connection Diagram

TN-S (Three-phase, 4+0)



Pluggable Multi-Pole SPD

SPT40-XXX/1(S)+1

Class II • Type 2•Type 1CA

Location of Use: Sub-Distribution Boards
Network Systems: TT, TN-S
Mode of Protection: L-N, N-PE
Surge Ratings: I_n = 20 kA(8/20μs)
IEC/EN/UL Category: Class II / Type 2 / Type 1CA
Protective Elements: High Energy MOV and GDT
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

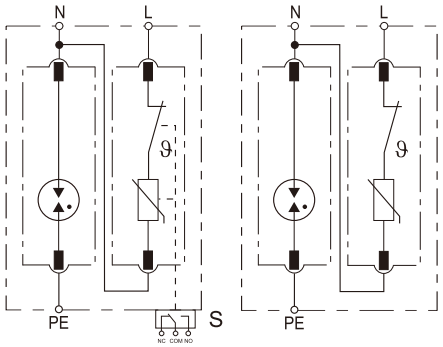
SPT40-XXX/1(S)+1			75	150	275	320
IEC Electrical						
Nominal AC Voltage (50/60Hz)			60 V	120 V	230 V	230 V
Maximum Continuous Operating Voltage	(L - N)	U_c	75 V	150 V	275 V	320 V
	(N - PE)	U_c	255 V	255 V	255 V	255 V
Nominal Discharge Current (8/20 μs)	(L - N) / (N - PE)	I_n	20 kA / 20 kA			
Maximum Discharge Current (8/20 μs)	(L - N) / (N - PE)	I_{max}	40 kA / 40 kA			
Voltage Protection Level	(L - N) / (N - PE)	U_p	400 V/ 1000 V	1000 V/ 1000 V	1500 V/ 1000 V	1600 V/ 1000 V
Follow Current Interrupt Rating	(N-PE)	I_{fi}	100 A_{RMS}			
Response Time	(L - N) / (N - PE)	t_A	< 25 ns / < 100 ns			
Back-Up Fuse (max)			125 A gL / gG			
Short-Circuit Current Rating (AC)	(L - N)	I_{SCCR}	25 kA / 50 kA			
TOV Withstand 5s	(L - N)	U_T	90 V	180 V	335 V	335 V
TOV 120min	(L - N)	U_T	115 V	230 V	440 V	440 V
		mode	Withstand	Withstand	Safe Fail	Safe Fail
TOV Withstand 200ms	(N - PE)	U_T	1200 V			
Number of Ports			1			
UL Electrical						
Maximum Continuous Operating Voltage (AC)	(L - N) / (N - PE)	MCOV	75 V / 255 V	150 V / 255 V	275 V / 255 V	320 V / 255 V
Voltage Protection Rating	(L - N) / (N - PE)	VPR	330 V / 1000 V	600 V / 1000 V	900 V / 1000 V	1000 V / 1000 V
Nominal Discharge Current (8/20 μs)	(L - N) / (N - PE)	I_n	20 kA / 20 kA	20 kA / 20 kA	20 kA / 20 kA	20 kA / 20 kA
Short-Circuit Current Rating (AC)	(L - N)	SCCR	100 kA	200 kA	150 kA	150 kA
Mechanical & Environmental						
Operating Temperature Range		T_a	-40 °F to +158 °F [-40 °C to +70 °C]			
Permissible Operating Humidity		RH	5%...95%			
Atmospheric pressure and altitude			80k Pa ... 106k Pa / -500 m ... 2000 m			
Terminal Screw Torque		M_{max}	39.9 lbf·in [4.5 Nm]			
Conductor Cross Section (max)			2 AWG (Solid, Stranded) / 4 AWG (Flexible)			
			35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)			
Mounting			35 mm DIN Rail, EN 60715			
Degree of Protection			IP 20 (built-in)			
Housing Material			Thermoplastic: Extinguishing Degree UL 94 V-0			
Thermal Protection			Yes			
Operating State / Fault Indication			Green ok / Red defect			
Remote Contacts (RC)			Optional			
RC Switching Capacity			AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A			
RC Conductor Cross Section (max)			16 AWG (Solid) / 1.5 mm^2 (Solid)			

Order Information				
Order Code	**75**	**150**	**275**	**320**
SPT40-XXX/1+1	4007513	4015013	4027513	4032013
SPT40-XXX/1S+1 (with remote contacts)	4007514	4015014	4027514	4032014
SPT40-XXX/0 (spare modules)	4007501	4015001	4027501	4032001
SPT40-NPE/0 (spare modules)	4025501	4025501	4025501	4025501

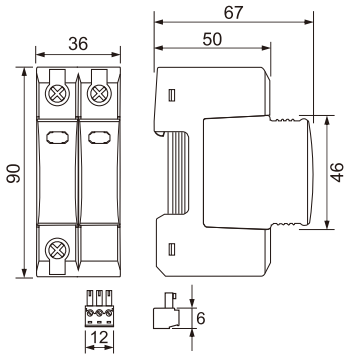
Internal Configuration

Legend

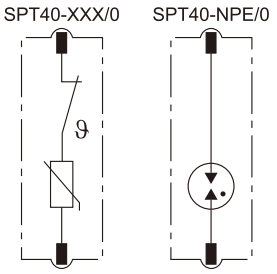
L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional



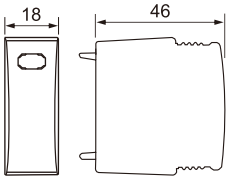
Dimensions & Packaging



Dimensions & Packaging				
SPT40-XXX/1(S)+1	**75**	**150**	**275**	**320**
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]			
Minimum Order Quantity	42 Units			



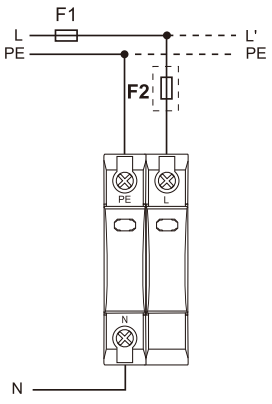
Dimensions & Packaging



Dimensions & Packaging				
SPT40-XXX/0	**75**	**150**	**275**	**320**
SPT40-NPE/0	**40**			
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]			
Minimum Order Quantity	96 Units			

Connection Diagram

TN-S,TT (Single-phase, 1+1)



Pluggable Multi-Pole SPD

SPT40-XXX/3(S)+1

Class II • Type 2•Type 1CA

Location of Use: Sub-Distribution Boards
Network Systems: TT, TN-S
Mode of Protection: L-N, N-PE
Surge Ratings: I_n = 20 kA(8/20 μs)
IEC/EN/UL Category: Class II / Type 2 / Type 1CA
Protective Elements: High Energy MOV and GDT
Housing: Pluggable Design
Compliance: IEC 61643-11:2011
EN 61643-11:2012
UL 1449 4th Edition

Technical Data

SPT40-XXX/3(S)+1

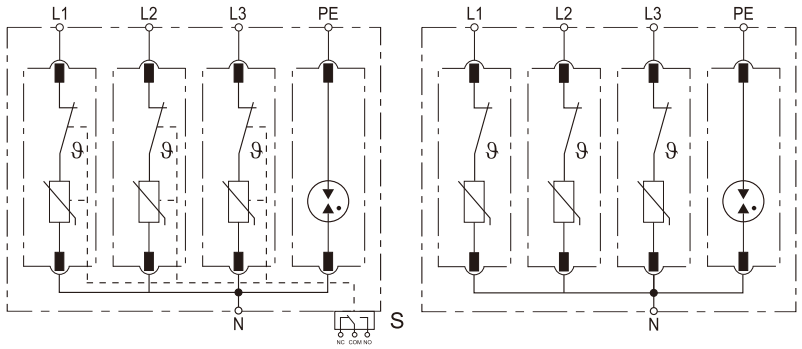
			150	275	320	385
IEC Electrical						
Nominal AC Voltage (50/60Hz)			120 V	230 V	230 V	230 V
Maximum Continuous Operating Voltage	(L - N)	U_c	150 V	275 V	320 V	385 V
	(N - PE)	U_c	255 V	255 V	255 V	255 V
Nominal Discharge Current (8/20 μs)	(L - N) / (N - PE)	I_n	20 kA / 20 kA			
Maximum Discharge Current (8/20 μs)	(L - N) / (N - PE)	I_{max}	40 kA / 40 kA			
Voltage Protection Level	(L - N) / (N - PE)	U_p	1000 V/ 1000 V	1500 V/ 1000 V	1600 V/ 1000 V	1750 V/ 1000 V
Follow Current Interrupt Rating	(N-PE)	I_{fi}	100 A RMS			
Response Time	(L - N) / (N - PE)	t_A	< 25 ns / < 100 ns			
Back-Up Fuse (max)			125 A gL / gG			
Short-Circuit Current Rating (AC)	(L - N)	I_{SCCR}	25 kA / 50 kA			
TOV Withstand 5s	(L - N)	U_T	180 V	335 V	335 V	335 V
TOV 120min	(L - N)	U_T	230 V	440 V	440 V	440 V
		Mode	Withstand	Safe Fail	Safe Fail	Safe Fail
TOV Withstand 200ms	(N - PE)	U_T	1200 V			
Number of Ports			1			
UL Electrical						
Maximum Continuous Operating Voltage (AC)	(L - N) / (N - PE)	MCOV	150 V / 255 V	275 V / 255 V	320 V / 255 V	320 V / 255 V
Voltage Protection Rating	(L - N) / (N - PE)	VPR	600 V / 1000 V	900 V / 1000 V	1000 V / 1000 V	1200 V / 1000 V
Nominal Discharge Current (8/20 μs)	(L - N) / (N - PE)	I_n	20 kA / 20 kA	20 kA / 20 kA	20 kA / 20 kA	20 kA / 20 kA
Short-Circuit Current Rating (AC)	(L - N)	SCCR	200 kA	150 kA	150 kA	150 kA
Mechanical & Environmental						
Operating Temperature Range		T_a	-40 °F to +158 °F [-40 °C to +70 °C]			
Permissible Operating Humidity		RH	5%...95%			
Atmospheric pressure and altitude			80k Pa ... 106k Pa / -500 m ... 2000 m			
Terminal Screw Torque		M_{max}	39.9 lbf·in [4.5 Nm]			
Conductor Cross Section (max)			2 AWG (Solid, Stranded) / 4 AWG (Flexible)			
			35 mm^2 (Solid, Stranded) / 25 mm^2 (Flexible)			
Mounting			35 mm DIN Rail, EN 60715			
Degree of Protection			IP 20 (built-in)			
Housing Material			Thermoplastic: Extinguishing Degree UL 94 V-0			
Thermal Protection			Yes			
Operating State / Fault Indication			Green ok / Red defect			
Remote Contacts (RC)			Optional			
RC Switching Capacity			AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A			
RC Conductor Cross Section (max)			16 AWG (Solid) / 1.5 mm^2 (Solid)			

Order Information				
Order Code	**150**	**275**	**320**	**385**
SPT40-XXX/3+1	4015033	4027533	4032033	4038533
SPT40-XXX/3S+1(with remote contacts)	4015034	4027534	4032034	4038534
SPT40-XXX/0(spare modules)	4015001	4027501	4032001	4038501
SPT40-NPE/0(spare modules)	4025501	4025501	4025501	4025501

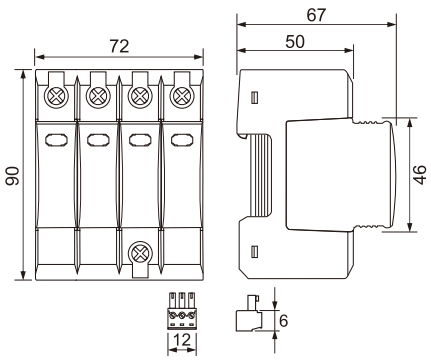
Internal Configuration

Legend

L Line
N Neutral
PE Protective Earth
S Signalling Contacts Optional

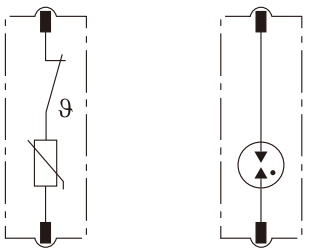


Dimensions & Packaging

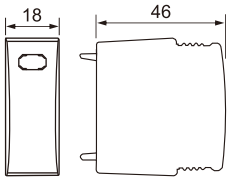


Dimensions & Packaging				
SPT40-XXX/3(S)+1	**150**	**275**	**320**	**385**
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]			
Minimum Order Quantity	24 Units			

SPT40-XXX/0 SPT40-NPE/0



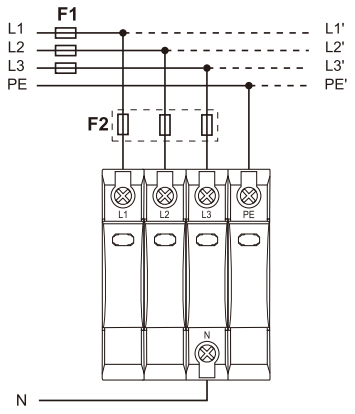
Dimensions & Packaging



Dimensions & Packaging				
SPT40-XXX/0	**150**	**275**	**320**	**385**
SPT40-NPE/0	**40**			
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]			
Minimum Order Quantity	96 Units			

Connection Diagram

TN-S, TT (Three-phase, 3+1)



Pluggable Multi-Pole SPD for Photovoltaic Systems

SPT40-PVXXX-(S)

Class II • Type 2•Type 1CA

Location of Use: String box, Inverter
Mode of Protection: (DC+)- PE, (DC-)- PE, (DC+)- (DC-)
Surge Ratings: I_n = 20kA (8/20μs)
I_{total} = up to 40kA (8/20μs)
IEC/EN/UL Category: Class II/ Type 2/ Type 1CA
Protective Elements: High Energy MOV
Housing: Pluggable Design
Compliance: IEC 61643-31:2018
EN 50539-11:2013+A1:2014
UL 1449 4th Edition

Technical Data

SPT40-PVXXX-(S)			600	1000	1200	1500
IEC Electrical						
Maximum Continuous Operating DC Voltage	(DC+) - PE, (DC-) - PE	U_{cpv}	600 V	1000 V	1200 V	1500 V
	(DC+) - (DC-)	U_{cpv}	600 V	1000 V	1200 V	1500 V
Nominal Discharge Current (8/20 μs)		I_n		20 kA		
Total Discharge Current (8/20 μs)		I_{Total}		40 kA		
Maximum Discharge Current (8/20 μs)		I_{max}		40 kA		
Voltage Protection Level	(DC+) - PE, (DC-) - PE	U_p	2200 V	4000 V	4400 V	5200 V
	(DC+) - (DC-)	U_p	2200 V	4000 V	4400 V	5200 V
Response Time		t_A		< 25 ns		
Short-Circuit Current Rating		I_{scpv}		2000A		
Number of Ports				1		
UL Electrical						
Maximum Permitted DC Voltage		V_{pvdc}	600 V	1000 V	1200 V	1500 V
Voltage Protection Rating	(DC+) - PE, (DC-) - PE	VPR	1600 V	2500 V	3000 V	4000 V
	(DC+) - (DC-)	VPR	1600 V	2500 V	3000 V	4000 V
Nominal Discharge Current (8/20 μs)		I_n		20 kA		
Short-Circuit Current Rating		SCCR	35 kA	50 kA	55 kA	65 kA
Mechanical & Environmental						
Operating Temperature Range		T_a		-40 °F to +158 °F [-40 °C to +70 °C]		
Permissible Operating Humidity		RH		5%...95%		
Atmospheric pressure and altitude				80k Pa ... 106k Pa / -500 m ... 2000 m		
Terminal Screw Torque		M_{max}		39.9 lbf·in [4.5 Nm]		
Conductor Cross Section (max)				2 AWG (Solid, Stranded) / 4 AWG (Flexible)		
				35 mm² (Solid, Stranded) / 25 mm² (Flexible)		
Mounting				35 mm DIN Rail, EN 60715		
Degree of Protection				IP 20 (built-in)		
Housing Material				Thermoplastic: Extinguishing Degree UL 94 V-0		
Thermal Protection				Yes		
Operating State / Fault Indication				Green ok / Red defect		
Remote Contacts (RC)				Optional		
RC Switching Capacity				AC: 250V / 0.5 A; DC: 250V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A		
RC Conductor Cross Section (max)				16 AWG (Solid) / 1.5 mm²(Solid)		

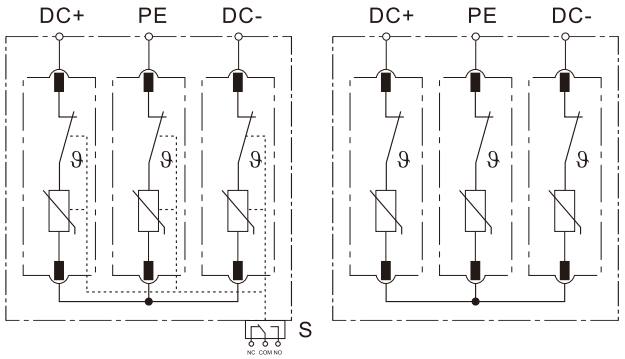
Order Information				
Order Code	**600**	**1000**	**1200**	**1500**
SPT40-PVXXX	4060025	4010235	4012231	4015231
SPT40-PVXXX-(S) (with remote contacts)	4060026	4010236	4012232	4015232
SPT40-PVXXX/0 (spare modules)	4060002	4010202	4012202	4015202

Internal Configuration

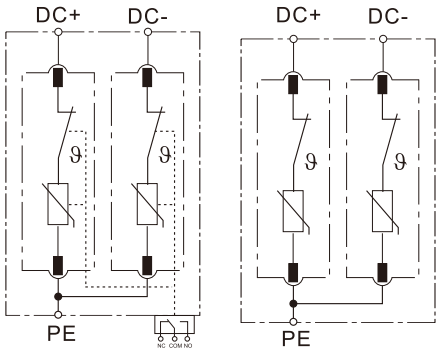
Legend

PE Protective Earth
S Signalling Contacts Optional

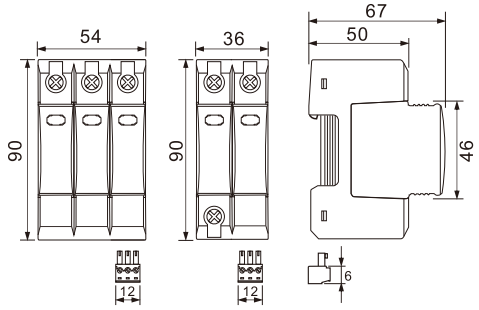
SPT40-PV1000-(S), SPT40-PV1200-(S), SPT40-PV1500-(S)



SPT40-PV600-(S)



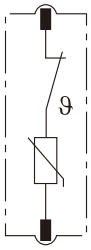
Dimensions & Packaging



SPT40-PV1500-(S) SPT40-PV600-(S)
SPT40-PV1200-(S)
SPT40-PV1000-(S)

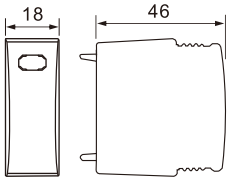
Dimensions & Packaging				
SPT40-PVXXX-(S)	**600**	**1000**	**1200**	**1500**
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]			
Minimum Order Quantity	42 Units	30 Units	30 Units	30 Units

SPT40-PVXXX/0



Plug Internal Configuration

Dimensions & Packaging



Dimensions & Packaging				
SPT40-PVXXX/0	**600**	**1000**	**1200**	**1500**
Single Unit DIN 43880 Dimension	1 CTN			
Packaging Dimensions (H x W x L)	[270 × 230 × 330 mm]			
Minimum Order Quantity	96 Units			

In-line SPD for Coaxial & RF Systems

SPT CP BNC

C1 • C2 • C3

IEC/EN Category: C1/C2/C3
Protection: Impedance Matched
Maximum Operating:
Voltage: 70, 180, 280 V
Maximum Peak Power: 40, 125, 300 W
Frequency Range: DC – 2.6 GHz
Surge Discharge Ratings: I n : 10 kA, I max : 20 kA
Impedance: 50 Ω
Insertion Loss: < 0.4 dB
Return Loss: > 20 dB
Termination: BNC Type (F-F, M-F)
Housing: In-line Installation, Shielded Enclosure
Compliance: IEC/EN 61643-21

The SPT CP BNC Series of coaxial surge protectors is intended to protect RF antenna systems and is suitable for frequencies from DC to 2.6 GHz.
It is designed as an in-line unit allowing ease of installation. The careful design, low capacitance gas discharge arresters and high quality BNC-type termination connectors, ensures a minimum of insertion loss throughout the frequency band.
Transfer power is 40 W to 300 W continuous, depending on the coaxial cable protector voltage.
The CP coaxial cable protector is designed in accordance with IEC61643-21: 2012 standards and regulations.
A grounding stud is provided which should be connected to the system ground or coaxial feed-through bulkhead, as directly as possible.

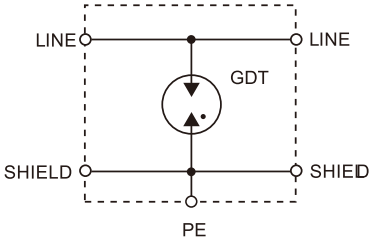
Technical Data

SPT CP BNC		70	180	280
IEC Electrical				
Maximum Continuous Operating Voltage	U_c	70V	180V	280V
Maximum Peak Power	P_{max}	40W	125 W	300W
C2 Nominal Discharge Current (8/20 µs)	I_n		10 kA	
Maximum Discharge Current (8/20 µs)	I_{max}		20 kA	
Residual Voltage at (1 kV/µs)	U_{res}	<600V	< 700V	<900V
Impedance	Z		500	
Insertion Loss	I_L		<0. 4dB ,	
Return Loss	R_L		>20dB	
Insulation Resistance of Protection	R_{iso}		>10GQ	
Frequency Range	f_G		0-2.6 GHz	
Mechanical				
Temperature Range		-40 ºF to +176 ºF [-40 ºC to +80 ºC]		
Connection		BNC Female/Female		BNC Male/Female
Degree of Protection IEC/EN 60529		IP 20 (built-in)		
Housing Material		Metal		
Order Information				
Order Code		**70**	**180**	**280**
SPT CP BNC-FF-xxx		800 850	800 851	800 852
SPT CP BNC-MF-xxx		800 853	800 854	800 855

Internal Configuration

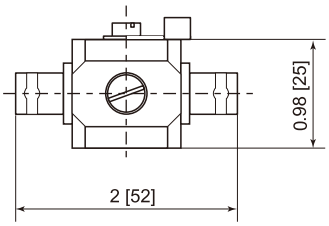
Legend

GDT Gas Discharge Tube
PE Ground

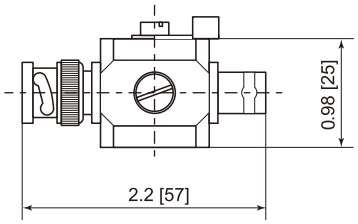


Dimensions & Packaging

SPT CP BNC-FF



SPT CP BNC-MF

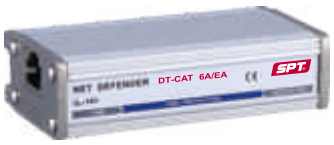


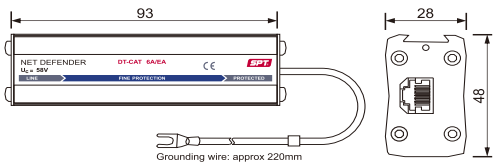
	SPT CP BNC-FF-xxx			SPT CP BNC-MF-xxx		
SPT CP BNC	**70**	**180**	**280**	**70**	**180**	**280**
Dimensions & Packaging						
Weight per Unit	3.74 oz [106 g]			4.02 oz [114 g]		
Packaging Dimensions (Single Unit)	2.9 × 1.2 × 1.2" [73 × 30 × 30 mm]					
Minimum Package Quantity	100 pieces					

SPTs for Telecommunication and Data Networks

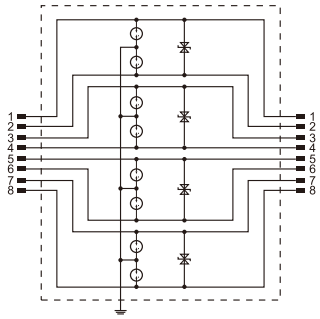
The "PoE Surge Protector" permits the use of Power over Ethernet with nominal currents of up to 1 A. It can be snapped directly onto the hat rail and uses it to create the necessary equipotential bonding. Alternatively, terminal protection using a separately connectable

- Support for Power over Ethernet + up to 1 A (PoE+ according to IEEE 802.3at)
- CAT 6A in the channel according to ANSI/TIA/EIA-568
- For installation in conformity with the lightning protection zone concept at the boundaries from 0 -2 and higher





Dimensions



Basic circuit diagram

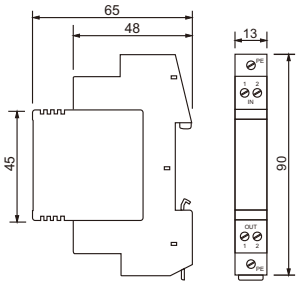
Type		DT-CAT 6A/EA
SPT according to EN 61643-21 / IEC 61643-21		type 2 / class II
Max. continuous operating a.c. voltage	U_c	41 V
Max. continuous operating d.c. voltage	U_c	58 V
Max. continuous operating d.c. voltage pair-pair (PoE)	U_c	57 V
Rated current	I_L	1 A
D1 Lightning impulse current (10/350 µs) per line	I_{imp}	1 kA
C2 Nominal discharge current (8/20 µs) line-line	I_n	150 A
C2 Nominal discharge current (8/20 µs) line-PG	I_n	2.5 kA
C2 Total nominal discharge current (8/20 µs) line-PG	I_n	10 kA
C2 Nominal discharge current (8/20 µs) pair-pair (PoE)	I_n	150 A
Voltage protection level line-line for In C2	U_P	< 190 V
Voltage protection level line-PG for In C2	U_P	< 600 V
Voltage protection level pair-pair for In C2 (PoE)	U_P	< 600 V
Voltage protection level line-line at 1 kV/µs C3	U_P	< 145 V
Voltage protection level line-PG at 1 kV/µs C3	U_P	< 500 V
Voltage protection level pair-pair at 1 kV/µs C3 (PoE)	U_P	< 600 V
Insertion loss at 250 MHz		< 2 dB
Capacitance line-line	C	< 165 pF
Capacitance line-PG	C	< 255 pF
Range of operating temperatures	T_U	-40/+80°C
Degree of protection		IP 20
Connection (input / output)		RJ45 / RJ45
Pinning		1/2, 3/6, 4/5, 7/8
Enclosure material		Aluminum housing
Earthing via		Connecting line
Transmission class according to ISO/IEC 11801		Cat. 6
Transmission class according to EN 50173-1		Class SPT
Transmission class according to ANSI/TIA/EIA-568		Cat. 6A in the channel

Modular SPD for Single Pair

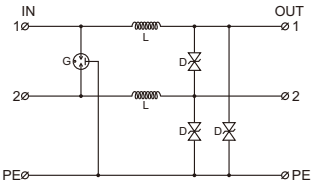
SPT-DC Series

D1•C1•C2•C3

IEC/EN Category: D1/C1/C2/C3
Mode of Protection: Longitudinal, Transverse
Coarse Protection: 3 Terminal GDT
Voltages: 5, 12, 15, 24, 30*, 48, 60, 110 V DC
Frequency Range: 30 MHz
Surge Discharge Ratings: I_n: 10 kA, I_{max}: 20 kA, I_{imp}: 2.5 kA
Series Load Current: 1 A
Enclosure: DIN 43880 2/3 TE, DIN Rail Mount
Terminals: Stranded to 4 mm2
Housing: Modular Design
Compliance: IEC/EN 61643-21
UL 497B 4th Edition



Dimensions



Basic circuit diagram

Technical Data

SPT-DC Series

		5	12	15	24	30*	48	60	110
Electrical									
Lines Protected		1							
Nominal Operating Voltage (DC)	U_n	5V	12 V	15 V	24 V	30 V	48 V	60 V	110 V
Maximum Continuous Operating Voltage (DC)	U_c	6V	15 V	18 V	28 V	33 V	52 V	64 V	170 V
Rated Load Current at 25°C	I_L	1A							
C2 Nominal Discharge Current (8/20 µs)	I_n	10 kA							
Maximum Discharge Current (8/20 µs)	I_{max}	20 kA							
D1 Impulse Current (10/350 µs)	I_{imp}	2.5 kA							
Residual Voltage at 5 kA (8/20 µs)	U_{res}	<22V	< 42 V	< 48 V	< 70 V	< 80 V	< 140 V	< 160 V	< 450 V
Rated Spark Overvoltage (Line-Ground)		7-10V	16-21 V	21-25 V	31-37 V	36-44 V	57-69 V	68-84 V	184-264 V
(Line-Line)		7-10V	16-21 V	21-25 V	31-37 V	36-44 V	57-69 V	68-84 V	184-264 V
Response Time Overvoltage Protection	t_A	< 1 ns							
Thermal Protection		Ye s							
Cut-off Frequency	f_G	30 MHz							
Mechanical									
Temperature Range		-40 °F to +176 °F [-40 °C to +80 °C]							
Terminal Cross Section Multi-strand (max.)		12 AWG [4 mm^2, 2.5 mm^2 Q Version]							
Degree of Protection IEC/EN 60529		IP 20 (built-in)							
Mounting IEC/EN 60715		35 mm DIN Rail							
Order Information									
Order Code		5	12	15	24	30*	48	60	110
SPT-DC-xxx		9086.33	9086.34	9086.35	9086.36	9082.80	9086.37	9086.38	9086.39
SPT-DC-xxxM (module)		9086.40	9086.41	9086.42	9086.43	9082.81	9086.44	9086.45	9086.46

STANDARDS FOR SURGE PROTECTORS

For almost 40 years, many worldwide organizations have developed standards that form the basis of our understanding of the surge environment and its effect on equipment. These surge protection working groups have been the catalyst for many of the advances that have been made related to the optimal performance, increased reliability and safety of surge protectors.
The most well-known reference standards are*:

Surge Protectors for Low-Voltage installations:

- UL1449 - AC and DC Power SPD (USA)
- CSA C22.2 (CANADA)
- NOM-001-SCFI (MEXICO)
- NOM-003-SCFI (MEXICO)
- IEC 61643-11 (International)
- NF EN 61643-11 (France)
- VDE 0675-6-11 (Germany)
- EN 61643-11 (Europe)

Surge Protectors for data and RF equipment:

- UL 497A - Primary Data SPD (USA)
- UL 497B - Secondary Data SPD (USA)
- UL 497E - RF Antenna SPD (USA)
- IEC 61643-21 (International)
- ITU-T recommendations K11, K12, K17, K20, K21, K36 (International)

Surge Protectors mandatory application:

- NFPA 70 - NEC - National Electric Code (USA)
- NFPA 79 - Electrical Standard for Industrial Machinery (USA)
- NFPA 780 - Guide on Electrical Inspections (USA)

Surge Protectors recommended guidelines:

- ANSI/IEEE C62.41 - Low-Voltage AC Power Circuits (USA)
- ANSI/IEEE C136.2 - Roadway & Area Lighting (USA)

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