# SPD
**Surge Protective Device**



## Overvoltage

Electricity is an essential part of modern human production and life. But power facilities are threatened by internal and external overvoltages. Power system overvoltage mainly includes:

**Transient overvoltage of atmospheric origin:** Lightning strikes instantly generate high energy, generating surge currents up to hundreds of kA, and lightning wave can invade along power lines, causing damage to power facilities and electrical equipment

**Transient overvoltage due to switching:** Switching operations of a power utility may cause overvoltage.

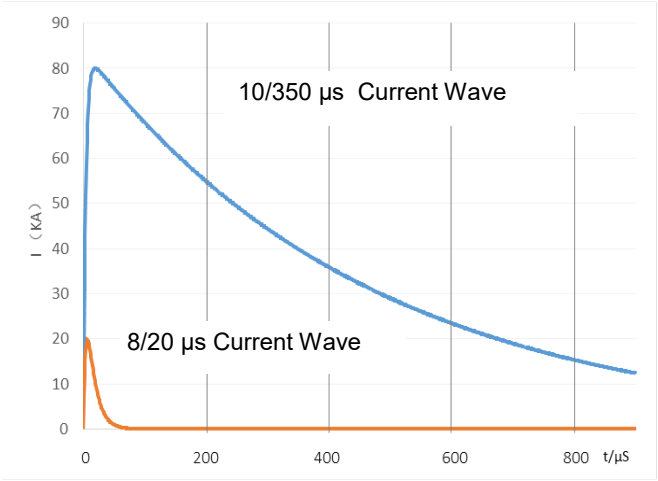
**Temporary overvoltage:** A long duration (second level) temporary overvoltage (asymmetric ground fault) or harmonious overvoltage.

## Surge Voltage Caused by Lightning

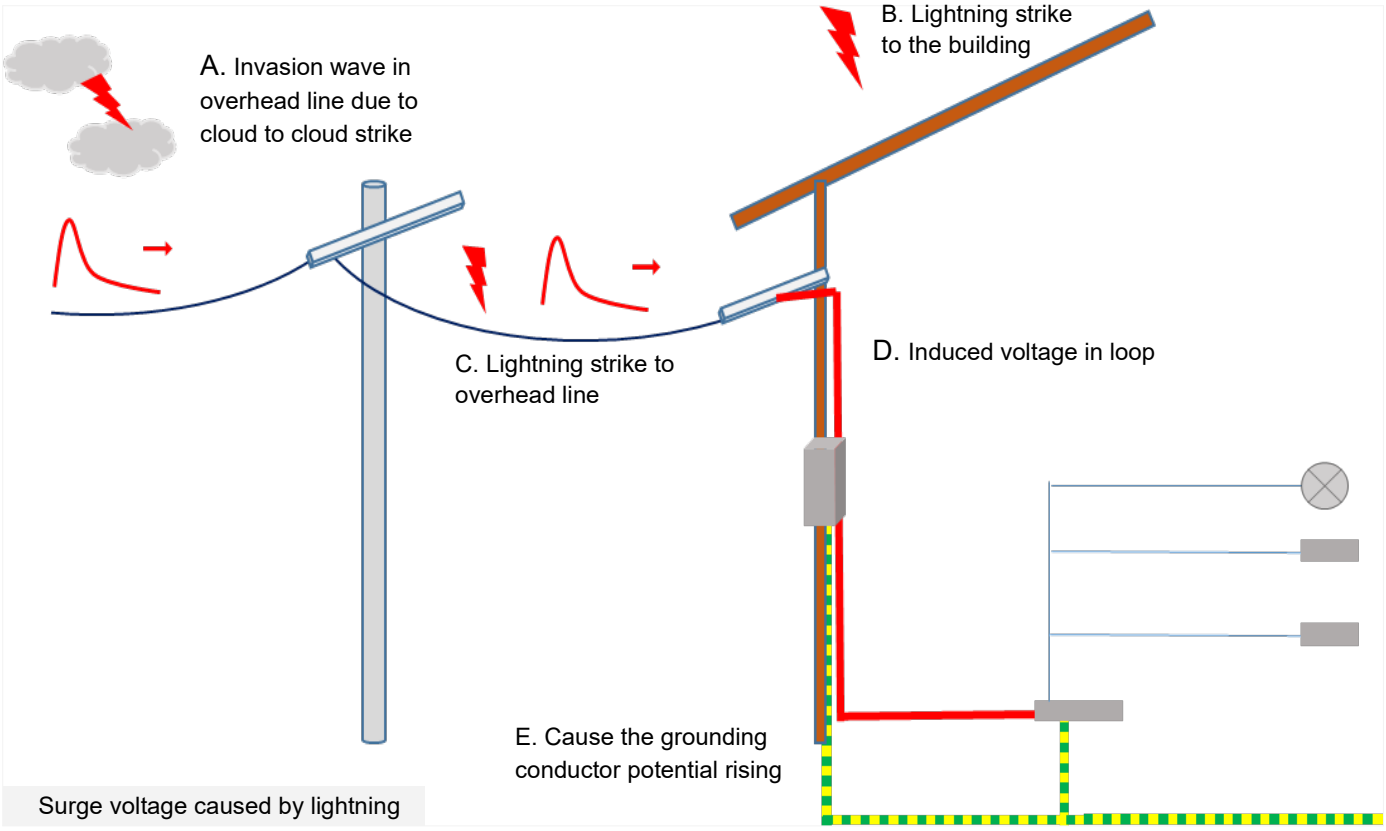
Electrical and electronic system are subject to damage from a lighting electromagnetic impulse (LEMP). Therefore SPM need to be provided avoid failure of internal system. LEMP may caused by direct, near and far lightning strikes. According to the relevant research, lightning strikes within a certain distance may cause dangerous overvoltage on the cable, endangering the equipment connected to it.

## Damage Due to Lighting

The lighting can cause three basic type of damage:
—D1: injury to living beings by electric shock;
—D2: physical damage (fire, explosion, mechanical destruction, chemical release) due to lighting current effects, including sparking;
—D3: failure of internal systems due to LEMP




Standard lightning test wave




Surge voltage caused by lightning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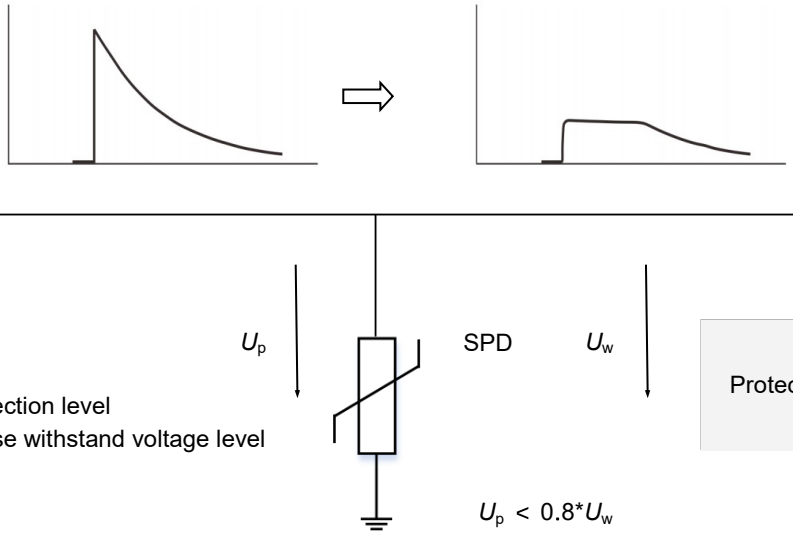
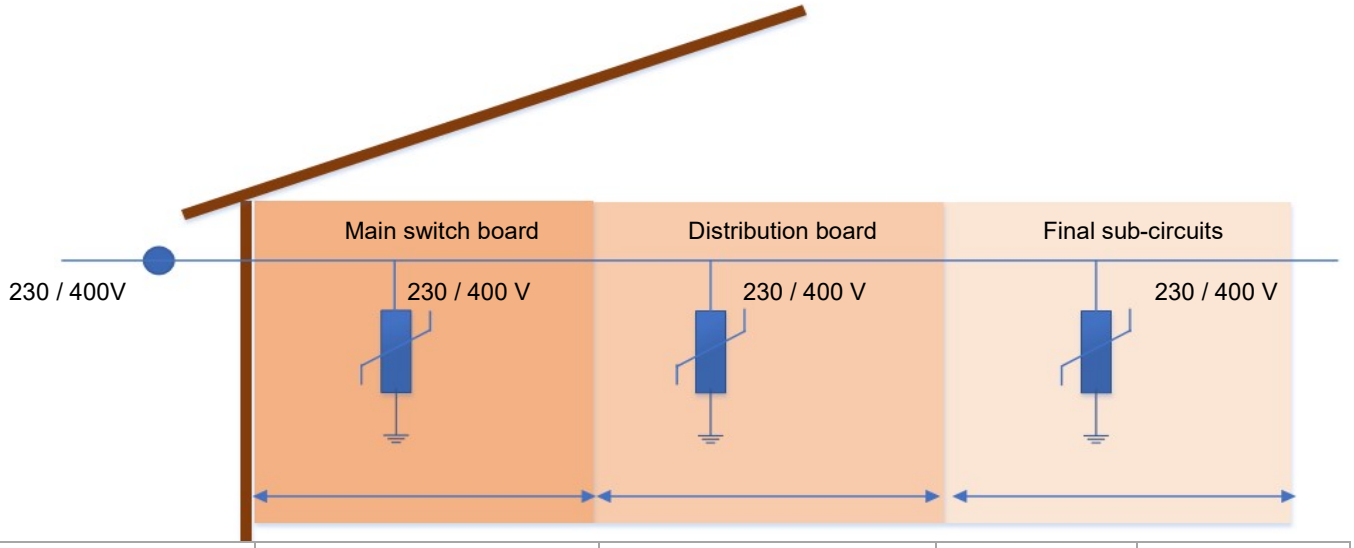
## Impulse Withstand Voltage and Surge Protection

As the primary equipment of internal lightning-proof, SPD needs to be able to withstand surge stress and provides the level of voltage protection required for the equipment. This involves the selection and coordination of SPD in different locations to form a complete protection system.




| Overvoltage Category | IV | III | II | I |
|---|---|---|---|---|
| $U_w$ (kV) Impulse Withstand Voltage | 6 | 4 | 2.5 | 1.5 |
| Lightning Protection Zone LPZ | LPZ1 | LPZ2 | LPZn | |
| SPD Type | Class I or Class II | Class II | Class II or Class III | |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# Din-rail Surge Protective Device

## Description

Surge protective devices (SPDs) are designed to meet requirements for UL 1449 and IEC/EN 61643-11. They are DIN-rail mountable featuring a fail-safe protection, visual indicator and remote signal contact. It has a good environmental adaptability and meets the requirements of high reliability in important field.

## Features

- With Remote Signal Contact and Failure Indication
- Pluggable Module for Easy Replacement
- Comply with UL 1449 / IEC 61643-11
- Internal Thermal Protection, Fail-safe

## Applications

- AC / DC Power Supplies
- New Energy
- Residential Building
- Telecommunications
- Internet Data Center (IDC)
- Industrial Control


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# Glossary

| Item | Description |
|---|---|
| $U_p$ | **Votage Protection Level**<br>Maximum voltage to be expected at the SPD terminals due to an impulse stress with defined voltage steepness and an impulse stress with a discharge current with given amplitude and wave shape.<br>— (IEC 61643-11) |
| **8/20 μs** | **8/20 Current Impulse**<br>Current impulse with a nominal virtual front time of 8 μs and a nominal time to half-value of 20 μs.<br>— (IEC 61643-11) |
| **1.2/50 μs** | **1.2/50 Voltage Impulse**<br>Voltage impulse with a nominal virtlual front time of 1.2 μs and a nominal time to half-value of 50 μs.<br>— (IEC 61643-11) |
| $U_c$ | **Maximum Continuous Operating Voltage**<br>Maximum r.m.s. voltage, which may be continuously applied to the SPD's mode of protection.<br>— (IEC 61643-11) |
| $I_n$ | **Nominal Discharge Current**<br>Crest value of the current through the SPD having a current waveshape of 8/20 μs.<br>— (IEC 61643-11) |
| $I_{imp}$ | **IImpulse Discharge Current for Class I Test**<br>Crest value of a discharge current through the SPD with specified charge transfer Q and specified energy W/R in the specified time.<br>— (IEC 61643-11) |
| $I_{max}$ | **Maximum Discharge Current**<br>Crest value of a current through the SPD having an 8/20 μs waveshape and magnitude according to the manufacturers specification. $I_{max}$ is equal to or greater than $I_n$.<br>— (IEC 61643-11) |
| **Modes of Protection** | **Modes of Protection**<br>An intended current path, between terminals that contains protective components, e.g. line-to-line, line-to-earth, line-to-neutral, neutral-to-earth.<br>— (IEC 61643-11) |
| **IP** | **Degrees of Protection of enclosure**<br>Classification preceded by the symbol IP indicating the extent of protection provided by an enclosure against access to hazardous parts, against ingress of solid foreign objects and possibly harmful ingress of water.<br>— (IEC 61643-11) |
| **TCO** | **Thermal-Link**<br>A non-resettable device incorporating a THERMAL ELEMENT which will open a circuit once only when exposed for a sufficient length of time to a temperature in excess of that for which it has been designed. |
| **ATCO** | **Alloy Thermal-Link**<br>Alloy Type Thermal-Link, Alloy is the thermal element. |


SPD


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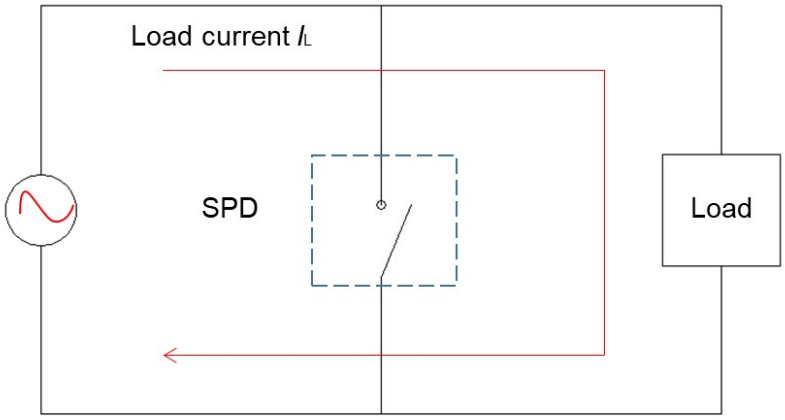
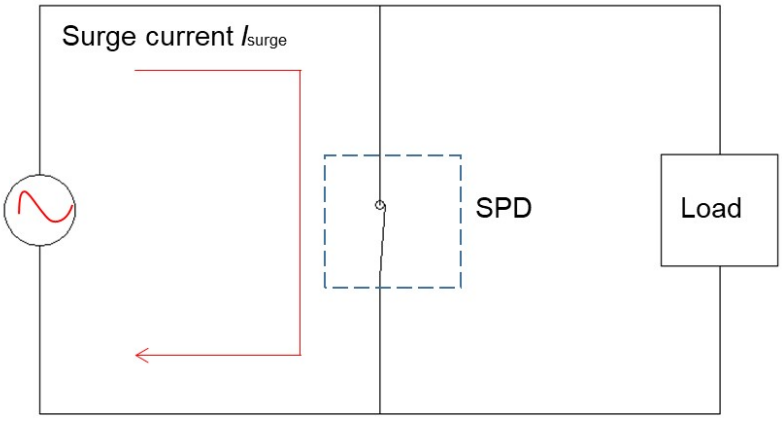
## Operation Principle

SPD is equivalent to open circuit when the circuit without surge (Impedance > 100 MΩ).




When a surge invades the circuit, the SPD circuit mutates to a low impedance, releasing the surge current into the ground.





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## Part Numbering System

SD 25 T 100 L 2 11 PV -xxx

**Other Options**

**Modes of Protection**

Default: For AC systems
PV: For PV/DC systems

**Wire Connection**

00: One protection mode, for L-line
01: Split-phase system, 2W+G
02: Split-phase system, 3W+G
03: 2W+G One-phase or DC system, 2W+G
04: Three-phase system TT/TN (3+1)
05: Three-phase system (4+0) or Single-phase system (2+0)
06: Three-phase system IT (3+0)
11: U shape construction for PV/DC system
12: Y shape construction for PV/DC system
16: Three-phase system TT/TN (3+1), N-PE has GDT without trip

**Characteristic code**

1: One pole
2: Two poles
3: Three poles
4: Four poles

**Circuit Characteristic**

A: With GDT
L: 2+0,3+0,4+0 without GDT
F: 3+1, N-PE has GDT without trip

**Nominal System Voltage**

150 V, 230 V, 270 V, 320 V

**Design Sequence**

T R H S C

**Nominal Discharge Current**

20: 20 kA
25: 25 kA
30: 30 kA

**Product Category**

## Agency Information

| Agency Information | | Standards | NO. | Category |
|---|---|---|---|---|
| | UL | UL 1449 | E322662 | VZCA2 |
| | CUL | CSA C22.2 NO.269, CSA ECN 516 | E322662 | VZCA8 |
| | TUV | IEC/EN 61643-11, IEC/EN 61643-31 | See different models for details | |
| | CE | IEC/EN 61643-11, IEC/EN 61643-31 | See different models for details | |
| | CQC | GB/T 18802.1-2011 | See different models for details | |


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# ATTENTION

## Usage

1. The voltage applied continuously to the SPD must not exceed its maximum continuous operating voltage $U_c$.
2. When atmosphere press is from 45 kPa to 106 kPa, the related altitude shall be from 5000 m to - 500 m.
3. Do not touch the product body or wires directly when power is on, to avoid electric shock.

## Replacement

As SPD is a non-repairable product, for safety sake, please use the same type of SPD for replacement.

## Storage

Do not store SPD at high temperature, high humidity or corrosive gas environment, to avoid oxidation of the wires. Use them up within 2 years after receiving the goods.

## Installation

1. Installation and startup may only be carried out by qualified personnel. The relevant country-specific regulations must be observed.
2. Check the device for external damage before installation. If the device is defective, it must not be used.
3. Pay attention to risk of electric shock. Please cutoff all electrical power before installation or service.
4. Lay the output cables to the surge protective devices (SPDs) as short as possible, without loops.
5. Please install proper backup protection devices in front of SPD.
6. Do not apply mechanical stress to the SPD body during or after the installation.

## Maintenance

1. Check SPD status according to instructions before and after the thunderstorm season each year.
2. If the indicator of "failure state" appears, the SPD is damaged. Replace the SPD with same type.
3. Ensure electrical connections and mountings are correct before energizing the circuit.
4. SPD`s quality is well controlled and strictly inspected before delivery. If non-functional ones are found during operation, please contact us early enough.


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## SPD Connected to LV Power Supply System

- AC / DC Power System
- New Energy
- Residential Building
- Telecommunications
- Distribution System


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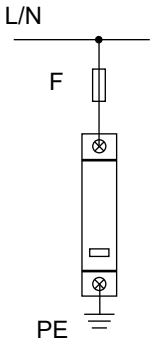
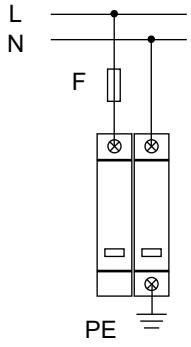
## Wiring Diagram

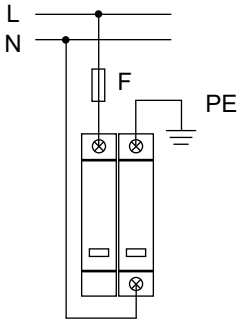
Single phase system




"1+0"
Connection

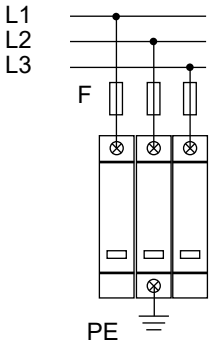



"2+0"
Connection

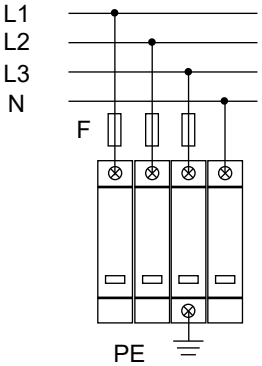



"1+1"
Connection

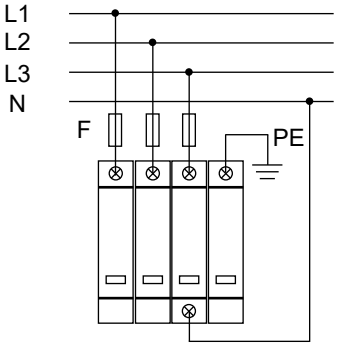
Three phase system




"3+0"
Connection

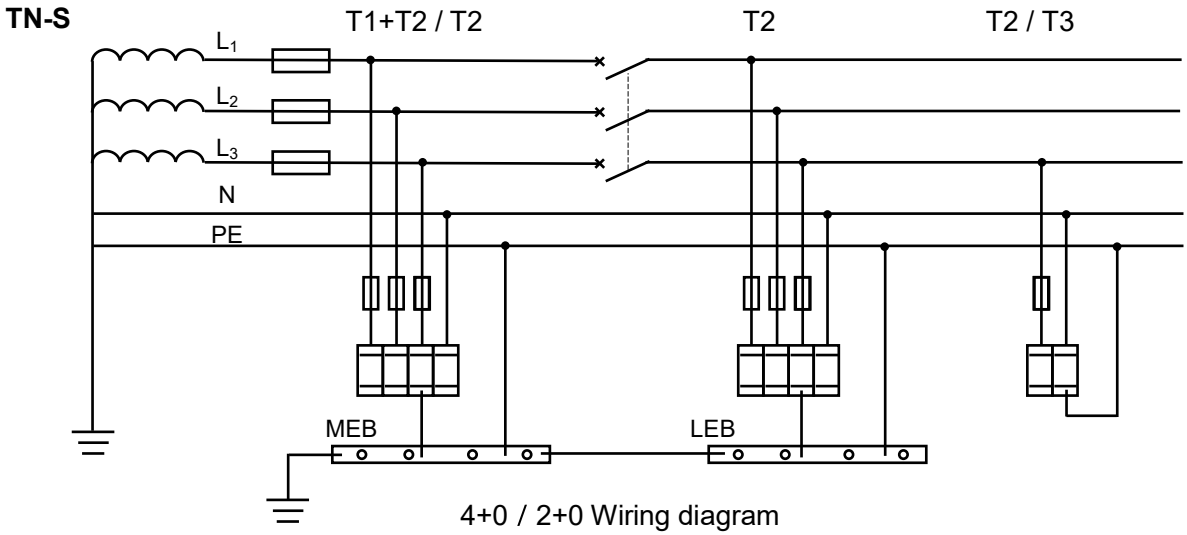



"4+0"
Connection




"3+1"
Connection

## Connection of SPD in networks




4+0 / 2+0 Wiring diagram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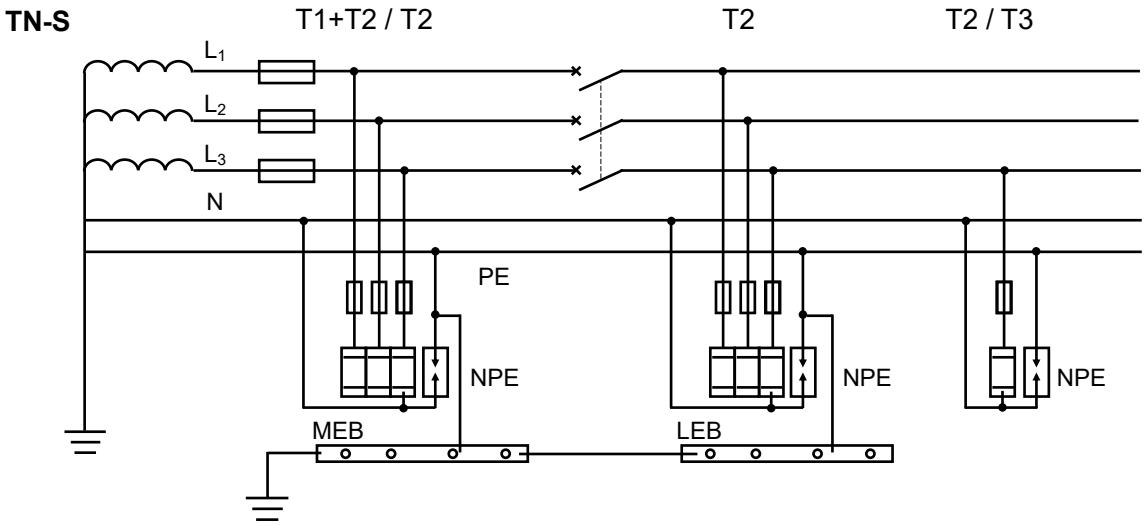
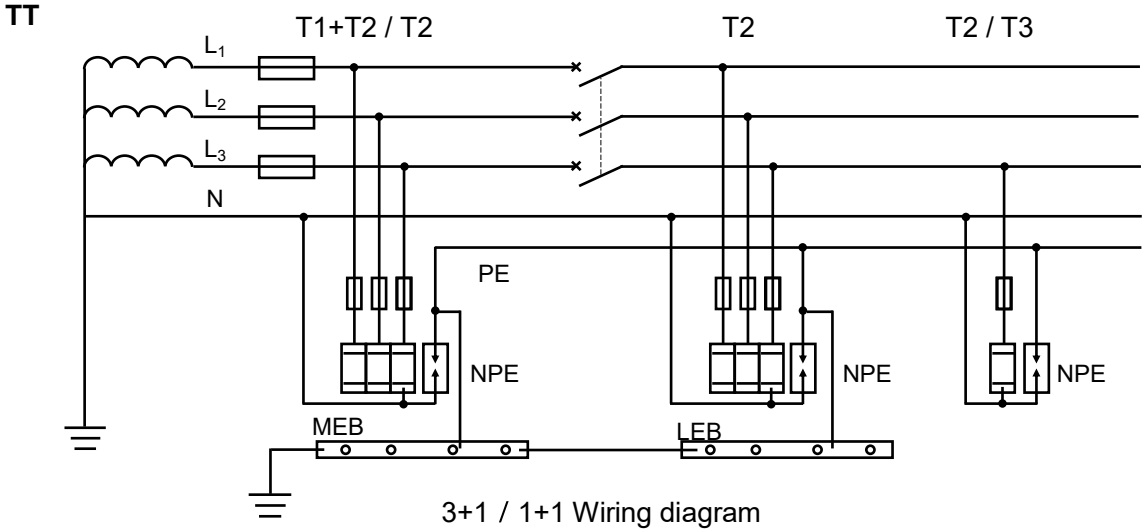
**TN-S**



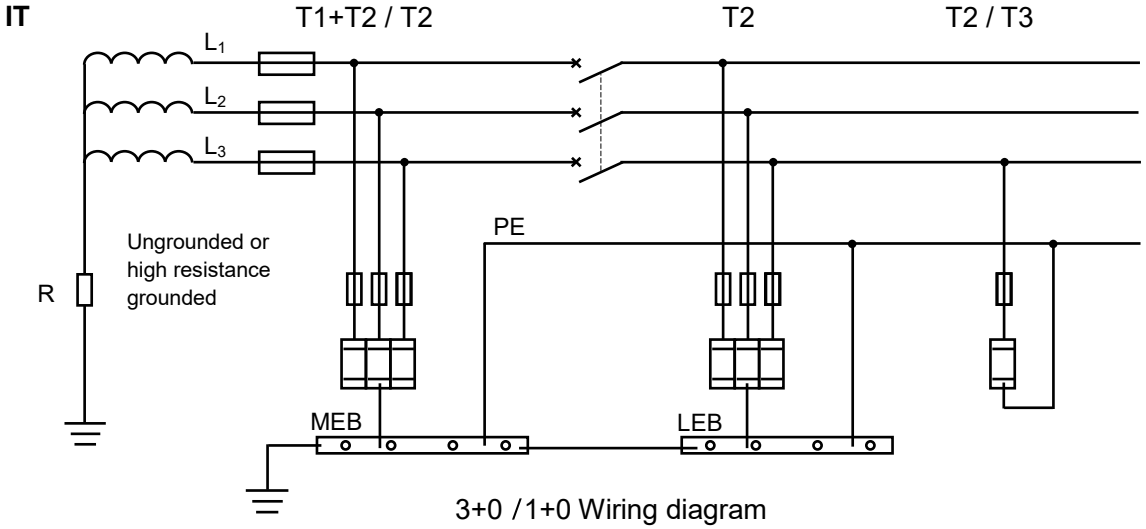

3+1 / 1+1Wiring diagram

**TT**




3+1 / 1+1 Wiring diagram

**IT**




3+0 /1+0 Wiring diagram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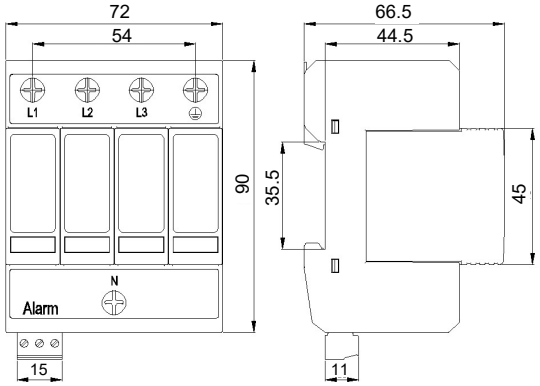
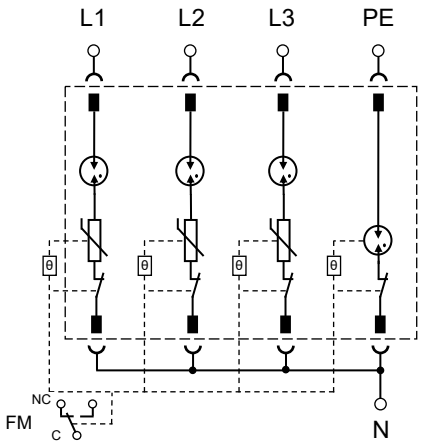
## Dimensions (mm)




## Schematics




- For AC Three-phase System
- Pluggable Module for Easy Replacement
- Low Residual Voltage, No Leakage Current

| Features | Specifications |
|---|---|
| Model | SD20H230A404 |
| Nominal System Voltage ($U_n$) | 230 VAC |
| Maximum Continuous Operating Voltage ($U_c$) | L - N: 275 VAC; N - PE: 255 VAC |
| Nominal Discharge Current (8/20 μs) ($I_n$) | 20 kA |
| Maximum Discharge Current (8/20 μs) ($I_{max}$) | 40 kA |
| Voltage Protection Rating ($U_p$) | 1.0 kV |
| Modes of Protection | 3+1 (L - N, N - PE) |
| Max. Main-side Overcurrent Protection | 125 A gL/gG |
| Short Current Rating $I_{SCCR}$ | 25 kA |
| Degrees of Protection of enclosure | IP20 |
| Wiring Ability | (1.5 to 25) $mm^2$ (Flexible) / 35 $mm^2$ (Rigid) |
| Installation | 35 mm DIN rail |
| Alarm | Remote + Indicator |
| Operating State / Fault Indication | Green / Red |
| Remote Indication Contacts | AC: 250 V / 0.5 A, DC: 250 V / 0.1 A |
| Altitude | 0 ~ 4000 m |
| Operational Temperature Range | (-40 to 85) °C |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