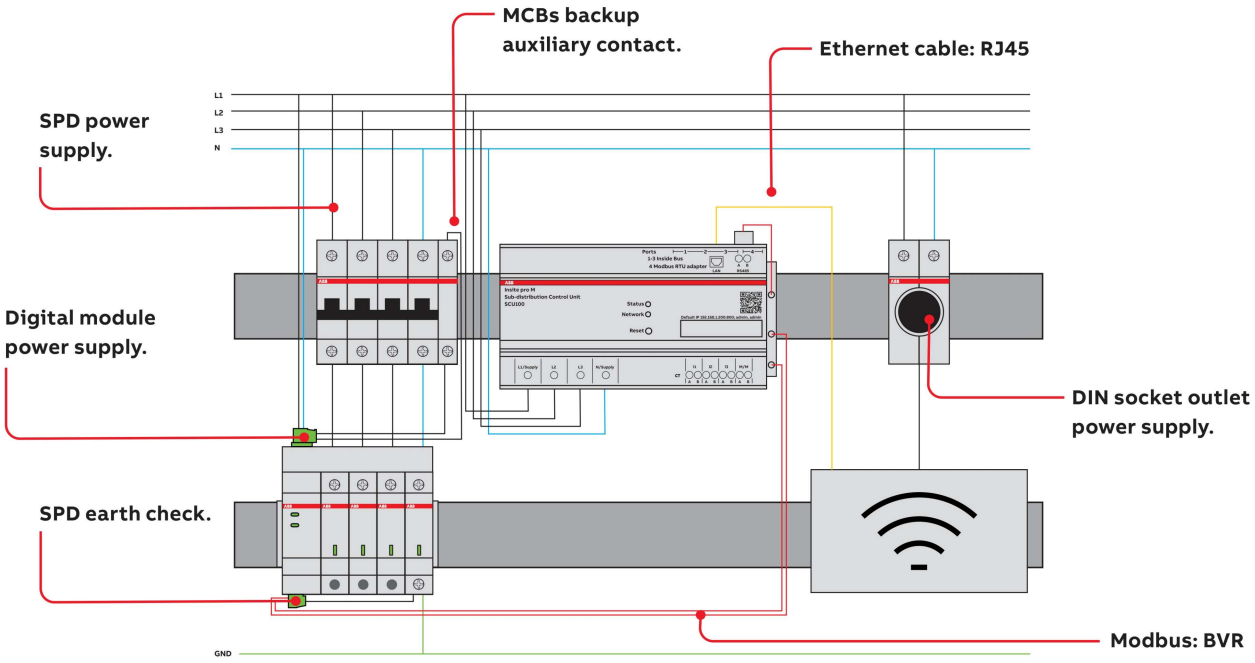
Digital SPD—eOVR

Wiring



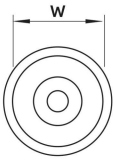
Wires	Type	Min section mm²	Max section mm²	Stripping lenght mm	Torque N.m
SPD power supply	Rigid/stranded	2.5	16/10	12.5	2.8
Digital module power supply	Rigid/stranded	0.5	2.5	7 7	0.4
Earth check	Rigid/stranded	0.5	1.5		0.2
SPD earth	Rigid/stranded	2.5	25/16	12.5	2.8
Modbus	BVR	0.5	1.5	7	0.2
MCBs backup auxiliary contact	Rigid/stranded	0.5	1.5	7	0.2
Ethernet	RJ45	-	-	-	-
DIN socket outlet power supply	Rigid/stranded	2.5	25	12.5	2.8

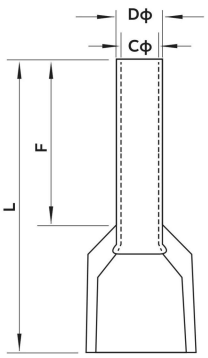
Ferrules:

Dimension(mm)						Cable size (mm²)
F	L	W	Dϕ	Cϕ	A.W.G	
8.0	14.0	2.6	1.3	1.0	#22	0.5
8.0	14.06	2.8	1.6	1.3	#20	0.8
8.0	14.4	3.0	1.7	1.4	#18	1.0
8.0	14.4	3.5	2.0	1.7	#16	1.5
8.0	15.2	4.0	2.6	2.3	#14	2.5

Materials: **Copper**

Insulation sheath material: **Nylon**





Surge and lightning protection solutions

Installation and wiring of SPDs in an electrical switchboard

Connection distance

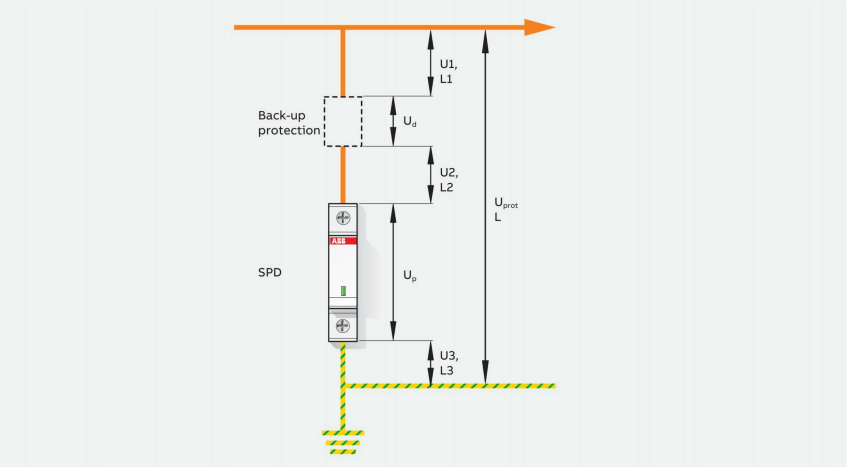
50 cm rule

A lightning current of 10 kA generates a voltage drop of approximately 1200 V in 1 m of cable due to the inductance of the conductor. Equipment protected by a SPD is therefore subject to a voltage of U_{prot} equal to the sum of:

- Protection level of the SPD U_p
- Voltage at the terminals of the back-up protection U_d
- Voltage in the connections U_1, U_2, U_3

$$U_{prot} = U_p + U_d + U_1 + U_2 + U_3$$

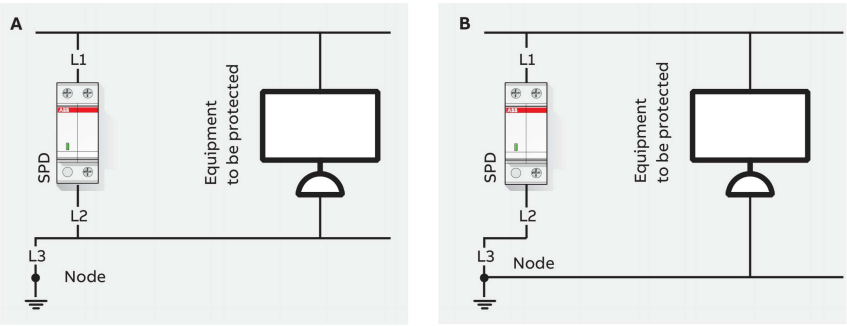
To maintain the level of protection below the impulse withstand voltage (U_w) of the devices to be protected, the total length (L = L1 + L2 + L3) of the connecting cables must be as short as possible (less than 0.50 m).



It is necessary to pay attention to the actual length of the connections, which must be measured from the SPD's terminals to the point at which the cable is taken off as a spur from the main conductor. Here is an example which demonstrates the importance of the lengths of connections (for simplicity the diagram omits the back-up protection).

A: in this case...
L = L1 + L2
The length L3 has no effect on the protection of equipment.

B: in this case...
L = L1 + L2 + L3
If the length of L3 is several meters, considering that every extra meter of wire increases the protection voltage by 1200 V, the protection loses a lot of effectiveness.



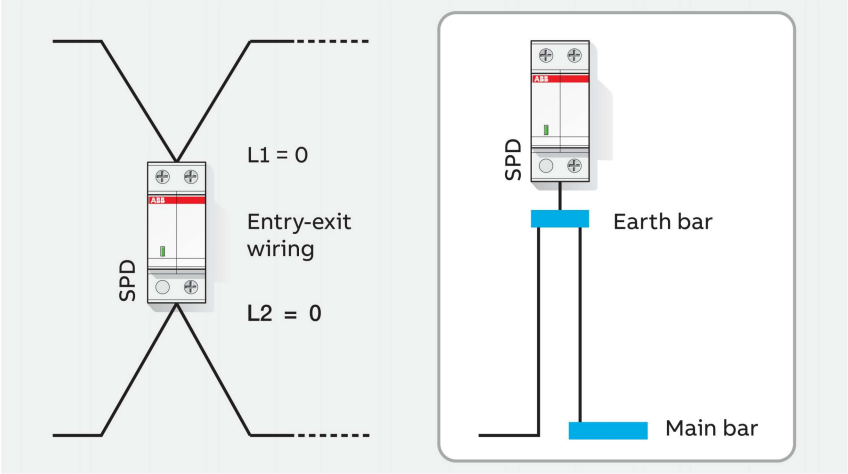
The equipment's earth connection must be distributed, starting from the connection of the SPD which protects it.

Surge and lightning protection solutions

Installation and wiring of SPDs in an electrical switchboard

In the case where the length of the connection (L = L1 + L2 + L3) exceeds 0.50 m, it is recommended to adopt one of the following steps:

1) Reduce the total length L:
- By moving the installation point of the SPD in the switchboard;
- Using V, or "entry-exit" wiring, which allows the lengths of the connections to be reduced to zero (it must, however, be ensured that the rated line current is compatible with the maximum current tolerated by the SPD's terminals);
- In large switchboards, connect the PE coming in to an earth bar near the SPD (the length of the connection is only the spur off from this point, so a few cm); downstream of the connection point, the PE can be taken to the main earth bar.



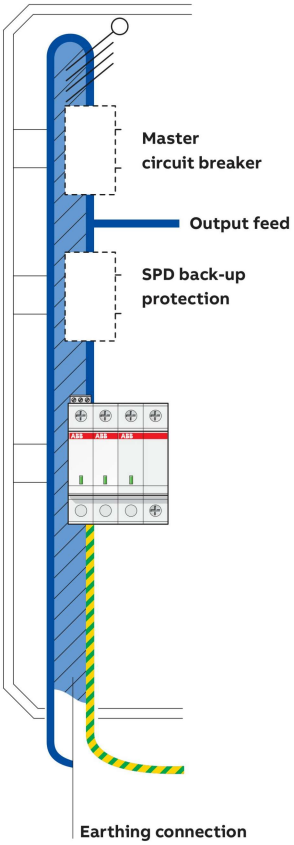
2) Choose a SPD with a lower level of protection U_p

Install a second SPD coordinated with the first as close as possible to the device to be protected, so as to make the level of protection compatible with the impulse withstand voltage of the equipment.

Alternatively, select an enhanced SPD which inherently has a superior lower protection level, such as the ABB Furse range.

Surge and lightning protection solutions

Installation and wiring of SPDs in an electrical switchboard



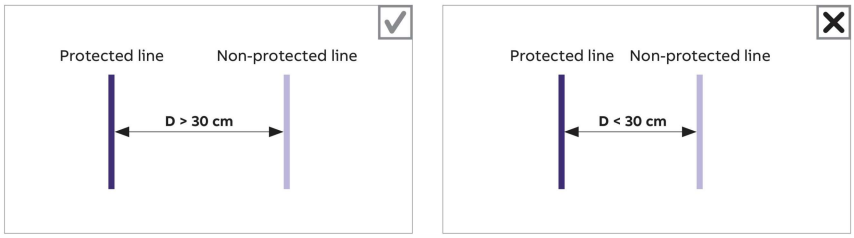
Electrical lines and connection area

It is necessary to arrange the lines so that the conductors are as close as possible to each other (see figure) to avoid surges induced by inductive coupling of an indirect lightning strike with a large loop contained between the phases, the neutral and the PE conductor.

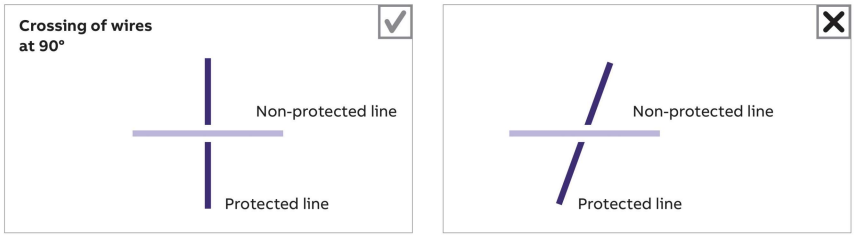
Cabling of protected and non-protected lines

During installation, run the protected and non-protected wiring according to the instructions in the diagrams below.
To avoid the risk of electromagnetic coupling between different types of wires, it is strongly recommended they be kept at a distance from one another (> 30 cm) and that when it is not possible to avoid them crossing, this needs to be performed at a right angle.

Distance between two wires:



Wires crossing:



Equipotential earthing

It is fundamental to check the equipotentiality of the earths of all the equipment. The equipment's earth connection must also be distributed, starting from the connection of the SPD which protects it.
This allows the connection distances and therefore the voltage U_{prot} to be limited.

Section of the connections

Wiring between active network conductors and the SPD

The cable section must be at least the same as the upstream wiring. The shape of wiring is more important than the section. The recommended section for Main Board is 10 mm² for phase and Neutral and 16 mm² for earth.

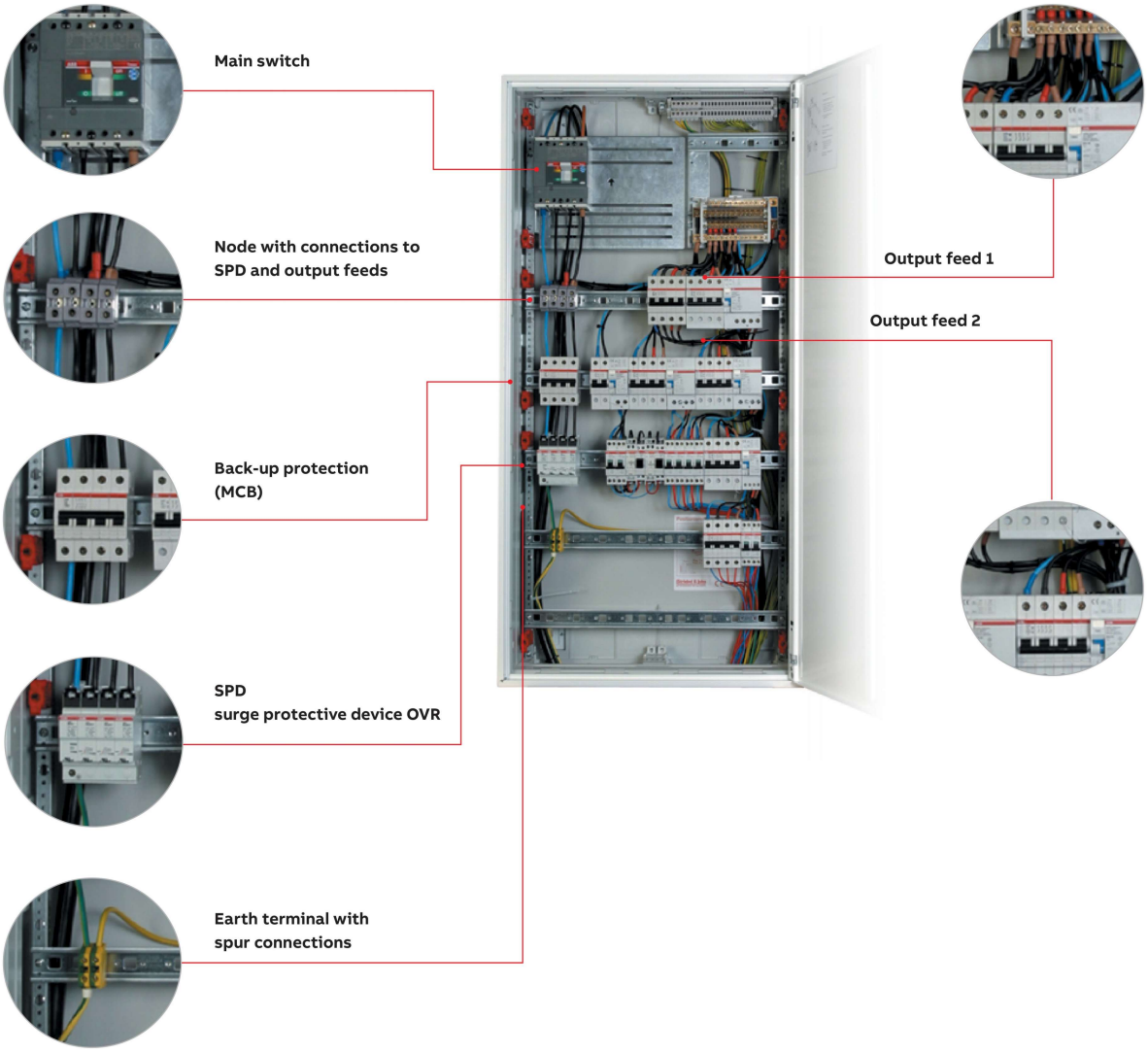
Wiring between the SPD and earth

The minimum section is 4 mm² in the case where there is no lightning conductor, and 10 mm² in the case one is installed. It is nevertheless recommended to use a cable with a greater section to leave a safety margin, e.g. 10-20 mm² section.

Surge and lightning protection solutions

Example of an electrical switchboard protected by ABB surge protection solutions

Rules followed by the installer:
- Connection distances < 50 cm
- Earth terminal in proximity to SPD
- Back-up protection dedicated to the SPD
- Protection installed upstream of RCDs
- Reduction of the loop between the phases, neutral and PE



Protection and safety technical details

The Underwriters Laboratories (UL) standard for surge protective devices (SPDs) has been the primary safety standard for surge protection since the first edition was published in 1985, the fourth edition became mandatory for AC SPDs in March 2016.

The objective of UL 1449 has always been to increase safety in terms of surge protection.

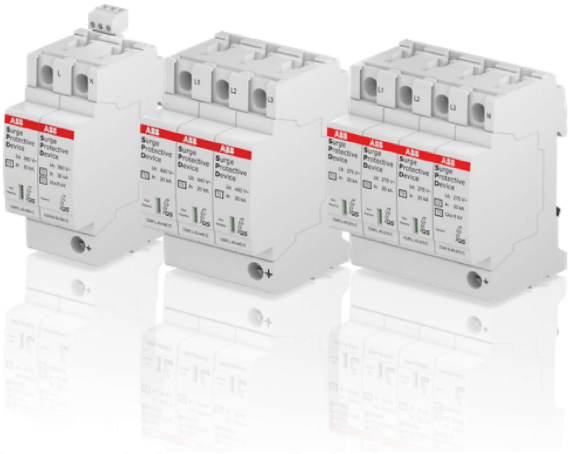
Change in the standard's name: From TVSS to SPDs
Prior to UL 1449 3rd Edition taking effect, the devices this standard covers were known as Transient Voltage Surge Suppressors (TVSS), operating on power circuits not exceeding 600 V. With the inception of the 3rd and 4th Edition, these devices are now known as Surge Protective Devices (SPDs), and may operate on power circuits not exceeding 1500 V DC.

This new designation moves the UL standard closer to the international designation and to IEC standards.

The different type designations of surge protective devices
The UL 1449 placed SPDs into five different Type categories based on installation location within an electrical system. While Type 1, Type 2 and Type 3 categories refer to different types of SPDs that can be installed at specific locations, Type 4 and Type 5 categories refer to components used in an SPDs configuration.

Type 1 – "Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent 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 - 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."
Type 1, 2, 3 - Component assemblies – "Consists of a Type 4 component assembly with internal or external short circuit protection."
Type 5 – "Discrete component surge suppressors, such as MOVs that may be mounted on a PWB, connected by its leads or provided within an enclosure with mounting means and wiring terminations."

The closer an SPD is installed to the equipment, the better the protection is. This is a push in the direction of providing stepped protection including external and internal surge protection.



The measured voltage protection level
The Measured Limiting Voltage (MLV) is the maximum magnitude of voltage measured at the application of a specific impulse wave shape.

When applying a certain surge current on the SPD the measured voltage at the device terminals is the so called "let-through voltage."

In UL 1449 2nd Edition, the let-through voltage was referred to as Suppressed Voltage Rating (SVR) and was calculated with a 0.5 kA surge wave form at 6 kV. The new designation is Voltage Protection Rating (VPR) and is calculated with a 3 kA surge wave form at 6 kV.

All products have been certified according to the UL 1449 5th Edition.

The MLV will allow comparison of different types of SPDs with regards to the let-through voltage. However, it is important to note that the surge current used to measure the let-through voltage is six times higher in the 3rd, 4th and 5th Edition than in the 2nd Edition. This means that, comparing the obsolete SVR designation with the new VPR ratings will not be valid, as VPR ratings will of course be higher than SVR ratings.

Protection and safety technical details

UL 1449 Ed5

List of OVR T2 UL products according to their certification

Type acc. To UL 1449 Ed5

Range	Type	Order code	Type 4 CA	Type 1 CA
T2 U	OVR T2 15-150 P U	2CTB802341R0000		■
	OVR T2 15-320 P U	2CTB802341R0400		■
	OVR T2 40-150 P U	2CTB802341R2000		■
	OVR T2 40-150 P TS U	2CTB802341R2100		■
	OVR T2 40-320 P U	2CTB802341R2400		■
	OVR T2 40-320 P TS U	2CTB802341R2500		■
	OVR T2 40-440 P TS U	2CTB802341R2900		■
	OVR T2 40-550 P TS U	2CTB802341R3300		■
	OVR T2 40-660 P TS U	2CTB802341R3700	■	
	OVR T2 70 N P U	2CTB802341R8000	■	
	OVR T2 1N 15-150 P U	2CTB802342R0000	■	
	OVR T2 1N 15-320 P U	2CTB802342R0400	■	
	OVR T2 1N 40-150 P U	2CTB802342R2000	■	
	OVR T2 1N 40-150 P TS U	2CTB802342R2100	■	
	OVR T2 1N 40-320 P TS U	2CTB802342R2500	■	
	OVR T2 1N 40-440 P TS U	2CTB802342R2900	■	
	OVR T2 1N 40-550 P TS U	2CTB802342R3300	■	
	OVR T2 1N 40-660 P TS U	2CTB802342R3700	■	
	OVR T2 2L 15-150 P U	2CTB802343R0000		■
	OVR T2 2L 15-320 P U	2CTB802343R0400		■
	OVR T2 2L 40-150 P TS U	2CTB802343R2100		■
	OVR T2 2L 40-320 P TS U	2CTB802343R2500		■
	OVR T2 2N 15-150 P U	2CTB802344R0000		■
	OVR T2 2N 15-320 P U	2CTB802344R0400	■	
	OVR T2 2N 40-150 P TS U	2CTB802344R2100	■	
	OVR T2 2N 40-320 P TS U	2CTB802344R2500	■	
	OVR T2 2N 40-440 P TS U	2CTB802344R2900	■	
	OVR T2 2N 40-550 P TS U	2CTB802344R3300	■	
	OVR T2 2N 40-660 P TS U	2CTB802344R3700	■	
	OVR T2 3L 15-150 P U	2CTB802345R0000		■
	OVR T2 3L 15-320 P U	2CTB802345R0400		■
	OVR T2 3L 40-150 P TS U	2CTB802345R2100		■
	OVR T2 3L 40-320 P TS U	2CTB802345R2500		■
	OVR T2 3L 40-440 P TS U	2CTB802345R2900		■
	OVR T2 3L 40-550 P TS U	2CTB802345R3300		■
	OVR T2 3N 15-150 P U	2CTB802346R0000	■	
	OVR T2 3N 15-320 P U	2CTB802346R0400	■	
	OVR T2 3N 40-150 P TS U	2CTB802346R2100	■	
	OVR T2 3N 40-320 P TS U	2CTB802346R2500	■	
	OVR T2 3N 40-440 P TS U	2CTB802346R2900	■	
	OVR T2 3N 40-550 P TS U	2CTB802346R3300	■	
	OVR T2 3N 40-660 P TS U	2CTB802346R3700	■	
	OVR T2 15-150 C U	2CTB802348R2500		■
	OVR T2 15-320 C U	2CTB802348R2700		■
	OVR T2 40-150 C U	2CTB802348R3500		■
	OVR T2 40-320 C U	2CTB802348R3700		■
	OVR T2 40-440 C U	2CTB802348R3900		■
	OVR T2 40-550 C U	2CTB802348R4100		■
	OVR T2 40-660 C U	2CTB802348R4300	■	
	OVR T2 70 N C U	2CTB802348R6500	■	

Protection and safety technical details

Products Standards, UL 1449 Ed4

Terminology of SPD electrical characteristics

SPD terminology

8/20 wave:
Current waveform which passes through equipment when subjected to an overvoltage (low energy).

Type 2 surge protective device (SPD)
Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device, including SPDs located at a branch panel. It has successfully passed testing to the standard with the 8/20 wave (class II test).

Metal oxide varistor (MOV)
A varistor is an electronic component with a "diode like" nonlinear current-voltage characteristic, used to protect circuits against excessive transient voltages. Most commonly composed of metal oxides.

Maximum continuous operating voltage (MCOV, Uc)
The maximum designated root mean square (rms) value of power frequency voltage that may be applied continuously between the terminals of the SPD.

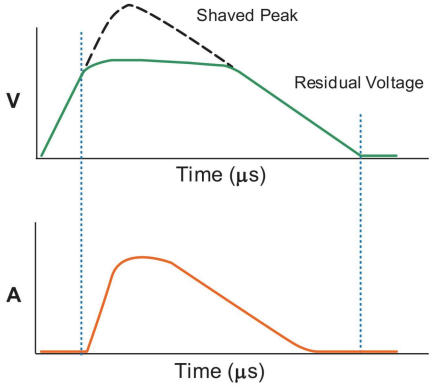
Nominal discharge current (In)
Peak current value of an 8/20 waveform which the SPD is rated for based on the test program.

Maximum discharge current (Imax)
Peak current value of an 8/20 waveform which can be safely discharged by the SPD, with an amplitude complying with the class II operating test sequence. Imax > In.

Short circuit current rating (SCCR)
Maximum symmetrical fault current, at rated voltage, that the SPD can withstand without sustaining damage that exceeds acceptable criteria or creates a hazardous operating condition.

Voltage protection rating (VPR)
The value of the VPR is determined as the nearest highest value, taken from Table 63.1 of ANSI/UL 1449 5th Edition, to the measured limiting voltage determined during the transient voltage surge suppression test using the combination wave generator at a setting of 6 kV, 3 kA.

Voltage protection level (Up or Ures)
The voltage let through by the SPD while diverting surge current to ground must not exceed the voltage withstand value of the equipment connected downstream.



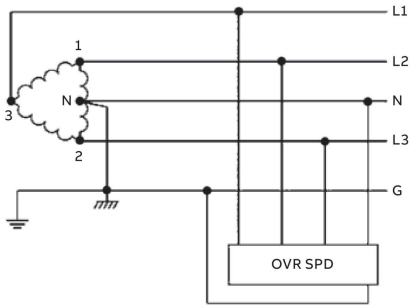
Notes:
Test wave 8/20 µs according to IEEE # C62.62-200/UL 1449
The first number corresponds to the time from 10% to 90% of its peak value (8 µs).
The second number corresponds to the time taken for the wave to descend to 50% of its peak value (20 µs).

Protection and safety technical details

OVR surge protective devices – UL Version

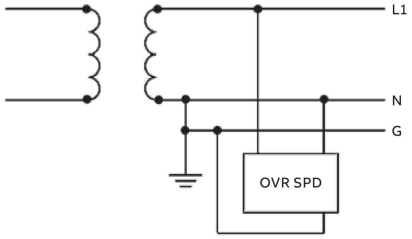
General wiring diagrams

Delta



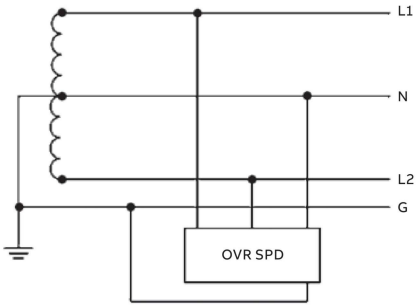
240 / 120 V HLD

Single phase



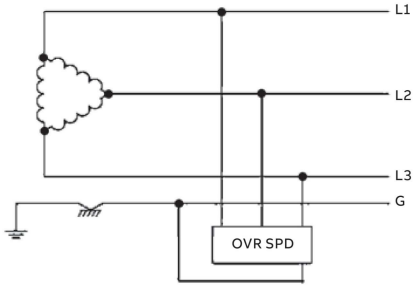
120 V, 240 V, 277 V

Split phase



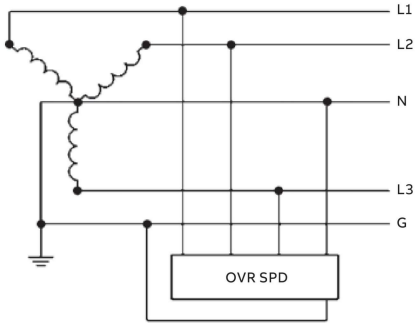
240 / 120 V, 480 / 240 V

Delta



240 V, 480 V

Wye



208 / 120 V, 480 / 277 V

NOTE: Multiple pole SPDs shown. Wiring diagrams for reference only.