

Catalogue - 2014

# System pro M compact<sup>®</sup> DIN Rail components for low voltage installation

# System pro *M* compact®

## SMISLINE TP plug-in system

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# Protection and safety technical details

## OVR Surge Protective Devices

### Selection of surge protective devices

The IEC standard introduced the concept of lightning protection zones (LPZ) to help in selecting the correct surge protection. This concept ensures the gradual reduction by stages of the energies and overvoltage caused by lightning or switching operations. This logic of coordination in the protection is what we call the “stepping protection”.

#### External Zones:

- LPZ 0A Unprotected zone outside the building subject to direct lightning strikes and therefore may have to handle the full lightning current and lightning electromagnetic field.
- LPZ 0B Zone protected against direct lightning strikes by external air terminal and where the threat is the full lightning electromagnetic field.

#### Internal Zones:

Zones inside the building which are protected against direct lightning flashes.

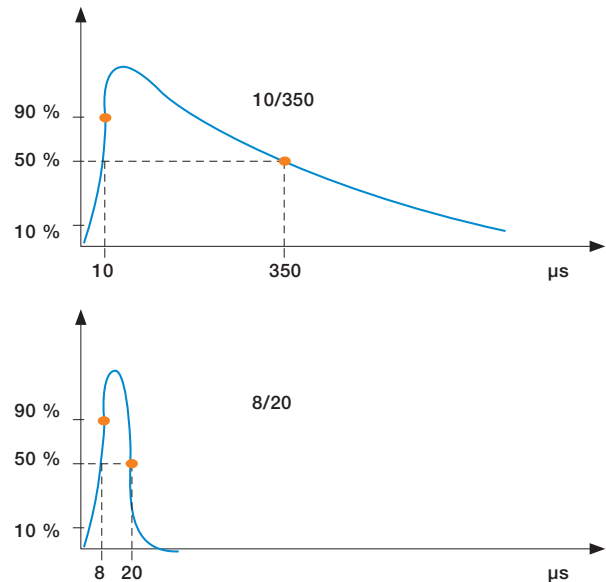
- LPZ 1 Zone subject to partial lightning or surge currents. Type I SPDs shall be installed at the boundary between LPZ 0A and LPZ 1 to reduce the entrance of lightning currents through power lines.
- LPZ 2...n Zone where the surge current is limited by current sharing and where the surge energy is reduced by additional surge protection like SPDs. Type 2 SPDs are installed at the boundaries of each zone, i.e. LPZ 1 and LPZ 2, LPZ 2 and LPZ 3, etc.

### Lightning protection zones description (IEC 62305-4):

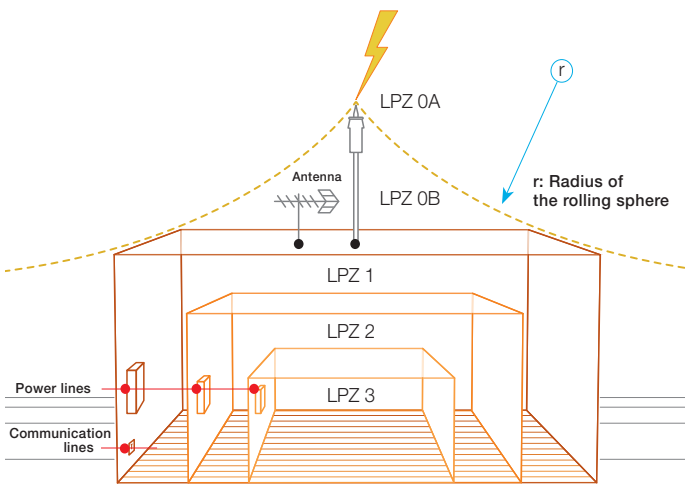
It consists in dividing a building in several volumes: the protection zone. The objective is to ensure that the LPZ gives enough protection to the equipment inside this zone. To do so, SPDs are installed at the protection zone boundaries. Each time an SPD is installed, a new protection zone is created.

#### Current impulse:

The 10/350 and 8/20 impulse waves are used in the Class I and Class II SPDs tests. The first number gives the rising time of the current impulse to reach 90% of the peak level and the second number gives the time to half value in micro-seconds ( $\mu\text{s}$ ).



External lightning protection system



## Mode of surge protection

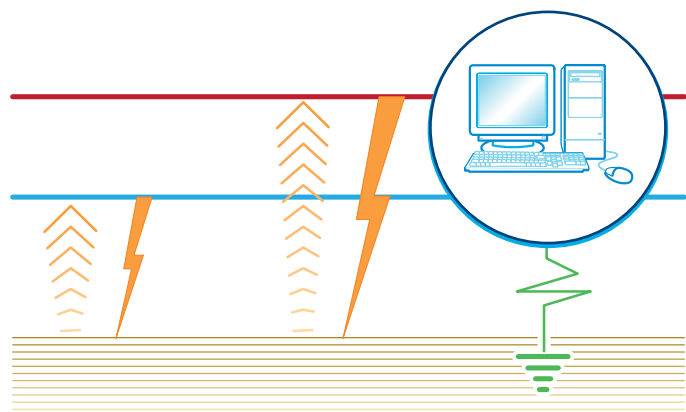
### Protection in common and/or differential mode

#### Common mode

Overvoltages in common mode concern all neutral point connections. They occur between the live conductors and earth (e.g. phase/earth or neutral/earth). The neutral conductor is a live cable, as well as the phase conductors.

This overvoltage mode destroys not only earthed equipment (Class I), but also non-earthed equipment (Class II) with insufficient electrical insulation (a few kilovolts) located close to an earthed mass.

Class II equipment that is not situated close to an earthed mass is theoretically protected from this type of attack.

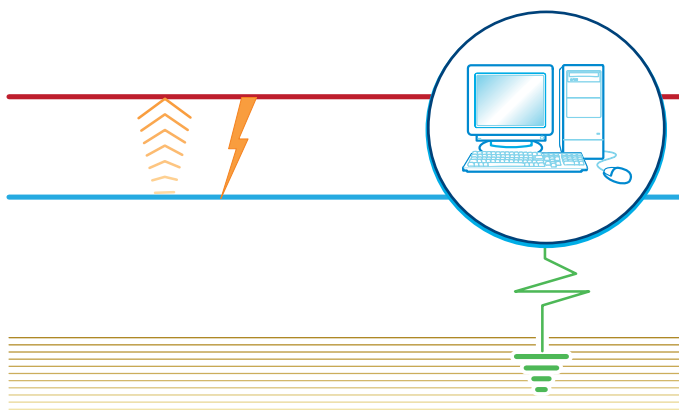


Overvoltages in common mode

#### Differential mode

Overvoltages in differential mode circulate between the live phase/phase or phase/neutral conductors. They can cause considerable damage to any equipment connected to the electrical network, particularly "sensitive" equipment.

These overvoltages concern TT earthing systems. They also affect TN-S systems if there is a significant difference in length between the neutral cable and the protective cable (PE).

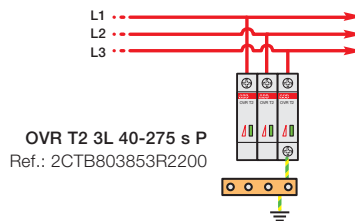
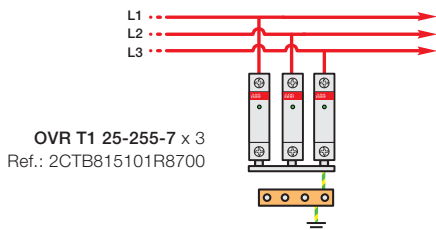


Overvoltages in differential mode

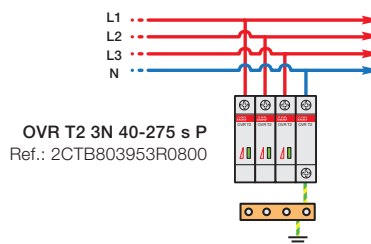
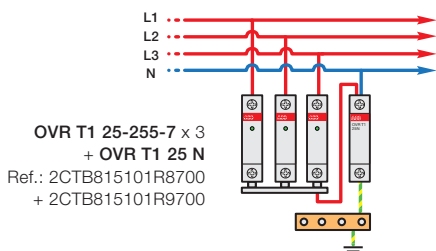
### Different types of OVR configuration

Either Common mode or differential mode of protection are required depending on the system configuration (IT, TNC, TNS, TT). For that purpose, you can find different OVR configuration (single pole, 3L, 4L, 1N, 3N).

#### Common mode configurations (TNC networks)



#### Common and differential mode configurations (TNS, TT networks)



# Protection and safety technical details

## OVR Surge Protective Devices

### Coordination and wiring principals

The SPD installed at the line entrance of an installation may not ensure an effective protection to the whole system. As a matter of fact, the selection of the voltage protection level ( $U_p$ ) of SPDs depends on many parameters: Type of equipment to be protected, the length of the connections to the SPDs, the length in between the SPDs and the equipment to be protected.

### Coordination required if :

The protection level ( $U_p$ ) of the SPDs is not low enough to protect the equipment.  
If the distance in between the SPDs and the equipment is  $>10$  m.

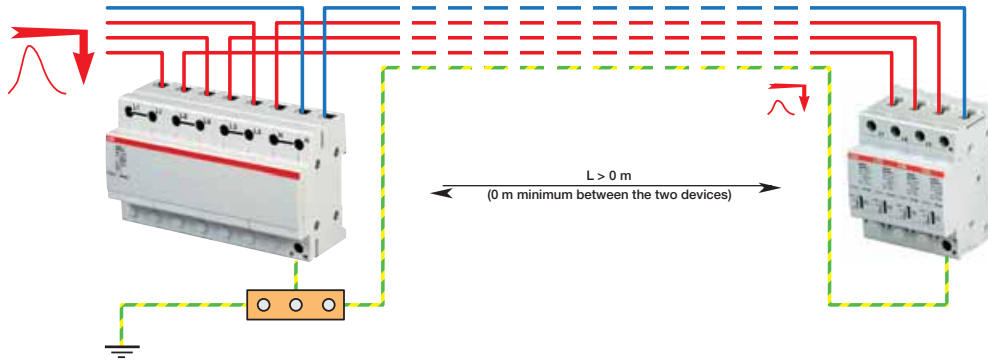
**NOTE:**

The first SPD is diverting most of the surge current to the ground, and the second SPD will ensure a good protection level to the equipment.

It is what we call the stepping protection.

## Coordination between Type 1 and Type 2 surge protective device

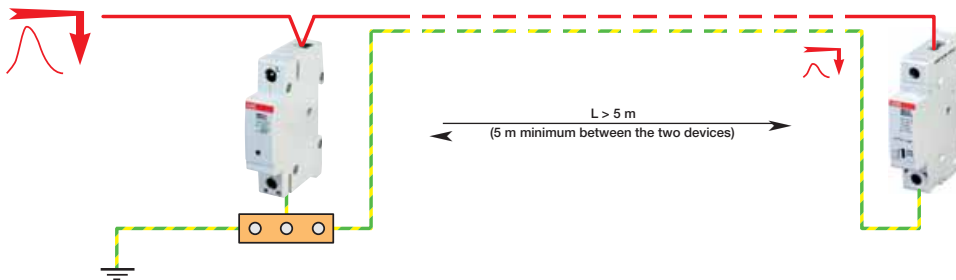
**Type 1**  
25 kA (10/350)  
 $I_{fi} = 50$  kA



**Type 2**  
40 kA (8/20)

10

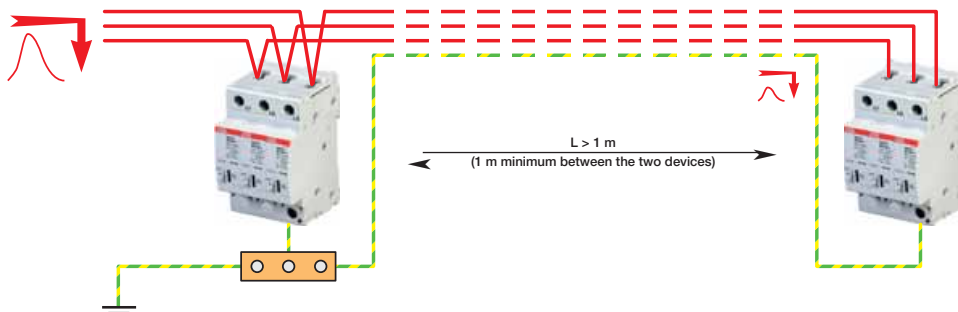
**Type 1**  
25 kA (10/350)  
 $I_{fi} = 7$  kA



**Type 2**  
40 kA (8/20)

## Coordination between Type 2 surge protective devices

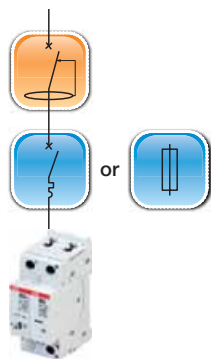
**Type 2**  
70 kA (8/20)



**Type 2**  
40 kA (8/20)

## Surge protective device disconnectors - Choice of backup protection

Surge protective device must have disconnectors which are internal and external. Internal is the so called thermal disconnection which helps to disconnect the SPD at the end of life (varistors technology). External is the backup protection which can be an MCB or a fuse dedicated to the SPD protection in case of short circuit due to very high surge transient current for example.



Designation	Function
Protection against indirect contact	Residual current devices (RCDs) assure a protection to people and installation. When installed with SPDs they must be of selective type "S" to avoid nuisance tripping. In ABB portfolio you can choose the F200 S type range for a safer installation.
Protection against fault currents	Miniature circuit breakers (MCBs) or fuses protect the installation against overload and short circuit. They can be associated with SPDs for the backup protection in agreement with coordination installation rules. You can either choose MCBs from the S200 or S800 series or fuses from the E90 range.
Thermal protection	The thermal disconnection is an internal disconnection which is there to bring a safer protection to the equipment. ABB is always developing new patents and has developed a thermal disconnection mechanism specifically dedicated to PV installation with the OVR PV range for a better and safer protection.

Type of Surge Protective Devices	System earthing	Circuit breaker maximum ratings * curve B or C Prospective short circuit current at SPD location (Ip)				Fuses maximum ratings* (gL - gG)
		Ip ≤ 6 kA	Ip ≤ 10 kA	Ip ≤ 25 kA	Ip ≤ 50 kA	
<b>Type 1</b>						
OVR T1	TNC	—	—	—	S803S - 125	E 933/125 - 125 A
Iimp 25 kA / I <sub>fi</sub> ≤ 50 kA	TNS/TT 1Ph+N				S802S - 125	E 931N/125 - 125 A
Uc 255 and 440 V	TNS/TT 3Ph+N				S804S - 125	E 933N/125 - 125 A
<b>Type 1+2</b>						
OVR T1+2	TNC	—	—	—	S803S - 125	E 933/125 - 125 A
Iimp 25 kA / I <sub>fi</sub> ≤ 15 kA	TNS/TT 1Ph+N				S802S - 125	E 931N/125 - 125 A
Uc 255 V	TNS/TT 3Ph+N				S804S - 125	E 933N/125 - 125 A
OVR T1+2	TNC	—	—	—	S803S - 125	E 933/125 - 125 A
Iimp 15 kA / I <sub>fi</sub> ≤ 7 kA	TNS/TT 1Ph+N				S802S - 125	E 931N/125 - 125 A
Uc 255 V	TNS/TT 3Ph+N				S804S - 125	E 933N/125 - 125 A
OVR T1+2	TNC	S203 - 50	S203 M - 50	S203 P - 50	S803S - 50	E 933/50 - 50 A
Iimp 7 kA	TNS/TT 1Ph+N	S201 - 50 NA	S201 M - 50 NA	S201 P - 50 NA	S802S - 50	E 931N/50 - 50 A
Uc 275 V	TNS/TT 3Ph+N	S203 - 50 NA	S203 M - 50 NA	S203 P - 50 NA	S804S - 50	E 933N/50 - 50 A
OVR HL	TNC	S203 - 50	S203 M - 50	S203 P - 50	S803S - 50	E 933/50 - 50 A
Iimp 15 kA	TNS/TT 1Ph+N	S201 - 50 NA	S201 M - 50 NA	S201 P - 50 NA	S802S - 50	E 931N/50 - 50 A
Uc 440 V	TNS/TT 3Ph+N	S203 - 50 NA	S203 M - 50 NA	S203 P - 50 NA	S804S - 50	E 933N/50 - 50 A
<b>Type 2</b>						
OVR T2 pluggable	TNC	S203 - 16	S203 M - 16	—	—	E 93/32 - 16 A
I <sub>max</sub> 15 kA	TNS/TT 1Ph+N	S201 - 16 NA	S201 M - 16 NA			E 91N/32 - 16 A
Uc 75 V	TNS/TT 3Ph+N	S203 - 16 NA	S203 M - 16 NA			E 93N/32 - 16 A
OVR T2 pluggable	TNC	S203 - 50	S203 M - 50	S203 P - 50	S803S - 50	E 933/50 - 50 A
I <sub>max</sub> 15, 40 and 70 kA	TNS/TT 1Ph+N	S201 - 50 NA	S201 M - 50 NA	S201 P - 50 NA	S802S - 50	E 931N/50 - 50 A
Uc 275 and 440 V	TNS/TT 3Ph+N	S203 - 50 NA	S203 M - 50 NA	S203 P - 50 NA	S804S - 50	E 933N/50 - 50 A
OVR T2 non-pluggable	TNC	S203 - 63	S203 M - 63	S203 P - 63	S803S - 63	E 933/125 - 125 A
I <sub>max</sub> 20 and 40 kA	TNS/TT 1Ph+N	S201 - 63 NA	S201 M - 63 NA	S201 P - 63 NA	S802S - 63	E 931N/125 - 125 A
Uc 150 V, 275 and 440 V	TNS/TT 3Ph+N	S203 - 63 NA	S203 M - 63 NA	S203 P - 63 NA	S804S - 63	E 933N/125 - 125 A
<b>Type 3</b>						
OVR T3	TNC	S203 - 10	S203 M - 10	—	—	E 93/32 - 25 A
I <sub>max</sub> 10 kA	TNS/TT 1Ph+N	S201 - 10 NA	S201 M - 10 NA			E 91N/32 - 25 A
Uc 275 V	TNS/TT 3Ph+N	S203 - 10 NA	S203 M - 10 NA			E 93N/32 - 25 A

\* Maximum ratings, must be in accordance with the installation to follow coordination rules with main or upstream short circuit protection(s).

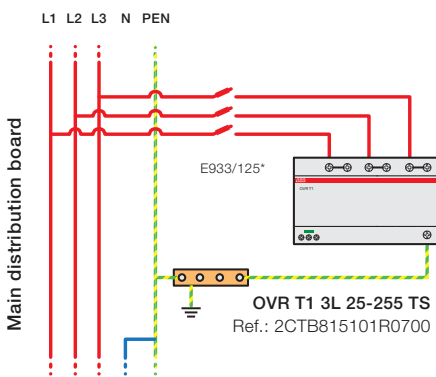
Service entrance SPDs	PE connection cable size
Type 1	16 mm <sup>2</sup>
Type 2	4 mm <sup>2</sup>

# Protection and safety technical details

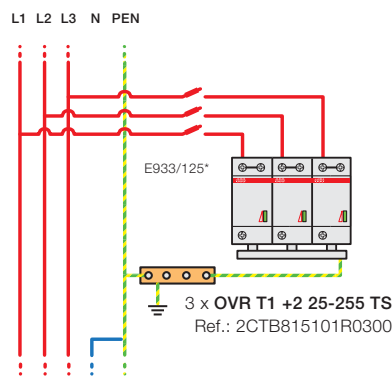
## OVR Surge Protective Devices

Selection tool: TNC-S network 230/400 V  
Industry, commercial building

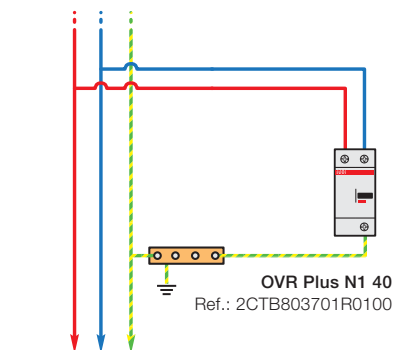
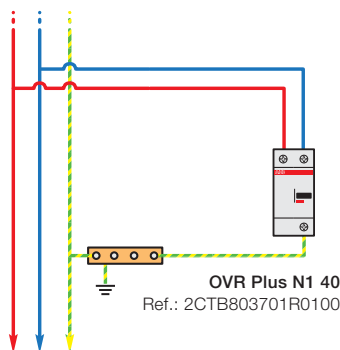
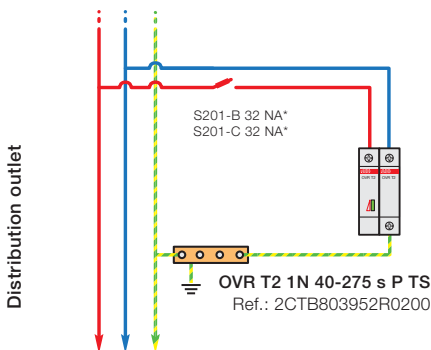
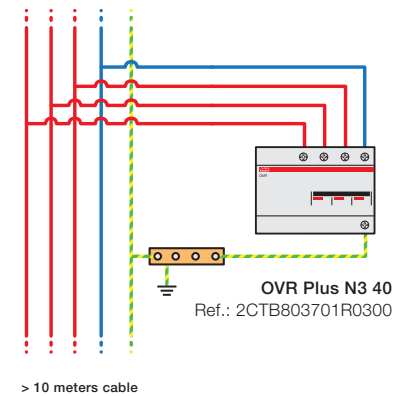
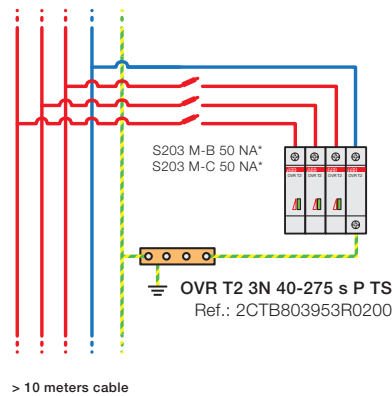
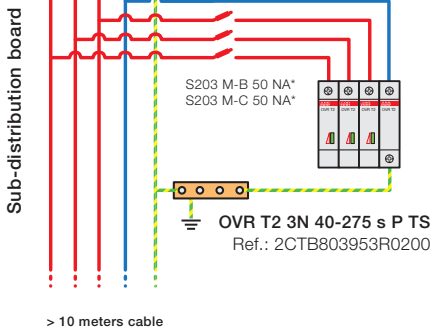
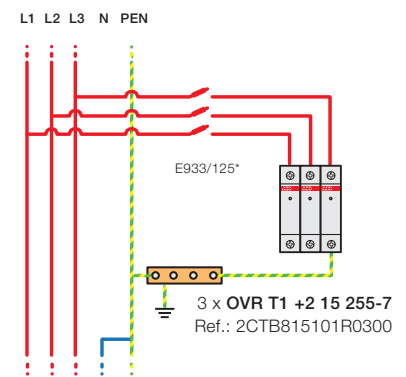
**Configuration 1**  
 $15 \text{ kA} \leq I_p \leq 50 \text{ kA}$



**Configuration 2**  
 $7 \text{ kA} \leq I_p \leq 15 \text{ kA}$



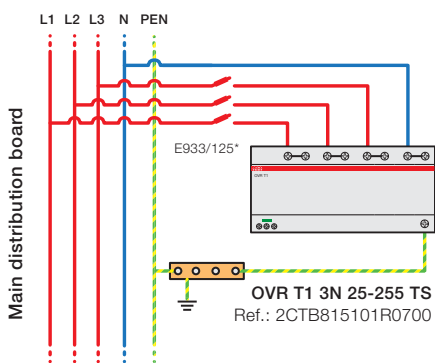
**Configuration 3**  
 $I_p \leq 7 \text{ kA}$



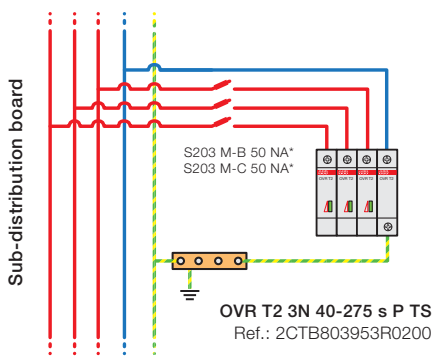
$I_p$ : prospective short circuit current of the power supply  
\* Must be according to the coordination rules with main or upstream short circuit protection(s).

# Selection tool: TT network 230/400 V Industry, commercial building

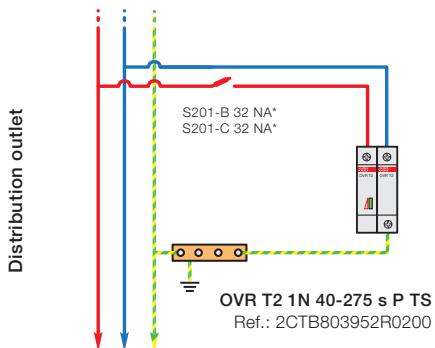
## Configuration 1 $15 \text{ kA} \leq I_p \leq 50 \text{ kA}$



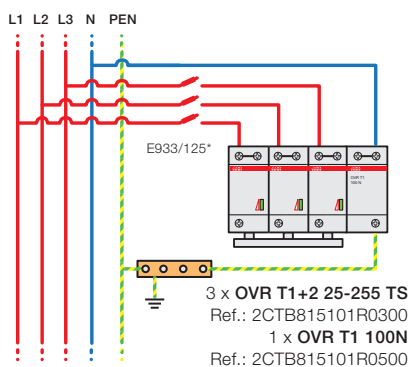
> 10 meters cable



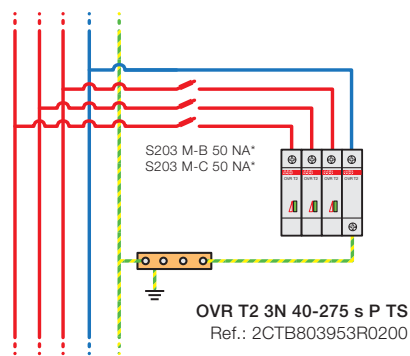
> 10 meters cable



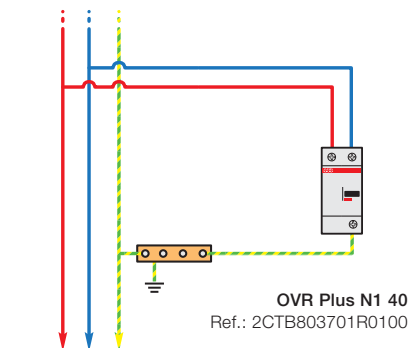
## Configuration 2 $7 \text{ kA} \leq I_p \leq 15 \text{ kA}$



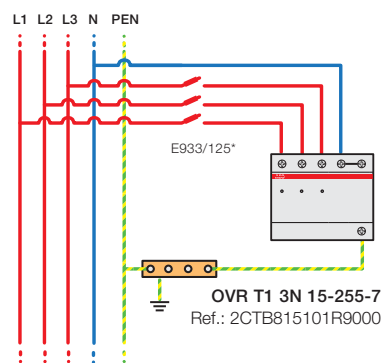
> 10 meters cable



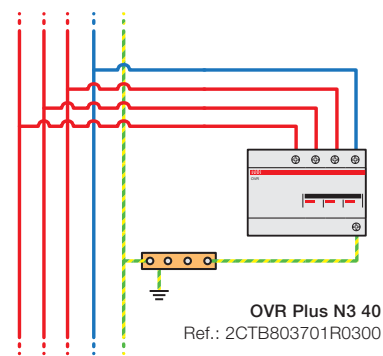
> 10 meters cable



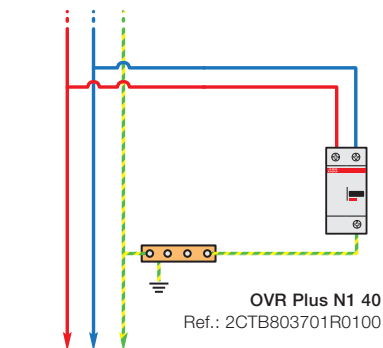
## Configuration 3 $I_p \leq 7 \text{ kA}$



> 10 meters cable



> 10 meters cable



$I_p$ : prospective short circuit current of the power supply  
\* Must be according to the coordination rules with main or upstream short circuit protection(s).



# Protection and safety technical details

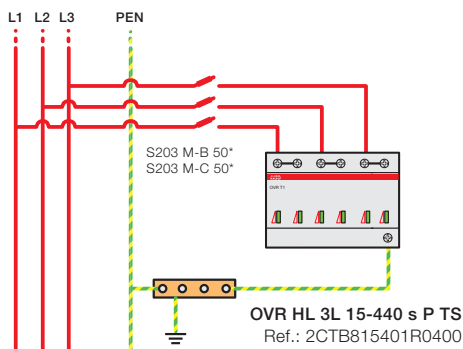
## OVR Surge Protective Devices

Selection tool: IT network 230 V without neutral  
Commercial, residential

The IT system has all live parts at the source isolated from earth or one part connected to earth with a high impedance.

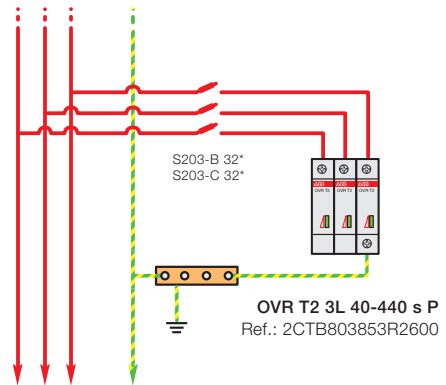
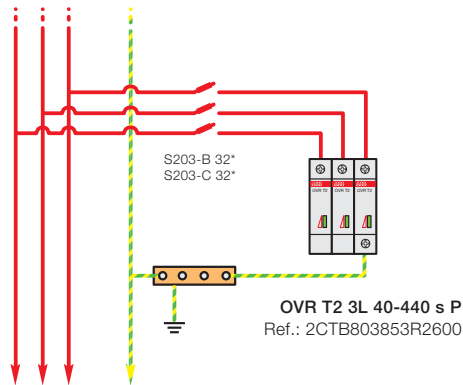
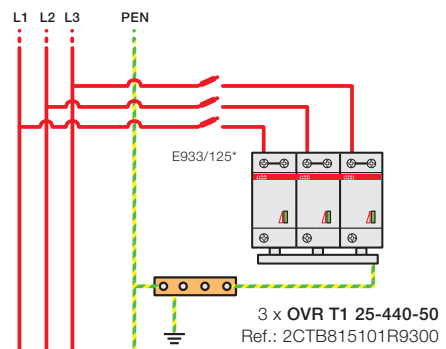
### Configuration 1

$I_p \leq 50$  kA



### Configuration 2

$I_p \leq 15$  kA



10

$I_p$ : prospective short circuit current of the power supply  
\* Must be according to the coordination rules with main or upstream short circuit protection(s).

# Selection tool: TNC, TNS/TT networks 230/400 V Residential

With external conductive parts (external lightning protection air terminal, antenna...) or powered by aerial lines

**YES**



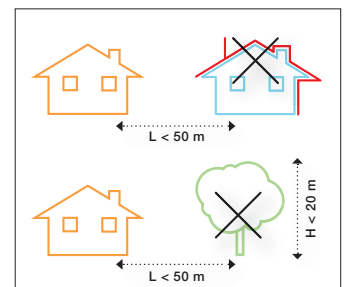
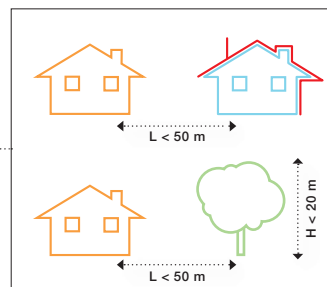
**NO**



Neighbour with external lightning protection system (or generally with earthed extraneous conductive parts), or proximity of high points

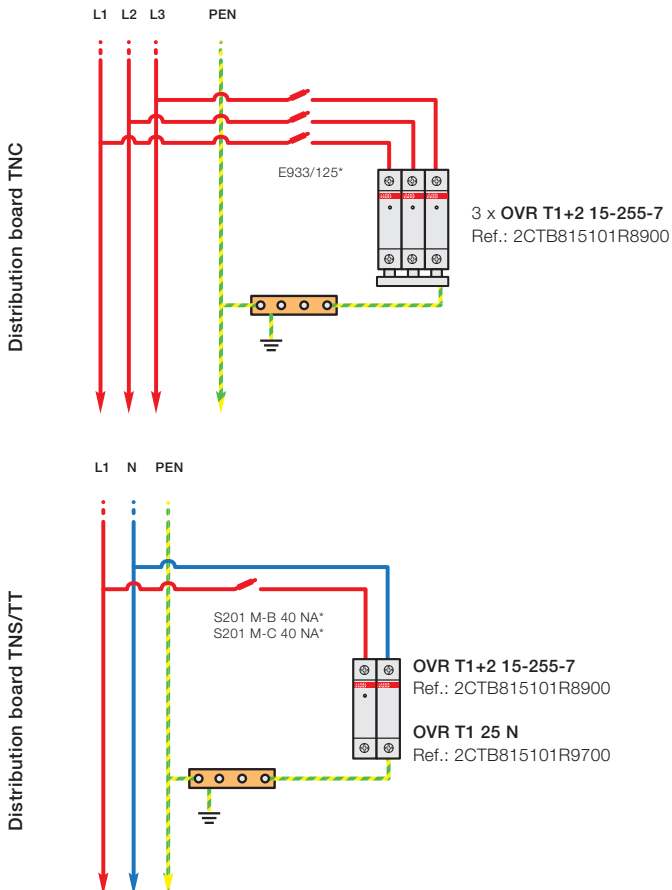
**YES**

**NO**



## Configuration 1

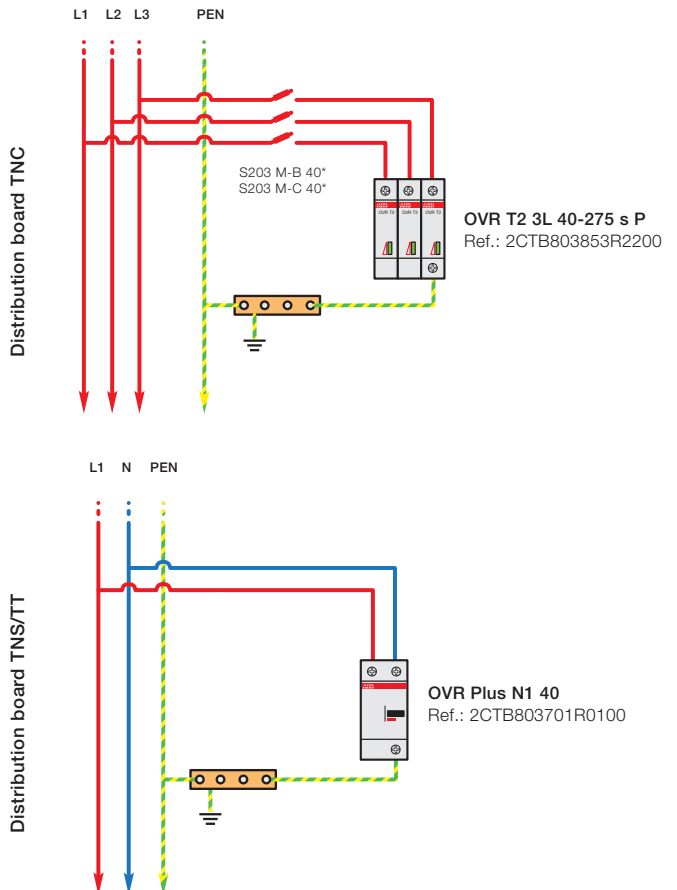
With risk of direct lightning current (external protection, aerial lines...)



\* Should be according to the coordination rules with installed main breakers

## Configuration 2

With risk of indirect lightning current, transient surges



# Contact us

**ABB SACE a division of ABB S.p.A.**  
**ABB STOTZ-KONTAKT GmbH**

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