WHITE PAPER

SURGE PROTECTION DEVICES FOR EV CHARGING STATIONS

The solution for the protection of AC and DC EV charging stations against transient overvoltages

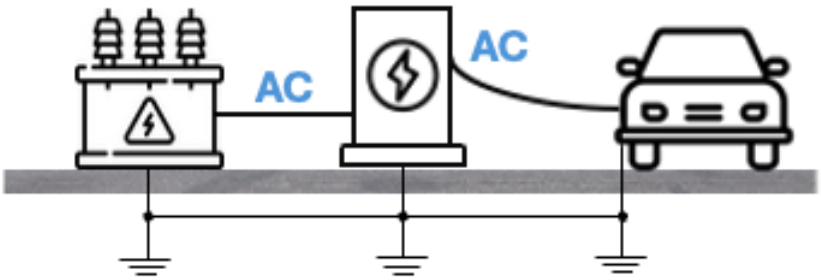
Lovato electric

ENERGY AND AUTOMATION

PURPOSE OF THE DOCUMENT

The purpose of this document is to describe LOVATO Electric solutions for protecting AC and DC electric vehicles charging stations against transient overvoltages, covering the different types of EV charging infrastructure.

SPD FOR AC CHARGING STATIONS



For the protection of **AC incoming line** against transient overvoltages in AC electric vehicle charging stations, the following standards specify the requirements outlined below.

- IEC 60634-7-722: A connecting point accessible to the public is considered as part of a **public service** and therefore **shall be protected against transient overvoltages**.

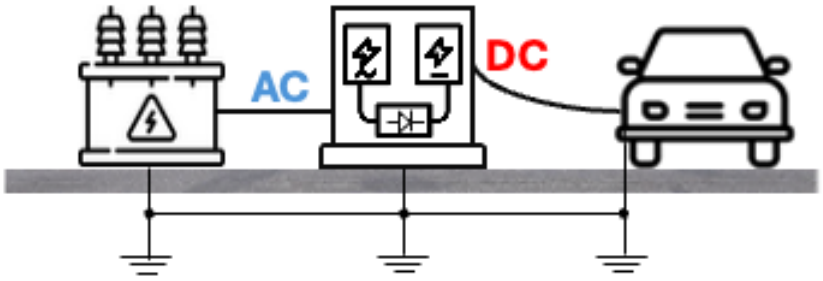
- IEC 60364-5-53: **At least a Type 2 SPD** is required.
  LOVATO Electric suggests to use SPD at least **Type 2** with with the following protection level:
  - **10kA for L-N** mode of protection
  - **40kA for N-PE** mode of protection in three-phase systems.

  Furthermore, for public installations LOVATO Electric suggests an **SPD Type 1+2** with $\mathbf{I_{imp}}$**=12.5kA**.

Due to the high potential loss value of the investment (wallbox, EV car, etc.), it is advisable to use overvoltage protection for **all types of AC charging stations, regardless of whether they are public or private**.

SPD FOR DC CHARGING STATIONS

For the protection of the **AC incoming line** against transient overvoltages, the same considerations outlined in the section above must be respected. Given the typical installation of DC charging stations, LOVATO Electric suggests the use of a **Type 1+2 SPD**.

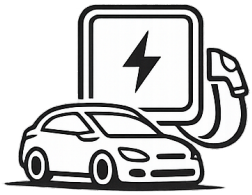
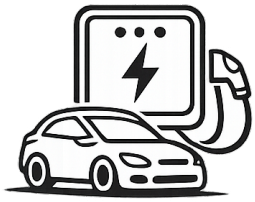
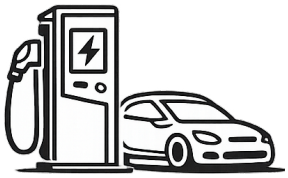
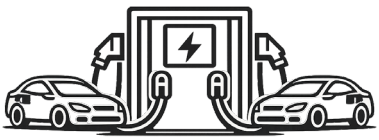
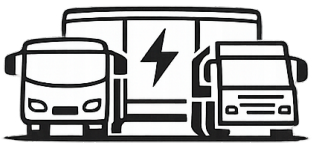


For the protection of the **DC outgoing line** against transient overvoltages, the following standard specifies the requirements outlined below.

- IEC 61851-23: A **surge protection device is mandatory** on the DC side with a **protection level** ($\mathbf{U_p}$):
  - **2500VDC** between DC+ and the protective conductor, and
  - **2500VDC** between DC- and the protective conductor.

SELECTION GUIDE FOR THE CORRECT CHOICE OF SPD

The following table shows the LOVATO Electric codes of surge protection devices recommended for each type of electric vehicle charging infrastructure.

EV charging infrastructure	Recommended Surge Protection Devices	
SINGLE-PHASE WALLBOX 	**SG21NA300(R)** - **Type 2**, with plug-in cartridges - 1 pole + neutral - IEC rated discharge current **In=20kA (L-N)** - IEC total discharge current **I_{tot}=40kA (N-PE)** - IEC maximum discharge current Imax=50kA - Rated voltage Un=230VAC - Voltage protection level Up<1.5kV L-N.	
THREE-PHASE WALLBOX 	**SG23NA300(R)** - **Type 2**, with plug-in cartridges - 3 pole + neutral - Rated voltage Un=230/400VAC - IEC rated discharge current **In=20kA (L-N)** - IEC total discharge current **I_{tot}=40kA (N-PE)** - IEC maximum discharge current Imax=50kA - Voltage protection level Up<1.5kV L-N.	
AC CHARGING STATION 	**SA0EVT13NA255R** - **Type 1+2**, monoblock - 3 pole + neutral - Rated voltage Un=230/400VAC - IEC impulse current **Iimp=12.5kA** - IEC rated discharge current In=20kA - IEC maximum discharge current Imax=50kA - Voltage protection level Up<1.5kV L-N.	
	AC SIDE	**DC SIDE**
DC CHARGING STATION FOR CARS (UP TO 1000VDC) 	**SA0EVT13NA255R** - **Type 1+2**, monoblock - 3 pole + neutral - Rated voltage Un=230/400VAC - IEC impulse current **Iimp=12.5kA** - IEC rated discharge current In=20kA - IEC maximum discharge current Imax=50kA - Voltage protection level Up<1.5kV L-N. 	**SG2EVT2K00M3R** - **Type 2**, with plug-in cartridge - Rated voltage Un=900VDC - Maximum continuous voltage Uc=1000VDC - IEC rated discharge current In=20kA - IEC maximum discharge current Imax=40kA - Short circuit current rating Isccr=50kA - Voltage protection level **Up≤2.5kV**. 
DC CHARGING STATION FOR BUS/TRUCKS (UP TO 1500VDC) 	**SA0EVT13NA255R** - **Type 1+2**, monoblock - 3 pole + neutral - Rated voltage Un=230/400VAC - IEC impulse current **Iimp=12.5kA** - IEC rated discharge current In=20kA - IEC maximum discharge current Imax=50kA - Voltage protection level Up<1.5kV L-N. 	**SG2EVT2K50M3R** - **Type 2,** with plug-in cartridge - Rated voltage Un=1250VDC - Maximum continuous voltage Uc=1500VDC - IEC rated discharge current In=20kA - IEC maximum discharge current Imax=40kA - Short circuit current rating Isccr=100kA - Voltage protection level **Up≤2.5kV**. 

Note. The letter R at the end of the code identifies a version with an integrated relay contact for remote status indication.

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LOVATO ELECTRIC S.P. A.
via Don E. Mazza, 12
24020 Gorle (Bergamo), ITALY
tel + 39 035 4282111
www.LovatoElectric.com