Surge protection devices

Lovato electric

ENERGY AND AUTOMATION

Surge protection dev

TYPE 1,2

CLASS B,C

- **MODULAR CONCEPT**
  For quick assembly of different versions based on various requirements
- **COMPACT SIZE**
  Also compliant with electrical equipment standards
- **EASY MOUNTING AND REMOVAL**
  With 35mm DIN rail
- **IP20 PROTECTION DEGREE**
  Finger safe
- **PHOTOVOLTAIC CERTIFIED VERSIONS**
  UL Recognized for USA and Canada and compliant with UTE C 61740-51
- **PROTECTION AGAINST OVERVOLTAGE**
  Caused by direct or indirect lightning strikes

CLASS C

TYPE 2

- **TYPES WITH PLUG-IN CARTRIDGES**
  For fast servicing capability
- **STATUS INDICATOR**
  For single modules
- **VERSIONS WITH OR WITHOUT CONTACT**
  For SPD remote status indication
- **VERSIONS FOR PHOTOVOLTAIC APPLICATIONS**
  Up to 1500VDC
- **EXCELLENT PROTECTION LEVEL Up ≤ 1.5kV**
  Suitable for protection of all terminal equipment.

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TYPE 1,2,3

CLASS B,C,D

LOVATO Electric surge arresters commonly defined as SPDs (Surge Protection Devices), are devices designed to protect electric systems and equipment against transient and impulse overvoltages such as those caused by lightning and by electric switching.
Their function is to divert the discharge or impulse current generated by an overvoltage to earth, thereby protecting the equipment downstream.
The range is available in monoblock versions or with removable cartridges in class I, II and III for alternating current (AC) applications and with removable cartridges in class II for photovoltaic applications (DC).

					
Range		**SA1**	**SA2**	**SA0**	**SA2 D**
Version		Monoblock	With plug-in cartridge	With plug-in cartridge	With plug-in cartridge
Classification	EN	Type 1, 2	Type 2	Type 1, 2, 3	Type 2 for PV
	IEC	Class I, II	Class II	Class I, II, III	Class II for PV
	VDE	Class B, C	Class C	Class B, C, D	Class C for PV
Continuous voltage Uc		320VAC/ 420VDC	320VAC/ 420VDC	320VAC/ 420VDC	600...1500VDC
Impulse current Iimp 10/350µs		25kA	-	12.5kA	-
Max discharge current Imax 8/20µs		100kA	40kA	60kA	40kA
Rated discharge current In 8/20µs		25kA	20kA	25kA	20kA
Combined surge Uoc/Isc 1.2/50, 8/20µs		-	-	10kV / 5kA	-

Surge protection devices

SPDs are installed in parallel to the electric line to be protected. At the mains rated voltage, they are comparable to an open circuit and have a high impedance at their ends. In the presence of an overvoltage, this impedance falls to very low values, closing the circuit to earth. Once the overvoltage has ended, their impedance rises again rapidly to the initial value (very high), returning to open loop conditions.

Protection zones

Standards define the LPZs (Lightning Protection Zones), which indicate the different zones at risk. These are distinguished as:

LPZ 0A: Area outside a building not protected by LPS (e.g. lightning rods) where a direct lighting strike is possible. In this zone, there is total exposure to induced electromagnetic fields.

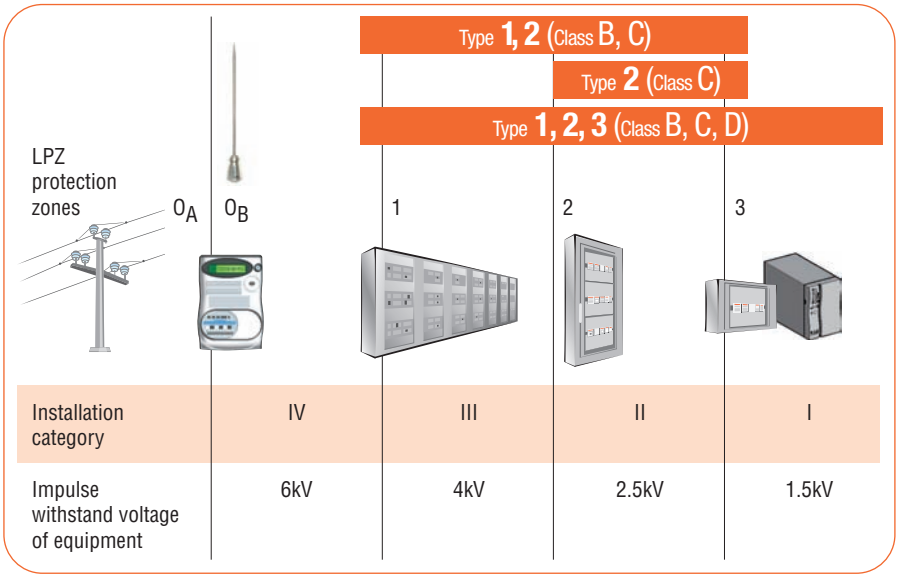
LPZ 0B: Area outside a building protected by LPS; therefore, a direct lighting strike is not possible. In this zone, there is total exposure to induced electromagnetic fields.

LPZ 1: Area inside a building so protected against direct lightning strikes. In this zone, there is the possibility of very high overvoltages and of induced electromagnetic fields which may be attenuated depending on the degree of screening. This zone must be protected by an SPD type 1 at the boundary with zone LPZ 0A or 0B.

LPZ 2: Area inside a building (e.g. in a room), in which there is the possibility of low overvoltages since they are limited by SPDs installed upstream. This zone must be protected by an SPD type 2 at the boundary with zone LPZ 1.

LPZ 3: Area inside a building (e.g. the system connected to a socket in a room) characterised by very sensitive equipment, in which there is the possibility of very low overvoltages as they are limited by SPDs installed upstream.

This zone must be protected by an SPD type 3 at the boundary with zone LPZ 2.



Installation category

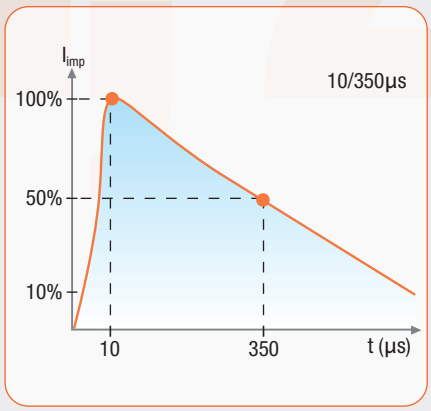
For the correct choice of the SPD, the dielectric strength of the equipment to protect needs to be considered. This level is established by IEC 60664-1 standard.

A 230/400V system specifies:

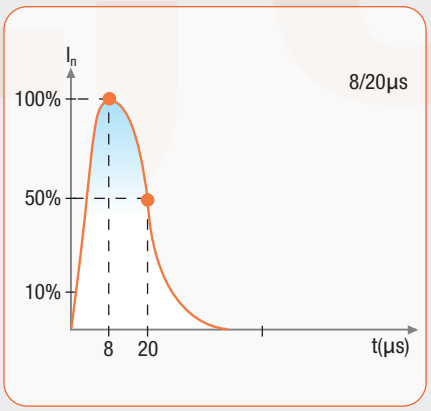
- **Installation category I:** 1.5 kV for equipment containing "particularly sensitive" electronic circuits (for example, electronic devices like PCs or TVs)
- **Installation category II:** 2.5 kV for non electronic devices (for example, household appliances or electric tools)
- **Installation category III:** 4 kV for devices being part of the fixed system (for example, distribution boards, switching devices, isolators, ducting and their accessories)
- **Installation category IV:** 6 kV for devices installed upstream of the distribution board (for example, delivery point with the distribution system).

Definitions and ratings

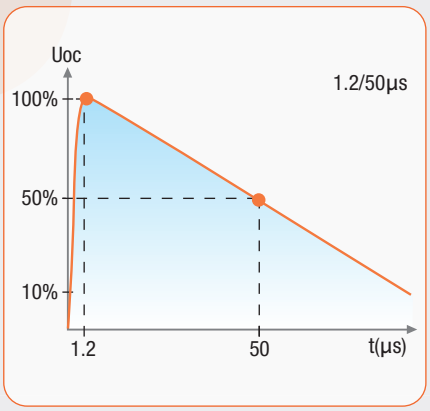
- **Maximum continuous voltage Uc:** Maximum value of AC or DC voltage that the SPD is capable of permanently withstanding without activating or getting damaged; this is its rated voltage.
- **Protection level voltage Up:** Maximum value of the voltage between the terminals of the SPD in presence of an impulsive overvoltage. It is a fundamental parameter to correctly choose the SPD; account of it must be taken in relation to the impulse voltage of the equipment to be protected.
- **Impulse current Iimp:** Peak value of the current that flows in the SPD with a



Impulse current Iimp



Rated discharge current In

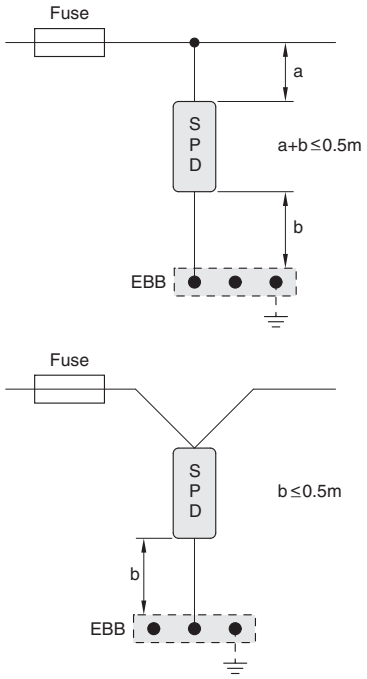


No-load charge voltage Uoc

10/350µs waveform (activation must be guaranteed for 20 times without damage).
It is used to classify SPDs in test class I.

- **Rated discharge current In:** Peak value of the current that circulates in the SPD with an 8/20µs waveform (activation must be guaranteed for 20 times without damage). It is used to classify SPDs in test class II.
- **No-load discharge voltage Uoc:** Peak value of the no-load discharge voltage delivered by the test generator with 1.2/50µs waveform simultaneously with a short-circuit current with 8/20µs waveform, applied at the terminals of the SPD. It is used to classify SPDs in test class III.
- **Maximum discharge current Imax:** Peak value of the current that flows in the SPD with an 8/20µs waveform. An SPD is capable of withstanding it at least once.

Suggestions for installation

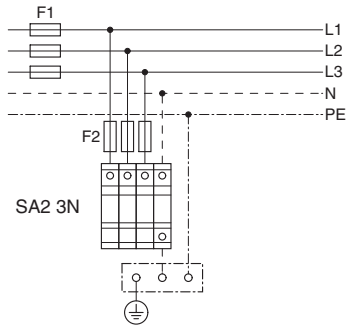


EBB: Equipotential Bonding Bar.

For correct installation, it is advisable to make connections between the line and the SPD input (phase or neutral terminals) as well as between the SPD output (earth terminal) and the equipotential bonding connection with a maximum 0.5m length of the leads. To reduce the distance, use of the so-called "V connection" is admissible.

Back-up protection

Protection against short circuits of SPDs is provided by overcurrent devices (gL/gG fuses), which should be chosen according to the SPD manufacturer's instructions.



F1 > 125A gL/gG → F2 =125A gL/gG
F1 ≤ 125A gL/gG → F2 = not required.

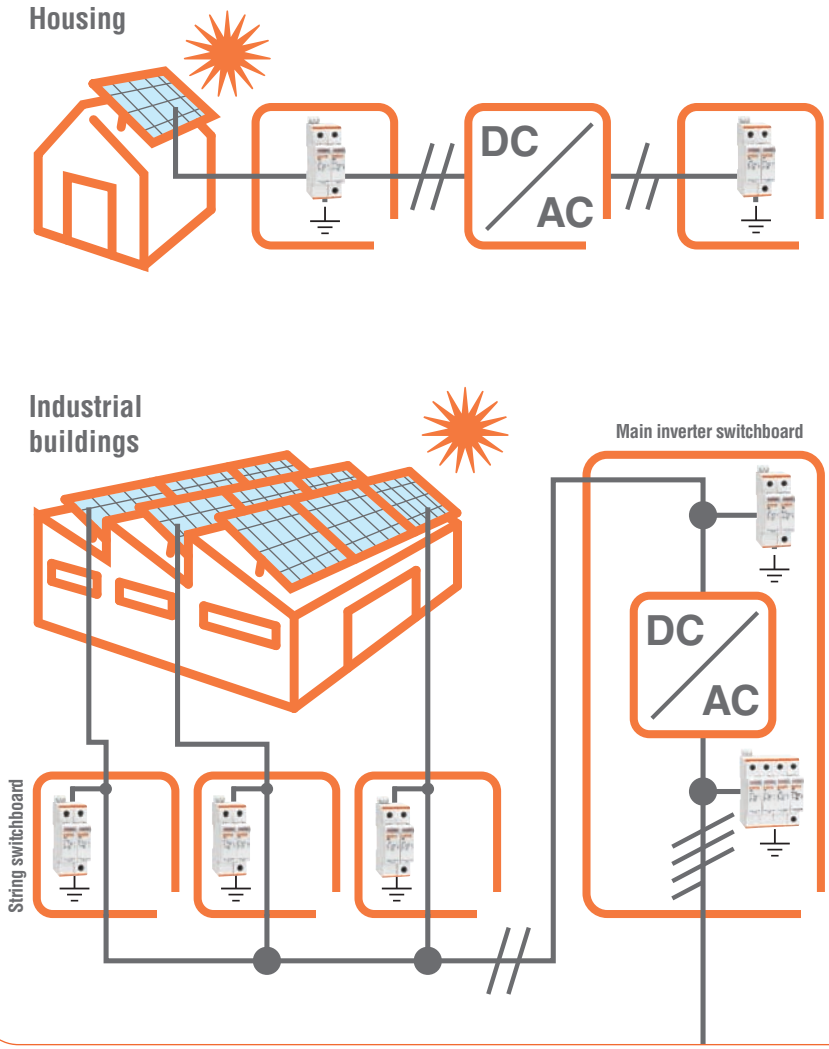
SPD coordination

In order to obtain an effective protection against overvoltage, it is advisable to install several SPDs coordinated with one another in cascade connection.

For instance, it is advisable to have a class I SPD in the main distribution board, a class II SPD in the sub-distribution board and a class III SPD near the end equipment to be protected.
In this way, the energy originating from an overvoltage gradually decreases as it reaches the equipment to protect.

SURGE PROTECTION DEVICES FOR PHOTOVOLTAIC APPLICATIONS

Class II SPDs can be used to protect the system in a domestic environment and in industrial buildings when equipped with lightning rod systems having a safety distance "S".
It is advisable to install class II SPDs as close as possible to the panels, consequently in the so-called string boards. If the inverter is far away from the string boards (indicatively more than10m away), another class II SPD needs to be installed next to the inverter on the DC side. Installation of a class II AC SDP suitable for the type of system is required downstream of the inverter on the AC side.



TYPE **1, 2** CLASS **B, C**

Monoblock

The surge protection device type SA1 combines the performance of SPD type 1 and 2 into a single product.
It protects against direct and indirect lightning strikes as well as induced overvoltage conditions.
It can be installed in areas with a high risk of direct lightning strikes, inside main distribution boards or sub-distribution boards.

SA1...

Operational characteristics
- Maximum continuous voltage Uc: 320VAC/420VDC
- Impulse current Iimp (10/350µs): 25kA per pole;
- Rated discharge current In (8/20µs): 25kA per pole;
- Maximum discharge current Imax (8/20µs): 100kA per pole
- Standard-supplied contact for remote status indication
- Degree of protection: IP20.

Reference standards
Comply with standards: IEC 61643-1, EN 61643-11.

Order code	Pole arrange-ment	Contact remote available	DIN size n°	Rated voltage Un [VAC]	Voltage pro-tection level Up [kV]	Power installation system	Qty per pkg n°	Wt [kg]
SA1 1P A320R	1P	YES	2	230	<1.3	TN-C, TN-S, TT❶	1	0.275
SA1 1N A320R	1P+N	YES	3	230	<1.4	TT, TN-S	1	0.390
SA1 2P A320R	2P	YES	2	230	<1.4	TN-S	1	0.395
SA1 3P A320R	3P	YES	3	230/400	<1.4	TN-C	1	0.595
SA1 3N A320R	3P+N	YES	5	230/400	<1.4	TT, TN-S	1	0.760
SA1 4P A320R	4P	YES	4	230/400	<1.4	TN-S	1	0.780

❶ For L-PE only.

TYPE	with signal contact	SA1 1P A320R	SA1 1N A320R	SA1 2P A320R	SA1 3P A320R	SA1 3N A320R	SA1 4P A320R
Electrical properties							
SPD per EN 61643-11		Type 1, 2					
SPD per IEC 61643-1		Class I, II					
SPD per VDE 0675-6		Class B, C					
Rated voltage Un	VAC	230	230	230	230 / 400	230 / 400	230 / 400
Maximum continuous voltage Uc	VAC / VDC	320 / 420					
Impulse current Iimp (10/350) (L-N/N-PE)	kA	25	25 / 50	25 per pole	25 per pole	25 / 100	25 per pole
Max impulse current Imax (8/20) (L-N/N-PE)	kA	100	100 / 100	100 per pole	100 per pole	100 / 100	100 per pole
Rated discharge current In (8/20) (L-N/N-PE)	kA	25	25 / 50	25 per pole	25 per pole	25 / 100	25 per pole
Voltage protection level Up (L-N/N-PE)	kV	<1.3	<1.4 / <1.5	<1.4	<1.4	<1.4 / <1.75	<1.4
Temporary overvoltage (TOV) Ut (L-N for 5s)	VAC	335					
Residual voltage Ures (L-N/N-PE) at 3kA (8/20)	kV	0.9	0.9 / 0.2	0.9	0.9	0.9 / 0.2	0.9
Follow current If (N-PE)	Arms	No	>100	No	No	>100	No
Tripping time ta (L-N/N-PE)	ns	<25	<25 / 100	<25	<25	<25 / 100	<25
Thermal isolation protection		Yes					
Back-up protection fuse (supply >250A)	A	250 gL/gG					
Maximum short-circuit current (50Hz)	kA	25					
Status indicator - blown	Colour	Red					
Connections							
Degree of protection	IP	20					
Terminal tightening torque	Nm	3					
Maximum conductor section	mm^2	25 (flexible) / 35 (rigid)					
Type of signalling contact		Changeover (SPDT)					
Contact capacity	A	250VAC / 0.5A; 125VAC / 3A; 250VDC / 0.1A; 125VDC / 0.2A					
Contact terminal tightening torque	Nm	0.25					
Maximum contact conductor section	mm^2	1.5					
Ambient conditions							
Operating temperature		-40....+80°C					
Fixing		On 35mm DIN rail (IEC/EN 60715)					
Housing material		Thermoplastic, RAL 7035, UL 94 V-0					

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SA2…

With plug-in cartridge

The surge protection device type SA2 is suitable for installation in sub-distribution boards and near to terminal equipment. It protects against indirect overvoltages. The protection cartridges are plug-in and can be easily replaced for quick servicing.

Operational characteristics

- Maximum continuous voltage Uc: 320VAC/420VDC
- Rated discharge current In (8/20µs): 20kA per pole
- Maximum discharge current Imax: (8/20µs) 40kA per pole
- Version with or without contact for remote status indication
- Degree of protection: IP20.

Reference standards

Comply with standards: IEC 61643-1, EN 61643-11.

Order code	Pole arrange-ment	Contact remote available	DIN size n°	Rated voltage Un [VAC]	Voltage pro-tection level Up [kV]	Power installation system	Qty per pkg n°	Wt [kg]
SA2 1P A320	1P	—	1	230	<1.5	TN-C, TN-S, TT❶	1	0.140
SA2 1P A320R	1P	YES	1	230	<1.5	TN-C, TN-S, TT❶	1	0.145
SA2 1N A320	1P+N	—	2	230	<1.5	TT, TN-S	1	0.240
SA2 1N A320R	1P+N	YES	2	230	<1.5	TT, TN-S	1	0.245
SA2 2P A320	2P	—	2	230	<1.5	TN-S	1	0.260
SA2 2P A320R	2P	YES	2	230	<1.5	TN-S	1	0.265
SA2 3P A320	3P	—	3	230/400	<1.5	TN-C	1	0.370
SA2 3P A320R	3P	YES	3	230/400	<1.5	TN-C	1	0.375
SA2 3N A320	3P+N	—	4	230/400	<1.5	TT, TN-S	1	0.465
SA2 3N A320R	3P+N	YES	4	230/400	<1.5	TT, TN-S	1	0.470
SA2 4P A320	4P	—	4	230/400	<1.5	TN-S	1	0.480
SA2 4P A320R	4P	YES	4	230/400	<1.5	TN-S	1	0.485

❶ For L-PE only.

TYPE	without signal contact / with signal contact	SA2 1P A320 / SA2 1P A320R	SA2 1N A320 / SA2 1N A320R	SA2 2P A320 / SA2 2P A320R	SA2 3P A320 / SA2 3P A320R	SA2 3N A320 / SA2 3N A320R	SA2 4P A320 / SA2 4P A320R
Electrical properties							
SPD per EN 61643-11		Type 2					
SPD per IEC 61643-1		Class II					
SPD per VDE 0675-6		Class C					
Rated voltage Un	VAC	230	230	230	230 / 400	230 / 400	230 / 400
Maximum continuous voltage Uc	VAC / VDC	320 / 420					
Max impulse current Imax (8/20) (L-N/N-PE)	kA	40	40 / 40	40 per pole	40 per pole	40 / 40	40 per pole
Rated discharge current In (8/20) (L-N/N-PE)	kA	20	20 / 20	20 per pole	20 per pole	20 / 20	20 per pole
Voltage protection level Up (L-N/N-PE)	kV	<1.5	<1.5 / <2	<1.5	<1.5	<1.5 / <2	<1.5
Temporary overvoltage (TOV) Ut (L-N for 5s)	VAC	335					
Residual voltage Ures (L-N/N-PE) at 3kA (8/20)	kV	0.95	0.95 / 0.1	0.95	0.95	0.95 / 0.1	0.95
Follow current If (N-PE)	Arms	No	>100	No	No	>100	No
Tripping time ta (L-N/N-PE)	ns	<25	<25 / 100	<25	<25	<25 / 100	<25
Thermal isolation protection		Yes					
Back-up protection fuse (supply >125A)	A	125 gL/gG					
Maximum short-circuit current (50Hz)	kA	25					
Status indicator - blown	Colour	Red					
Connections							
Degree of protection	IP	20					
Terminal tightening torque	Nm	3					
Maximum conductor section	mm^2	25 (flexible) / 35 (rigid)					
Contact capacity	A	250VAC / 0.5A; 125VAC / 3A; 250VDC / 0.1A; 125VDC / 0.2A					
Type of signalling contact		Changeover (SPDT)					
Contact terminal tightening torque	Nm	0.25					
Maximum contact conductor section	mm^2	1.5					
Ambient conditions							
Operating temperature		-40….+80°C					
Fixing		On 35mm DIN rail (IEC/EN 60715)					
Housing material		Thermoplastic, RAL 7035, UL 94 V-0					

TYPE **1,2,3** CLASS **B, C, D**

SA0...

With plug-in cartridge

The surge protection device type SA0 with plug-in cartridge combines the performance of SPD type 1, 2 and 3 into a single product. It is ideal in all those systems of reduced extent, to protect the load side from the main circuit breaker downstream to terminal equipment.
It protects against direct and indirect lightning strikes as well as induced overvoltage conditions. It can be installed inside main distribution boards and near by terminal equipment.
The protection cartridges are plug-in and can be easily replaced for quick servicing.

Operational characteristics
- Maximum continuous voltage Uc: 320VAC/420VDC
- Impulse current Iimp (10/350µs): 12.5kA per pole
- Rated discharge current In (8/20µs): 25kA per pole
- Maximum discharge current Imax (8/20µs): 60kA per pole
- Combined surge Uoc/Isc (1.2/50, 8/20µs): 10kV/5kA
- Standard-supplied contact for remote status indication
- Degree of protection: IP20.

Reference standards
Comply with standards: IEC 61643-1, EN 61643-11.

Order code	Pole arrange-ment	Contact remote available	DIN size n°	Rated voltage Un [VAC]	Voltage pro-tection level Up [kV]	Power installation system	Qty per pkg n°	Wt [kg]
SA0 1P A320R	1P	YES	1	230	<1.5	TN-C, TN-S, TT❶	1	0.195
SA0 1N A320R	1P+N	YES	2	230	<1.5	TT, TN-S	1	0.365
SA0 2P A320R	2P	YES	2	230	<1.5	TN-S	1	0.370
SA0 3P A320R	3P	YES	3	230/400	<1.5	TN-C	1	0.540
SA0 3N A320R	3P+N	YES	4	230/400	<1.5	TT, TN-S	1	0.670
SA0 4P A320R	4P	YES	4	230/400	<1.5	TN-S	1	0.670

❶ For L-PE only.

TYPE	with signal contact	SA0 1P A320R	SA0 1N A320R	SA0 2P A320R	SA0 3P A320R	SA0 3N A320R	SA0 4P A320R
Electrical properties							
SPD per EN 61643-11		Type 1, 2, 3					
SPD per IEC 61643-1		Class I, II, III					
SPD per VDE 0675-6		Class B, C, D					
Rated voltage Un	VAC	230	230	230	230 / 400	230 / 400	230 / 400
Maximum continuous voltage Uc	VAC / VDC	320 / 420					
Impulse current Iimp (10/350) (L-N/N-PE)	kA	12.5	12.5 / 50	12.5 per pole	12.5 per pole	12.5 / 50	12.5 per pole
Max impulse current Imax (8/20) (L-N/N-PE)	kA	60	60 / 50	60 per pole	60 per pole	60 / 50	60 per pole
Rated discharge current In (8/20) (L-N/N-PE)	kA	25	25 / 30	25 per pole	25 per pole	25 / 30	25 per pole
Combined surge Uoc/Isc (1.2/50, 8/20)	kV/kA	10/5					
Voltage protection level Up (L-N/N-PE)	kV	<1.5	<1.5 / <1.7	<1.5	<1.5	<1.5 / <1.7	<1.5
Temporary overvoltage (TOV) Ut (L-N for 5s)	VAC	335					
Residual voltage Ures (L-N/N-PE) at 3kA (8/20)	kV	0.8	0.8 / 0.2	0.8	0.8	0.8 / 0.2	0.8
Follow current If (N-PE)	Arms	No	>100	No	No	>100	No
Tripping time ta (L-N/N-PE)	ns	<25	<25 / 100	<25	<25	<25 / 100	<25
Thermal isolation protection		Yes					
Back-up protection fuse (supply>160A)	A	160 gL/gG					
Maximum short-circuit current (50Hz)	kA	25					
Status indicator - blown	Colour	Red					
Connections							
Degree of protection	IP	20					
Terminal tightening torque	Nm	3					
Maximum conductor section	mm^2	25 (flexible) / 35 (rigid)					
Type of signalling contact		Changeover (SPDT)					
Contact capacity	A	250VAC / 0.5A; 125VAC / 3A; 250VDC / 0.1A; 125VDC / 0.2A					
Contact terminal tightening torque	Nm	0.25					
Maximum contact conductor section	mm^2	1.5					
Ambient conditions							
Operating temperature		-40....+80°C					
Fixing		On 35mm DIN rail (IEC/EN 60715)					
Housing material		Thermoplastic, RAL 7035, UL 94 V-0					

SA2 D...

For photovoltaic applications

The surge protection device type SA2 D with plug-in cartridge for photovoltaic applications is suitable for installation on the DC side of a photvoltaic system and protects against induced overvoltage conditions.
The protection cartridges are plug-in and can be easily replaced for quick servicing.

Operational characteristics
- Maximum continuous voltage Ucpv: 600VDC, 1000VDC, 1200VDC, 1500VDC
- Rated discharge current In (8/20µs): 20kA per pole
- Maximum discharge current Imax: (8/20µs) 40kA per pole
- Temporary overvoltage (TOV) Ut: 1.5Ucpv (SA2 DA... type only)
- Version with or without contact for remote status indication
- Degree of protection: IP20.

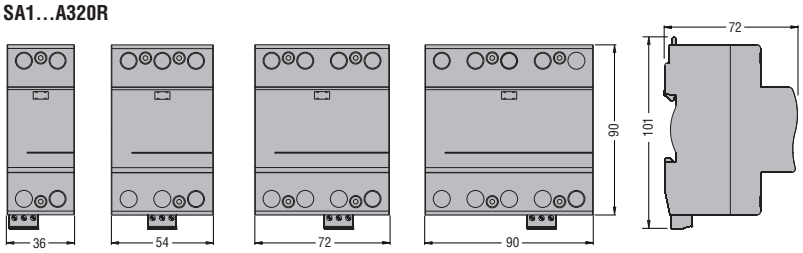
Certifications and compliance
Certifications obtained: cURus (except for SA2 DA K50R and SA2 DB... types).
Comply with standards: IEC 61643-1, EN 61643-11; UTE C 61740-51 for SA2 DA... types only.

Order code	Pole arrange-ment	Contact remote available	DIN size n°	Rated voltage Un [VDC]	Continuous voltage Ucpv [VDC]	Voltage pro-tection level Up [kV]	Qty per pkg n°	Wt [kg]
SA2 DB 600	+, -, PE	—	2	600	600	<1.9	1	0.320
SA2 DB 600R	+, -, PE	YES	2	600	600	<1.9	1	0.325
SA2 DB K00	+, -, PE	—	3	1000	1000	<3.6	1	0.420
SA2 DB K00R	+, -, PE	YES	3	1000	1000	<3.6	1	0.425
Version compliant with UTE C 61740-51 Guide.								
SA2 DA 600R	+, -, PE	YES	2	600	600	<2.2	1	0.285
SA2 DA K00R	+, -, PE	YES	2	1000	1000	<2.8	1	0.305
SA2 DA K20R	+, -, PE	YES	3	1200	1200	<4.4	1	0.410
SA2 DA K50R	+, -, PE	YES	3	1500	1500	<4.8	1	0.500

TYPE	without signal contact	—	—	—	—	SA2 DB 600	SA2 DB K00
	with signal contact	SA2 DA 600R	SA2 DA K00R	SA2 DA K20R	SA2 DA K50R	SA2 DB 600R	SA2 DB K00R
Electrical properties							
Certifications		cURus			—		
SPD per EN 61643-11		Type 2					
SPD per IEC 61643-1		Class II					
SPD per VDE 0675-6		Class C					
Rated voltage Un	VDC	600	1000	1200	1500	600	1000
Maximum continuous voltage Ucpv	VDC	600	1000	1200	1500	600	1000
Max discharge current Imax (8/20)	kA	40 per pole	30 per pole	40 per pole	40 per pole	40 per pole	40 per pole
Rated impulse voltage In (8/20)	kA	20 per pole	20 per pole	20 per pole	20 per pole	20 per pole	20 per pole
Voltage protection level Up	kV	<2.2	<2.8	<4.4	<4.8	<1.9	<3.65
Residual voltage Ures at 3kA (8/20)	kV	1					
Follow current If	Arms	No					
Tripping time ta	ns	< 25					
Thermal isolation protection		Yes					
Back-up protection fuse (Isc >10A)	A	Not required				10gPV	
Maximum short-circuit current Iscwpv	A	200				10	
Status indicator - blown	Colour	Red					
Connections							
Degree of protection	IP	20					
Terminal tightening torque	Nm	3			3		
Maximum conductor section	mm^2	25 (flexible) / 35 (rigid)					
Type of signalling contact		Changeover (SPDT)					
Contact capacity	A	250VAC / 0.5A; 125VAC / 3A; 250VDC / 0.1A; 125VDC / 0.2A					
Contact terminal tightening torque	Nm	0.25					
Maximum contact conductor section	mm^2	1.5					
Ambient conditions							
Operating temperature		-40….+80°C					
Fixing		On 35mm DIN rail (IEC/EN 60715)					
Housing material		Thermoplastic, RAL 7035, UL 94 V-0					

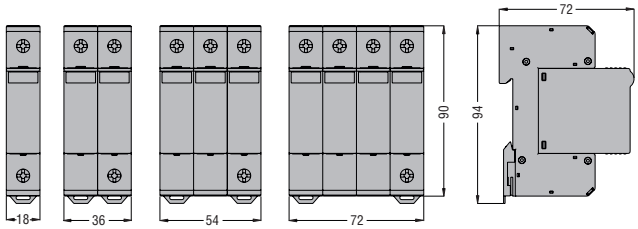
Type 1, 2 (Class B, C)

SA1…A320R

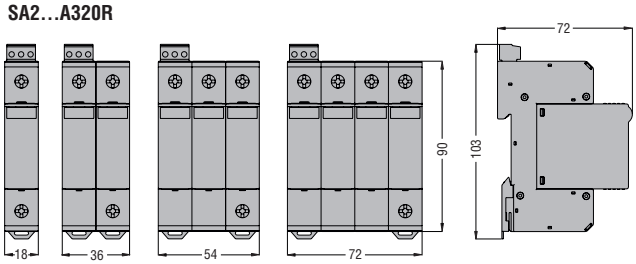


Type 2 (Class C)

SA2…A320

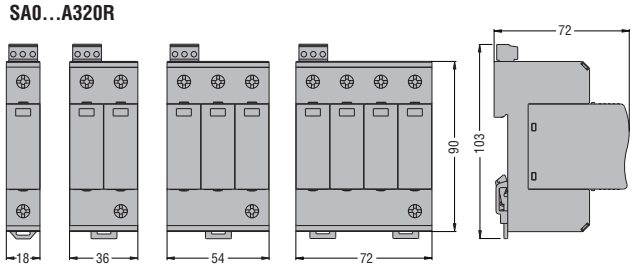


SA2…A320R



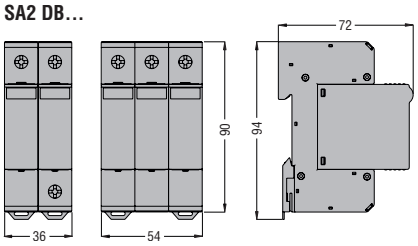
Type 1, 2, 3 (Class B, C, D)

SA0…A320R

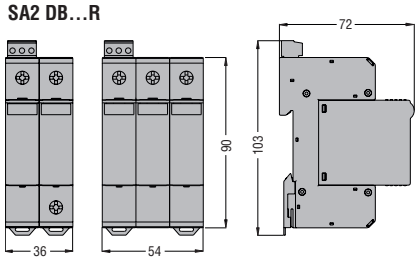


Type 2 for photovoltaic applications (Class C PV)

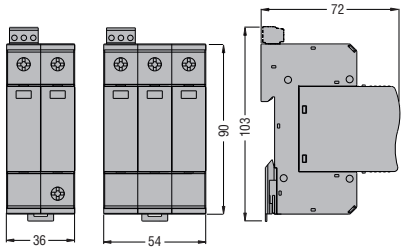
SA2 DB…



SA2 DB…R

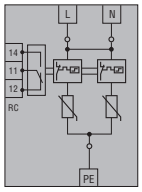


SA2 DA…R

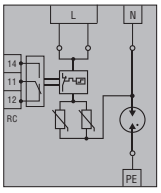


Type 1, 2 (Class B, C)

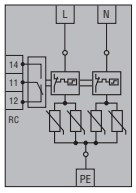
SA1 1P A320R



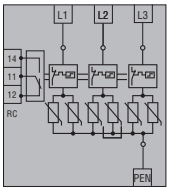
SA1 1N A320R



SA1 2P A320R



SA1 3P A320R



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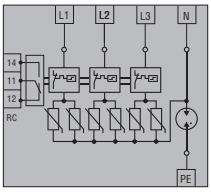
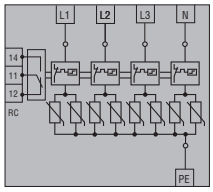


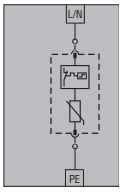
SA1 4P A320R



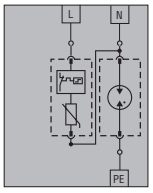
TYPE 1, 2

Type 2 (Class C)

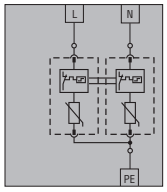
SA2 1P A320



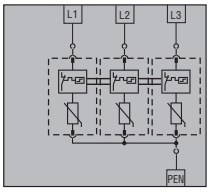
SA2 1N A320



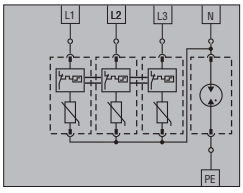
SA2 2P A320



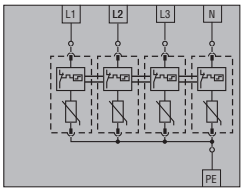
SA2 3P A320



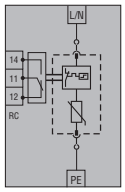
SA2 3N A320



SA2 4P A320



SA2 1P A320R



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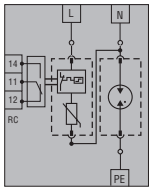
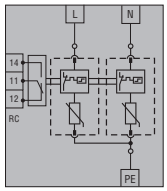
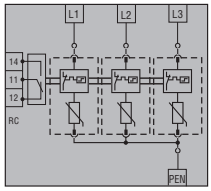


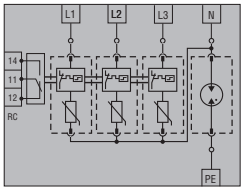
SA2 2P A320R



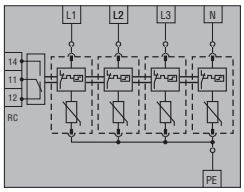
SA2 3P A320R



SA2 3N A320R



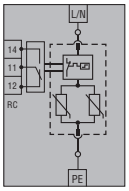
SA2 4P A320R



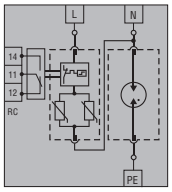
TYPE 2

Type 1, 2, 3 (Class B, C, D)

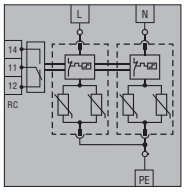
SA0 1P A320R



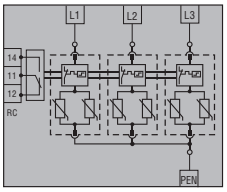
SA0 1N A320R



SA0 2P A320R



SA0 3P A320R



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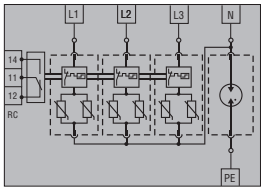

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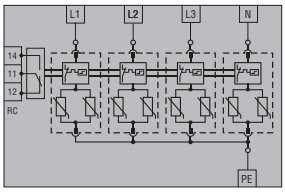
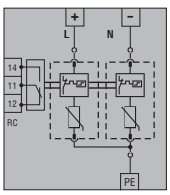


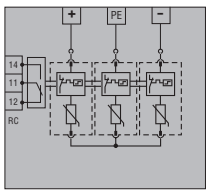
TYPE 1, 2, 3

Type 2 for photovoltaic applications (Class C PV)

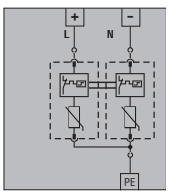
SA2 DB 600R



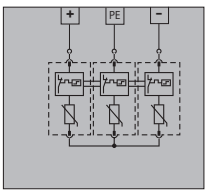
SA2 DB K00R



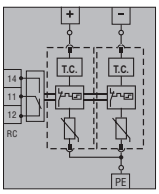
SA2 DB 600



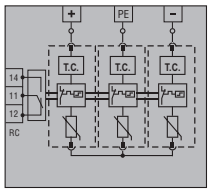
SA2 DB K00



SA2 DA 600R -
SA2 DA K00R



SA2 DA K20R
SA2 DA K50R



TYPE 2 DC

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