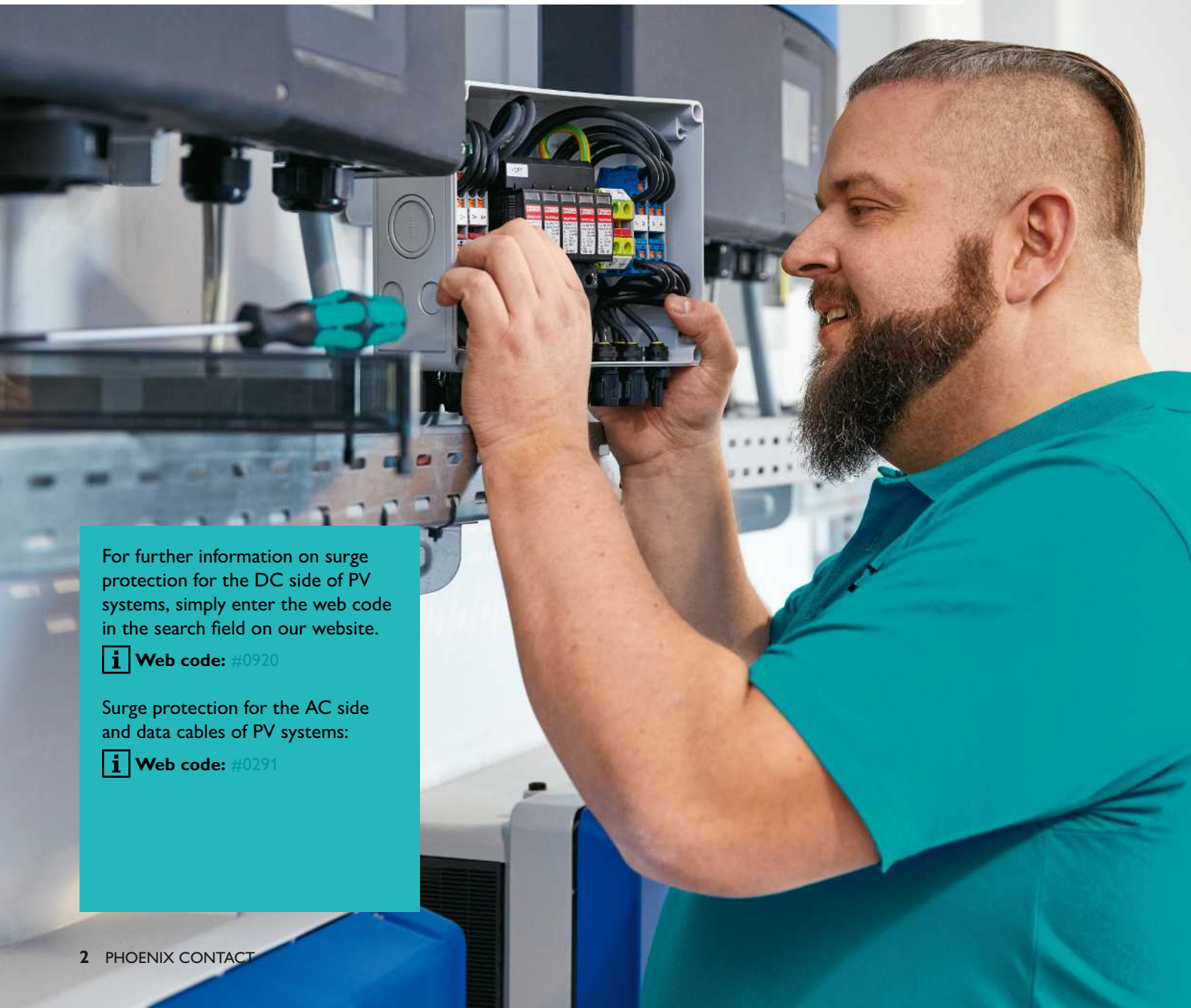
Solar power

Surge protection for photovoltaic rooftop systems

PHOENIX CONTACT
INSPIRING INNOVATIONS

Surge protection for photovoltaic systems

Solar power is an essential source of renewable energy. Decreasing system costs mean that photovoltaic power generation systems are attractive not only from an ecological perspective; they are also extremely competitive from an economic point of view when compared with conventional power generation. In order to provide optimum protection against overvoltages for the various system parts such as PV panels, inverters, and battery storage systems, surge protection must be used.



For further information on surge protection for the DC side of PV systems, simply enter the web code in the search field on our website.

Web code: #0920

Surge protection for the AC side and data cables of PV systems:

Web code: #0291

Directives for lightning and surge protection

Certain guidelines must be observed when installing photovoltaic systems. Defined standards also apply to the surge protection of the corresponding system parts.

HD 60364-7-712:2016 is a harmonized standard developed by CENELEC on behalf of the European Commission. It describes how to plan and install PV systems. DIN EN 61643-32 describes the selection criteria for DC and AC protective devices in photovoltaic systems. The contents of both standards have been incorporated into the national standards of many European countries. In terms of their contents, the standards are identical or there is a very high degree of overlap. The following table provides a brief overview of some of the applicable national standards.

With our international sales network, our experts are able to consult with you on site regarding your lightning and surge protection needs.

Country/region	Installation of PV systems	DC surge protection	AC surge protection
Europe	HD 60364-7-712	DIN EN 61643-32	
Germany	DIN VDE 0100-712	DIN EN 62305-3 Supplement 5	DIN VDE 0100-443
Switzerland	SN 411000 (NIN)	SN EN 62305 SN 411000 (NIN)	SN EN 62305-4 SN 411000 (NIN)
Austria	OVE directive: R 6-2-1 OVE directive: R 6-2-2 OVE directive: R 6-3	ÖVE/ÖNORM EN 62305-3	OVE E 8101
Netherlands	NEN 1010:1015-712	NEN-EN 62305-3	NEN 1010:1015-440
Poland	PN-HD 60364-7-712	–	PN-HD 60364-4-443 PN-HD 60364-5-534
Belgium	AREI 2020	–	AREI 2020

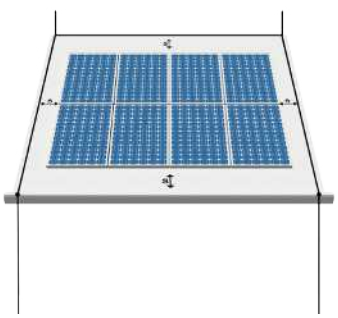
Selection of standards for the installation of PV systems and the selection of surge protection for the DC and AC side

Selecting surge protective devices

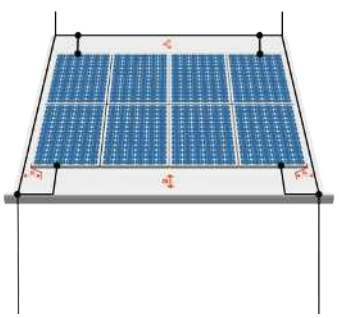
The selection criteria for your surge protection solution are illustrated based on the DIN EN directive. As per DIN EN 61643-32, a distinction is made between three application scenarios which determine the appropriate protection that should be selected. More detailed information on all three scenarios can be found in the overview on pages 4 and 5.

1. **Building without external lightning protection**

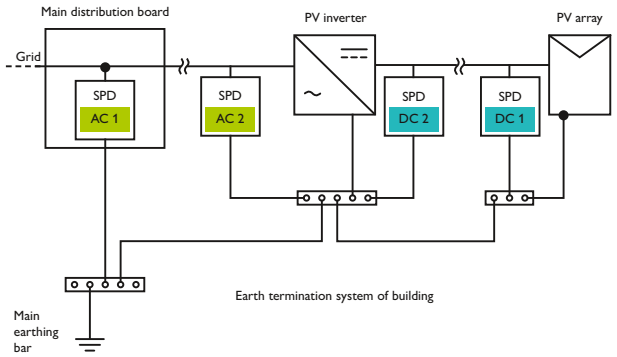
2. **Building with external lightning protection**
The separation distance “s” is maintained.



3. **Building with external lightning protection**
The separation distance “s” is not maintained.



Overview of lightning and surge protection for your PV rooftop system

	Photovoltaic rooftop system without external lightning protection
The most important properties of a lightning protection system are, firstly, the reliable protection of people and/or fire safety and, secondly, the effective protection of the technical building infrastructure. The correct selection and execution of the lightning protection system is just as important as the right choice and installation of surge protection components. This table provides an overview of the type of surge protection that should be used in the relevant application scenario for each area.	
DC 1 **DC surge protection in the proximity of the PV panels**	**Type 2** A surge protective device is not required here if the cable length between "DC 1" and "DC 2" is less than 10 m.
DC 2 **DC surge protection in the proximity of the inverter**	**Type 2**
AC 2 **AC surge protection on the AC side of the inverter**	**Type 2** A surge protective device is not required here if the cable length between "AC 1" and "AC 2" is less than 10 m.
AC 1 **AC surge protection in the main distribution**	**Type 2**

Tailor-made portfolio

When it comes to surge protection for PV systems, the type of inverter plays a crucial role in determining the appropriate protective circuit. Phoenix Contact offers a wide range of surge protective devices for the AC side as well as comprehensive surge protection for the DC side of many types of inverter. Surge protection for communication cables, as required in accordance with DIN EN 61643-32, completes our portfolio. Find out more about our products on the following pages.

DC 1 DC 2

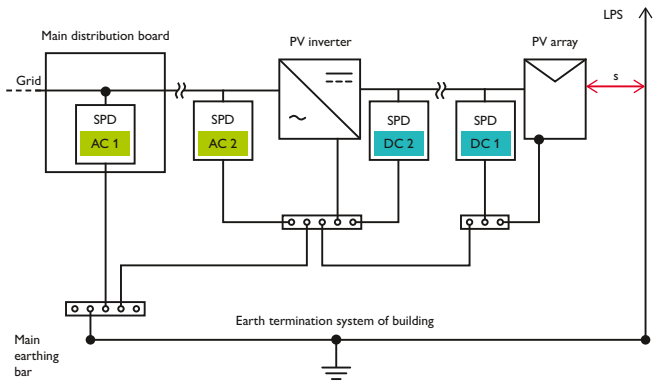
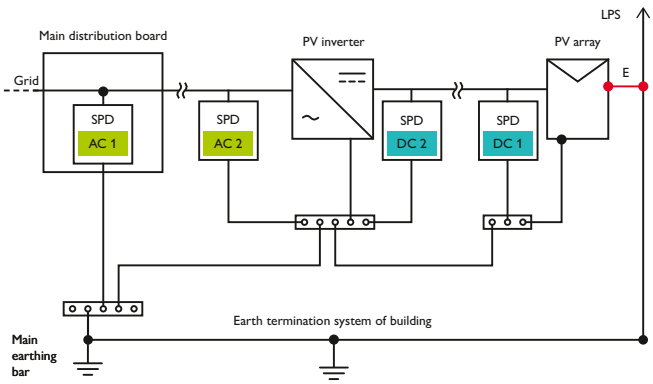
Flexible and fast installation

With the string combiner boxes, our PV sets, all the necessary field connectors are always included as well.

DC 1 DC 2

Safe connection technology

PV strings with ferrules can be wired without using tools by means of Push-in connection terminal blocks.

Photovoltaic rooftop system with external lightning protection	
Separation distance “s” is maintained.	**Separation distance “s” is not maintained.**
	
Type 2 A surge protective device is not required here if the cable length between “DC 1” and “DC 2” is less than 10 m.	**Type 1** A surge protective device is not required here if the cable length between “DC 1” and “DC 2” is less than 10 m.
Type 2	**Type 1**
Type 2 A surge protective device is not required here if the cable length between “AC 1” and “AC 2” is less than 10 m.	**Type 1** A surge protective device is not required here if the cable length between “AC 1” and “AC 2” is less than 10 m.
Type 1	**Type 1**

Additional safety

Our PV sets with integrated fireman's switch enable the external disconnection of the PV panels from the rest of the system.

Comprehensive portfolio

Whether a 3-conductor or 1-conductor system, and whatever the supply system configuration, we offer a broad portfolio for the protection of the AC side.

High data availability

As per DIN EN 61643-32, the telecommunications and data cables must be protected if the PV installation is equipped with surge protection.

Surge protection for the DC side

DC 1 **DC 2**

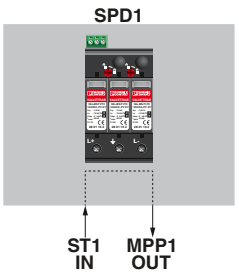
Below you will find a small selection of string combiner boxes, our PV sets, which you can use as surge protection for the DC side of your system.
They are produced in Germany and are available from stock for worldwide shipping.
We also offer corresponding accessories for all of our string combiner boxes.

You will find many more string combiner boxes in our product overview online. Visit our website at phoenixcontact.com and enter the following web code in the search field:

Web code: #2268

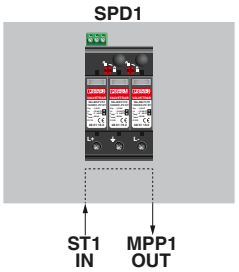
SOL-SC-1ST-0-DC-1MPPT-1001
Order No. 2404298

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 1
- Current per string: 40 A (I_{max})
- Number of outputs: 1
- Number of supported MPP trackers: 1
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 130 x 180 x 111 mm



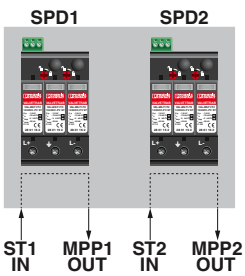
SOL-SC-1ST-0-DC-1MPPT-1000
Order No. 1182566

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 1
- Current per string: 40 A (I_{max})
- Number of outputs: 1
- Number of supported MPP trackers: 1
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 130 x 180 x 111 mm



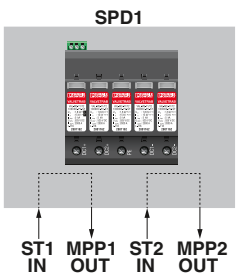
SOL-SC-1ST-0-DC-2MPPT-1001
Order No. 2404299

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 1 (per MPP tracker)
- Current per string: 40 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 180 x 180 x 111 mm



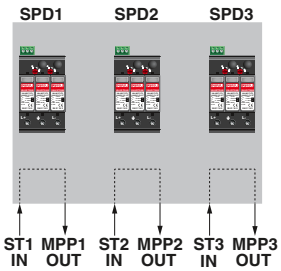
SOL-SC-1ST-0-DC-2MPPT-1000SE
Order No. 1101176

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 1 (per MPP tracker)
- Current per string: 40 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 254 x 180 x 111 mm



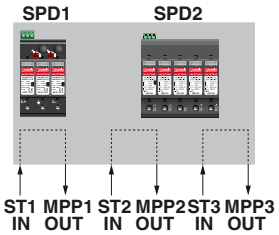
SOL-SC-1ST-0-DC-3MPPT-1001
Order No. 2404301

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 1 (per MPP tracker)
- Current per string: 40 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 3
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 254 x 180 x 111 mm



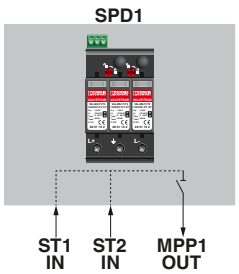
SOL-SC-1ST-0-DC-3MPPT-1000SE
Order No. 1182571

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 1 (per MPP tracker)
- Current per string: 40 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 3
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 361 x 254 x 111 mm



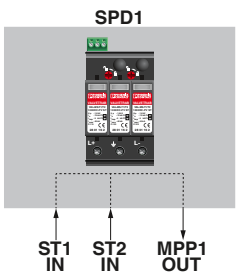
SOL-SC-2ST-0-DC-1MPPT-1101
Order No. 2404297

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2
- Current per string: 16 A (I_{max})
- Number of outputs: 1
- Number of supported MPP trackers: 1
- Switching capacity: 32 A/1000 V DC
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 180 x 180 x 111 mm



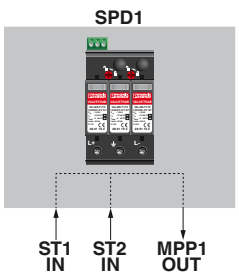
SOL-SC-2ST-0-DC-1MPPT-1000
Order No. 1016811

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2
- Current per string: 20 A (I_{max})
- Number of outputs: 1
- Number of supported MPP trackers: 1
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 180 x 180 x 111 mm



SOL-SC-2ST-0-DC-1MPPT-2000
Order No. 1055626

Technical data
- Surge protective device: type T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2
- Current per string: 20 A (I_{max})
- Number of outputs: 1
- Number of supported MPP trackers: 1
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 180 x 180 x 111 mm

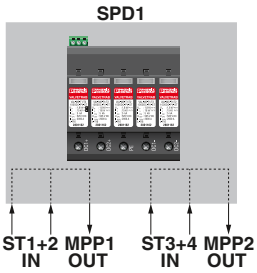


* SUNCLIX connectors included

DC 1 DC 2

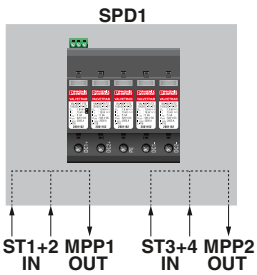
SOL-SC-2ST-0-DC-2MPPT-1001SE
Order No. 1016813

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 254 x 180 x 111 mm



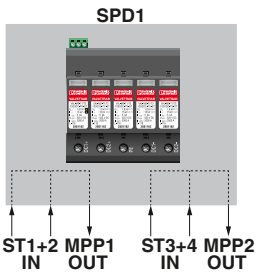
SOL-SC-2ST-0-DC-2MPPT-1000SE
Order No. 1016812

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 254 x 180 x 111 mm



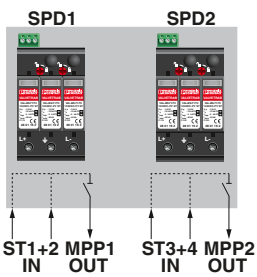
SOL-SC-2ST-0-DC-2MPPT-2000SE
Order No. 1055628

Technical data
- Surge protective device: type T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 254 x 180 x 111 mm



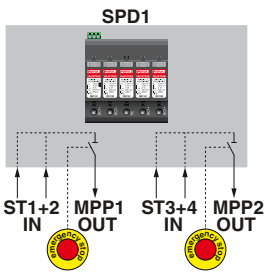
SOL-SC-2ST-0-DC-2MPPT-1101
Order No. 2404569

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Switching capacity: 32 A/1000 V DC (per MPP tracker)
- Switch disconnector type: rotary switch (lockable)
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 361 x 254 x 111 mm



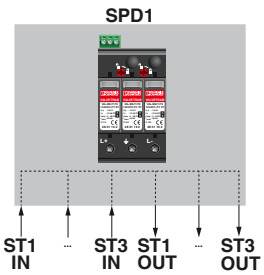
SOL-SC-2ST-0-DC-2MPPT-1300FS
Order No. 1137059

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- Switching capacity: 50 A/1000 V DC (per MPP tracker)
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 400 x 400 x 200 mm



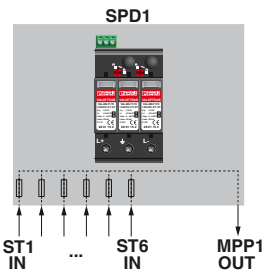
SOL-SC-3ST-0-DC-1MPPT-1001EQ
Order No. 1064363

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 3
- Current per string: 13.3 A (I_{max})
- Number of outputs: 3
- Number of supported MPP trackers: 1
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 180 x 180 x 111 mm



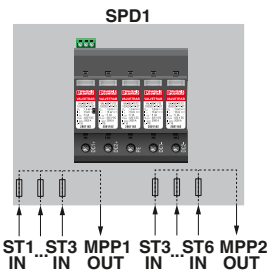
SOL-SC-6ST-0-DC-1MPPT-1010
Order No. 1113128

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 6
- Current per string: 10 A (I_{max})
- Number of outputs: 1
- Number of supported MPP trackers: 1
- String fuse: midget/10.3 x 38 (not included)
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 361 x 254 x 111 mm



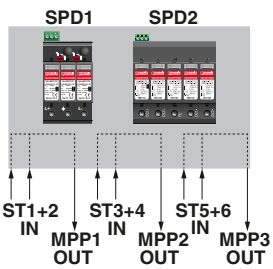
SOL-SC-3ST-0-DC-2MPPT-1011SE
Order No. 1042281

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 3 (per MPP tracker)
- Current per string: 12 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 2
- String fuse: midget/10.3 x 38 (12 A included)
- Type of cable entry: SUNCLIX*
- Housing dimensions (W x H x D): 361 x 254 x 111 mm



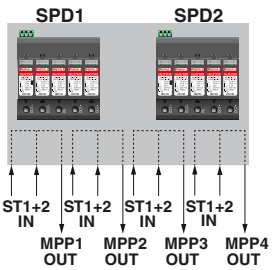
SOL-SC-2ST-0-DC-3MPPT-1000SE
Order No. 1053613

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 3
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 361 x 254 x 111 mm



SOL-SC-2ST-0-DC-4MPPT-1000SE
Order No. 1081867

Technical data
- Surge protective device: type T1/T2
- System voltage: 1000 V DC (U_{max})
- Number of string inputs: 2 (per MPP tracker)
- Current per string: 20 A (I_{max})
- Number of outputs: 1 (per MPP tracker)
- Number of supported MPP trackers: 4
- Type of cable entry: cable gland
- Housing dimensions (W x H x D): 361 x 254 x 111 mm



* SUNCLIX connectors included

Surge protection for the AC side and data interfaces

AC 1 AC 2 **Web code:** #0291

Surge protection for the AC side (suitable for TN-S and TT supply system configurations)			
Type 1/type 2 combined lightning current and surge arrester	**For 3-phase power supply networks**		**For 1-phase power supply networks**
When it comes to lightning discharge or direct lightning strikes, our type 1/type 2 combined lightning current and surge arresters provide the best protection for your installations.			
Type designation	FLT-SEC-P-T1-3S-350/25-FM	FLT-SEC-ZP-3S-255/7,5	FLT-SEC-P-T1-1S-350/25-FM
Order No.	2905421	1074741	2905415
Type 2 surge protective device	**For 3-phase power supply networks**		**For 1-phase power supply networks**
Switching operations are far and away the most common cause of overvoltages. Type 2 surge protective devices provide effective protection against these dynamic disturbance variables.			
Type designation	VAL-SEC-T2-3S-350-FM		VAL-SEC-T2-1S-350-FM
Order No.	2905340		2905333

TC

Surge protection for interfaces on the inverter		
	For digital signals	**For RS-485 (2-wire)**
All conventional inverters use an RS-485 data interface as well as digital inputs and outputs; these can be protected effectively against overvoltages.		
Type designation	2x TTC-6P-2X1-F-M-24DC-PT-I	TTC-6P-3-HF-F-M-12DC-UT-I
Order No.	2906794	2906786
	In accordance with Class EA (CAT6$_A$), for Gigabit Ethernet (up to 10 Gbps)	
Signal interfaces are particularly sensitive to overvoltages. You should therefore use our surge protection with components that are powerful and respond quickly.		
Type designation	DT-LAN-CAT.6+	
Order No.	2881007	

Request your individual string combiner box

We will be happy to help you find a solution that meets your specific requirements. If you cannot find the appropriate surge protection solution in our selection of PV sets or the extensive product list available online, you are welcome to submit a request. Please use the form below. We will examine the new specification and discuss its development with you. We look forward to receiving your suggestions and questions.

Please contact your local subsidiary and send us a photo of the form or submit it by e-mail. The contact details for your local subsidiary can be found on our website under the following web code:

Web code: #2554

Select your configuration

Inverter type*

_____

_____

DC switch disconnector*

☐ None

☐ DC switch disconnector ☐ Fireman's switch

Number of strings per MPP tracker

☐ 1 ☐ 2 ☐ 3 ☐ 4 _____ Other

Number of MPP trackers*

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6

Maximum string voltage

☐ 1000 V DC

Maximum string current (A)*

_____

Surge protection type

☐ T2 ☐ T1/T2

String fuse*

☐ +/- ☐ + ☐ None

Cable entry system IN*

☐ Cable gland ☐ SUNCLIX

Connection cross section IN (mm²)*

≤ 6.0 mm²

Cable entry system OUT*

☐ Cable gland ☐ SUNCLIX

Connection cross section OUT (mm²)*

_____

_____
Customer number (if known)

_____
Company

_____
Last name, first name*

_____
Department

_____
E-mail address*

_____
Street and house number

_____
Phone

_____
Zip code and city

_____
Availability (time: between __ and __)

_____
Country

* Mandatory fields that must be completed

Open communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for producing future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation. With a global network reaching across more than 100 countries with over 17,600 employees, we maintain close relationships with our customers, something we believe is essential for our common success.

Our wide variety of innovative products makes it easy for our customers to implement the latest technology in a variety of applications and industries. We focus on developing the fields of energy, infrastructure, process, and factory automation.

You can find your local partner at

phoenixcontact.com

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