

Product Details

Features and Mounting Options

for **SUNNY STRING-MONITOR SSM16-11**



Contents

The Sunny String-Monitor SSM16-11 is specifically designed for monitoring large PV generators. This Technical Information contains important information about the features and product details that are required for plant planning.

1 Product Details

- With the Sunny String-Monitor SSM16-11, SMA Solar Technology AG offers a detailed monitoring unit for large PV generators.
- The Sunny String-Monitor SSM16-11 continuously measures and compares the individual string currents. The analysis takes place in the Sunny Central Control.
- The Sunny String-Monitor SSM16-11 is provided with 16 measuring channels to which 16 or 32 strings can be directly connected.
- The Sunny String-Monitor SSM16-11 has string fuses at the positive and negative pole. For grounded PV generators, the Sunny String-Monitor SSM16-11 can also optionally be equipped with cylindrical bridges at the positive or negative pole.
- The Sunny String-Monitor SSM16-11 can be disconnected using a circuit breaker installed on the output side to the inverter. The circuit breaker is included in all Sunny String-Monitor versions.
- The Sunny String-Monitor SSM16-11 is equipped with monitored overvoltage protectors of category II.
- The Sunny String-Monitor SSM16-11 has a pending utility patent.

2 Technical data

Enclosure

Outdoor installation	Shaded
UV resistance	Yes
Base installation*	Yes
Wall mounting*	Yes
Material	Glass-fiber reinforced plastic
Combustion properties	Self extinguishing, halogen-free
Color	RAL 7035
Protective insulation	Yes
Lock cylinder (double-bit) with switch cabinet key**	Yes
Cable support rail***	Yes

* optional

** prepared for customer mounting

*** only for base mounting

Mechanical data, plinth

Width x height x depth	1 060 mm x 894 mm x 245 mm
Installation depth of the plinth	595 mm
Weight	16 kg
Total weight, enclosure and plinth	86 kg

Mechanical data, enclosure

Width x height x depth	1 060 mm x 820 mm x 245 mm
Weight	70 kg

General data

DC power switch*	280 A
Pollution degree**	2

* Direct drive

** according to DIN EN 50178:1997

Input Data at 40 °C Ambient Temperature

PV array configuration		Negative or positive grounded, insulated
Maximum permissible DC voltage with 10 A, 12 A, 16 A, 20 A	U_{DC}	1 000 V
Maximum permissible DC voltage for 5 A string fuse	U_{DC}	950 V
Maximum permissible DC current	I_{DC}	280 A
Number of measurement inputs		16
Maximum number of connections per measurement input*		2
Possible string fuses		10 A / 12 A / 16 A / 20 A / 25 A
Maximum string current per measurement input for 10 A string fuse**		7 A
Maximum string current per measurement input for 12 A string fuse**		8.4 A
Maximum string current per measurement input for 16 A string fuse**		11.2 A
Maximum string current per measurement input for 20 A string fuse**		14 A
Maximum string current per measurement input for 25 A string fuse**		17.5 A

* optional

** reduction factor 0.7

Input Data at 50 °C Ambient Temperature

PV array configuration		Negative or positive grounded, insulated
Maximum permissible DC voltage with 10 A, 12 A, 16 A, 20 A	U_{DC}	1 000 V
Maximum permissible DC voltage for 25 A string fuse	U_{DC}	950 V
Maximum permissible DC current	I_{DC}	260 A
Number of measurement inputs		16
Maximum number of connections per measurement input*		2
Possible string fuses		10 A / 12 A / 16 A / 20 A / 25 A
Maximum string current per measurement input for 10 A string fuse**		6.5 A
Maximum string current per measurement input for 12 A string fuse**		7.8 A
Maximum string current per measurement input for 16 A string fuse**		10.4 A
Maximum string current per measurement input for 20 A string fuse**		13 A
Maximum string current per measurement input for 25 A string fuse**		16.25 A

* optional

** reduction factor 0.65

DC Main Connection

Type of terminal	Cage clamp
Maximum connection cross-section	240 mm ² / 300 mm ²
Suitable connection material	Copper / aluminum
Number of connection terminals per DC output*	1 / 2
Cable entry via cable gland	M40
Sealing range of the cable gland	13 mm ... 32 mm

* Sunny String-Monitor SSM16-11 with bottom plate: connection of 1 cable per DC terminal possible.

Sunny String-Monitor SSM16-11 without bottom plate: connection of 2 cables per DC terminal possible.

DC String Connection to MC4 Plug Connector

Cable cross-section	6 mm ²
Maximum rated current	30 A

DC String Connection to MC3 Plug Connector

Cable cross-section	4 mm ²
Maximum rated current	20 A

DC String Connection to Plug Connector SUNCLIX

Cable type	PV1-F
Cable cross-section	2.5 mm ² ... 6 mm ²
Cable diameter	5 mm ... 8 mm
Maximum rated current	40 A

DC String Connection to Disconnection and Measurement Terminal

Type of terminal	Spring terminal
Maximum connection cross-section	0.2 mm ² ... 6 mm ²
Cable entry via multiple cable gland	M50
Grip range of multiple cable gland	5.0 mm ... 5.5 mm / 5.6 mm ... 6.0 mm / 6.1 mm ... 7.0 mm / 7.1 mm ... 8.0 mm / 8.1 mm ... 9.0 mm

Grounding Connection

Type of terminal	Cage Clamp
Maximum connection cross-section	35 mm ²
Cable gland	M25
Sealing range	7 mm ... 14 mm

Connecting the communication

Measurement voltage supply	35 V _{DC} ... 55 V _{DC}
Type of terminal	Spring terminal
Connection cross-section	0.08 mm ² ... 2.5 mm ²
Cable gland	M25
Sealing range	7 mm ... 14 mm
Cable type	4 mm x 2 mm x 0.5 mm Li2YCYv (TP)
Number of shield clamps	2
Maximum shield diameter	8 mm

Remote triggering with shunt release (optional)

Nominal voltage	220 V _{AC} ... 240 V _{AC}
Extended operating range	- 30 % ... +10 %
Nominal frequency	50 Hz / 60 Hz
Power Consumption	100 VA

Remote triggering with undervoltage release (optional)

Nominal voltage	220 V _{AC} ... 240 V _{AC}
Extended operating range	- 15 % ... +10 %
Nominal frequency	50 Hz / 60 Hz
Power consumption	3 VA

Connection Remote Triggering (optional)

Type of terminal	Spring terminal
Maximum connection cross-section	0.5 mm ² ... 6 mm ²
Cable entry via cable gland	M25
Cable gland clamping zone	7 mm ... 14 mm

Feedback contact with remote triggering (optional)

Nominal voltage	250 V _{AC/DC}
Nominal current	5 A _{AC} / 0.15 A _{DC}
Format	Changeover contact

Connection Feedback Contact (optional)

Type of terminal	Spring terminal
Maximum connection cross-section	0.25 mm ² ... 2.5 mm ²
Cable entry via cable gland	M25
Cable gland clamping zone	7 mm ... 14 mm

Protection Rating and Ambient Conditions

Protection rating *		IP 54
Permissible ambient temperatures	T _{AMB}	- 25 °C ... +50 °C
Relative air humidity		15 % ... 95 %
Maximum altitude above sea level, AMSL		1 000 m

* according to DIN EN 60529

Interfaces

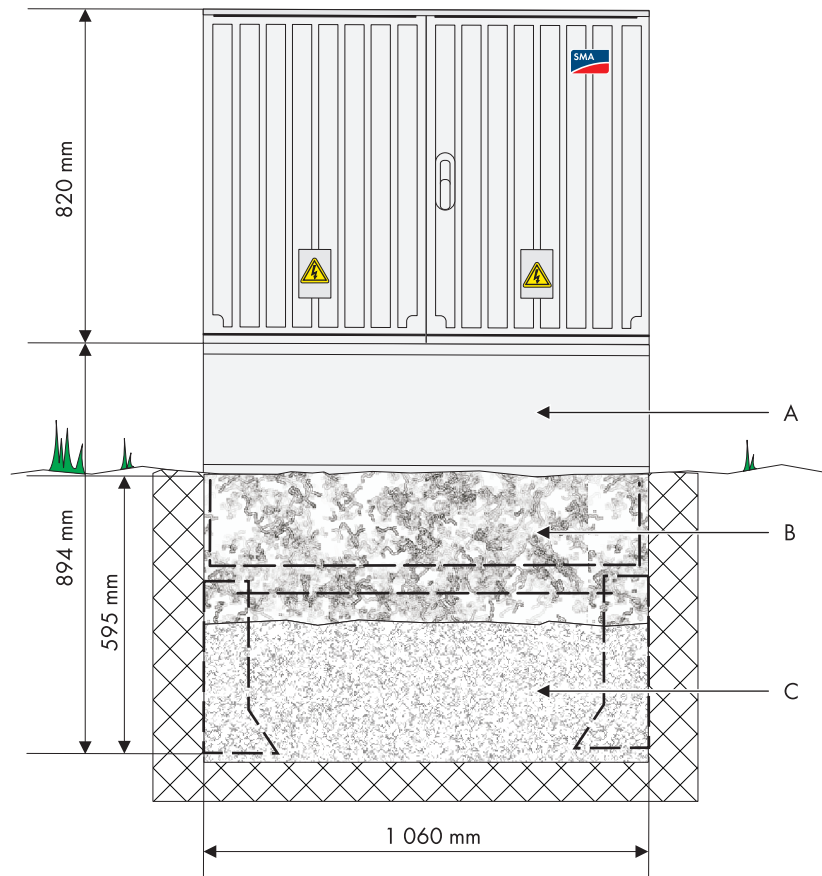
Communication	RS485
Transmission rate	19 200 Baud
Monitored overvoltage protectors type II	Yes
String current measurement	Yes

3 Mounting Options and Dimensions

The Sunny String-Monitor SSM16-11 is suitable for both wall and plinth mounting. For both mounting options, a strain relief for the connecting cables is to be installed:

- Base mounting: strain relief using an internal cable support rail in the plinth. The scope of delivery includes the strain relief.
- Wall mounting: strain relief via an external cable support rail. The scope of delivery does not include the strain relief.

Base Mounting

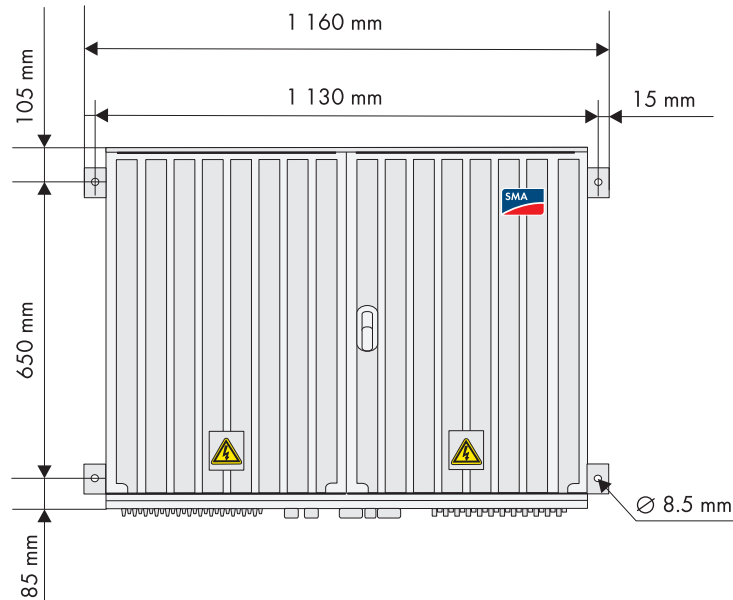


A	Upper plinth panel
B	Plinth filler or coarse gravel with a grain size of 4 mm ... 8 mm
C	Fine gravel or sand with a grain size of 2 mm ... 4 mm

Accumulation of Moisture

The filled plinth area largely prevents accumulation of moisture in the Sunny String-Monitor SSM16-11. Rising soil humidity is responsible for up to 90 % of condensation.

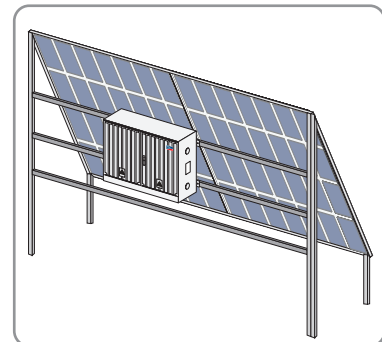
Wall mounting



4 Mounting location

Select a mounting location for the Sunny String-Monitor SSM16-11 where it stands level and is protected against direct sunlight. The mounting location should be accessible for maintenance work.

In the case of a rack-mounted PV generator, the Sunny String-Monitor SSM16-11 can ideally be positioned directly behind the generator in the shadow. Here, make sure that no rain flows over the Sunny String-Monitor SSM16-11 enclosure from the module surface.



5 Electrical Connection

Single and multi-strand copper and aluminum cables with round or sectoral cross-section can be connected to the DC main connection. The following table shows the different connection possibilities.

Terminal Average for Copper Cable

Connection terminal	Number of conductors	Terminal Average			
		Round, single-strand	Round, multi-strand	Sectoral, single-strand	Sector, multi-strand
maximal 240 mm ²	1*	25 mm ² ... 50 mm ²	25 mm ² ... 240 mm ²	50 mm ² ... 185 mm ²	35 mm ² ... 240 mm ²
	2**	25 mm ² ... 50 mm ²	25 mm ² ... 120 mm ²	50 mm ² ... 120 mm ²	35 mm ² ... 120 mm ²
maximal 300 mm ²	1*	-	150 mm ² ... 300 mm ²	150 mm ² ... 185 mm ²	150 mm ² ... 240 mm ²
	2**	70 mm ²	70 mm ² ... 185 mm ²	95 mm ² ... 185 mm ²	95 mm ² ... 185 mm ²

* Sunny String-Monitor SSM16-11 with bottom plate: connection of 1 cable per DC terminal possible.

** Sunny String-Monitor SSM16-11 without bottom plate: connection of 2 cables per DC terminal possible.

Terminal Average for Aluminium Cable

Connection terminal	Number of conductors	Terminal average			
		Round, single-strand	Round, multi-strand	Sectoral, single-strand	Sector, multi-strand
maximal 240 mm ²	1*	25 mm ² ... 50 mm ²	25 mm ² ... 240 mm ²	50 mm ² ... 185 mm ²	95 mm ² ... 185 mm ²
	2**	25 mm ² ... 50 mm ²	25 mm ² ... 120 mm ²	50 mm ² ... 120 mm ²	50 mm ² ... 95 mm ²
maximal 300 mm ²	1*	-	150 mm ² ... 300 mm ²	150 mm ² ... 185 mm ²	150 mm ² ... 240 mm ²
	2**	70 mm ²	70 mm ² ... 185 mm ²	95 mm ² ... 185 mm ²	95 mm ² ... 185 mm ²

* Sunny String-Monitor SSM16-11 with bottom plate: connection of 1 cable per DC terminal possible.

** Sunny String-Monitor SSM16-11 without bottom plate: connection of 2 cables per DC terminal possible.

Grip Range of Spring-type Terminals

If bootlace ferrules are used on spring-type terminals of the "cage clamp" type, connection cables with the maximum permissible standard terminal cross-section may not be used. The next smaller cross-section must be selected.

Measurement voltage supply

Measurement voltage supply and interface connection are to be routed in a single cable. The corresponding cable type must contain eight wires and have a minimum cross-section of 0.5 mm^2 . The cable shield must be connected to the according shield connections in the inverter and the Sunny String-Monitor SSM16-11.

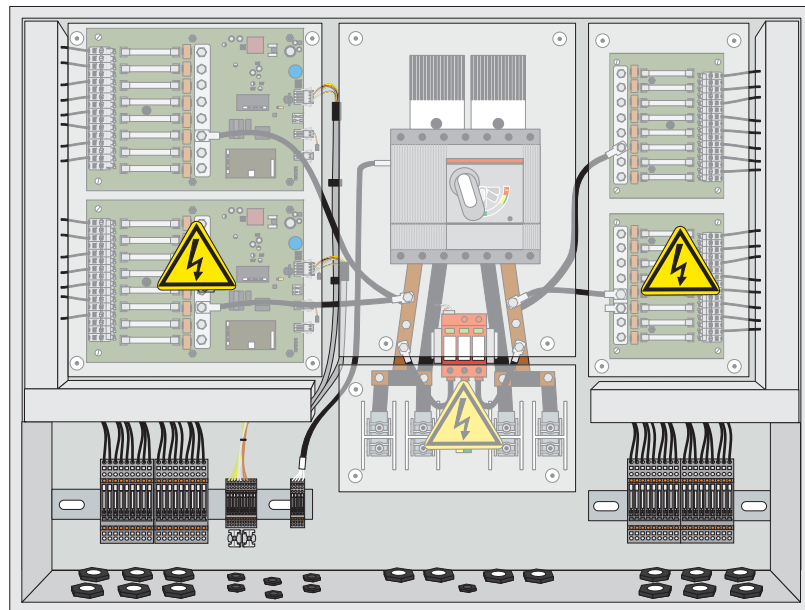
Documentation

Please follow all instructions contained in the Sunny String-Monitor SSM16-11 documentation.

6 Features

6.1 Interior View

Use the option code to select the features for the Sunny String-Monitor SSM16-11. The following overview shows a Sunny String-Monitor SSM16-11 with fuses in the positive and negative pole. The currents are measured in the positive pole. The standard DC switch is equipped with an optional remote triggering.



6.2 Remote Triggering for DC Switch (optional)

The DC switch can be fitted with an auxiliary circuit breaker for remote triggering. The auxiliary tripping unit can be implemented as shunt trip or undervoltage release. Like this, it is possible to disconnect the PV generator from the inverter via the DC switch in the Sunny String-Monitor. The integrated feedback contact shows the current switching status.

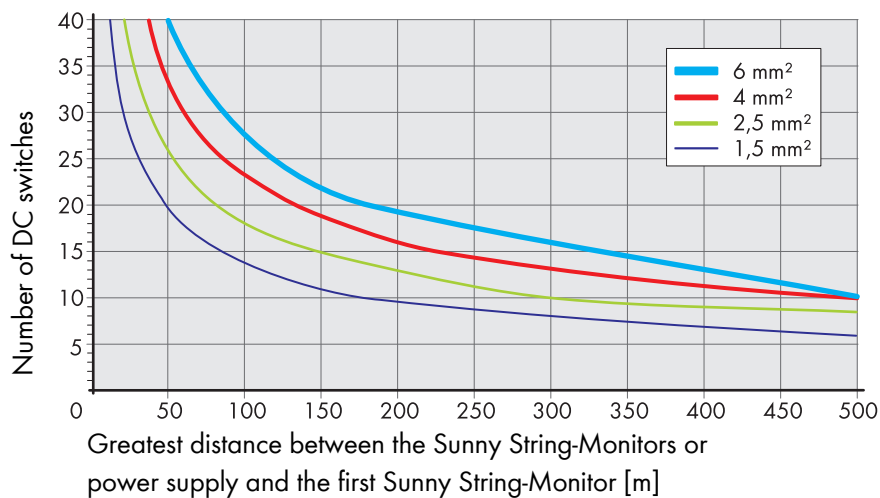
Remote Tripping with Shunt Release

The shunt release is used to switch off the DC switch in an electrically controlled way. Operation of the shunt trip is only guaranteed at a voltage between 70 % and 110 % of the nominal voltage U_N .

If a voltage is present at the shunt trip, the DC switch is triggered. This is controlled via a make contact. In the event of wire breakage, loose connection, undervoltage or loss of voltage supply, the function of the shunt release is not guaranteed. We recommend operating the shunt release with an uninterrupted voltage supply. The activation time for safely activating the shunt trip is at least 3 seconds.

Cable Requirements

In order to achieve secure triggering, the minimum cross-sectional area of the connection cable must be determined. The cable cross-sectional area to be selected depends on the number of connected Sunny String-Monitors, the cable length to the voltage supply and the cable lengths between the connected Sunny String-Monitors. The following diagram shows the relation between cable length, number of connected Sunny String-Monitors and cable cross-section.



Remote Tripping with Undervoltage Release

The undervoltage release is used to switch off the DC switch in an electrically controlled way. The DC circuit breaker is tripped when there is no voltage at the undervoltage release, or if the voltage falls below 85 % of the nominal release voltage U_N . After tripping, the circuit breaker can be switched back on when the voltage rises above 85 % of the nominal release voltage U_N . Only if voltage is present at the undervoltage release, the DC switch can manually be switched on again. In order to avoid inadvertent tripping, an uninterrupted power supply is recommended.

The undervoltage release is designed for continual operation. This is controlled via a break contact. The undervoltage release is the suitable triggering element for secure shutdowns or locks, for example emergency stop, because they shut off in case of disturbance. The minimum interruption time for secure tripping of the undervoltage release is 1 second.

Cable Requirements

For safe operation we recommend a minimum cable cross-section of 2.5 mm² with an overall cable length of 1 000 m.

Selection of the Tripping Type

Depending on the legal regulations at the installation site, the remote tripping can be required as a break-contact function. Remote tripping with undervoltage release complies with this requirement.