

Multi-Function Interface

MULTI-FUNCTION RELAY

Installation Manual

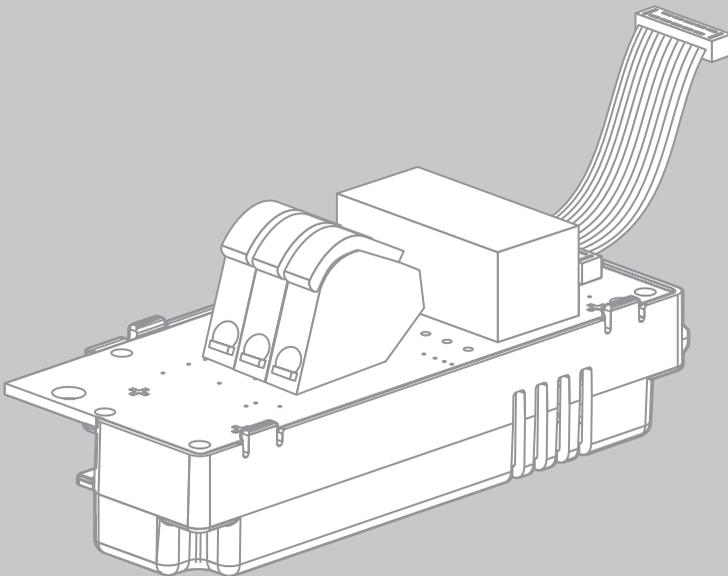


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1 Information on this Document

Validity

This document is valid for device type "MFR01-10".

Target Group

This document is for skilled persons. Only qualified personnel with the appropriate skills are allowed to perform the tasks described in this manual (see Section 2.2 "Qualification of Skilled Persons", page 8).

Additional Information

Links to additional information can be found at www.SMA-Solar.com:

Document title	Document type
Measured Values and Parameters	Technical description
Temperature Derating	Technical information

Symbols

Symbol	Explanation
 DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury
 WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE	Indicates a situation which, if not avoided, could result in property damage
	Information that is important for a specific topic or goal, but is not safety-relevant
<input type="checkbox"/>	Indicates an essential requirement for achieving a specific goal
<input checked="" type="checkbox"/>	Desired result
	A problem that might occur

Typography

Typography	Usage	Example
bold	<ul style="list-style-type: none"> Parameter Elements to be selected Elements to be entered 	<ul style="list-style-type: none"> Select the parameter Operating mode of multifunction relay or Mlt.OpMode and set the desired operating mode .

Nomenclature

Full designation	Designation in this document
Sunny Boy, Windy Boy, Sunny Tripower	Inverter
Operating parameter	Parameter

Display of Parameters

Depending on the type of communication, RS485, *Bluetooth* or Speedwire, the parameters are displayed differently in the communication products. This document contains both display types.

Example: Display of the operating mode parameter of the multi-function relay

- With communication via RS485: parameter **Mlt.OpMode**
 - With communication via *Bluetooth* or Speedwire: parameter **Operating mode of multi-function relay**
-

2 Safety

2.1 Intended Use

You can use the multi-function relay for various purposes:

Application (operating mode)	Description
Fault indication/FltInd	The multi-function relay controls a display device which, depending on the type of connection, either reports an error or the undisturbed operation of the inverter.
Self-consumption/ SelfCsmP	The multi-function relay switches loads on or off, depending on the power supply status of the plant.
Control via communication/ ComCtl	The multi-function relay switches the loads on and off via a communication product.
Battery bank/BatCha	The multi-function relay controls battery charging, depending on the power supply situation of the plant.
Fan control/FanCtl	The multi-function relay controls an external fan depending on the temperature of the inverter.
Switching status grid relay/ GriSwCpy	The local network operator may require that a signal is transmitted as soon as the inverter connects to the electricity grid. The multi-function relay simulates the switching status of the grid relay and trips a signal to the network operator.

The multi-function relay is suitable for use in the following SMA inverters:

- SB 3000TL-21, SB 3600TL-21, SB 4000TL-21, SB 5000TL-21
- WB 3000TL-21, WB 3600TL-21, WB 4000TL-21, WB 5000TL-21
- SB 2500TLST-21, SB 3000TLST-21
- STP 8000TL-10, STP 10000TL-10, STP 12000TL-10, STP 15000TL-10, STP 17000TL-10
- STP 15000TLHE-10, STP 20000TLHE-10, STP 15000TLEE-10, STP 20000TLEE-10

Use the multi-function relay only for one of the indicated purposes. Any other use may result in personal injury or property damage.

For safety reasons, it is not permitted to modify the product or install components that are not explicitly recommended or distributed by SMA Solar Technology AG for this product.

The enclosed documentation is part of this product.

- Read and adhere to the documentation.
- Keep the documentation in a convenient place for future reference.

2.2 Qualification of Skilled Persons

The work described in this document must be performed by skilled persons only. Skilled persons must have the following qualifications:

- Knowledge of how an inverter works and is operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and plants
- Training in the installation and commissioning of electrical devices and plants
- Knowledge of the applicable standards and directives
- Knowledge of and adherence to this document and all safety precautions

2.3 Safety Precautions

Electric Shock

High voltages which may cause electric shocks are present in the conductive parts of the inverter.

- Prior to performing any work on the inverter, always disconnect the inverter as described in the corresponding installation manual from any voltage sources on the AC and DC sides (see inverter installation manual).

Burn Hazards

Some parts of the enclosure may get hot during operation.

- Do not touch any parts other than the lower enclosure lid of the inverter during operation.

Electrostatic Discharge

Touching electronic components can cause damage to or destroy the inverter through electrostatic discharge.

- Earth yourself before touching any components.
- Avoid contact with components or plug contacts inside the inverter.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your specialist dealer if the scope of delivery is incomplete or damaged.

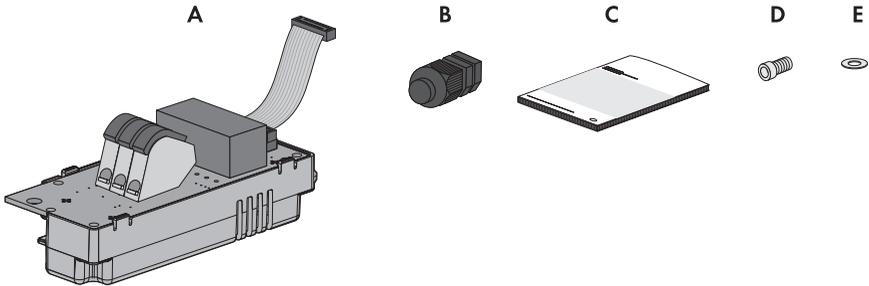


Figure 1: Components included in scope of delivery

Item	Quantity	Description
A	1	Multi-function relay*
B	1	M20x1.5 cable gland*
C	1	Installation manual
D	1	M4x8 cheese-head screw*
E	1	Washer M4*

* If the multi-function relay has already been installed at the factory, this component is not included.

4 Product Description

You can use the multi-function relay for various purposes:

Application (operating mode)	Description
Fault indication/FltInd	The multi-function relay controls a display device which, depending on the type of connection, either reports an error or the undisturbed operation of the inverter.
Self-consumption/ SelfCsmP	The multi-function relay switches loads on or off, depending on the power supply status of the plant.
Control via communication/ ComCtl	The multi-function relay switches the loads on and off via a communication product.
Battery bank/BatCha	The multi-function relay controls battery charging, depending on the power supply situation of the plant.
Fan control/FanCtl	The multi-function relay controls an external fan depending on the temperature of the inverter. If the temperature of the inverter is 5 °C higher than a specific threshold set in the inverter, the fan starts automatically. If the temperature of the inverter is 10 °C lower than the threshold, the fan stops automatically.
Switching status grid relay/ GriSwCpy	The multi-function relay switches simultaneously with the grid relay of the inverter.

The multi-function relay can be retrofitted, or installed in the inverter at the factory if specified in the order.

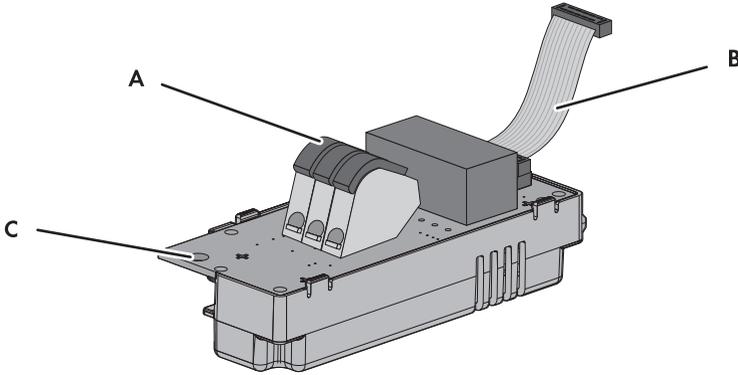


Figure 2: Design of the multi-function relay

Item	Description
A	Connecting terminal plate for the connection to the multi-function relay
B	Ribbon cable for the connection in the inverter
C	Hole for attaching the multi-function relay in the inverter

There are different connection procedures depending on how you intend to use the multi-function relay (see Section 5.4.1 "Connection Options for the Multi-Function Relay", page 15).

The operating mode of the multi-function relay has been set by default to **Fault indication/FltInd**. If you have chosen another operating mode, you need to change the operating mode of the multi-function relay via a communication product after commissioning the inverter and possibly adjust other settings as well (see Section 6 "Setting the Operating Mode of the Multi-Function Relay", page 22).

Symbol on Product

Symbol	Description	Explanation
	Danger to life due to high voltages	The inverter operates at high voltages. All work on the inverter and on the multi-function relay must be carried out by skilled persons only.

5 Electrical Connection

5.1 Safety during Electrical Connection

Electric Shock

High voltages which may cause electric shocks are present in the conductive parts of the inverter.

- Prior to performing any work on the inverter, always disconnect the inverter as described in the corresponding installation manual from any voltage sources on the AC and DC sides (see inverter installation manual).

Electrostatic Discharge

Touching electronic components can cause damage to or destroy the inverter through electrostatic discharge.

- Earth yourself before touching any components.
- Avoid contact with components or plug contacts inside the inverter.

5.2 Mounting Position and Cable Routing

Mounting Position and Cable Routing in the Sunny Tripower

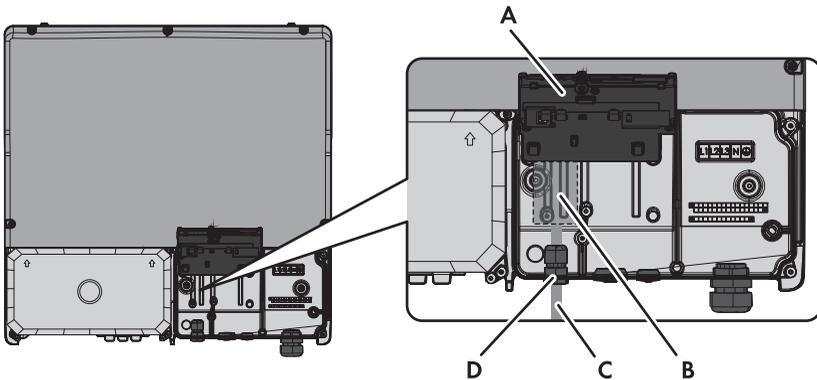


Figure 3: Installation area and cable route in the Sunny Tripower with the lower enclosure lid open and the display flipped up

Item	Description
A	Inverter display
B	Installation location of the multi-function relay
C	Cable route for the connection to the multi-function relay
D	M20x1.5 cable gland

Mounting Position and Cable Routing in the Sunny Boy/Windy Boy

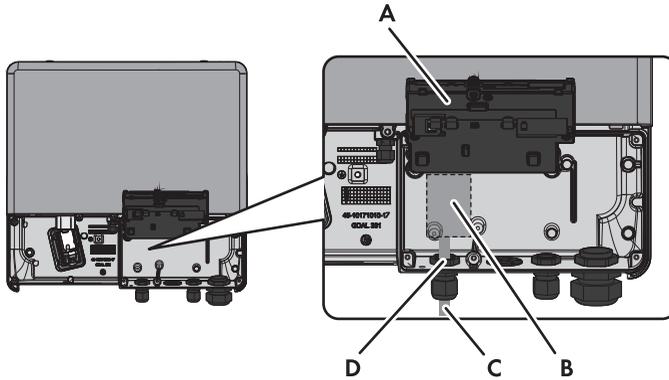


Figure 4: Installation area and cable route in the Sunny Boy/Windy Boy with the lower enclosure lid open and the display flipped up

Item	Description
A	Inverter display
B	Installation location of the multi-function relay
C	Cable route for the connection to the multi-function relay
D	M20x1.5 cable gland

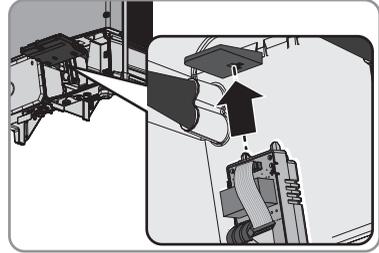
5.3 Installing the Multi-Function Relay in the Inverter

i Graphics

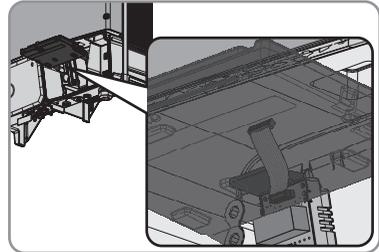
This section describes the installation of the multi-function relay using the Sunny Tripower as a graphical example. The installation is identical for the following inverter types: Sunny Tripower, Sunny Boy and Windy Boy. The only difference is the inverter environment.

1. Disconnect the inverter from voltage sources on the AC and DC sides and open the lower enclosure lid (see the inverter installation manual).
2. Flip up the display. Loosen the screw on the display.
 - The display clicks into place.

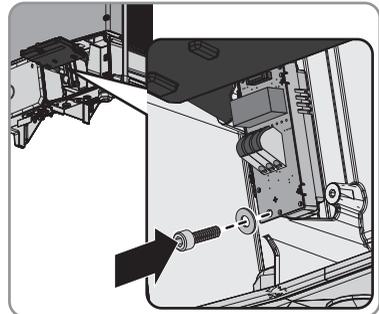
3. Insert the multi-function relay in the inverter. To do this, insert the left-hand keyway at the top of the multi-function relay into the cutout of the plastic retainer of the inverter display.



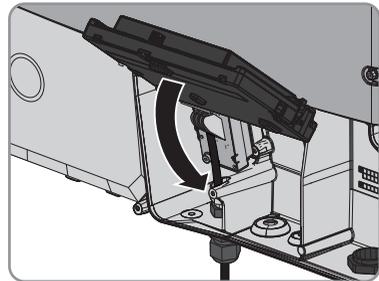
4. Lead the ribbon cable upwards behind the display.



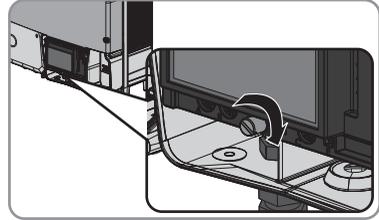
5. Fasten the multi-function relay using the washer and the cheese-head screw (torque 1.5 Nm). For this purpose, use an Allen key (AF 3).



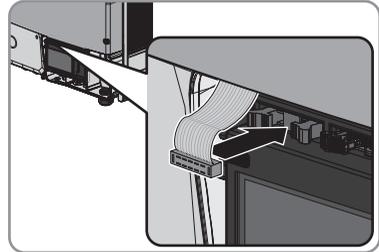
6. Flip the display down.



7. Fasten the screw of the display hand-tight.



8. Insert the ribbon cable into the left socket on the display of the inverter.



5.4 Multi-Function Relay Connection

5.4.1 Connection Options for the Multi-Function Relay

You can choose between three connection options:

- Using the multi-function relay as fault indication relay or operation signalling contact
- Controlling loads or charging batteries in a power-dependent way via the multi-function relay
- Reporting switching status of grid relay

Using the Multi-Function Relay as Fault Indication Relay or Operation Signalling Contact

You can make use of the multi-function relay as a fault signalling contact and have an error of the inverter either displayed or reported. Alternatively, you can choose to have uninterrupted operation displayed or reported. It is possible to connect several inverters to one fault or operation indicator. To enable this function, the multi-function relays of several inverters must be switched in parallel.

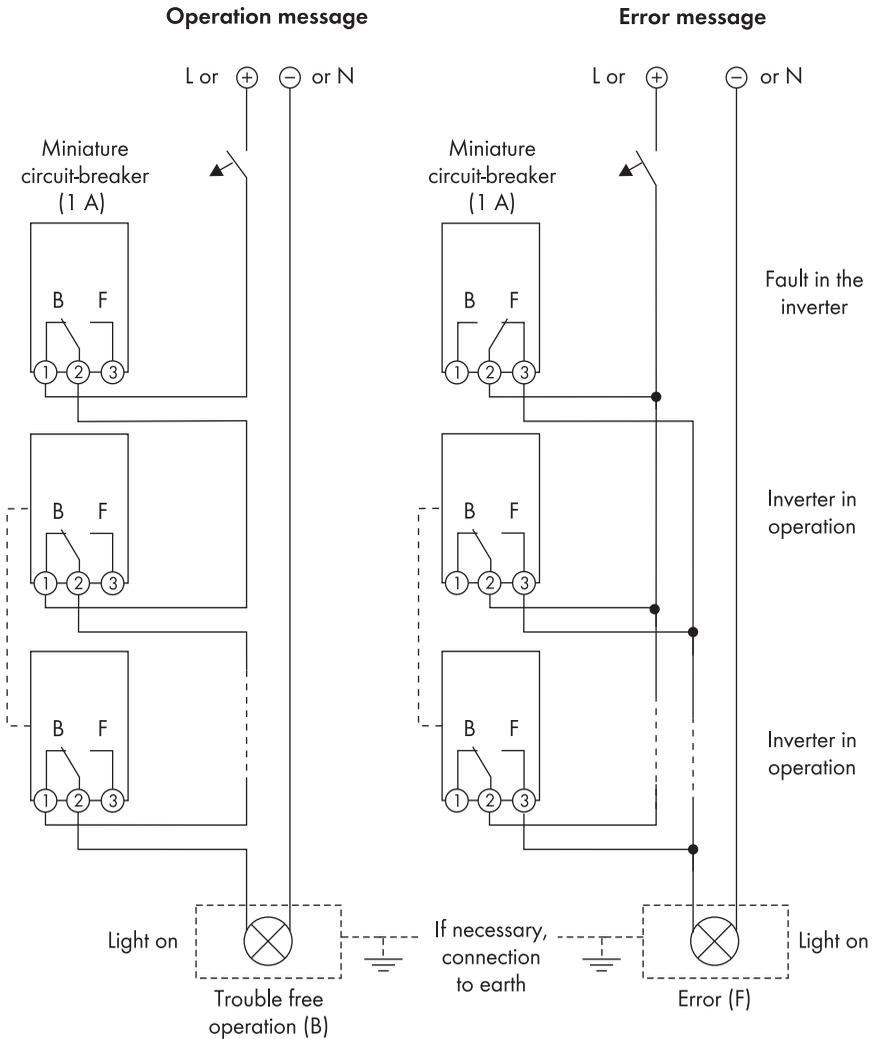


Figure 5: Wiring diagram with several inverters for connection of operation indicator and fault indicator (example)

Controlling Loads or Charging Batteries in a Power-Dependent Way via the Multi-function Relay

Loads can be controlled and batteries charged in a power-dependent way via the multi-function relay. To enable this function, you need to connect a contactor (K1) to the multi-function relay. The contactor (K1) switches the operating current for the load on or off. If you want batteries to be charged depending on the available power, the contactor serves to activate or deactivate the charging of the batteries.

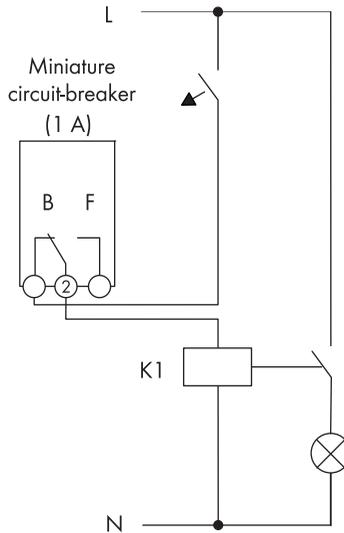


Figure 6: Wiring diagram for connection to control a load or for the power-dependent charging of the batteries

Reporting Switching Status of Grid Relay

The multi-function relay can trip a signal to the network operator as soon as the inverter connects to the electricity grid. To enable this function, the multi-function relays of all inverters must be switched in parallel.

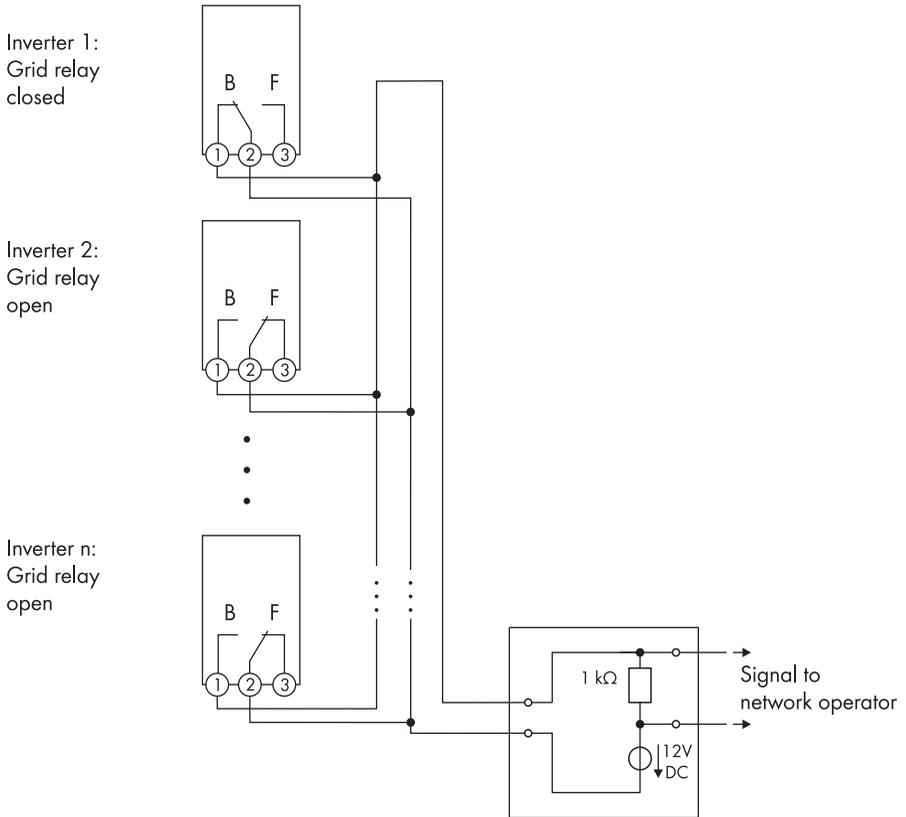


Figure 7: Wiring diagram for reporting the switching status of the grid relay (example)

5.4.2 Connection to the Multi-Function Relay

Requirements:

- The technical requirements of the multi-function relay must be met (see Section 7 "Technical Data", page 23).

Cable requirements:

- The cable must be double-insulated.
- External diameter: 5 mm ... 12 mm
- Conductor cross-section: 0.08 mm² ... 2.5 mm²
- The cable type and cable-laying method must be appropriate to the application and location.

NOTICE

Destruction of the multi-function relay as a result of excessive contact load

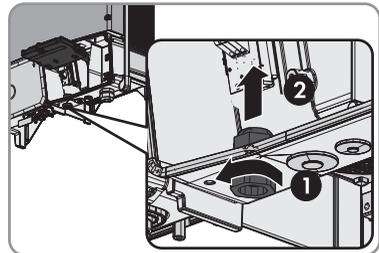
- Adhere to maximum switching voltage and maximum switching current (see Section 7 "Technical Data", page 23).
- When connecting the multi-function relay to the electricity grid, protect the multi-function relay with an individual miniature circuit-breaker.



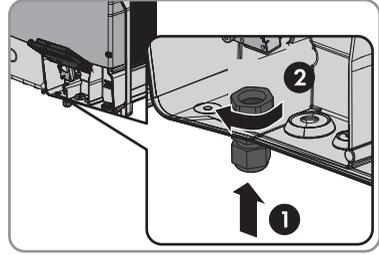
Graphics

This section describes the connection to the multi-function relay using the Sunny Tripower as a graphical example. The connection to the multi-function relay is identical for the following inverter types: Sunny Tripower, Sunny Boy and Windy Boy. The only difference is the inverter environment.

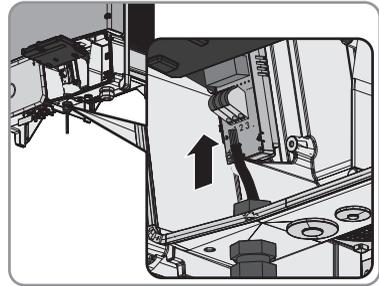
1. When connecting to the electricity grid, protect the multi-function relay with an individual miniature circuit-breaker.
2. Disconnect the inverter from any voltage sources (see the inverter installation manual).
3. If the cable gland on the inverter is installed inwardly, insert the cable gland from the outside.
 - Unscrew the counter nut from the outside of the inverter and remove the cable gland from the inside of the inverter.



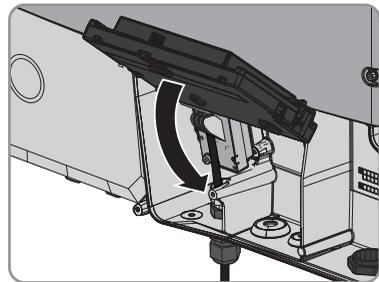
- Insert the cable gland from the outside into the enclosure opening and tighten it from the inside using the counter nut.



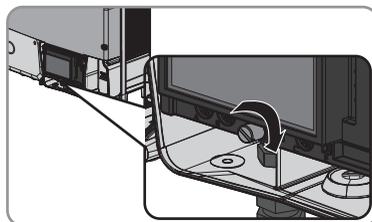
4. Slightly loosen the swivel nut of the cable gland and remove the sealing plug.
5. If the diameter of the connection cable is more than 8 mm, remove the internal seal insert from the cable gland.
6. Route the cable into the inverter through the cable gland.
7. Strip the the cable jacket by a maximum of 15 mm.
8. Strip 8 mm of the conductor insulation at maximum.
9. Depending on the intended use (operating mode), connect the cable to the terminal plate for connection to the multi-function relay in accordance with the wiring diagram.



10. Tighten the swivel nut of the cable gland.
11. Flip the display down.



12. Fasten the screw on the display hand-tight.



13. Commission the inverter again (see the inverter installation manual).

6 Setting the Operating Mode of the Multi-Function Relay

By default, the multi-function relay is set to activate a fault indicator when an error occurs. If you use the multi-function relay for another purpose, you must change the operating mode with a communication product and, if necessary, adjust settings relating to the operating mode (for information on changing parameters, refer to the manual of the communication product used). No further settings are necessary for the operating modes **Fan Control/FanCtl** and **Switching status grid relay/GriSwCpy**.

1. Select the parameter **Operating mode of multi-function relay/Mlt.OpMode** and set the desired operating mode (for information on the operating modes (see Section 4 "Product Description", page 10).
2. Once you have set the operating mode **Self-consumption/SelfCsmP**, you can carry out other settings:
 - Select the parameter **Minimum On power for MFR self-consumption/Mlt.MinOnPwr** and set the desired value. By doing this, you are setting the power threshold from which a load is to be activated.
 - Select the parameter **Minimum power On time, MFR self-consumption/Mlt.MinOnPwr** and set the desired value. By doing this, you are setting the minimum time for which the power must have exceeded the minimum switch-on power threshold in order to trip activation of the load.
 - Select the parameter **Minimum On time for MFR self-consumption/Mlt.MinOnTmm** and set the desired value. By doing this, you are setting the minimum time for which the load remains activated.
3. If you have set the operating mode **Control via communication**, select the parameter **Status of MFR with control via communication/MltComCtl.Sw** and set the desired value. By doing this, you are setting the status at which the multi-function relay is controlled via a communication product.
4. If you have set the operating mode **Battery bank**, adjust other settings:
 - Select the parameter **Minimum On power of MFR battery bank/Blt.BatCha.Pwr** and set the desired value. By doing this, you are setting the power threshold from which the battery is to be charged.
 - Select the parameter **Minimum time before reconnection of MFR battery bank/Blt.BatCha.Tmm** and set the desired value. By doing this, you are setting the minimum time which must elapse after charging the battery before the battery can be charged again.

7 Technical Data

Maximum AC switching voltage	240 V
Maximum DC switching voltage	30 V
Maximum AC switching current	1.0 A
Maximum DC switching current	1.0 A
Minimum electrical endurance when the maximum switching voltage and maximum switching current are complied with *	1,000,000 switching cycles

* Corresponds to 20 years with 12 switching operations per day

8 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Inverter device type
- Inverter serial number
- Firmware version of the inverter
- Special country-specific settings of the inverter (if applicable)
- Type and number of the PV modules connected
- Installation location and installation altitude of the inverter
- Four-digit event number and display message of the inverter
- Optional equipment, e.g. communication products
- Use of a multi-function relay
- Use of the multi-function relay (if available)

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