ENGLISH

Solar Frontier Europe GmbH

Installation and Operating Manual

SolarSet 2.0 / SolarSet 2.4 / SolarSet 3.1 / SolarSet 3.6 / SolarSet 4.1 /
SolarSet 4.8 / SolarSet 5.1 / SolarSet 6.1 / SolarSet 7.1 / SolarSet 8.2

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1. Preface

Thank you for choosing a SolarSet with CIS photovoltaic modules from Solar Frontier. Solar Frontier (SF) offers the highest standards in creating electrical power from solar energy, and in customer service.

This manual contains important information with regards to the installation, operation, maintenance, cabling and use of the SolarSet, and the safety instructions involved. To ensure a proper and safe use of the SolarSet, all tips and warnings in this document, as well as the advice of the manufacturers of the system components should be carefully read, understood and applied. Please make sure that the installer and operator of the plant obtain a copy of this manual. Please save this document for future use. All applicable local and national laws and norms should be obeyed during installation, cabling, operation and maintenance of the SolarSet. In case of further questions please get in touch with your dealer or with Solar Frontier directly.

2. Identification

Type plate of the Solar Frontier inverter SF-WR

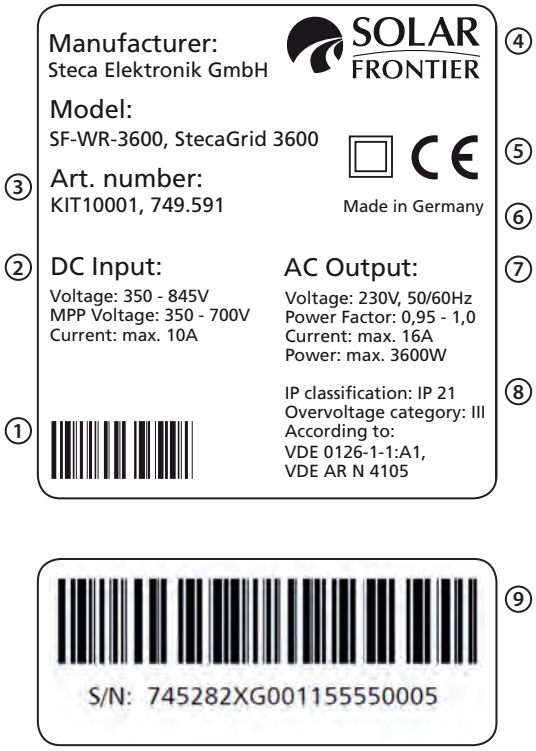


Figure 1

Type plate of the SF module

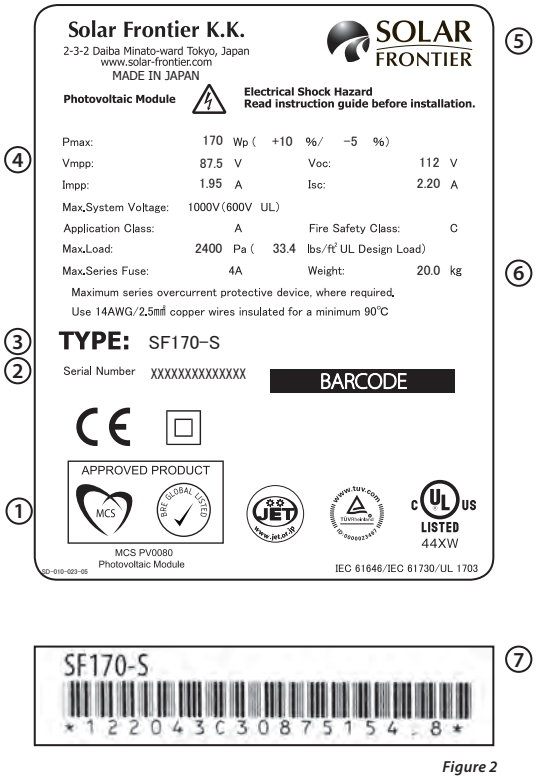


Figure 2

1. Barcode for internal purposes
2. Technical Data –DC input
3. Article number and product designation
4. Manufacturer
5. Protection Class II and CE symbols
6. Country of manufacture
7. Technical Data – AC output
8. Protection classification and grid-monitoring standard
9. Serial number (and barcoded serial number)

1. Certifications and protection classes
2. Serial number (and barcoded serial number)
3. Name of product
4. Technical data at STC
5. Manufacturer and country of manufacture
6. General product characteristics
7. Serial number on frame

3. General Safety Advice

Please ensure all necessary measures are taken to prevent accidents. The use of SolarSets in applications that may endanger human lives is prohibited, including in air and road transport systems. SolarSets must not be used for anything other than their expressed purpose.
Solar Frontier strongly advises you to follow the instructions below in order to avoid bodily injury, damage to property and/or death.

SolarSets sold by Solar Frontier GmbH may only be installed by authorized professionals (see 6.2). As soon as it becomes evident that safe operation is no longer possible (e.g. visible damage), remove the SolarSet immediately from the grid.

3.1 Safety advice for photovoltaic modules of type Solar Frontier SF170-S

- Installation, wiring, and maintenance of SF modules must only be carried out by licensed and trained persons.
- Ensure that all instructions and information related to SF modules and other balance of system components are fully understood prior to handling and installing a PV solar system.
- The front surface of SF modules should be covered with an opaque material during installation to decrease the potential of electrical shock.
- SF modules only generate direct current (DC) electricity.
- SF modules do not have the ability to store electricity.
- SF modules will experience higher voltage when connected in series and higher electrical current when connected in parallel.
- Only interconnect SF modules with similar electrical characteristics in series or in parallel to prevent system imbalance conditions and module damage.
- The PV array open-circuit voltage must never exceed the maximum system voltage (including in low temperature conditions).
- Leakage currents could create a shock hazard or fire.
- Do not disconnect operational modules or electrical arcing may occur. This may result in serious bodily harm or death.
- Do not use SF modules for purposes other than terrestrial power generation to prevent electrical shock, fire or other accidents.
- Do not artificially concentrate sunlight on modules using lenses or mirrors.
- Do not use light sources other than natural sunlight and general illumination for power generation.
- Do not use SF modules in water or liquid. There is a serious risk of electric shock, an electric leak or an accident.
- The level of leakage current must be limited in accordance with local regulations for safety reasons.
- Carefully check the polarity of the wiring before installing. Incorrect wiring may damage SF modules or appliances.
- Only use equipment, connectors, wiring and support frames suitable for solar electric systems.
- Wear appropriate protection and take all necessary precautions to prevent electric shock, especially when DC voltage exceeds 30 V.

3.2 Safety advice for the inverter SF-WR

- Install and use the device only after reading and understanding this document.
- Always perform the measures described in this document in the sequence specified.
- Keep this document in a safe place for the entire service life of the device. Pass the document on to subsequent owners and operators of the device.
- Improper operation can reduce the yields of the photovoltaic system.
- The device must not be connected to the DC or AC cables if it has a damaged casing.

- If one of the following components is damaged, immediately take the device out of operation and disconnect it from the mains grid and solar modules.
  - Device (not functioning, visible damage, smoke, etc.)
  - Cables
  - Solar modules
- The system must not be switched on again until:
  - The device has been repaired by a dealer or the manufacturer.
  - Damaged cables or solar modules have been repaired by a technical specialist.
- Never cover the cooling fins.
- Do not open the casing. This will void the warranty and could result in serious bodily harm or death.
- Factory labels and markings must never be altered, removed or rendered unreadable.
- Observe the respective manufacturer's manual when connecting an external device that is not described in this document (e.g. external data logger). Incorrectly connected devices can damage the inverter.

Safety advice on the inverter

Figure 3

① Dangerous voltages can remain present on the compo-nents up to 10 minutes after switching off the DC circuitbreaker **and** the line circuit breaker.

② Warning. There are 2 voltage sources present: powergrid, solar modules.

③ Disconnect both voltage sources from the device before working on the device:
The solar modules via the DC circuit breaker **and** the power grid via the line circuit breaker.

④ Read and follow the instructions!

4. Proper Usage

The SolarSet may only be used in grid-connected photovoltaic systems. The modules, inverter, cables, and connectors have been mutually calibrated for best performance. The connections may not be grounded.

Potential curves of the photovoltaic voltage U_{PV} at 350 V and 550 V

U_{PV} = Potential between plus and minus poles at the DC input

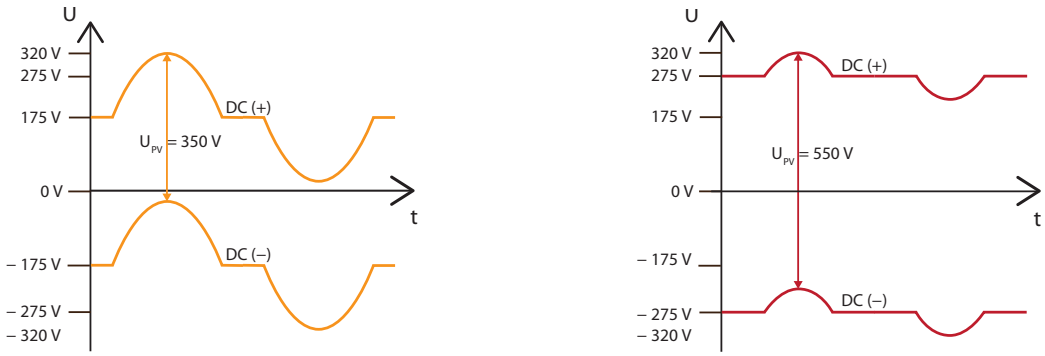


Figure 4

5. Scope of Delivery

The Solar Frontier SolarSet comprises the following components. The number of components required can be determined using the list below based on the type of SolarSet you have:

① Photovoltaic module Solar Frontier SF170-S
② Solar Frontier inverter SF-WR (incl. Inverter, Mounting plate and AC plug)
③ Connecting cable (Versions for + and -, with either 2, 3 or 4 outputs)
④ DC cable (in 50m or 100m)
⑤ DC plugs und DC sockets (5 of each in each package unit)
⑥ Unlocking tool
⑦ Installation Manual

	2.0	2.4	3.1	3.6	4.1	4.8	5.1	6.1	7.1	8.2
① **SF170-S**	12	14	18	21	24	28	30	36	42	48
② **SF-WR-XXXX**	1	1	1	1	1	1	2	2	2	2
③ **Connecting cable**	2	2	2	2	2	2	4	4	4	4
④ **DC cable [m]**	50	50	50	50	50	50	100	100	100	100
⑤ **Plugs & Sockets**	5	5	5	5	5	5	10	10	10	10
⑥ **Unlocking tool**	1	1	1	1	1	1	2	2	2	2
⑦ **Installation Manual**	1	1	1	1	1	1	1	1	1	1

Table 1

Not scope of the delivery are:

- Installation scaffolding and installation materials
- Tools for installation and confectioning of the cables

6. About this Manual

6.1 Contents

These instructions contain all information required by a technical professional for setting up and operating the inverters. Follow the instructions of the respective manufacturers when installing other components (e.g. AC cable, substructures).

6.2 Target audience

Unless otherwise indicated, the target audiences of this manual are technical professionals and system operators.
Technical professionals are, for example:

- Persons who have the knowledge of terminology and the skills necessary for setting up and operating photovoltaic systems.
- Persons who have the necessary training, knowledge and experience, and knowledge of the applicable regulations in order to evaluate and recognise the dangers inherent in the following work:
  - Installation of electrical equipment
  - Production and connection of data communication cables
  - Production and connection of mains grid power supply cables

6.3 Markings

6.3.1 Symbols

Symbol	Description	Location
	general danger warning	manual
	danger from electricity	manual device
	Read manual before using the product.	device

6.3.2 Keywords

Keywords used in conjunction with the symbols described above:

Keyword	Description
Danger	Immediate danger of death or serious bodily injury
Warning	Possible danger of death or serious bodily injury
Caution	Possible danger of light or medium bodily injury
Attention	Possible damage to property
Note	Tips on operation or usage of the manual

6.3.3 Markings used in the text

Marking	Description
√	Condition for action
▶	Single step
1., 2., 3., ...	Several steps in series
cursive	light emphasis
bold	strong emphasis
`Courier`	Designation of product elements such as buttons, displays, operating state

6.3.4 Abbreviations

Abbreviation	Description
A	Current in Amperes
AC	Alternating current
ca.	circa
i.e.	that is
DC	Direct current
Derating	Power reduction
DHCP	The use of DHCP allows automatic integration of the device into an existing network (Dynamic Host Configuration Protocol)
MSD	Internal grid monitoring of the inverter (Mains monitoring with allocated Switching Devices).
tot.	total
I	Current
I_k	Short circuit current
I_{mpp}	MPP circuit current
incl.	inclusive
kVA	Kilovoltampere
kW	Kilowatt
kWh	Kilowatthour
m	Meter
m^2	Square meter
MPP	maximum power point
MPP tracker	Controls the power of the connected module strings to match the MPP
Nm	Newtonmeter
P	Electrical power
Pa	Pascal
PV	Photovoltaic
SELV, TBTS, MBTS	Schutzkleinspannung (EN: Safety Extra Low Voltage; FR: Très Basse Tension de Sécurité; ES: Muy Baja Tensión de Seguridad)
SF	Solar Frontier
STC	Standard Test Conditions
U	Voltage
et al	and others
U_L	Open circuit voltage
U_{mpp}	Voltage im Maximum Power Point
U_{PV}	The generator voltage present at the DC connection (photovoltaic voltage)
etc.	and so on
V	Volt
W/m^2	Watt per square meter
e.g.	for example
η	Efficiency

7. Composition of the Solar Frontier SolarSets

Solar Frontier currently offers ten different Solarsets with nominal power outputs from 2.0 kW to 8.2 kW. The SolarSets consist of Solar Frontier modules, Solar Frontier inverter(s), the necessary connecting cables, DC cable and plugs and sockets.

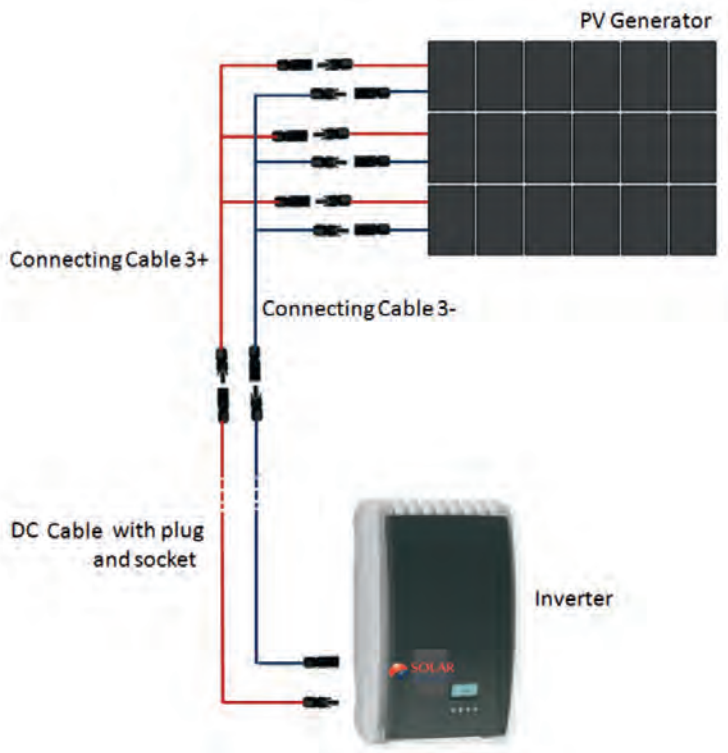
Table shows the exact composition of each SolarSet, including the electrical structure:

Position	Description	2.0	2.4	3.1	3.6	4.1	4.8	5.1	6.1	7.1	8.2
Module	SF170-S	12	14	18	21	24	28	30	36	42	48
Inverter	SF-WR-3000	1	1	1	1			2	2	2	
Inverter	SF-WR-3600					1					2
Inverter	SF-WR-4200						1				
Roof Area	Area in m^2	15,6	18,2	23,4	27,3	31,2	36,4	39	46,8	54,6	62,4
Module	Number in Series	6	7	6	7	6	7	6	6	7	6
Strings	Number parallel	2	2	3	3	4	4	5	6	6	8
Connecting cable	2+	1	1					1			
Connecting cable	2-	1	1					1			
Connecting cable	3+			1	1			1	2	2	
Connecting cable	3-			1	1			1	2	2	
Connecting cable	4+					1	1				2
Connecting cable	4-					1	1				2
DC cable	50 Meter	1	1	1	1	1	1				
DC cable	100 Meter							1	1	1	1
Plugs	5 pces	1	1	1	1	1	1	2	2	2	2
Sockets	5 pces	1	1	1	1	1	1	2	2	2	2
Unlocking tool	Number	1	1	1	1	1	1	2	2	2	2

Table 2

Schematic structure based on SolarSet 3.1

Figure 5 shows the schematic structure of the SolarSet. The modules are connected serially to strings. The outputs of each single string are drawn together using the appropriate connecting cable. The connecting cables have to be assembled on the spot, and serve to extend the connection to the inverter.



The connecting cables have two, three or four outputs depending on the plant size. Cables are provided for each polarity (plus and minus).

Figure 5

8. Installation

For a safe installation, all relevant national and local laws, regulations and directives, especially for accident avoidance, as well as all relevant technical standards are to be adhered to.

8.1 Mounting system/ substructure

The SolarSets are delivered without mounting systems. In general, all mounting systems commercially available, are suitable (e.g. Novotegra (MHH), HatiCon, K2 Mounting Systems, Easy Roof (IRFTS), Schletter, Tritec) provided that the installation is in accordance with the requirements indicated in 8.2.3. Your installer will be able to suggest a suitable solution.

8.2 Mechanical installation of Solar Frontier SF170-S photovoltaic modules

8.2.1 Site location

- Ensure that the maximum wind and snow loads in local conditions do not exceed the SF module maximum load ratings.
- Avoid installing SF modules in areas where they are exposed to oil vapour and /or corrosive gas.
- Avoid accumulation of grit or dust on the SF modules as it may influence the output yield.
- Do not expose SF modules to sulphurous atmospheres.
- Do not install SF modules in locations where flammable gases accumulate or flow as there is a risk of sparks from SF PV modules.
- Do not install SF modules near fire.
- Avoid installing SF modules in locations where they may be covered by permanent shadows. This may adversely affect their performance.
- Do not install SF modules in locations where temperatures exceed the temperature range indicated in the module's technical specifications

8.2.2 Module handling instructions

- Do not disassemble or modify SF modules. This may result in an electric shock, fire or other accidents. Solar Frontier cannot be held responsible for any loss or damage caused by unauthorized disassembling, modification or misuse of SF modules.
- Do not drill additional mounting holes into the aluminum frame. Only pre-drilled holes should be used.
- Avoid placing any stress onto the SF modules, cables or connectors.
  (Minimum bending radius of 39 mm for module cables is recommended)
- Do not stand or step on SF modules. This may result in damage to the module and/ or bodily harm by falling.
- Do not drop SF modules or drop objects onto them. Both sides of the module (the glass surface and the back sheet) are fragile.
- Do not strike the terminal box or pull the cables. The terminal box can crack and break, while the output cable may unplug and cause electricity leakage or an electric shock.
- Do not scratch the back sheet or cables of the SF modules. Rubbing or scratching may result in an electric shock, electric leakage or an accident.
- Do not scratch the insulation coating of the frame (except for the grounding connection). This may weaken the strength of the frame or cause corrosion.
- Do not cover the water drain holes of the frame. Doing so may cause frost damage.
- Do not use glue when closing the cover of the junction box. Similarly, do not use a sealant to bond the junction box lid to its base.

8.2.3 Module mounting instructions

Mounting structures cautions

- Pay attention to the electrochemical series when selecting support structure material to avoid galvanic corrosion.
- Fasten and lock bolts completely. Inadequate mounting may result in SF modules falling or other accidents.
- Ensure that the SF modules are securely fastened to the mounting support structure that is durable, made of UV and corrosion resistant material, and follow the applicable local and civil codes.
- Ensure that your mounting support structure is designed to withstand the SF module design snow and wind loads applicable for the chosen site. Solar Frontier will not be responsible if the SF modules are damaged due to the durability of the mounting support structure. Please consult your mounting structure manufacturer.

Mounting the solar modules

- PV modules should typically face South in the Northern Hemisphere and North in the Southern Hemisphere for optimal power production.
- Modules can be installed horizontally (landscape) or vertically (portrait).
- Maintain a space between SF modules and the roof. This will allow air to circulate, cooling the module, and allowing condensation to dissipate. Solar Frontier recommends a distance of at least 100 mm (3.94 in).

Mounting with Screws

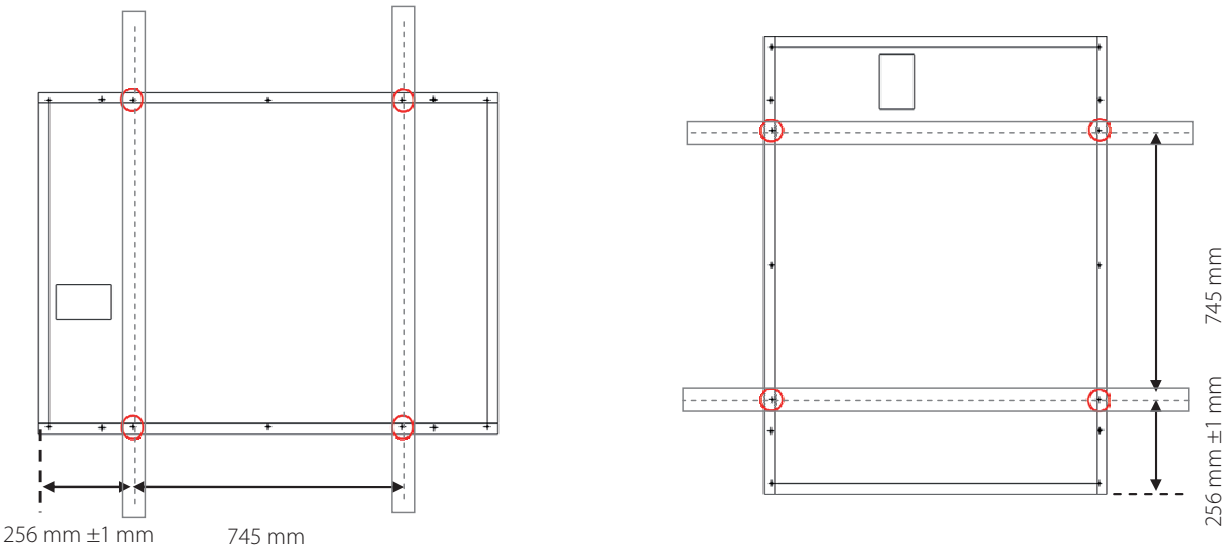
SF modules should be fastened to the support structure using the mounting holes on the frame. The support structure should be securely fastened to a non-corrosive roof.

Mounting with Inner Holes

Each module will require four M6 (or 1/4 in) bolts with washers, lock washers and nuts. Tighten the screws with an adequate torque value.

UL: Recommended tightening torque is 8 Nm (70.8 lb in) minimum.

TUV: 2,400 Pa (50 lbs/ft²) to the front and back of the module



Landscape (horizontal) **Portrait (vertical)** *Figure 6*

UL: 1,600 Pa (33.4 lbs/ft²) to the front and back of the module

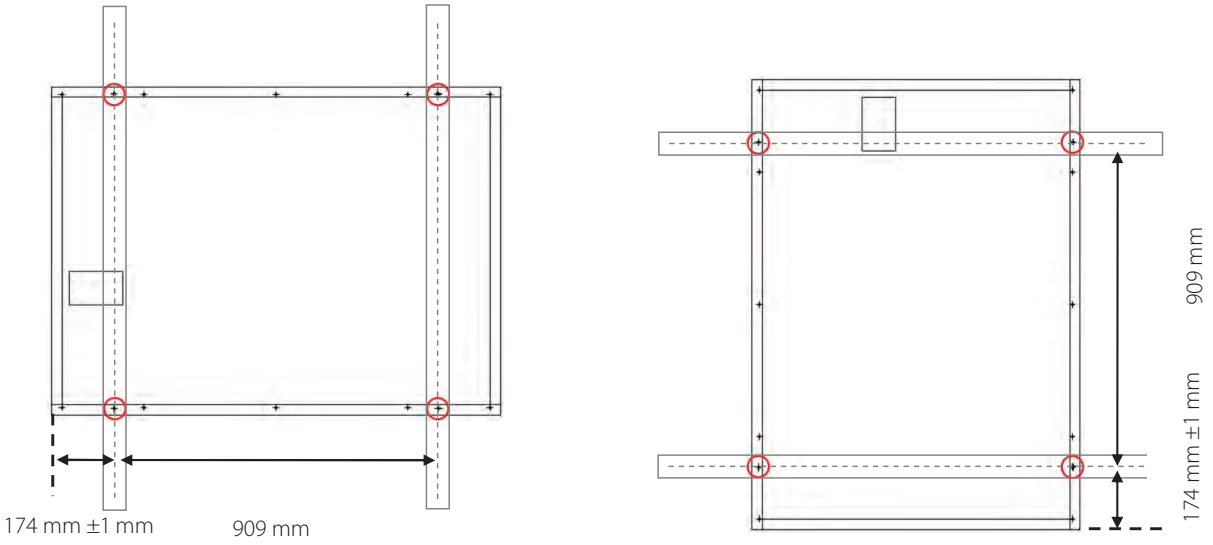
1.5 times the design load is applied to the module during UL testing. 2,400 Pa (50 lbs/ft²) is applied to test 1,600 Pa (33.4 lbs/ft²) UL design load.

Mounting with Outer Holes

Each module will require four M8 (or 5/16 in) bolts with washers, lock washers and nuts. Tighten the screws with an adequate torque value.

UL: Recommended tightening torque is 15 Nm (132.8 lb in) minimum.

TUV: 2,400 Pa (50 lbs/ft²) to the front and back of the module



Landscape (horizontal) **Portrait (vertical)**

Figure 7

UL: 1,600 Pa (33.4 lbs/ft²) to the front and back of the module

1.5 times the design load is applied to the module during UL testing. 2,400 Pa (50 lbs/ft²) is applied to test 1,600 Pa (33.4 lbs/ft²) UL design load.

Please refer to further instructions and adequate torque value provided by the screw manufacturer.

Mounting with clamps

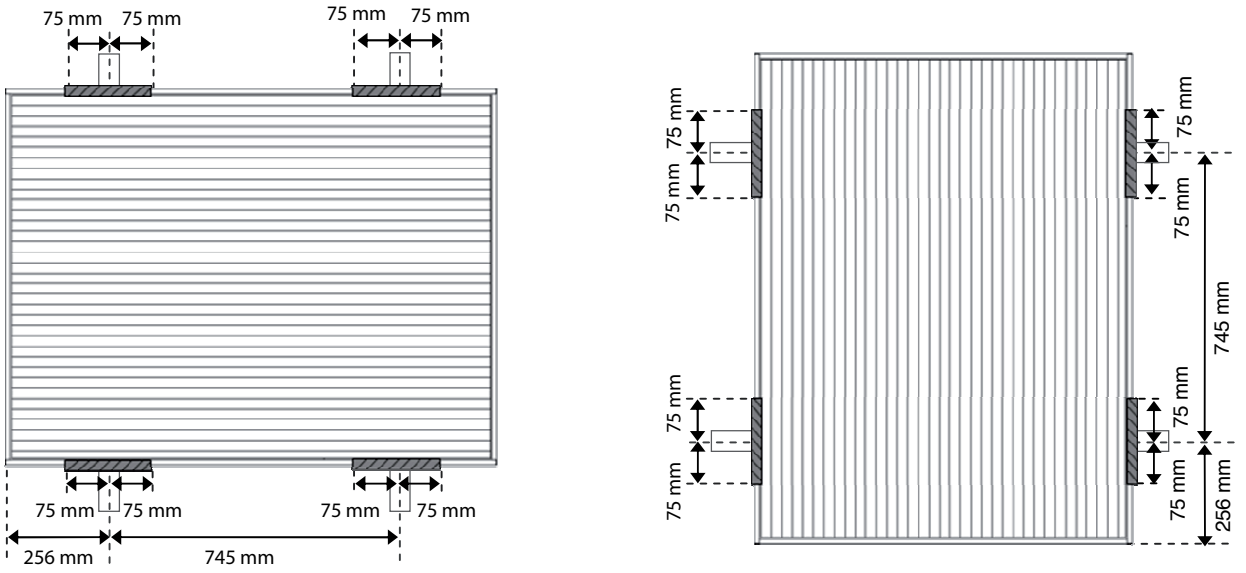
Four or more corrosion-proof aluminum clamps should be used to fasten SF modules to the support structure. Center-line of the clamps shall be secured within the indicated clamping zone (256 mm +/- 75 mm) from the corners of the longer side of the module frame using stainless-steel M8 bolts with a minimum length of 20 mm. Tighten the clamps with an adequate torque value.[*1]
All selected module clamps must be at least 50 mm long, 3 mm thick, and overlap the module frame by 8 mm or more.

Clamps must not create shadow nor cover the front glass, and shall not deform the module frames during installation. Please refer to the instructions provided by the clamp manufacturer for further instructions.

[*1] **UL:** Recommended tightening torque is 15 Nm (132.8 lb in) minimum.

TUV: 2,400 Pa (50 lbs/ft2) to the front and back of the module
UL: 1,600 Pa (33.4 lbs/ft2) to the front and back of the module
1.5 times the design load is applied to the module during UL testing. 2,400 Pa (50 lbs/ft2) is applied to test 1,600 Pa (33.4 lbs/ft2) UL design load.

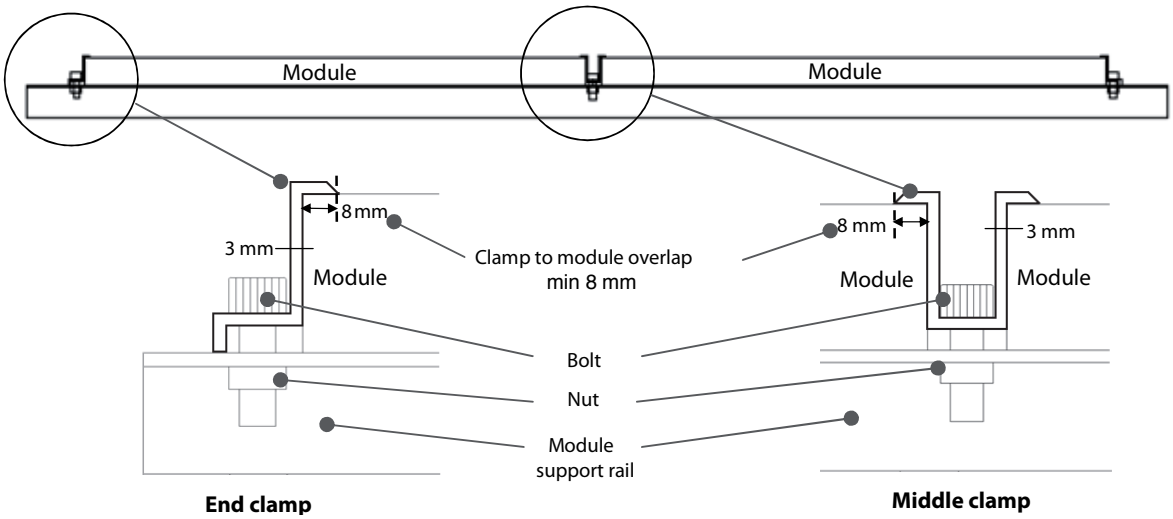
Module perpendicular to support rails



Landscape (horizontal) **Portrait (vertical)**

Figure 8

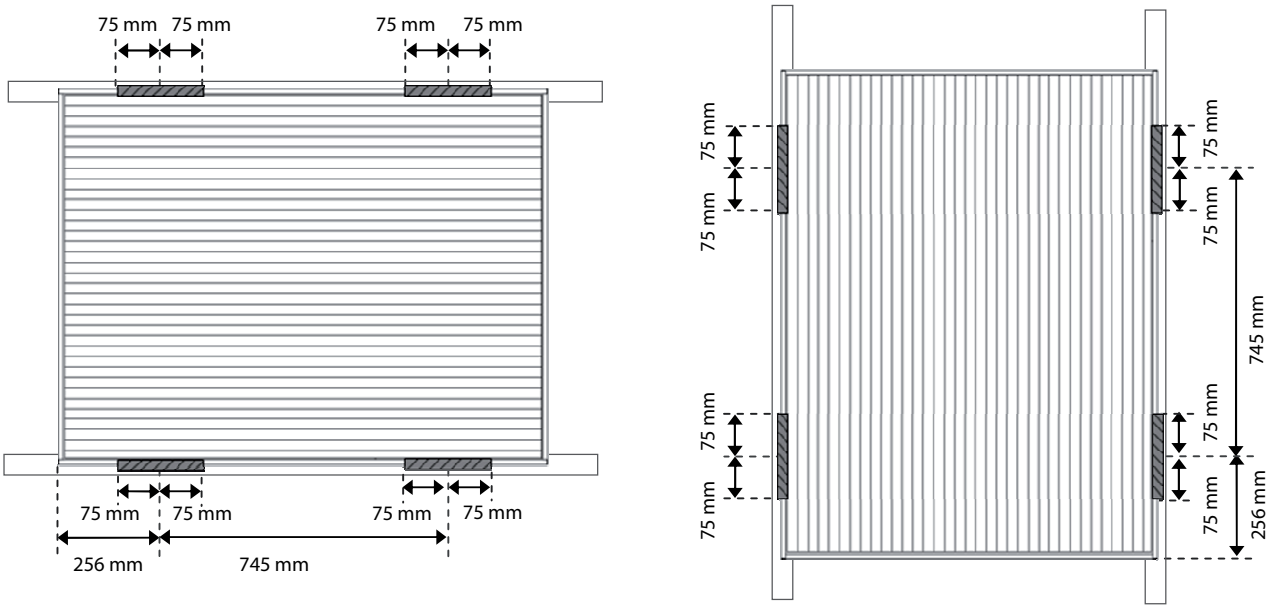
Array Installation (section)



End clamp **Middle clamp**

Figure 9

Module parallel to support rails



Landscape (horizontal)

Portrait (vertical)

Figure 10

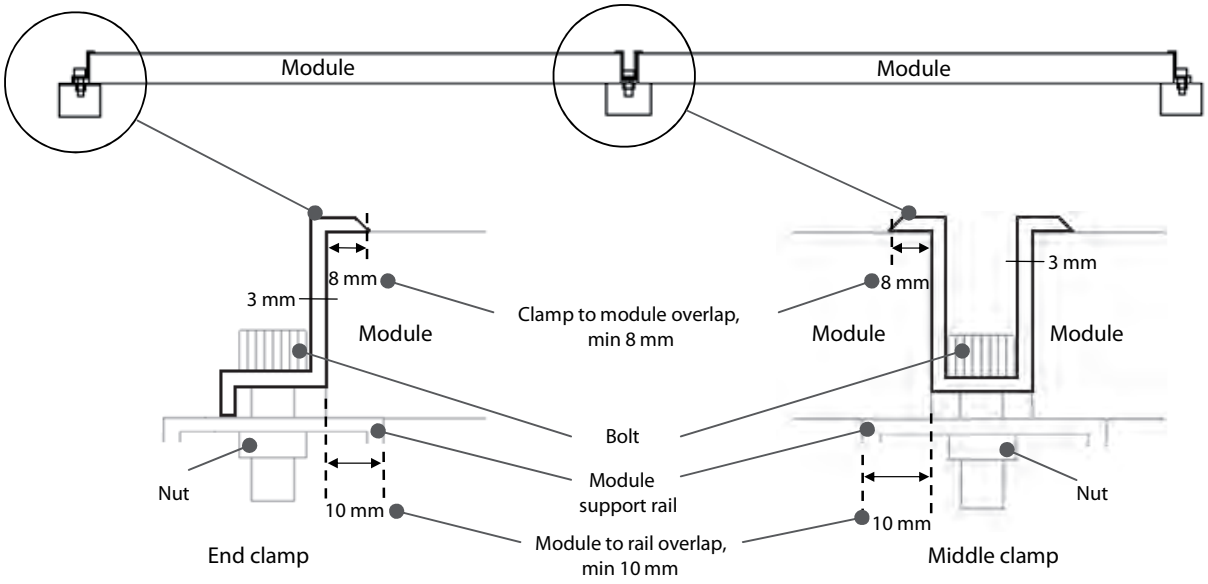


Figure 11

For alternative mounting methods, please consult Solar Frontier.

8.3 Electrical installation photovoltaic generator

8.3.1 Electrical wiring safety precautions

- The sum of Voc of modules in series must not exceed the maximum system voltage of the module under any condition. Reverse current applied to the modules must not exceed 7 A.
- Do not touch or handle the PV module, terminal box or the end of output cables with bare hands.
- Do not carry out installation when PV modules, installation tools or installation area are exposed to water.
- Ensure that the connection parts between SF modules and power receiving devices are isolated and waterproof. Using SF modules with insufficient isolation and waterproofing could result in an electric shock, an electric leak or an accident.
- Keep the wiring box (junction box) and the module connector away from any liquids until connectors are mated. Failure to do this may cause faulty wiring.
- Components interconnecting the modules must be compatible with the connectors, and must provide system operation and fault protection.
- Inverters must meet the technical requirements of SF modules.
- Do not connect the PV modules directly to loads such as motors. Variation in output power may damage the motor.
- Observe and understand the safety instructions of batteries. Their misuse can result in serious bodily harm due to high electrical current.
- Cables should be adequately protected from damage by wildlife

8.3.2 Cabling

Solar Frontier places great value on delivering as many components as possible pre-assembled in order to help avoid sources of error. Since roof and PV installation has its own specialities, it may be necessary to adapt certain cables on site to fit them best (e.g.: connections cables to the inverter shall be cut and assembles on site, and/or extension cable will be necessary to wire around interrupted strings on the roof of obstacles exist such as chimneys). The DC cable, sockets and plugs which are included in the SolarSet are for this purpos. A suitable crimping tool is necessary but excluded of the SolarSet).

Please ensure a clean and proper assembly of the cables to avoid error sources and to ensure safe cabling.

To assemble the cables the following tools are necessary:
- Mounting key (not scope of the delivery)
- Crimping tool for twisted contacts (not scope of the delivery)
- Insulation stripping pliers (not scope of the delivery)

Shortening and stripping the insulation from cables

First, the cable has to be shortened to the proper length. Then the outer insulation is removed with a suitable insulation stripping pliers to a length of 7 mm.

Ensure that the wires are not damaged – a reduction of the cross-sectional area can result in electrical errors.

See Figures 12 and 13:

Figure 12

Figure 13

Crimping the twisted contacts

Push the stripped end of the cable into the crimp sleeve as shown in Figure 14 Make sure that all wires are inside the crimp sleeve. The wires must be visible in the small opening.

Figure 14

To crimp the sleeves use the„hex" or„4-ident" crimp die. Put the crimp sleeve with the cable in the respective slot on the crimp pliers. The crimping tool must be suitable for drilled crimp contacts of the type Amphenol Helios H4. For more detailed information on using the crimp pliers please consult the operations manual of the pliers manufacturer.

See Figures 15 and 16:

Checking the crimping results

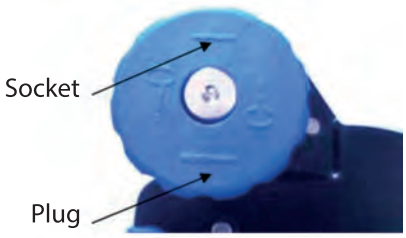


Figure 15

Figure 16

A visual check of the crimping results, and a pull test are needed to ensure a correct crimping.
Figure 17 and Figure 19 show a good result for a„hex" crimping; Figure 18 and Figure 20 show a good result for a„4-ident" crimping:

Figure 17

Figure 18

Figure 19

Figure 20

The pull test should be for at least 310 Newton.

Assembling the plugs and sockets

To assemble the plugs and socket the respective cover should be pushed over the contact until a clear click is heard or felt. The click shows that the contact is in the right position in the plug/socket. Contacts cannot be released when they have been positioned.

See Figures 21 to 24:

Figure 21

Figure 22

Figure 23

Figure 24

The covering cap is to be tightened with 2.6 to 2.9 Nm. A suitable installation spanner can be used for this purpose.

Figure 25

Figure 26

Connecting and disconnecting the plug/socket combination

Connect the plug and socket to each other. A click shows that the connection has been successful. To open and disconnect the plug/socket combination a suitable tool is necessary. This could be a disconnecting tool as delivered or another suitable tool.

See Figure 27.

Never disconnect plug/socket combinations when the plant is in operation in order to avoid light arcing, which can lead to serious injury or death.

Figure 27

8.3.3 Procedures for electric cabling

The electrical cabling of Solar Frontier SolarSets has to be done as described in Chapter 7, Table 2. Take care that the exact number of modules in series are connected in accordance with Table 2, and that the respective number of parallel strings is adhered to.

String connection

The serial connection of modules should be done in accordance with 8.3.5, Figure 31 and 32.

Procedure by interrupted strings:

If it isn't possible to connect modules directly, the plugs, sockets and DC cable provided can be used to bridge gaps.

An exemplary approach is shown in 8.3.5, Figure 33 and 34. The basics on assembling an extension cable can be found in Chapter 8.3.2 Assembly. Please note that only a limited number of plugs/sockets are provided in the set, and that the cable provided is primarily for the extension from the generator to the inverter.

If you should need extra material, please ensure that the compatibility to the SolarSet products is confirmed. If in doubt please contact Solar Frontier.

Connecting the strings

The string connecting cable in the set is used to connect the strings and lead them to a mutual collection point. The number of strings can be determined in Chapter 7, Table 2.

DC cable

The DC cable is used to extend the connecting cables in the PV generator with the inverter. Basics on assembling the cable can be found in chapter 8.3.2

Connecting to the inverter

The connection of the PV generator to the inverter is described in detail in chapter 8.4. Please ensure that the instructions and procedures described there are strictly adhered to to avoid possible danger sources and to ensure a safe installation.

8.3.4 Grounding

Grounding cautions

- Be aware of the necessary grounding requirements prior to installation. Your local authorities can help you further.
- Install arrestors, surge absorbers or any other appropriate lightning protection tools as needed.
- Module frames, mountings, connection boxes and metal conduits should be connected to an earth ground as lightning protection, in accordance with local, regional and national standards and regulations.
- Grounding holes (ϕ 4 mm) on the aluminum frame of the SF modules are provided to accommodate grounding. Use a grounding wire made of copper, not smaller than 2 mm^2 (14AWG). Temperature rating of the conductors must be between -40 °C to 85 °C. Ensure that the crimping terminal is tightly tied to the module frame with a rolling thread screw and a lock washer to ensure electrical contact.
- Grounding devices such as module clamps with an integrated grounding pin, serrated washers, grounding clips or lugs, designed for bonding photovoltaic modules to the mounting structures may also be used for grounding as described in NEC section 250. These grounding devices shall be made in conformance with the grounding device manufacturer instructions. Consult the grounding device manufacturer to identify the appropriate grounding and bonding device for your mounting structure or design.

For alternative grounding methods please consult Solar Frontier.

UL: The module with exposed conductive parts is considered to be in compliance with UL 1703 only when it is electrically grounded in accordance with the instruction presented below and the requirements of the NEC.

Earth by connecting from ⏚ to earth.

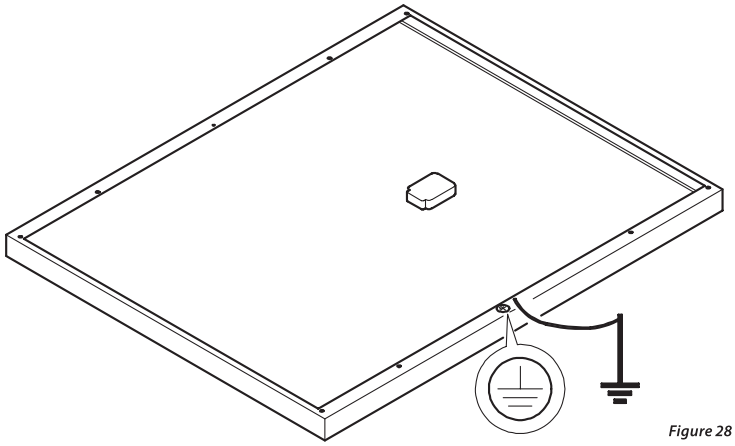
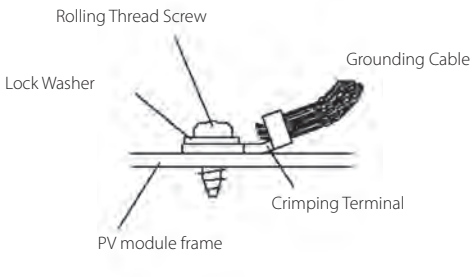


Figure 28

Grounding (IEC)



Grounding with washer (UL)

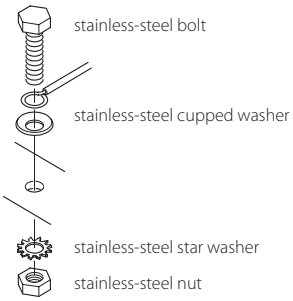


Figure 29

Use M4 bolt (torque value 1.5 Nm) or standard gauge size #6 bolt (torque value 1.0 Nm). Tighten the bolts or screw with an adequate torque value. Please refer to further instructions provided by the screw or bolt manufacturer.
UL: Recommended tightening torque is 1.5 Nm and 1.0 Nm minimum for M4 and standard size #6 bolt respectively.

8.3.5 Electrical wiring

- A set of cables with a plastic connector for each polarity is supplied with SF modules. Use these to connect modules.
- Do not open the junction box.
- Fasten the module cable to the frame or to the mounting system in order to avoid any stress to the connector.
- Cables drooping from the terminal box are hazardous and must be avoided.
- Cables should be secured so they are not exposed to direct sunlight (such as behind the module).
- The sum of Voc of modules in series must not exceed the maximum system voltage rating of the module under any condition, even at low temperature.
- Reverse current applied to the modules should not exceed 7 A under any condition.
- Minimum cable diameter: 2.5 mm^2.

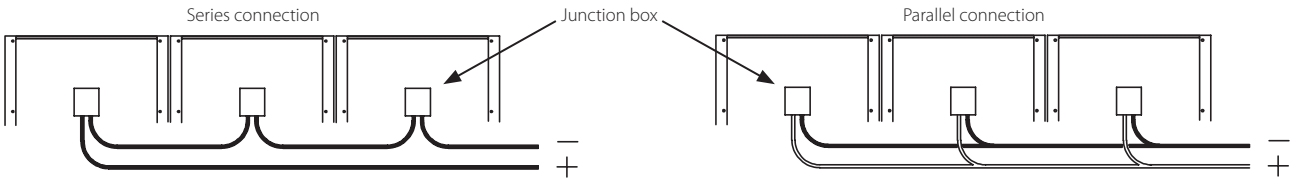


Figure 30

Carry out installation and wiring work in compliance with all relevant health, safety and environment laws and regulations.

Schematic structure of standard module cabling

The standard module cabling is applicable for modules mounted in portrait and landscape direction. Modules connected in series make up a string. The string cabling can be done as shown in Figure 31 and Figure 32. The strings are picked up with the delivered connecting cables one on each side and led to a mutual collection point.

Landscape:

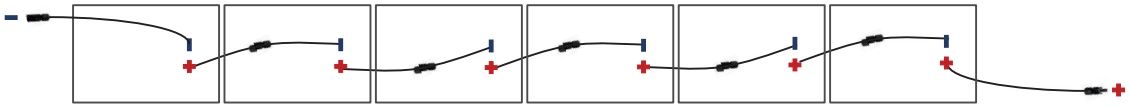


Figure 31

Portrait:

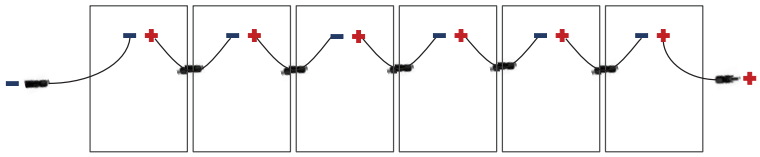


Figure 32

Schematic structure of standard cabling with interruption

If obstacles such as windows and chimneys exist on site, it is not possible to mount the modules directly next to each other. In cases like these, DC cable, plugs and sockets, which are provided with the kit, could be used as a bridge connection. A simple example is shown in Figure 33 and Figure 34:

Landscape:

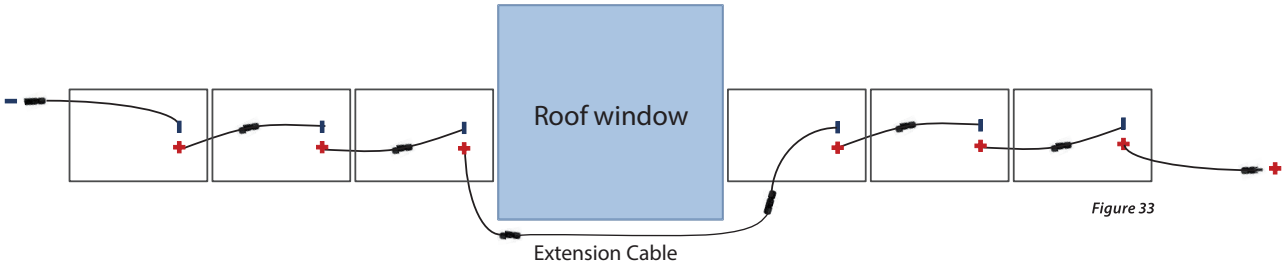


Figure 33

Portrait:

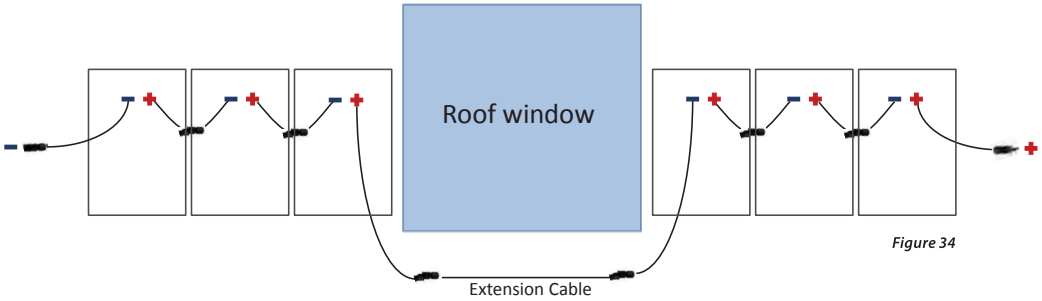


Figure 34

Schematic structure of cross cabling

Those modules connected in series make up a string. The string cabling should be done as shown in Figure 35:

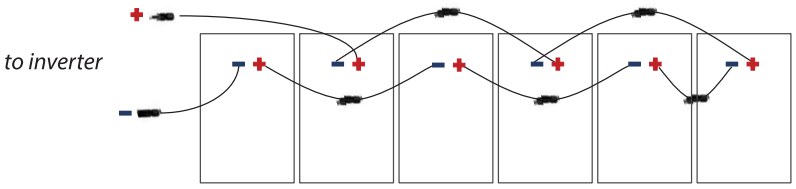


Figure 35

Cross cabling is used only for a portrait installation of the modules, whereby modules are alternately cross connected in series to optimize the use of the cable length. The serially connected modules make up a string. The wiring of one string should be effected as shown in Figure 35. The strings are picked up with the delivered connecting cable and led to a mutual collection point. The number of strings and the number of parallel strings can be found in Table 2 on page 11.

Schematic structure of cross cabling with interruptions

If obstacles such as windows and chimneys exist on site, it is not possible to mount the modules directly next to each other. In cases like these, DC cable, plugs and sockets, which are provided with the kit, could be used as a bridge connection. A simple example is shown in Figure 36:

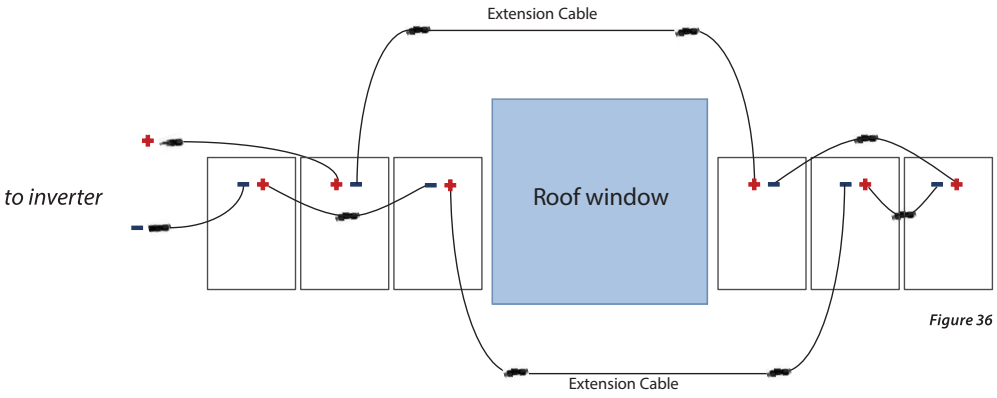


Figure 36

8.4 Installation Inverter SF-WR

8.4.1 Safety measures during installation

Observe the following safety notes when performing the work described in section *Installation*.

Danger

Risk of death by electrocution!

- Only technical professionals may perform the work described in section *Installation*.
- **Always** disconnect all DC and AC cables as follows before starting work on the inverter:
  1. Turn the AC circuit breaker to off. Take measures to prevent the system from being unintentionally switched on again.
  2. Set the DC circuit breaker on the inverter to position 0. Take measures to prevent the system from being unintentionally switched on again.
  3. Disconnect the Amphenol Helios H-4 connections of the DC cables according to the manufacturer's instructions. A special tool is required for this.
     Warning: DC cables carry voltage when the solar modules are subjected to sunlight.
  4. Pull out the AC plug from the inverter as described in section 8.4.9.
  5. Check that all pins of the AC plug are free of voltage. Use a suitable voltmeter for this (do not use a simple neon phase checker).
- Do not connect cables to the inverter until explicitly asked to do so in the instructions.
- Do not open the casing of the inverter.
- Connect only SELV circuits to the RJ45 sockets.
- Lay the cables such that the connection cannot come loose accidentally.
- When laying cables, ensure that no damage occurs to any of the constructional fire safety measures in the building.
- Make sure that no inflammable gases are present.
- Observe all applicable installation regulations and standards, national laws and connection values specified by the regional power supply company.

Attention

Danger of damage to the inverter or derating!

- The mounting location must satisfy the following conditions:
  - The mounting surface and immediate environment are permanently fixed, vertical, flat, non-inflammable and not subject to constant vibration.
  - The permissible ambient conditions are conformed to; *see Technical data Inverter,* 15.2.1.
  - The following free spaces must be present around the inverter:
    Above/below: at least 200 mm:
    At the sides/in front: at least 60 mm
- Do not install the inverter in areas where animals are kept.
- Observe the connection ratings specified on the type plate.
- The DC cables must not be connected to an earth potential (DC inputs and AC output are not galvanically isolated).

Attention

When transmitting data over a public network:

- Transmitting data over a public network can incur additional costs.
- Data transmitted over a public network is not protected from unauthorised access by third-parties.

Note

- Avoid exposing the inverter to direct sunlight.
- The display must be readable on the installed device.

8.4.2 Mounting the inverter

Fastening the mounting plate

Screw the mounting plate to the mounting surface using 4 screws:

- Use screws (and dowels etc.) appropriate for the weight of the inverter.
- The mounting plate must lie flat on the mounting surface and the metal strips at the sides must point forwards (Figure 37).
- Install the mounting plate vertically with the retaining plate ① at the top (Figure 37).

Note

More information on determining the optimum position for the mounting plate is provided in the attached information sheet.

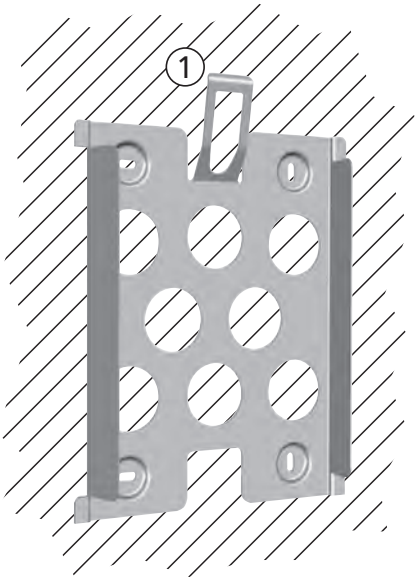


Figure 37

For Australia only: Mask off the *Protection Class II* symbol on the type plate

Note

When the inverter is used in Australia, the national regulations do not permit the *Protection Class II* symbol to be displayed on the type plate. The inverter is therefore supplied with a small sticker in the same bag as the AC plug.

Completely cover the *Protection Class II* symbol using the small sticker provided, as shown in Figure 38.

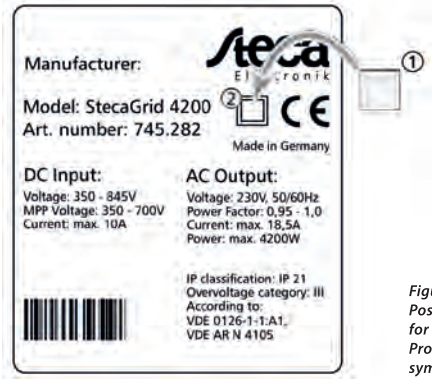


Figure 38
Position of the sticker for covering the Protection Class II symbol

Mounting the inverter on the mounting plate

1. Grasp the inverter by the recesses ①, position it ❶ in the middle of the mounting plate ② and press lightly (Figure 39).

2. Lower the inverter into place ③ until the retaining plate on the mounting plate clicks audibly into place. The hooks on the rear side of the inverter must slide over matching protrusions on the mounting plate.

3. The inverter must now sit securely on the mounting plate and can no longer be slid upwards.

Note

The procedure for removing the inverter from the mounting plate is described in 8.4.9

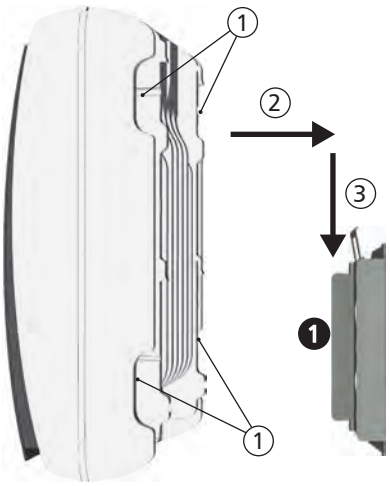


Figure 39

8.4.3 Preparing the AC connection

Line circuit breaker

Information on the required line circuit breaker and the cables to be used between the inverter and the line circuit breaker is provided in chapter 15.3.

Residual current circuit breaker

If the local installation regulations require the installation of an external residual current circuit breaker, then a Type A residual current circuit breaker as per IEC 62109-1, § 7.3.8. is sufficient.

Wiring the AC plug

Danger

Risk of death by electrocution! Observe the warning notes in 8.4.1!

Grid voltage 220 V ... 240 V

Wire the AC plug supplied as described in 19.2.

Grid voltage 100 V ... 127 V

Danger

Risk of death by electrocution! Never connect one of the phases L1, L2 or L3 to PE or N on the mains grid side.

Note

With a mains grid voltage of 100 V ...127 V, the inverter can be connected between the L1, L2 and L3 external conductors as follows:

2-phase mains grids

- N and L are connected between the L1 – L2 external conductors at the inverter side. See ② and ③ Figure 40.
- One of the two connected external conductors is connected to PE at the inverter side. This connection can be made within the AC plug or in an external junction box.
- Figure 40 shows an example of an inverter-side connection between L1 and PE:
  Above: Connection ① in the AC plug ⑤
  Below: Connection ④ in an external junction box ⑥).

3-phase mains grids

- N and L are connected between the L1 – L2 or L1 – L3 or L2 – L3 external conductors at the inverter side.
- Connect the external conductor on the inverter side to PE: as above.
- Figure 40: as above.

The external conductor voltages are shown in Figure 41.

1. Wire the AC plug supplied to match the selected external conductors, as described in chapter 19.2. Do not yet close the AC plug.
2. Connect one of the two connected phases to PE at the inverter side. Make this connection inside the AC plug or use an external junction box; see Figure 40.

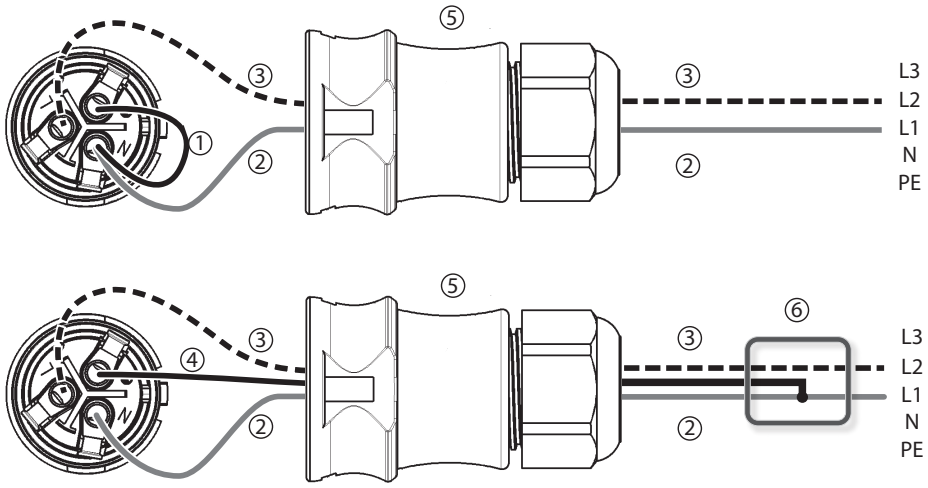


Figure 40
connecting N and PE
in AC plug (above)
or distribution box (below)

① Connection cable between N and PE with the connection point inside the AC plug
② External conductor L1
③ External conductor L2
④ Connection cable between N and PE with the connection point inside the junction box
⑤ Casing of the AC plug
⑥ Junction box

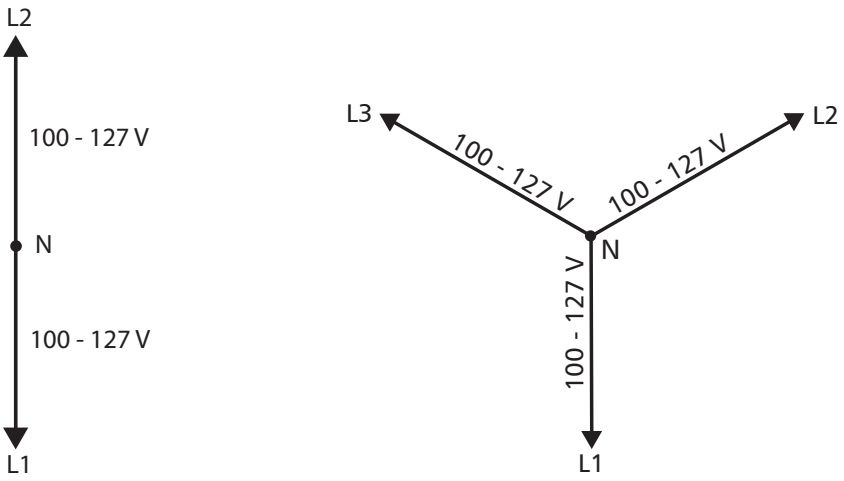


Figure 41
external conductor voltages
in 2- and 3-phase nets
with 100 V ... 127 V

8.4.4 Preparing the DC connections

Danger

Risk of death by electrocution!

Opposing Amphenol Helios H4 connectors must be attached to the DC cable to suit the Multi-Contact MC4 DC connections (opposing connectors included in Set).

Observe the warning notes in 8.4.1

Attention

Danger of damage to the inverter and the modules.

Connect the opposing connectors for the DC connections to the DC cable, observing the correct polarity.

Attach the Amphenol Helios H4 opposing connectors to the DC cable according to 8.3.2

8.4.5 Preparing the data connection cable

If a data connection is required, use a standard RJ45 cable (patch cable, Cat5) or construct an alternative data connection cable (see page 41).

8.4.6 Connecting the inverter and switching on the AC power

Danger

Risk of death by electrocution! Observe the warning notes in 8.4.1.

Attention

Maintain a minimum clearance of 200 mm between the data connection cables (RS485/Ethernet) and the DC /AC cables to prevent data transmission interference.

1. If necessary, establish a data connection:
   - Connect the inverter and master using the data connection cable.
   - Switch on the termination (slide switch) at the last inverter.
2. Push the Amphenol Helios H4 opposing connector of the DC cable firmly into the DC connection of the inverter until it audibly clicks into place.
3. Insert the AC plug into the socket on the inverter until it audibly clicks into place.
4. Switch on the AC line circuit breaker. The start page for initial commissioning is shown on the display.
5. Perform initial commissioning and switch on the DC supply, as described in 8.4.7 and 8.4.8.

8.4.7 Initial commissioning of the inverter

- Before connecting the PV system to the grid, ensure that the complete system has been checked, tested and approved in accordance with the relevant laws, norms, and regulations.
- Depending on local regulations only accredited personnel may connect the PV system to the grid, and commission it.

Function

Conditions for starting initial commissioning

Initial commissioning starts automatically when at least the AC connector has been installed and switched on as described previously. If initial commissioning is not fully completed then it starts anew the next time the device is switched on.

Guided initial commissioning

Initial commissioning is a guided procedure that sets the following information:

- Display language
- Date / Time
- Country
- Reactive power characteristic curve (if prescribed for the selected country)

Setting the country

The following applies when setting the country:

- The country set must always be the same as the country where the inverter is installed. This causes the inverter to load the prescribed grid parameters for the selected country. More information on this is provided in the table of countries, chapter 15.4.
- **The country can only be set once!**
- Contact your installer if you have set the wrong country.
- Contact your installer if you cannot select the country where your inverter is installed.
- The country setting does not affect the language used on the display. The display language is set separately.

Operation

Starting initial commissioning

√ The check list for initial commissioning is displayed.

- The **Language** entry is selected.
- The check boxes are not selected.

Notes

- When a check list item is called up the corresponding check box is automatically selected.
- The following items are only displayed when the use of a reactive power characteristic curve is prescribed for the country currently selected in the **Country** item:
  - **Reac. pwr. ch. c.** (type of reactive power characteristic curve)
  - **No. of nodes**[1)]
  - **Node 1**[1)]
  - **Node 2**[1)]
  - **Node n**[1) 2)]
  - **Display char. curve**

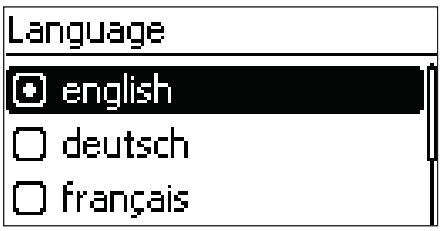
  [1)]: Is only displayed for reactive power characteristic curve type **Enter char. curve**.

  [2)]: Is only displayed when **no. of nodes** has been set to a value > 2.
- Initial commissioning is completed by calling up the **Finish** item.
- **Finish** can only be performed when **all other** checkboxes are selected.

1. Press △▽ to select a check list item.
2. Press **SET** to call up the item.

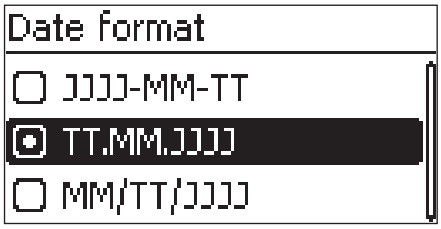
   The items are described in detail below.

Language



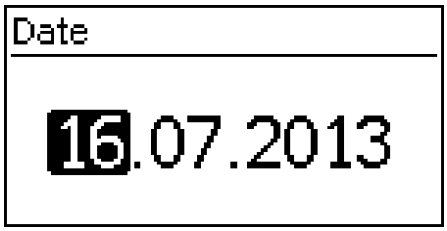
1. Press △▽ to select a display language.
2. Press **SET**. The language is adopted.
3. Press **ESC**. The check list is shown.

Date format



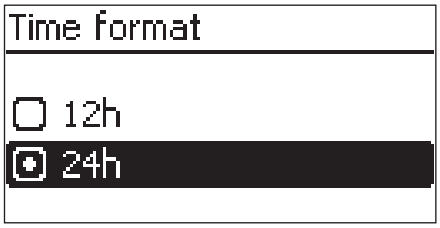
1. Press △▽ to select a date format.
2. Press **SET**. The date format is adopted.
3. Press **ESC**. The check list is shown.

Date



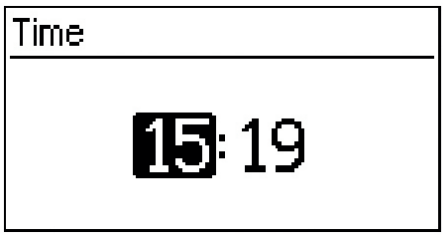
1. Press **SET**. The date flashes.
2. Press △▽ to change the day
3. Press **SET**. The change is adopted.
4. Press ▽. The month is selected.
5. Repeat steps 1 to 3 for the month.
6. Press ▽. The year is selected.
7. Repeat steps 1 to 3 for the year.
8. Press **ESC**. The check list is shown.

Time format



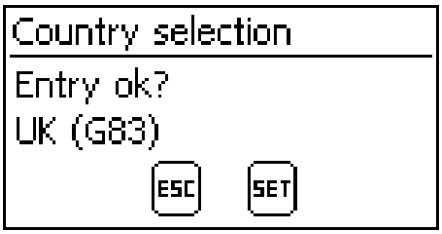
1. Press △▽ to select a time format.
2. Press **SET**. The time format is adopted.
3. Press **ESC**. The check list is shown.

Time



1. Press **SET**. The hour display flashes.
2. Press △▽ to change the hour.
3. Press **SET**. The change is adopted.
4. Press ▽. The minutes are selected.
5. Repeat steps 1 to 3 for the minutes.
6. Press **ESC**. The check list is shown.

Country selection

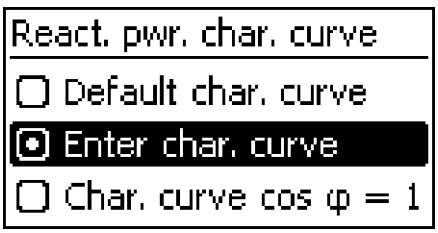


Note

The country can only be set once!

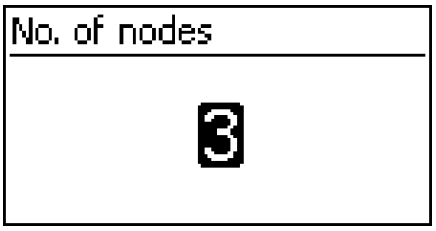
1. Press △▽ to select a country.
2. Press **SET**.
3. Press **ESC**. The dialogue shown at the left is displayed.
4. Press **ESC** to select a different country by performing step 1 and step 2, or
   Press **SET** for a longer period of time (> 1 s) to confirm the currently selected country.
   The check list is shown.

Reactive power characteristic curve



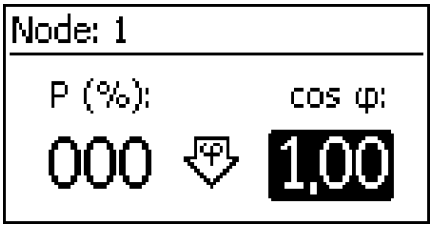
1. Press △▽ to select the reactive power characteristic curve corresponding to to the local regulations.
2. Press **SET**. The power characteristic curve type is adopted.
3. Press **ESC**. The check list is shown.

Number of nodes



1. Press **SET**. The value flashes.
2. Press △▽ to change the number of nodes.
3. Press **SET**. The value is adopted.
4. Press **ESC**. The check list is shown.

Node n



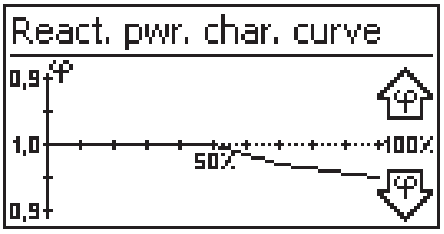
1. Press △▽ to select a parameter for the node.

Note

P % cannot be changed at the first and last nodes (000 %,100 %).

2. Press **SET**. The parameter value flashes.
3. Press △▽ to change the value.
4. Press **SET**. The change is adoptted.
5. Repeat steps 1 to 4 for the other parameters.
6. Press **ESC**. The check list is shown.

Display characteristic curve

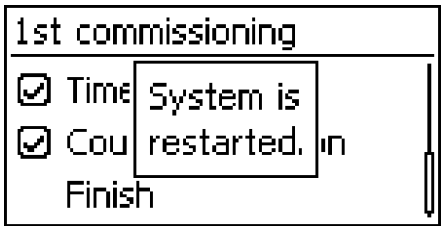


1. The previously set reactive power characteristic curve is displayed graphically (example in Fig. left).
2. Press **ESC**. The check list is shown.

Finish

√ **Finish** has been selected in the check list and **SET** has been pressed. One of 2 possible dialogues is displayed.

1. Proceed as follows, depending on the respective dialogue:
   - Dialogue *Settings are incomplete*: Press **SET** and and work through the open items in the check list.
   - Dialogue *Are all settings correct?*: Press **ESC** to correct settings or
     Press and hold **SET** (> 1 s) to finish initial commissioning.



2. If **SET** was pressed for a longer time then the inverter starts anew and synchronises itself with the grid (Fig. left).

8.4.8 Switching on the DC supply

▶ Set the DC circuit breaker on the inverter to position I (Figure 42).
After testing via the internal MSD (approx. 2 minutes), the power fed into the grid can be shown on the display (assuming that sunlight is present).

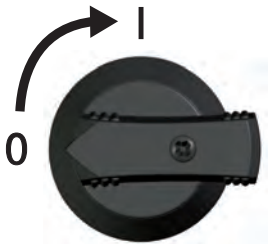


Figure 42
DC circuit breaker set to position I

8.4.9 De-installing the inverter

Danger
Risk of death by electrocution!
Only technical professionals may perform the work described in section *De-installing the inverter*.
Observe the warning notes in chapter 8.4.1.

Switching off AC and DC supplies

1. Turn the AC circuit breaker to off.
2. Set the DC circuit breaker on the inverter to position 0 (Figure 43).

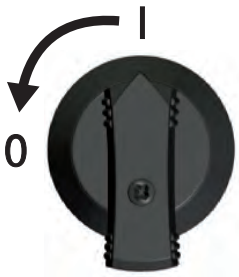


Figure 43
DC circuit breaker set to position 0

Disconnecting DC connections from the inverter

▶ Disconnect the Amphenol Helios H4 to Multi-Contact MC4 connections of the DC cable in accordance with the instructions of the manufacturer. A special tool is required for this.

Warning
DC cables are under current if light falls on the modules.

Disconnecting the AC plug from the inverter

1. Remove the AC plug from the socket on the inverter as described in chapter 19.2.
2. Check that all pins of the AC plug are free of voltage. Use a suitable voltmeter for this (do not use a simple neon phase checker).

Opening the AC plug (only if required)

Open the AC plug as described in the Appendix under Mounting ▶ AC plugs.

Removing the inverter from the mounting plate

1. Use one hand to press the retaining plate on the mounting plate approx. 5 mm towards the mounting surface ① (Figure 44)

2. Use the other hand to push the inverter upwards, far enough so that the retaining plate no longer latches ② Release the retaining plate.

3. Lift the inverter with both hands until the hooks on the rear side of the inverter are free ③

4. Remove the inverter from the mounting surface ④

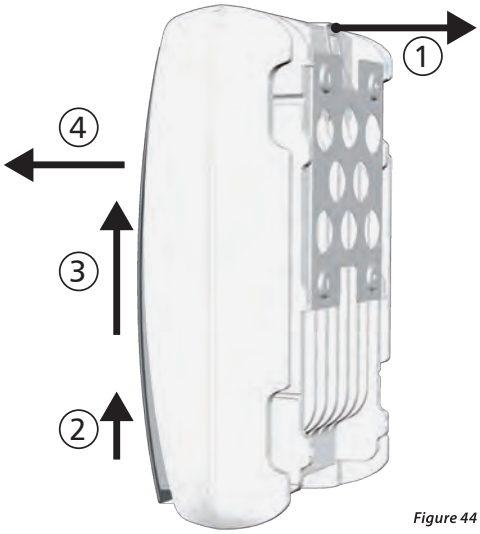


Figure 44

9. Structure and Function of the Inverter SF-WR

9.1 Casing

① Hood

② Display (monochrome, 128 x 64 Pixel)

③ Type plate, warning notices

④ Operating buttons: **ESC**, △ , ▽, **SET** (from left to right)

⑤ 1x AC connection

⑥ 2x RJ45 sockets (RS485 bus)

⑦ 1x Minus DC connection (–) for solar modules (Multi-Contact DC socket MC4, contact proof)

⑧ 1x RJ45 socket (Ethernet)

⑨ 1x Plus DC connection (+) for solar modules (Multi-Contact MC4 DC socket, contact proof)

⑩ DC circuit breaker (interrupts the plus and minus inputs simultaneously)

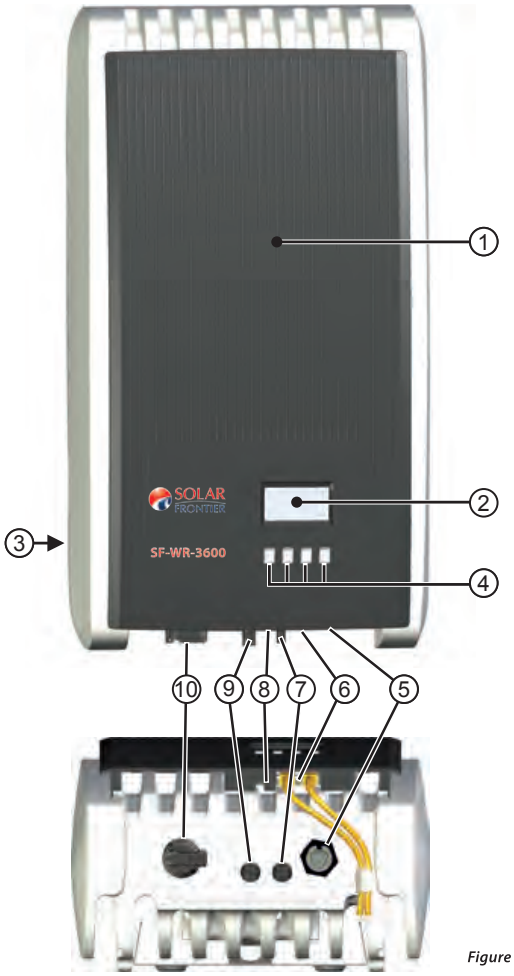


Figure 45

The casing components are described in detail below.

9.2 Operating buttons

The operating buttons (④ in Figure 45) have the following functions:

Button	Action	Function general	Guided configuration
ESC	Press briefly	jumps up by 1 menu level	navigates 1 step
		discards any changes	
	Press longer (≥ 1 second)	jumps to status display	jumps to the start of the guided configuration process
△	Press briefly	• moves the selection bar or the display content upwards • when performing numerical settings, moves the selection 1 position to the left • increases the setting value by 1 step	
▽	Press briefly	• moves the selection bar or the display content downwards • when performing numerical settings, move the selection 1 position to the right • decreases the setting value by 1 step	
SET	Press briefly	jumps down 1 menu level	–
		• a selected numerical value starts flashing and can be changed • accepts a change • changes the state for a control element (check box/ radio button)	
	Press longer (≥ 1 second)	answers a query dialogue with yes	navigates 1 step forward

Table 3

9.3 Display

9.3.1 General information

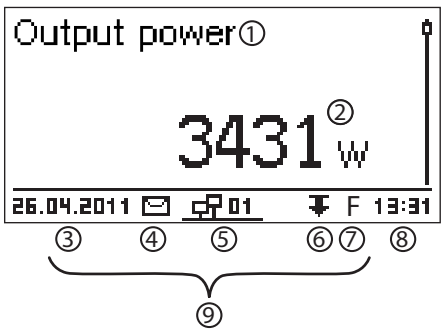
For information shown in the display (② in Figure 45) the following generally applies:

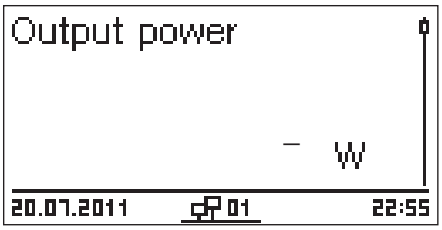
- Symbol ✳: the inverter is processing large amounts of data and is not able to process any user input at this times. The resulting waiting time is indicated by the animated sun symbol.
- Errors are indicated by a red flashing backlighting. An event message is also displayed at the same time.

9.3.2 Information

The information shown on the display is described below using illustrative examples.
The status display shows the following values:

Status display



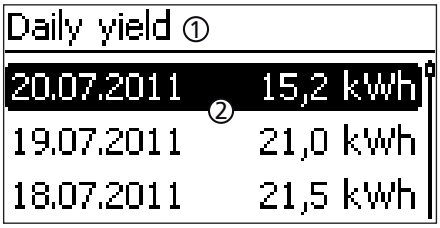


① Measurement name
② Measurement with units
③ Date
④ Symbol *non-confirmed event messages*; more information on this is provided in 9.9.
⑤ Animated *Connect* symbol with 2-digit inverter address; indicates data traffic on the RS485 bus.
⑥ Symbol *derating*
⑦ Symbol *Fixed voltage mode* activated
⑧ Time
⑨ IP address of the device when a network connection has been established, display alternates with ③ - ⑦

The following applies to the status display:

- The measurements shown in the status display are defined under **`Settings/Measurement values`**. Some measurements are always displayed (default setting).
- Current values are not displayed at night (solar irradiation too low; example in Figure left).
- The **`CO2 savings`** shown in the staus display are calculated using the savings factor of 508g/kWh

Numeric Yield (day, month, year)



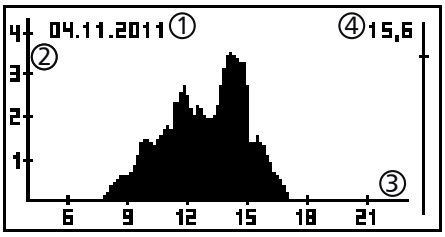
Daily, monthly and annual yield can be displayed numerically in a list.

① Yield period (day/month/year)
② Individual yields with period and value (1 per row)

The yield periods contain the following numbers of individual entries:
Day yield: last 31 days [1)]
Monthly yield: last 13 months [1)]
Annual yield: last 30 years [1)]

[1)] A yield value of 0 is shown when the inverter has not yet been installed at that time.

Graphical Yield (day, month, year)



Daily, monthly, and annual yields can be graphically displayed in a chart.

① Period for a single yield value (here: day yield).

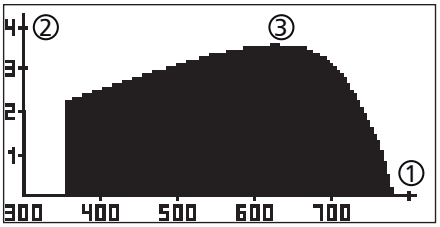
② y-axis:
- Yield in kWh
- With an extra M: yield in MWh
- The scaling changes depending on the maximum value

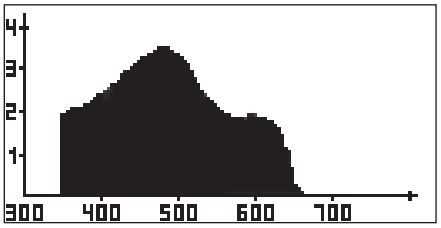
③ x-axis: time in hours / days/ months/ years

④ Total of all individual yields shown in the graph, in kWh; The graphical representation can show annual yields for the last 20 years.

Event messages (See section 9.9).

Generator characteristic curve





① x-axis: input voltage in V

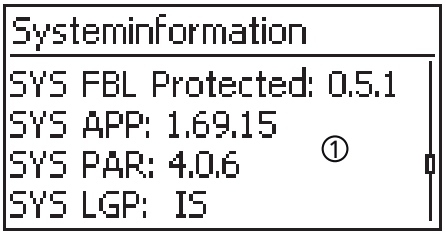
② y-axis: power in kW

③ Peak = MPP

When the *Generator characteristic curve* menu item is called, the inverter records the generator chracteristic curve of the generator and then displays it (see left). The following applies:

- The inverter traverses the input voltage range and records the power generated over this range. Duration: a few seconds, ✱ is displayed.
- The MPP is the peak of the generator characteristic curve.
- This peak and the generator characteristic curve change with the level of solar irradiation.
- Multiple peaks are a sign of partial shading (see example on the left).
- If the top of the curve is flat then the inverter may possibly no longer feed power into the grid.

Information



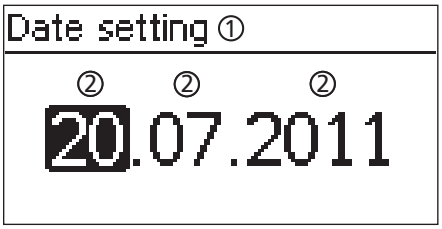
The **`information`** menu item contains the following submenu items:

- **`Contact information`**
- **`Systeminformation`** (see left):
  · Product designation
  · Serial number of the inverter
  · Information on the software and hardware versions of the inverter (see example ① on the left)
  · Inverter address
  · Version of the relevant operating instructions for the inverter.
- **`Country setting`**:
  currently set country and country-specific grid parameters.
- **`React.pwr.char.curve`**: reactive power characteristic curve graph (only when prescribed for currently set country)
- **`Network`**: network parameters, partially configurable under **`Settings`** > **`Network`**
  · **`DHCP status`**: DHCP on/off
  · **`Link status`**: Network connection state
  · **`IP address`**: IP address of the inverter
  · **`Subnet mask`**: subnet mask of the inverter
  · **`Gateway`**: IP address of the network gateway
  · **`DNS address`**: IP address of the DNS server
  · **`MAC address`**: hardware address of the inverter
- **`Result of the last self test:`** (only when the configured country is *Italy*)

9.3.3 Settings

The control elements shown on the display, which are used for performing settings in the inverter, are described below using illustrative examples:

Numerical settings



① Designation of the numerical setting.

② Value to be set; the selected value to be set is highlighted in black.

When performing numerical settings of remuneration and dates, the following applies:

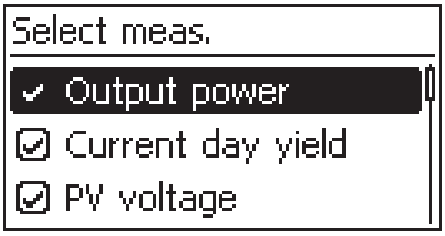
Remuneration

- Possible currencies: £ (pound), € (Euro), kr (Krone), `none`.
- The maximum value that can be set for remuneration is limited for technical reasons. The remuneration must be set using different units as required. Example: dollars instead of cents (set a currency of `none`).

Date

When setting the month/year, a check is performed to ensure that the selected day is valid. If not, then the day is automatically corrected.
Example: 31.02.2011 is corrected to 28.02.2011.

Selection of the measurements



Selection of the measurements to be shown in the status display. The following measurements can be selected:

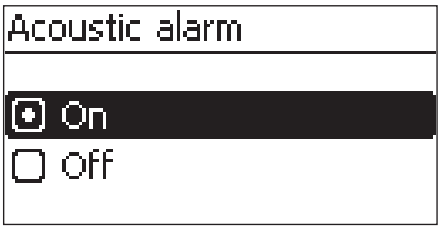
- `Output power`: output power of the inverter [1)]
- `Act. day yield`: daily yield since 0:00
- `PV Voltage`: voltage supplied by the solar modules
- `PV Current`: current supplied by the solar modules
- `Grid voltage` [1)]
- `Grid current`: current fed into the mains grid
- `Grid frequency`
- `Internal temperature`: internal temperature of the inverter.
- `Derating`: cause for the derating [2)]
- `Max. daily power`: maximum power supplied in the current day. [3)]
- `Absolute max. power`: maximum power ever fed into the grid. [3)]
- `Max. daily yield`: max. daily yield achieved [3)]
- `Operating hours`: the operating hours during which the device has been connected to the grid (including nighttime hours)
- `Total yield`: yield since commissioning
- `CO2 saving`: CO_2-savings achieved since commissioning

[1)] Measurement is always displayed (cannot be switched off)

[2)] Possible causes:
- internal temperature too high
- User default Power limiter
- frequency too high
- controlled by grid operator (feed-in management)
- delayed increase in power after starting

[3)] can be reset to 0 via: `Settings/Reset max. Values`

Acoustic Alarm

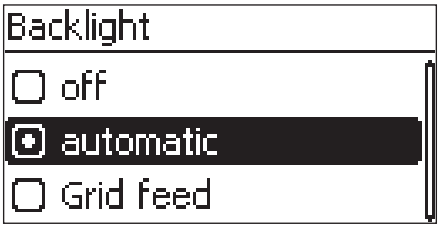


An acoustic alarm sounds (approx. 4.5 kHz) when an event message is displayed.

- 2 tones: warning
- 3 tones: error

The acoustic alarm is switched off with the factory default settings.

Backlighting



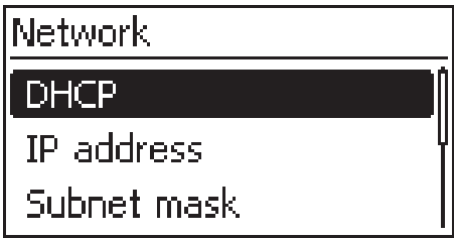
- **off**
- **automatic**: switches on for 30 seconds when a button is pushed.
- **Grid feed**:
  - Not feeding: switches on for 30 seconds when a button is pushed; then switches off.
  - Feeding: switches on for 30 seconds when a button is pushed; then dims.

Note:

The following section assumes that you know the parameters required for setting up the TCP/IP network connection. Consult (further) technical professionals if required.

DHCP is activated in the device ex-works. This allows automatic integration of the device in most networks.

TCP/IP-Network



Network settings, required for network communication, e. g. with an Internet portal:

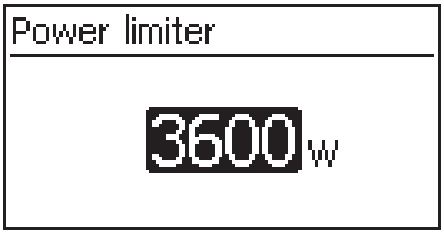
- **DHCP**: switch DHCP on/off
- **IP address**: IP address of the inverter
- **Subnet mask**: subnet mask of the inverter
- **Gateway**: IP address of the network gateway
- **DNS address**: IP address of the DNS server
- **Connection test**: Tests the Internet connection and then displays the result

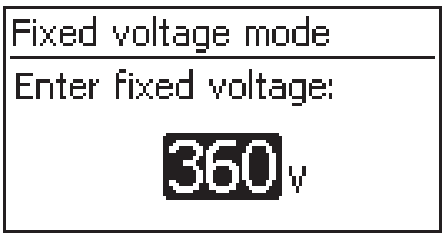
9.3.4 Service menu

The following section describes the service menu items. Some items have password protection.
You can also obtain the password from our technical support; see chapter 17.

Attention

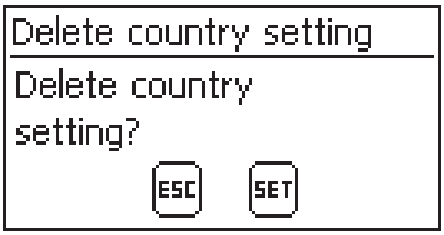
Risk of reduced yields. Inverter and grid parameters can be changed in the service menu. The service menu may only be used by technical professionals who can ensure that the changes do not contravene the applicable regulations and standards.

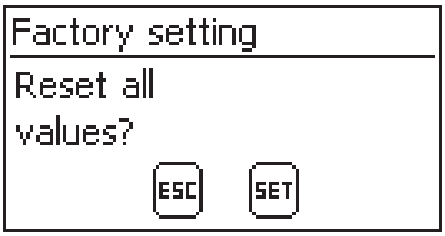
Power limiting	
	The inverter output power can be manually limited to a minimum of 500 W. When the power is manually limited, the `Derating` symbol is shown in the status display and the `Derating/Cause`: `User default` measurement is displayed.

Fixed voltage	
	The device can regulate the input voltage to a manually adjustable value. This switches off the automatic setting of the MPP (MPP tracking). The input voltage can be adjusted over a range between the maximum and minimum input voltage. Example of application: fuel cell.

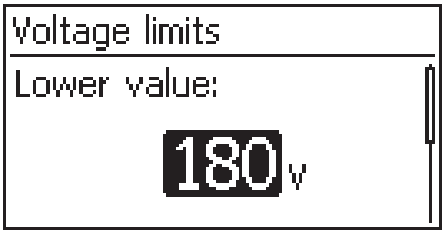
Attention

Before setting a fixed input voltage, make sure that the generator is suitable for this.
Otherwise, this may result in yield losses or damage to the system.

Delete country setting	
	After the country setting has been deleted, the device starts a new and displays the guided initial commissioning menu.

Factory setting	
	Resetting the device to the factory setting deletes the following data: • Yield data • Event messages • Date and time • Country setting • Display language After the factory setting has been deleted, the device starts a new and displays the guided initial commissioning menu.

Voltage limits (peak values)

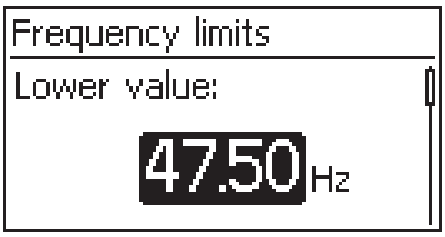


The following voltage limits can be changed:

- Upper disconnection value [1)]
- Lower disconnection value [1)] (figure left)

[1)] The disconnection value relates to the peak value of the voltage.

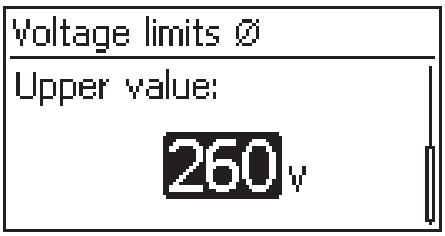
Frequency limits



The following frequency limits can be changed:

- Upper disconnection value.
- Lower disconnection value (figure left)
- Derating switch-on threshold (because frequency is too high)
- Frequency threshold when switching on again.

Voltage limits Ø (average value)

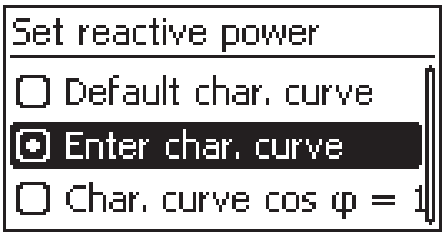


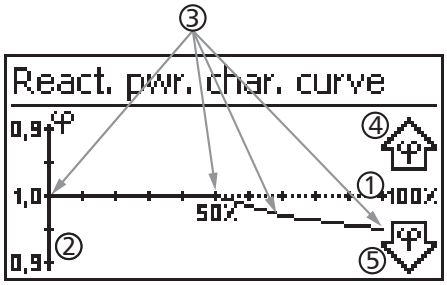
The following voltage limits can be changed:

- Upper disconnection value [1)] (Figure left)
- Lower disconnection value [1)]

[1)] The disconnection value relates to the average value of the voltage.

Reactive power characteristic curve - Overview



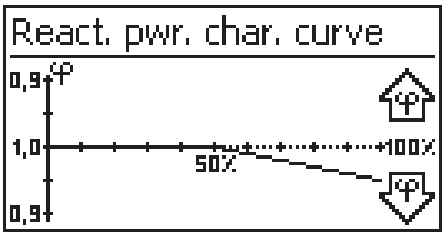


The reactive power characteristic curve must be set during initial commissioning if this is prescribed for the previously selected country. The following applies:

- 3 characteristic curves are available for selection (see left):
  - **`Default. char. curve`** (pre-defined)
  - **`Enter char. curve`** (manually adjustable)
  - **`Char. curve cos`** φ **`= 1`** (pre-defined)
- After configuration, the characteristic curve is diplayed as a graph (example left).

① x-axis, output power P in %
② y-axis, phase shift cos φ
③ nodes (in example: 4 nodes)
④ arrow symbol overexcitation
⑤ arrow symbol underexcitation

Technical details



- Each characteristic curve is defined by 2 to 8 nodes.
- A node is defined by the output power P of the inverter (x-axis) and the associated phase shift (y-axis).
- The phase shift can be set over a range of 0.95 (overexcitation) through 1.00 (no phase shift) to 0.95 (underexcitation)
- The type of phase shift is shown in the graph using arrow symbols defined as follows (defined from the point of view of the inverter:
  Overexcitation - inductive
  Underexcitation - capacitive
- The 3 characteristic curves available for selection have the following properties:
  `Default char. curve`: pre-defined according to the selected country (example left)
  `Char. curve cos` φ `= 1`: pre-defined with cos φ = constantly 1.00. this characteristic curve must be selected if no reactive power control is to be performed on the device.
  `Enter char. curve`: the number of nodes and their x/y values can be configured. Exceptions: the first node is always located at x (P%)= 0% and the last node is always located at x (P%) = 100%.

All parameters

Service technicians can use this menu item for changing additional MSD parameters.

9.4 Cooling

The internal temperature control system prevents excessive operating temperatures. When the internal temperature is too high, the inverter adjusts the power consumption from the solar modules to reduce the heat dissipation and operating temperature.
The inverter is convection cooled via fins on the front and rear side. A maintenance-free fan circulates the heat within the closed casing evenly over the entire surface of the casing.

9.5 Grid monitoring

The inverter constantly monitors the mains grid parameters while feeding the grid. If the grid deviates from the legally prescribed specifications then the inverter automatically switches off. When the grid conforms to the legally prescribed specifications then the inverter automatically switches on again.

9.5.1 Data communication

The device has the following communication interfaces:

- 1x RJ45 socket (Ethernet for TCP/IP network) for communication, e. g. with a central data server
- 2x RJ45 sockets (RS485 bus) for communication with external devices, e. g. a data logger

Data

The inverter can transmit a wide range of data to other devices. Some of this data is shown on the display and certain data is stored in the internal memory (EEPROM) as described below.

Displayed data

- Voltage and current of the solar generator
- Power and current fed into the grid
- Voltage and frequency of the power grid
- Energy yields on a daily, monthly and annual basis
- Error conditions, notes
- Version information

Logged data (EEPROM)

- Event messages with date
- Energy yields on a daily, monthly and annual basis (Table 4)

The storage resolution of the energy yield data is as follows:

Energy yield data	Storage resolution/Period
10-minute values	31 days
Daily values	13 months
Monthly Values	30 years
Annual values	30 years
Total yield	permanent

Table 4

Network (TCP/IP)

The device can transfer yield data and event messages via the TCP/IP interface to the Internet portal server at http://www.solare-energiewende.de. The yield data can be displayed graphically in the Internet portal as illustrated below. This service is free of charge for a period of 2 years from the time of registration. The following applies:

- The user must first register at http://www.solar-frontier.eu/produkte/produktuebersicht/solarsets/ before the Internet portal can be used. More information on this is provided in chapter 9.7.
- The local network settings must be set at the inverter in order to establish a connection to the Internet portal server. This can be performed automatically or manually:
  Automatically: If IP addresses are automatically assigned in your network (DHCP), then no settings need to be made at the inverter.
  Manually: If IP addresses are not automatically assigned in your network, then you must manually set the inverter network settings via `Settings` > `Network`, see p. 37.
- The address of the Internet portal server is permanently stored in the inverter and cannot bechanged.

Figure 46

- Once the network connection is established, the inverter automatically starts non-encrypted transmission of data to the server.

Attention

The network cable must be disconnected in order to prevent transmission of the data.

RS485 bus

The inverter communicates with other devices via an RS485 bus. The following applies:

- The inverter has two RS485 interfaces (RJ45 sockets) on the lower side of the casing.
- The beginning and end of the RS485 bus must be terminated; see P. 43.
- Standard RJ45 cables can be used as bus cables (Cat-5 patch cables, not supplied). Use an alternative data connection cable for longer connections; see P. 43.
- The inverters connected to the RS485 bus operate as bus slave units.

Attention

The following inverters have compatible data interfaces and can be connected to the RS485 bus as slaves:
– 3000, 3600 und 4200.
Observe the manuals of these devices concerning the definition of addresses, termination and permissible data cables.

Attention

If a country setting of Italy is set then the RS485 bus must be wired as follows in order to allow control via an external device as per CEI 0-21:
– External fast disconnection (Ital.: Teledistacco): If wires 3[1)] and 8[1)] of the RS485 bus 2) are connected, e. g. via an external relay, then the following applies:
Relay closes: The inverters connected to the bus disconnect themselves from the grid.
Relay opens: The inverters connected to the bus connect themselves from the grid (normal operation).
– Switch-over of the grid frequency disconnection thresholds (ital.: Modalità definitiva di funzionamento del sistema di protezione di interfaccia (impiego del SPI sulla base di letture locali e di informazioni/comandi esterni)): If wires 5[1)] and 8[1)] of the RS485 bus[2)] are connected, e. g. via an external relay, then the following applies:
Relay closes: The inverters connected to the bus set the switch-off thresholds as per CEI 0-21 to 47.5 Hz and 51.5 Hz.
Relay opens: The inverters connected to the bus set the switch-off thresholds as per the Italy country setting; see the Technical Data section.

We recommend integrating the interconnection of wires 3, 5 and 8 into the bus termination.

[1)] Pin assignments of the RJ45 plug for the RS485 bus: see Fig. 47.
[2)] See (6) under 9.1, p. 33.

Figure 47

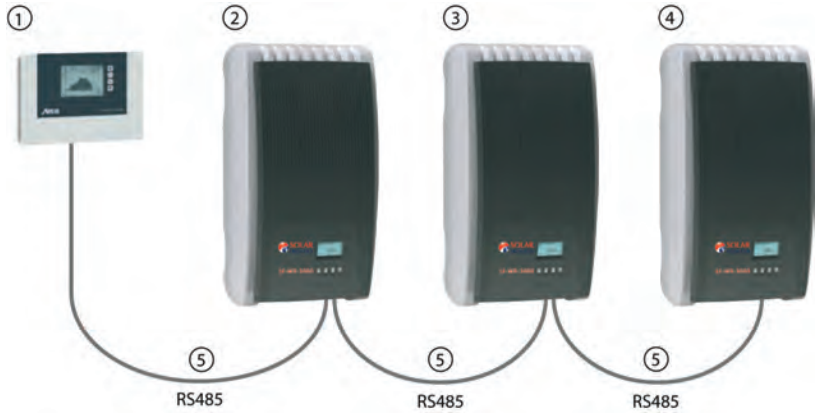
One (!) of the following master devices can be connected to the RS485 bus.
The devices support the transfer protocol used by the inverter.

- Energy management unit StecaGrid SEM: Interface to a ripple control receiver for EEG compliant feed-in management
- PC or notebook (with suitable software, for technical professionals only):
  – Load firmware updates
  – Read inverter information using service software
  – An optional RS485↔USB adapter for connecting to the inverter is also available.
- External data loggers, recommended for professional system monitoring:
  – WEB'log (Meteocontrol)
  – Solar-Log (Solare Datensysteme)

Note

The correct settings must be made in external data loggers, according to the manufacturer's instructions, before connecting them to the bus.

The wiring diagram of the RS485 bus is shown below.



① External data logger
② First inverter
③ Inverter
④ Last inverter, terminated
⑤ Standard RJ45 cable (patch cable)

Figure 48

Alternative data connection cable

ATTENTION!

Material damage caused by electrical voltage! The alternative data connection cable may only be manufactured by professional personnel.

The alternative data connection cable is a Cat-5 cable for long data connections. The following applies to the alternative data connection cable

- The total length of the RS485 bus must not exceed 1,000 m (master/first inverter to last inverter)
- Use the pin assignment according to the table below if the alternative data connection cable is connected to the RJ45 socket of the first inverter and to the connector of the data logger.

Pin assignments of the alterative data cable

Device	Inverter	Solar -Log	WEB'log	Signal
Connection	RJ45	Terminal strip	RJ12	
Pin	1	1	2	Data A
	2	4	4	Data B
	3	—	—	—
	4	—	—	—
	5	—	—	—
	6	—	—	—
	7	—	—	—
	8	3	6	Ground

Attention

Danger of destroying the RS485 input of the inverter. Pin 1 of the RJ12 socket of the Web'logdata logger carries 24 V DC. Never connect the alternative data connection cable to pin 1!

Termination

To prevent data transmission errors, the start and end of the RS485 bus should be terminated:

- The external data logger (at the start of the data connection) must be terminated according to the manufacturer's specifications.
- The last inverter (at the end of the data connection) is terminated by plugging the optionally available termination plug into the free RJ45 socket (for RS485 bus).

Addressing

Every inverter must be assigned its own unique address for communication between the bus master and the slaves. Every inverter is set with an address of 1 at the factory. This means that the addresses must be adjusted in systems having more than 1 inverter. The following applies:

- The address is changed at the inverter via the menu items `Settings` > `Address` .
- Only addresses ranging from 1 – 99 may be set.
- The bus master devices usually support less than 99 addresses. Consult the respective operating instructions for these devices before setting the addresses of the inverters.
- We recommend starting with address 1 for the first inverter on the bus and then incrementing the address by 1 for each subsequent inverter on the bus, in the same order as they are physically installed. This makes it easier to identify the relevant inverters when their address is displayed in messages shown on the remote display.

Feed-in management

Depending on the country, the active power fed into the grid by a photovoltaic system must be ableto be reduced by the grid operator. The following products are recommended for implementing this legally prescribed specification:

- StecaGrid SEM
- WEB'log from Meteocontrol
- Solar-Log from Solare Datensysteme

9.6 Operation

9.6.1 Overview of operating functions

For the sake of clarity, only the operating buttons ▽ and SET are illustrated.

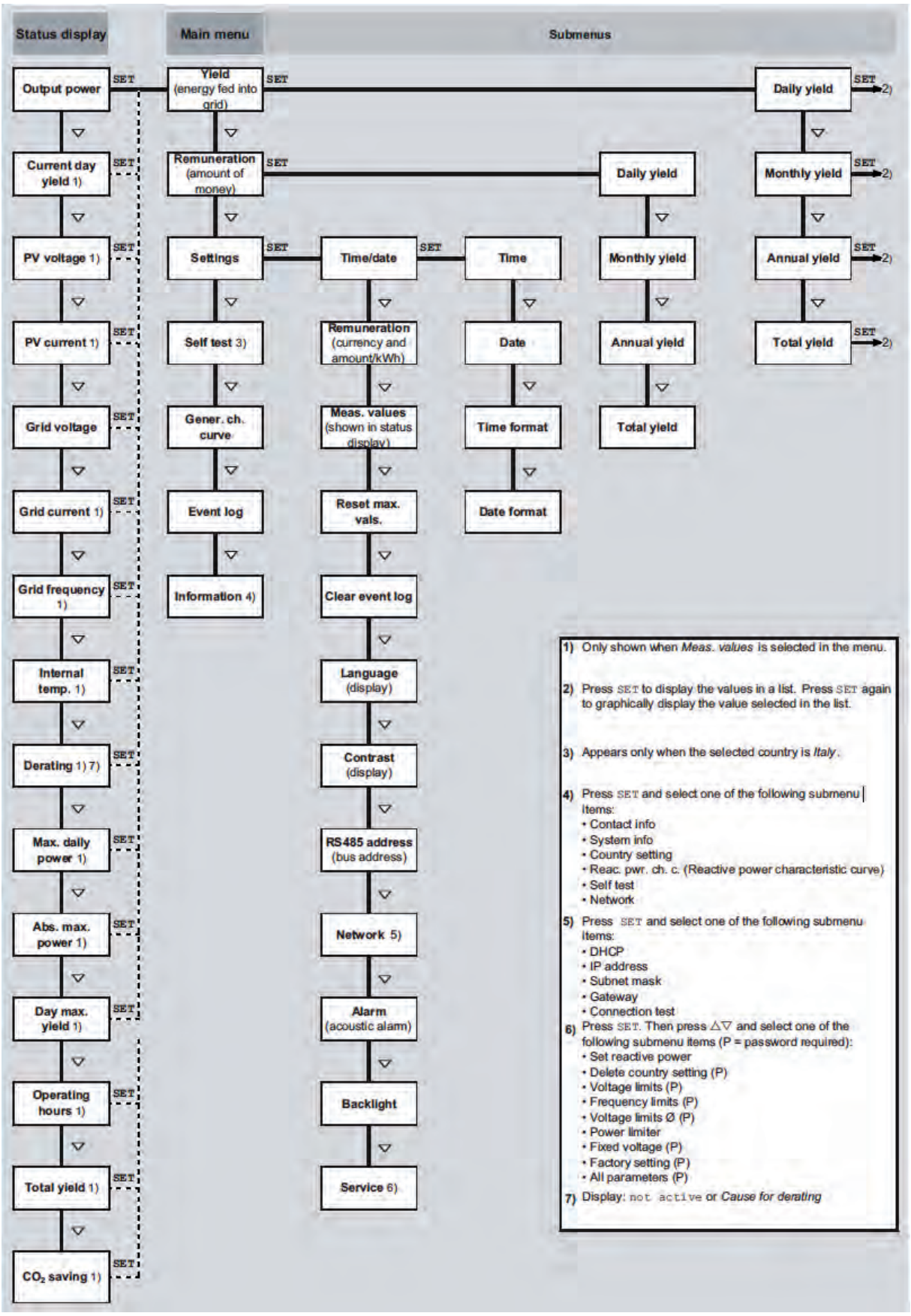


Figure 49

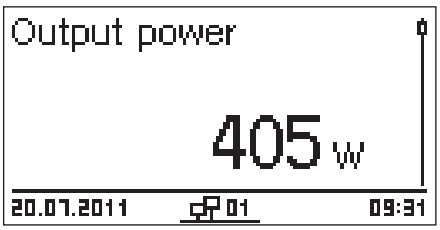
9.6.2 General operating functions

- Hidden content is shown using the △ and ▽ buttons.
- Repeated button presses: If △▽ need to be pressed repeatedly, you can alternatively hold these buttons pressed for a *long* time. The rate of repetition increases the longer the button is held.
- Pressing any button switches on the display backlighting.

9.6.3 Main operating functions

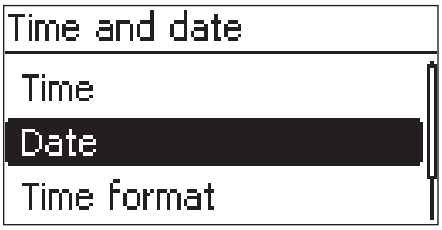
The figures in this section show examples.

Status Display



1. If nessessary press **ESC** 1 for one second to call up the status display (fig. left).
2. Press △▽ to display a different parameter.

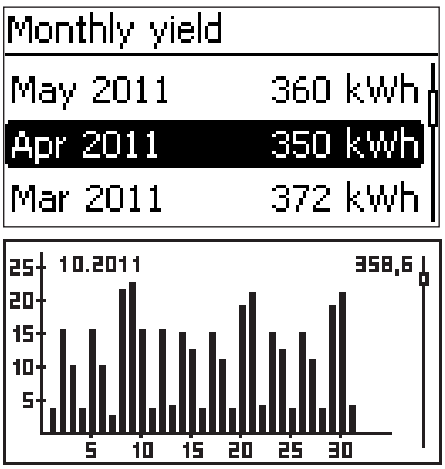
Menu Navigation



1. Press **ESC** for one second to call up the status display as required.
2. Press **SET** The main menu is diplayed with the top item selected.
3. Press △▽ to select a menu item.
4. Press **SET**, to call up the submenu (fig. left).
5. Repeat steps 3 and 4 for further submenus as required.

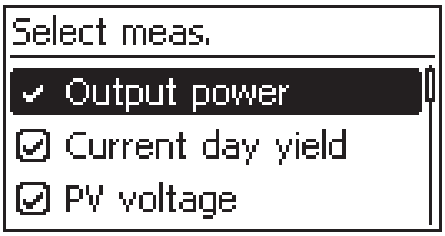
Event messages (See section 9.9)

Displaying yields numerically (list) and graphically (chart)



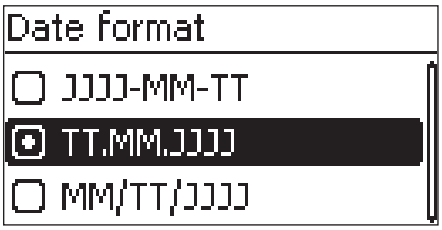
√ The status display is shown.
1. Press **SET**. The main menu is displayed with **Yield** selected.
2. Press **SET**. The list with yield times periods is shown.
3. Press △▽ to select a yield time period.
4. Press **SET**. The individual yields for the yield time period are shown in a list (fig. left).
5. Press △▽ to select an individual yield value.
6. Press **SET**. The selected individual yield is shown in a chart (fig. left).
7. Press △▽ to page through the charts.
8. Press **SET** to return to the list.

Editing selection lists containing check boxes



√ A selection list with check boxes is displayed (fig. left).
1. Press △▽ to select a check box.
2. Press **SET**. The state of the check box changes from *on* to *off* and vice-versa (preset check boxes cannot be changed).
3. Repeat steps 1 and 2 for further check boxes as required.
4. Press **ESC**. The changes are adopted and the next higher menu level is displayed.

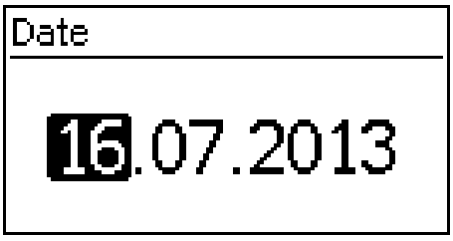
Editing selection lists containing radio buttons



√ A selection list with radio buttons is displayed (fig. left).

1. Press △▽ to select a radio button that is currently switched off.
2. Press **SET**. The selected radio button is switched on and the previously switched on radio button is switched off.
3. Press **ESC**. The next higher menu level is displayed.

Changing numeric settings



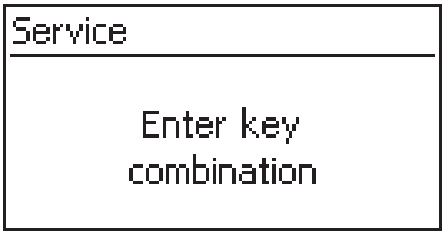
√ A numeric setting is displayed (example Date in fig. left)

1. Press **SET**. The selected value flashes (Day in fig. left)
2. Press △▽ to change the value
3. Press **SET**. The change is adopted (value no longer flashes) or press **ESC** to cancel the change (value no longer flashes).
4. Press ▽. The next value is selected.
5. Repeat steps 1 to 4 for the remaining values.
6. Press **ESC**. The next higher menu level is displayed.

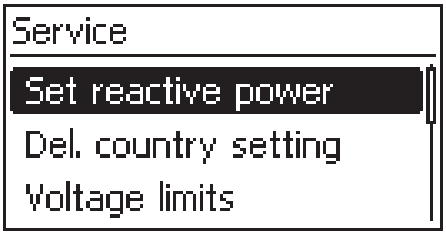
Attention

Risk of yield losses and contravention of regulations and standards. Inverter and grid parameters can be changed in the service menu. The service menu must therefore only be used by technical professionals who know the applicable regulations and standards.

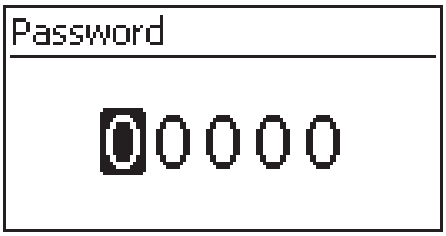
Calling up the service menu and editing the values



1. Select the **Service** menu item.
2. Press **SET**. The fig. shown at the left appears.



3. Press △▽ simultaneously for 3 seconds.
   The service menu is displayed (fig. left).
4. Press △▽ to select a menu item.



5. Press **SET** to edit the menu item. The following applies:
   - Enter the password if required (fig. left).
   - Press △▽ within a menu item, if required, to display and edit other settings (e.g. **Voltage limits**).
   - The menu items are described in section 9.3.4.

9.7 Internetportal

9.7.1 Registration

Call up the Internet portal, enter the language and serial number

1. Enter the following address into the Internet browser (or click the address if you are reading this document as a PDF on a computer monitor): https://www.solar-monitoring.net/registration/?source=0CHFT. Ensure that scripting and cookies for www.solar-monitoring.net/registration/?source=0CHFT are enabled in the browser.
   → Figure 50 appears.

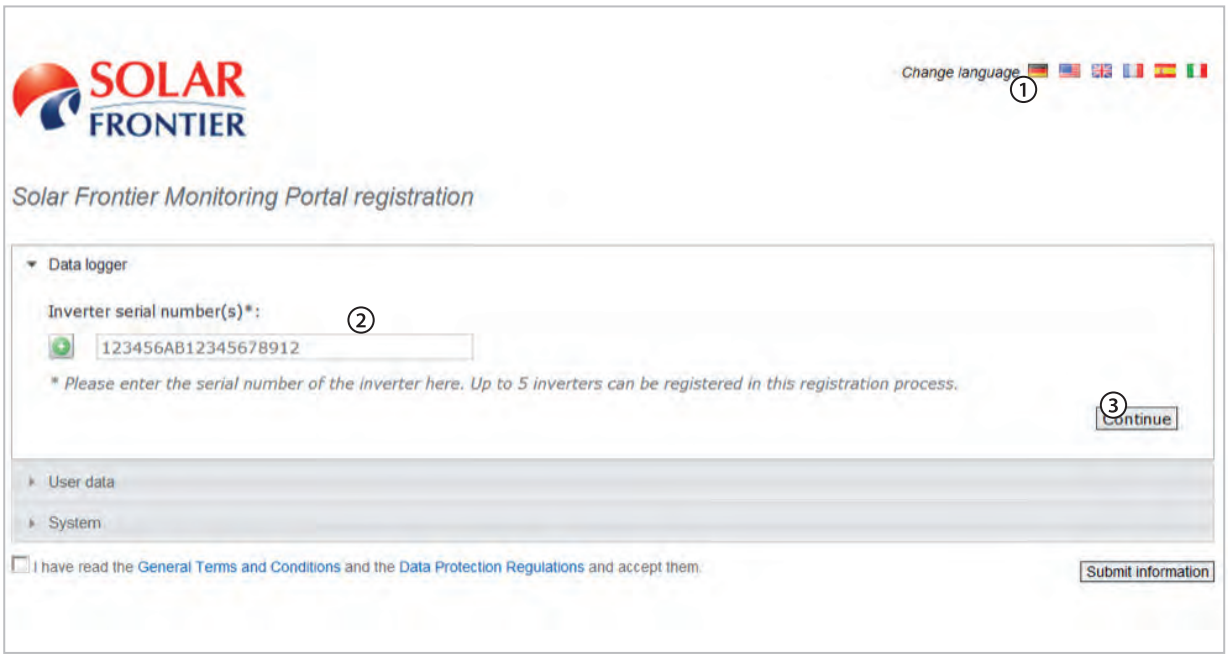


Figure 50

2. Select your language using the buttons ① (in Figure 50). The language is set immediately.
3. Enter the serial number of the device into the field ②.

Note

The serial number always consists of a sequence with 6 numbers – 2 letters – 12 numbers, e. g. 123456AB123456789012.

If you enter an invalid serial number, an error message is displayed and the login process is cancelled.

Press the green button „+" (at the left next to the field ②), to enter the serial numbers of further inverters (a maximum of 5 inverters are possible).

---

4. After entering the last serial number, press the button ③.
   → Figure 51 appears.

Entering the user data

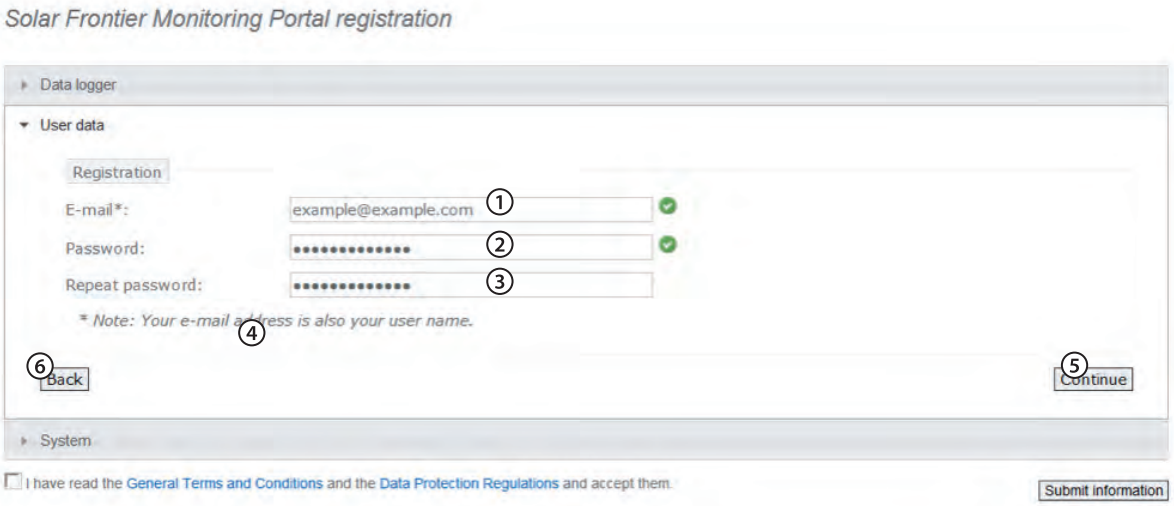


Figure 51

Attention

The email address can only be entered once and cannot be subsequently changed! The email address is also the user name; see also ① in Figure 57, p. 51.

1. Enter your email address into the field ① (Figure 51). Observe the note ④.
2. Enter any desired password into the field ② and repeat the entry of this password in the field ③ (safety check).
3. Confirm via the button ⑤

   or

   use the ⑥ button to return to the previous page if necessary (entries in Figure 51 are discarded).

   → After ⑤ has been pressed, Figure 52 appears.

Entering system data

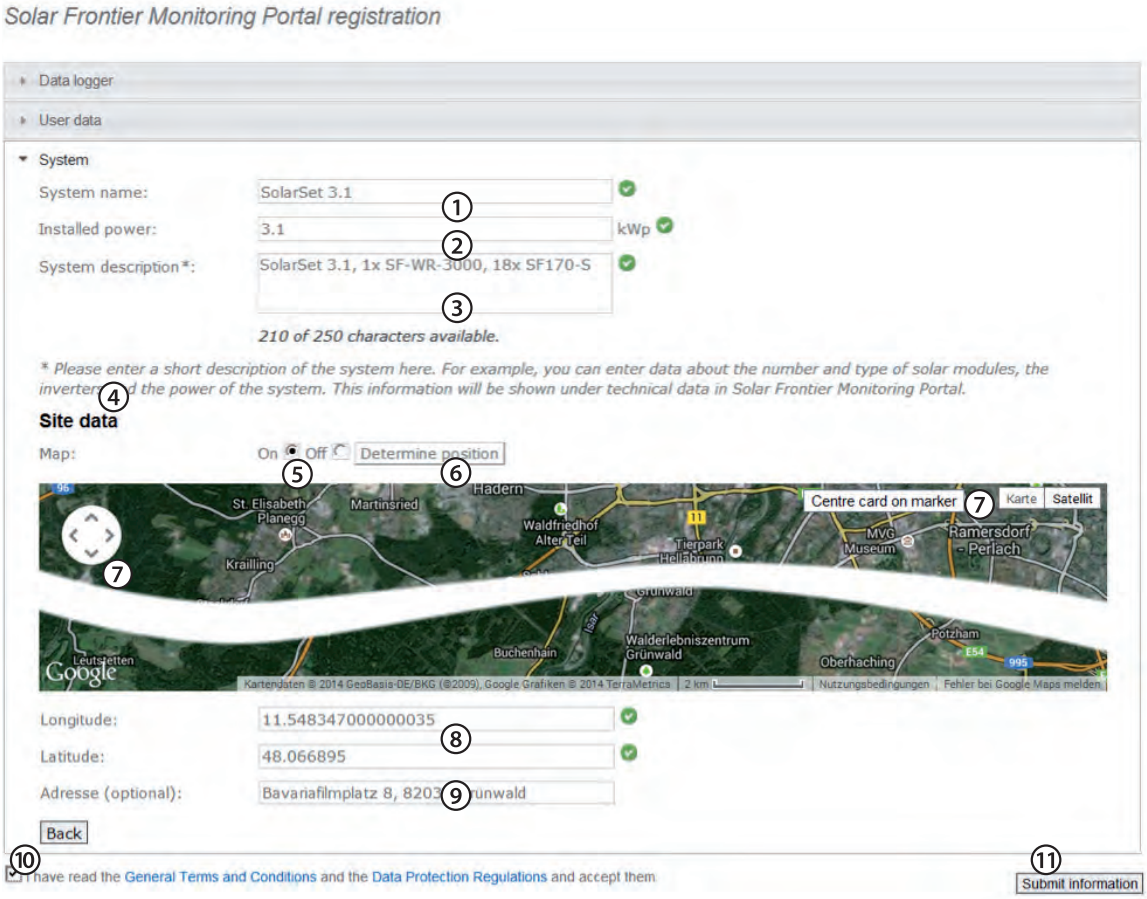


Figure 52

1. Enter any desired name[A)] for your solar system into the field ① in Figure 52.
2. Enter the installed power[A)] of the system into the field ②.
3. Enter a description[A)] of the system into the field ③. Observe the note ④.
4. Use the Google Maps buttons ⑤ to ⑦ to navigate to the location of the system.
   → The location data is displayed in the fields ⑧.
5. Enter an optional address of the system into the field ⑨.
6. Select the check box ⑩ and confirm via the button ⑪.
   → Figure 54 appears; an email with the activation code, as shown in Figure 53 , is sent to the email address ① in Figure 51.

==========
[Solar Frontier Monitoring Portal registration]
E-Mail verification
==========
Dear User,

this is an automatically generated e-mail to verify your e-mail address.

If you have not yet registered Solar Frontier portal, you do not need to take further action and can simply ignore this e-mail.

To activate your account and continue the set-up procedure, please click on the following, please click on the following activation link:
---
https://www.solar-monitoring.net/ssp/anmeldung/einrichtungSimple.php ... device=desktop
---

Alternatively, you can enter the following activation key on the login page:

JqwMBfcPgovBwPzkUHlzHHMhoiDWtYlBLVejBwoHAm

Kind regards
Solar Frontier Europe GmbH

Figure 53

[A)] Data can be subsequently changed.

Completing registration

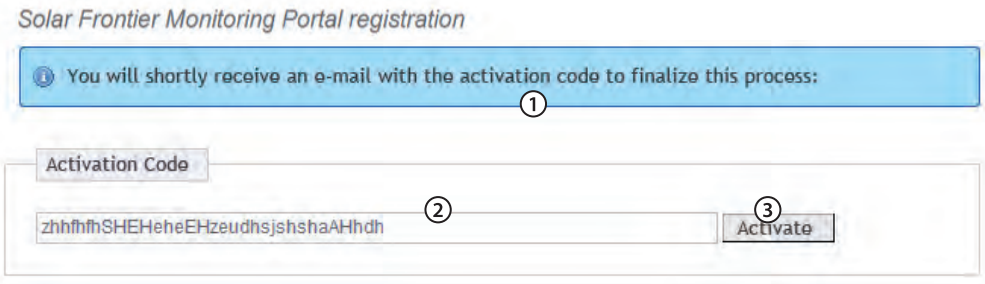


Figure 54

1. Enter the activation code that you received in the email as per Figure 53 into the field ② (Figure 54).
2. Confirm via the button ③.
   → If the registration was successful then Figure 55 appears and you will receive an additional confirmation email (Figure 56). This email contains a direct link to Figure 58, p. 52.

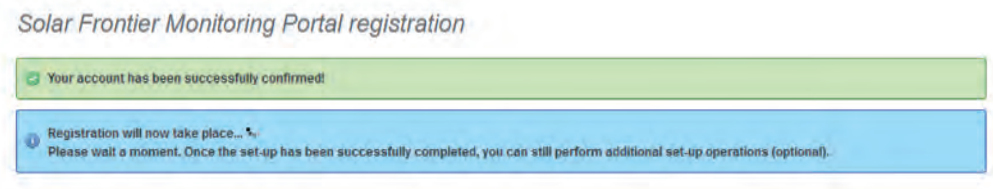


Figure 55

==========
[Solar Frontier Monitoring Portal registration]
==========
Dear User,

Congratulations on successfully registering your data logger.

Your system has been set up with the following data:

System name:
My SolarSet 3.1

Installed power:
3.1 kWp

System description:
Solar Set 3.1, 1x SF-WR-3000, 18x SF170-S

Data logger hardware number:
748613YH005179760001

We hope you will enjoy using your dashboard.

The following link will take you to your system:
http://public.solarmonitoring.net/dashboard/system/9FM2X/BI

User data:

E-mail/Login: example@example.com
Passwort: solarfrontier

Kind regards
Solar Frontier Europe GmbH

Figure 56

9.7.2 Login – Displaying yield data – Changing settings

1. Enter the following address into the browser: www.solare-energiewende.de. Ensure that scripting and cookies for www.solare-energiewende.de are enabled in the browser.
   → The home page of the Internet portal as shown in Figure 57 is displayed.
2. The functions as per the legend shown in Figure 57 are available on the home page of the Internet portal.

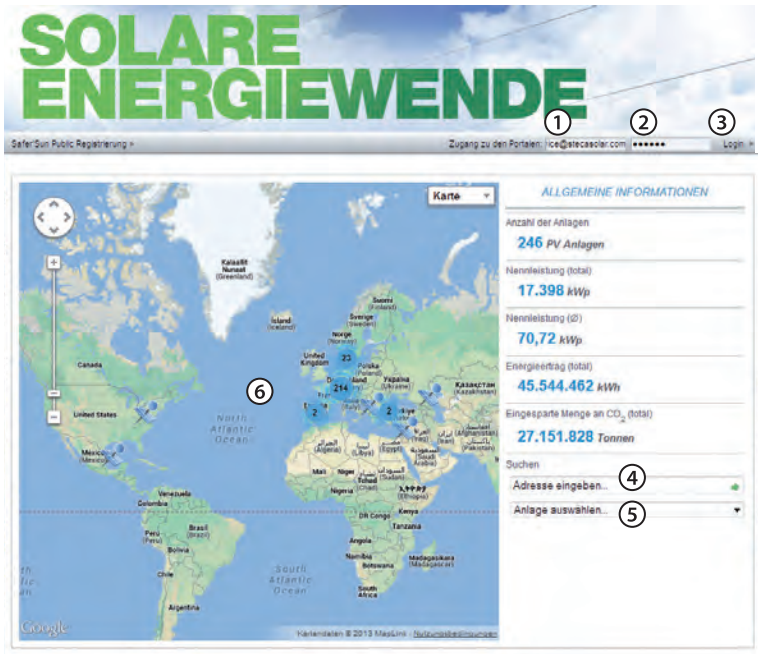


Figure 57

① *Username* data entry field (= email address)
② *Password* data entry field
③ Button for logging in after ① and ② have been entered. After logging in, the functions as per the legend shown in Fig. 58 are available.
④ Data entry field for the postal address of the system that is to be displayed.
⑤ Data entry field for the name of the system that is to be displayed.
⑥ Map for searching for systems.

① System data display
② Performance data display
③ Environmentally related data display
④ Buttons for changing the display
⑤ Yield charts display
⑥ Buttons for setting the period shown in ⑤
⑦ Button for changing the *system data*, as described on p. 49.
⑧ Button for selecting the language

Figure 58

9.8 Self test

The self test is mandatory for operation of inverters in Italy.

Function

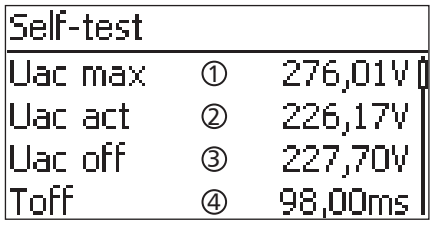
The prerequisites for performing the self test are as follows:

- The country *Italy* was selected during initial commissioning.
- The level of solar irradiation is high enough to ensure that the inverter can feed the grid.

During the self test, the inverter checks its switch-off behaviour with regard to too high / too low grid voltage and frequency (6 test phases, duration of approx. 40 minutes). The following applies:

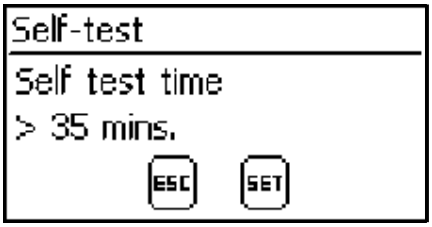
- In each phase of the self test, the inverter changes its switch-off threshold, step-by-step upwards/downwards from the set lower/upper limit values.
- When the switch-off threshold reaches the actual grid voltage/frequency then the inverter stores this information.
- The data is shown on the display as follows:
  - The current values of the *first* test phase are displayed first; see the following illustration p. 53.
  - The values of the subsequent test phases are added below (initially hidden)
  - If the self test succeeded then the message **`Self test passed`** is added below.
    The message must be displayed and confirmed.
- If the self test conditions are not satisfied, one of the messages listed in Table 5 is displayed.
- If a measurement lies outside the required tolerance during the self test then the self test is cancelled and the inverter displays the message **`Self test failed`**. The inverter remains disconnected from the grid (relay open, no feeding) until the self test is passed successfully.

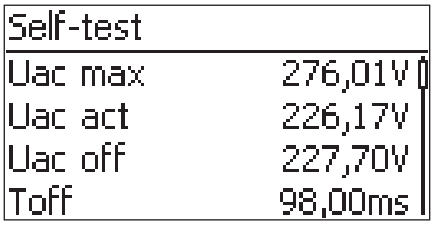
Selftest



① Lower / upper limit value according to the country setting
② Measured actual grid voltage / frequency
③ Switch-off threshold (changed in steps)
④ Switch-off time = time between the following events:
- Switch-off threshold reaches the actual grid voltage/frequency
- The inverter disconnects itself from the grid

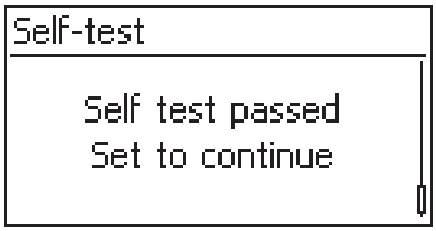
Operation





√ *Italy* is set in the inverter to be tested.
1. Check the country setting via **`Information/ System information`** the main menu as required
2. Select **`Self test`** in the main menu. The dialogue shown at the left is displayed
3. Press **`SET`** for 1 second. The self test starts.
4. The values for the first test phase are displayed (fig. left).
5. Press ▽ to display the values for the subsequent test phases (if available).
6. Only when **`Self test failed`** is displayed:
   `SET` to confirm the message.
   The status display appears.

Operation



Attention
If **`Self test failed`** is displayed then repeat the self test as soon as possible so that the inverter can resume feeding. When the test has finished, proceed as follows:

7. Press ▽ several times until the message **`Self test passed`** is displayed (fig. left).
8. Press **`SET`** to confirm the result of the self test.
   The status display appears.

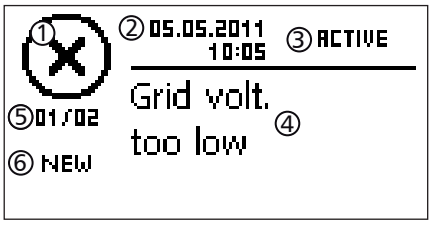
Messages about errors that prevent the self test from running:

Message	Description	Remedy
An error was detected	An internal error prevented the self test from starting.	Contact your installer if this error occurs frequently.
Not enough sunlight	The self test was not started or was cancelled due to insufficient sunlight, especially in the evening/ at night.	Repeat the self test during the day when the inverter is feeding the grid.
Invalid grid conditions	The self test was cancelled due to invalid grid conditions, e.g. due to insufficient AC voltage.	Repeat the self test later.
MSD not ready	The self test was not started because the inverter was not ready for operation.	Repeat the self test a few minutes later when the inverter is ready for operation and is feeding.

Table 5

9.9 Troubleshooting

Faults are indicated by event messages as described below. The display flashes red. Table 6 „List of event messages" contains information on troubleshooting and fault correction.

Structure	
	Event messages have the following information: ① Symbol for the type of event message ② `Date/Time` when the event occurred ③ `ACTIVE`: The cause of the event message is still present or date/time when the cause of the event message was corrected. ④ Cause of the event message. ⑤ Counter: ***No. of the displayed event messages / Total number of event messages;*** max. number of all ***event messages*** = 30 ⑥ `NEW` is displayed until the event message has been manually confirmed via the `ESC` or △▽ button

Function

Event message types

- Type **Information** (Symbol ⓘ)
  The inverter has detected an error that does not affect the feed-in process. The user does not need to intervene.
- Type **Warning** (Symbol ⚠)
  The inverter has detected an error that may result in reduced yields. It is highly recommended that you correct the cause of the error.
- Type **Error** (Symbol ⊗)
  The inverter has detected a serious error. The inverter will not feed into the grid while this error is present. Please contact your installer. More information is provided in table 6 „List of event messages".

Display behaviour

New event messages are displayed immediately. The messages disappear after they have been confirmed or their cause(s) have been corrected.

Note

When an event message is confirmed, the user thereby simply confirms that he/she has seen the message. This does not correct the error that caused the event message to be shown!

If messages exist whose cause has been corrected but have not been confirmed then ✉ is shown in the status display. If an already confirmed error recurs then it is displayed again.

Operation

Confirming event messages

√ An event message with the comment `NEW` is displayed.

▶ Press `ESC`/△/▽. The event message is confirmed.

Displaying event messages

1. Select `Event log` in the main menu.
2. Press `SET`. The event messages are displayed in chronological order (latest message first).
3. Press △▽ to page through the `Event Messages`.

Event Message	Description	Type
`Grid Frequency too low`	The grid frequency at the inverter is less than the minimum permissible value. Due to legal requirements, the inverter switches automatically off while the error state is present. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid Frequency too high`	The grid frequency at the inverter is greater than the maximum permissible value. Due to legal requirements, the inverter switches automatically off while the error state is present. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid voltage too low`	The grid voltage at the inverter is less than the minimum permissible value. Due to legal requirements, the inverter switches automatically off while the error state is present. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid voltage too high`	The grid voltage at the inverter is greater than the maximum permissible value. Due to legal requirements, the inverter switches automatically off while the error state is present. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid voltage too high for reactivation`	After switching off, the inverter cannot resume feeding because the grid voltage exceeds the legally prescribed switch-on value. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid voltage Ø too low`	The output voltage averaged over the legally prescribed period of time exceeds the permissible tolerance range. The inverter switches automatically off while the error state is present. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid voltage Ø too high`	The output voltage averaged over the legally prescribed period of time exceeds the permissible tolerance range. The inverter switches automatically off while the error state is present. ▶ Contact your installer if this error occurs frequently.	⊗
`Grid current DC offset too high`	The DC current portion fed into the grid by the inverter exceeds the maximum permissible value. Due to legal requirements, the inverter switches automatically off while the error state is present. ▶ Contact your installer.	⊗
`Resid. Current too high`	The residual current flowing from the plus or minus inputs to earth via the photovoltaic modules exceeds the maximum permissible value. Due to legal requirements, the inverter switches automatically off while the error state is present. ▶ Contact your installer.	⊗
`L und N swapped`	The live and neutral conductors are wrongly connected. For safety reasons, the inverter must not feed into the grid. ▶ Contact your installer.	⊗
`PE not connected`	The protective earth is not connected. For safety reasons, the inverter must not feed into the grid. ▶ Contact your installer.	⊗
`Insulation error`	The insulation resistance between the plus or minus inputs and earth is less than the permissible value. For safety reasons, the inverter must not feed into the grid. ▶ Contact your installer.	⊗
`Fan faulty`	The internal fan of the inverter is faulty. In certain situations the inverter will feed less power into the grid. ▶ Contact your installer.	⚠
`Device overheated`	Despite derating, the maximum permissible temperature has been exceeded. The inverter feeds no power into the grid until the maximum permissible temperature is no longer exceeded. ▶ 1. Check that the installation conditions are satisfied. ▶ 2. Contact your installer.	⊗

PV voltage too high	The input voltage at the inverter is greater than the maximum permissible value. ▶ Switch off the DC circuit breaker at the inverter and contact your installer.	⊗
PV current too high	The input current at the inverter exceeds the permissible value. The inverter limits the current to the permissible value. ▶ Contact your installer if this message occurs frequently.	⚠
Grid islanding detected	There is no grid voltage present (inverter running independently). For safety reasons, the inverter must not feed into the grid and switches off while the error is present(dark display). ▶ Contact your installer if this message occurs frequently.	⊗
Time / Date lost	The inverter has lost the time settings because it was disconnected from the grid for too long. Yields cannot be stored and event messages will have the wrong date. ▶ Correct the time under Settings/Time/Date.	⚠
Internal Info	▶ Contact your installer if this information occurs frequently.	🛈
Internal Warning	▶ Contact your installer if this warning occurs frequently.	⚠
Internal Error	▶ Contact your installer if this error occurs frequently.	⊗
Self test failed	An error occurred during the self test and the self test was cancelled. ▶ Contact your installer when – the self test is cancelled due to an error several times at different times of the day and – it is certain that the grid voltage and frequency were within the limit values defined by the country setting; see section 15.4.	⊗
Faulty country setting	An inconsistency exists between the selected country settings and those stored in memory. ▶ Contact your installer.	⊗
BCONV over-temperature	The maximum permissible boost converter temperature has been exceeded. The inverter feeds no power into the grid until the maximum permissible temperature is no longer exceeded. 1. Check that the installation conditions are satisfied. 2. Contact your installer if this message occurs frequently.	⊗
Boost converter defective	The boost converter is defective, the inverter is not feeding into the grid or is feeding at reduced power. ▶ Contact your installer.	⊗
Boost converter not detected	▶ Contact your installer.	⊗

Table 6

10. Registration and warranty

The standard product- and output warranty for this photovoltaic system (system warranty) runs for five years. It is possible to extend the system warranty to ten years, by registering the SolarSet with Solar Frontier at **www.solar-frontier.eu.** Full warranty conditions are available on the websites.

11. Maintenance

11.1 Maintenance Solar Frontier SF170-S photovoltaic module

A monthly visual check is highly recommended in order to maintain the efficiency of SF modules and the security of the mounting.

- Remove any dirt, fallen leaves or bird droppings from the surface, and check that there is no damage to the surface. Do not use detergent or chemicals for cleaning dirt off SF modules as it may damage the modules and result in degradation of insulation.
- Do not use hard brushes or any other hard materials; use only soft cloths or sponges for removing dirt from the SF modules surface.
- When replacement parts are required, be sure the installer/servicer uses parts specified by the manufacturer with the same characteristics as the original parts. Unauthorized substitutions may result in fire, electric shock, or other hazard.
- Stop using SF modules when any damage or unusual phenomena are observed. Have them immediately replaced or removed by a qualified technician.

11.2 Maintenance DC system

The DC system is maintenance-free. It is still recommended that cables and connectors are regularly checked for signs of damage.

11.3 Maintenance inverter SF-WR

The inverter is basically maintenance-free. Despite this, it is a good idea to regularly check that the cooling fins on the front and rear sides of the device are free of dust. Clean the inverter when necessary as described below.

Attention

Danger of destruction of components in devices.

- Do not allow cleaning agents and devices to penetrate between the cooling fins at the front of the inverter (under the grey hood).
- Do not use especially the following cleaning agents:
  - Solvent-based cleaning agents
  - Disinfection agents
  - Coarse or sharp-edged cleaning agents

Removing dust

▶ Dust should be removed using compressed air (max. 2 bar).

Removing heavy soiling

Danger

Risk of death by electrocution. Use cleaning agents only with a slightly damp cloth.

1. Remove heavy soiling with a slightly damp cloth (use clear water). If necessary, use a 2 % hard soap solution instead of water.
2. After cleaning, remove any soap residue using a slightly damp cloth.

12. Accessories

Accessories such as data loggers, data interfaces to laptops are not available at the moment. Should you have questions, or want recommendations, please get in touch with our technical support.

13. Transport and Storage

Pay attention to all advice on the packaging, if you store or transport SF SolarSets. A dry room should be chosen for storage. The packaging is not waterproof. All electronic components should be kept away from liquids during transport and storage. The SF SolarSets must remain in the original packaging until the installation.

Small amounts of white powder from packaging material may adhere to the modules. This may safely be ignored and has no affect on performance.

14. Disposal

14.1 Disposal of Solar Frontier SF170-S photovoltaic modules

SF modules must be disposed of in a responsible manner. Please contact your local supplier or disposal company for further information. For health and safety reasons, SF modules should not be disposed of with household garbage, and must be dealt with in accordance with local codes and regulations.

Solar Frontier is a member of PV Cycle, marking its commitment to the environment and public safety. PV Cycle's initiatives can be found at: http://www.pvcycle.org/

14.2 Disposal of inverter SF-WR

Do not dispose of the device in household garbage. Please send the device to Steca customer service at end of operative life with the remark **"For disposal".** The packaging is recyclable.

14.3 Disposal of DC cabling

The DC cables can be disposed of in municipal collection points as electric waste.

15. Technical Data, Data Sheets and Certificates

Below you find a summary of product data sheets and certificates of the single components.

15.1 Solar Frontier SF170-S photovoltaic module

Solar Frontier's CIS modules generate an electrical direct current when exposed to sunlight. They are designed for terrestrial use. The nominal power of SF modules indicates the power generated under Standard Test Conditions (module temperature: 25 °C, air mass 1.5, solar irradiance 1,000 W/m²). SF module power output in actual operating conditions may vary. The amount of electrical direct current generated by SF modules is proportional to irradiance intensity, while the voltage is affected by temperature.

15.1.1 Technical data

Electrical characteristics

Information required by UL is marked accordingly and is only relevant to US installers.

Electrical Performance at Standard Test Conditions (STC)*1

Nominal power	Pmax	170 W
Power tolerance		+5 W / 0 W
Open circuit voltage	Voc	112 V
Short circuit current	Isc	2.20 A
Voltage at nominal power	Vmpp	87.5 V
Current at nominal power	Impp	1.95 A

Photovoltaic modules may produce more current and/or voltage under actual operating conditions than in Standard Test Conditions. The electrical characteristics are within 10 % of the indicated Isc and Voc values under STC. The power output stated on the label is measured at the plant after module preconditioning. The values of Isc and Voc marked on modules should be multiplied by a factor of 1.25 to determine component voltage ratings, conductor ampacities, overcurrent device ratings and size of controls connected to the module output.
UL: Refer to section 690.8 of the National Electrical Code for an additional multiplying factor of 125 % (80 % derating). Installation must be completed in accordance with CSA C22.1, Safety Standard for Electrical Installations, Canadian Electrical Code, Part 1.

Electrical Performance at Nominal Operating Cell Temperature (NOCT) Conditions*2

Nominal power	Pmax	126 W
Open circuit voltage	Voc	102 V
Short circuit current	Isc	1.76 A
Voltage at nominal power	Vmpp	82.1 V
Current at nominal power	Impp	1.55 A

*1 Standard Test Conditions (STC): 1,000 W/m² irradiance, module temperature 25 °C, air mass 1.5. Isc and Voc are ±10 % tolerance of STC rated values. Module output may rise due to the Light Soaking Effect. Subject to simulator measurement uncertainty (using best-in-class AAA solar simulator and applying Solar Frontier preconditioning requirements): +10 % / -5 %.
*2 Nominal Operating Cell Temperature Conditions: Module operating temperature at 800 W/m² irradiance, air temperature 20 °C, wind speed 1 m/s and open circuit condition.

Module performance at low irradiance

Efficiency reduction of maximum output from an irradiance of 1,000 W/m² to 200 W/m² at 25 °C is typically 2.0 %.
The standard deviation for the reduction in efficiency is 1.9 %.

Thermal characteristics

NOCT		47 °C
Temperature-coefficient Isc	α	+0.01 %/K
Temperature-coefficient Voc	β	-0.30 %/K
Temperature-coefficient Pmax	δ	-0.31 %/K

Characteristics for system design

Maximum system voltage	Vsys	1,000 V DC (UL 600 V DC)
Limiting reverse current	Ir	7 A
Maximum series fuse rating	Isf	4 A

- The sum of Voc for modules in series must not exceed the maximum system voltage of the module under any condition. This includes also low temperature conditions.
- Reverse current applied to the modules should not exceed 7 A under any circumstances.

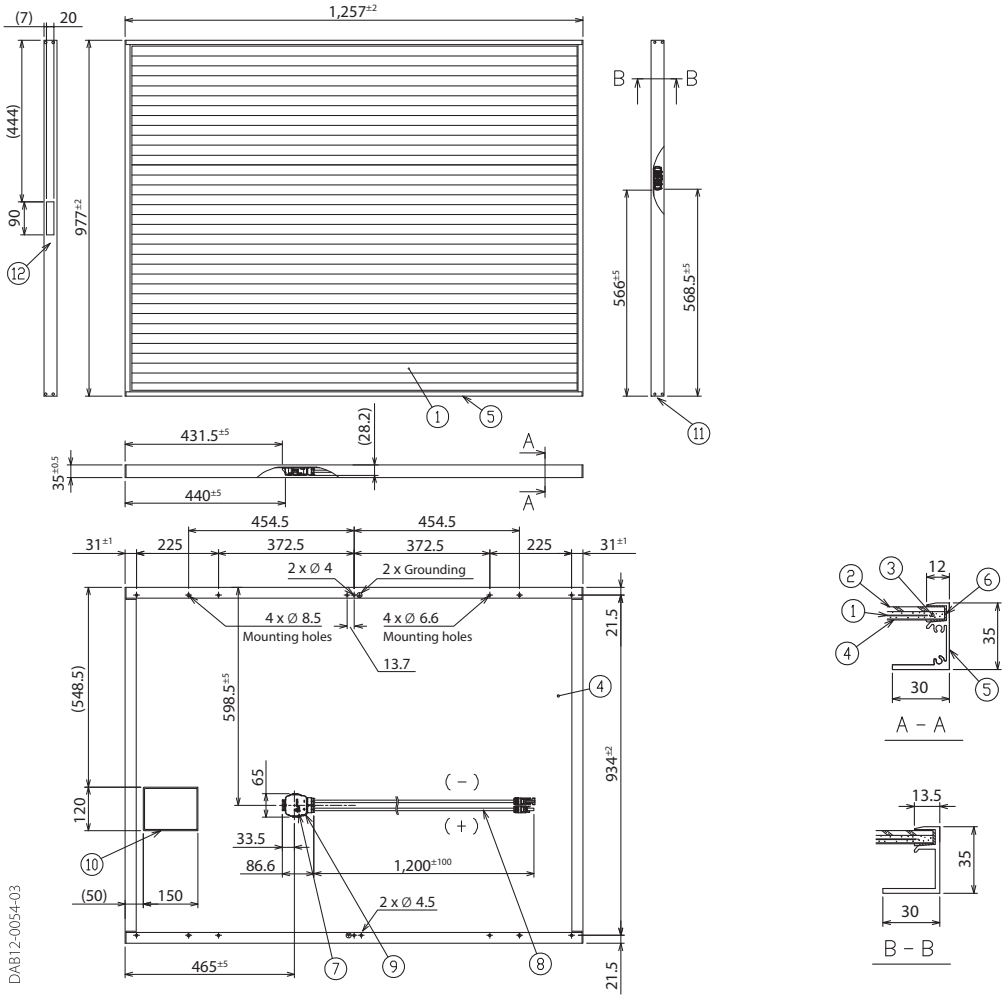
UL: Modules installed in parallel will be provided with the listed maximum series fuses, as specified.

Mechanical Data

Dimensions (L x W x H)	1,257 x 977 x 35 mm (49.5 x 38.5 x 1.4 in)
Weight	20.0 kg (44.1 lbs) / 16.3 kg/m² (3.3 lbs/ft²)
Module operating temperature	-40 °C to 85 °C
Application class according to IEC 61730 d	Class A
Fire safety class according to IEC 61730	Class C
Cable	2.5 mm² / AWG14 (halogen free)
Snow load (to the front of the module)	2,400 Pa (IEC61646) / 1,600 Pa design load (UL1703)
Wind load (to the back of the module)	2,400 Pa (IEC61646) / 1,600 Pa design load (UL1703)

*1 UL: The fire rating of this module is valid only when mounted in the manner specified in the mechanical mounting instructions.
*2 UL: The load applied to a module under UL testing conditions is 1.5 times greater than the module's design load. Accordingly, 2,400 Pa (50 lbs/ft²) is loaded to test the 1,600 Pa (33.4 lbs/ft²)UL design load.

Module drawing



No.	Item	Qty.	Description
1	Cell	1	CIS (Substrate glass)
2	Cover glass	1	Clear tempered glass
3	Encapsulant		EVA
4	Back sheet		Weatherproof plastic film / Colour: black and silver
5	Frame	1 Set	Anodized aluminium alloy / Colour: black
6	Edge sealant		Butyl rubber
7	Junction box	1	With bypass diode
8	Cable		2.5 mm^2 / AWG14 (with waterproof and locking connector MC4-compatible)
9	Adhesive		Silicon
10	Label	1	Product label
11	Screw	8	Stainless tapping (SUS304J3)
12	Bar code label	1	Serial number

15.1.2 Certificates for Solar Frontier SF170-S

Solar Frontier's CIS modules are not only tested under extreme conditions, such as heat, cold and high stress tests, in our own research center, the Atsugi Research Center (ARC). Independent institutions, such as TÜV or Atlas 25+, confirm the long-term yield capabilities of our modules on the basis of accelerated aging tests.
Regional certifications are limited to the respective business locations of Solar Frontier. These include the dependencies in Japan, Europe, North America and Saudi Arabia, our three production sites and the Atsugi Research Center in Japan.

Module certificates from Solar Frontier can be downloaded at:
http://www.solar-frontier.eu

15.2 Inverter SF-WR

15.2.1 Technical data inverter

	SF-WR-3000	SF-WR-3600	SF-WR-4200
DC input side (PV generator connection)			
Number of DC inputs	1	1	1
Maximum start voltage	845 V	845 V	845 V
Maximum input voltage	900 V	900 V	900 V
Minimum input voltage for grid-feeding	350 V	350 V	350 V
Startup input voltage	350 V	350 V	350 V
Rated input voltage	380 V	455 V	540 V
Minimum input voltage for rated output	350 V	350 V	360 V
MPP voltage	350 V … 700 V	350 V … 700 V	360 V … 700 V
Maximum input current	12 A	12 A	12 A
Rated input current	8 A	8 A	8 A
Maximum input power at maximum active output power	3060 W	3690 W	4310 W
Rated input power (cos φ = 1)	3060 W	3690 W (Portugal: 3450 W)	4310 W (Portugal: 3680 W)
Recommended maximum PV output	3800 Wp	4500 Wp	5200 Wp
Derating / power limiting	Occurs automatically when: • input power > max. recommended PV power • cooling is inadequate • input current too high • grid current too high • internal or external derating • grid frequency too high (according to country settings) • limiting signal received via an external interface • output power is limited (set at the inverter)		
AC output side (mains grid connection)			
Output voltage	185 V ... 276 V (depending on the country settings)		
Rated output voltage	230 V	230 V	230 V
Maximum output current	16 A	16 A	18,5 A
Rated output current	13 A	15,6 A	18,3 A
Maximum active power (cos φ = 1)	3000 W	3600 W (Belgium: 3330 W)	4200 W (Belgium: 3330 W)
Maximum active power (cos φ = 0.95)	3000 W	3530 W	3990 W
Maximum apparent power (cos φ = 0.95)	3130 VA	3680 VA	4200 VA
Rated output	3000 W	3600 W (Portugal 3450 W)	4200 W (Portugal 3680 W)
Rated frequency	50 Hz and 60 Hz		
Grid type	L / N / PE (Protective Earth ⏚)		
Grid frequency	45 Hz ... 65 Hz (depending on the country settings)		
Power losses in nighttime operation	< 0.7 W		
Feeding phases	single-phase		
Distortion factor (cos φ = 1)	< 2 %		
Power factor cos φ	0.95 capacitive ... 0.95 inductive		
Characterisation of the operating behaviour			
Maximum efficiency	98,6 %	98,6 %	98,6 %
European efficiency	98,3 %	98,3 %	98,2 %
CEC Efficiency	98,4 %	98,3 %	98,2 %
MPP efficiency	> 99.7 % (static), > 99 % (dynamic)		
Efficiency values (at 5 %, 10 %, 20 %, 25 %, 30 %, 50 %, 75 %, 100 % of the rated power) at rated voltage	95,4%, 97,3%, 98,2%, 98,4%, 98,5%, 98,5%, 98,3%, 98,0%	95,8%, 97,4%, 98,2%, 98,3%, 98,4%, 98,4%, 98,1%, 97,7%	96,2%, 97,6%, 98,3%, 98,3%, 98,3%, 98,2%, 97,9%, 97,4%
Efficiency values (at 5 %, 10 %, 20 %, 25 %, 30 %, 50 %, 75 %, 100 % of the rated power) at minimum MPP voltage	95,7%, 97,5%, 98,4%, 98,5%, 98,6%, 98,6%, 98,4%, 98,1%	96,3%, 97,7%, 98,5%, 98,6%, 98,6%, 98,5%, 98,3%, 97,7%	96,7%, 98,0%, 98,5%, 98,6%, 98,6%, 98,4%, 98,1%, 97,6%

	SF-WR-3000	SF-WR-3600	SF-WR-4200
Efficiency values (at 5 %, 10 %, 20 %, 25 %, 30 %, 50 %, 75 %, 100 % of the rated power) at maximum MPP voltage	94,6%, 96,7%, 97,7%, 97,9%, 98,0%, 98,2%, 97,9%, 97,6%	95,2%, 97,0%, 97,8%, 98,0%, 98,1%, 98,0%, 97,8%, 97,5%	95,7%, 97,0%, 98,0%, 98,1%, 98,2%, 97,9%, 97,6%, 97,2%
Efficiency reduction in case of a rise in ambient temperature (at temperatures > 40 °C)	0.005 %/°C		
Efficiency change in the case of deviation from the DC rated voltage	0.002 %/V		
Own consumption	< 4 W		
Derating at full power	from 50 °C (T_{amb})	from 50 °C (T_{amb})	from 45 °C (T_{amb})
Switch-on power	10 W		
Switch-off power	5 W		
Standby power	6 W		
Safety			
Protection class	II		
Isolation principle	No galvanic isolation; transformerless		
Grid monitoring	Yes, integrated		
Insulation monitoring	Yes, integrated		
Residual current monitoring	Yes, integrated [1)]		
Overvoltage protection version	Varistors		
Reverse polarity protection	Yes		
Application conditions			
Area of application	Indoor rooms, with or without air conditioning		
Ambient temperature range (T_{amb})	–15 °C ... +60 °C		
Storage Temperature	–30 °C ... +80 °C		
Relative humidity	0 % ... 95 %, non-condensing		
Installation elevation	≤ 2000 m above sea level		
Degree of pollution	PD3		
Noise emission (typical)	26 dBA	29 dBA	31 dBA
Impermissible ambient gases	Ammonia, solvents		
Equipment and design			
Degree of protection	IP21 (Casing: IP51; Display: IP21)		
Overvoltage category	III (AC), II (DC)		
DC connection	Multi-Contact MC4 (1 pair)		
AC connection			
Type	Wieland RST25i3 plug		
Connection conductor cross-section	Cable diameter 10 ... 14 mm conductor cross-section ≤ 4 mm^2		
Opposing connector	Included in delivery		
Dimensions (X x Y x Z)	340 x 608 x 222 mm		
Weight	9 kg		
Display	Grafical display 128 x 64 Pixel		
Communication interface	3 x RJ45 socket (2 x RS485 for connection to Meteocontrol WEB'log or Solar-Log; 1 x Ethernet)		
Feed-in management as per EEG 2012	EinsMan-ready, über RS485 interface		
Integrated DC circuit breaker	Yes, compliant via VDE 0100-712		
Cooling principle	Temperature-controlled fan, variable speed, internal (dust protected)		
Test certificate	CE-Zeichen, VDE AR N 4105, G83, UTE, C 15-712-1, AS4777, CEI 0-21	CE-Zeichen, VDE AR N 4105, G83, UTE, C 15-712-1, AS4777, CEI 0-21	CE-Zeichen, VDE, AR N 4105, G83, CEI 0-21

Technical data at 25 °C/ 77 °F.

[1)] The design of the inverter prevents it from causing DC leakage current.

15.3 Technical data AC cable and line circuit breakers

Inverter	AC cable conductor cross-section	Power loss[1)]	Line circuit breaker
SF-WR-3000	2,5 mm²	25 W	B16 or B25
	4,0 mm²	15 W	B16 or B25
SF-WR-3600	2,5 mm²	35 W	B25
	4,0 mm²	22 W	B25
SF-WR-4200	2,5 mm²	48 W	B25
	4,0 mm²	30 W	B25

Table 7

[1)] Power loss of the AC cables at the rated power of the inverter and a cable length of 10 m.

15.4 Table of countries

Details on setting the country are provided in section 8.4.6.

Note

The requirements for the country-specific grid parameters may change at short notice. Contact the technical support of Solar Frontier if the parameters specified in table 8 no longer correspond to the legally prescribed requirements in your country. See section 17.

Country			Reconnection time	Voltage disconnection values (peak values) [2)]				Voltage disconnection value ø (average value) [3)]				Frequency disconnection values [4)]			
				upper		lower		upper		lower		upper		lower	
Name	Display [1)]		s	%	s	%	s	%	s	%	s	Hz	s	Hz	s
Germany	4900	Deutschland	60	15	0.2	–20	0.2	10	600	–	–	1.,5	0.2	–2.5	0.2
Sweden	4600	Sverige	30	15	0.2	–15	0.2	11	60	–10	60	1	0.5	–3.0	0.5
France	3300	France	30	15	0.2	–15	0.2	10	600	–	–	0.4	0.2	–2.5	0.2
Portugal	35100	Portugal	20	15	0.2	–15	1.5	10	600	–	–	1	0.5	–3.0	0.5
Spain 1699	3400	España	180	15	0.2	–15	1.5	10	1.5	–	–	1	0.5	–2.0	3
Netherlands	3100	Nederland	30	10	2	–20	2	–	–	–	–	1	2	–2.0	2
Belgium 2	3202	Belgique 2 [5)]	30	15	0.2	–20	0.2	10	600	–	–	1.5	0.2	–2.5	0.2
Belgium 2 unlimited	3203	Belgique 2 unl [5)]	30	15	0.2	–20	0.2	10	600	–	–	1.5	0.2	–2.5	0.2
Austria	4300	Österreich	30	15	0.2	–20	0.2	12	600	–	–	1	0.2	–3.0	0.2
Italy 3	3902	Italia 3	30	22	0.1	–25	0.2	–	–	–	–	5	0.2	–5.0	0.2
Italy 8	3907	Italia 8[10)]	300	15	0.2	– 60	0.2	10	600	–15	0.4	0.5	0.1	–0.5	0.1
Italy 9	3908	Italia 9[10)]	300	15	0.2	– 60	0.2	10	600	–15	0.4	0,5	0.1	–0.5	0.1
Slovenia	38600	Slovenija	30	15	0.2	–30	0.2	10	1.5	–15	1.5	1	0.2	–3.0	0.2
Czech Republic	42000	Česko	30	15	0.2	–15	0.2	10	600	–	–	0.5	0.2	–0.5	0.2
Greek Islands	3001	Greece islands	180	15	0.5	–20	0.5	10	600	–	–	1	0.5	–2.5	0.5
Greek Mainland	3000	Greece continent	180	15	0.5	–20	0.5	10	600	–	–	0.5	0.5	–0.5	0.5
Australia	6100	Australia	60	17	2	–13	2	–	–	–	–	5	2	–5.0	2
Israel	9720	Israel	300	35	0.05	–50	0.1	10	2	–15	2	5	2	–5.0	2
Turkey	9000	Türkiye	30	15	0.2	–20	0.2	10	600	–	–	0.2	0.2	–2.5	0.2
Ireland	35300	Éire	30	10	0.5	–10	0.5	–	–	–	–	0.5	0.5	–2.0	0.5
United Kingdom G83	4400	United Kingdom G83 [6)]	20	19	0.5	–20	0.5	14	1	–13	2.5	2	0.5	–3.0	0.5
United Kingdom G59	4401	United Kingdom G59 [6)]	180	15	0.5	–20	0.5	10	1	-13	2.5	1.5	0.5	–2.5	0.5
Switzerland	4100	Suisse	30	15	0.2	–20	0.2	10	600	–	–	0.2	0.2	–2.5	0.2
Hungary	3600	Magyarország	30	35	0.05	–50	0.1	10	2	–15	2	1	0.2	–1.0	0.2

Country			Reconnection time	Voltage disconnection values (peak values) [2]				Voltage disconnection value Ø (average value) [3]				Frequency disconnection values [4]			
				upper		lower		upper		lower		upper		lower	
Name	Display [1]		s	%	s	%	s	%	s	%	s	Hz	s	Hz	s
Denmark unlimited	4500	Danmark unl.	60	15	0.2	–20	0.2	10	600	–	–	1.5	0.2	–2.5	0.2
Denmark	4501	Danmark [7]	60	15	0.2	–20	0.2	10	600	–	–	1.5	0.2	–2.5	0.2
Cyprus	35700	Cyprus	30	10	0.5	–10	0.5	–	–	–	–	2	0.5	–3.0	0.5
Finland	35800	Suomi	30	10	0.2	–15	0.2					1	0.2	–2.0	0.2
Poland	4800	Polska	20	15	0.2	–15	1.5	10	600	–	–	1	0.5	–3.0	0.5
EN 50438	50438	EN 50438	20	15	0.2	–15	1.5	–	–	–	–	1	0.5	–3.0	0.5
Costa Rica	5060	Latinoamérica 60Hz [6]	20	10	0.2	–20	0.2	–	–	–	–	0.6	0.2	–0.6	0.2
Tahiti	6890	Tahiti 60Hz	30	15	0.2	–20	0.2	10	600	–	–	2.5	0.2	–5.0	0.2
Bulgaria	3590	Bâlgarija	30	15	0.2	–20	0.2	10	600	–	–	0.2	0.2	–2.5	0.2
Mauritius	23000	Mauritius	180	10	0.2	– 6	1.5	6	1.5	–	–	1	0.5	–3.0	0.5
Brazil 220	5500	Brasil 220V 60Hz	300	10	0.2	–20	0.4					2	0.2	–2.5	0.2
Brazil 230	5501	Brasil 230V 60Hz	300	10	0.2	–20	0.4					2	0.2	–2.5	0.2
Thailand PEA	6600	Thailand	300	40	0.05	–50	0.1	9	2	–9	2	0.5	0.1	–0.5	0.1
Estonia	3720	Estland	30	15	0.2	–15	1.5					1	0.5	–3	0.5
Malaysia	6000	Malaysia	60	17.4	2	–13	2					5	2	–5	2
India	9100	India	300	35	0.05	–50	0.1	10	2	–15	2	1	2	–1	2
South Africa	2700	South Africa	60	20	0.16	–50	0.2	10	2	–15	2	2	0.5	–2.5	5
Droop-Mode	0007	Droop-Mode [9]	60	20	0.5	–20	0.5	–	–	–	–	5	0.5	–3.5	0.5
Droop-Mode 60 Hz	0008	Droop-Mode 60 Hz [9]	60	20	0.5	–20	0.5	–	–	–	–	5	0.5	–3.5	0.5

Table 8

Country table

[1] Country code and name as shown on the display.

[2] Disconnection values are upper and lower deviations from the peak values of the rated voltage (in %) and the associated switch-off time (in s).

[3] Disconnection values are upper and lower deviations from the average values of the rated voltage (in %) and the associated switch-off time (in s).

[4] Disconnection values are upper and lower deviations from the rated frequency (in Hz) and the associated switch-off time (in s).

[5] SF-WR 3600 and 4200 only:
Maximum output power Belgium 1 / Belgium 2: 3330 W
Maximum output power Belgium 1 unlimited / Belgium 2 unlimited: 3600 W

[6] The rated voltage is 240 V (instead of 230 V).

[7] Maximum output power: 2,000 W.

[8] The rated voltage is 220 V (instead of 230 V).

[9]

Attention

Danger of yield losses. Activation of the *Droop Mode* is not permitted in systems connected to the public electricity grid.

Activation of the *Droop Mode* is recommended when the inverter is operated in conjunction with a stand-alone inverter in a system that is not connected to the public electricity grid. *Droop mode*: 50 Hz; *Droop mode 60 Hz*: 60 Hz.

[10] *Italy 8*: Systems smaller than 3 kW maximum output power; *Italy 9*: Systems greater than 3 kW maximum output power.

Note

The requirements for the country-specific grid parameters may change at short notice. Contact the technical Support of Solar Frontier if the parameters specified in the table below no longer correspond to the legally prescribed requirements in your country.

15.5 EU – Declaration of conformity inverter SF-WR

CE

EU – KONFORMITÄTSERKLÄRUNG
EC – DECLARATION OF CONFIRMITY
DECLARATION DE CONFORMITE DE LA CE

Zertifikat/ Certificat/ Certificat Nr. **006-0313**

Die Firma
The company
La société

Steca Elektronik GmbH
Mammostraße 1
87700 Memmingen
Germany
www.steca.com

erklärt in alleiniger Verantwortung, dass folgendes Produkt
hereby certifies on its responsibility that the following product
se déclare seule responsable du fait que le produit suivant

Netzwechselrichter
StecaGrid 1800, StecaGrid 1800x
StecaGrid 2300, StecaGrid 2300x
StecaGrid 3010, StecaGrid 3010x
StecaGrid 3000, StecaGrid 3000x
StecaGrid 3600, StecaGrid 3600x
StecaGrid 4200, StecaGrid 4200x

auf das sich diese Erklärung bezieht, mit folgenden Richtlinien bzw. Normen übereinstimmt.
which is explicitly referred to by this Declaration meet the following directives and standard(s).
qui est l'objet de la présente déclaration correspondent aux directives et normes suivantes.

Elektromagnetische Verträglichkeit – Richtlinie
Electromagnetic Compability – Directive
Compatibilité éléctromagnetique – Directive **2004/108/EG**

Niederspannungsrichtlinie
Low Voltage Directive
Directive de basse tension **2006/95/EG**

Europäische Normen 1) (2 / 2)
European Standard
Norme européenne

EN 55 014-1	EN 55 014-2	EN 61 000-6-2
EN 61 000-6-3	EN 62 109-1	EN 62 109-2

Die oben genannte Firma hält Dokumentationen als Nachweis der Erfüllung der Sicherheitsziele und die wesentlichen Schutzanforderungen zur Einsicht bereit.

Documentation evidencing conformity with the requirements of the Directives is kept available for inspection at the above company.

En tant que preuve de la satisfaction des demandes de sécurité la documentation peut être consultée chez la société sousmentionnée.

Memmingen, 27.03.2013

Ralf Griepentrog, Entwicklungsleiter

1 / 2

EU – KONFORMITÄTSERKLÄRUNG
EC – DECLARATION OF CONFIRMITY
DECLARATION DE CONFORMITE DE LA CE

Netzwechselrichter

StecaGrid 4200 | **StecaGrid 3000** | **StecaGrid 3600**

BG
Декларация за съответствие на европейските норми
С настоящето декларираме, че посочените на страница 1 продукти, отговарят на следните норми и директиви:
Електромагнитна устойчивост 2004/108/EG,
директива за ниско напрежение – 2006/95/EG.
Приложими съгласувани стандарти и норми в частност: [1)]

CZ
Prohlášeni o shodě EU
Prohlašujeme tímto, že tento agregát v dodaném provedeni odpovidá následujicim príslušným ustanovenim:
Smêrnicim EU-EMV 2004/108/EG,
Smêrnicim EU-nízkê napéti 2006/95/EG.
Pouzité harmonizační nomy, zejména: [1)]

DK
EF-overensstemmelseserklæring
Vi erklærer hermed, at denne enhed ved levering overholder følgende relevante bestemmelser:
Elektromagnetisk kompatibilitet: 2004/108/EG,
Lavvolts-direktiv 2006/95/EG.
Anvendte harmoniserede standarder, særligt: [1)]

EE
EL vastavusavaldus
Käesolevaga avaldame, et nimetatud toode on kooskõlas järgmiste direktiivide ja standarditega:
Elektromagnetilise ühilduvuse direktiiv 2004/108/EG,
Madalpingedirektiiv 2006/95/EG
Kohaldatud Euroopa standardid, eelkõige: [1)]

ES
Declaración de conformidad CE
Por la presente declaramos la conformidad del producto en su estado de suministra con las disposiciones pertinentes siguientes:
Compatibilidad electromagnética 2004/108/EG,
Directiva sobre equipos de baja tensión 2006/95/EG.
Normas armonizadas adoptadas, especialmente: [1)]

FI
CE-standardinmukaisuusseloste
Ilmoitamme täten, että tämä laite vastaa seuraavia asiaankuuluvia määräyksiä:
Sähkömagneettinen soveltuvuus 2004/108/EG,
Matalajännite direktiivit: 2006/95/EG
Käytetyt yhteensovitetut standardit, eritysest: [1)]

GR
Δήλωση προσαρμογής στις προδιαφές της Ε.Ε. (Ευρωπαϊκής Ένωσης)
Δηλώνουμε ότι το προϊόν αυτο σ' αυτή την κατάσταση παράδοσης ικανοποιεί τις ακόλουθες διατάξεις:
ΗλΕκτρομαγνητική συμβατότητο 2004/108/EG,
Οδηγία χαμηλής τάσης 2006/95/EG.
Εναρμονισμένα χρησιμοποιούμενα πρότυπα, ιδιαίτερα: [1)]

HU
EK. Azonossági nyilatkozat
Ezennel kijelentjük, hogy az berendezés az alábbiaknak megfelel:
Elektromágneses zavarás/türés: 2004/108/EG,
Kisfeszültségü berendezések irány-Elve: 2006/95/EG.
Felhasznált harmonizált szabványok, különösen: [1)]

IT
Dichiarazione di conformitá CE
Con la presente si dichiara che i presenti prodotti sono conformi alle sguenti disposizioni e direttive rilevanti:
Compatibilitá elettromagnetica 2004/108/EG,
Direttiva bassa tensione 2006/95/EG.
Norme armonizzate applicate, in particolare: [1)]

LT
Atitikties pareiškimas su Europos Sąjungoje galiojančiomis normomis
Šiuo mes pareiškiame, kad nurodytas gaminys atitinka sekančias direktyvas bei normas:
Elektromagnetinio suderinamumo direktyvą 2004/108/EG,
Žemosios įtampos direktyvą 2006/95/EG.
Naudojamas Europoje normas, ypač: [1)]

LV
ES Atbilstības deklarācija
Paziņojam, ka minētais izstrādājums atbilst sekojošām direktīvām jeb normām:
2004/108/EG Par elektromagnētisko panesamību,
2006/95/EG Direktīvai par zemspriegumu.
Izmantotās Eiropas normas, īpaši: [1)]

NL
EU-verklaring van overeenstemming
Hiermede verklaren wij dat dit aggregaat in die geleverde uitvoering voldoet aan de volgende bepalingen:
Elektromagnetische compatibiliteit 2004/108/EG,
EG-laagspanningsrichtlijn 2006/95/EG.
Gebruikte geharmoniseerde normen, in het bijzonder: [1)]

NO
EU-Overensstemmelseserkæring
Vi erklærer hermed at denne enheten i utføreise som levert er i overensstemmelse med følgende relevante bestemmelser:
EG-EMV-Elektromagnetisk kompatibilitet 2004/108/EG,
EG-Lavspenningsdirektiv 2006/95/EG .
Anvendte harmoniserte standarder, særlig: [1)]

PL
Deklaracja Zgodności CE
Niniejzym deklarujemy z pełną odpowiedzialnoscią że dostarczony wyrób jest zgdony z następującymi dokumentami:
Odpowiedniść elektromagnetyczna
2004/108/EG,
Normie niskich napięć 2006/95/EG.
Wyroby są zgodne ze szczególowymi normami zharmonizowanymi: [1)]

PT
Declaração de Conformidade CE
Pela presente, declaramos que esta unidada no seu estado original, está conforme os seguintes requisitos:
Compatibilidade electromagnética 2004/108/EG,
Directiva de baixa voltagem 2006/95/EG.
Normas harmonizadas aplicadas, especialmente: [1)]

RO
Declarație de conformitate UE
Prin prezenta se declară că produsul mai sus menționat este în conformitate cu următoarele directive, respectiv norme:
Compatibilitate electromagnetică 2004/108/EG,
Directiva CE referitoare la tensiunile joase 2006/95/EG.
Norme europene utilizate, în special: [1)]

RU
Деклация о соответствии Европейским нормам
Настоящим документом заявляем, что данный агрегат в его объеме поставки соответствует следующим нормативным документам:
Электромагнитная устойчивость 2004/108/EG,
Директивы по низковольтному напряжению 2006/95/EG.
Используемые согласованные стандарты и нормы в частности: [1)]

SE
CE-försäkran
Härmed förklarar via tt denna maskin i levererat utförande motsvarar följande tillämpliga bestämmelser:
EG-Elektromagnetisk kompatibilitet 2004/108/EG,
EG-Lägspänningsdirektive 2006/95/EG.
Tilämpada harmoniserade normer, i synnerhet: [1)]

SI
EU-izjava o skladnosti
Izjavljamo, da je navedeni izdelek skladen z naslednjimi direktivami oz. standardi:
Direktiva o elektromagnetni združljivost 2004/108/EG,
Direktiva o nizkonapetostni opremi 2006/95/EG.
Uporabljene evropski standardi, še posebej: [1)]

SK
Prohlásenie o zhode ES
Týmto prehlasujeme, že sa uvedený produkt zhoduje s nasledovnými smernicami príp. normami:
Elektromagnetická zlučiteľnosť 2004/108/EG,
Smernica o nízkom napätí 2006/95/EG.
Použité európske normy, predovšetkým: [1)]

TR
EC Uygunluk Teyid Belgesi
Bu cihazın teslim edildiği şekliyle aşağıdaki standartlara uygun olduğunu teyid ederiz:
Elektromanyetik Uyumluluk 2004/108/EG,
Alçak gerilim direktifi 2006/95/EG.
Kısmen kullanılan standartlar: [1)]

15.6 Plugs and Sockets

15.6.1 Product information plugs and sockets

Features

Producer: Amphenol
Product: Helios H4

- UL, TÜV and CSA approved
- Fully intermateable with industry standard
- Meets all new NEC 2008 requirements
- Quick and easy secure snap lock mating
- Simple unlocking tool meets NEC requirements
- Long-term UV and Ozone resistance
- Highest current rating in industry
- RoHS compliant
- Complete Cable Assemblies available
- Low contact resistance means low loss
- Ready for field assembly

Technical Data

Rated current	32A (2,5mm, AWG14), 40A (4,0mm, AWG 12), 44A (6,0mm, AWG10), 65A (10,0mm, AWG 8)
Rated voltage	1000 V (IEC), 1000 V (UL)
Test voltage	6 KV for 1 minute, 10 kV impulse (1,2/50µS) (IEC)
Typical contact resistance	0,25m Ω
Contact material	Copper, tin plated
Contact system	Machined/Cold Formed or Stamped & Formed with RADSOK® insert
Insulation material	PC
Locking mechanism	Snap-lock, special unlock tool required to un-mate as required by NEC 2008
Cable strain relief	Compression gland with ratcheting gland nut
Degree of protection	IP68
Safety class	II (IEC61140)
Pollution degree	2 (IEC60664)
Overvoltage category	III (IEC60664)
Flame class	UL94-VO
Ambient temperature range	-40 °C to 85 °C

Tools

Crimp Tool

Strip Tool

Wrench Tool

Universal Unlocking Tool

For the purchase of the special tool, please contact directly the manufacturer Amphenol.

15.6.2 TÜV certificate plugs and sockets

Zertifikat *Certificate*

TÜVRheinland®

Zertifikat Nr. *Certificate No.*
R 50157783

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0002

Ihr Zeichen *Client Reference*	Unser Zeichen *Our Reference*	Ausstellungsdatum	*Date of Issue (day/mo/yr)*
J.L.	02-CHENAND- 17011847 002	26.10.2009	

Genehmigungsinhaber *License Holder*
Amphenol Industrial Operations
40-60 Delaware Avenue, Sidney
New York State 13838-1395
USA

Fertigungsstätte *Manufacturing Plant*
Amphenol Technology (Shenzhen)
Co., Ltd.
Blk5, FuAn 2nd Industrial Park
Dayang Rd., Fuyong Town, Baoan
Shenzhen, Guangdong 518103
P.R. China

Prüfzeichen *Test Mark*

www.tuv.com ID:2000000000 TÜVRheinland
• BAUART GEPRÜFT
• TYPE APPROVED

Geprüft nach *Tested acc. to*
EN 50521:2008

Zertifiziertes Produkt (Geräteidentifikation) *Certified Product* *(Product Identification)*

Lizenzentgelte - Einheit *License Fee - Unit*

Connector (Connector for Photovoltaic System)

as page 0001
Change
Addition

Test Requirement : See above
Type Designation : Helios H4 2.5mm² (for cable)
Helios H4 4mm² (for cable)
Helios H4 6mm² (for cable)
Helios H4 2.5mm² bulkhead (for panel)
Helios H4 4mm² bulkhead (for panel)
Helios H4 6mm² bulkhead (for panel)
Rated Current : 32A/ta=90°C, 40A/ta=85°C for 2.5mm²
40A/ta=90°C, 48A/ta=85°C for 4.0mm²
44A/ta=90°C, 56A/ta=85°C for 6.0mm²
Ambient Temperature (ta) : 90°C
Upper Limiting Temperature: 120°C
The labelling requirements acc. to EU Directive 2001/95 have to be observed for distribution within the EEA.

6

ANLAGE (Appendix): 1.1

Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde und es bestätigt die Konformität des Produktes mit den oben genannten Standards und Prüfgrundlagen. Zusätzliche Anforderungen in Ländern, in denen das Produkt in Verkehr gebracht werden soll, müssen zusätzlich betrachtet werden. Die Herstellung des zertifizierten Produktes wird überwacht.
This certificate is based on our Testing and Certification Regulation and states the conformity of the product with the standards and testing requirements as indicated above. Any additional requirements in countries where the product is going to be marketed have to be considered additionaly. The manufacturing of the certified product is subject to surveillance.

TÜV Rheinland Product Safety GmbH, Am Grauen Stein, D-51105 Köln
Tel.: (+49/221)8 06 - 13 71 e-mail: cert-validity@de.tuv.com
Fax: (+49/221)8 06 - 39 35 http://www.tuv.com/safety

TÜV Rheinland Product Safety GmbH TÜVRheinland Zertifizierungsstelle

Zertifizierungsstelle
Dipl.-Ing. S. O. Steinke

DC Cable

15.6.3 Product information DC cable

Features	
 Hersteller: HIS Produkt: HIKRA® S	• UV-, ozone-, acid-, alkali- and weather-resistance • Flame-retardant, halogen-free • Good abrasion resistance, robust • Short-circuit-proof up to 200°C/5s, thanks to double insulation • Highly flexible for high mechanical stress • RoHS and REACH-conformant • Sheath colours: black • 25-year factory warranty from date of delivery. The warranty conditions for HIRKA® PRO apply for intended use, installation and operating conditions.

Technical Data	
Approvals	DKE (PV1-F), TÜV 2 PfG. 1169/08.07 (R 60033853)
Working temperature flexible	-25° C bis +125° C
Working temperature fixed	-50° C bis +150° C
Minimum bending radius flexible	10 x cable dia
Minimum bending radius fixed	5 x cable dia
Nominal voltage [U0/U]	AC 600 / 1.000 V | DC 900 / 1.500 V
Voltages up to 1,8 kV are possible (conductor / conductor, not grounded system, unloaded circuit)	
Test voltage	AC 6.500 V
Rated voltage	Maximum permissible voltage up to 1.8 kV DC (conductor/conductor, non grounded system, unstressed circuit)
General Construction	
Number x section in mm²	1 x 4.0
Conductor construction n x max-ø (mm)	56 x 0.30
External diameter approx. (± 0,2 mm)	5.2
Weight ca. kg/km	59
Construction	
Tin-plated copper strand, fine wire as per IEC EN 60228 class 5	
Polyolefin	
Double isolated	
Insulation / Chemically cross-linked special compound	

15.6.4 EU declaration of conformity DC cable

EC Declaration of Conformity

Issuer's name and address:

HI-Kabelkonfektionierungs GmbH
Siemensstr. 4
64743 Beerfelden

Product: Cables for photovoltaic systems

Type designation: HIKRA Solar PV1-F

The designated product is in conformity with the European Directive:

2006/95/EC

"Council Directive on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits".

Full compliance with the standards listed below proves the conformity of the designated product with the provisions of the above-mentioned EC Directive:

Anforderungsprofil Leitungen für
PV-Systeme/requirements for cables for PV systems 2008-02-12
(in Anlehnung an/with reference to) und nach Werksspezifikation/and according to manufacturer's specification

The VDE Testing and Certification Institute GmbH (EU Identification No.0366), Merianstr. 28, D-63069 Offenbach, has tested and certified the product granting the VDE Approval for the mark(s) as displayed.

VDE REG.-Nr. 8322 oder/or VDE REG.-Nr. 8322 oder/or VDE-REG.-Nr. 8322

Certificate No. 40026479
File Reference 5003369-5920-0070 / 112511 FG41 / LR

Beerfelden 12-8-10
(Place, Date)

(Legally binding signature of the issuer)

15.6.5 TÜV certificate DC cable

Zertifikat *Certificate*

TÜVRheinland®

Zertifikat Nr. *Certificate No.*
R 60033853

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0001

Ihr Zeichen *Client Reference*	Unser Zeichen *Our Reference*	Ausstellungsdatum	*Date of Issue (day/mo/yr)*
	0010-- 21148677 007	10.09.2010	

Genehmigungsinhaber *License Holder*
HIS Solarsysteme GmbH
Siemensstr. 4
64743 Beerfelden
Deutschland

Fertigungsstätte *Manufacturing Plant*
0010--21148677 002

Prüfzeichen *Test Mark*

www.tuv.com TÜVRheinland ID:2000000000
• BAUART GEPRÜFT
• TYPE APPROVED

Geprüft nach *Tested acc. to*
2 PfG 1169/08.07

Zertifiziertes Produkt *Certified Product* **(Geräteidentifikation)** *(Product Identification)* — **Lizenzentgelte - Einheit** *License Fee - Unit*

PV-Leitungen

Bezeichnung	:	HIKRA Solar	11
Bauartkurzzeichen	:	PV1-F	
Bemessungsquerschnitt	:	2,5 mm²; 4,0 mm²; 6,0 mm²; 10,0 mm² 16,0 mm² und 35,0 mm²	5
Bemessungsspannung	:	AC Uo/U 0,6/1kV; DC 1,8kV (Leiter-Leiter, nicht geerdetes System, unbelasteter Stromkreis)	
Temperaturbereich	:	- 40°C bis + 90°C	
max. Temp. am Leiter	:	120°C (für 20.000h)	
Material Isolation	:	XLPE schwarz	
Material Mantel	:	XLPE	
Mantelfarbe für:		2,5 mm²; 4,0 mm²; 6,0 mm²; 10,0 mm²: schwarz, rot oder blau	
Mantelfarbe für:		16,0 mm² und 35,0 mm²: schwarz	

Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde und es bestätigt die Konformität des Produktes mit den oben genannten Standards und Prüfgrundlagen. Zusätzliche Anforderungen in Ländern, in denen das Produkt in Verkehr gebracht werden soll, müssen zusätzlich betrachtet werden. Die Herstellung des zertifizierten Produktes wird überwacht.
This certificate is based on our Testing and Certification Regulation and states the conformity of the product with the standards and testing requirements as indicated above. Any additional requirements in countries where the product is going to be marketed have to be considered additionally. The manufacturing of the certified product is subject to surveillance.

TÜV Rheinland LGA Products GmbH, Tillystraße 2, 90431 Nürnberg
Tel.: +49 221 806-1371 e-mail: cert-validity@de.tuv.com
Fax: +49 221 806-3935 http://www.tuv.com/safety

Zertifizierungsstelle

TÜV Rheinland LGA Products GmbH Zertifizierungsstelle

Dipl.-Ing. O. Brumm

16. Exclusion of Liability

This manual is the proprietary information of Solar Frontier Europe GmbH (SF). Solar Frontier´s limited warranty will be voided if the instructions here within are not strictly observed. Solar Frontier will not assume any liability for personal injuries and damage to property arising from improper use, wrong assembly, operation and maintenance of SolarSets. Solar Frontier reserves the right to make amendments to the contents of this document without prior notice. This manual is valid from September 2013.

The information provided with this installation and operation manual represent the latest information of the manufacturer of the single components at the time of printing. Subject to changes and modifications.

17. Contact

In case of complaints or faults, please contact the dealer from whom you purchased the product. They will help you with any issues you may have.

Solar Frontier Europe GmbH	Phone	**+49 (0) 89 92 86142 0**
		Monday to Friday from 8 am to 5 pm
Bavariafilmplatz 8	Fax	**+49 (0) 89 92 86142 11**
82031 Grünwald bei München	Internet	**www.solar-frontier.eu**
Germany	E-Mail	**solarsets@solar-frontier.eu**

18. Notes

Inverter

Type

Serial number

Installation company

Company

Contact

Street

ZIP

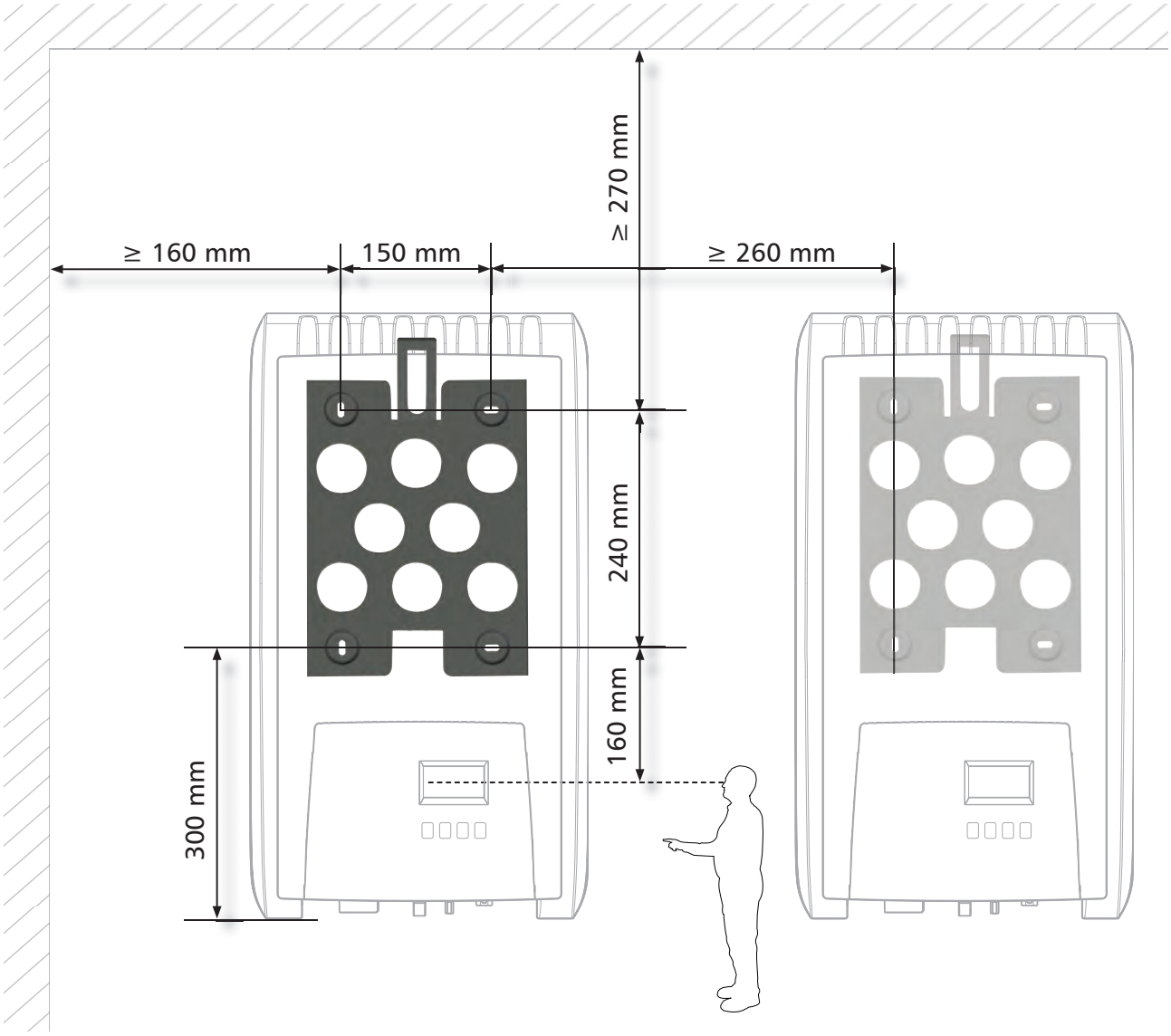
City

Telephone number

E-Mail

19. Appendices

19.1 Installation SF-WR



19.2 AC plug SF-WR

Wichtige Information - bitte aufmerksam lesen

Dieses Beiblatt beschreibt die Montage der zwei- und dreipoligen ***gesis*** RST-Steckverbinder. Bitte beachten Sie, daß elektrische Anschlüsse und Installationen ausschließlich von hierfür ausgebildeten Fachkräften vorgenommen werden dürfen.

Important information - please read carefully

This leaflet is intended for use by trained electricians only. It describes the mounting of the two and three pole gesis RST connectors. Please observe the warnings and notes.

Einsatzbereich und Zündschutzart

Operating conditions and type of protection

- Ex II 3 G Ex nA II, 80°C (T6)
- Ex II 3 D Ex tD A22 T85 °C (H05VV-F…: T70 °C; H07RN-F…: T60 °C)

Zertifikat Nr./Certificate No. SEV 07 ATEX 0110 X

Erweiterter Einsatzbereich für nachfolgende Geräte- und Erstanschlüsse in Schraubtechnik:
Extended range of application for following screw-type appliance and power connectors:

- RST20I3S(D)S1 ZR.. / ..S(D)B1 ZR..
- RST20I3S(D)S1 M.. / ..S(D)B1 M..

Siehe auch „Besondere Bedingungen X“
See also „Special conditions X“

Kabeltypen

Cable types

- H05VV-F… 1,5 mm² und 2,5 mm²
- H07RN-F… 1,5 mm² und 2,5 mm²

Technische Spezifikationen

Technical specifications

Bemessungsspannung Rated voltage	50V, 250V, 250/400V
Bemessungsquerschnitt Rated diameter	2,5 mm²
Schutzart Type of protection	IP 66/68

Bemessungsstrom/ Rated current

Geräte- und Erstanschlüsse, Schraub und Federkraftanschluss Device and mains connections, screw and spring clamp terminals		
1,5 mm² 2,5 mm²	16 A 20 A	
Konfektionierte Leitungen, Crimpanschluss Assembled cables, crimp connection		
Kabeltyp / Cable type	H05VV-F	H07RN-F
1,5 mm²	16 A	14,5 A
2,5 mm²	20 A	17,5 A

Anschließbare Querschnitte (mm²) / Connectable cross sections (mm²)

	min.	max.
Schraubtechnik / Screw technique	1,5	4,0
Federkrafttechnik / Spring force technique	1,5	2,5

Ein- und feindrähtige Leiter mit 0,75 mm² und 1,0 mm² sind auch klemmbar
Single-wire and fine-strand conductors with 0.75 mm² and 1.0 mm² can also be connected

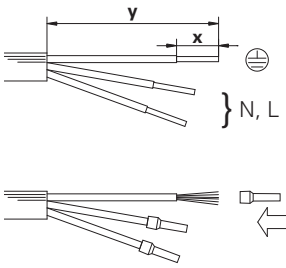
Anschließbare Leiterarten / Type of conductors which can be connected

		Leiterquerschnitt (mm²) / conductor cross section (mm²)
Schraubklemmstelle / Screw terminal	ein-/feindrähtig single-wire/fine strand	1,5…2,5
– zusätzlich / additionally	feindrähtig fine-strand	4,0
– zusätzlich / additionally	flexibel mit Aderendhülse flexible with core end sleeve	1,5…2,5
Schraubenlose Klemmstelle / Screwless terminal	eindrähtig single wire	1,5…2,5
– zusätzlich / additionally	flexibel mit ultraschallverdichteten Leiterenden flexible with ultrasonically densified lead ends	1,5; 2,5
– zusätzlich / additionally	flexibel mit Aderendhülse flexible with core end sleeve	1,5
Crimpanschluss / Crimp connection	flexibel mit ultraschallverdichteten Leiterenden flexible with ultrasonically densified lead ends	1,5; 2,5

Anzahl der Kabel pro Klemmstelle: 1 bzw. 2
Number of cables per terminal point: 1 or 2 respectively

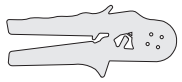
Abmantellängen und Abisolierlängen (mm)

Dismantling and Insulation strip lengths (mm)



Preßzange für
Aderendhülsen: Art.-Nr. **95.101.1300.0**

Crimping tool for ferrules
Wieland order ref.-no. **95.101.1300.0**



Federkraft-Anschlüsse / Spring clamp connections

Leiter / conductor	PE	N,L	PE	N,L
	Einfach-Anschluß Single connector		Doppel-Anschluß Dual connector	
Abmantellänge y (mm) / Dismantling length y (mm)	**40**	**35**	**55**	**50**

	Abisolierlänge x (mm) / Insulation strip length x (mm)	
Leiterquerschnitt (mm²) / Conductor cross section (mm²)	1,5	2,5
eindrähtig / solid	**14,5+1**	**14,5+1**
feindrähtig (nur mit Aderendhülse) / fine stranded (ferrules required)	**13+1**	
Aderendhülse entspr. DIN 46228-E-… Ferrules acc. to DIN 46228-E-…	**12**	
Aderendhülse entspr. DIN 46228-E-… Ferrules acc. to DIN 46228-E-…	**12**	
Ultraschallverdichtet / ultrasonically compressed	**14,5+1**	**14,5+1**

Schraubanschlüsse / Screw connections

Zugentlastung / strain relief	∅ 10…14		∅ 13…18	
Leiter / conductor	PE	N,L	PE	N,L
		Einfach-Anschluß Single connector		
Abmantellänge y (mm) / Dismantling length y (mm)	**30**	**25**	**42**	**37**
		Doppel-Anschluß Dual connector		
	45	**40**		

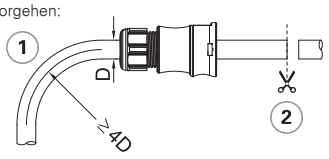
Abisolierlänge x (mm) / Insulation strip length x (mm)	**8** (Leiterquerschnitt 1,5…4 mm²) (conductor cross section 1,5…4 mm²)

Biegeradien

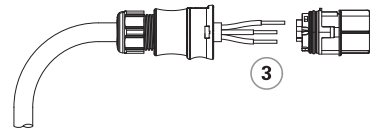
Beachten Sie den minimalen Biegeradius der Leiter. Vermeiden Sie Zugkräfte auf die Kontaktstellen, indem Sie wie folgt vorgehen:

Bending radius

Note the minimum bending radius for conductors. Avoid pull forces on the contact points by proceeding as follows:



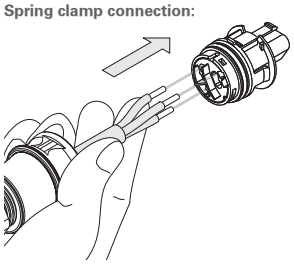
1. Leitung wie benötigt biegen
   Bend the wire as required
2. Leitung ablängen
   Cut the wire to length
3. Abmanteln, abisolieren.
   Strip the cable and wires.



Leitermontage

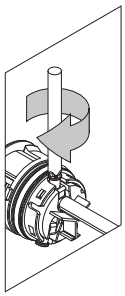
Wire connection

Federkraft-Anschluß:
Spring clamp connection:



Schraubanschluß:
Antrieb PZ1,
Anzugsmoment
typ. 0,8…1 Nm

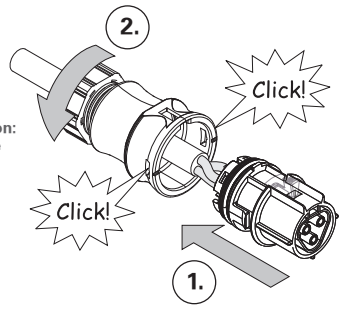
Screw connection:
Drive PZ1,
Tightening torque
typ. 0.8…1 Nm



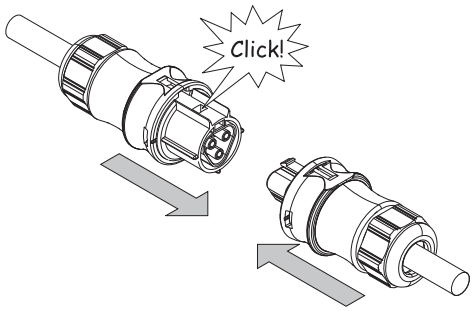
Verschließen
Closing

Verschraubung:
Anzugsmoment
typ. 4+1 Nm

Screw connection:
Tightening torque
typ. 4+1 Nm



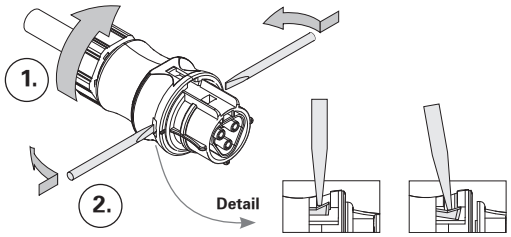
Stecken und verriegeln
Plugging and locking



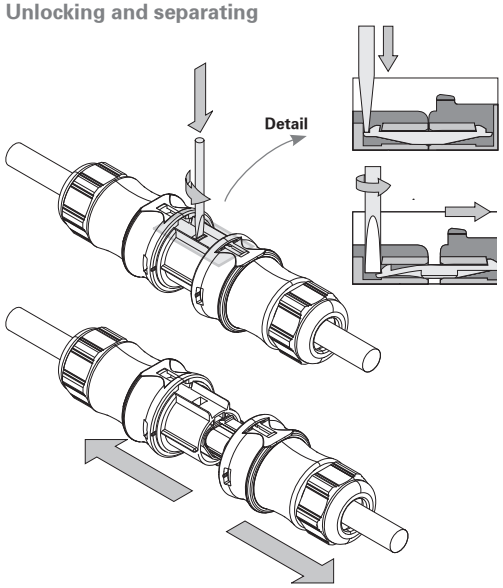
ACHTUNG / CAUTION

- Die Steckverbinder sind nicht zur Stromunterbrechung geeignet. Trennen oder stecken Sie die Verbindung niemals unter Last!
  The connectors are not for current interrupting. Never connect or disconnect under load!
- Um die Einhaltung der IP-Schutzart gewährleisten zu können, müssen an allen nicht belegten Stecker- oder Buchsenteilen Schutzkappen (Zubehör) montiert werden!
  To maintain IP 65 type of enclosure, protective caps (accessory) must be mounted on all unoccupied connectors!

Öffnen des Steckverbinders
Opening the connector



Entriegeln und Trennen
Unlocking and separating

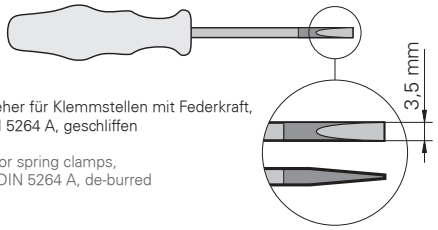


ACHTUNG / CAUTION

Die Steckverbinder sind nicht zur Stromunterbrechung geeignet. Trennen oder stecken Sie die Verbindung niemals unter Last!

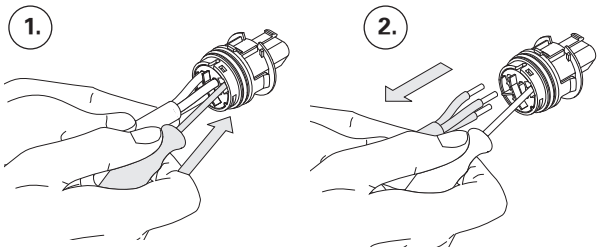
The connectors are not for current interrupting. Never connect or disconnect under load!

Leiterdemontage
Unlocking



Schraubendreher für Klemmstellen mit Federkraft,
Schneide DIN 5264 A, geschliffen

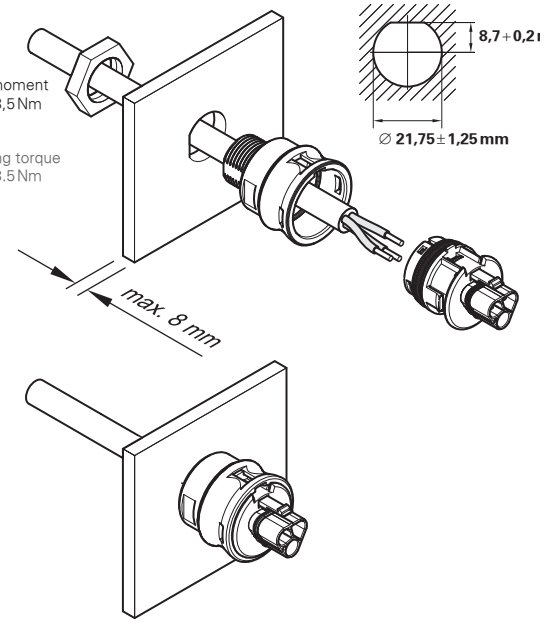
Screwdriver for spring clamps,
edge acc. to DIN 5264 A, de-burred



Gehäuseeinbau mit M20-Durchführung
Housing installation with M20 feedthrough

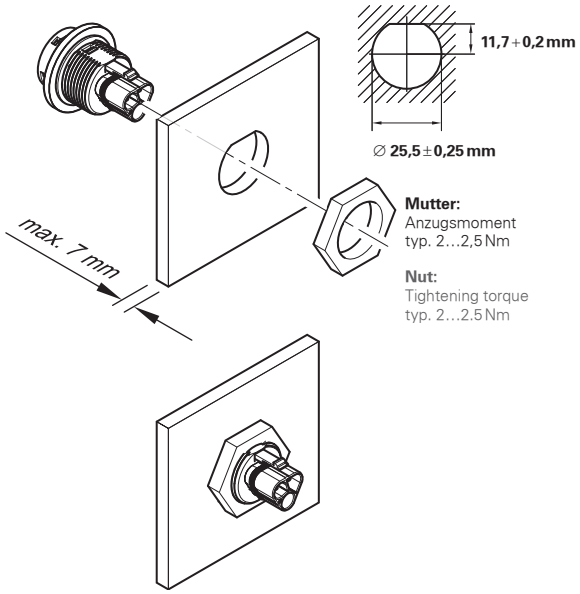
Mutter:
Anzugsmoment
typ. 3…3,5 Nm

Nut:
Tightening torque
typ. 3…3.5 Nm



Gehäuseeinbau mit M25-Durchführung

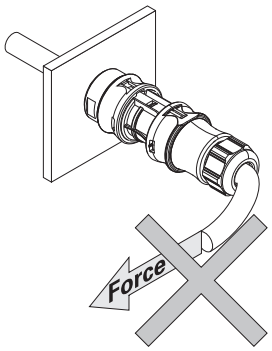
Housing installation with M25 feedthrough



ACHTUNG / CAUTION

Damit die Schutzart IP68 eingehalten wird, stellen Sie durch geeignete Maßnahmen sicher, daß die Steckverbinder vor Biegekräften geschützt sind (z.B. keine Lasten an Kabel hängen; Kabelaufwicklungen nicht freihängend etc.).

To ensure protection category IP68, do not expose the connection to bending forces (e.g. do not attach loads to the cable, no free-dangling cable windings etc.)



HINWEISE / NOTES

1. **DE** Die Installationssteckverbinder RST 20i2…- i3… sind nach RL 94/9/EG (ATEX 95) An-hang I Geräte der Gerätegruppe II Kategorie 3G die nach RL 99/92/EG (ATEX 137) in der Zone 2 sowie den Gasgruppen IIA, IIB und IIC, die durch brennbare Stoffe im Bereich der Temperaturklassen T1 bis T6 explosionsgefährdet sind, eingesetzt werden dürfen.
   Bei der Verwendung/Installation sind die Anforderungen nach EN 60079-14 einzuhalten.
   EN The installation plug connectors RST 20i2…- i3… are, according to RL 94/9/EG (ATEX 95) Appendix I, appliances of Appliance Group II, Category 3G, which, according to RL 99/92/EG (ATEX 137), may be used in Zone 2, as well as in the gas groups IIA, IIB, and IIC, which are subject to the risk of explosion due to combustible materials in the range of temperature classes T1 to T6.
   During use/installation, the requirements according to EN 60079-14 are to be respected.
2. **DE** Die Installationssteckverbinder RST 20i2…- i3… sind nach RL 94/9/EG (ATEX 95) An-hang I auch Geräte der Gerätegruppe II Kategorie 3D die nach RL 99/92/EG (ATEX 137) in der Zone 22 von brennbaren Stäuben eingesetzt werden dürfen.
   Bei der Verwendung/Installation sind die Anforderungen nach EN 61 241-14 einzuhalten.
   EN The installation plug connectors RST 20i2…- i3… are, according to RL 94/9/EG (ATEX 95) Appendix I, appliances of Appliance Group II, Category 3D, which, according to RL 99/92/EG (ATEX 137), may be used in Zone 22 of combustible dusts.
   During use/installation, the requirements according to EN 61 241-14 are to be respected.
3. **DE** Der zulässige Umgebungstemperaturbereich beträgt –20°C bis +40°C.
   EN The permissible ambient temperature range is -20 °C to + 40 °C.

BESONDERE BEDINGUNGEN X / SPECIAL CONDITIONS X

1. **DE** Die Installationssteckverbinder RST 20i2…- i3… dürfen nur dort eingebaut werden, wo diese vor Einwirkung mechanischer Gefahr geschützt sind.
   EN The installation plug connectors RST 20i2…- i3… may only be installed at locations at which they are protected from the effects of mechanical dangers.
2. **DE** Nicht benötigte Stecker- und Buchsenteile müssen mit dem jeweils zugehörigen Verschlussstück verschlossen werden.
   EN Unnecessary plug and socket parts must be closed off with the pertinent closure element which relates to them.
3. **DE** Die am Installationssteckverbinder RST 20i2…- i3… angeschlossenen Kabel und Leitungen sind vor Einwirkung mechanischen Gefahr zu schützen. Zusätzlich muss der Installateur/Betreiber eine entsprechende Zugentlastung der angeschlossenen Kabel und Lei-tungen gewährleisten.
   EN The cables and leads connected to installation plug connectors RST 20i2…- i3… are to be protected from the effect of mechanical danger. In addition to this, the installer/operator must guarantee an appropriate strain relief for the connected cables and leads.
4. **DE** Bei Verwendung eines Leiterquerschnittes ≥ 2,5mm² und bei einer Umgebungstemperatur bis max. 70 °C dürfen die Installationssteckverbinder RST20i3 als Geräte- und Erstanschlüsse in Schraubtechnik mit einem maximalen Belastungsstrom von 9,4 A eingesetzt werden.
   EN The screw-type appliance and power connectors RST20i3 may be operated with 9.4 A if conductor cross section is equal or greater than 2.5 mm² and ambient temperature does not exceed 70 °C.
5. **DE** Wartungs- und Reinigungsarbeiten dürfen nur durchgeführt werden, wenn keine explosive Atmosphäre vorhanden ist.
   Elektrostatische Aufladung der Installationsverbinder RST20i2...-i3…, z.B. durch Staubabwischen, muss vermieden werden.
   EN Maintenance and cleaning may only be performed in a non-explosive atmosphere.
   Electrostatic charging of installation connectors RST20i2...-i3…, e.g. by dusting, must be avoided.

Europe

Solar Frontier Europe GmbH
Bavariafilmplatz 8
82031 Grünwald bei München
Germany

Tel: +49 89 92 86 142 0

Italy

Solar Frontier Europe GmbH
Sede Secondaria per l'Italia
Via Domenico Cotugno 49/A scala B
70124 Bari
Italy

Tel. +39 080 89 66 984

Asia (HQ)

Solar Frontier K.K.
Daiba Frontier Building
2-3-2 Daiba, Minato-ku
Tokio 135-8074
Japan

Tel: +81 3 5531 5626

Middle East

Solar Frontier K.K.
Technical & Scientific Office
Eastern Cement Tower, #306
King Fahd Road
Al Khobar
Kingdom of Saudi Arabia

Tel: +966 3882 0260

Americas

Solar Frontier Americas Inc.
3945 Freedom Circle
Santa Clara, CA 95054
USA

Tel: +1 408 916 4150

www.solar-frontier.eu

IMSS1-G1-42-PEE-41