

Photovoltaic Solar Inverter Series ES ES2200 / ES3300 / ES4200 / ES5000 to VDE AR-N 4105

Operating Manual V. 4.0



Article number: SLWRABSI2K0Wx001
SLWRABSI3K0Wx001
SLWRABSI4K0Wx001
SLWRABSI5K0Wx001

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EFFEKTA Regeltechnik GmbH

Rheinwaldstraße 34
D – 78628 Rottweil

Phone: + 49 (0) 74 1 / /1 74 51 - 0
Fax: + 49 (0) 74 1 / /1 74 51 - 22
E-mail: ups@effekta.com
Internet: www.effekta.com

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We reserve the right to make changes to the design and the system that will improve the system, the production process or the product.

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1. Introduction

1.1 Foreword

Dear Operator,

You are about to operate a photovoltaic solar inverter.

This operating manual should provide you with support for working responsibly and basic information about the photovoltaic solar inverter, namely how it operates, its application and what you should do in the event of malfunctioning. Furthermore, this operating manual contains instructions for the transport and storage as well as the handling and installation of the photovoltaic solar inverter.

The plan guidelines in this operating manual only relate to special requirements for the photovoltaic solar inverter. During installation, make sure you follow the national and local requirements for electrical installations.

The content of this device description may change due to technological progress. We have tried to present the content correctly and clearly. If, however, we have made errors, we would be grateful for information about this.

The photovoltaic solar inverter is intended to convert the energy generated by solar modules into 230 VAC and to feed it into the power grid.

Please read this operating manual carefully and take note particularly of the safety instructions.

If you have questions about the device, the technical supervisor in your company or our employees will be glad to help you.

Your
EFFEKTA Regeltechnik GmbH

1.2 Validity

The descriptions in this operating manual relate solely to the

Photovoltaic solar inverter

defined in the technical data as a whole or as it refers to modules, components and individual parts that were developed and built by **EFFEKTA Regeltechnik GmbH**.



★ 11. Technical Data

1.3 Storage

This operating manual for the device must be stored in the vicinity of the device at all times so it is immediately available if need be.

1.4 Symbols in this Manual

The abbreviation PV in this manual stands for photovoltaic.

- Read this documentation carefully and make yourself familiar with the product before using it.
- Store this operating manual in an easily accessible place to refer to it if necessary.
- Please pass this operating manual on to later users of the product.

1.4.1 Danger warning levels



DANGER!

Text that is marked with **DANGER!** provides a warning about dangers. If accident prevention measures are not taken, these dangers may result in serious (irreversible) injuries or even death!

WARNING!



Text that is marked with **WARNING!** provides a warning about hazards. If accident prevention measures are not taken, these hazards may result in serious (irreversible) injuries or even death!

CAUTION!



Text that is marked with **CAUTION!** provides a warning about hazards. If accident prevention measures are not taken, these dangerous situations can lead to slight or medium reversible injuries.

ATTENTION!

Text that is marked with **ATTENTION!** contains very important instructions for situations that, if accident prevention measures are not taken, may result in damage to the product and / or its functions or an object in its vicinity.



This symbol indicates text that contains important instructions / comments or tips.

1.4.2 Warning information

1.4.2.1 Warning about danger spots



General warning about danger spots!

1.4.2.2 Specific warning



Warning about dangerous electrical voltage!

1.4.3 Instruction symbols



Take note of the provided documentation and/or instructions!



Disconnect before work!

1.4.4 General symbols

- This dot marks descriptions of activities that you should carry out.
- This dash marks specifications.
- ★ This arrow marks a cross reference.
If a cross reference to another chapter is necessary in the text, this is shortened for clarity.

Example: ★ **OM, 2 Safety Instructions**
This means: See Operating Manual, Chapter 2 Safety Instructions.

If the cross reference refers to a page, figure or position number, this information is added at the end of the cross reference.

Example: ★ **Fig. 4 - 4, Pos. 1**
This means: See position number 1 in figure 4 in Chapter 4 of this manual.

(3) Numbers in brackets refer to the positions in the figures.



Identifies instructions for recycling.



Identifies components that are subject to the Electronic Scrap Regulation.



Identifies components or parts that must be disposed of. Do not throw these in the household waste.



Requirement that must be fulfilled:
✓ The DC circuit breaker is on "OFF."

1.5 Information Obligation

This operating manual must be read, understood and all its points must be taken note of by all persons that are responsible for the

- Operation
- Cleaning and
- Disposal

of the device.

EFFEKTA Regeltechnik GmbH is not liable for damage incurred or caused by staff who have not been trained or who have been insufficiently trained!

1.6 Warranty Conditions

The receipt of delivery is considered as the record for the initial purchase and should be kept in a safe place. It will be necessary for making use of the warranty. If the product is passed on to another user, he has the right to the warranty for the remainder of the warranty period. The purchase receipt as well as this declaration should also be given to the new owner if the device is passed on.

We guarantee that this device, upon delivery, is in a functional state and technically conforms to the descriptions in the appended documentation.

The warranty period for special devices corresponds to the minimum periods stipulated by law.

The warranty ceases to apply in the following cases:

In the event of defects caused by: freight damage, accident, natural catastrophes, misuse, vandalism, improper use, defective maintenance or incorrect repair by third parties.

- In the event of changes, unauthorised intervention, incorrect operation, another device or accessories, false installation or other modifications not approved by us.
- Improper use such as plugging the device into unsuitable energy sources, attempts to overload the photovoltaic solar inverter, use in an unsuitable environment, etc.
- In the event of failure to follow instructions in the provided documentation.

- In the event that the product is incompatible due to possible technical innovations or regulations that occur after the purchase.
- In the event of incompatibility or malfunctioning that was caused by product components we did not install.
- In the event of developments that are related to the normal aging process of the product (wear parts).
- In the event of defects that were caused by external fixtures.

The warranty period for replaced and/or repaired parts as part of this warranty expires together with the original warranty for the product.

Devices that are supplied without accessories are replaced without accessories. The return of the device is only accepted if this is done in the original packaging.

Incurred transport costs are generally not included in the warranty.

You shall bear the cost of repair and exchange, and **EFFEKTA Regeltechnik GmbH** is not liable for damage, whether directly, unintentionally, specifically, or for subsequent damage, even if it was caused by negligence or other errors.

EFFEKTA Regeltechnik GmbH does not provide either explicit or implicit warranties related to this device and its quality, performance, saleability or suitability for a certain purpose. In some countries, the exclusion of implicit warranties is not permitted by law. In this case, the validity of all explicit and implicit warranties is limited to the warranty period. With the expiration of these periods, all warranties lose their validity. In some countries, a limitation of the validity period of implicit warranties is not permitted by law so that the aforementioned limitation does not take effect.

1.6.1 Limitation of liability

Claims to damage compensation are excluded unless they involve intent or gross negligence by **EFFEKTA Regeltechnik GmbH** or its employees. This does not affect liability according to the Product Liability Act. Under no circumstances are we liable for:

- Claims that third parties make against you due to losses or damage.
- Loss or damage of your records or data or the costs of recovering this data.
- Economic subsequent damage (including lost profits or savings) or concomitant damage, including in the event that we were informed of the possibility of such damage.

Under no circumstances is **EFFEKTA Regeltechnik GmbH** responsible for any accidental, indirect, specific, subsequent or other damage of any kind (including, without any limitation, damage related to a loss of profits, interruption of business, loss of business information, or any other losses) that result from use of the device or are connected with the device whether they are based on the contract, damage compensation, negligence, strict liability or other claims, even if **EFFEKTA Regeltechnik GmbH** was informed about the possibility of such damage in advance. This exemption also includes any liability that can result from the claims of third parties against the initial purchaser.

In some countries, the exemption or the limitation of concomitant or subsequent damage is not permitted by law so that the aforementioned declaration does not enter into force.

1.7 Transport and Storage

The photovoltaic solar inverter may only be transported to the intended location in the original packaging. The same applies to moves or returns.

The packaging plays no role as fall protection, so all fallen devices must be checked by **EFFEKTA Regeltechnik GmbH** before commissioning.

1.8 Positioning

WARNING!



Do not install in an area in which combustible vapours result e.g. from petrol tanks, engine compartments, etc.

The photo voltaic solar inverter is designed for operation in ventilated rooms with an ambient temperature of 0° to 40°C.

If the photovoltaic solar inverter is exposed to severe and quick temperature changes, there is danger of condensation. Before you take additional steps, an acclimatisation period of at least 2 hours is to be observed.

Never place or operate the device in a moist environment. Keep liquids away from the device.

The photovoltaic solar inverter may not be placed in the vicinity of heat sources.

It is to be placed in a horizontal position.

Ensure that the external side and the front side of the device are at least 20 cm from other objects for ventilation in order to prevent trapped air and too much warming. Make sure that the air openings cannot be covered, e.g. through sucked-in paper, material, etc.

2. Safety Instructions

2.1 Introduction



The photovoltaic solar inverter is a device that has been produced according to the rules and regulations of technology for the generation of 230 VAC from a solar module. The device and its related components, modules and parts meet individually and in their entirety the currently valid safety standards.

The device is safe when used properly and under consideration of the safety requirements and instructions provided in this operating manual.

2.2 Proper Use



The photovoltaic solar inverter and its related components may only be used for purposes in accordance with its design - for the generation of 230 VAC from a solar module.

Any other use is considered improper and can lead to personal injury or damage to the device!

Improper use:

The device is not designed for use in

- explosive,
 - dusty,
 - radioactive or
 - biologically or chemically contaminated atmospheres!
-

ATTENTION!

This is equipment of class A. This equipment can cause radio interference in residential areas. In this case, the operating company may be requested to take appropriate measures!

2.3 Avoiding Personal Injury / Property Damage

- Please read this operating manual carefully to familiarise yourself with the device.
- In particular, take note of the information regarding the installation and commissioning of the device.
- Only operate the product in an appropriate and proper way and within the parameters stated in the technical data.
- Only perform maintenance and service work that is described in the documentation. Observe the required steps. Only use original replacement parts from **EFFEKTA Regeltechnik GmbH**.

2.4 Protecting the environment

- Send the product back to **EFFEKTA Regeltechnik GmbH** after the end of its use. We will ensure environmentally friendly disposal.

2.5 Connection

DANGER!



Before connecting, always compare the indicated voltages of the photovoltaic solar inverter. These values must match.



Before connecting your PV modules to the photovoltaic solar inverter, check whether this is suitable for operation with your PV modules.

When reading off the values, note that PV modules achieve a higher open circuit voltage at lower temperatures and unchanged solar radiation.

The EFFEKTA Regeltechnik GmbH Company is not liable for damage caused by this to the PV modules and to the photovoltaic solar inverter.

★ 2.8 Working with PV modules



Wrongly polarised connections cause the fuses in the photovoltaic solar inverter to blow out and can result in longterm damage to the device.

Our warranty does not cover damage that is caused by reverse polarity.

Make sure that all connections are firmly in place, since loose connections overheat and represent a potential danger.

The operation of the photovoltaic solar inverter without a correct grounded contact can cause electrical safety hazards.

The requirements for the earthing vary depending on the country and the application. All installations must meet the requirements of the applicable national regulations.

You must use suitable power cables, e.g. cable diameter, insulation, VDE-approved and CE-labelled, with appropriate cable ends for the connection of the photovoltaic solar inverter to the PV modules.

Use only a VDE-approved and CE-labelled power cable with the appropriate cable diameter to connect the PV modules to the photovoltaic solar inverter. Do not connect any PV modules to the photovoltaic solar inverter, which could overload the device (take note of the high starting currents).

Dangers such as stumbling, squeezing, clipping, etc. are to be avoided with the cables.

2.6 Advice about specific dangers

2.6.1 Danger from electrical energy

DANGER!

There is risk of receiving a life-threatening electric shock if you touch live components.

Only authorised electricians may work on electrical components or equipment in accordance with electrotechnical rules

Covers of live components may not be removed.



- In the case of faults in the supply of electrical energy to the device and the ancillary devices, switch off immediately at the main switch(es) and/or separate the device from the power supply.
- Check the electrical equipment of the device and the ancillary devices regularly. In the case of damage to the electrical equipment of the device and the ancillary devices, switch off immediately at the main switch(es) Have any loose connections and/or burnt/damaged cables rectified immediately.
- If there is a risk of an electric shock, switch the device and the ancillary devices off.
- Secure the device and the ancillary devices against being started up again, e.g. by posting corresponding signs / notices and/or by cordoning off the area of risk with a coloured safety chain or tape. If required, ask for assistance.

Even after the separating the device from the power supply, there is still life-threatening current present through the charged capacitors.

Make sure no voltages are still present before starting work on electrical components.

2.7 Operation

When the supply voltage is applied, the photovoltaic solar inverter is ready for operation mode straight away.

2.8 Working with PV modules

DANGER!



Before connecting your PV modules to the photovoltaic solar inverter, check whether this is suitable for operation with your PV modules.

When reading off the values, note that the PV modules achieve a higher open circuit voltage at lower temperatures and unchanged solar radiation.

The EFTEKTA Regeltechnik GmbH Company is not liable for damage caused by this to the PV modules and to the photovoltaic solar inverter.

ATTENTION!



At -20°C , the open circuit voltage of the PV modules may not be above 500 V. To determine the theoretical open circuit voltage at -20°C , use the temperature factors in the data sheet of the PV modules.

If the PV module open circuit voltage is above 500 V, the PV modules may not be connected as this will cause damage to the photovoltaic solar inverter.



The PV solar inverter contains a monitoring unit for fault currents in accordance with VDE 0126-1-1. This unit measures the ground current of the PV modules and prevents the feeding into the mains in the event of an earthing fault.

2.9 Maintenance, Service and Malfunctions

DANGER!



There is risk of receiving a life-threatening electric shock if you touch live components.

Even after separating the device from the power supply, parts of the photovoltaic solar inverter can still have high voltages.

2.10 Advice about connecting to the mains power

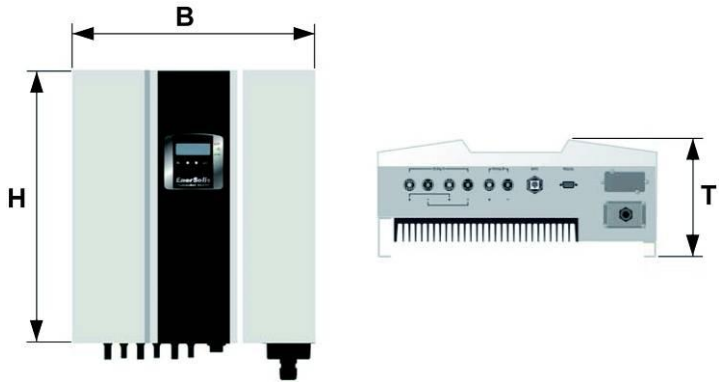
The photovoltaic solar inverter may only be connected to the mains by appropriately licensed customers.

Please contact your regional energy supplier with regard to special requirements.

Permission from the energy supplier must be present for connection of the photovoltaic solar inverter.

3. Device Description

3.1 Dimensions

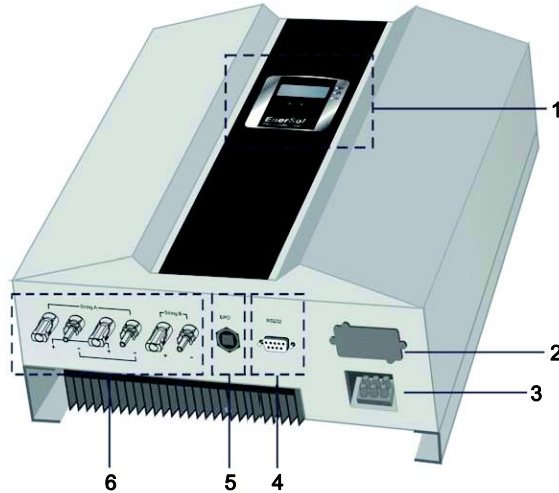


		ES2200 / ES3300	ES4200 / ES5000
H (Height)	[mm]	430	510
W (Width)	[mm]	455	455
D (Depth)	[mm]	190	190

Fig. 3-1 - 1 Dimensions of the photovoltaic solar inverter

3.2 Display and connections

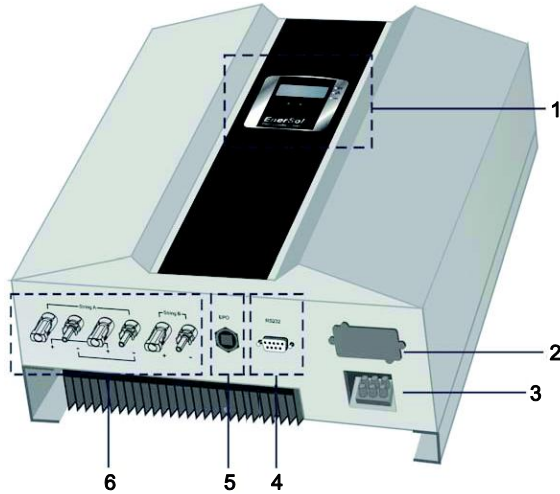
3.2.1 Display and connections ES2200 / ES3300



- 1 *Front panel with LCD display and LED displays
Operation and display of the operating state of the photovoltaic solar inverter*
- 2 *Data transmission interface to (option)
USB, RS485, floating contact, TCP/IP*
- 3 *AC output terminal
AC output for power supply connection*
- 4 *Data transmission interface (standard)
RS232*
- 5 *Interface for emergency shutdown
EPO*
- 6 *Feed for PV module
Plug and holders for the connection of the solar module:
ES2200: 3 connections (1 MPPT)
ES3300: 3 connections (1 MPPT)*

Fig. 3-2 - 1 *Display and connections ES2200 / ES3300*

3.2.2 Display and connections ES4200 / ES5000



- 1 *Front panel with LCD display and LED displays
Operation and display of the operating state of the photovoltaic solar inverter*
- 2 *Data transmission interface (option)
USB, RS485, floating contact, TCP/IP*
- 3 *AC output terminal
AC output for power supply connection*
- 4 *Data transmission interface (standard)
RS232*
- 5 *Interface for emergency shutdown
EPO*
- 6 *Feed for PV module
Plug and holders for the connection of the solar module:
ES4200: 3 connections (2 MPPT)
ES5000: 3 connections (2 MPPT)*

Fig. 3-2 - 2 Display and connections ES4200 / ES5000

4. Assembly



Before starting the assembly of the photovoltaic solar inverter, take note of Chapter 2, Safety instructions.

4.1 Assembly of the wall mounting

ATTENTION!

Before starting the assembly of the photovoltaic solar inverter, take note of load bearing capacity of the wall.

There is a requirement for a load bearing capacity of at least 300 kg/m³.

Plasterboard or metal stud partition walls are not sufficient.

Dimensions for wall mounting

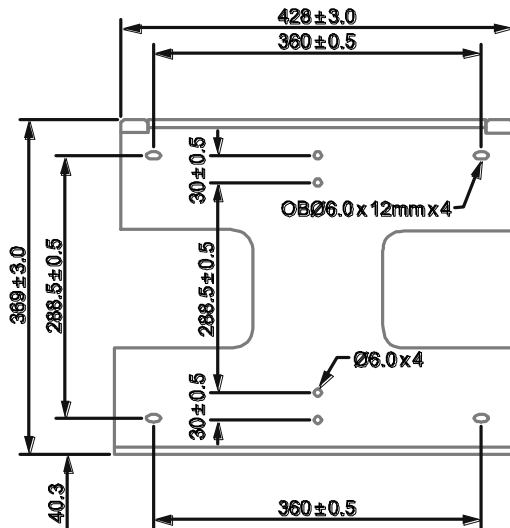


Fig. 4-1 - 1 Wall mounting for photovoltaic solar inverter ES2200 / ES3300

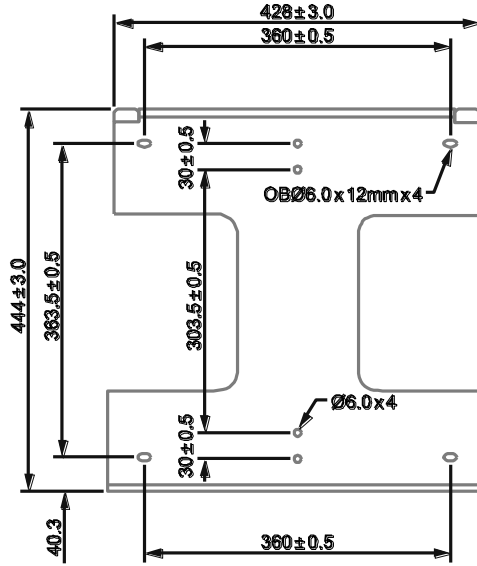


Fig. 4-1 - 2 Wall mounting for photovoltaic solar inverter ES4200 / ES5000

4.2 Ambient conditions for assembly

To guarantee perfect operation and a long service life, assemble the photovoltaic solar inverter in accordance with the following requirements.

- **Select the coolest possible location for assembly.**
High temperatures hamper the effectiveness and shorten the service life of the photovoltaic solar inverter. If need be, install an additional cooling system in the room in which the photovoltaic solar inverter is assembled.
- **When assembling the photovoltaic solar inverter, the ambient temperature must be in the range from - 25 °C to + 50 °C.**



- 1 - 25 °C
2 + 50 °C

Fig. 4-2 - 1 Ambient conditions for assembly (temperature)

- **Relative humidity 0 % to 90 % (without condensation)**
- **The photovoltaic solar inverter may not be exposed to any direct solar radiation.**

- The photovoltaic solar inverter is constructed for vertical assembly. Never assemble the photovoltaic solar inverter in a horizontal position and make sure it does not tilt forward if assembled outdoors.

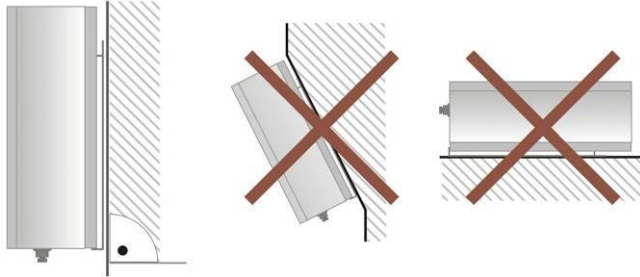
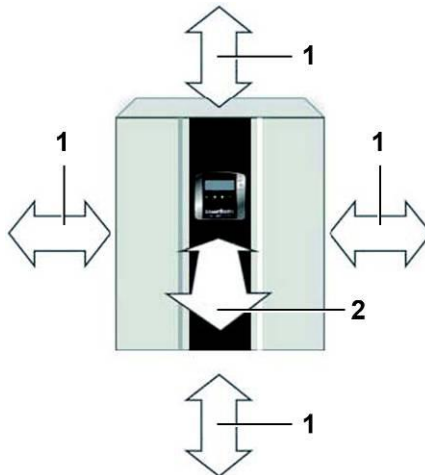


Fig. 4-2 - 2 Ambient conditions for assembly (positioning)

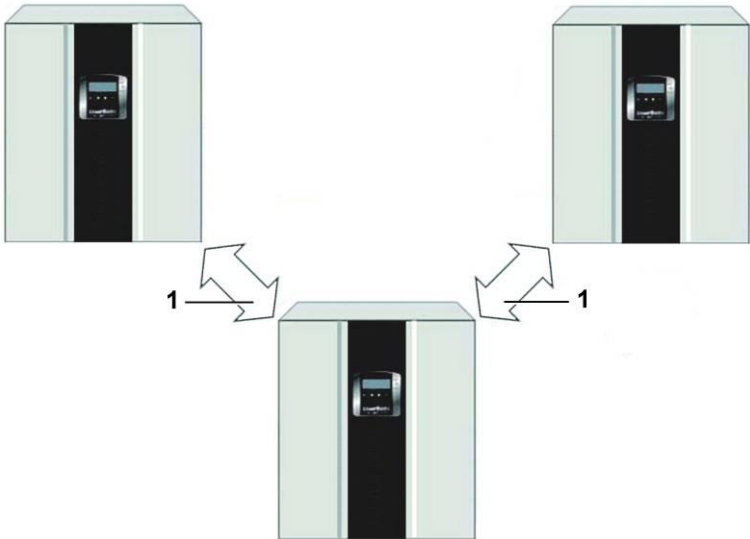
- When selecting the assembly location for the photovoltaic solar inverter, you must ensure that there is sufficient heat dissipation. The following minimum amounts of free space around the photovoltaic solar inverter must be maintained:



- 1 Spacing of at least 20 cm
- 2 Spacing of at least 5 cm

Fig. 4-2 - 3 Ambient conditions for assembly (spacings)

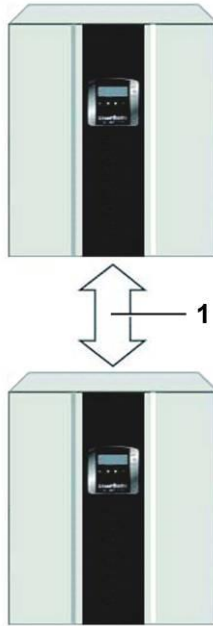
If the photovoltaic solar inverters are to be assembled above each other, we recommend offsetting them because of the heat emissions.



1 Spacing of at least 20 cm

Fig. 4-2 - 4 Spacings with offset assembly

If the photovoltaic solar inverters are assembled directly above each other, the spacings must be adhered to.



1 Spacing of at least 50 cm

Fig. 4-2 - 5 Spacings with inline assembly

4.3 Assembling photovoltaic solar inverters

CAUTION!



When lifting heavy loads, take note of the local regulations of the employers' liability insurance association and if necessary, use several persons to lift the photovoltaic solar inverter.

Use the supplied wall mounting for the assembly of the photovoltaic solar inverter.



When selecting the fixing material for vertical assembly using the wall-mounting, take into account the weight of the photovoltaic solar inverter. See Chapter 11, Technical data.

You can use the wall mounting to mark the holes for drilling. If you do not want to use the wall mounting as a template for the drill holes, please refer to the dimensions of the wall mounting in Chapter 4.1, Assembly of the wall-mounting.

The selection of the fixing material is dependent on the characteristics of the wall. Fixing material is not included in the scope of delivery and must be supplied by the customer.

When selecting the fixing material, take into account the characteristics of the wall and the weight of the photovoltaic solar inverter.

To mount the photovoltaic solar inverter, proceed as follows:

1. Mark the positions for the drill holes on the wall.
2. Drill the holes in accordance with the screws you have selected.
3. Screw on the wall mounting.

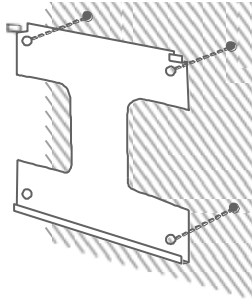
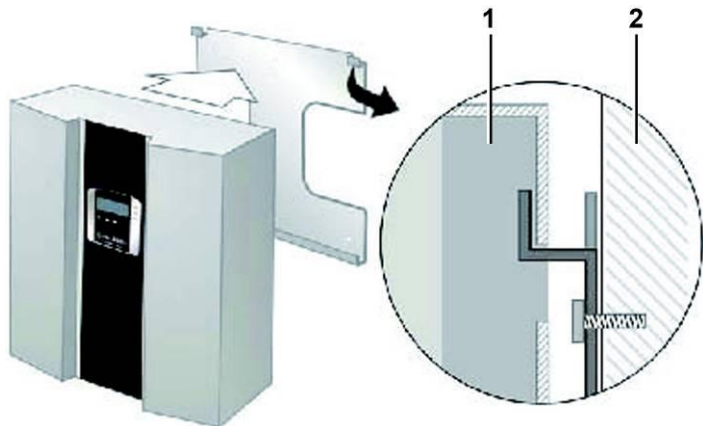


Fig. 4-3 - 1

4. Hang the photovoltaic solar inverter on the wall mounting. Use the upper carrier plate so that the photovoltaic solar inverter cannot slip.
5. Check whether the photovoltaic solar inverter is safely attached to the mounting.



- 1 Photovoltaic solar inverter
- 2 Wall

Fig. 4-3 - 2 Assembly of the photovoltaic solar inverter in the wall-mounting

5. Electrical Installation

DANGER!

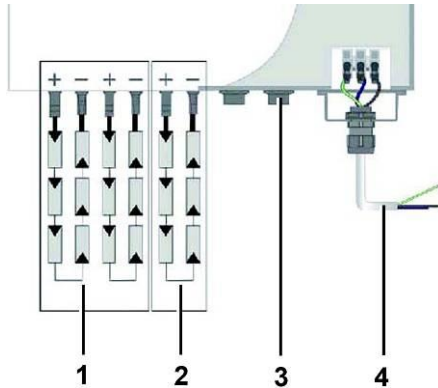


There is risk of receiving a life-threatening electric shock if you touch live components.



Only authorised electricians may work on electrical components or equipment in accordance with electrotechnical rules.

★2 Safety Instructions



- 1 String A
- 2 String B
- 3 Data transfer
- 4 AC output

Fig. 5 - 1 Wiring of the photovoltaic solar inverter
(Example ES4200 / ES5000)



Two strings can be connected with the ES4200 / ES5000 models. Here it should be ensured that the load on both strings is symmetrical.

This means: One input on the photovoltaic solar inverter can process 50 % of the rated power and may be overloaded by a maximum of 10 %.

5.1 Connecting AC power cable



There is risk of receiving a life-threatening electric shock if you touch live components.

Only authorised electricians may work on electrical components or equipment in accordance with electrotechnical rules.

★2 Safety Instructions

There is risk of receiving a life-threatening electric shock if a grounding is missing or is incorrectly connected.

- Make sure that the grounding conductor is correctly connected before you start operating the photovoltaic solar inverter.
- Position the cable inlet and screw it to the housing of the photovoltaic solar inverter.

Connection conditions

Take note of the connection conditions of your mains power supplier. Pay attention to the locally required country settings on the photovoltaic solar inverter.

★ 7.2 Country settings, operating mode settings and ID settings



Ground fault circuit breaker

The photovoltaic solar inverter is equipped with an integrated ground fault circuit breaker.

If an external RCD or FI circuit breaker is required, please use a type B circuit breaker which triggers above a 100 mA fault current.

Cable line layout

The mains line resistance should not exceed 0.1 Ω as this causes a high voltage drop and a loss.

Your electricity supplier must calculate the maximum line lengths after taking the cross section of the line into consideration.

The following cable sizes are recommended for the AC power cables:

Model	Line cross section
ES2200 / ES3300	4 mm ²
ES4200 / ES5000	6 mm ²

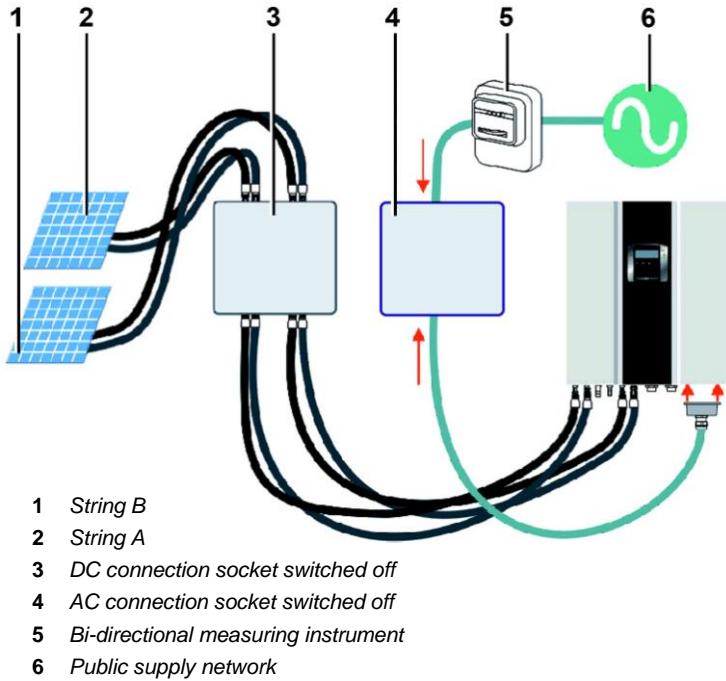


Fig. 5-1 - 1 Overview of the cable lines

To connect the AC cable, please proceed as follows:

- Measure the voltage and frequency of the supply mains.



Supply voltage and frequency are country-specific.

In order to separate the photovoltaic solar inverter from the mains power and the PV modules, a customer-supplied circuit-breaker must be installed for each circuit.

★ 11.4 Scope of Delivery / (Optional) Accessories

The AC circuit-breaker may not break the grounding.

In order to separate the photovoltaic solar inverter on the AC side, customer-supplied circuit-breakers must be supplied.

I	ES2200	ES3300	ES4200	ES5000
Circuit-breaker	B10	B16	B20	B25

DANGER!



Even after the circuit-breaker is switched off, individual sub-assemblies and components of the photovoltaic solar inverter still have a life-threatening level of voltage charge.

You should make sure that all the sub-assemblies and components of the photovoltaic solar inverter are voltage-free before starting work.

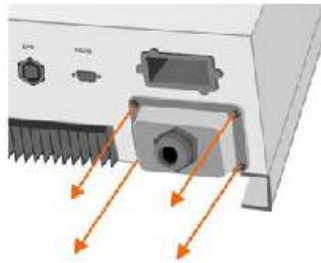


Fig. 5-1 - 2 Removing cable inlet

- Loosen the screws of the cable inlet and remove it.

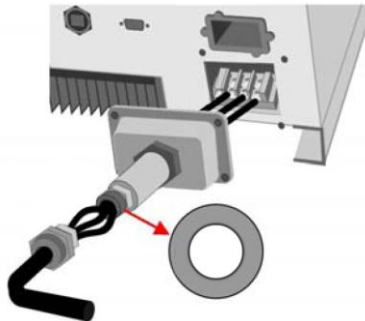
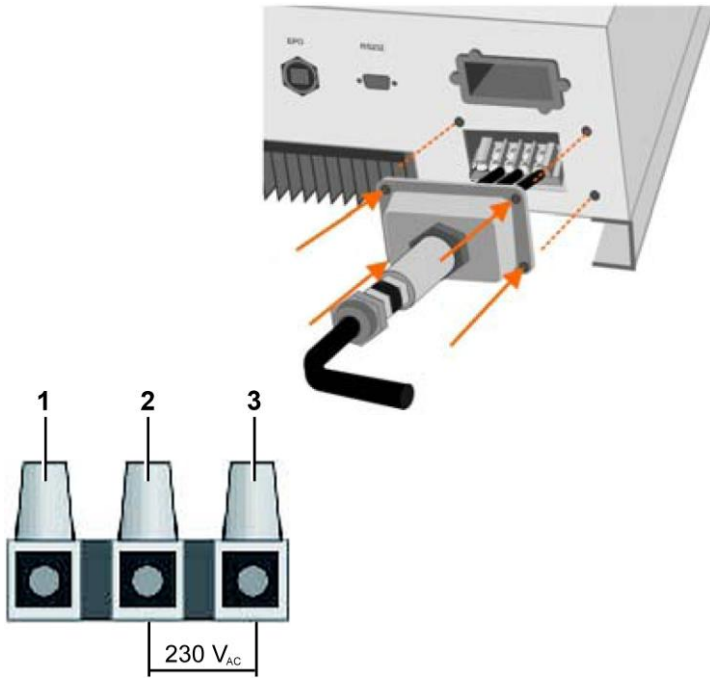


Fig. 5-1 - 3 Cable inlet

- Insert the supply cable through the cable inlet and connect the wires as indicated on the splitter:



- 1 PE Grounding conductor (yellow-green)
- 2 N Neutral
- 3 L Conductor

Fig. 5-1 - 4 Power cable connection

5.2 Connecting PV module

ATTENTION!

Before installation, check whether your PV modules are suitable for operation with your photovoltaic solar inverter.

Not all PV modules are suitable for operation with transformerless photovoltaic solar inverters.

Check with the PV module manufacturer.

5.2.1 Requirements the PV modules have to meet

The ES4200 / ES5000 photovoltaic solar inverters both have two MPP trackers (each with approx. 50% of the total output of the inverter). Of these, tracker A has a connection for up to 2 strings and tracker B for one string.

The ES2200 / ES3300 photovoltaic solar inverters have only one MPP tracker with a connection for up to 3 strings. Both the maximum DC input voltage of 500 V and the maximum input current may **not** be exceeded.

The PV module connection cables must be suitable for these connections.

A set of connectors for connecting the line ends of a string is included in the scope of delivery. The type descriptions for other PV connectors are:

- Connection plug: PV-KST4/6II-UR
- Coupling socket: PV-KBT4/6II-UR

You will find more information online at www.multi-contact.com.

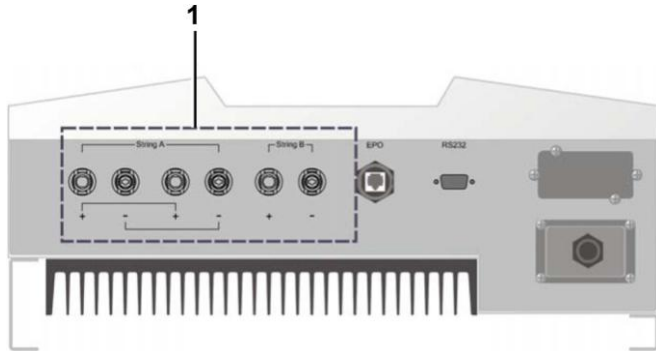
5.2.2 Cabling to the PV module

The photovoltaic solar inverters are equipped with type MC4 PV quick connecting terminals. These allow up to three of the same strings to be directly connected with the ES2200 / ES3300 and up to two of the same strings to tracker A and one string to tracker B with the ES4200 and ES5000.

Please take note of the symmetrical power distribution between tracker A and B.



The connection of additional strings is possible. These must be externally connected. We recommend connecting further strings in parallel to the DC circuit-breaker.



1 PV quick connections

Fig. 5-2-2 - 1

DANGER!



There is risk of receiving a life-threatening electric shock if you touch live components.

Only authorised electricians may work on electrical components or equipment in accordance with electrotechnical rules.

★2 Safety Instructions

Make sure that the DC circuit breaker is in the "OFF" position before you connect the PV module.

CAUTION!



Attention! Danger of material damage

In determining the required panels in the PV string, please take note of the following points:

- To avoid damage to the photovoltaic solar inverter, make sure that the output on the PV module is never above 500 VDC.
- Make sure that the maximum open circuit voltage U_{oc} of each PV string is less than 500 VDC. Voltages of over 500 VDC may damage the photovoltaic solar inverter.
- Make sure that the short circuit current of the module is not greater than the measurement on the photovoltaic solar inverter.
- To achieve the maximum energy output from your PV module, make sure that the voltage does not fall below 150 VDC at maximum UMP performance or exceed 450 VDC.

Within one tracker, only modules of the same type with the same power can be used.



Two strings can be connected with the ES4200 / ES5000 models. Here it should be ensured that the load on both strings is symmetrical.

This means: One input on the photovoltaic solar inverter can process 50% of the rated power and may be overloaded by a maximum of 10%.

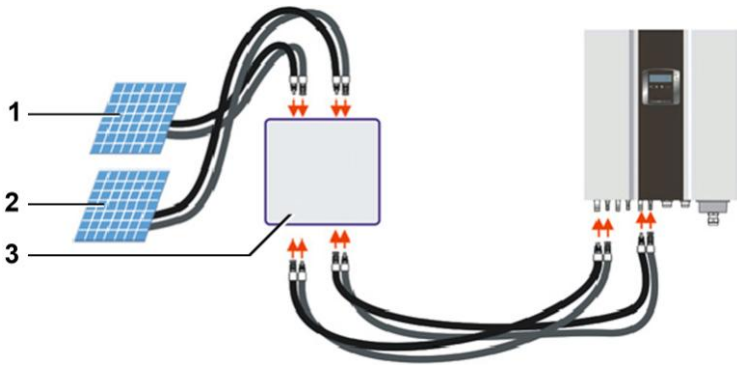
To connect the PV module to the photovoltaic solar inverter, proceed as follows:

1. Check whether the generator terminals have the correct polarity and do not exceed the maximum voltage for each string.
2. Connect the positive (+) wire of the PV string 1 to the positive quick connection terminal on the photovoltaic solar inverter.
3. Connect the negative (-) wire of the PV string 1 to the negative quick connection terminal on the photovoltaic solar inverter.

Repeat steps 2 and 3 for other PV strings.

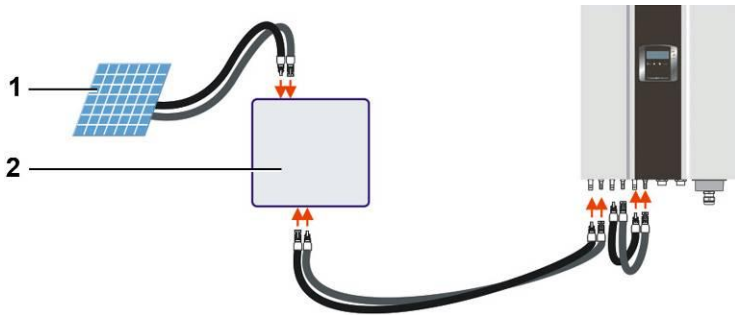
- 4. Check whether all wires and contacts have been connected correctly.
- 5. Cover the unused sockets of the DC input with the supplied protective caps.
- 6. Start up the photovoltaic solar inverter.

5.2.3 Overview of cabling for the PV module



- 1 String A
- 2 String B
- 3 DC connection socket switched off

Fig. 5.2.3 - 1 ES4200 / ES5000 cabling overview using 4-pin DC disconnect for each string on tracker A and/or B



- 1 String A
- 2 DC connection socket switched off

Fig. 5.2.3 - 2 ES4200 / ES5000 cabling overview in parallel operation using 2-pin DC disconnecter (all modules before the DC disconnecter cabled on one string)

In the case of wiring with one string, you must switch the operating mode in the configuration to "parallel"; see Chapter

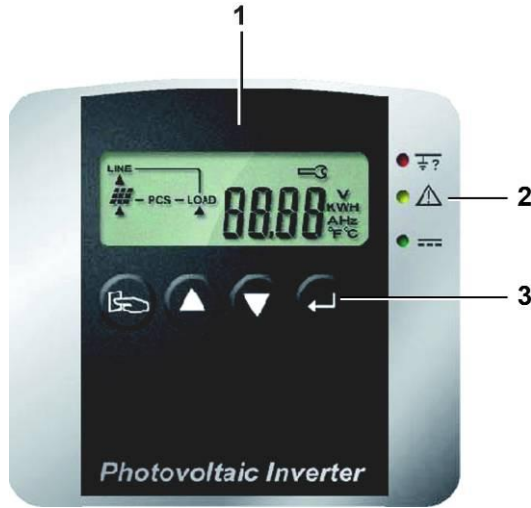
⇨ 7.2 Country settings, operating mode settings and ID settings

Please note that the ES2200 / ES3300 only have one tracker with connections for three of the same strings (internally switched in parallel).

If you connect the strings individually, you need a corresponding DC disconnecter for several (4-pin of 6-pin) strings.





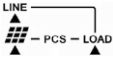

6. Control Panel



- 1 LCD display
- 2 LED display
- 3 Operating keys

Fig. 6 - 1 Control panel

1 LCD display

LINE	Power source
	Service operation
	Solar cells
	Flow chart of the photovoltaic solar inverter in operation
	4-position measurement display

2 LED display



Red LED lights up constantly - indicates a ground fault or an isolation fault at the DC input.



Yellow LED lights up constantly - indicates that the supply (voltage, frequency, etc.) does not correspond to the entered standard of the photovoltaic solar inverter.



- Green LED lights up constantly - indicates that the performance of the solar cells is greater than 5 % of the nominal performance of the photovoltaic solar inverter.
- Green LED blinks - indicates that the performance of the solar cells is less than 5 % of the nominal performance of the photovoltaic solar inverter.

3 Operating keys



Confirm a change to the settings of the photovoltaic solar inverter.



Continue to next page or change the settings of the photovoltaic solar inverter.



Return to the previous page or change the settings of the photovoltaic solar inverter.



Special function Log in / Log out.

Log in / Log out

The Log in / Log out function gives you the option of displaying the internal settings of the photovoltaic solar inverter.



The settings can only be display but not changed.

The following settings are displayed when you operate the Log in / Log out key:

- Bus address
- Country setting
- Operating mode

You can scroll up and down through the settings with the arrow up/arrow down keys.

7. Commissioning

DANGER!



There is risk of receiving a life-threatening electric shock if you touch live components.

Only authorised electricians may work on electrical components or equipment in accordance with electrotechnical rules.

★2 Safety Instructions

Check the following points before you start up the photovoltaic solar inverter:

- The housing is safely screwed in place.
 - The DC cables (PV strings) are completely connected and unused DC connection terminals on the bottom of the housing are covered with safety caps.
 - The AC cable is connected correctly.
 - The AC switch is "OFF".
-

7.1 Starting device for the first time

- Switch on the voltage of the PV string by turning on the DC circuit breaker.

The photovoltaic solar inverter starts automatically when the voltage reaches 120 VDC. All LEDs light up. The following is shown on the LCD display:



Fig. 7-1 - 1 Display A

After 3 seconds, the LCD display changes from Display A to Display B1 (total feed power) and Display B2 (alarm code).

The green LED blinks to indicate that the output performance of the alternating current is below 5 % of the nominal performance.

The yellow LED lights up constantly and indicates no power.



Fig. 7-1 - 2 Display B1



Fig. 7-1 - 3 Display B2

7.2 Country settings, operating mode settings and ID settings

ATTENTION!

Make sure before changing the settings that the AC switch is "OFF".

1. Press the ▲ key and the ▼ key simultaneously for about 5 seconds.
The solar inverter switches to the mode "Settings" and you see the following display:

SEt dE

2. Press the ▼ key to select the appropriate country settings:
dE (Germany), ES (Spain), It (Italy), Fr (France), bE (Belgium),
Pt (Portugal), Au (Australia), Gb (Great Britain), CZ (Czech Republic),
Gr (Greece), nL (Netherlands), At (Austria), EC (User defined).



dE ES It Fr bE

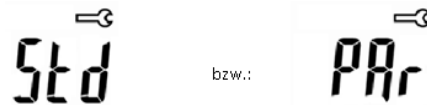
Pt Au Gb CZ Gr


nL At EC

ATTENTION!

Incorrect country settings can compromise your mains electricity, cause the photovoltaic solar inverter to malfunction and lead to the termination of your authorisation to operate the device.

3. Press the  key to confirm the selection and to proceed to the operating mode selection.
4. Select either "Standard" or "Parallel" operation with the  key.
The display shows:





5. Press the  key to confirm the selection and to proceed to the setting of the ID number.


You can assign an identification number (ID no.) to your photovoltaic solar inverter in the range from 1 - 200.



You need the ID number to be able to differentiate between different photovoltaic solar inverters in one system. To do this, each photovoltaic solar inverter must be assigned a different ID number.

6. Change the ID number in a range of 1 to 200 with the  key or the  key.
The display shows:



7. Press the  key to save the settings.
The display shows:



The photovoltaic solar inverter goes into normal operating mode automatically after 2 seconds.

7.3 Commissioning the photovoltaic solar inverter

- Check whether the DC circuit breaker is switched on and set it to "ON" if necessary.
- Set the AC circuit breaker to "ON".
- Wait 30 seconds (legally required waiting period).
- The LCD display changes between the Displays C1 (total feed power) and Display C2 (alarm code). The yellow LED lights up and the green LED blinks.



Fig. 7-3 - 1 Display C1



Fig. 7-3 - 2 Display C2

After 30 seconds, the yellow LED goes off and the green LED blinks again. The LCD display shows Display D.



Fig. 7-3 - 3 Display D

After 5 seconds, the LCD display shows Display E. The green LED lights up constantly.



Fig. 7-3 - 4 Display E

If the photovoltaic solar inverter is working incorrectly, e.g. short circuit, an error code or the error status will appear on the display.



Fig. 7-3 - 5 Display F



A list of possible error codes with explanations can be found in **Chapter 9, Error codes and explanations.**

If the photovoltaic solar inverter was started up completely and successfully, the LCD display shows Display E.

7.4 Checking measurement readings and numbers

You can check the measurement readings and numbers determined by the photovoltaic solar inverter through the LCD display.

- Use the ▲ and ▼ buttons to scroll the displays.

The measurement readings and numbers are shown in the following order when scrolling downwards:



Fig. 7-4 - 1 Display G - Total feed power



Fig. 7-4 - 2 Display H - Internal temperature of the photovoltaic solar inverter in °C



Fig. 7-4 - 3 Display I - Temperature of cooling element in °C



Fig. 7-4 - 4 Display J - Internal temperature of the photovoltaic solar inverter in °F



Fig. 7-4 - 5 Display K - Temperature of cooling element in °F



Fig. 7-4 - 6 Display L - String A voltage

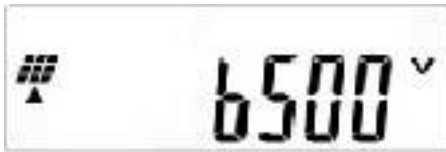


Fig. 7-4 - 7 Display M - String B voltage



Fig. 7-4 - 8 Display N - String A current



Fig. 7-4 - 9 Display O - String B current



Fig. 7-4 - 10 Display P - String A output power



Fig. 7-4 - 11 Display Q - String B output power



Fig. 7-4 - 12 Display R - Output voltage of the photovoltaic solar inverter



Fig. 7-4 - 13 Display S - Frequency of the photovoltaic solar inverter output voltage



Fig. 7-4 - 14 Display T - Output current of the photovoltaic solar inverter





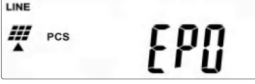
Fig. 7-4 - 15 Display U - Current feed power

7.5 Operating states of the photovoltaic solar inverter

The photovoltaic solar inverter starts automatically when the PV panel DC power is sufficient.

After starting, the photovoltaic solar inverter goes into the following operating states.

Operating state	Display on the LCD display	Explanation
Normal	The image shows the LCD display in Normal state. It features the "LINE" indicator with an upward triangle, a solar panel icon, and the text "PCS - LOAD" with a line connecting the solar panel icon to the "LOAD" text. To the right, the number "0" is displayed in a large digital font, followed by "KWH" in a smaller font.	The photovoltaic solar inverter is working normally. When the delivered performance of the PV panel is sufficient (500 VDC > PV > 120 VDC), it supplies the energy to the mains. The green LED lights up and shows that energy is being fed into the mains.
Standby	The image shows the LCD display in Standby state. It features the "LINE" indicator with an upward triangle, a solar panel icon, and the text "PCS". To the right, the number "0" is displayed in a large digital font, followed by "KWH" in a smaller font.	If the performance is insufficient (60 VDC < PV < 100 VDC), the photovoltaic solar inverter switches to standby operation and searches for a connection to the mains. It has only limited power from the PV module to monitor the internal system state.

Operating state	Display on the LCD display	Explanation
Error	 	<p>The internal regulator continually monitors the system state and adjusts it.</p> <p>If the photovoltaic solar inverter registers malfunctions, such as mains problems or internal errors, this is showed on the display and the red LED lights up.</p>
EPO		<p>Emergency power off.</p> <p>The photovoltaic solar inverter does not receive any power from the mains in this state.</p>
Shut down process	No display	<p>If there is too little sunlight, the photovoltaic solar inverter automatically ends operation.</p> <p>It does not receive any power from the mains. The display and the LEDs on the control panel are out of operation.</p>

8. Communication Interfaces

You can connect external devices such as PC, Solar-Log or Ethernet (SNMP card) to the photovoltaic solar inverter to call up data from it. The various communication interfaces are designed for this.

8.1 Standard communication interface

The standard communication interface for the photovoltaic solar inverter is an RS232 serial interface (otherwise known as EIA-232).

8.1.1 Settings for the RS232 interface

The RS232 interface is set as follows:

- Baud rate: 9600 bps
- Data length: 8 Bit
- Stop bit 1 Bit
- Parity: None

8.1.2 Pin assignment of the RS232 interface

Pin 3: RS232 Rx

Pin 2: RS232 Tx

Pin 5: GND

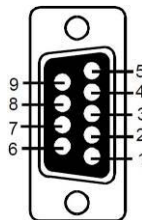


Fig. 8-1-2 - 1 Pin assignment.

8.2 Solar-Log™



Our photovoltaic solar inverters are suitable for operation with Solar-Log™. Our Sales and Service team will be pleased to give you information about accessories and technical details.

8.3 Optional data cards

If you need other interfaces than the standard communication interface, you can install an optional communication card.

ATTENTION!

Data cards should only be plugged in when the photovoltaic solar inverter is **switched off**. Otherwise, the photovoltaic solar inverter can be seriously damaged as a result.

8.3.1 Installing communication cards

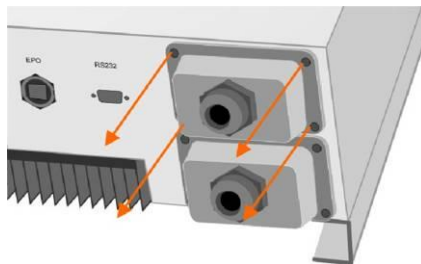


Fig. 8-1-3 - 1 Open the housing cover

- Loosen the screws and open the cover of the housing.



Fig. 8-1-3 - 2 Data cable

- Insert the data cable through the cable inlet of the cover.

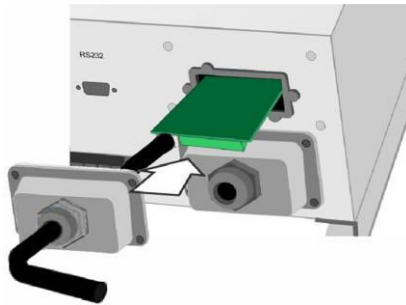


Fig. 8-1-3 - 3 Connect the communication card

- Connect the data cable to the communication card.

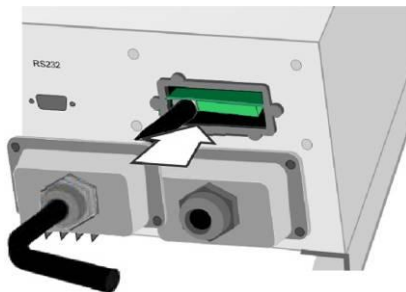


Fig. 8-1-3 - 4 Insert the communication card

- Insert the communication card in the receiver.

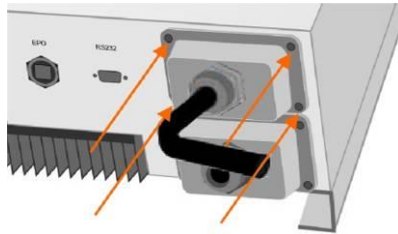


Fig. 8-1-3 – 5 Fasten the cover

- Place the cover back on top and tighten the four screws evenly.

8.3.2 RS485 card



Fig. 8-1-2 - 1 RS485 card

CN1 is intended for the terminating resistor. You can activate the function with pin 1 - 2 (terminating resistor jumper "ON"); you can deactivate the function with pin 2 - 3 (terminating resistor jumper "OFF"). CN2 is intended for RS485 and CN3 for remote start-up.

Definition:

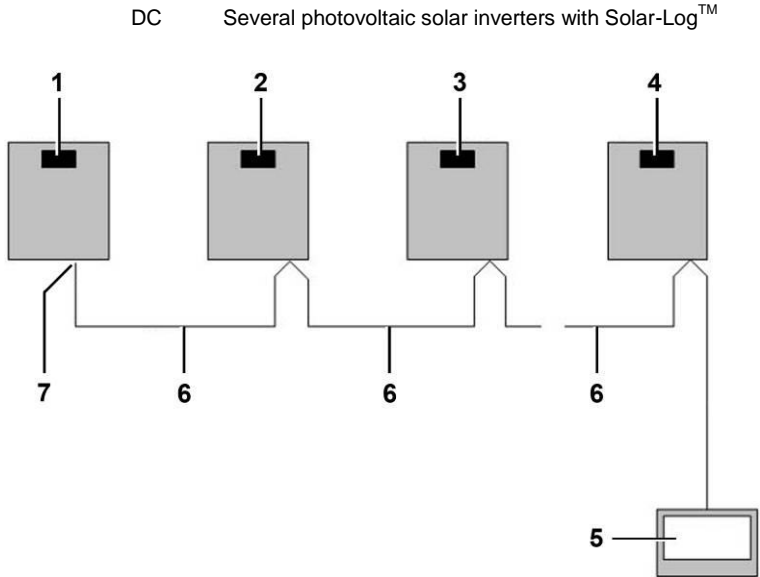
CN2		
1	2	3

1: GND
2: A/Data+
3: B/Data-

CN3	
1	2

1: AC+
2: AC-

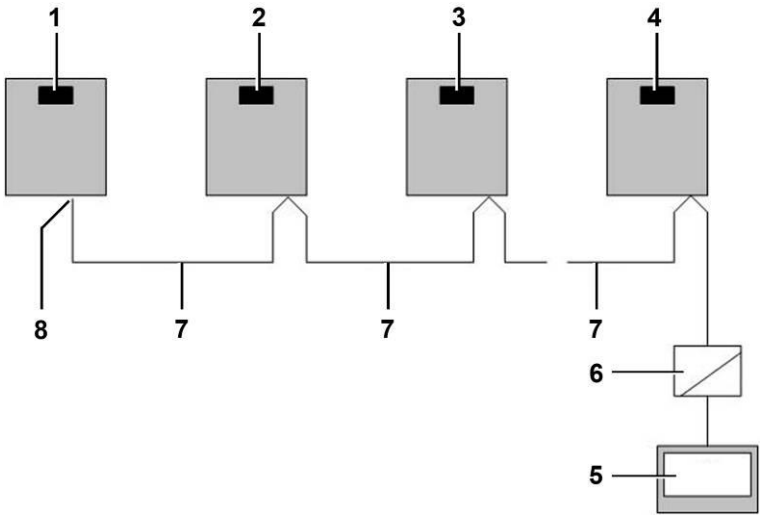
8.3.3 RS485 interface wiring



- 1 Solar inverter address 1
- 2 Solar inverter address 2
- 3 Solar inverter address 3
- 4 Solar inverter address 4
- 5 Solar-Log™
- 6 RS485
- 7 Terminating resistor jumper "ON"

Fig. 8-3-3 - 1 Solar-Log™

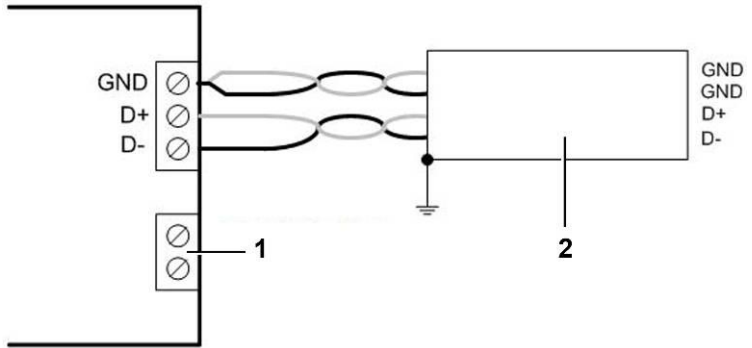
2. Several photovoltaic solar inverters connected to a PC



- 1 Solar inverter address 1
- 2 Solar inverter address 2
- 3 Solar inverter address 3
- 4 Solar inverter address 4
- 5 PC
- 6 RS485/RS232 adapter
- 7 RS485
- 8 Terminating resistor jumper "ON"

Fig. 8-3-3 - 2 Connection to the PC

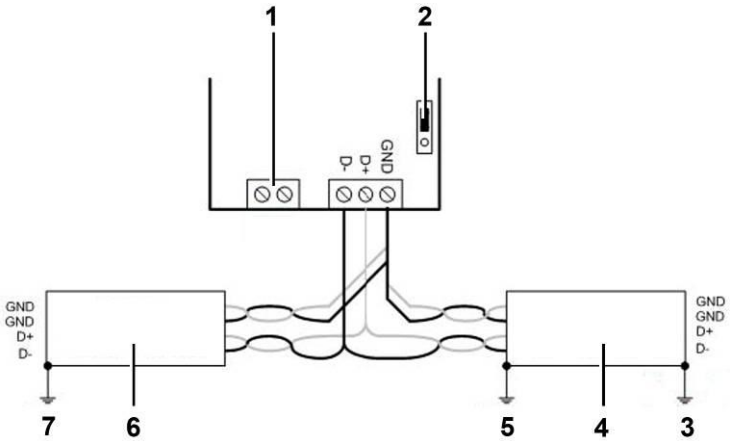
DCI Connection to the RS485 card (first photovoltaic solar inverter)



- 1 **Nothing should be connected here**
- 2 *4-core, twisted-pair, screened cable*

Fig. 8-3-3 - 3 Connect the RS485 card (first photovoltaic solar inverter)

DCII Connection to the RS485 card (several photovoltaic solar inverters)



- 1 Free
- 2 Jumper = OFF
- 3 Screen to PE
- 4 4-core, twisted-pair, screened cable
- 5 Screen, one-sided, to PE
- 6 4-core, twisted-pair, screened cable
- 7 Screen, one-sided, to PE

Fig. 8-3-3 - 4 Connect the RS485 card (several photovoltaic solar inverters)



In the case of several photovoltaic solar inverters, the RS485 bus is looped through the individual photovoltaic solar inverters. The bus cables D-, D+ and GND (incoming and outgoing) are connected in parallel to the screw connectors on the Rs485 card. The screening on the bus cables should each only be connected at one end with the PE on the photovoltaic solar inverter housing.

8.3.4 USB card



Fig. 8-3-4 - 1 USB card

Definition:

- Compatible USB version 1.0, 1.5 MBit/s
- Compatible HID Version 1.0

Pin assignment for the USB card

- 1 VCC (+ 5 V)
- 2 D -
- 3 D +
- 4 GND

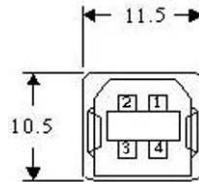


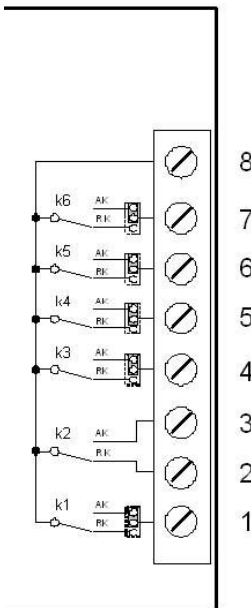
Fig. 8-3-4 - 2 USB card pin assignment

8.3.5 Relay contact card (DCE-B card)



Fig. 8-3-5 - 1 Relay contact card (DCE-B card)

The pin assignment of the 10 pin terminal



- 1 Pin 1:
One DC input voltage within and one DC input voltage below the range
- 2 Pin 2:
At least one DC input above the minimum limit
- 3 Pin 3:
All DV input voltage below the minimum limit
- 4 Pin 4:
Frequency of the AC output (mains) outside the tolerance
- 5 Pin 5:
Isolated operation switched off
- 6 Pin 6:
Output current of the photovoltaic solar inverter above the tolerance
- 7 Pin 7:
The cooling element temperature of the photovoltaic solar inverter is too high
- 8 Pin 8:
Common

Fig. 8-3-5 - 2 The pin assignment of the 10 pin terminal

Each relay contact can take a load of max 40 VDC / 25 mA.

You can switch the output signal from N.C. (normal close) to N.O. (normal open) by bridging Pin 1 and 2 or Pin 2 and 3 from JP1-5 with the jumpers.

8.3.6 SNMP card



Fig. 8-3-6 - 1 SNMP card

You will find more information and installation advice in the documents that accompany the SNMP card.

9. Status Diagnosis and Troubleshooting

The photovoltaic solar inverter is equipped with a self-diagnosis system that identifies a large number of possible operating procedures independently and shows them on the LCD display. This makes it possible to quickly eliminate technical problems.

Furthermore, a differentiation is possible between

- Service codes concerning installation and
- Service codes that relate internally to the photovoltaic solar inverter

Whenever the self-diagnosis system identifies a particular problem, the appropriate service code is showed on the LCD display.

ATTENTION!

The following work may only be performed by trained technical staff

9.1 Error codes and explanations

LCD display	Description	Explanation	Troubleshooting
Er00	DC_BUS pre-Charge fail	The device is in soft start mode, but after 2 seconds, no stable charging voltage is determined on the DC bus.	<ol style="list-style-type: none"> 1. Disconnect all PV (+)- or PV (-) connections. 2. Wait a few seconds. 3. After the LCD display goes out, reinsert all the connections and check it again. 4. If the error occurs again, please contact your dealer.
Er03	Inverter voltage abnormal	The output voltage is not correct.	
Er07	DC_BUS over-voltage	The internal voltage of the DC bus is outside the tolerance.	
Er08	DC_BUS under-voltage		

LCD display	Description	Explanation	Troubleshooting
Er19	DC_BUS discharge failure	The capacitors of the DC bus cannot be discharged correctly.	<ol style="list-style-type: none"> 1. Disconnect all PV (+)- or PV (-) connections. 2. Wait a few seconds. 3. After the LCD display goes out, restore all the connections and check again. 4. If the error occurs again, please contact your dealer.
Er22	Output Relay fail	Malfunction on the output relay of the photovoltaic solar inverter.	
Er24	Output current sense fail	Error in the output current reading.	
Er25	BOOSTER_A over-current	The current in the DC mains is higher than expected.	
Er26	BOOSTER_B over-current		
Er29	PV inverter output DC current over spec.	DC current at output of photovoltaic solar inverter is too high.	
Er06	EPO	The photovoltaic solar inverter is in emergency power off mode.	<ol style="list-style-type: none"> 5. Detach the connection at the EPO connection. 6. If the error occurs again, please contact your dealer.
Er09	PV inverter over-current	Over-current on the AC side. The current in the AC mains is higher than expected.	<ol style="list-style-type: none"> 7. Turn off the AC current switch, check the peripheral AC current system configurations and the mains conditions. 8. If the error occurs again, please contact your dealer.
Er11	PV inverter over-load	Over-load on the AC side. The mains load in the AC mains is higher than expected.	
Er13	PV inverter short-circuit	Short circuit on the AC side.	
Er14	PV inverter PLL failure	The photovoltaic solar inverter is not in phase with the mains electricity.	

LCD display	Description	Explanation	Troubleshooting
Er10	PV inverter over temperature	The indoor temperature is too high.	9. Try to reduce the surrounding temperature. 10. Install the photovoltaic solar inverter in a cooler place. 11. If the error occurs again, please contact your dealer.
Er18	Heat sink over temperature	The temperature on the cooling element is too high.	
Er01	Ground fault	The fault current has reached the authorised upper limit.	12. Disconnect the feed from the PV generator and check the peripheral AC system. 13. When the reason is found, reconnect the PV panel and check the status of the photovoltaic solar inverter. 14. If the error occurs again, please contact your dealer.
Er17	EEPROM ERROR on the control board	EEPROM data is faulty.	15. Please contact your dealer.

9.2 Mains error alarm codes and explanations

LCD display	Description	Explanation	Troubleshooting
AL00	Utility Voltage Over-Voltage	The mains voltage is higher or lower than the authorised amount.	16. Wait 5 minutes. When the mains supply returns to normal, the photovoltaic solar inverter starts up automatically.
AL01	Utility Voltage Under-Voltage		
AL02	Utility Voltage Over Frequency	The mains frequency is higher or lower than the authorised amount.	17. Check the mains connection (cable and terminals). 18. Make sure the mains voltage and frequency meet the requirements. 19. If the error occurs again, please contact your dealer.
AL03	Utility Voltage Under Frequency		
AL04	BOOSTER_A Input Over-Voltage	Under or over-voltage of the DC input.	20. Disconnect all PV (+)- or PV (-) connections. 21. Check whether the PV voltage is under 120 VDV or above 500 VDC. 22. If the voltage is within this range and the problem continues, please contact your dealer.
AL05	BOOSTER_A Input Under-Voltage		
AL06	BOOSTER_B Input Over-Voltage		
AL07	BOOSTER_B Input Under-Voltage		
AL08	Anti-Islanding	No mains supply or mains outside the tolerances.	23. Disconnect all PV (+)- or PV (-) connections. 24. Check the mains connection (cable and terminals). 25. Check the phasing and the waveform of the mains supply. 26. If the supply is normal and the problem persists, please contact your dealer.
AL13	Phase of Utility fail		
AL14	Waveform of Utility fail		

LCD display	Description	Explanation	Troubleshooting
AL09	Inverter Voltage unbalance	The waveform of the voltage of the photovoltaic solar inverter is outside the tolerance.	27. Shut down the photovoltaic solar inverter (disconnect PV generator from the feed). 28. Restart the photovoltaic solar inverter (plug the PV generator into the feed). 29. If the error occurs again, please contact your dealer.
AL10	GFDI	The fault current of the grounding wire is too high.	30. Disconnect the PV generator from the feed and check the peripheral AC system. 31. When the problem is resolved, reconnect the PV. Check the status of the photovoltaic solar inverter. 32. If the error occurs again, please contact your dealer.
AL11	Isolation Fault	The insulation between the PV connections and the earth is less than 1 MΩ.	33. Disconnect all PV (+)- or PV (-) connections. 34. Check the impedance between PV (+), PV (-) and the ground (must be more than 2 MΩ). 35. If the error occurs again, please contact your dealer.

10. Service

There are no parts on the photovoltaic solar inverter that have to be maintained by the customer.

Clean the device at regular intervals with a dry, soft towel to avoid an accumulation of dust.

In particular, clean the cooling fins on the back of the device.

Service hotline and contact addresses

If unexpected problems occur with the photovoltaic solar inverter or you need safety information, please contact our service hotline:

Phone no.: 0049 / (0) 741 – 17451-0

Fax no.: 0049 / (0) 741 – 17451-29

If you cannot reach us by phone or fax, we have set up an e-mail contact for you:

solar-service@effekta.com.

You will also find additional contact addresses online at:

<http://www.effekta.com/html/kontakt.html>.

You will find the entire spectrum of our services at:

<http://www.effekta.com/html/service/html>.

You will find an exchange form to download under:

http://www.effekta.com/pdf/Austausch_SolarPhotovoltaik-Wechselrichter.zip.

11. Technical Data

11.1 Device specifications

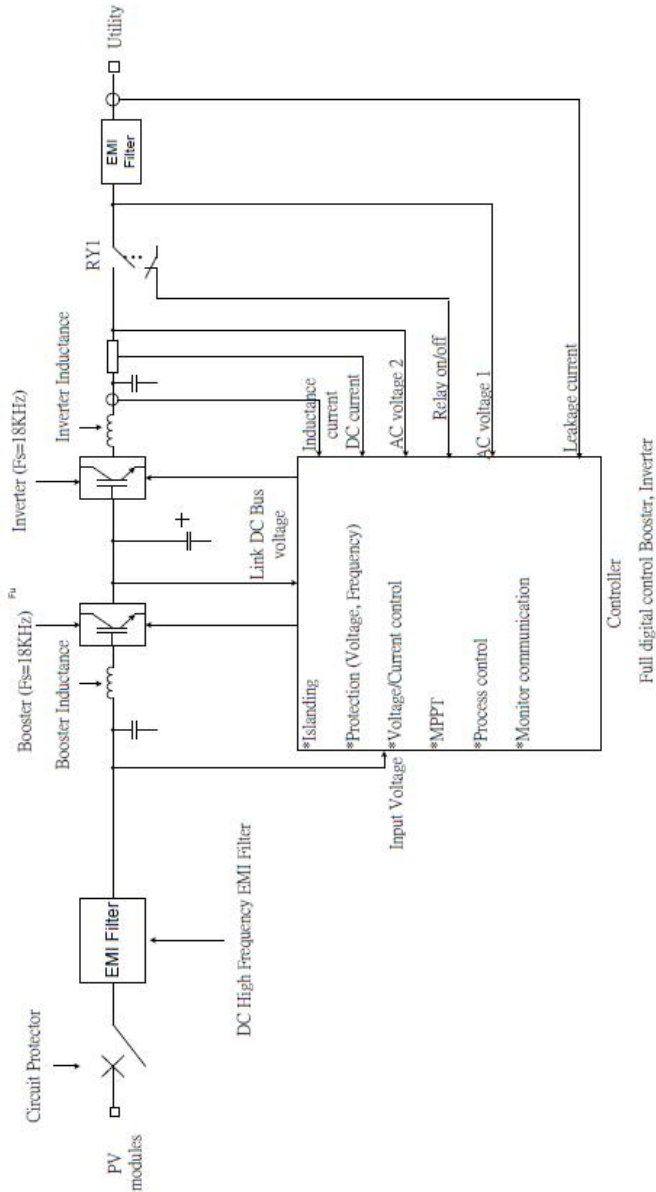
		ES2200	ES3300	ES4200	ES5000
Photovoltaic solar inverter technology	Implementation	Sinusoidal, power source, high frequency pulse width modulation (PWM)			
	Isolation method	Execution without isolation transformer (without galvanic isolation)			
Input data DC	Rated DC	360 VDC			
	Max. input DC	500 VDC			
	Work area	120 VDC to 500 VDC**			
	Max. electricity per MPP tracker	14.6 A	22 A	(2 x) 14 A	(2 x) 17.65 A
	Max. power per MPP tracker	2200 W	3300 W	2200 W	2500 W
	MPPT range	150 V _{DC} to 450 V _{DC}			
	MPP tracker	1		2	
Output data AC	Nom. AC power	2000 W	3000 W	4000 W	4600 W
	Max. AC power	2200 W	3300 W	4200 W	4600 W
	Nominal AC voltage	230 V~			
	Type of output connection	Single-phase, mains connection (L, N, PE)			
	AC voltage range	184 V _{AC} to 264.5 V _{AC} (Base 230 V _{AC})			
	Nominal alternating current	8.69 A	13 A	17.7 A	20.0 A
	Frequency	50/60 Hz, automatic settings			
	Power factor	>0.99 with nominal alternating current			
	Distortion factor of current (sinus deviation)	Percentage of total harmonious vibration: Below 5 % of harmonious individual vibration: Below 3 %			

		ES2200	ES3300	ES4200	ES5000
Efficiency data	Max. implementation performance	> 96 %			
	Euro power	> 94 %			
	CEC power	> 94 %			
	Standby consumption	< 7 W			
	Night-time consumption	approx. 1 W			
Environment	Operating temperature	- 25 °C to + 50 °C (- 13 °F to 122 °F)			
	Humidity	0 to 90 % (without condensation)			
Technology	Dimensions (H x W x D mm)	430 x 455 x 190		510 x 455 x 190	
	Weight (net)	27 kg		29 kg	
	Weight (gross)	30.5 kg		32.5 kg	
	Protective class	IP65 (outdoor area)			
	Cooling	Convection			
	AC connection	Screw connection			
	DC connection	MC4 plug			
Communication	Standard	RS232			
	Optional	USB, RS485, relay contact, SNMP			

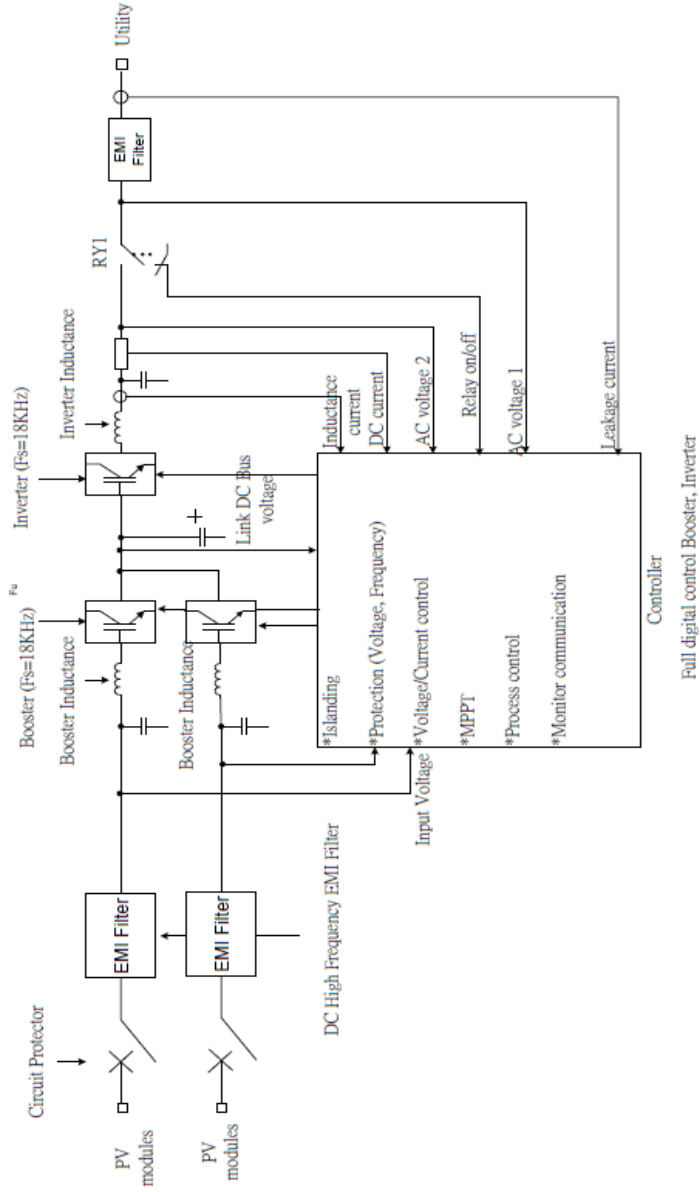
		ES2200	ES3300	ES4200	ES5000
Control Panel	LCD display	Input DC voltage / input direct current / input DC power / output AC voltage / output alternating current / output frequency / output AC power / Energy output / internal temperature / cooling element temperature / status message / error message			
	LED display	Red:		Grounding fault or DC input isolation fault	
		Yellow:		Supply conditions do not correspond to the input standard of the photovoltaic solar inverter	
		Green:		Performance of solar cells is above or below 5 % of the nominal performance of the photovoltaic solar inverter	
	Operating keys	Navigation keys / function key / enter key			
Safety	Mains	Over-/ under-voltage, over-/ under-frequency, grounding fault, DC isolation error, no isolated operation			
	Short circuit	DC input: Reverse pole protection / electronic switching AC output: Output relay / electronic switching			
	EPO (emergency power off)	The photovoltaic solar inverter switches off immediately			
	Over-temperature	≤ 50 °C (122 °F) at full capacity ≥ 50 °C(122 °F) at reduced capacity			
Certification	Safety	Europa VDE0126-1-1, VDE-AR-N 4105 EN50178, IEC62103			
	EMI/EMC	EN 61000-6-2: 2005 EN 61000-6-3: 2007			

** The nominal range should be between 150 VDC and 500 VDC to achieve nominal power.

11.2 ES2200 / ES3300 Block diagram




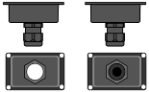



11.3 ES4200 / ES5000 Block Diagram



11.4 Scope of Delivery / (Optional) Accessories


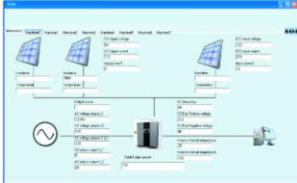


Check the completeness of the delivery after receiving the goods:



	Description	Function / View	Article number	***
1	Photovoltaic solar inverter		ES2200: SLWRABSI2K0Wx001 or ES3300: SLWRABSI3K0Wx001 or ES4200: SLWRABSI4K0Wx001 or ES5000: SLWRABSI5K0Wx001	X
1	Wall mounting	 Assembly plate for wall mounting	Upon request	X
3	PV coupling plug	 Coupling plug PV-KST4/6II-UR	PV-KST-4-6.0	X
3	PV coupling bush	 Coupling bush PV-KBT4/6II-UR	PV-KBT-4-6.0	X
3	PV closure cap	for coupling plug	Upon request	X

	Description	Function / View	Article number	***	
3	PV closure cap	for coupling bush	Upon request	X	
2	Cable inlets	Including assembly material	Upon request	X	
1	IP65 protection 	IP65 protection consists of:	Upon request	X	
		2 covers		Upon request	X
		2 washers		Upon request	X
		8 screws		Upon request	X
1	DC circuit-breaker		SLDFKNMS32AWX000	O	
1	AC circuit-breaker		to be provided by the customer		

*** X = included in standard scope of delivery
 O = can be ordered as an option. The EFFEKTA sales team will be pleased to advise you.

In the following, you will find a list of components that **EFFEKTA Regeltechnik GmbH** has approved and tested especially for this photovoltaic solar inverter.

	Description	Function / View	Article number	***
	Solar-Log™ Monitoring	 <p>Remote diagnostics system</p>	SLZBSLDL21022000 (Solar Log 200 for 1 photovoltaic solar inverter) SLZBSLDL21050100 (Solar Log 500 up to 10 photovoltaic solar inverters) SLZBSLDL21100100 (Solar Log 1000 up to 100 photovoltaic solar inverters) Further versions available on request	○
	Software	 <p>"EnerSolis" software for photovoltaic solar inverter</p>	SWABENERSOLIXX00	○
	RS232 connection	RS232 interface connection cable, approx. 170 cm (necessary for operating the software)	M2505	○
	RS485 plug-in card	 <p>RS485 expansion card for photovoltaic solar inverter</p>	SLZBABEK485PX000	○
	USB plug-in card	 <p>Expansion card for USB -</p>	SLZBABEKUSBPX000	○

	Description	Function / View	Article number	***
		interface		
	Relay plug-in card	 <p>Relay expansion card for photovoltaic solar inverter</p>	SLZBABEKRCBPX000	O
	SNMP/WEB plug-in card	 <p>SNMP/WEB expansion card for photovoltaic solar inverter</p>	SLZBABEKWEBPX000	O

*** X = included in standard scope of delivery
 O = can be ordered as an option. The EFFEKTA sales team will be pleased to advise you.

12. Declaration of Conformity

Declarations of Conformity can be found on our website

www.effekta.com

under Downloads; Download brochure; Category: Solar power

EFFEKTA[®]

EFFEKTA Regeltechnik GmbH

Rheinwaldstraße 34

D-78628 Rottweil

Germany