

Central Inverter

SUNNY CENTRAL 400HE / 500HE / 630HE

Installation Guide



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1 Notes on this Manual

1.1 Validity

This manual describes the transport, installation, and commissioning of SMA central inverters of the following types:

- Sunny Central 400HE (SC 400HE-11)
- Sunny Central 500HE (SC 500HE-11)
- Sunny Central 630HE (SC 630HE-11)

1.2 Target Group

This manual is intended for installers and operators of PV plants equipped with Sunny Centrals.

1.3 Additional Information

All manuals for the Sunny Central as well as for the installed components must be stored together with the plant documentation and must be accessible at all times. The documents listed below are included in the scope of delivery for your Sunny Central. The following information is contained in these documents.

- | | |
|----------------------------|---|
| • Installation guide: | Setup and installation of the Sunny Central |
| • User manual: | How to operate the Sunny Central and Sunny Central Control |
| • Circuit diagrams: | Variant circuit diagram of the Sunny Central |
| • Maintenance manual | Regular maintenance work on the Sunny Central |
| • Maintenance protocol | List of the regular maintenance work and its intervals as well as the preventive replacement intervals of individual components. |
| • Commissioning report | Check list for commissioning. After successful commissioning, the commissioning report has to be sent to SMA Solar Technology AG. |
| • Accessory documentation: | The documentation for optional accessories or optional equipment for the Sunny Central can be found at www.SMA.de/en . |

1.4 Symbols Used

The following types of safety instructions and general information appear in this document as described below:



DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE!

NOTICE indicates a situation that can result in property damage if not avoided.



Information

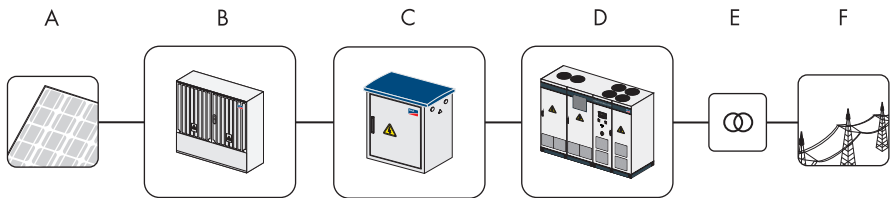
Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety

2.1 Appropriate Usage

The Sunny Central is a PV inverter. It allows photovoltaic solar energy from solar modules to be converted and fed into a medium-voltage grid.

Principle of a grid-tie PV plant with a Sunny Central



A	PV modules
B	Sunny String-Monitor
C	Sunny Main Box
D	Sunny Central
E	Medium-voltage transformer
F	Electrical grid

Sunny Central HE

The Sunny Central HE is a high efficiency solar inverter. It does not have its own low-voltage transformer. The Sunny Central HE requires an adapted external medium-voltage transformer via which it can feed into the grid.

The following standards apply for all devices of this series:

EMC	EN 61000-6-2, EN 61000-6-4
Grid monitoring	As per BDEW regulations
CE conformity	yes

2.2 Safety Precautions

Failures that affect or limit the safety of the device must be rectified immediately. Unauthorized modifications and the use of spare parts not recommended by SMA Solar Technology may cause fire, material damage, and electrical shock. Unauthorized personnel must not have access to the devices.

Warning signs must always be clearly readable and immediately replaced if damaged.

2.2.1 Personnel

Any work on the Sunny Central may be executed by qualified technical personnel only. "Qualified" means that the personnel must possess training relevant to the activity performed.

The personnel must be familiar with the content of the Sunny Central installation guide and user manual in order to commission and / or operate the Sunny Central. Please observe all safety information carefully.

2.2.2 Installation

The installation requirements described in the installation guide must be satisfied. Installation must occur in an electrical operating room, in order to guarantee optimum noise and fire protection.

With regard to the EMC limit values (EMC = electromagnetic compatibility), the Sunny Central device range is type tested for installation in an industrial environment. Devices suitable for installation in domestic areas are available on request.

The following points must be observed for the installation:

- The intake and exhaust ventilation systems for the Sunny Central must be separate to any other ventilation systems so as to prevent smoke distribution in the event of a fire.
- A sufficient escape route must be guaranteed.
- Appropriate sound insulation must be provided.
- The EMC specifications must be observed (see technical data).



WARNING!

Smoke development in electrical operating rooms.

We recommend the installation of a smoke detector inside the operating room which controls the external emergency stop switch of the device and switches off the Sunny Central in the event of smoke.

2.2.3 Special Hazards of Photovoltaic Plants

Photovoltaic plants have special characteristics representing special hazards that are described here:

- An active power source is connected. Depending on the operating mode, there may be voltage present from the photovoltaic generator and/or the Sunny Central. This is especially important to note when disconnecting particular parts of the plant.
- Very high DC voltages are present (no zero-crossing) that, in the case of a fault or inappropriate use of fuses or plugs, may lead to arcing.
- The short circuit current of the photovoltaic generator is only slightly higher than the maximum operating current and also depends on the irradiation. If a short-circuit occurs in the plant, the available fuses are not guaranteed to switch off.
- The grid structure of the PV generator is generally a non-grounded grid that could become unintentionally grounded if a ground fault occurs.
- A highly branched generator array may be difficult to disconnect if a fault develops (e.g. short circuit). We recommend the extra use of external DC circuit breakers for disconnecting the inverter and / or the DC main cables / Sunny String-Monitors, DC circuit breakers optionally available. At every DC input, an easily accessible DC circuit breaker should be installed. For further information see pre-standard VDE 0100, part 712 and VDI guideline 6012.

2.2.4 Electrical Connection

The electrical connection must be performed according to this installation guide, the variant circuit diagram and the technical data of the device.

Ensure the grid connection cable for grid feeding-in is fused at the nominal current indicated on the type plate. If the specified nominal current differs from the nominal current of the fuse plug, the fuse plug having the next highest nominal current may be used.



Grid connection cable

The grid connection cable for the internal power supply must be secured with the line circuit breaker specified in the technical data.

Lightning Protection

The devices have type I internal lightning protection on the AC side and type II internal overvoltage protection on the DC side and the internal power supply. However, the desired protection level can only be achieved if a lightning protection area concept exists for the installation building as per DIN VDE 0185-4, i.e. lightning conductors or combined overvoltage and lightning conductors (not included in delivery) are available at locations including the building's entrance (transfer lightning protection area LPZ 1).

Combined overvoltage and lightning protection for the signal inputs can be optionally ordered.

Emergency Stop

In plants having more than one device, the respective emergency stop switches must be connected together and checked for correct operation as described in this installation guide. The emergency stop circuit may only be supplied with voltage from a single device.



Emergency stop circuit

- The emergency stop circuit may only be supplied by a Sunny Central.
- Correctly mount the bridges on the device's emergency stop terminal strip.

2.2.5 Power Supplies



WARNING!

Risk of lethal electric shock.

High voltages are present in the device.

- The grounding conductor must be made before the external voltage is switched on.
- At the AC grid connection terminal, the nominal voltage, frequency and the right-hand rotary field have to be maintained.
- The correct polarity and ungroundedness must be ensured before inserting the DC input fuses (internal or external). The fuses may only be inserted and / or removed under load-free conditions and using the appropriate personal protective equipment and fuse carriers.
- When the DC fuses (internal or external) have been inserted, reverse voltage exists, via the Sunny Central busbars, on all externally connected DC main distribution boxes and DC sub-distribution boxes (Sunny String Box).
- The doors must remain closed when connecting the supplies!

Requirements for the Use of External Power Supplies

- All connections have been made according to the installation guide and the circuit diagram.
- The grounding conductor for grid feed-in and for internal power supply has been made.
- The device is switched off. The key switch is in the "Stop" position and the main switches are off.
- The DC input fuses (internal or external) are connected and the protection against contact (Plexiglas covers) is mounted.
- The nominal voltages, frequencies and the right-hand rotary field are maintained.
- The polarity of the DC voltage at the inputs / fuse inputs (device dependent) has been checked.
- The polarity of the DC voltages at the inverter input (device dependent) has been checked.
- The photovoltaic generator has been checked with an insulation test to ensure that there is no ground fault.

Sequence for Switching On the External Power Supplies

1. Grid voltage for grid feeding
2. Grid voltage for internal power supply
3. DC voltage from the photovoltaic generator

2.2.6 Disconnecting

External isolation of the device must always occur under load-free conditions. The device must be switched off in order to do this, i.e. the key switch must be in the "Stop" position.



DANGER!

Risk of lethal electric shock.

Work on the Sunny Central may be performed only after switching off the power to the unit. The VDE regulations must be followed:

- Disconnect
- Ensure that the device cannot be reconnected
- Ensure that no voltage is present
- Ground and short-circuit the unit if necessary (not on the DC side)
- If necessary, cover or shield any adjacent live components

The following power supplies must be isolated:

- Grid voltage for grid feeding
- Grid voltage for internal power supply (optional)
- DC voltage from the photovoltaic generator
- Additional external voltage if necessary (e.g. emergency stop)

Simply switching off the main AC and DC switches is not sufficient to ensure proper isolation of the device. The main switches only separate the power circuit from the grid and the photovoltaic generator.



DANGER!

Risk of lethal electric shock.

Dangerous accidental-contact voltages can be present in the Sunny Central even when the main AC and DC switches are switched off!

- Wait at least 5 minutes after switching off the Sunny Central.

The DC voltage is isolated using the internal or external DC input fuses, or using an external circuit breaker if present. Isolation by removing the DC input fuses must occur under load-free conditions.

The device contains capacitors on the AC and DC sides that must discharge once the device has been switched off. After switching off, dangerous accidental-contact voltages remain within the device for several minutes. If there is a fault in the device, these voltages may also be present for a longer period of time. Wait at least 5 minutes after switching off the device before opening the device.

**WARNING!****Risk of lethal electric shock!**

- To avoid arcing, the load-free status of the device must be checked with a current probe (using a clamp-on ammeter) before removing the DC input fuses. The fuses may only be inserted or removed using the appropriate personal protective equipment and fuse carrier.
- When the DC fuses (internal or external) have been inserted, reverse voltage exists, via the Sunny Central busbars, on all externally connected DC main distribution boxes and DC sub-distribution boxes (Sunny String-Monitor).
- In the event of a failure, the DC contactor may carry a life-threatening DC voltage!
- The discharge time of the capacitors is longer than 5 minutes.

To extract the fuses, the Plexiglass cover must be removed. Immediately reinstall the cover after the cover has been removed from one pole and the fuse has been extracted. The cover must always be mounted unless a fuse is to be extracted.

**Disconnecting plant parts without danger**

We recommend the extra use of external DC circuit breakers for disconnecting the Sunny Central, DC main cables and Sunny String-Monitor; DC circuit breakers are optionally available. This allows system components to be safely isolated, even in the case of faults or fire.

2.2.7 General Information

Ear Protection

The device fans and the power module create significant levels of operating noise. In addition to this, a fault in the device can lead to very high sound levels.



High noise levels in electrical operating rooms

We recommend the use of ear protection when in the vicinity of the Sunny Central operating room for extended periods.

Burns

Immediately after isolating the device, depending on the operating conditions, certain components can be very hot (e.g. fuses, transformer core, sinusoidal filter, heat sinks etc.).

Safety gloves should always be worn when working near components that can be expected to be very hot.

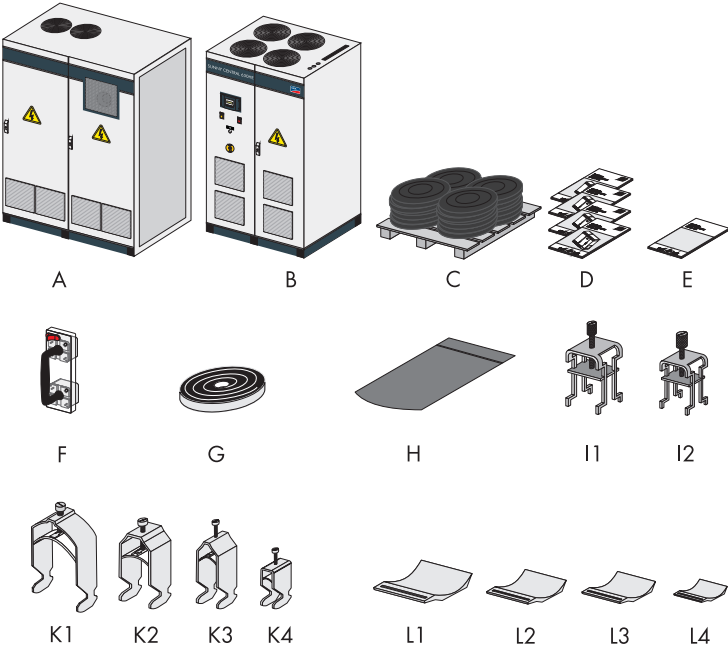


High temperature on device parts

We recommend that safety gloves be worn during all work on the device.

3 Delivery

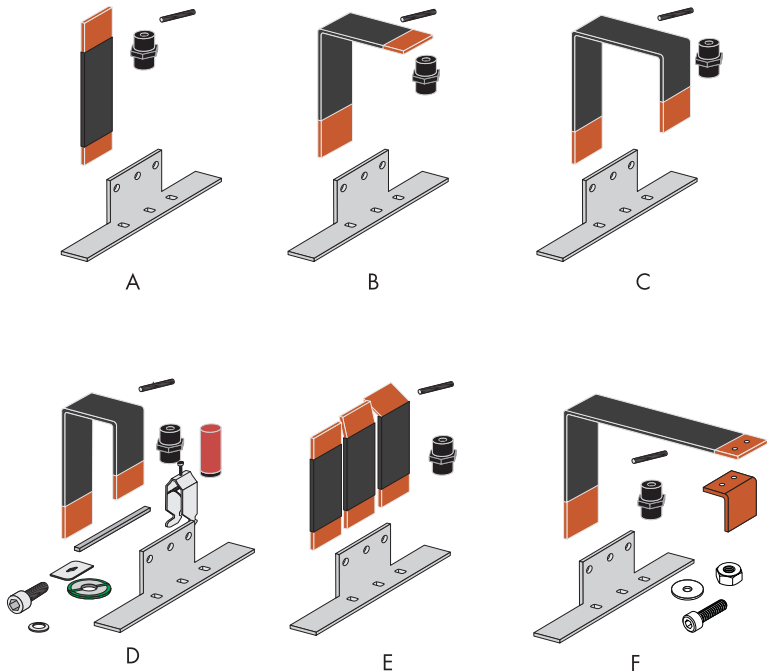
3.1 Standard Scope of Delivery



Position	Quantity	Designation
A	1	DC / inverter cabinet
B	1	AC cabinet
C	1	Power cabling
D	1	SMA document set • Installation guide • User manual • Variant circuit diagram • Commissioning report
E	1	Documentation of the optional insulation monitoring (Bender)
F	1	Low-voltage HRC fuse carrier, optional
G	2	Terminal profile, 3 m Rittal SZ 2573.000

Position	Quantity	Designation
H	1	Rittal assembly set • Delivery pouch, 2-door TS8 1200 x 2000 • Angle bracket TS corner TS8800.430 • Quick angle connector TS TS8800.500 • Rittal angle plate PS 4582.500 • Sealing tape
I1	4	Shield clamping saddle 7 - 16mm Wago 790-116
I2	5	Shield clamping saddle 0 - 8mm Wago 790-108
K1	6	OBO cable clip 34 - 40 mm
K2	17	OBO cable clip 28 - 34 mm
K3	21	OBO cable clip 22 - 28 mm
K4	14	OBO cable clip 12 - 16 mm
L1	6	OBO opposite sleeve 1197169 2058 FW/40
L2	17	OBO opposite sleeve 1197282 2058 FW/34
L3	21	OBO opposite sleeve 1197347 2058 FW/28
L4	14	OBO opposite sleeve 1197401 2058 FW/16

3.2 Scope of Delivery (depending on the model)



Position	Quantity	Designation
A	1	AC connection model 13/0: • 3 x straight copper bar (same length) • 3 x insulator • 1 x retaining bracket • 3 x insulator and setscrew
B	1	AC connection model 13/1: • 3 x L-shaped copper bar • 3 x insulator • 1 x retaining bracket • 3 x insulator and setscrew

Position	Quantity	Designation
C	1	AC connection model 13/2: • 3 x U-formed copper bar • 3 x insulator • 3 x insulator and setscrew
D	1	AC connection model 13/3: • 3 x U-formed copper bar • 3 x support • 1 x retaining bracket • 3 x insulator and setscrew • 18 x cable clip and opposite sleeve • 3 x cable rail for side panels • 6 x sliding nut
E	1	AC connection model 13/4: • 3 x copper bar, varying angles • 3 x insulator • 1 x retaining bracket • 3 x insulator and setscrew
F	1	AC connection model 13/5 • 3 x copper bar 2 x angled + separated • 3 x insulator • 1 x retaining bracket • 3 x insulator and setscrew • 6 x screw connector for the separated bars



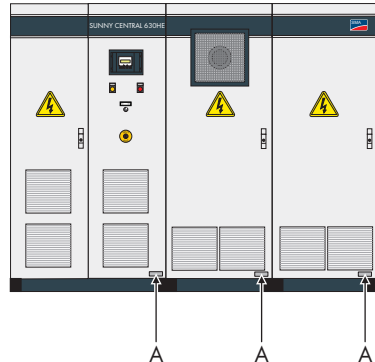
Retaining brackets on the device

The retaining brackets are pre-installed on the device.

3.3 Identifying your Sunny Central

You can identify the Sunny Central using the type label. The type label is located on the inside of the Sunny Central's door.

In addition, the series number (A) is located on the front side of the device.



Selecting switch cabinet units

Sunny Centrals are supplied as two switch cabinet units. If several Sunny Centrals are delivered and installed together, switch cabinet units with the same serial number have to be installed side by side.

3.4 Check for Transport Damage

Check the packaging and the device for any possible damage and compare the scope of delivery with the delivery documentation. In the case of damage to the device and/or unclear delivery contents, immediately contact SMA Solar Technology.



Transport safety

The inverters are delivered as two separate switch cabinet units. They do not satisfy the protection class requirements as specified in the technical data. The transport packaging provides sufficient protection against moisture and damage.

3.5 Storage

The switch cabinet units do not satisfy the protection class requirements as specified in the technical data. The transport packaging provides sufficient protection against moisture and damage after shipping. The switch cabinet units may not be stored outdoors.

**Notice!**

Improper storage may cause damage to the Sunny Central.

Improper storage can cause moisture or dust to seep into the Sunny Central.

- Only store the Sunny Central in areas where it is protected from dust and moisture.
- The conditions under which the Sunny Central is stored must correspond to the intended operating conditions.
- Do not store the Sunny Central outdoors.

4 Installation



Sunny central installation requirements

Each Sunny Central has individual installation requirements. These can be ordered at any time from SMA Solar Technology and have to be observed for project planning and preparation of the installation site.



Selecting switch cabinet units

During installation and internal cabling, make sure the switch cabinet units have the same series number.

4.1 Installation Site Requirements



Sunny central installation location

The Sunny Central should be installed in an electrical operating room.

Floor

The foundation must guarantee solid and safe positioning of the inverter. The foundation must provide the load-carrying capacity necessary to cope with the weight of the inverter. The inverter cabinet must be installed on a level surface. Any existing unevenness, depression or slope must be corrected prior to installation.

Wall Clearances

When installing the inverter, appropriate distance to the wall for minimum passageways, escape routes, and ventilation have to be observed. Appropriate specifications for each type of inverter are contained in the Sunny Central Installation Requirements (separate document).

Inverter Protection Rating / EMC / Sound Levels

The Sunny Central is suitable for a dry, dust-reduced environment, according to IP20 protection rating. With regard to the EMC emissions and the noise level, the Sunny Central inverter is conceived for setup in an industrial environment.

4.2 Electrical Operating Room

For the installation and connection of the Sunny Central central inverters, observe DIN VDE 0100, part 729, part 731. The requirements for the electrical operating room for the installation of high-voltage systems up to 1 000 V as well as the requirements for passageways and escape routes are included therein.



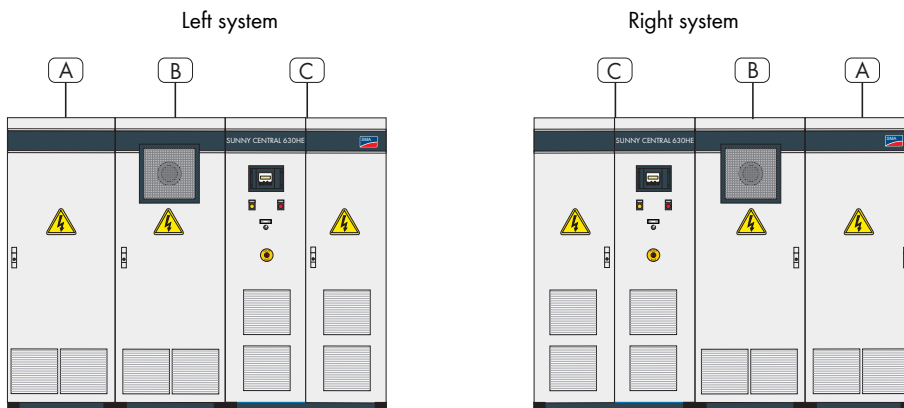
Minimum passageway in electrical operating rooms

Observe the following points for a minimum passageway:

- With fully opened switch cabinet doors, a minimum passage width of 500 mm (escape routes) must be maintained, see DIN VDE 0100 part 729, part 731.
- To maintain the minimum passageway requirements, the cabinet doors in an inverter system with two rows of opposing cabinets (e.g. in a station building) may only be opened on one side at a time.

4.2.1 MV Stations

Inverters in the HE series are normally set up in a compact concrete substation, opposite to each other as a “left-hand system” and a “right-hand system”. The installation has to be carried out in accordance with the VDE guidelines for a closed electrical operating room. The figure below depicts a left-hand and a right-hand system.



- A DC cabinet
- B Inverter cabinet
- C AC cabinet

The AC cabinets should always stand next to the dividing wall to the transformer room, to allow the AC power cables to be connected to the transformer over the shortest possible route.



WARNING!

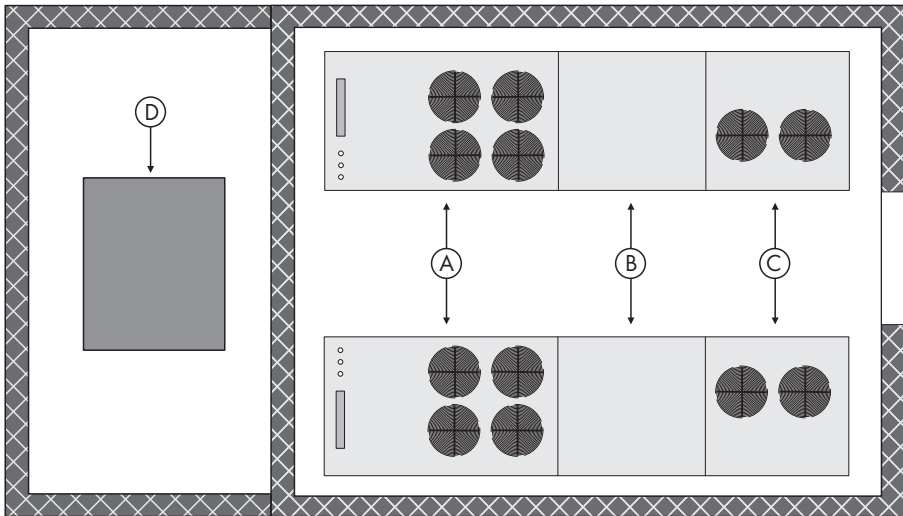
Smoke development in electrical operating rooms.

We recommend the installation of a smoke detector inside the operating room which controls the external emergency stop connection of the device and which switches off the Sunny Central in the event of smoke.

Sunny Centrals in a Station

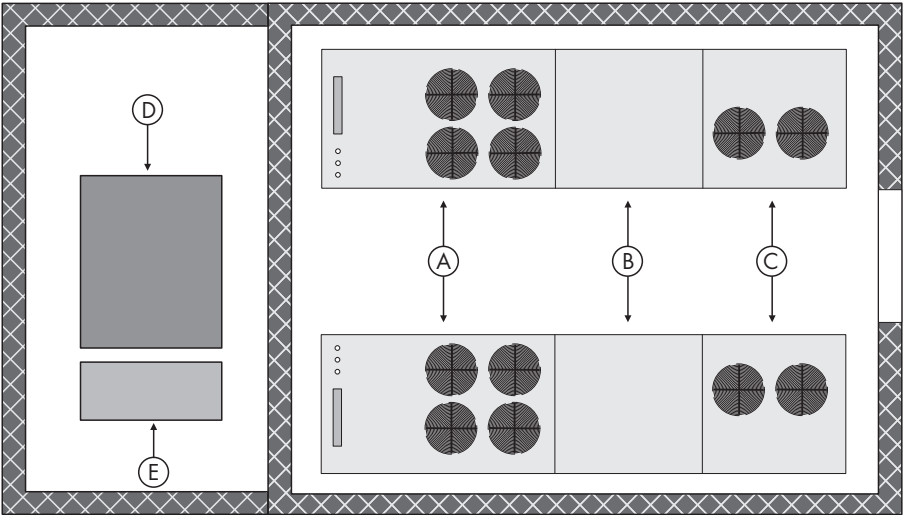
A selection of schematic top views of a Sunny Central installed in a station and a transformer room are included below. The inverter has been installed as a "right-hand system" (above) and a "left-hand system" (below). A station may also include only one Sunny Central. In addition to a transformer, the option exists to also include a medium-voltage switchgear in a transformer room.

MV Station with two Sunny Centrals without Medium-Voltage Switchgear



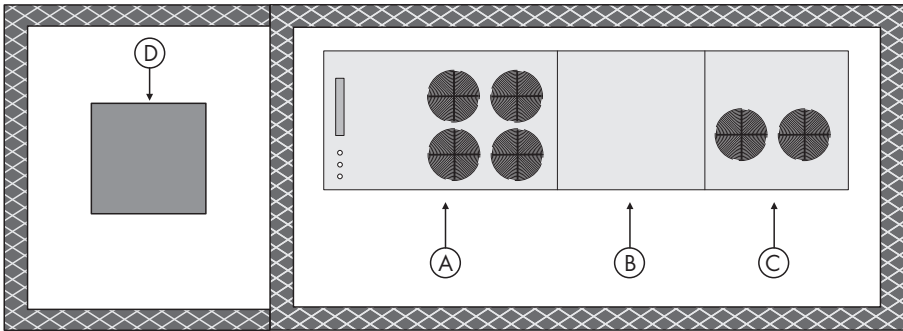
- A AC cabinet
- B Inverter cabinet
- C DC cabinet
- D Transformer

MV Station with two Sunny Centrals and Medium-Voltage Switchgear



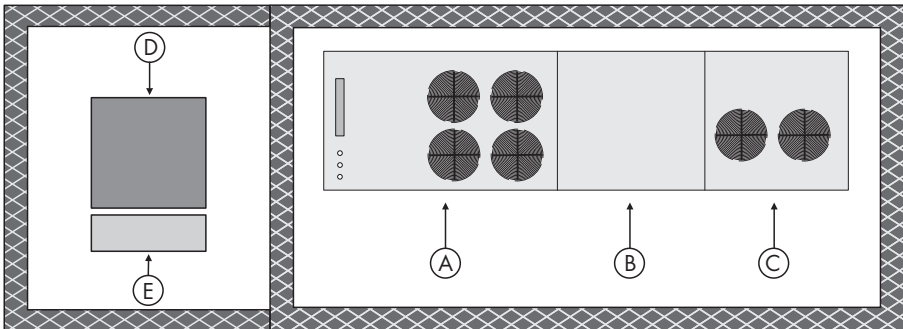
- A AC cabinet
- B Inverter cabinet
- C DC cabinet
- D Transformer
- E Medium-voltage switchgear

MV Station with one Sunny Central without Medium-Voltage Switchgear



- A AC cabinet
- B Inverter cabinet
- C DC cabinet
- D Transformer

MV Station with one Sunny Central and Medium-Voltage Switchgear



- A AC cabinet
- B Inverter cabinet
- C DC cabinet
- D Transformer
- E Medium-voltage switchgear

4.3 Ventilation

Appropriate inlet ventilation is required for cooling the inverter. In order to guarantee safe operation and maximum feed-in power, the permissible ambient temperature must be observed.

The required air is drawn through the switch cabinet doors and is blown out via the roof or the rear panel of the cabinet unit depending on the Sunny Central model. This allows the devices to be installed directly next to each other. See the Sunny Central Installation Requirements (separate document) for the air requirements as well as appropriate wall clearances. Filters for cleaning the inlet air are installed at the inlet vents.

If the required volume of air at the installation site of the Sunny Central is too small, then on-site measures must be taken to provide greater quantities of air (ventilation grills, blowers, fans, etc.).

The inlet air must satisfy the requirements of classification 3S2 (see table). Classification 3C2 must be met if installation is to occur in chemically aggressive environments, e.g. installation near the sea. The operation of the inverter is suited to a relative humidity of 15 ... 95 %.

Air Quality Classification for Mechanically Active Substances

Environmental conditions for stationary application	Class			
	3S1	3S2	3S3	3S4
a) Sand in the air [mg / m ³]	-	30	300	3 000
b) Dust (suspended matter) [mg / m ³]	0.01	0.2	0.4	4.0
c) Dust (fallout) [mg / m ³]	0.4	1.5	15	40
Sites where appropriate measures are taken to keep dust levels to a minimum.	x	x	x	x
Sites where no special measures have been taken to reduce the sand or dust levels and which are not located in the vicinity of sand or dust sources.		x	x	x
Sites near sand and dust sources			x	x
Sites in production halls where sand or dust is present, or sites in geographical locations where the air is prone to high levels of sand and dust.				x

Air Quality Classification for Chemically Active Substances

Environmental conditions for stationary application	Class					
	3C1R	3C1L	3C1	3C2	3C3	3C4
a) Marine salt	-	-	-	Occurrence of marine salt		
b) Sulfur dioxide, mg / m ³	0.01	0.1	0.1	1.0	10	40
c) Hydrogen sulfide, mg / m ³	0.0015	0.01	0.01	0.5	10	70
c) Chlorine, mg / m ³	0.001	0.01	0.1	0.3	1.0	3.0
d) Hydrogen chloride, mg / m ³	0.001	0.01	0.1	0.5	5.0	5.0
e) Hydrogen fluoride, mg / m ³	0.001	0.003	0.003	0.03	2.0	2.0
f) Ammonia, mg / m ³	0.03	0.3	0.3	3.0	35	175
g) Ozone, mg / m ³	0.004	0.01	0.01	0.1	0.3	2.0
h) Nitrogen oxides, mg / m ³	0.01	0.1	0.1	1.0	9.0	20
Installation sites with carefully monitored and regulated atmospheres (category clean spaces).	x	x	x	x	x	x
Installation sites with carefully regulated atmospheres.		x	x	x	x	x
Installation sites in rural or densely populated areas with little industry and moderate traffic volume.			x	x	x	x
Installation sites in densely populated areas with industry and high traffic volume.				x	x	x
Installation sites directly neighboring industrial plants, with chemical emissions.					x	x
Installation sites directly inside of industrial plants, with emission of high concentrations of chemical pollutants.						x



Environmental Conditions

The following points must be observed in relation to environmental conditions:

- Required amount of fresh air
- Stipulated air quality
- Relative humidity
- Permissible ambient temperature

4.3.1 Exhaust Airflow

The heated exhaust air generated by the inverter must be ducted away from the device so that the maximum permissible environmental temperature is not exceeded and / or the warm exhaust air does not unnecessarily heat the installation room.

**CAUTION!**

Risk of crushing from metal parts.

- Remove the finger protection from the fan openings of the Sunny Central before installing the exhaust airflow.

The exhaust airflow of the DC and AC cabinets occurs upward. This is achieved through the on-site installation of an exhaust airflow (e.g. air conduit).

The exhaust airflow of the inverter cabinet occurs on the rear-side. The Sunny Central can be set up with the rear panel directly against the opening in the building wall. An on-site sealing or a frame-like air box with seals is to be installed for this purpose. The air box must be fastened onto the building wall.

**NOTICE!**

Operational reduction of the Sunny Central through overtemperature!

For an appropriate cooling of the inverter, the following points have to be observed:

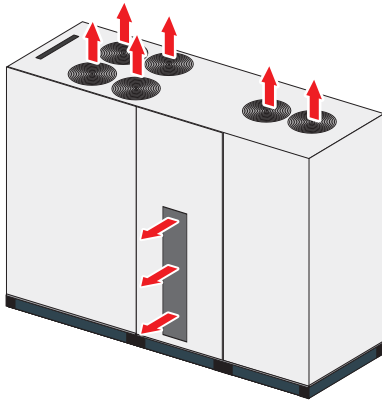
- Observe the indicated amount of air.
- Clean the ventilation openings (filter pads) and the exhaust grills at regular intervals.
- Expel the exhaust air separately out of the individual cabinet components in order to avoid thermal short circuit breaks.

**Information regarding the inverter**

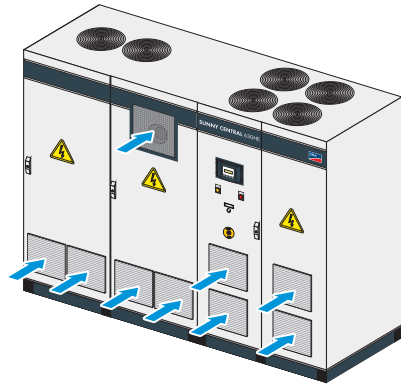
The specific configuration of the ventilation systems for each inverter is to be taken from the Sunny Central Installation Requirements (separate document).

Overview of the Air Inlets and Outlets

Examples are used below to illustrate the exact position and size of the single air grills as well as for the supply air on the front side (B) and the exhaust air on the roof or at the rear side (A) of the switch cabinets.



A Exhaust air



B Supply air



Exact dimensions

For exact dimensions, please refer to the Installation Requirements of the relevant device. The Installation Requirements are available at www.SMA.de/en.

4.4 Transport Options

The inverter consists of two switch cabinet units, the DC / inverter cabinet and the AC cabinet, which are separately transported and assembled together on site.

The inverters and switch cabinet units are delivered on pallets. A fork lift or a hoist is used to transport the device to its final mounting location.

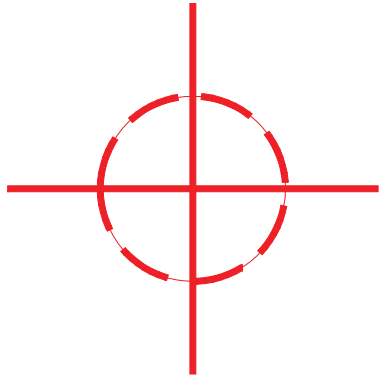


WARNING!

Heavy weight of the switch cabinet units!

Danger of tipping during transport!

- The cabinet units must always be transported in an upright position.
- When unloading, the heavy-load markings must be given due consideration.
 - The center of gravity of the Sunny Central is marked on the outside of the packaging and on the switch cabinet units.
 - The labeling on the switch cabinet units can be removed residue-free following installation.



NOTICE!

Missing base panels could damage the Sunny Central.

- The base panels are essential for stable positioning of the switch cabinet.
- In the case of transport on a pallet, it is necessary to install the base panels. Otherwise there is the danger that the base will collapse under the weight of the switch cabinet.

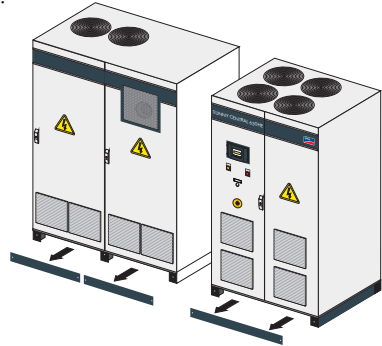


Remove side base panels for cable routing

In the final installation location, one of the side base panels can be removed for cable routing. The stability of the switch cabinet is still guaranteed.

4.4.1 Transport Using a Pallet Truck or Forklift

1. Unscrew the base panels on the front and back base.
2. The two screws per base panel can be unscrewed using a Torx TX30 screwdriver.



3. Insert the fork of a pallet truck or forklift under the cabinet.



4.4.2 Transport Using a Crane

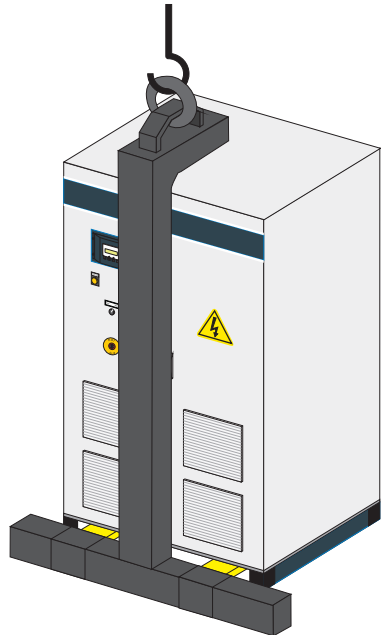
**NOTICE!**

Inappropriate transport could cause damage to the Sunny Central.

In case of transport using a crane, the following points have to be observed:

- Asymmetric weight distribution
- Heavy duty
- The weight of the switch cabinet units is mainly distributed to the rear of the cabinet.

1. Unscrew the base panels on the front and back; see 4.4.1 "Transport Using a Pallet Truck or Forklift" (page 32).
2. Insert the fork of a crane under the cabinet.

**Transport using crane eyelets.**

The heavy weight of the individual switch cabinet units means that transport using crane eyelets is not permitted. A suitable crane fork should be used instead.

4.5 On-Site Inverter Installation

After both switch cabinet units have been installed next to each other, the transport locks of the sinusoidal filter have to be removed, the seals have to be inserted and the individual cabinets have to be mechanically and electrically connected for the final mounting in the operating room. All necessary materials required for connecting the switch cabinets are included in the delivery.

4.5.1 Mechanical Coupling

**NOTICE!****Moisture ingress due to lack of sealing!**

- Before the two cabinets can be mechanically joined together, the seals provided must be glued into the appropriate recesses in the cabinets, if this has not already been done by default.

The mechanical connection of the two cabinets is done using baying clamps. They consist of terminal clamps and brackets with which the cabinets can be screwed together in several places. In order to do this, both cabinets have to be at the same level.

**NOTICE!****Damage due to impurities!**

- Do not carry out any machining work on or in the inverter.
- Remove impurities from the Sunny Central.
- Seal openings.

**Observe the installation guide of the switch cabinet manufacturer.**

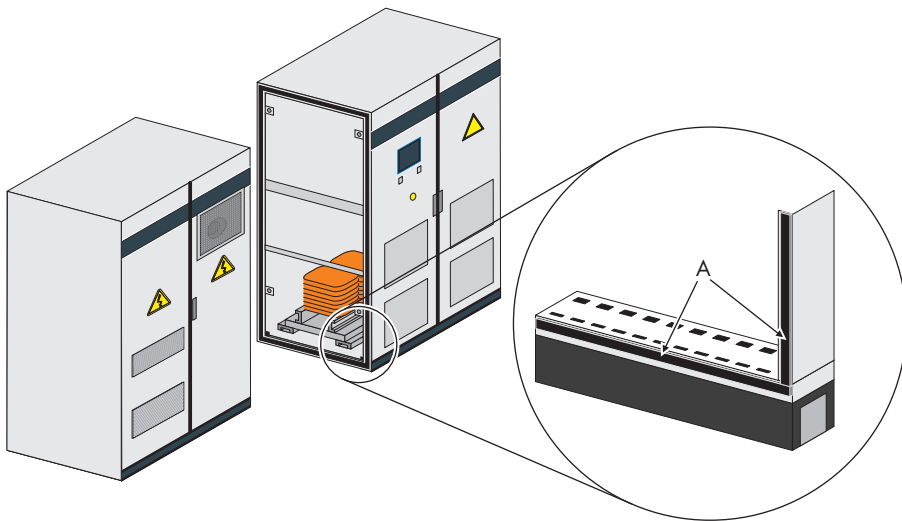
The installation of the seals and baying clamps is described in the installation guide from the Rittal company annexed to this document.

4.5.2 Mechanical Coupling for the "Chemically Active" Option

If you are using a Sunny Central with the "Protection against chemically active substances" option, the switch cabinets must be connected to one another as described below.

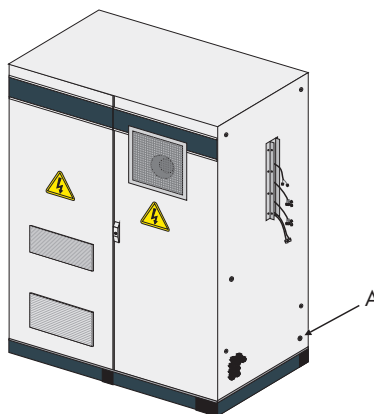
Mounting the Switch Cabinet Units

1. Attach the included sealing material all around the cabinet frame (A) of the AC cabinet.



2. Position the switch cabinet units near the installation location.
3. During mounting, insert the PE cable through the cable gland (A).
4. Set up the switch cabinet units in the installation location.
5. Connect the PE cable, see 5.2 "Connecting the Internal PE Connection" (page 42).

☒ The switch cabinet units are mounted and can now be screwed together.

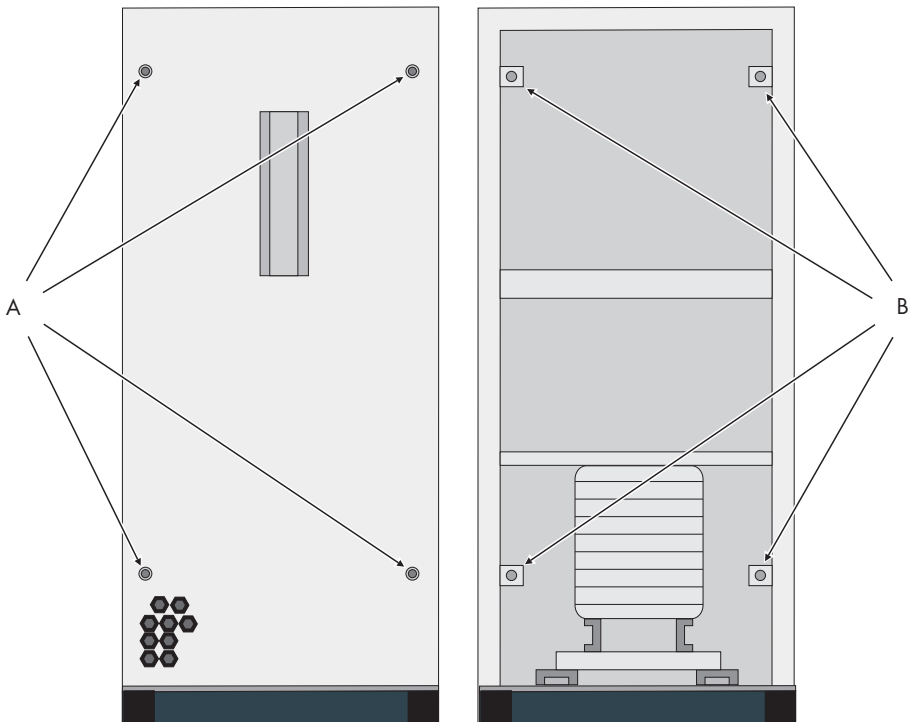


Screwing the Switch Cabinet Units Together

6. Open the AC cabinet.
 7. Connect the switch cabinet units at positions A and B with the provided bolts (M8x45 mm), washers, and brackets. Torque: 21 Nm.
 8. The switch cabinet units are screwed together in the AC cabinet.
- ☒ The switch cabinet units are connected to each other.

DC/inverter cabinet side view

AC cabinet side view



4.5.3 Anchorage to the Ground or Wall

The weight of the Sunny Centrals is heavy, and for this reason additional anchorage to the ground or wall is not necessary.



Anchorage in an MV station

Sunny Centrals that are housed and transported within an MV station are anchored to the wall and floor of the station so that they do not slide and become damaged during transport.

5 Internal Electrical Connections

Once both switch cabinet units have been installed alongside each other and are mechanically connected, the individual cabinets must be electrically joined together.



Realizing the electrical connection

The circuit diagram provided must be used for establishing the electrical connections and connectors.

To prepare the inverter for the external AC and DC connections, all internal connections must be installed first.

For internal electrical connection of the two cabinets, the following connections must be established:

- Power cable connection between the sinusoidal filter and power unit
- Grounding connection between AC cabinet and DC / inverter cabinet
- Control cables on the transfer terminal strip
- Communication between the Sunny Central Control and the power unit in the inverter cabinet
- Communication between the Sunny Central Control and the insulation monitoring system



Installing the internal connections

For the most part, the internal connections are pre-assembled and must be plugged or screwed in when joining the cabinets together.

5.1 Connecting the Power Cable Connection

The power cable connection of the power units in the inverter cabinet to the sinusoidal filter choke in the AC cabinet is to be carried out using the delivered Radox cables (W131 to W139).



Observe the cable length

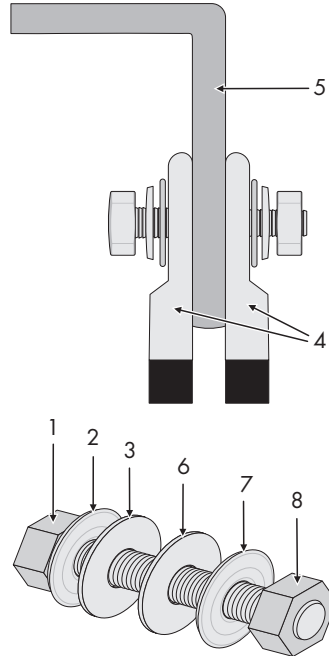
The Radox cables included in the delivery have different lengths for left-hand and right-hand systems. Arrange the cables according to the circuit diagram of the respective Sunny Central.

According to the circuit diagram included in the delivery, one power unit per phase is connected to the sinusoidal filter choke, each measuring $3 \times 1 \times 185 \text{ mm}^2$. The corresponding terminal screws are located on the connection points.

**NOTICE!****Operational reduction of the Sunny Central due to faulty connection!**

The following connection sequence must be observed when connecting the power cables to the sinusoidal filter choke:

1. Screw
2. Spring washer
3. Washer
4. Terminal lug
 - Only in the case of a middle power cable; this will be installed on the rear-side of the connection point.
5. Connection point sinusoidal filter or power module
 - Terminal lug
 - Only in the case of the two exterior power cables; these will be installed on the front-side of the connection point.
6. Washer
7. Spring washer
8. Nut



Procedure for power cabling:

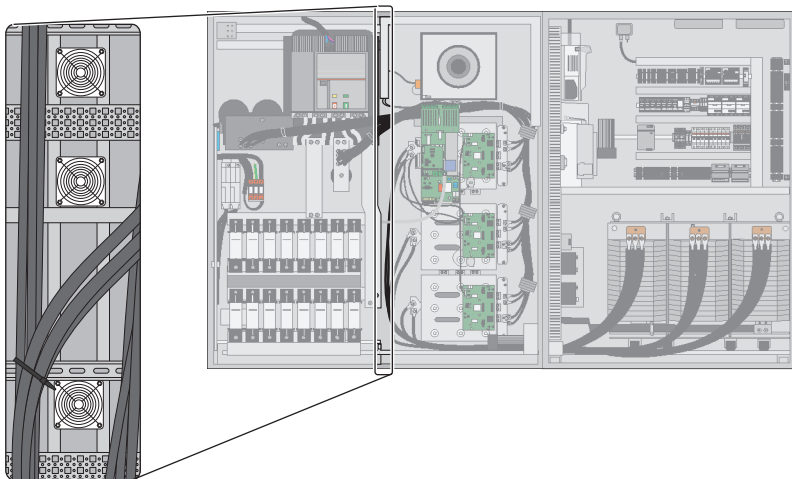
1. First connect the lower power unit followed by the middle unit and then the upper unit.

**NOTICE!**

Warming of the Sunny Central due to cable routing near the internal fans.

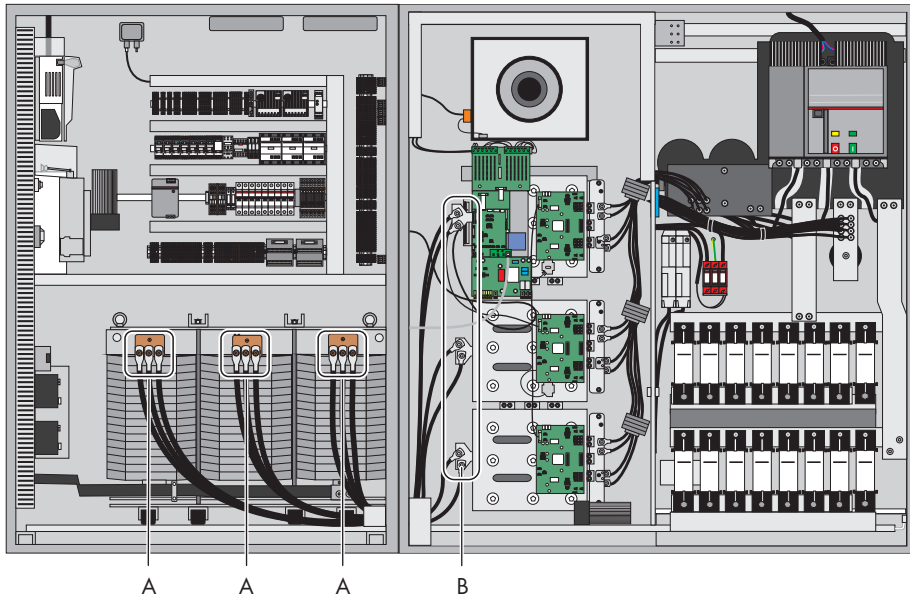
- In the left cabinet system, lay the power cables to the left and right of the three internal fans in order to avoid affecting their function.

2. Affix the 3 power cables of the respective external conductor to the stabilizer bars using cable ties.



3. Feed the power cables through the opening in the side wall above the cabinet plate and feed back in at the area of the AC cabinet.
4. Use cable ties to bind the power cables to the plates of the switch cabinet.
5. Connect the 3 power cables of the respective external conductor to the sine-wave filter.

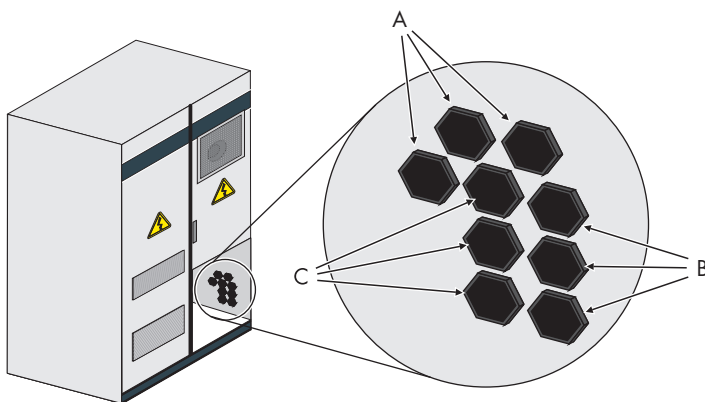
The following figure shows the terminal lugs at the three power units in the inverter cabinet and the connection of the power cables to the sinusoidal filter in the AC cabinet of the Sunny Central.



- A Terminal lugs of the sinusoidal filter choke
- B Terminal lugs of the power unit

5.1.1 Connecting the Power Cable for the "Chemically Active" Option

The power cables are included in the scope of delivery and must be connected to the power units in the inverter cabinet and to the sinusoidal filter choke in the AC cabinet. Three cables are connected per phase. The cable routing in the right and left system is different. The following figure shows the position of the glands in the left system; the position of the glands in the right system are mirror-inverted.



Connecting the Power Cables in the Left System

1. Connect L3 at the lower power module in the inverter cabinet.
2. Insert L3 through the cable gland A.
3. Connect L3 at the sinusoidal filter in the AC cabinet according to the label,
4. Tighten the cable gland A.
5. Connect L1 at the middle power module in the inverter cabinet.
6. Insert L1 through the cable gland B.
7. Connect L1 at the sinusoidal filter in the AC cabinet according to the label.
8. Tighten the cable gland B.
9. Connect L2 at the upper power module in the inverter cabinet.
10. Insert L2 through the cable gland C.
11. Connect L2 at the sinusoidal filter in the AC cabinet according to the label.
12. Tighten the cable gland C.

Connecting the Power Cables in the Right System

1. Connect L1 at the lower power module in the inverter cabinet.
2. Insert L1 through the cable gland A.
3. Connect L1 at the sinusoidal filter in the AC cabinet according to the label.
4. Tighten the cable gland A.
5. Connect L3 at the middle power module in the inverter cabinet.
6. Insert L3 through the cable gland B.
7. Connect L3 at the sinusoidal filter in the AC cabinet according to the label.
8. Tighten the cable gland B.
9. Connect L2 at the upper power module in the inverter cabinet.
10. Insert L2 through the cable gland C.
11. Connect L2 at the sinusoidal filter in the AC cabinet according to the label.
12. Tighten the cable gland C.



Laying cables

The power cables must be bundled in the inverter cabinet by using cable ties. This prevents the cables from being damaged by pointed or sharp metal edges.

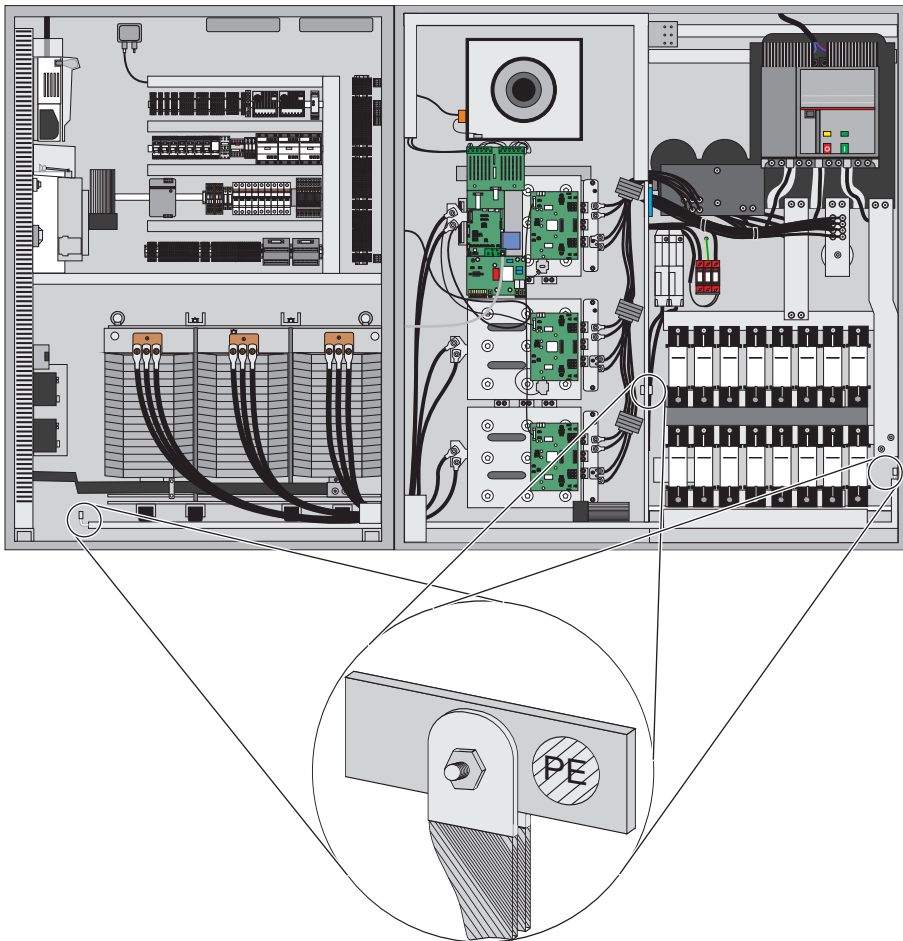
- ☒ The power cables are connected.

5.2 Connecting the Internal PE Connection

The individual switch cabinets are equipped with PE rails that must be connected together at the time of installation. A pre-assembled PE cable can be found in the AC cabinet. The PE rails are located at the bottom of the AC cabinet, behind the sinusoidal filter choke. A PE rail is located in the DC / inverter cabinet at the bottom of the exterior wall of the DC cabinet, and an additional rail can be found in the connecting point between the DC and inverter switch cabinet units.

1. Feed the cable behind the sinusoidal filter choke in the AC cabinet and the power units in the inverter cabinet into the DC cabinet.
2. Connect the cable to the PE rail in the DC cabinet.

Example PE connection between the switch cabinets of the Sunny Central

**Check the grounding connection**

When connecting the grounding connection, make sure that the screws are securely positioned.

**Position of the PE rail**

Due to the design, the exact position of the PE rail is next to the fuse strip in the DC cabinet and behind the sinusoidal filter in the AC cabinet. The exact position of the PE rail can be determined with the help of the equipment identifier and the provided circuit diagram.

5.3 Connecting the Control Cables on the Transfer Terminal Strip

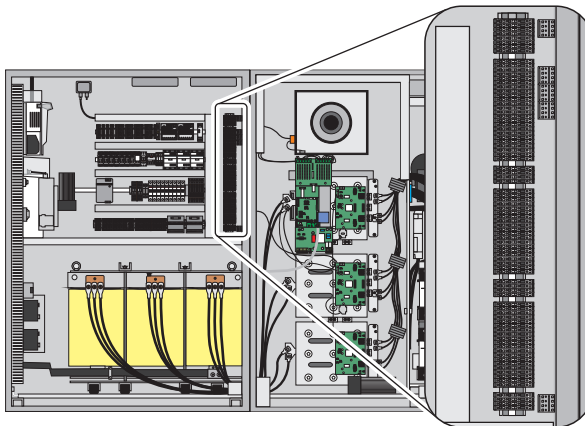


Check the cabling

When connecting the control lines, the correct sequence and the appropriate colors of the insulated conductors have to be observed. The plugs are sequentially numbered.

Most control cables that have to be connected between the switch cabinets are connected to the transfer terminal strips via plugs. The transfer terminal strip is located in the AC cabinet on the mounting plate that is oriented toward the inverter cabinet. The cable bundles to be plugged in are labeled with their destination.

Example transfer terminal strip between the switch cabinets of the Sunny Central



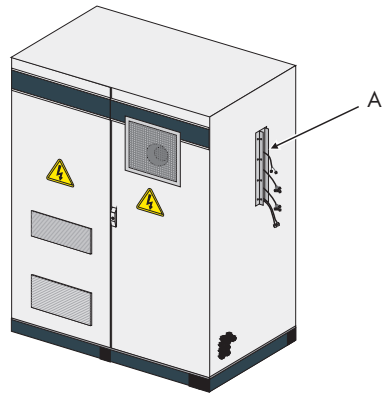
Position of the transfer terminal strips

The exact position of the transfer terminal strips can be determined with the help of the equipment identifier and the provided circuit diagram.

5.3.1 Connecting the Control Cables to the Transfer Terminal Strip in the AC Cabinet

The control cables (A) are routed to the outside of the DC / inverter cabinet during factory production.

1. Insert the control cables into the sockets in the AC cabinet as described in 5.3 "Connecting the Control Cables on the Transfer Terminal Strip" (page 44).
Make sure the plugs are not swapped.
- ☒ The control cables are connected.



5.4 Connecting the Sunny Central Control to the Power Unit



Notice!

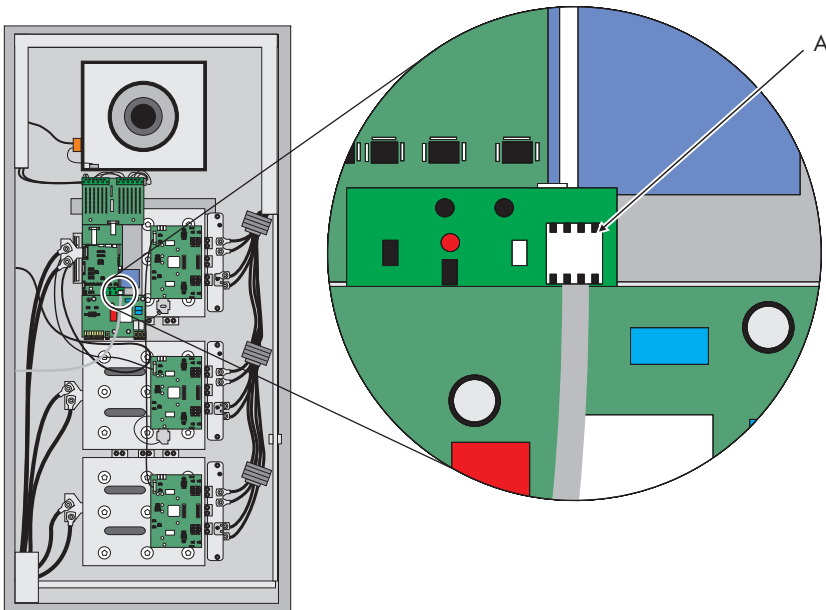
Faulty installation could damage the cabling

- Do not lay the cables in the cable channel or parallel to the power cables (EMC).
- Place the cables freely in the switch cabinet.
- Connect the plug-in contact carefully to the board.

Connect the data line of the Sunny Central Control to the controller board at the power unit. The cable possesses a 4-pole white plug that is to be plugged into the controller board. The ADAPBFS (control board) and controller board are located in the inverter cabinet on the topmost power unit.

The controller board communicates with the ADAPBFS board via a ribbon cable. The slot for the plug of the data line is located on the right side of the board directly at the communication interface (Piggy-Back).

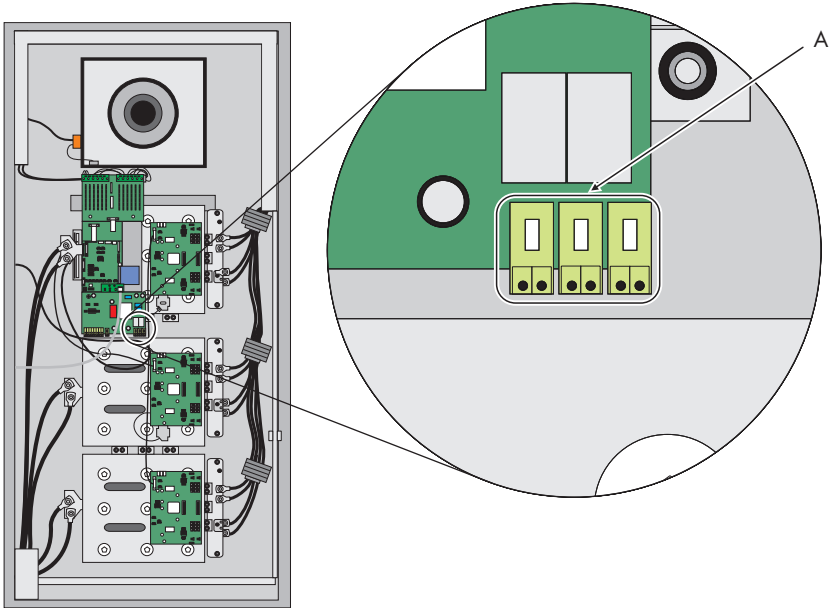
Connection terminal (A) for the data cable in the Sunny Central



5.5 Connecting the Internal Control Cables of the Power Unit

The control cable coming from the AC cabinet is already plugged in upon delivery. Plug in the X31/32 control cable via the terminal strip.

Connection (A) of the internal control cable for the Sunny Central



Connecting the control cable

Adhere to the circuit diagram included in the delivery when connecting the internal control cable.

5.6 Connecting the Communication Unit for Insulation Monitoring



Insulation monitors from Bender

An insulation monitoring device from Bender can optionally be built into the Sunny Central. A user manual is included with the device.



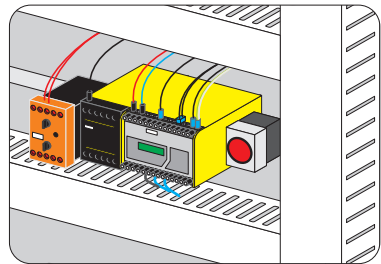
Notice!

A faulty installation could damage the cabling.

- Lay the connection cables in the cable channel.

The insulation monitoring system is located in the DC cabinet. A 2-conductor data cable connects the Sunny Central Control to the insulation monitoring system and is delivered pre-cabled. The connection is made via the transfer terminal strip.

Insulation monitor with connected data cable in the Sunny Central.



Position of the connection terminal of the insulation monitoring

The exact position of the connection terminals of the insulation monitoring can be determined with the help of the equipment identifier and the circuit diagram included in the delivery.

6 External Connections

The following connections have to be made in order to connect the Sunny Central externally:

- AC grid connection
- PE rail connection
- AC control voltage
- DC connection
- External messages and signals
- Sensors and digital outputs
- Communication connector
- Emergency stop cabling
- Lightning and overvoltage protection



Installing the external connections

Adhere to the circuit diagram included in the delivery when realizing external connections.



Dimensioning the connections

The implementation of the AC grid connection point as well as the maximum inverter-specific connection cross-section and terminal lugs are included in the Installation Requirements of the relevant Sunny Central.

6.1 Connecting High-Current Contacts

The terminals in the DC and AC areas of the Sunny Central are made of copper, so there are no special requirements for the connection of copper cables. No special measures are required to connect the DC cable to the cage clamps. The connection of aluminum terminal lugs to the copper bars of the AC connection or to the fuse holders of LV / HRC 3 fuses in the DC connection area requires the use of copper-clad aluminum washers. The copper-clad aluminum washers neutralize the contact resistance between the aluminum terminal lugs and the copper bars. See below for installation of the copper-clad aluminum washers.



Keeping the contacts clean

Sweat and fatty acids from the fingers must not be transferred to the contacts. Use clean gloves to connect the power cabling.

1. Remove any grease from the contacts with a clean cloth and ethanol cleaning solution. Clean only the contacts used.
2. Clean the contacts with a cleaning felt. The contacts are clean if they have a slight metallic shine.



Using different cleaning cloths

The cleaning felt can only be used for one type of material. Never use a felt for aluminum if it has been used on copper. Store and select the cleaning felt and cloth in a way that ensures they cannot be mixed up, e.g. by using different colored cloths.

Tin-plated copper is to be treated like copper and tin-plated aluminum like aluminum.

3. Cleaning creates metal dust. Remove this with a clean cloth and ethanol cleaning solution.



Removing metal dust

Do not remove metal dust with the compressed air gun.

4. Clean copper-clad aluminum washers. Even when cleaning the copper-clad aluminum washers, copper and aluminum must be strictly kept separate. Only touch the edges of the washers.
5. Insert the copper-clad aluminum washer between the copper and aluminum. For rails, adjust this copper-clad aluminum washer to the dimensions of the contact areas.
6. Observe the connection sequences and secure the terminal lug.

Connection Sequence for DC Connection

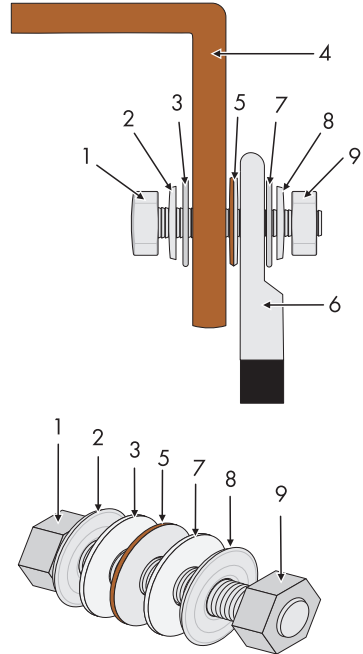


NOTICE!

Operational reduction of the Sunny Central due to faulty connection!

When connecting the power cables, the following connection sequence must be observed:

1. Screw
2. Spring washer
3. Washer
4. Connection point for copper bar
5. Copper-clad aluminum washer
 - when using aluminum cables
6. Aluminum terminal lug
7. Washer
8. Spring washer
9. Nut



Connection Sequence for AC Connection

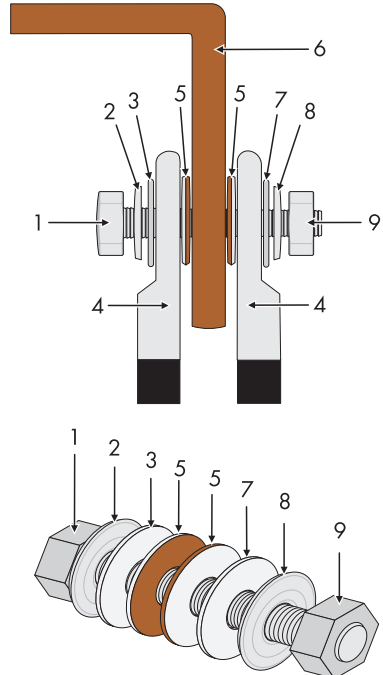


NOTICE!

Operational reduction of the Sunny Central due to faulty connection!

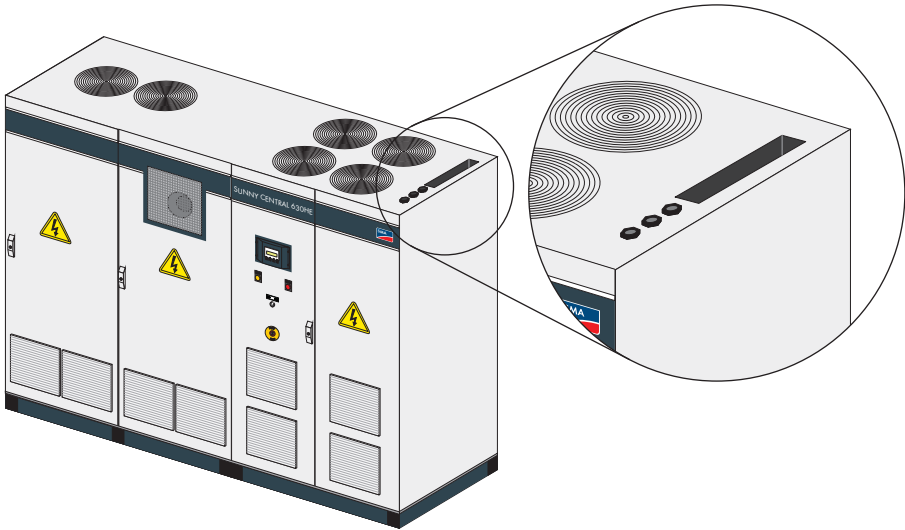
When connecting the power cables, the following connection sequence must be observed:

1. Screw
2. Spring washer
3. Washer
4. Terminal lug
5. Copper-clad aluminum washer
6. Connection point for copper bar
 - Copper-clad aluminum washer, if required
 - Terminal lug, if required
7. Washer
8. Spring washer
9. Nut



6.2 Connecting the AC Grid

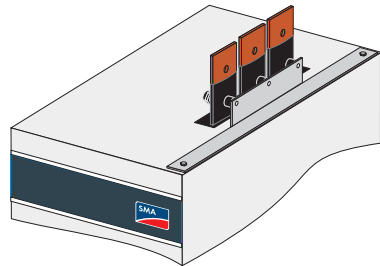
The AC connection is made on the copper bars located on the outside on top of the Sunny Central roof.



The connection can be made in five different manners:

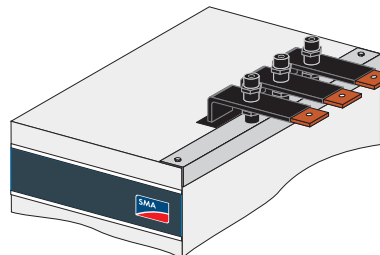
Model 13/0

In this case, the connection is made to three straight copper bars.



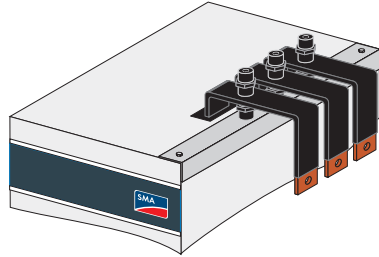
Model 13/1

In this case, the connection is made to three L-shaped copper bars.



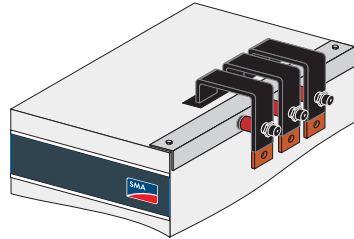
Model 13/2

In this case, the connection is made to three U-shaped copper bars.

**Model 13/3**

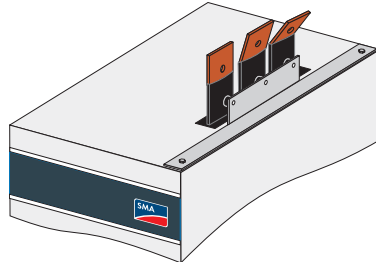
In this case, the connection is made to three U-shaped copper bars.

The particularity of this connection is the so-called side outlet; here the AC cabling is fed downward directly along the side of the Sunny Central.

**Model 13/4**

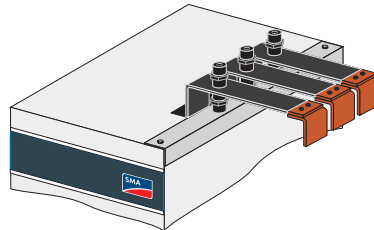
In this case, the connection is made to three copper bars, each of which is angled differently. Seen from the front, the first will not be angled, and the second and third will be angled at 15 ° and 30 °, respectively.

These models are only offered for left-handed switch cabinets.

**Model 13/5**

In this case, the connection is made to three U-shaped copper bars.

The particularity of of this connection is the separated copper bars.

**Diverse installation models**

Depending on the specific model, the different copper bars or insulators as well as other add-on parts included in the accessories must be installed.

**Damaged insulators**

If an insulator becomes damaged, it must be replaced with an insulator of the same type or model.

**Observe the internal power supply connection**

If the Sunny Central power supply is picked up internally at the AC connection, the internal power supply must be connected prior to the installation of the AC copper bars (see 6.5.2 "Connecting the Internal Power Supply" (page 74)).

6.2.1 Mounting and Dismounting the Plexiglas Cover and Sliding Plate

Regardless of the type of AC grid connection, the Plexiglas cover over the fuse load disconnection unit and the sliding plate in the roof of the Sunny Central must be removed in order to install the relevant copper bars. These components are put back on once the copper bars have been installed. Instructions for mounting and dismounting these parts are provided in this chapter.

**WARNING!**

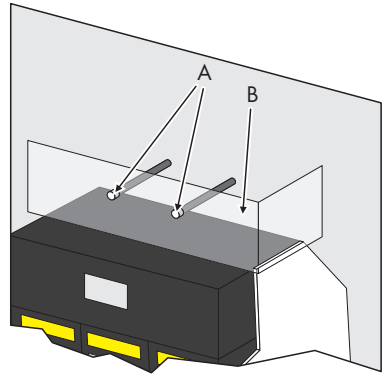
Risk of death due to burns and electric shock when live parts are touched!

- Do not touch the live components of the Sunny Central, the power distribution grid or the low-voltage grid.
- All safety precaution measures regarding the power distribution grid must be observed.
- Only work on the device when it is switched off and voltage-free.

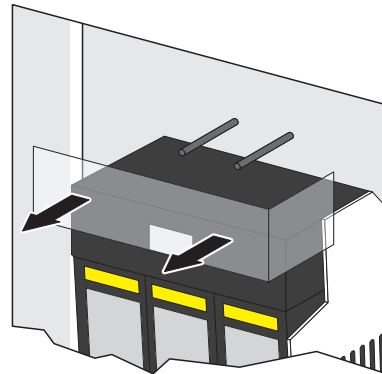
Removing and Mounting the Plexiglas Cover

The Sunny Central is delivered with a Plexiglas cover mounted above the load disconnection unit. The cover must be dismantled prior to the installation of the copper bars.

1. Unscrew the two knurled screws (A) of the Plexiglas cover (B) located above the load disconnection unit.

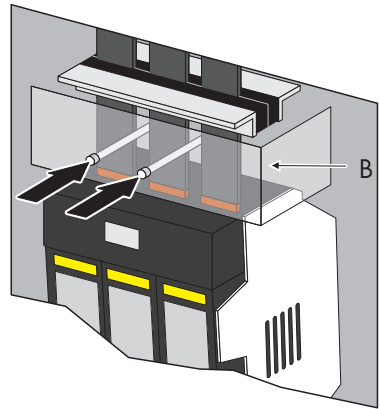


2. Remove the Plexiglas cover.



The Plexiglas cover must be put back on once the copper bars have been installed.

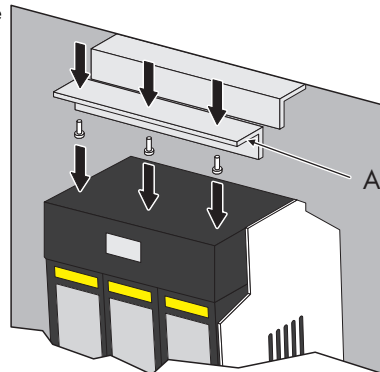
1. Mount the Plexiglas cover (B). For this purpose, tightly screw in the two knurled screws.



Mounting and Dismounting the Sliding Plate

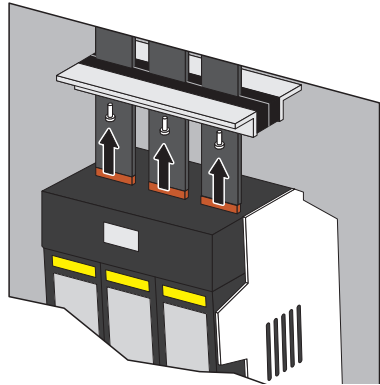
Sliding plates are included in the delivery of the Sunny Central. The front sliding plate must be dismantled prior to the installation of the copper bars.

1. Remove the front sliding plate (A) from the roof of the Sunny Central. For this purpose, remove the three screws on the underside.



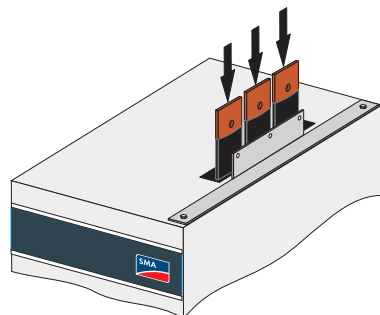
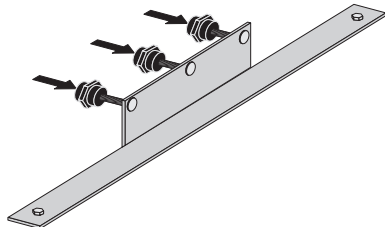
The sliding plate must be put back on once the copper bars have been installed.

1. Mount the front sliding plate into the roof of the Sunny Central. For this purpose, tightly fasten the three screws on the underside.

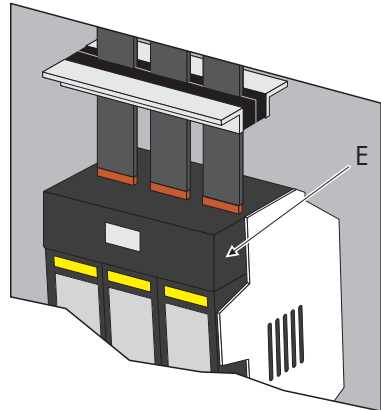


6.2.2 Procedure for Models 13/0 and 13/4

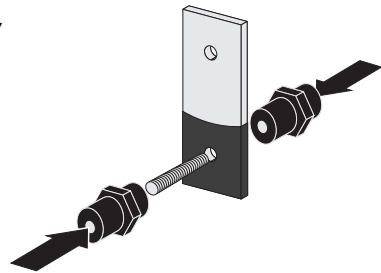
1. Remove the Plexiglas cover and sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
2. Mount the three insulators to the angle section. For this purpose, tightly fasten the three insulators to the press-fitted threaded bolts.
3. Feed the copper bars into the AC cabinet from above.



4. Connect the copper bars to the fuse load disconnection unit (E) in the AC cabinet.



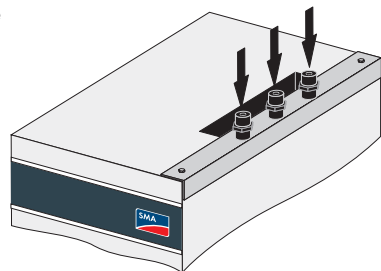
5. Mount the copper bars to the insulators. For this purpose, screw the setscrews included in the delivery into the still unused insulators and fasten them to the other insulators through the copper bars. In this manner, the two insulators function like locknuts.



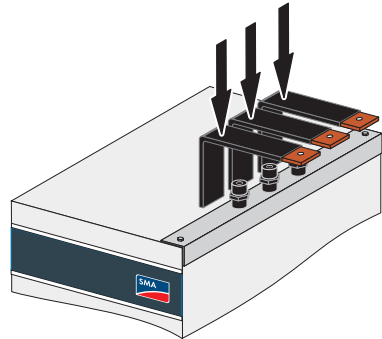
6. Mount the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
7. Connect the AC cable to the copper bars from the outside.

6.2.3 Procedure for Model 13/1

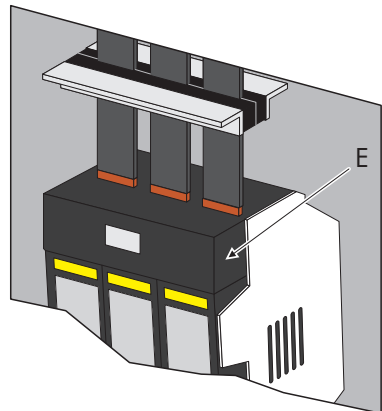
1. Remove the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
2. Mount the three insulators next to the opening in the roof of the switch cabinet for the copper bars.



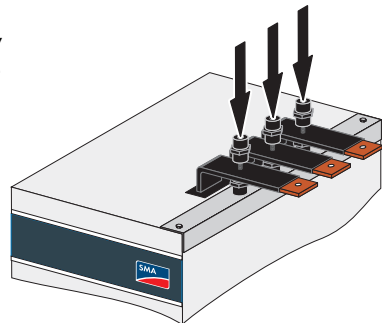
3. Feed the copper bars into the AC cabinet from above.



4. Connect the copper bars to the fuse load disconnection unit (E) in the AC cabinet.



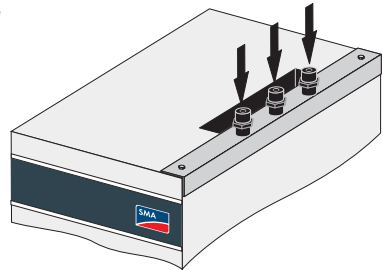
5. Mount the copper bars to the insulators. For this purpose, screw the setscrews included in the delivery into the still unused insulators and fasten them to the other insulators through the copper bar. In this manner, the two insulators function like locknuts.



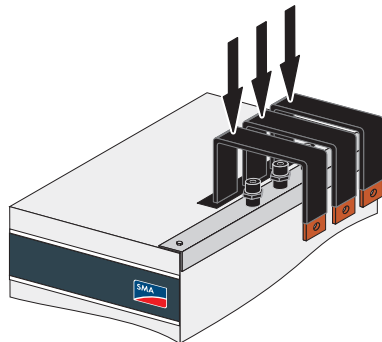
6. Mount the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
7. Connect the AC cable to the copper bars from the outside.

6.2.4 Procedure for Model 13/2

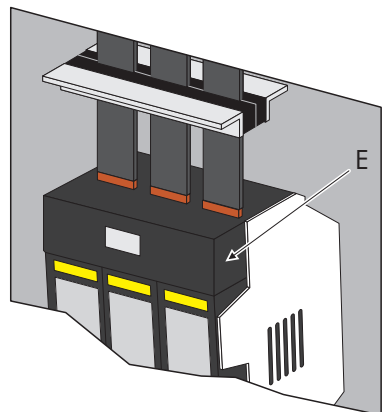
1. Remove the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
2. Mount the three insulators next to the opening in the roof of the switch cabinet for the copper bars.



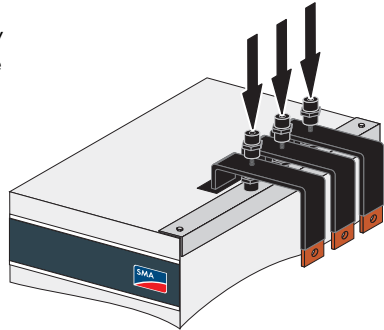
3. Feed the copper bars into the AC cabinet from above.



4. Connect the copper bars to the fuse load disconnection unit (E) in the AC cabinet.



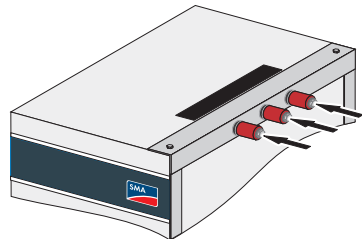
5. Mount the copper bars to the insulators. For this purpose, screw the setscrews included in the delivery into the still unused insulators and fasten them to the other insulators through the copper bars. In this manner, the two insulators function like locknuts.



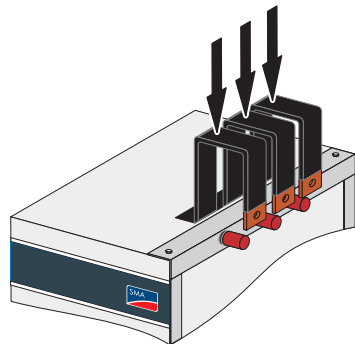
6. Mount the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
7. Connect the AC cable to the copper bars from the outside.

6.2.5 Procedure for Model 13/3

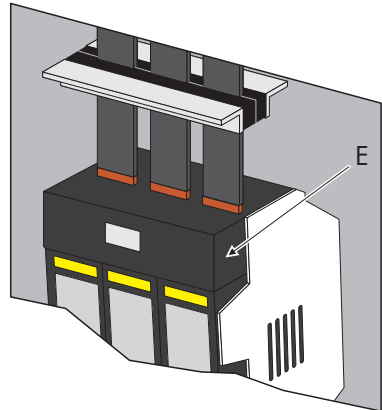
1. Remove the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
2. Mount the three supports to the angle bracket on the side wall of the Sunny Central.



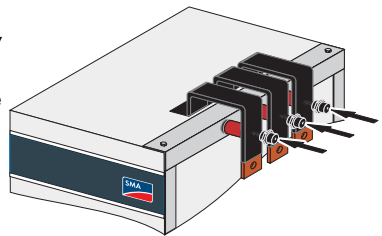
3. Feed the copper bars into the AC cabinet from above.



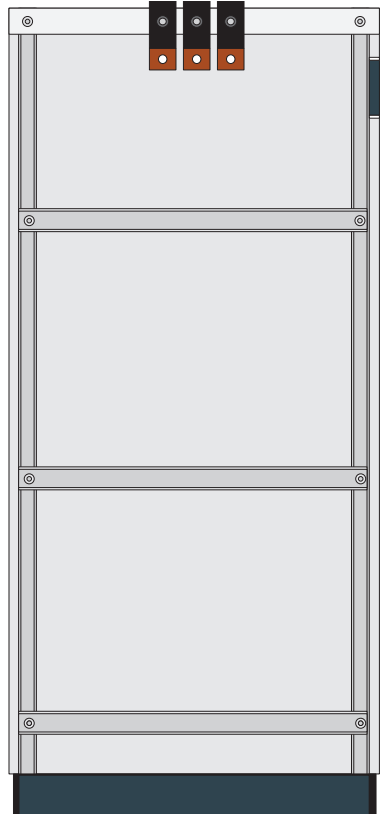
4. Connect the copper bars to the fuse load disconnection unit (E) in the AC cabinet.



5. Mount the copper bars to the insulators. For this purpose, screw the setscrews included in the delivery into the still unused insulators and fasten them to the supports through the copper bars. In this manner, the two insulators function like locknuts.



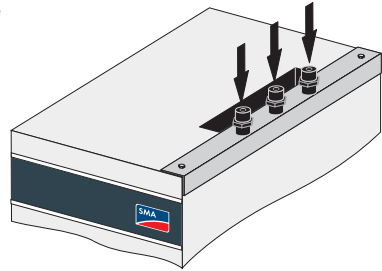
6. Mount the cable rails to the pre-assembled rails on the side wall of the Sunny Central. Use the sliding nuts included in the delivery for this. These are located in the middle of the rails on the side wall of the Sunny Central.



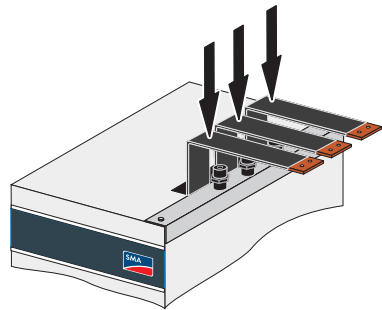
7. Mount the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
8. Connect the AC cable to the copper bars from the outside. Feed the cables down the rails located on the side of the Sunny Central and fasten them with cable clips and opposite sleeves.

6.2.6 Procedure for Model 13/5

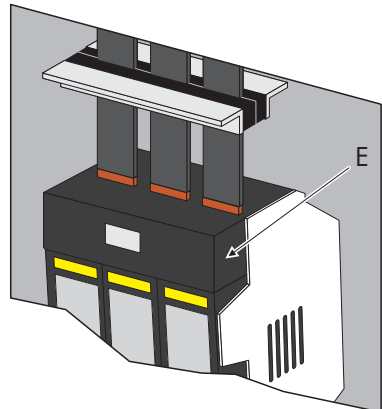
1. Remove the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
2. Mount the three insulators next to the opening in the roof of the switch cabinet for the copper bars.



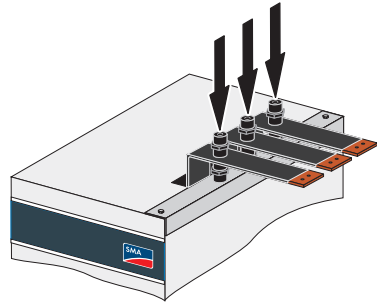
3. Feed the copper bars into the AC cabinet from above.



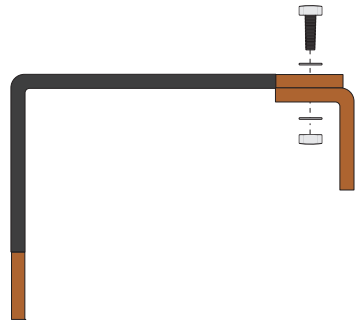
4. Connect the copper bars to the fuse load disconnection unit (E) in the AC cabinet.



5. Mount the copper bars to the insulators. For this purpose, screw the setscrews included in the delivery into the still unused insulators and fasten them to the other insulators through the copper bars. In this manner, the two insulators function like locknuts.



6. Screw the second part of the copper bar to the part that is already mounted. Use the screw connections included in the delivery for this.



7. Mount the Plexiglas cover and front sliding plate, see 6.2.1 "Mounting and Dismounting the Plexiglas Cover and Sliding Plate" (page 55).
8. Connect the AC cable to the copper bars from the outside.

6.2.7 Connecting the AC Cable



Selection of the medium-voltage transformer.

The Sunny Centrals of the HE series are inverters without a low-voltage transformer. Special transformers are required for connecting the Sunny Central to the medium-voltage grid. Connecting several Sunny Central inverters in parallel at one transformer coil is not permitted. If requested, SMA Solar Technology offers support in specifying and selecting a suitable medium-voltage transformer.

The connection must be 3-phase with the following operating voltages:

- U, nominal voltage between the external conductors
 - for SC 400HE-11 = 270 V
 - for SC 500HE-11 = 270 V
 - for SC 630HE-11 = 315 V
- U₀, nominal voltage between external conductor and ground: 1 350 V (depending on the current operating point of the device)



NOTICE!

High voltages in the grid.

Damage to the Sunny Central through faulty AC connection.

Due to the typology of the grid nominal voltages of up to 1 350 V are present between the external conductor and ground. Pay attention to the dimensioning of the AC cables to be connected.

- When choosing the AC cables, take into account the increased demands on the nominal voltage V₀ against grounding.
- Dimension the AC cables with a voltage resistance of at least 1 350 V.
- Lay the AC cables ground- and short-circuit proof.
- Only use aluminum cable clips for the cable inlet of the AC connection.

The connection of one fuse load disconnection unit in the AC cabinet of the inverter to the low-voltage winding of a medium-voltage transformer is 3-phase.

AC power supply line for IT grid on the copper bars on the outside of the AC cabinet of the Sunny Central.



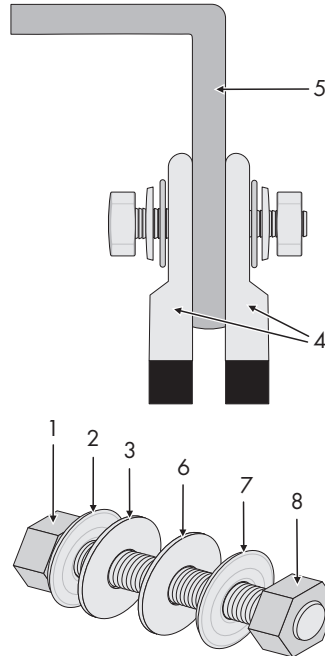
Connection of aluminum terminal lug

If aluminum terminal lugs are used for connection to the copper bar, refer to notes in chapter 6.1 "Connecting High-Current Contacts" (page 50).

**NOTICE!****Operational reduction of the Sunny Central due to faulty connection!**

The following connection sequence must be observed when connecting the power cables:

1. Screw
2. Spring washer
3. Washer
4. Terminal lug
5. Connection point for copper bar
 - Terminal lug, if required
6. Washer
7. Spring washer
8. Nut



The AC grid connection cable is dimensioned on site and fed into the Sunny Central. Any mounting brackets, cable clips or other equipment must be provided by the customer.

**Cable clamp**

An appropriate clamp is required for the AC cables in the operating room. This must be provided by the customer.

For the model 13/3, the AC grid connection cable is fed directly downward on the side wall of the Sunny Central. A device has been pre-assembled on the Sunny Central for this purpose.

6.3 AC Grid Connection for MV Stations



WARNING!

Risk of death due to burns and electric shock when live parts of the power distribution grid are touched!

- Do not touch the live components of the Sunny Central, the power distribution grid or the low-voltage grid.
- All safety precaution measures regarding the power distribution grid must be observed.
- Only work on the device when it is switched off and voltage-free.

The connection concept for two Sunny Central HE inverters is factory provided in the Sunny Central MV station. In the MV station, the AC grid connection is made 3-phase to the high-voltage winding of a 3-phase current-rectifying medium-voltage transformer. Connection is made using externally conical plugs to be made on-site.

Earths and Short-Circuits of the High-Voltage Side of the Medium-Voltage Transformer

- Grounding and short-circuiting of the medium-voltage transformer high-voltage side is made in the customer side upstream medium-voltage switching station.
- The grounding and short-circuiting of the medium-voltage transformer undervoltage side occurs on the Sunny Central at the AC fuse load disconnection unit. For this purpose, a respective grounding and short-circuiting device can be delivered upon request.
- The set is connected to the grounding cable, then set into the fuse load disconnection unit and closed.
- The grounding cable is located in the labeled cable channel of the AC cabinet.



Optional grounding and short-circuiting device

A grounding and short-circuit device can be ordered as an optional accessory.

6.4 Connecting the PE Rail

**WARNING!**

Risk of death due to burns and electric shock when live parts are touched!

- Do not touch the live components of the Sunny Central, the power distribution grid or the low-voltage grid.
- Observe all applicable safety precautions.
- Only work on the device when it is switched off and voltage-free.

**Routing the grounding cable**

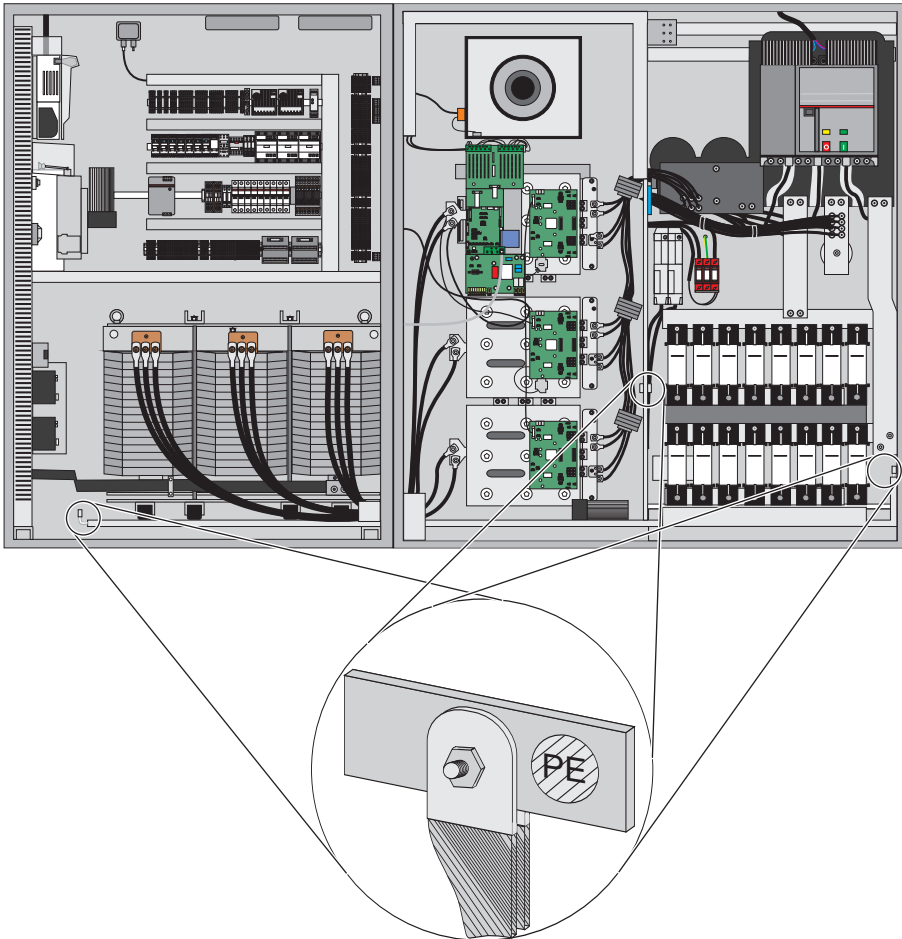
The cable is fed in together with the DC cabling through the sliding plate in the floor of the DC cabinet. For instructions on mounting and dismounting the sliding plate, see 6.6 "Connecting the DC Cable" (page 76).

Connect the equipotential bonding or ground electrode to the PE rail in the DC / inverter cabinet.

**Position of the PE rail**

The PE rail is located behind the fuse strip in the DC cabinet. The exact position of the PE rail can be determined with the help of the equipment identifier and the provided circuit diagram.

Connection point for equipotential bonding in the Sunny Central

**Cable dimensioning of the PE connection**

Provide at least 1 x 50 mm² for the PE connection to the equipotential bonding.

6.5 Connecting the Internal Power Supply

The energy required for operating the Sunny Central is either provided via an external power supply or internally, directly at the AC outlet of the Sunny Central via an internal power supply transformer. The grid connection structure for internal power supply is, as standard, a TN-S grid.

6.5.1 Connecting the External Power Supply

**The external power supply of the internal power supply is 3-phase**

It is obligatory to follow the circuit diagram provided when connecting the internal power supply!

**Cable routing of the internal power supply**

The cable is fed in together with the communication unit through the sliding plate in the floor of the AC cabinet.

**Minimum connected load**

The minimum connected load to be provided per phase is 1 500 W.

**WARNING!****Risk of death due to burns and electric shock when live parts are touched!**

- Do not touch the live components of the Sunny Central, the power distribution grid or the low-voltage grid.
- Observe all applicable safety precautions.
- Only work on the device when it is switched off and voltage-free.

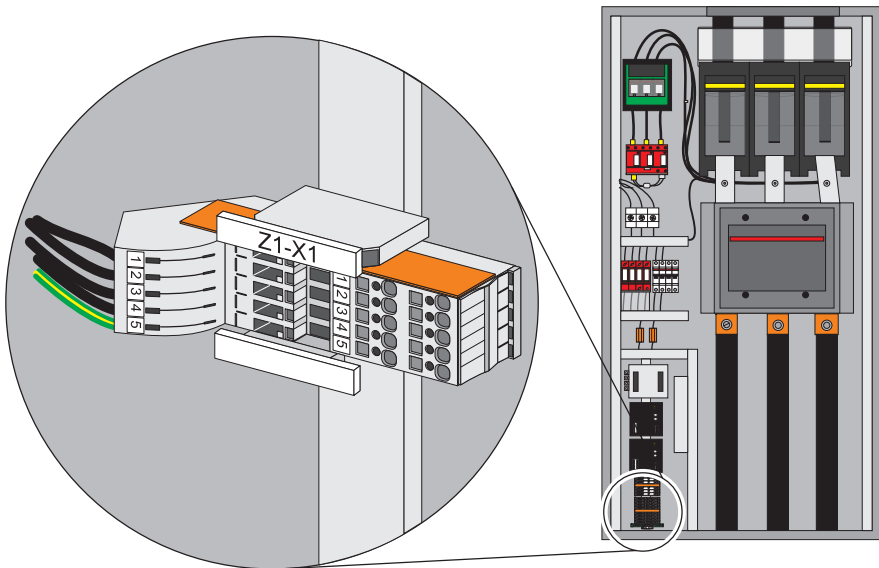
**Internal overvoltage protector**

An internal overvoltage protector is provided for in the Sunny Central for the internal power supply of the inverter.

**External automatic circuit breaker**

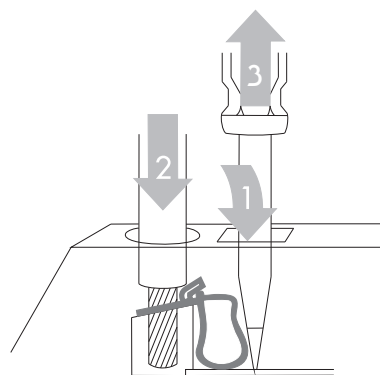
The internal power supply should be externally protected using a suitable automatic circuit breaker.

A 3-phase connection of the internal power supply is made to the control circuit terminals.



Handling the Connection Terminals for the Internal Power Supply

The following figure shows the correct method for handling the terminals used for connecting external cables to the control terminal strip of the control voltage. The connection terminals are designed as maintenance-free spring-loaded terminals that can be operated using a screwdriver of the correct size. Handling the connection terminals (source: WAGO)



6.5.2 Connecting the Internal Power Supply



Necessary components

For the internal power supply you will need an internal power supply transformer, the right cables and a suitable right screw set. You can order these components directly from SMA Solar Technology AG.



Implementing the internal power supply

It is obligatory to follow the circuit diagram contained in the delivery when connecting the internal power supply.



WARNING!

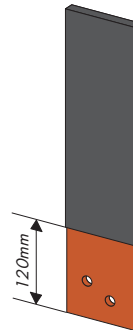
Risk of death due to burns and electric shock when live parts are touched!

- Do not touch the live components of the Sunny Central, the power distribution grid or the low-voltage grid.
- Observe all applicable safety precautions.
- Only work on the device when it is switched off and voltage-free.

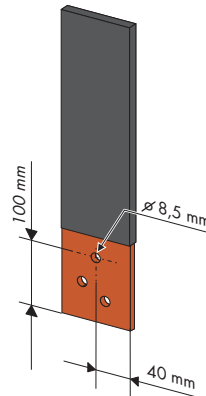
Cable routing of the internal power supply

Connect the internal power supply transformer on the primary side directly behind the fuse load disconnection unit to the copper bars which are included in delivery. Connect and prepare the copper bars as described below.

1. Strip the lower ends of the three copper bars, which are intended for the AC connection and to be fed into the load disconnection unit, to a length of 120 mm.



2. Drill a hole in the copper bar as illustrated in the figure to the right.

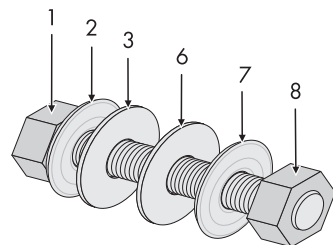
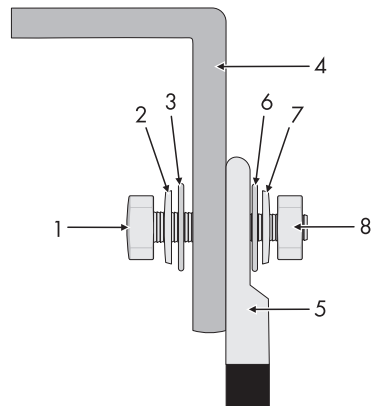


3. Use a ring terminal lug (25 mm² M8) to connect the internal power supply transformer to the copper bar.

**NOTICE!****Operational reduction of the Sunny Central due to faulty connection!**

Configuration of the components for connection
(from back to front):

1. Bolt, M8x25
2. Washer
3. Locking washer
4. Copper bar
5. Ring terminal lug
6. Washer
7. Locking washer
8. Nut

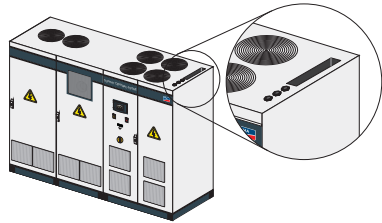




Connection of aluminum terminal lug

If aluminum terminal lugs are used for connection to the copper bar, refer to notes in chapter 6.1 "Connecting High-Current Contacts" (page 50).

9. Feed the cables through the cable glands in the roof of the AC cabinet to the internal power supply transformer.
10. The power supply is fed from the secondary side of the internal power supply transformer to the terminals in the Sunny Central, see 6.5.1 "Connecting the External Power Supply" (page 72).



6.6 Connecting the DC Cable

Optional low-voltage HRC fuses are located in the DC cabinet of the Sunny Central, allowing the connection of string distribution boxes. All Sunny Central inverters are equipped as standard with one busbar per potential.



DANGER!

Death or serious injuries. Risk of electric shock when touching the DC cable attached to the PV generator.

- Cover the PV modules.
- Follow all safety instructions of the module manufacturer.
- Disconnect the Sunny Central.



NOTICE!

Damage to the Sunny Central or the PV generator due to faulty DC cabling

- When connecting the DC cables, it is obligatory to follow the circuit diagram provided.



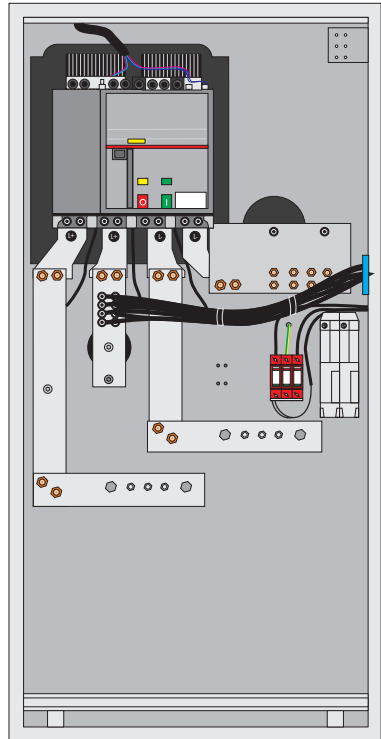
NOTICE!

Weak voltage resistance or poor sealing could impair operational capacity.

- Ensure that the DC cables are appropriately voltage-resistant!
- Lay the DC cables so that they are ground- and short-circuit-proof.
- All cable inlets must be sealed airtight with respect to the local environment. This prevents cooling air from being sucked into the system bypassing the inlet filters.

6.6.1 Connecting the DC Cable to the Busbar

The cables are fed through the base and floor of the DC cabinet. The DC cables can be connected to 3 connection points with the DC busbar. In total, 6 cables each with 300 mm² per potential can be connected to the busbars.



Mounting material for the connection

The mounting material is installed to the bar in the factory. A M12 ring terminal lug is used for the connection to the bar and must be provided for by the customer.



Connecting the terminal lugs to the DC busbar

Do not connect the terminal lugs one on top of the other, rather connect them to the DC busbar from the front and back.

1. Remove the narrow sliding plate located in the rear part of the DC cabinet.
2. Attach the sealing tape to the rear frame of the base.
3. Pull the DC cables into the interior of the switch cabinet and cut them to length up to the busbars.
4. For strain relief, use cable clips to fasten the cables to the cable rail.
5. Attach the sealing tape to the front side of the narrow sliding plate.
6. Insert the narrow sliding plate against the mounted DC cables.
7. If necessary, seal the free space around the cable inlet using PU foam.



Connection of aluminum terminal lug

If aluminum terminal lugs are used for connection to the copper bar, refer to notes in chapter 6.1 "Connecting High-Current Contacts" (page 50).

8. Fasten the DC cables to the busbars.

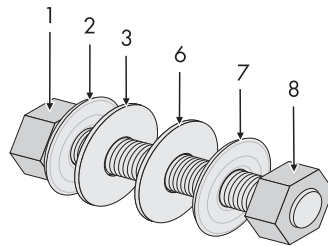
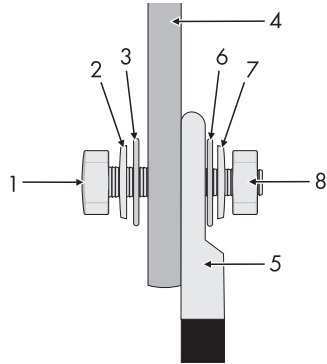


NOTICE!

Operational reduction of the Sunny Central due to faulty connection!

Configuration of the components for connection
(from back to front):

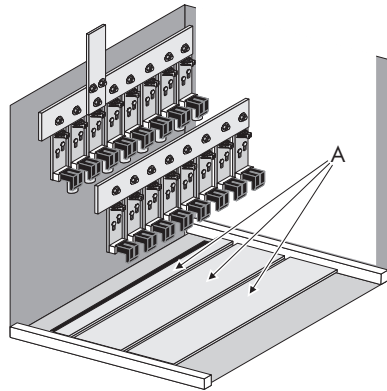
1. Screw
2. Spring washer
3. Washer
4. Terminal lug
5. Conductor rail
6. Washer
7. Spring washer
8. Nut



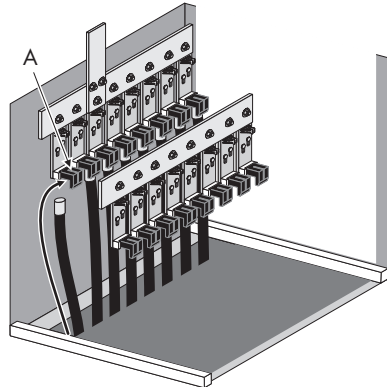
6.6.2 Connecting the DC Cable to the Low-Voltage HRC Fuses

The cables are fed through the base and floor of the DC cabinet.

1. Remove the sliding plate (A) located in the DC cabinet.
2. Attach the sealing tape to the rear frame of the base.



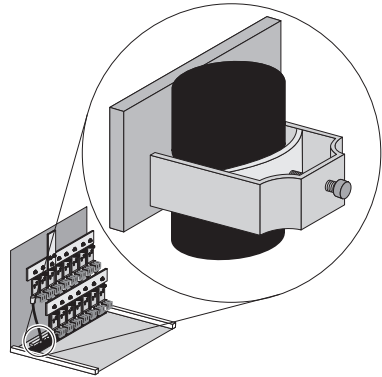
3. Pull the DC cables of the back row of fuses into the interior of the switch cabinet and cut them to length up to the fuse holders (A).



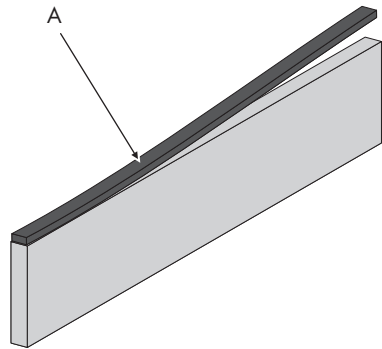
Dismounting the front fuse holder

The front fuse holders can be removed, thus making it easier to mount the DC cables to the back row of fuses.

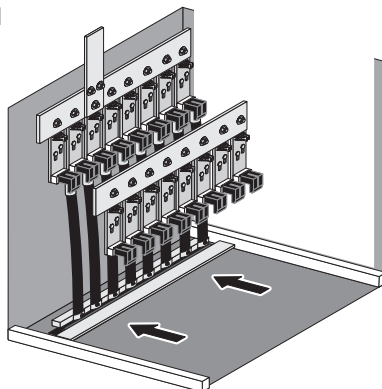
4. For strain relief, use cable clips to fasten the cables to the cable support rail.



5. Attach sealing tape (A) to the front side of the narrow sliding plate.



6. Insert the narrow sliding plate in behind the mounted DC cables.



7. Pull the DC cables of the front row of fuses into the interior of the switch cabinet and cut them to length up to the fuse holders (A).
8. For strain relief, use cable clips to fasten the cables to the cable support rail.

**NOTICE!****Improper handling can cause faulty terminal connection**

- Do **not** use any grease for the connection of the DC cables to the terminals.
- The cable endings and terminal points must be free of grease and dirt.

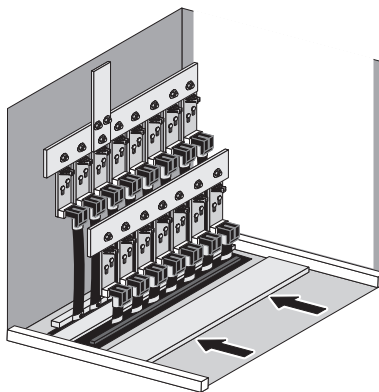
9. Connect the DC cables on the cage clamps directly to the low-voltage HRC fuse holders.

**Connection to LV / HRC 3 fuses**

If LV / HRC 3 fuses are used, no cage clamps are required. The DC cable is then connected to the low-voltage fuse holders with terminal lugs, see notes in chapter 6.6.1 "Connecting the DC Cable to the Busbar" (page 77).

10. Tape sealing tape to the front side of the remaining sliding plates.

11. Insert the sliding plate into the DC cabinet.



12. If necessary, seal the free space around the cable inlet using PU foam.

6.6.3 Additional Connections of DC Main Distributors

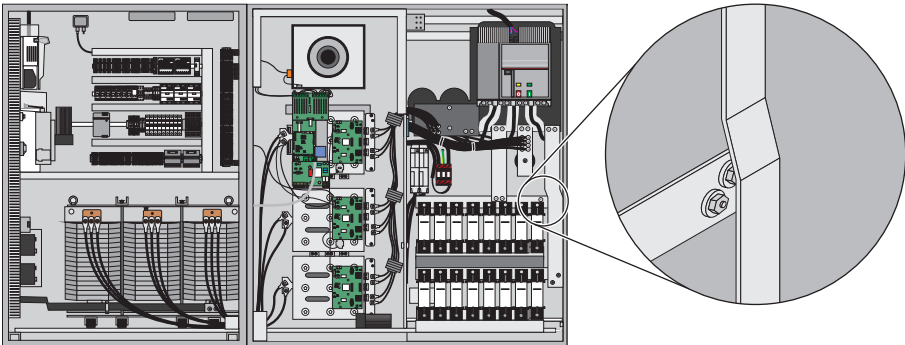
In the event that the quantity of optional low-voltage HRC fuses in the Sunny Central prove to be insufficient, the possibility exists to connect additional DC strings to the Sunny Central. To this end, up to two more DC main distribution boxes (Sunny Main Boxes) can be connected in the DC terminal area of the Sunny Central.

**Number of Sunny Main Boxes and their corresponding connection cross-sections**

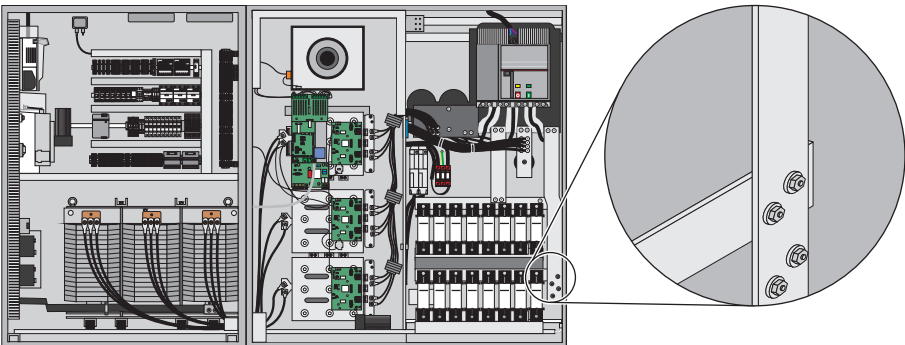
- Two additional external Sunny Main Boxes with a maximum connection cross-section of $1 \times 300 \text{ mm}^2$ per potential
- An additional external Sunny Main Box with a maximum connection cross-section of $2 \times 300 \text{ mm}^2$ per potential

The following two figures illustrate the connection points for the Sunny Main Boxes. Two bore holes for M12 have been drilled into the output rails.

The bore holes for the minus pole are housed in the busbar on the DC side.



The bore holes for the plus pole are housed on the lower edge of the rail which is connected to the busbar of DC+ and the EMC filter.



Connecting Sunny Main Boxes



DANGER!

Death or serious injuries. Risk of electric shock when touching the DC cable attached to the PV generator.

- Cover the PV modules.
- Follow all safety instructions of the module manufacturer.
- Disconnect the Sunny Central.

**NOTICE!****Damage to the Sunny Central or the PV generator due to faulty DC cabling.**

- It is obligatory to follow the circuit diagram provided when connecting the additional Sunny Main Boxes.

**Mounting material for the connection**

The mounting material is installed to the bar in the factory. A M12 ring terminal lug is used for the connection of the Sunny Main Boxes to the bar and must be provided for by the customer.

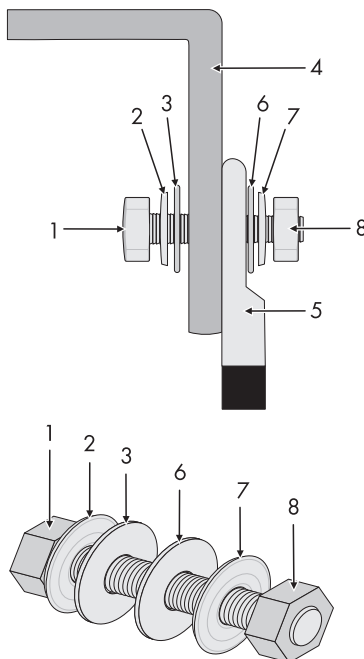
**Connection of aluminum terminal lug**

If aluminum terminal lugs are used for connection to the copper bar, refer to notes in chapter 6.1 "Connecting High-Current Contacts" (page 50).

**NOTICE!****Due to spatial considerations, connect the ring terminal lug to the front of the busbar.**

Configuration of the components for connection (from back to front):

1. Screw
2. Spring washer
3. Washer
4. Conductor rail
5. Terminal lug
6. Washer
7. Spring washer
8. Nut



6.7 Analog Inputs



Cable routing of analog inputs

The analog cable inputs and the communication unit are fed in through the sliding plate in the floor of the AC cabinet.

6.7.1 Analog Sensors

In the Sunny Central it is possible to install a temperature sensor PT 100 and two additional sensors (pre-assembled as ExtSolrrr, ExtGloIrr) on the Sunny Central Control panel via the customer's terminal strip. See the table below for the respective connection options available for the customer. These sensors can be configured by the customer.



Connecting the sensors

The procedure for connecting the sensors to the terminal strip in the Sunny Central Control is described in the documentation included in the delivery.



Configuring the sensors

Please refer to the Sunny Central user manual for detailed information.

6.7.2 External Signals

In addition to the analog sensors, three further signals can be connected: ExtAlarm, ExtSolP, ExtSolQ. These signals have a direct effect on the operation of the Sunny Central.

A voltage supply of $24 V_{DC}$ must be provided if an ExtAlarm sensor is to be connected. The voltage supply is made available internally within the Sunny Central, but can also be tapped externally.

The other analog inputs (ExtSolP, ExtSolQ) help to regulate the effective and reactive power of the Sunny Central. These sensors are also connected to the customer's terminal strip.

6.7.3 Overview of the Analog Inputs



Assignment of the analog inputs on the Sunny Central Control

When connecting the analog inputs and for the digital signals, it is obligatory to follow the circuit diagram included with delivery.

The connection is made at the connection terminals. Here, the connections for four-conductor and two-conductor sensors should be noted and any required measuring converters should be made available.

Analog inputs	Ain	Name	Meaning
Customer	Ain1	ExtSolP	External default nominal value for active power
Customer	Ain3	ExtSolIrr	External radiation sensor
Customer	Ain4	ExtGloIrr	Pyranometer (measurement of global solar irradiation)
Customer	Ain5	ExtAlarm	External alarm input, e.g. for monitoring the functioning of the medium-voltage transformer
Customer	Ain6	ExtSolQ	External default nominal value for reactive power
Customer	Ain8	TmpExt C	External temperature sensor / PT 100From production version "C", this PT 100 is installed as standard at the factory.

If you use sensors other than those listed here, contact the SMA Serviceline.

6.7.4 Handling the Shield Contact

The external signal and bus cables must be shielded. The shield must contact the shield bus, provided for this purpose, along a large surface area.

The contact is made with the shield clamps included in the delivery.

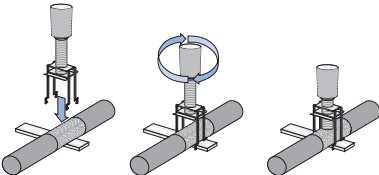


NOTICE!

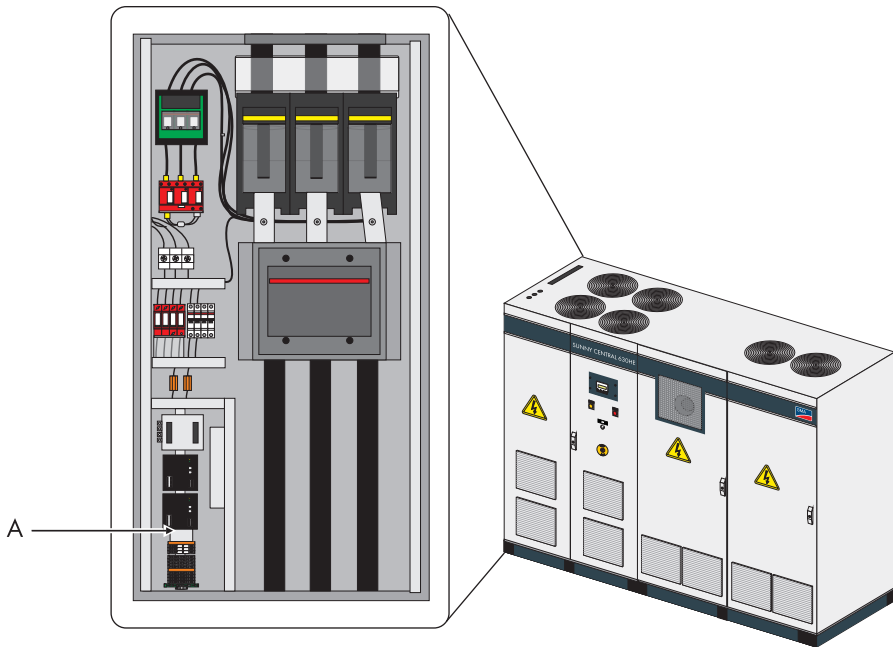
The shield clamps could become damaged through improper handling

- The shield clamps must only be hand-tightened. Never use a screwdriver.
- Tightening the clamps with the use of a screwdriver can damage the insulation of the individual insulated conductors in the cable.

The correct handling of the shield clamps is shown in the figure on the right.



Shield bus (A) in the area of the external connection terminals in the Sunny Central



6.8 Remote Deactivation Unit



Cable routing of the remote deactivation unit

The cable is fed in through the sliding plate in the floor of the AC cabinet.

In addition to the key switch, another deactivation device can be implemented. It is installed on the terminals in the Sunny Central. For this purpose, a 230 V power supply must be connected with the internal terminal.



Remote deactivation unit

For special project-specific requirements, the Sunny Central can be fitted with a remote deactivation unit combined with monitoring of the activation condition. This switching option allows the Sunny Central to be controlled from a control center without activating the key switch on the Sunny Central.

When connecting the remote deactivation unit, the circuit diagram included must be observed.

6.9 Serial Interfaces



Cable routing of the serial interface

The cable is fed in together with the communication unit through the sliding plate in the floor of the AC cabinet.

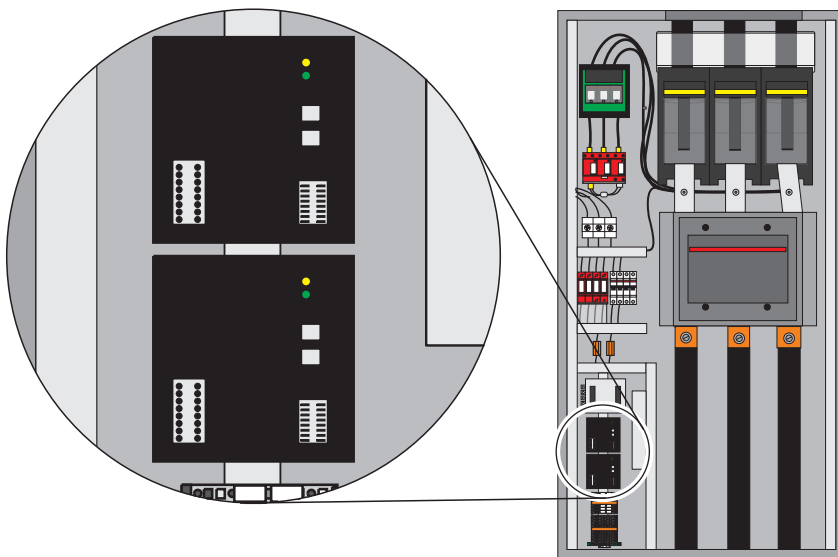
NET interface

For communication of the Sunny Central Control for data transmission to a PC, modem or Sunny WebBox, use the NET interface.

RS485 Data Line

Communication between the Sunny Central Control and the optional Sunny String-Monitors (DC distributor with integrated string current monitoring) occurs via an RS485 data line using the COM1 port of the Sunny Central Control. The RS485 data line of the string current monitoring of the Sunny String-Monitor is connected to the HUB assembly in the Sunny Central.

Connection of the RS485 data line in the Sunny Central



Position of the HUB assembly

The exact position of the HUB assembly varies according to the Sunny Central. With the help of the equipment identifier and the provided circuit diagram, the exact position of the HUB as well as of the NET interface can be determined.



Technical description of the Sunny String-Monitor

The documentation of the Sunny String-Monitors contained in the delivery provides a detailed description of the installation of the integrated string current monitoring.

6.10 Emergency Stop Cabling



Cable routing of the emergency stop

The cable is fed in through the sliding plate in the floor of the AC cabinet.

The Sunny Central is equipped ex-works with an internal emergency stop switch. If an external emergency stop is desired, this can be connected to terminals 2 and 3 of terminal strip Z3-X3. Otherwise, these terminals must be bridged.

Emergency Stop Circuit



NOTICE!

Damage to the Sunny Central through missing emergency stop function.

- In installations with more than one inverter, the emergency stop circuits of the existing devices have to be connected with each other and be tested for correct functionality.
- The emergency stop circuit may only be supplied with voltage from a single Sunny Central.

If several Sunny Centrals are in operation in one plant, all of them have to be switched off when the emergency stop switch is activated on one inverter (creation of an emergency stop circuit). For this purpose, all Sunny Central emergency stop switches are connected in series.

The necessary 24 V supply voltage for the emergency stop circuit can be tapped internally by up to two Sunny Centrals which, for example, are built into one station. The voltage supply must be provided externally if more than two Sunny Centrals are built into one station.



Connecting the external emergency stop cabling

When connecting the external emergency stop cabling, it is obligatory to follow the circuit diagram included in the delivery. The connection is made at the connection terminals.

6.11 Overvoltage Protection



Position of the overvoltage protectors

The exact position of the overvoltage protectors varies according to the Sunny Central. The exact position of the overvoltage protector in the respective cabinet can be determined with the help of the equipment identifier and the circuit diagram included with delivery.

7 Commissioning



Warranty or guaranty claims

Warranty or guaranty claims may only be asserted when the first commissioning has been performed by SMA Solar Technology AG or when the provided Commissioning Report for Sunny Central Systems has previously been completed, signed, and returned to SMA Solar Technology AG.



Test and rectify any faults

Rectify wiring faults based on the existing documentation and the circuit diagram.

The commissioning report supports you in the commissioning procedure.

1. Before initial commissioning, check the work carefully.
2. Check voltages and polarity on both DC and AC sides. The voltages and polarity may not exceed the limit values permitted by the inverter.

The main tests for commissioning are described below.

Necessary Tests

The following conditions must be fulfilled before commissioning:

- All electrical connections made on-site must be checked for correct connection and secure attachment.
- The entire electrical system, including the photovoltaic generator, must be tested by the system installer in accordance with DIN VDE 0100-600 "Installing Low-Voltage Systems - Part 6: Tests". A test report of the tests made in accordance with DIN VDE 0100-600 must be completed. Additional tests are required for medium-voltage systems if applicable. The grounding resistance of the system must be measured as part of this test. The grounding resistance is one of the key factors for the safety of the plant.
- The voltages on the Sunny Central must be tested.



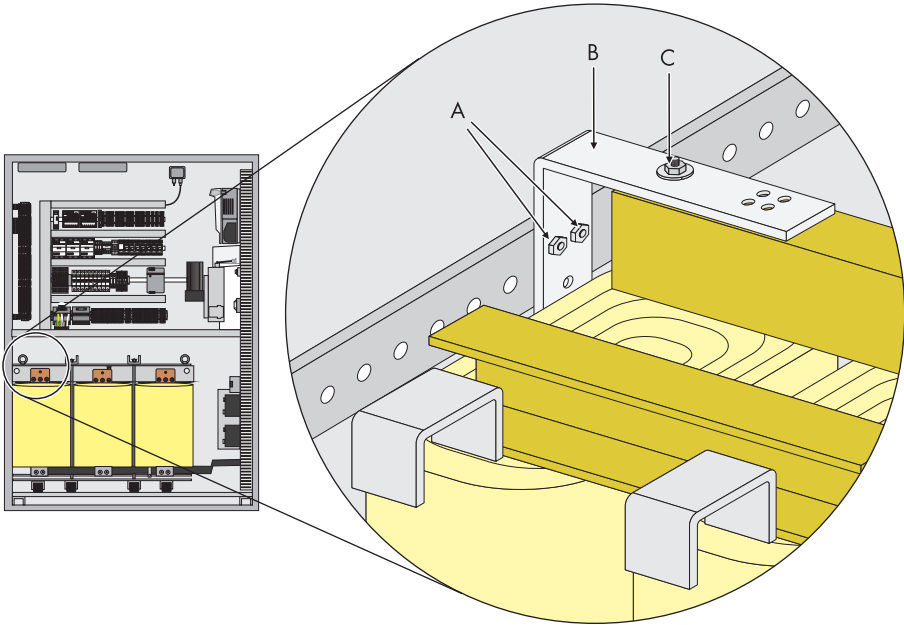
Switching elements

When delivered, all switching elements, e.g. circuit breakers and motor overload switches in the Sunny Central are switched off.

7.1 Removing the Transport Locks

The sinusoidal filter must be secured with a transport lock on the AC cabinet of the Sunny Central. The transport lock is a metal bracket which is to be fastened on the side of the switch cabinet.

1. Remove the mounting screws (A) on the switch cabinet.
2. Remove the mounting screw (C) on the sinusoidal filter.
3. Remove the fastening bracket (B).



7.2 Checking the Sunny Central Cabling

All electrical connections made on-site must be checked for correct connection and secure attachment.



Checking connections

See the documentation provided and the circuit diagram for the precise electrical connections.

In particular, note the following points:

- Misconnections.
- Incorrect polarity, in particular for power connections.



Make sure that everything is securely in place.

- Check that the connections have been tightened. Where possible, avoid retightening in accordance with the torque specifications in the circuit diagram.
- Only retighten connections according to the torque specifications in the circuit diagram if they are loose.

7.2.1 Checking Internal Connections

- Check that the plugs of the transfer terminal strip are in the correct sequence and are securely in place.
- Check that the transformer or sinusoidal filter connections are securely in place and have the correct phase sequence.
- Check that the data and control lines are correctly connected to the power unit.
- Check that the data line for insulation monitoring is correctly connected.
- Check the installation location of the internal temperature sensor.
- Check the internal power cabling of the team connection (optional).
- Check the connection between the PE rails of the partial barrier.

7.2.2 Checking the AC Grid Connection

- Check the connections to ensure that they are securely in place.
- Check the phase sequence.
- Check the correct connection in accordance with the circuit diagram.
- Check the PE-N bridge for the grid structure TN-C or TN-S on-site and remove it if necessary.
- Check the correct installation of the covers. Correct installation means that contact protection is guaranteed.

Equipotential Bonding

- Check whether the Sunny Central is connected to the equipotential bonding of the installation site.
- Check that the connections are secure.

7.2.3 Checking the Internal AC Power Supply

- Check the connections to ensure that they are securely in place.
- If power is supplied internally from the grid feed line, check that the jumper required is correctly positioned in accordance with the circuit diagram.
- If a separate external power supply from the electrical grid is used, check that the connection cable is securely in place.
 - Remove the jumpers where applicable.
- Check that the connection is correct in accordance with the circuit diagram.
- Check that contact protection is guaranteed.

7.2.4 Checking the DC Cabling

- Check that the connection is securely in place.
- Check the polarity of the DC cables.
- Check that the connection is correct in accordance with the circuit diagram.
- Check the correct installation of the covers. Correct installation means that contact protection is guaranteed.

7.2.5 Checking the Connection of the Serial Interfaces

Checking the external communication and the string current monitoring.

- Check the cabling of the connection of the data lines to the Sunny String-Monitor HUB.
- Check the connection of the NET interface.
- Check that the connection is correct in accordance with the circuit diagram.

7.2.6 Checking the Emergency Stop Cabling

- Check that the connection is securely in place.
- Check that the connection is correct in accordance with the circuit diagram.
- Check that the emergency stop circuit is only be supplied with voltage by one Sunny Central.
- Check that contact protection is guaranteed.

7.2.7 Checking the Thermostat and Hygrostat Settings

The device contains adjustable thermostats for controlling the switch cabinet ventilators and the over-temperature shut-off system. The heating system is controlled by an adjustable hygrostat. All thermostats and hygrosats are pre-adjusted before delivery.



Checking the settings of the thermostats and the hygrostat

Compare the settings with the specifications in the circuit diagram. If they deviate, set the values specified in the circuit diagram.



System check

The system must be checked by the system installer.

7.3 Checking the Voltages on the Sunny Central



WARNING!

Danger of fire if the connection is faulty.

Procedure before the commissioning test:

- Switch the Sunny Central to "Stop".
- Ensure that the fuses are not inserted.
- Ensure that the internal main switch, load disconnection unit and circuit breakers are not activated.
- Leave the operating room before switching on the voltage.

Checking the AC Grid Voltage

- Measure and record AC voltages
 - L1-L2
 - L1-L3
 - L2-L3
 - L1-N
 - L2-N
 - L3-N

Check that there is a field of rotation to the right.



Deviating grid voltage

If the grid voltage deviates greatly, adjust the transformation ratio of the medium-voltage transformer, where applicable.

Checking the Internal AC Power Supply

- Measure and record AC voltages
 - L1-L2
 - L1-L3
 - L2-L3
 - L1-N
 - L2-N
 - L3-N

Checking DC Voltages



WARNING!

Danger of arcing if the measuring device is incorrectly connected.

- Ensure that the measuring device is connected correctly.
 - Select the appropriate measuring range.
-
- Measure and record the DC voltage for every input.
 - Check that the polarity of each input is correct.
 - Check the correct polarity of the DC busbar in the Sunny Central.
 - Measure the voltage for every input and every pole to ground.
 - If the value is stable, a short to ground is present.
 - Measure and compare the voltages of the individual inputs. The voltages must be approximately equal.
 - The voltage must not exceed the maximum DC voltage of the inverter.



NOTICE!

Damage to the Sunny Central due to high DC voltages

The DC voltage of the photovoltaic generator must never exceed the maximum permissible inverter voltage.

- $U_{PV} = 1\,000\text{ V}$

7.4 Preparation for Commissioning



Fault display on the Sunny Central Control

See the Sunny Central user manual for details on troubleshooting.

If you cannot rectify the fault, contact the SMA Serviceline.

Preparatory Work

1. Disconnect all voltages.
2. Ensure that no voltage is present in the system.
3. Set the device to "Stop".
4. Insert the fuses.
5. Fit the covers.
6. Activate the internal main switch.
7. Close the load disconnection unit.
8. Activate the circuit breakers fuses.
9. Close the doors.
10. Leave the operating room before switching on the voltage.

Switching on the Voltages.

1. Activate the internal AC power supply externally.
 - ☒ The Sunny Central boots and displays "Grid fault".
2. Activate the AC grid voltage externally.
 - ☒ "Grid fault" is acknowledged automatically after a short period.
 - Check the current values of the grid voltage on the display.

Checking the Emergency Stop

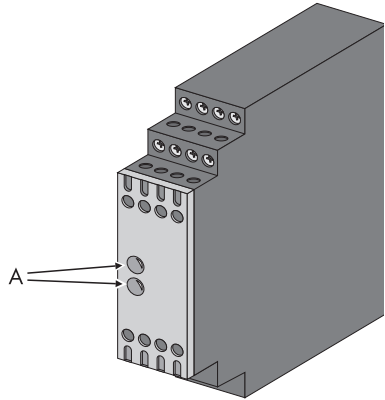


DANGER!

Death resulting from electric shock and burning upon touching the medium-voltage grid's live components.

- Do not touch parts other than those described in the instructions.

3. Open the switch cabinet doors of the AC cabinet.
4. Make sure that the emergency stop on the outside of the device is not activated.
5. Tape all door contact switches to the "On" position.
 - ✓ During normal operation, both signal lights (A) of the emergency stop relay must be illuminated.
6. If the emergency stop is activated, the signal lights of the emergency stop relay must switch to "OFF".
 - ✓ The Sunny Central Control displays error message "206" and the fault must be acknowledged manually.
7. Unlock the emergency stop and acknowledge the fault on the Sunny Central Control. The fault is only displayed on the Sunny Central on which the emergency stop was activated.
8. Release door contact switches (remove the adhesive tape).
9. Close the switch cabinet doors.



Testing the emergency stop circuits

If one emergency stop switch is activated, the emergency stop relay in all Sunny Centrals must be activated.

If an external emergency stop switch is activated, the Sunny Central does not indicate a fault.

10. Carry out this functional test for every individual emergency stop switch. Test the switches on the cabinet, in the stations, and the other external emergency stop switches.

DC Voltages

11. Switch on the external DC voltages.

7.5 Switching On

The system may not be switched on until the following points are ensured:

- All tests and measurements have been performed.
 - All values measured are within the permissible range.
 - All switch cabinet doors must be closed.
- ☒ The inverter is now completely connected on the AC side and DC side.

Switching on the Sunny Central

1. Turn the key switch to the "Start" position.
 2. Leave the operating room.
- ☒ The Sunny Central will start automatically. First, the grid voltage and frequency parameters are checked. After approx. 20 seconds, the motorized DC switch is activated automatically and starts the photovoltaic generator.

After a wait period, the grid contactor is activated and the Sunny Central enters feed-in mode.

All device parameters are preset, even for options ordered. See the Sunny Central user manual for notes on system-optimized parameter settings. Turn the key switch to the "Stop" position to configure the Sunny Central.

Continue by commissioning the Sunny String-Monitors and external communication. The commissioning process for the Sunny String-Monitors is described in the Sunny String-Monitor installation guide.

8 Technical Data

8.1 Sunny Central 400HE-11

Input data

Nominal power DC	P_{PV}	408 kW
Maximum PV power recommended*	P_{PV}	450 kW _p
Maximum input voltage	$U_{DC\ max}$	1 000 V
DC voltage range, MPPT	U_{DC}	450 V – 820 V
Max. input current	$I_{DC, \max}$	993 A
Voltage ripple	U_{pp}	< 3 %
Number of non-fused connection points / maximum number of fused DC inputs		2 ports for external DC main distributions (Sunny Main Box) / 8 per potential

*Specifications apply to irradiation values below STC

Output data

Nominal AC output	P_{ACNom}	400 kW
Operational voltage $\pm 10\ %$	U_{ACNom}	270 V
Nominal output current	I_{ACNom}	855 A
Nominal operating frequency	f_{ACNom}	50 Hz / 60 Hz
Total harmonic distortion of output current at nominal output power	K_{IAC}	< 3 %
Power factor	$\cos \varphi$	90 leading / 90 lagging

Efficiency

Max. efficiency	$\eta_{\max}$	98.6 %
European efficiency	η_{euro}	98.4 %

Mechanical data

Width x height x depth	1 600 + 1 200 mm x 2 120 mm x 850 mm
Weight: approx.	1 900 kg

Power consumption

Internal consumption in operation*	P_{day}	< 1 500 W
Internal consumption in night mode	P_{night}	< 100 W
Internal power supply / grid structure		3 x 230 V, 50 / 60 Hz, TN-S grid / TNC grid / TT grid
External pre-fuse for internal power supply		B 20 A, 3 pol.

* Internal consumption measured in clock-rate operation with activated AC fans, activated DC fans and power unit cooling unit at 100 % Minimum connected load per phase < 1 500 W

Sunny Central Control interfaces

Communication (NET Piggy-Back, optional)	Analogue, ISDN, Ethernet
Analog inputs*	1 x PT 100, 5 x A_{in}
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC connection (COM2)	RS232
Potential-free contact (ext. malfunction report)	1

*Terminal for an analog sensor provided by the customer in two-wire and four-wire version

Protection rating and environmental conditions

Protection rating as per EN 60529		IP20
Protection rating as per EN 60721-3-3 Environmental conditions: fixed location, with protection against wind and weather		Classification of - chemically active substances: 3C1L - mechanically active substances: 3S2
Permissible ambient temperatures	T	-20 °C ... +50 °C
Relative humidity, not condensing	U_{air}	15 % ... 95 %
Max. altitude above sea level	Mean sea level	1 000 m
Fresh air consumption	V_{air}	6 200 m ³ /h

8.2 Sunny Central 500HE-11

Input data

Nominal power DC	P_{PV}	509 kWp
Maximum PV power recommended*	P_{PV}	560 kWp
Maximum input voltage	$U_{DC\ max}$	1 000 V
DC voltage range, MPPT	U_{DC}	450 V – 820 V
Maximum input current	$I_{DC, max}$	1 242 A
Voltage ripple	U_{pp}	< 3 %
Number of non-fused connection points / maximum number of fused DC inputs		2 ports for external DC main distributions (Sunny Main Box) / 8 per potential

*Specifications apply to irradiation values below STC

Output data

Nominal AC output	P_{ACNom}	500 kW
Operational voltage ± 10 %	U_{ACNom}	270 V
Nominal output current	I_{ACNom}	1 070 A
Nominal operating frequency	f_{ACNom}	50 Hz / 60 Hz
Total harmonic distortion of output current at nominal output power	K_{IAC}	< 3 %
Power factor	$\cos \varphi$	90 leading / 90 lagging

Efficiency

Max. efficiency	η_{max}	98.6 %
European efficiency	η_{euro}	98.4 %

Mechanical data

Width x height x depth	1 600 + 1 200 mm x 2 120 mm x 850 mm
Weight: approx.	1 900 kg

Power consumption

Internal consumption in operation*	P_{day}	< 1 500 W
Internal consumption in night mode	P_{night}	< 100 W
Internal power supply / grid structure		3 x 400 V, 50 / 60 Hz, TN-S grid / TNC grid / TT grid
External pre-fuse for internal power supply		B 20 A, 3 pol.

* Internal consumption measured in clock-rate operation with activated AC fans, activated DC fans and power unit cooling unit at 100 % Minimum connected load per phase < 1 500 W

Sunny Central Control interfaces

Communication (NET Piggy-Back, optional)	Analogue, ISDN, Ethernet
Analog inputs*	1 x PT 100, 5 x A_{in}
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC connection (COM2)	RS232
Potential-free contact (ext. malfunction report)	1

* Terminal for an analog sensor provided by the customer in two-wire and four-wire version.

Protection rating and environmental conditions

Protection rating as per EN 60529		IP20
Protection rating as per EN 60721-3-3 Environmental conditions: fixed location, with protection against wind and weather		Classification of - chemically active substances: 3C1L - mechanically active substances: 3S2
Permissible ambient temperatures	T	-20 °C ... +50 °C
Relative humidity, not condensing	U_{air}	15 % ... 95 %
Max. altitude above sea level	Mean sea level	1 000 m
Fresh air consumption	V_{air}	6 200 m ³ /h

8.3 Sunny Central 630HE-11

Input parameters

Nominal power DC	P_{PV}	642 kWp
Maximum PV power (recommended)*	P_{PV}	705 kWp
Maximum input voltage	$U_{DC\ max}$	1 000 V
DC voltage range, MPPT	U_{DC}	500 V – 820 V
Maximum input current	$I_{DC,\ max}$	1 422 A
Voltage ripple	U_{pp}	< 3 %
Number of non-fused connection points / maximum number of fused DC inputs		2 ports for external DC main distributions (Sunny Main Box) / 8 per potential

* Specifications apply to irradiation values below STC

Output data

Nominal AC output	P_{ACNom}	630 kW
Operational voltage ± 10 %	U_{ACNom}	315 V
Nominal output current	I_{ACNom}	1 155 A
Nominal operating frequency	f_{ACNom}	50 Hz / 60 Hz
Total harmonic distortion of output current at nominal output power	K_{IAC}	< 3 %
Power factor	$\cos \varphi$	90 leading / 90 lagging

Efficiency

Max. efficiency	η_{max}	98.6 %
European efficiency	η_{euro}	98.4 %

Mechanical data

Width x height x depth in (W x H x D)	1 600 + 1 200 mm x 2 120 mm x 850 mm
Weight: approx.	1 900 kg

Power consumption

Internal consumption in operation*	P_{day}	< 1 500 W
Internal consumption in night mode	P_{night}	< 100 W
Internal power supply / grid structure		3 x 400 V, 50 / 60 Hz, TN-S grid / TNC grid / TT grid
External pre-fuse for internal power supply		B 20 A, 3 pol.

* Internal consumption measured in clock-rate operation with activated AC fans, activated DC fans and power unit cooling unit at 100 % Minimum connected load per phase < 1 500 W

Sunny Central Control interfaces

Communication (NET Piggy-Back, optional)	Analog, ISDN, Ethernet
Analog inputs*	1 x PT 100, 5 x A _{in}
Overvoltage protection for analog inputs	Optional
Sunny String-Monitor connection (COM1)	RS485
PC connection (COM2)	RS232
Potential-free contact (ext. malfunction report)	1

* Terminal for an analog sensor provided by the customer in two-wire and four-wire version.

Protection rating and environmental conditions

Protection rating as per EN 60529		IP20
Protection rating as per EN 60721-3-3 Environmental conditions: fixed location, with protection against wind and weather		Classification of - chemically active substances: 3C1L - mechanically active substances: 3S2
Permissible ambient temperatures	T	-20 °C ... +50 °C
Relative humidity, not condensing	U _{air}	15 % ... 95 %
Max. altitude above sea level	Mean sea level	1 000 m
Fresh air consumption	V _{air}	6 200 m ³ /h

9 Contact

If you have technical problems with our products, please contact our Serviceline. We require the following information in order to provide you with the necessary assistance:

- Device type of the Sunny Central
- Sunny Central serial number
- Type and number of modules connected
- Communication type
- Failure or warning number of the Sunny Central
- Display of the Sunny Central

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- Operating the product under incorrect safety or protection conditions
- Altering the product or supplied software without authority
- The product malfunctions due to operating attached or neighboring devices beyond statutory limit values
- In case of unforeseen calamity or force majeure

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