Central inverter

SUNNY CENTRAL 100LV - 560HE

Installation Guide

SC125_560HE-IEN083220 | 98-4004820 | Version 2.0

EN

Table of Contents

1 Notes on this Manual

1.1 Validity

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

- Sunny Central 100LV (SC 100LV)
- Sunny Central 125LV (SC 125LV)
- Sunny Central 150 (SC 150)
- Sunny Central 200 / 200HE (SC 200 / SC 200HE)
- Sunny Central 250 / 250HE (SC 250 / SC 250HE)
- Sunny Central 350 / 350HE (SC 350 / SC 350HE)
- Sunny Central 500HE (SC 500HE)
- Sunny Central 560HE (SC 560HE)

1.2 Target Group

This manual is addressed to the installer and the operator of a PV system equipped with Sunny Centrals.

1.3 Storage of the Manuals

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

- Installation guide: Mounting and Installation of the Sunny Central
- User manual: Operation of the Sunny Central and the Sunny Central Control
- Circuit diagrams: Variant circuit diagram of the Sunny Central
- Commissioning report: Checklist for commissioning. After successful commissioning, the commissioning report has to be sent to SMA Solar Technology AG.
- Documentation of accessories: You will find documentation for optional accessories or optional equipment for the Sunny Central (e.g. installation near the sea) at www.SMA.de.

1.4 Symbols Used

The following types of safety warnings as well as general information appear in this document:

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.

ATTENTION!

"Attention!" indicates a situation that can result in property damage if not avoided.

Information

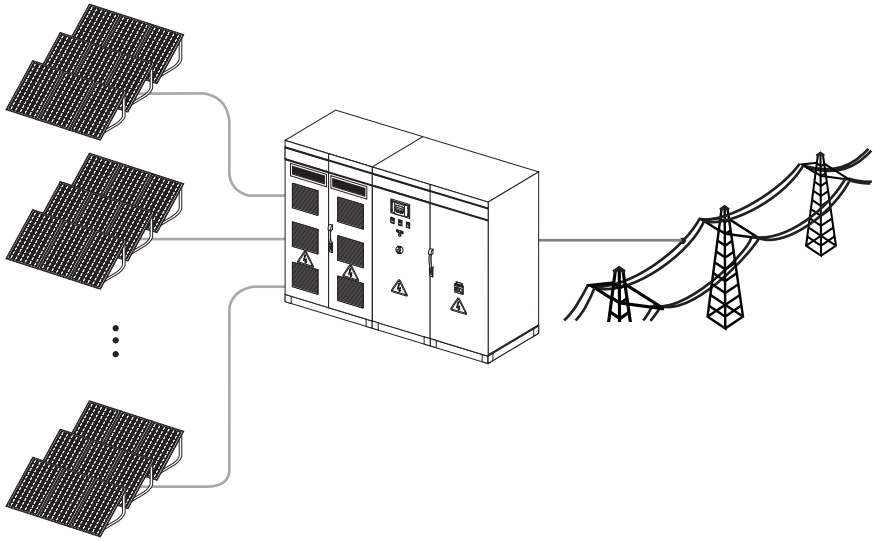
Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety

2.1 Appropriate Usage

The Sunny Central is a solar inverter. It is used to feed solar energy converted by solar modules using photovoltaics into a low- or medium-voltage grid.

Principle of a grid-connected solar power system with a Sunny Central



Sunny Central

The standard Sunny Central is equipped with a low-voltage transformer and feeds into the low-voltage grid.

Sunny Central LV

The Sunny Central LV feeds into the low-voltage grid. It is suitable for the connection of modules with low voltage.

Sunny Central HE

The Sunny Central HE is a high efficiency photovoltaic inverter. It is not equipped with a low-voltage transformer. The Sunny Central HE requires a suitable external medium-voltage transformer through which it can feed into the grid.

Sunny Central MV

The MV stations are medium-voltage stations. In an MV station, two Sunny Central HEs feed into a shared medium-voltage transformer. The Sunny Central MV feeds into the medium-voltage grid.

2.2 Safety Instructions

Faults which affect the safety of the device must be immediately rectified. Unauthorized modifications and the use of spare parts not recommended by SMA Solar Technology may cause fire, material damage and electrical shocks. Unauthorized personnel must not have access to the equipment.

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

2.2.1 Personnel

Only qualified technical personnel may perform any and all work on the Sunny Central. "Qualified" means that the personnel must possess training relevant to the activity performed.

For commissioning and operation of the Sunny Central, the personnel must be familiar with the content of the Sunny Central installation guide and user manual. In particular, the safety instructions must be followed.

2.2.2 Installation

The mounting requirements described in the installation guide must be observed. The installation has to be carried out in an electrical operating room to guarantee optimal noise and fire protection.

The Sunny Central product line has been type-tested and approved for installation in an industrial environment in accordance with the industry-standard EMC limits (EMC = Electro Magnetic Compatibility). Devices for installation in households are available upon request.

For the installation, the following points have to be taken into consideration:

- Separate airflow of the supply and exhaust air of the Sunny Central from other ventilation systems to avoid the spread of smoke in the event of fire.
- An appropriate escape route must be ensured.
- An appropriate sound insulation (see Technical Data) must be ensured.
- The EMC specifications must be observed (see Technical data)

WARNING!

Smoke in electrical areas of operation

We recommend the installation of a smoke detector inside the electrical 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 Systems

Photovoltaic systems 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, either from the photovoltaic generator and/or the Sunny Central. This is especially important to note when disconnecting parts of the system
- 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 more than the maximum operating current and is also dependent on the level of solar irradiation. If a short-circuit occurs in the system, the available fuses are not guaranteed to switch off.
- The grid structure of the PV generator is usually an IT grid, i.e. a non-grounded grid that could become unintentionally grounded if a ground fault occurs.
- A highly branched generator may be difficult to disconnect if a fault develops (e.g. short-circuit). In addition, we recommend the use of external DC circuit breakers for disconnecting the inverter and/or the DC main cables / Sunny String monitors (DC circuit breakers are 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 guidelines 6012).

2.2.4 Electrical Connection

The electrical connection must be carried out according to the installation guide, the relevant circuit diagram and the technical data of the device.

Ensure the grid connection cable for grid feeding 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 fused with the line circuit breakers specified in the technical data.

Lightning protection

The devices are equipped with an internal overvoltage protection on the AC and DC sides. The desired protection level can only be achieved, if a lightning protection area concept exists for the installation building according to DIN VDE 0185-4, which means that at the building's entrance (transfer lightning protection area LPZ 1), lightning conductors or combined surge and lightning conductors are available among others which are not included in the delivery.

The combined surge and lightning protection for the signal inputs can be optionally ordered.

Emergency-stop

In installations with more than one device or with additional external emergency-stop switches, the emergency shut-off circuits have to be connected and tested for correct functionality, as described in the installation guide. The emergency shut-off circuit may only be supplied with voltage from a device.

Emergency shut-off circuit

- The emergency shut-off circuit may only be supplied with power from a single Sunny Central.
- Set the bridges at the emergency-stop terminal strip of the device into correct position.

2.2.5 Power Supplies

WARNING!

Risk of lethal electric shock!

High voltages are present in the device.

- The protective ground connection 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.
- Before inserting the DC input fuses (internal or external), the correct polarity and earth fault protection of the inputs must be ensured. The fuses may only be inserted or removed under load-free conditions and when using the appropriate personal protective equipment and fuse carriers.
- In the case of inserted DC fuses (internal or external), reverse voltage is applied to all externally connected DC main distributors and DC sub-distributors (Sunny String Box) as well as the team device via the bus bar in the Sunny Central.
- The doors must remain closed when connecting the supplies!

Requirements for switching on the external power supplies

- All connections have been carried out according to the installation guide and the circuit diagram.
- The protective ground connection for grid feed-in and for internal power supply has been made.
- The device has been switched off. The key switch is in the "stop" position and the main switches are switched off.
- The DC input fuses (internal and external) are pulled and the protection against accidental contact (Plexiglas covers) is installed. For team operation on both devices.
- The nominal voltage, frequencies and the right-hand rotary field are maintained (see device technical data).
- The polarity of the DC voltage at the inputs/fuse inputs (device dependent) has been checked.

- The polarity of the DC voltage at the inverter input/team 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

- Grid voltage for the grid feed-in
- Grid voltage for internal power supply
- DC voltage from the photovoltaic generator
- DC voltage for team operation (optional)

2.2.6 Disconnecting the device

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

DANGER!
Risk of lethal electric shock!

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

- Disconnection (also team device)
- Secure against re-connection
- Verify that the installation is free of voltage
- Ground and short the unit if necessary (not on the DC side)
- If necessary, cover or protect against accidental contact with any neighboring voltage carrying components

The following power supplies must be disconnected:

- Grid voltage for the grid feed-in
- Grid voltage for internal power supply (optional)
- DC voltage from the photovoltaic generator
- DC voltage for team operation (optional)
- If necessary, additional external voltages (e.g. emergency-stop)

Simply switching off the main AC and DC switches is not sufficient to ensure proper disconnection 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!

- After switching off the Sunny Central, wait a minimum of 5 minutes.

The disconnection of the DC voltage is carried out by the internal or external DC input fuses or, if available, external circuit breakers. The disconnection with the DC input fuses has to be carried out under load-free conditions.

The device contains capacitors on the DC and AC sides that discharge when the device is disconnected. After switching off, there are dangerous accidental-contact voltages present within the device for several minutes. If there is a fault in the device, these voltages may also remain present for a longer period of time. For these reasons, wait a minimum of 5 minutes after switching off before opening the device.

WARNING!
Risk of lethal electric shock!

- To avoid arcing, the load-free status must be checked with a current probe (using a clamp-on ammeter) before removing the DC input fuses. The fuses may only be pulled/inserted using the personal protective equipment and fuse carriers.
- In the case of inserted DC fuses (internal or external), reverse voltage is applied to all externally connected DC main distributors and sub-distributors (Sunny String Monitor) as well as the team device via the the bus bar in the Sunny Central.
- In the event of a failure, the DC contactors may carry a life-threatening DC voltage!
- The discharge time of the capacitors is longer than 5 minutes.

The Plexiglas cover must be removed in order to pull the fuses. The cover must never be removed from both poles at the same time. After the cover has been removed from one pole, and the fuse has been pulled, the cover must be immediately re-installed before removing the cover from the second pole. The covers must always remain in place when fuses are not to be pulled.

Disconnection of system components without risk

In addition, we recommend the use of external DC circuit breakers for disconnecting the inverter and/or the DC main cables / Sunny String monitors (DC circuit breakers are optionally available). Even in the case of faults or fire, this allows system components to be safely disconnected.

Team devices

WARNING!
Risk of lethal electric shock!

Before working on a team device, both devices must be disconnected.

If two devices in the team are connected, all necessary measures have to be taken to disconnect both devices. This especially applies to the DC inputs. The team contactor is not a reliable disconnection unit between the devices.

2.2.7 General Information

Hearing Protection

The device fans and the power unit create significant levels of operating noise. In addition to this, a fault in the device can lead to very high noise levels. For these reasons, we recommend the use of ear protection when in the vicinity of the device.

High noise levels in electrical operating rooms

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

Burns

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

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

High temperature of device components

We recommend wearing safety gloves during all work on the device.

3 Delivery

3.1 Transport

Only the transport methods described in the installation guide are permissible, follow the transport requirements in **Appendix A**.

The inverters consist of two switch cabinet units, the DC / inverter cabinet and the AC cabinet which are separately transported and installed on site.

The inverters and/or inverter units are delivered on pallets. Under standard delivery conditions, a forklift must be available. When unloading, the heavy-load markings must be given due consideration.

3.1.1 Transport Possibilities

WARNING!

Heavy weight of switch cabinet units!

Danger of tipping during transport!

- The cabinet units must always be transported in an upright position.
- The center of gravity of the Sunny Central is indicated on the outside of the packaging.

Transport using a pallet truck or forklift

For the transport of the respective switch cabinet with pallet trucks or forklifts, the plinth panel can be unscrewed and in this way the fork of the pallet truck or lift can be put under the cabinet.

Both screws per plinth panel can be loosened with a TX30 torque key.

ATTENTION!

Damage to the Sunny Central through missing plinth panels

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

Transport using a crane

Due to the heavy weight of the switch cabinets, the transport with crane eyelets is only permitted under certain conditions. The inverters are therefore delivered without crane eyelets. Otherwise there is the risk of damaging the cabinet. Use an appropriate crane fork instead which can be put below the switch cabinet when the plinth panels are unscrewed.

Transport using crane eyelets

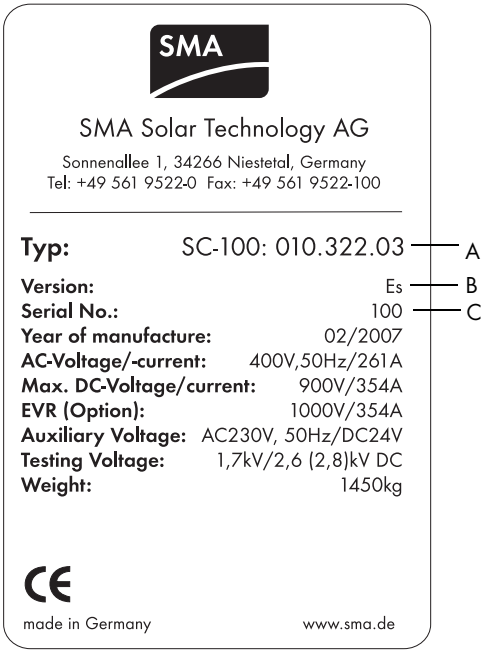
The transport of the switch cabinets with crane eyelets is not permitted as a standard means of transport!

In exceptional cases, the transport with crane eyelets is permitted. In case of transport using a crane, the following points have to be observed:

- Asymmetric weight distribution
- Heavy load.
- Most of the switch cabinet's weight is located in the rear area.

3.2 Identifying the Sunny Central

You can identify the Sunny Central using the type plate (see figure below). The type plate can be found on the inside of the door of the Sunny Central.



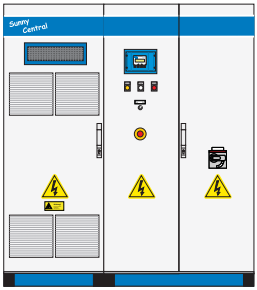
A Type description of the Sunny Central with option key

B Version of the Sunny Central. "s" stands for "special version".

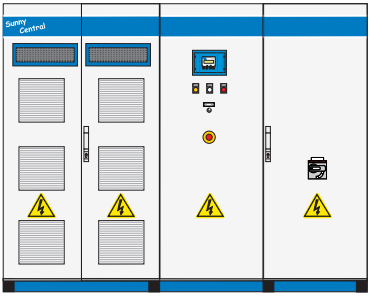
C Sunny Central Serial number

Switch cabinet view of Sunny Central inverter cabinets

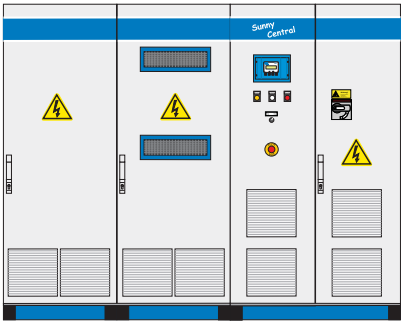
Switch cabinet view Sunny Central 150



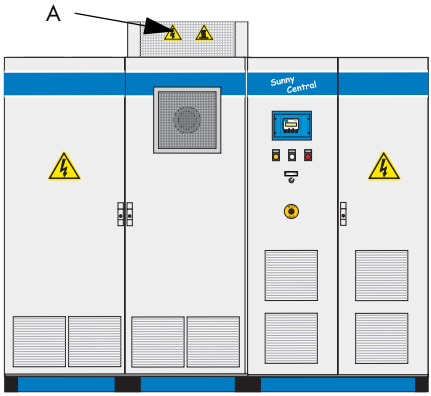
Switch cabinet view
Sunny Central 250 / 250HE



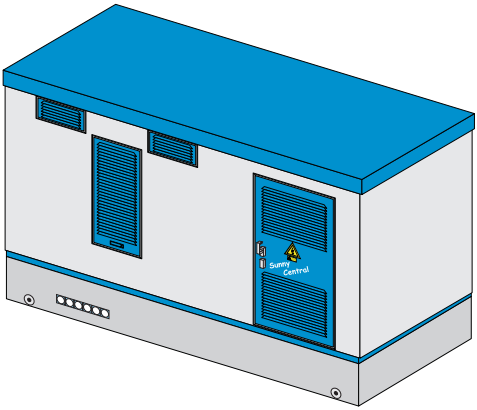
Switch cabinet view
Sunny Central 350 / 350HE



Switch cabinet view
Sunny Central 500 / 560HE
with EVR option (A)



Sunny Central MV station view



3.2.1 Checking for Transport Damages

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

Transport security

The devices are delivered in part units which do not reflect the protection class specified in the technical data. The packaging offers an appropriate protection against humidity and damage.

3.2.2 Storage

Storage information

The equipment may only be stored in rooms protected from dust and moisture.

4 Mounting the Device

Sunny Central Installation requirements

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

4.1 Installation Site Requirements

4.1.1 Foundation

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, depressions or slopes must be corrected prior to installation.

4.1.2 Distance to the wall

When installing the inverter, appropriate distance to the wall for minimum passageways, escape routes and ventilation have to be observed. Corresponding information about the inverter type in question are included in the "Sunny Central Installation requirements" (separate document).

4.1.3 Inverter Protection Rating / EMC / Sound Levels

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

Sunny Central installation location

The Sunny Central inverter has to be installed in an electrical operating room.

4.1.4 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 1000 V as well as the requirements for passageways and escape routes are included here.

Minimum passageway in electrical operating rooms

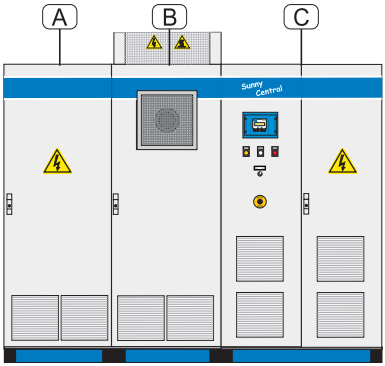
Observe the following points for a minimum passageway:

- With fully opened cabinet doors, a minimum passage width of 500 mm (escape route) 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. installation in a station building) may only be opened on one side at a time.

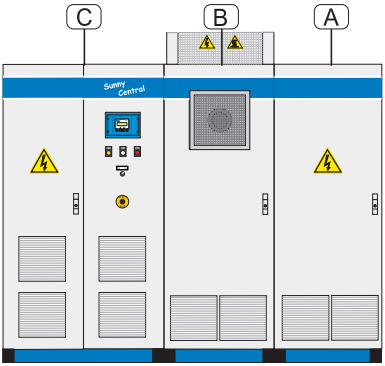
MV Stations

The inverters of the HE series are usually installed in a concrete compact station, generally opposite as a "left" system and "right system". The installation has to be carried out in accordance with the VDE guidelines for a closed electrical operating room. In the figure below, a left-hand and right-hand system is shown.

Left system



Right system



A DC cabinet

B Inverter cabinet

C AC cabinet

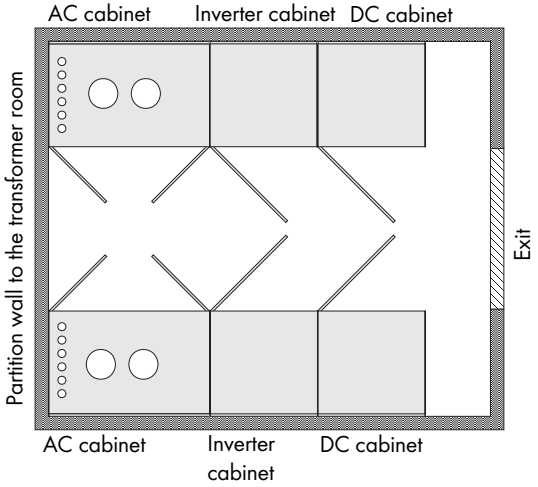
The AC cabinets should in any case be located at the partition wall to the transformer room in order to implement the AC power cabling to the transformer with short cable routes.

WARNING!

Smoke in electrical areas of operation

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.

In the following a schematic top view of the Sunny Boys located in a station is shown. The installation of the inverters is realized as a "right-hand system" (above) and "left-hand system" (below).



4.1.5 Ventilation

For cooling the inverter, an appropriate air supply is necessary. To guarantee secure operation and the maximum of feed-in power, the allowable ambient temperature has to be observed.

The required air is drawn through the switch cabinet doors and is blown out via the roof or the back wall of the cabinet unit depending on the Sunny Central model Thus the devices can be installed directly adjacent to each other. The air needed as well as the appropriate distance to the wall can be found in the "Sunny Central Installation requirements" (separate document). Filters which clean the absorbed air are installed at the air inlet openings.

Should the required amount of air at the installation site of the Sunny Central be too low, a larger amount of air has to be made available (supply air bars, fan etc.) through construction measures.

The inlet air must satisfy the requirements of classification 3S2 (see table). The operation of the inverter is suited to a relative humidity of 15 ... 95 %.

Air Quality Classification

Environmental requirements for fixed site use	Class			
	3S1	3S2	3S3	3S4
a) Sand in the air [mg/m³]	-	30	300	3000
b) Dust (suspended matter) [mg/m³]	0.01	0.2	0.4	4.0
c) Dust (fallout) [mg/m³]	0.4	1.5	15	40
Sites where dust fallout is kept to a minimum through appropriate measures.	x	x	x	x
Sites where no special measures have been taken to reduce the sand or dust levels and which are far from sand and dust sources		x	x	x
Sites near to sand and dust sources			x	x
Sites in production halls where sand or dust is present, or sites in geographical locations in which the air can contain high quantities of sand and dust				x

Should the required air quality at the installation site of the Sunny Central not be available, corresponding requirements have to be made available (e.g. additional filters in the building supply air bar) through construction measures.

Ambient Conditions

The following points for environmental conditions have to be observed:

- amount of fresh air
- required air quality,
- relative humidity
- Allowable ambient temperatures

The waste heat (exhaust air) produced by the inverter has to be led away from the device to observe the maximum allowable ambient temperature and to ensure that the installation room is not unnecessarily heated up by the warm exhaust air. This takes place through the installation of an exhaust airflow (e.g. air channel).

CAUTION!

Risk of crushing and bruising by metal parts.

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

According to the Sunny Central type, the exhaust air is lead out of the inverter through either the top or the rear. The Sunny Central types 350, 350HE, 500HE and 560HE have a combined exhaust airflow from the top and through the rear of the cabinet units. The method of exhaust is described in the "Sunny Central Installation requirements". With the exhaust airflow to the "rear" it is possible to lead the exhaust air directly out of the building through a weather protection bar installed inside the building wall. The inverter can be installed with the rear to the open building wall. To do this, dismantle the finger protection from the fan openings and provide a seal or a frame-like air scoop with a seal. Attach the air scoop to the building wall.

ATTENTION!

Operational reduction of the Sunny Central through overtemperature!

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

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

Inverter specific details

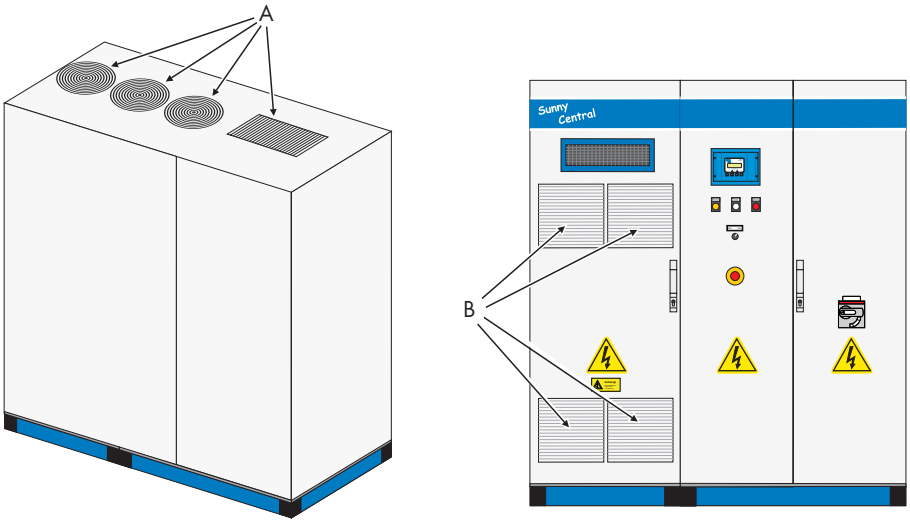
The inverter-specific models of the ventilation system are described in the Sunny Central Installation requirements (separate document).

Overview of the ventilation openings

The exact position and size of the single air grills as well as for the supply air on the front side and the exhaust air on the roof or at the rear side of the switch cabinets, are displayed with some example cabinets.

The figures in this chapter show a "left system". Find more details about left and right systems in chapter 4.1.4 „Electrical Operating Room“ (21).

Sunny Central 100LV / Sunny Central 150 / Sunny Central 125LV / Sunny Central 200



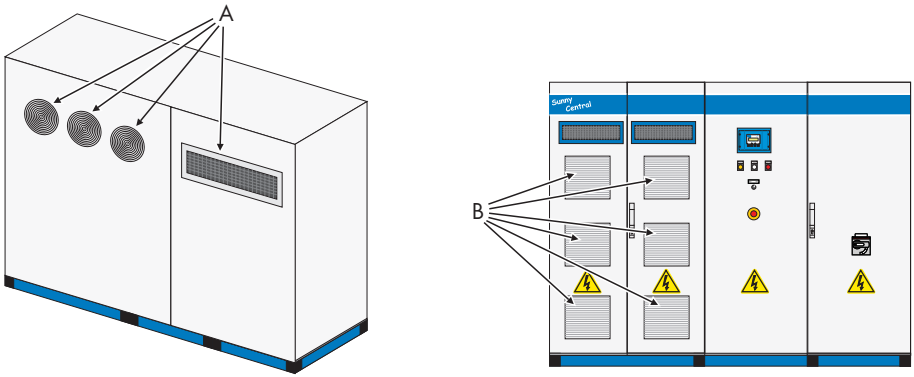
A Exhaust air

B Supply air

Sunny Central 200HE

See figure above. The AC cabinet of the Sunny Central 200HE has 2 exhaust air openings; instead of 3 as shown in the figure above.

Sunny Central 250

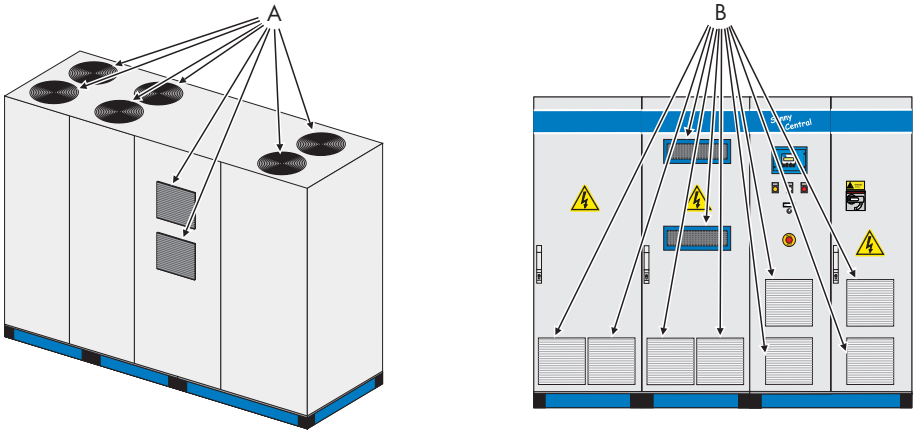


A Exhaust air B Supply air

Sunny Central 250HE

See figure above. The AC cabinet of the Sunny Central 250HE has 2 exhaust air openings; instead of 3 as shown in the figure above.

Sunny Central 350

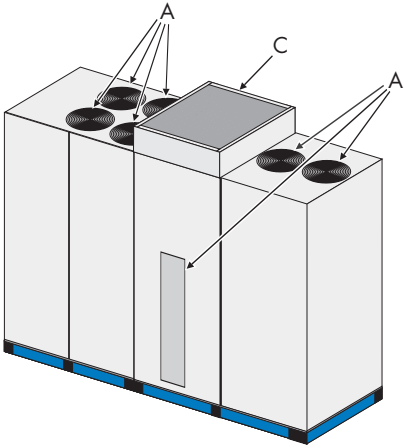


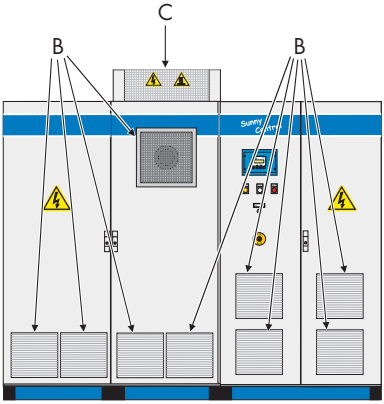
A Exhaust air B Supply air

Sunny Central 350HE

See figure above. The AC cabinet of the Sunny Central 350HE has 2 exhaust air openings; instead of 4 as shown in the figure above and 2 supply air openings instead of 4 as shown in the figure above.

Sunny Central 500HE / Sunny Central 560HE





A	Exhaust air	B	Supply air
C	EVR option		

4.2 On-Site Inverter Installation

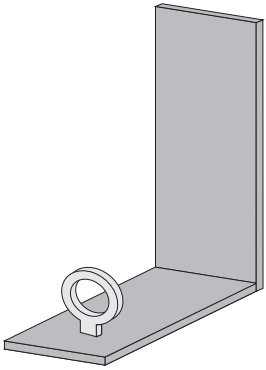
The Sunny Centrals consist of two switch cabinet units, which are electrically and mechanically connected on site. Make sure that both switch cabinets have the same serial number. You will find the serial number on the type plate or on the transport packaging of the Sunny Central switch cabinet.

After both switch cabinets have been installed next to each other, the transport locks of the transformer 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 electrical operating room. All necessary materials required for the connection of the switch cabinets are included in the delivery.

4.2.1 Remove transport locks

Remove the transport locks.

In some Sunny Centrals, the transfomers and the sine filter are secured with transport locks on the cabinet. The transport lock is a metal angle which is fixed at the switch cabinet side.



The following table shows which type is delivered with transport locks.

Sunny Central	Transport lock Transformer	Transport lock Sine filter
100LV	yes	no
125LV	yes	no
200	yes	no
200HE	no	no
250	yes	no
250HE	no	no
350	yes	no
350HE	no	no
500HE	no	yes
560HE	no	yes

4.2.2 Mechanical coupling

ATTENTION!

Humidity through missing seal!

Before both switch cabinets are connected with each other, the delivered seal must be stuck into the interface of the cabinets - if not already carried out ex-works.

The mechanical coupling of both switch cabinets is made through clamp joints. 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.

In the enclosed Rittal manual you will find information about how to mount the seals and the clamp joints.

4.2.3 Anchorage to the ground or wall

The Sunny Centrals are so heavy that an additional anchorage to the ground or the wall is not necessary.

Anchoring in a MV station

Sunny Centrals which are housed and transported in a MV station are anchored to the wall and to the ground of the station to avoid moving and damage during transport.

5 Electrical Connection

After both switch cabinets have been installed next to each other and have been mechanically connected, the individual cabinets must be electrically connected with each other. Afterwards, the external electrical connections are established.

Realization of the electrical connection

For establishing the electrical connections and terminals, it is obligatory to follow the circuit diagram included in the delivery.

All internal connections have to be made in order to prepare the inverter for the external AC and DC connections.

5.1 Internal Connections

For the internal electric connection of the two cabinets, the following internal connections have to be made:

- Power cabling between sine filter and transformer (not for the HE version)
- HE version: Power cabling between sine filter and power unit
- Sunny Central 250HE: Power cabling between sine filter and EMV filter
- Grounding connection between AC cabinet and DC / inverter cabinet
- Control line at the transfer terminal strip
- Communication between Sunny Central Control and power unit in DC / inverter cabinet
- Communication between Sunny Central and insulation monitoring
- Mounting of temperature sensor
- Power cabling Team concept (optional)
- Team communication RS485 (optional)
- Team control (optional)
- EVR resistor (optional)

Mounting the internal connections

The internal connections are to a great extent pre-mounted and must finally be inserted or screwed into the cabinets when putting together.

5.1.1 Power cabling between sine filter and transformer

At the sine filter choke in the DC / inverter cabinet, three power cables (U1, V1, W1) are connected; in the AC cabinet, they have to be connected to the appropriately marked terminal clamps (U1, V1, W1) of the transformer. The cables have already been equipped with cable lugs and cut in a way that the connection to the contact tip is clear. The sine filter is located in the Sunny Centrals of the types 100LV, 125LV, 150, 200 and 250 behind the fuses of the DC / inverter cabinet.

The transformer is located in these Sunny Central behind the front mounting plate of the AC cabinet. In the Sunny Central 350, the sine filter is located under the power units in the DC / inverter cabinet and the transformer is located in the lower area of the AC cabinet.

ATTENTION!

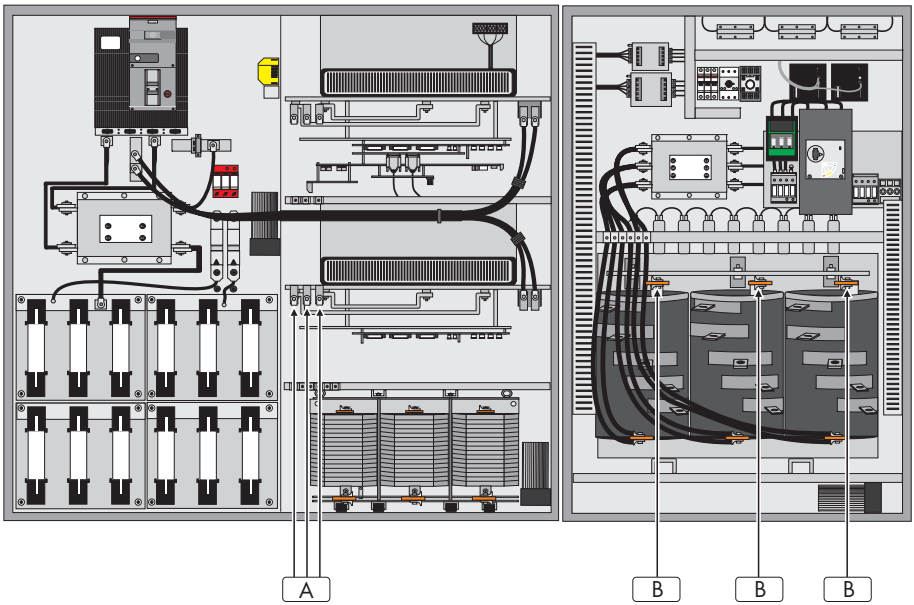
Operational reduction of the Sunny Central through faulty connection!

When connecting the power cables, be absolutely sure that the sensor cables are connected to the respective connection tips.

The following connection order has to be observed:

1. Connection tip transformer with inserted screws
2. Cable lug power cable
3. Cable lug measurement cable
4. Detent edged ring
5. Nut

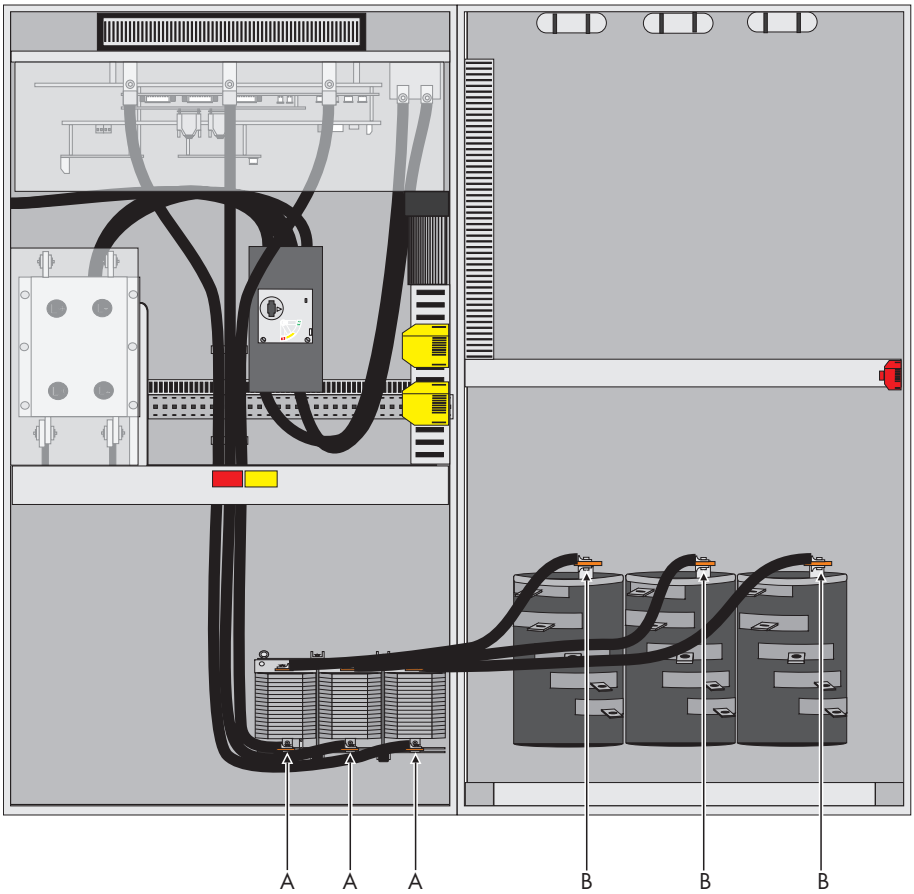
Connection points U, V, W for power cable in the Sunny Central 350



A Terminal lugs Sine filter choke (DC / inverter cabinet)

B Terminal lugs Transformer (AC cabinet)

Connection points U, V, W for power cable in the Sunny Central 150



A Terminal lugs Sine filter choke (DC / inverter cabinet)

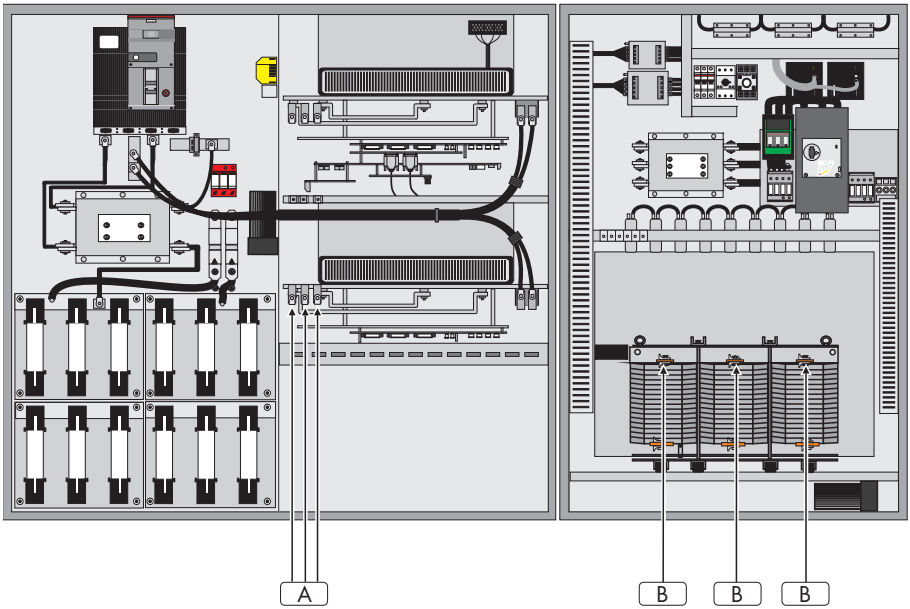
B Terminal lugs Transformer (AC cabinet)

5.1.2 HE version: Power cable connection

Sunny Central 200HE / Sunny Central 250HE / Sunny Central 350HE

At the inverter bridge in the DC / inverter cabinet, three power cables (U1, V1, W1) per power unit are connected; in the AC cabinet, they have to be connected to the corresponding marked terminal clamps (U1, V1, W1) of the sine filter choke. The cables have already been equipped with cable lugs and cut in a way that the connection to the contact tip is clear.

Connection Sine filter choke in the AC cabinet Sunny Central 350HE



A Terminal lugs Power unit

B Terminal lugs Sine filter

Sunny Central 500HE / Sunny Central 560HE

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

The delivered Radox cables have different lengths for the left-hand and right-hand systems. With the help of the circuit diagram for the appropriate Sunny Central, attach the cables.

According to the provided circuit diagram, one power unit per phase is connected to the sine filter choke with 3 x 1 x 185 mm². The appropriate connection screws are to be found at the connection points.

ATTENTION!

Operational reduction of the Sunny Central through faulty connection!

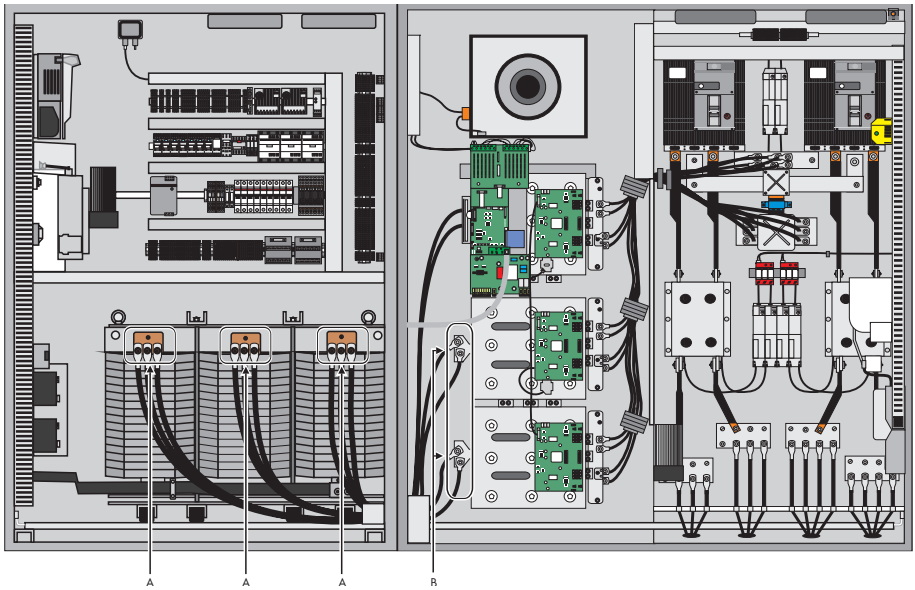
When connecting the power cables, the following connection order has to be observed (viewed from the front):

1. Screw
2. Washer
3. Cable lug
4. Connection point sine filter or power unit
5. Cable lug
6. Washer
7. Detent edged ring
8. Nut

Procedure for power cabling:

1. The lower power unit has to be connected first, then the middle one and finally the top one.
2. The power cables with the delivered cable clamps have to be clamped into the corresponding cable clamp rail.
3. Feed the cables through the opened side wall above the cabinet bottom plates, reinsert them in the area of the AC cabinet and connect to the sine filter choke.

The following figure shows the terminal lugs at the three power units in the DC / inverter cabinet and the connection of the power cables to the sine filter in the AC cabinet of the Sunny Central 500HE / Sunny Central 560HE.



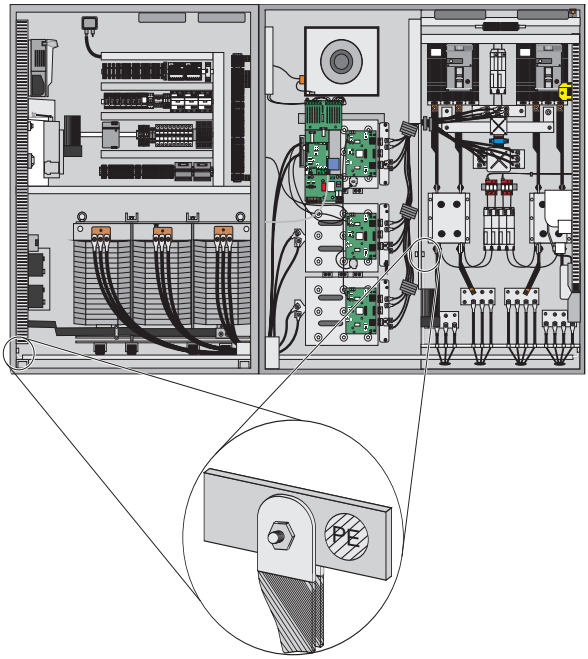
A Terminal lugs Sine filter choke

B Terminal lugs Power unit

5.1.3 PE connection between AC cabinet and DC / inverter cabinet

The PE rails for the individual switch cabinets are located at the bottom of the side areas. The two PE rails with the prefabricated PE bridge which is already connected in a switch cabinet must be connected together when putting together both inverters.

Example PE connection between the switch cabinets of the Sunny Central 500HE



Checking the grounding connection

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

Position of the PE rail

Depending on the construction, the exact position of the PE rail in some switch cabinets is located behind the fuse strip in the DC cabinet or behind the transformer in the AC cabinet. With the help of the equipment identifier and the provided circuit diagram, the exact position of the PE rail can be determined.

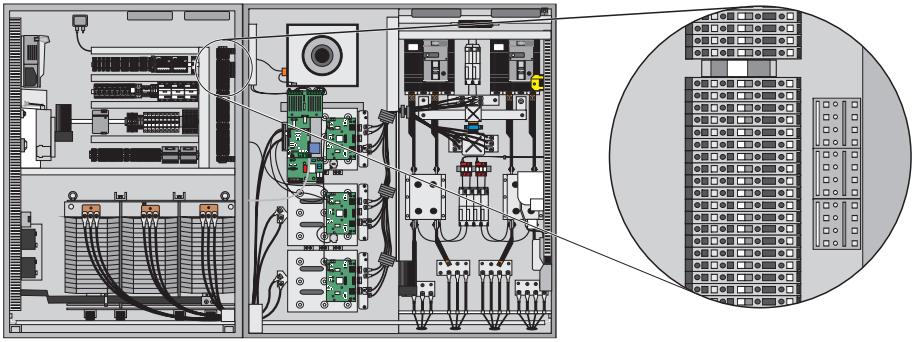
5.1.4 Control lines at the transfer terminal strip

Checking of the cabling

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

Most control lines, which have to be connected between the switch cabinets, are simply connected to the transfer terminal strips via plugs. The transfer terminal strips are located in the AC cabinet on the mounting plate facing the DC / inverter cabinet. The cable bundles to be connected are marked with target descriptions.

Example transfer terminal strip between the switch cabinets of the Sunny Central 500HE



Position of the transfer terminal strips

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

5.1.5 Connecting Sunny Central Control to power unit

Attention!

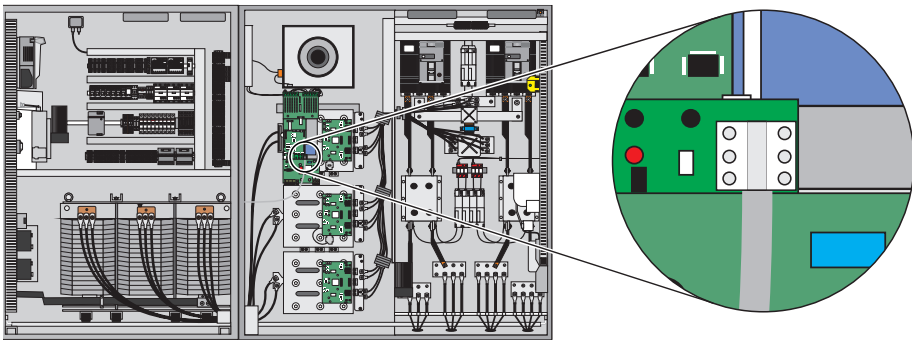
Damage to the cabling through faulty installation

- The cables must neither be laid in the cable channel, nor parallel to the power cables (EMV).
- In the switch cabinet, the cables have to be laid freely.
- Connect he plug-in contact carefully to the board.

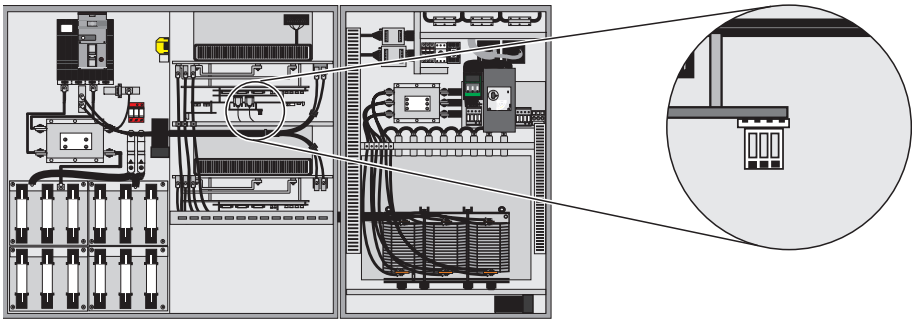
Connect the data line of the Sunny Central Control to the system control board at the power unit. For this, the cable has a 4-pole white plug-in contact which has to be plugged into the system control board. In most switch cabinets, the system control board and the control board (ADAPBFS) are positioned below the power units, hanging upside down. In the switch cabinets of the Sunny Centrals 500HE and 560HE, they are located on the top power unit.

The system control board communicates with the control 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 for data line Sunny Central 500HE / Sunny Central 560HE



Connection terminal for data line Sunny Central 350HE



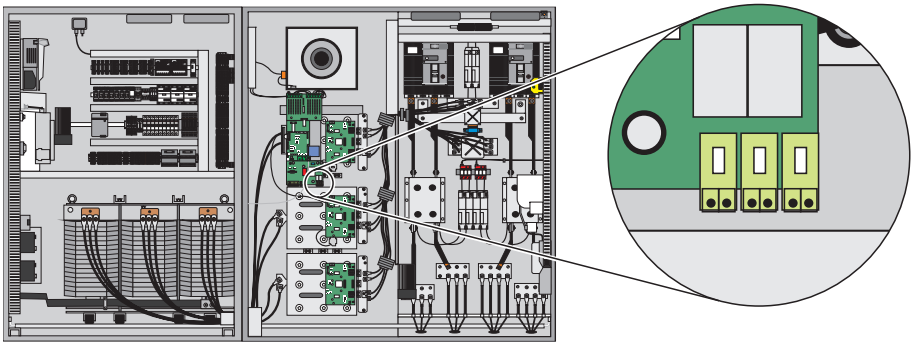
Position of connection terminal of data line

With the help of the equipment identifier and the provided circuit diagram, the exact position of the connection terminal can be determined.

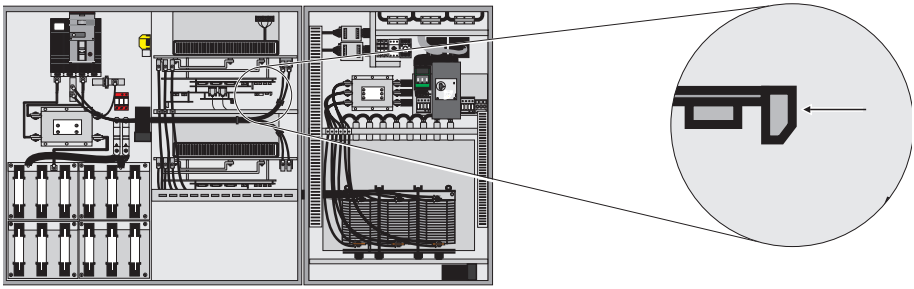
5.1.6 Internal control lines of the power unit

The X8 and X9 control lines coming from the AC cabinet are connected to the control board at the power unit. The control board is also located hanging upside down at the power unit. In the switch cabinets of the Sunny Centrals 500HE and 560HE, they are located on the top power unit. Both 2-pole green X8 and X9 plug-in contacts have to be fixed to the correspondingly marked sockets.

Connection of the internal control line with Sunny Central 500HE



Connection of the internal control line with Sunny Central 350HE



Position of the connection terminals in the control line

With the help of the equipment identifier and the provided circuit diagram, the exact position of the connection terminals can be determined.

5.1.7 Communication for insulation monitoring

Attention!

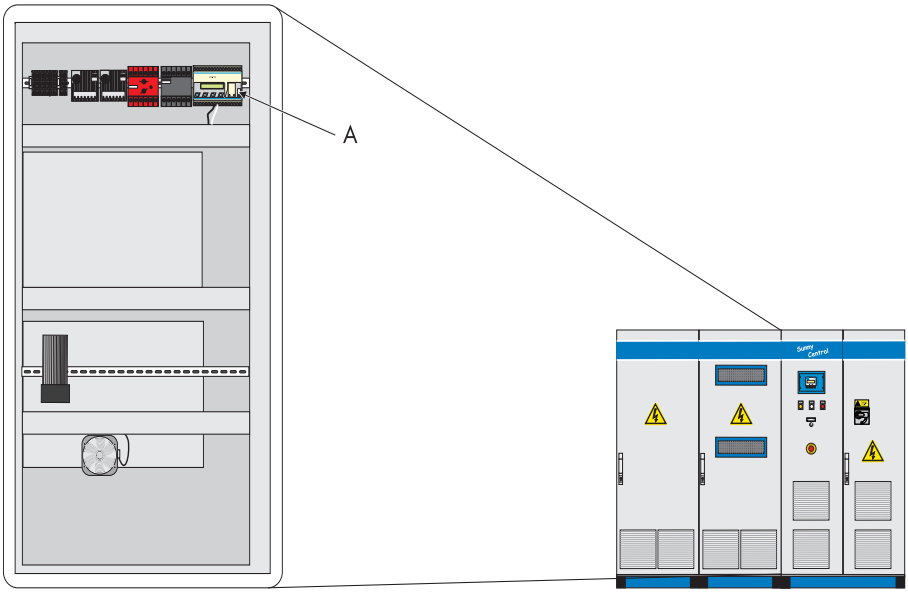
Damage to the cabling through faulty installation.

- Lay the connection cables in the cable channel.

The insulation monitoring is located in the DC cabinet. A 2-wire data line connects the Sunny Central Control with the insulation monitoring and has to be connected as follows:

- Connection: M (+) clamp insulation monitoring: brown wire
- Connection: M (-) clamp insulation monitoring: white wire

Insulation monitoring with connected data line (A) with Sunny Central 500HE and Sunny Central 560HE



Position of the connection terminal of the insulation monitoring

With the help of the equipment identifier and the provided circuit diagram, the exact position of the insulation monitoring can be determined.

5.1.8 Installing internal temperature sensor

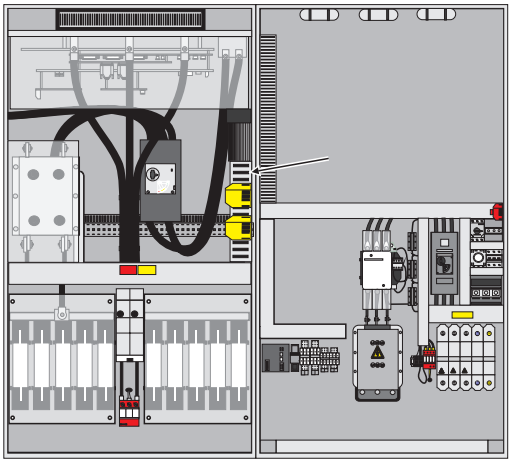
The measurement of the inside temperature of the switch cabinet is carried out by a temperature sensor. In the switch cabinets of the Sunny Central 350, Sunny Central 350HE, Sunny Central 500HE and Sunny Central 560HE, the temperature sensor is pre-mounted. In all other switch cabinets, the temperature sensor is located in the DC cabinet upon delivery of the inverters and has to be moved to and fixed into the AC cabinet when assembling the two switch cabinets.

The temperature sensor has to be fixed in the middle of the inverter. Appropriate retaining screws and a cable clamp are pre-mounted at the marked installation site.

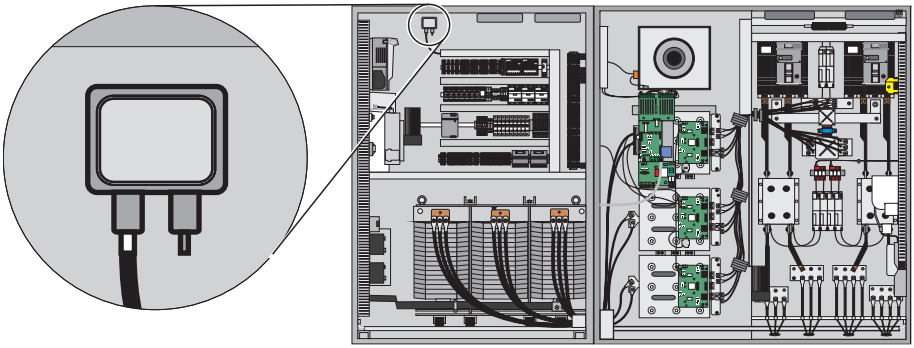
Fixing the sensor:

1. Open the housing of the temperature sensor.
2. The lower part has to be screwed slightly onto the inside construction.
3. Close the cover of the temperature sensor.

Mounting the temperature sensor in the DC cabinet of the Sunny Central 150. The temperature sensor has to be fixed to the right side panel in the DC cabinet.



Position of the temperature sensor in the AC cabinet of the Sunny Central 500HE and Sunny Central 560HE



5.1.9 Team cabling (optional)

Optionally, two Sunny Centrals can be interconnected in one concrete station or in another electrical operating room and together feed their power into the grid by means of a medium-voltage transformer.

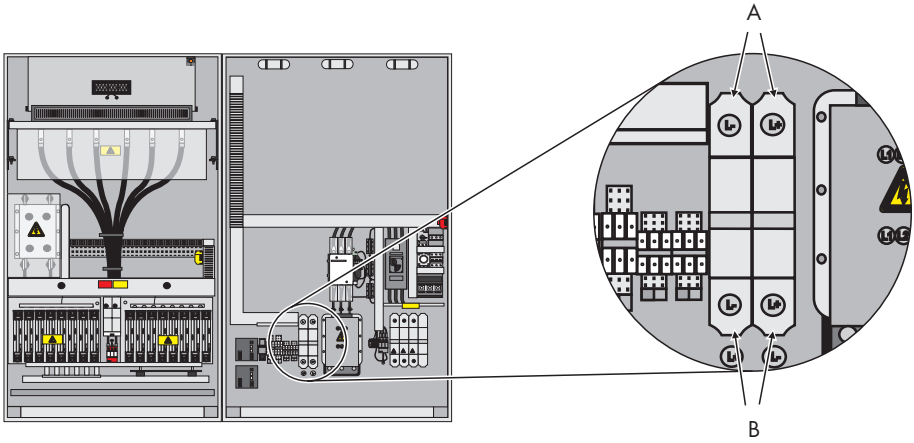
When using the team concept, the internal DC power connection of the team configuration has to be connected between the two cabinet components.

With the inverters Sunny Central 350HE, Sunny Central 500HE and Sunny Central 560HE this is already installed ex-works. The terminals of the team chief and the team member are different.

Team cabling of the team chief

With the team chief, two DC cables coming from the DC bus bar of the DC cabinet have to be connected to the input of the team clamps in the AC cabinet.

Team clamp for team cabling with team chief with Sunny Central 250HE



A Connection points for internal team cabling

B Connection points for external team cabling

Team cabling of the team member

ATTENTION!

Damage to the Sunny Central through incorrect cabling

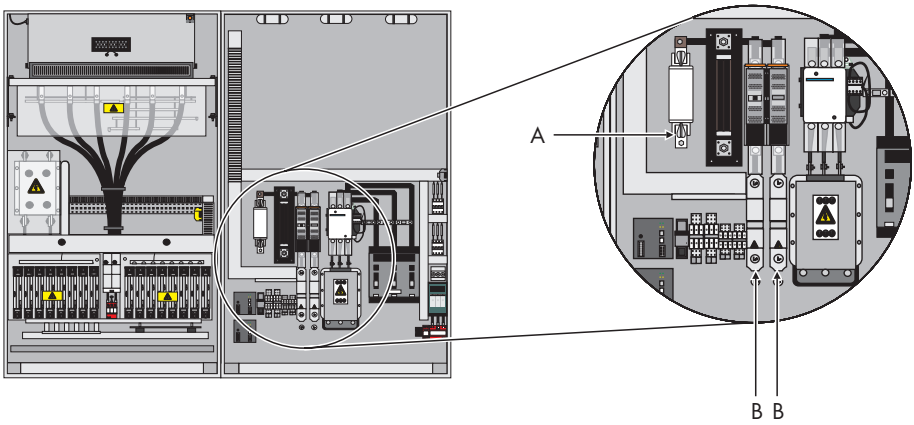
- When connecting the team cables at the team contactor, the labeling of the cables has to be observed.
- Check polarity of DC cables.

With the team member, the two DC cables for the internal team cabling coming from the DC bus bar of the DC cabinet are to be led to the connection points (Shunt and NH fuses) at the team contactor. The team contactor is located in the AC cabinet at the front mounting plate.

Checking of the cabling

When connecting the power cables, make sure that the screws are securely positioned.

Team contactor for team cabling with team member for Sunny Central 250HE



A Connection points for internal team cabling

B Connection points for external team cabling

External team connection

The external team cabling is described in chapter **5.2.8?„Team Power Cabling“ (64)**.

Position of the connection terminals of the team contacts

With the help of the equipment identifier and the provided circuit diagram, the exact position of the internal and external team contacts can be determined.

5.1.10 EVR Cabling (optional)

With the Sunny Centrals 350 and 500, the EVR resistor has to be mounted on top of the Sunny Central. Proceed as follows:

1. The EVR resistor between the rails has to be pushed onto the roof of the Sunny Central.
2. 9 screws at the protective bar of the EVR resistor have to be removed.
3. Protective bar has to be taken off to the front.
4. Connect the grounding cables in EVR resistor to the left side of the bolt (torque 21 Nm).
5. Fix the EVR resistor with both screws on the left and right side of the EVR resistor onto the rails.
6. Connect the power cables using the provided circuit diagram (torque 21 Nm).
7. Fix the protective bar with 9 screws onto the EVR resistor (torque 2.6 Nm).

☑ The EVR resistor is installed.

5.1.11 Sunny Central for installation near the sea (optional)

Optional package for Sunny Centrals in the case of installation near the sea. With this optional package, the Sunny Centrals are protected against salt mist and comply to the requirements of DIN EN 60721-3-3, class 3C2 "Environmental Conditions for Fixed Use,. Weather-protected". You can find further information in the separate documentation.

5.2 External Connections

ATTENTION!

Yield loss due to poor electrical conductivity!

The connection points for the external terminals are either copper or aluminum. If copper and aluminum are connected with each other at the connection point, the electrical conductivity decreases.

- Check which material is used at the connection point.
- When combining both materials, use either a copper-aluminum washer or copper-aluminum cable lugs.

For external electrical connection of the Sunny Centrals, the following connections have to be made:

- AC grid connection
- Connection PE rail with HE version
- AC control voltage
- DC connection
- Power cabling Team concept (optional)
- External messages and signals
- Sensors and digital outputs
- Communications connection
- Emergency-stop cabling
- Lightning / Surge protection

Making the external connections

Make the external connections with the help of the provided circuit diagram.

Dimensioning the connections

How to carry out the AC grid-connection point as well as the maximum inverter-specific connection cross-section and cable lugs are included in the installation requirements of the relevant Sunny Central.

5.2.1 AC grid-connection standard devices

WARNING!

Risk of death due to burns and electric shock when live parts of the low-voltage grid are touched!

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

The AC grid connection of the Sunny Central (except Sunny Central type HE) is 3-phased.

The Sunny Centrals are configured for the connection to a TN-C grid as standard.

Connection to TN-S or TT grid: Remove bridge between N and PE at the grid connection (see circuit diagram).

Connection to IT grid: An IT grid can be project-specifically realized. Contact the Sunny Central Service Line

The connection terminals are to be located in the AC switch cabinet in the lower area of the front mounting plate. The cable must be routed into the inverter from below, the connection of the AC cables are made using cable lugs.

Ensure the grid connection cable 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.

The cables are fed through the socket and the base of the cabinet.

1. Open the base plates (slideable plate) in the front of the cabinet and pull the cable into the inside of the cabinet.
2. For strain relief of the cables, fix the cable clamp rail with cable clips. The cable clips are included in the delivery.

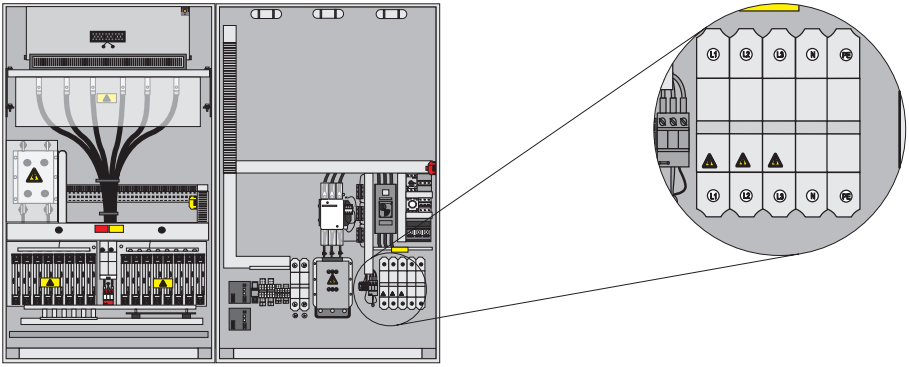
The connection terminals of the Sunny Central 350 are located in the upper area of the side panel of the AC switch cabinet. The cable must be routed through cable bolting in the roof of the AC switch cabinet, the AC cables are connected using cable lugs.

ATTENTION!

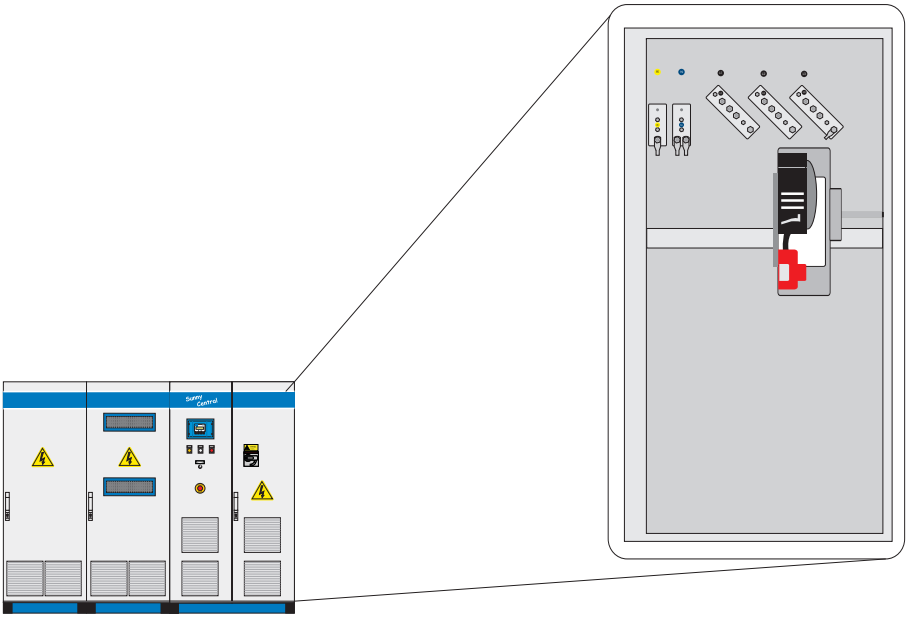
Damage to the Sunny Central due to faulty bolted connection at the AC connection.

- For strain relief of the AC connection, only use aluminum cable clips.
- Screw the AC cables at the connection point with the appropriate torque (see appendix).

View of the AC connection of the Sunny Central 250



View of the AC connection of the Sunny Central 350



Sealing the cable ports

To seal the slideable plates and the installed cables, install the seals included in the delivery.

Correct installation of the rotary field

The grid connection must be installed in such a way that a right-hand rotary field lies at the input of the cabinet. In case of incorrect connection, the Sunny Central issues a fault message.

Position of the AC connection terminals

Due to construction, the AC connection can vary. With the help of the equipment identifier and the provided circuit diagram, the exact position of the AC connection terminals can be determined.

5.2.2 AC grid connection of HE versions

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 or the public grid.
- All safety precaution measures regarding the public grid must be observed.
- Only work on this device when it is switched off and under voltage-free conditions.

The Sunny Central HE series is designed for grid connection through a medium-voltage transformer. The medium-voltage transformer is realized depending on the project. The form of grid connection of the inverter is IT grid. That means: the grid between the inverters and the medium-voltage transformer is not grounded. The connection is 3-phased with the following operating voltage:

V: nominal voltage **between the external conductor:** depending on the device type 270 V (315 V with Sunny Central 560)

Vo: Nominal voltage between external conductor and ground: 1000 V (depending on the current operation of the device)

ATTENTION!

High voltages in the IT grid.

Due to the IT grid, during inverter operation there are nominal voltages of up to 1000 V between the external conductor and ground.

- When choosing the AC cables, take into account the increased demands on the nominal voltage Vo against grounding.

The connection of one fuse load break switch in the AC cabinet of the inverter to the low voltage winding of a medium-voltage transformers is 3-phase.

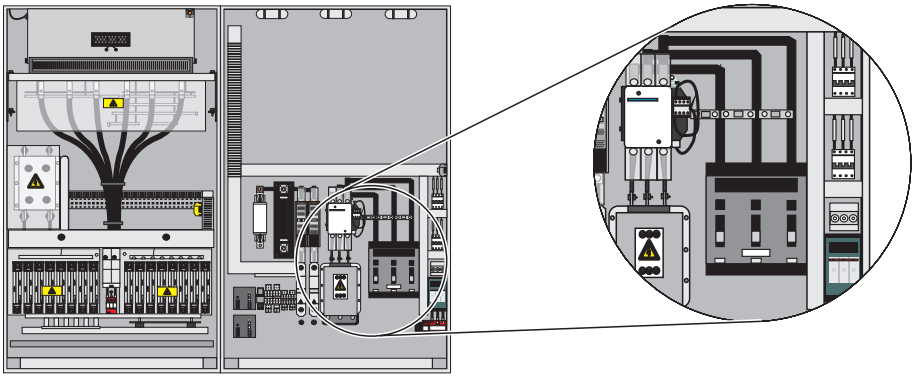
ATTENTION!

Damage to the Sunny Central through faulty AC connection.

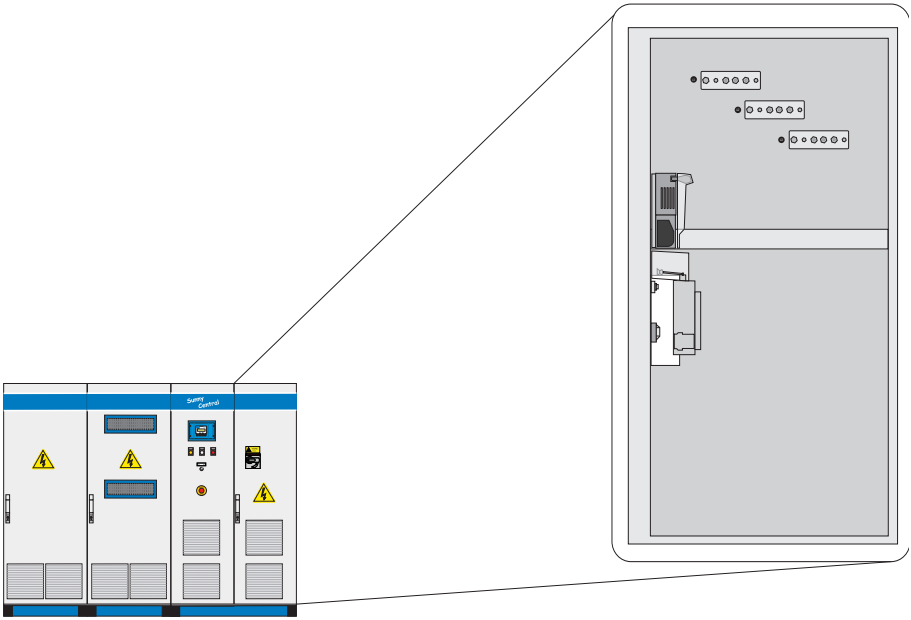
Dimensioning of the AC cables which have to be connected

- Lay the AC cables with a voltage resistance of minimum 1000 V.
- Lay the AC cables ground- and short-circuit proof.
- Only use aluminum cable clips (included in the delivery) for the cable clips of the AC connection.

AC grid connection for IT grid at the fuse switch disconnector in the AC cabinet Sunny Central 250HE, the cable must be routed into the inverter from below.



AC grid connection for IT grid to copper bus bar via fuse switch disconnector in the AC cabinet of the Sunny Central 350HE. Cables must be routed into the inverter from the top.



AC grid connection for IT grid to EriFlex bus bars outside the AC cabinet of the Sunny Central 500HE and 560HE

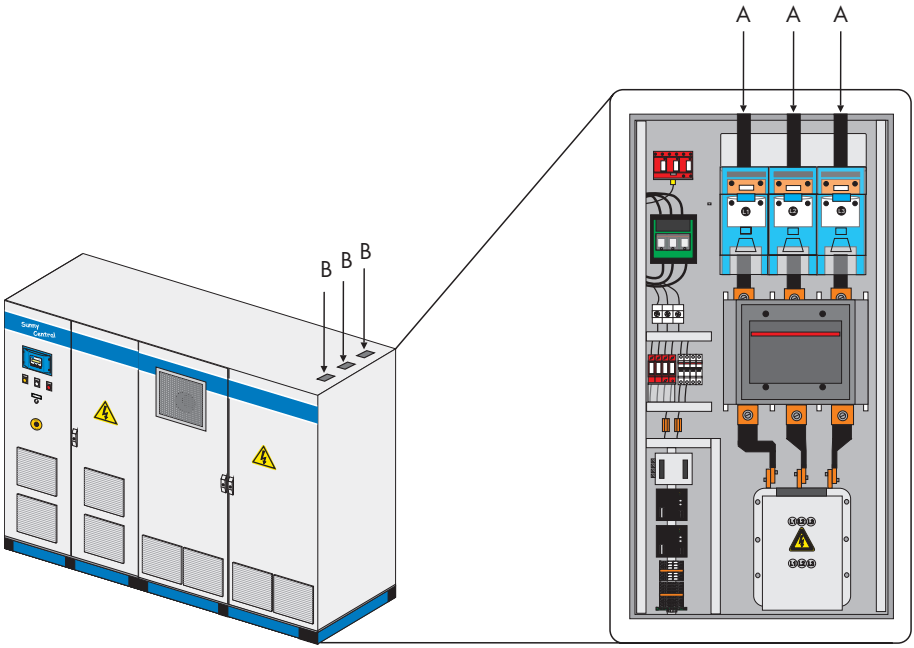
ATTENTION!

Operational reduction of the Sunny Central through faulty connection!

When connecting the power cables, the following connection order has to be observed (viewed from the front):

1. Screw
2. Washer
3. Cable lug
4. Connection EriFlex
5. Cable lug
6. Washer
7. Detent edged ring
8. Nut

1. EriFlex bus bars (included in the delivery) have to be inserted into the AC cabinet from the top.
2. Connect the EriFlex bus bars to the fuse switch disconnector in the AC cabinet.
3. Connect the AC cables from outside to the EriFlex bus bars.



A EriFlex bus bars in the Sunny Central

B Openings in the switch cabinet roof for the EriFlex bus bars

AC connection Sunny Central 500HE / Sunny Central 560HE

The AC connection of the Sunny Central of the types 500HE and 560HE must be made using the EriFlex bus bars that are included in the delivery.

5.2.3 AC grid connection with MV stations

WARNING!

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

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

The connection concept for two Sunny Central HE inverters is factory provided in the Sunny Central MV station. In the Sunny Central MV station, the AC connection is 3-phase to the high-voltage winding of a three winding power converter medium voltage transformer. The connection is made with male taper plug-in contacts not included in the delivery.

Grounding and short-circuiting of the MS transformer high-voltage side

- Grounding and short-circuiting of the MS transformer high-voltage side is made in the customer side upstream MS switching station.
- Grounding and short-circuiting of the MS transformer under-voltage side is made in the Sunny Central HE inverter on the AC fuse switch disconnector. The corresponding grounding and short-circuiting set can be ordered at SMA.
- This is connected to the grounding cable, then put into the fuse switch disconnector and closed.
- The grounding cable is located in the marked cable channel of the AC cabinet.

Optional grounding and short-circuiting set

The grounding and short-circuiting set can be ordered at SMA.

WARNING!

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

For service and maintenance work on the Sunny Central, disconnect the medium voltage transformer from the grid.

5.2.4 Connection PE rail with HE version

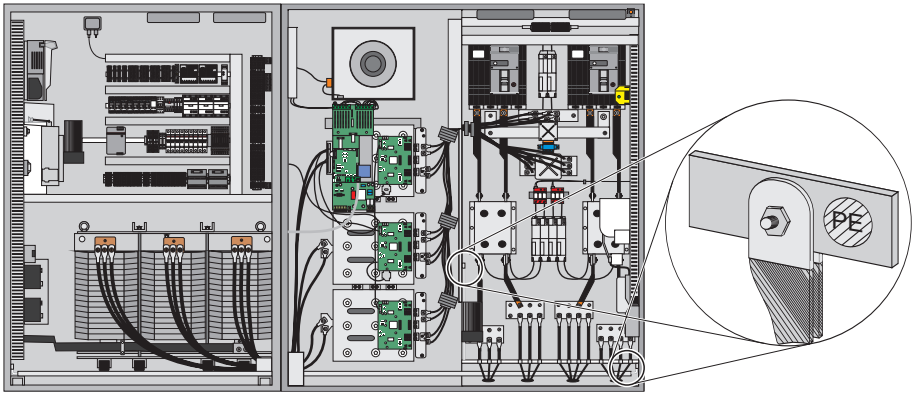
WARNING!

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 public grid or the low-voltage grid.
- All applicable safety regulations must be observed.
- Only work on this device when it is switched off and under voltage-free conditions.

In the Sunny Central 200HE, Sunny Central 250HE and Sunny Central 350HE, the PE rail in the AC cabinet has to be connected to the equipotential bonding of the installation site or the electrical operating room. In the Sunny Central 500HE and Sunny Central 560HE, connect both PE rails in the DC cabinet and in the inverter cabinet separately to the equipotential bonding or grounding.

Terminal for equipotential bonding in Sunny Central 500HE



Cable dimensioning of the PE connection

The PE connection for the equipotential bonding has to be carried out with at least 1 x 50 mm².

Position of the PE rail

Depending on the construction, the exact position of the PE rail in some switch cabinets is located behind the fuse strip in the DC cabinet or behind the transformer in the AC cabinet. With the help of the equipment identifier and the provided circuit diagram, the exact position of the PE rail can be determined.

5.2.5 AC control voltage

WARNING!

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

- Only work on this device when it is switched off and under voltage-free conditions.

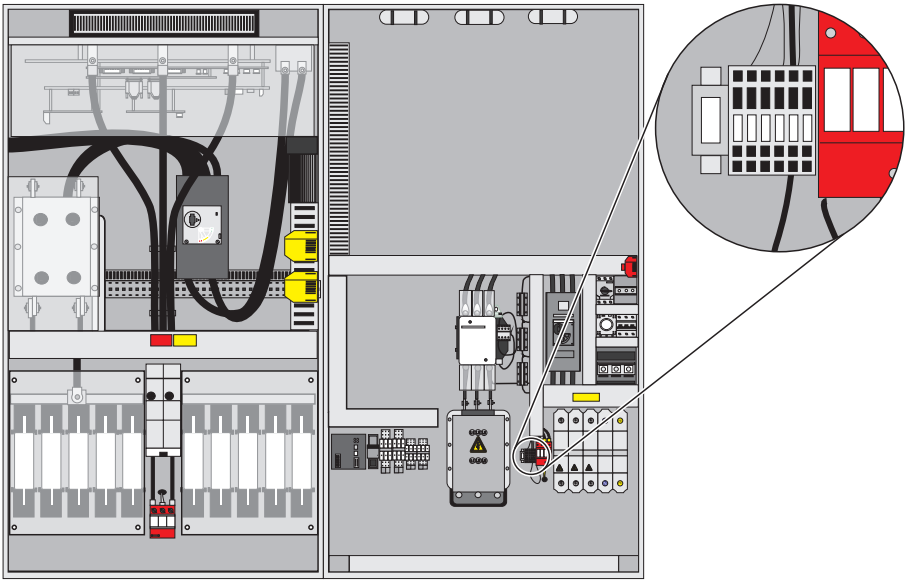
The energy required for driving the Sunny Central is provided by an external control voltage supply source. As standard, The form of grid connection of the control voltage supply source is TN-S grid. The connection in the Sunny Central inverters of the type 100LV, 125LV, 150, 200 and 200HE is single-phase. For all other Sunny Centrals it is three phase. The connection is made via a separate cable.

Realization of the external control voltage

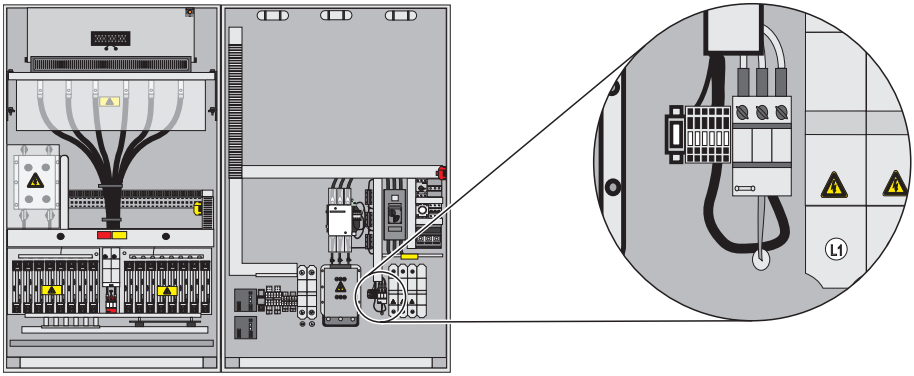
When connecting the external control voltage, it is obligatory to follow the circuit diagram included in the delivery.

As an option, the power required for driving the internal circuits of the Sunny Central 230 / 400 V (except HE version) can be taken internally from the grid-feed-in line of the inverter. This reduces the feed-in energy yields by the amount of power required by the inverter itself (fans, heating etc.). To realize this, the connection terminals of the AC control voltage have to be bridged according to the circuit diagram.

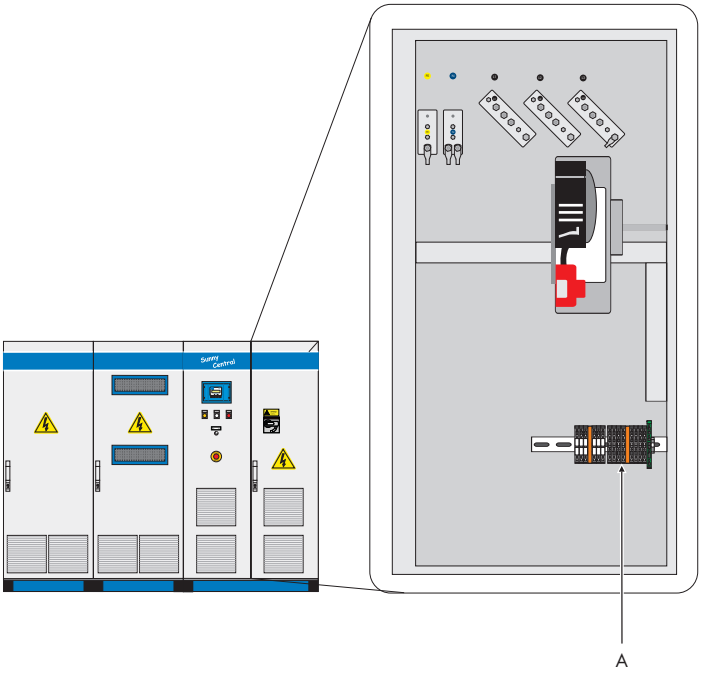
Connection terminal for control voltage in the Sunny Central 150



Connection terminal for control voltage in the Sunny Central 250



Connection terminal for control voltage in the Sunny Central 350



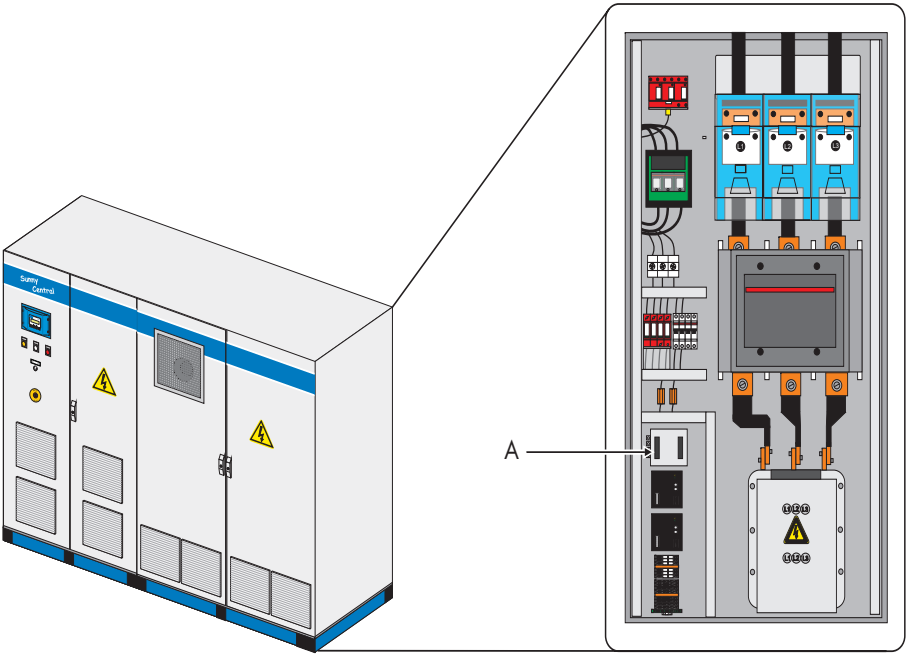
A Connection terminal for control voltage (Standard)

ATTENTION!

Realization of the external control voltage with Sunny Central 500HE and Sunny Central 560HE

As described in the circuit diagram, connect the cable of the external control voltage in the Sunny Central 500HE and Sunny Central 560HE directly to the EMV filter.

Connection terminal for control voltage (A) Sunny Central 500



Internal surge protectors

One internal surge protector is provided for the internal control voltage of the HE version.

Dimensioning of the auxiliary supply voltage

The auxiliary supply voltage required for the relevant Sunny Central is described in the installation requirements, can be ordered at SMA at any time and has to be observed for project planning and for preparing the installation site.

5.2.6 Handling the Connection Terminals Control voltage

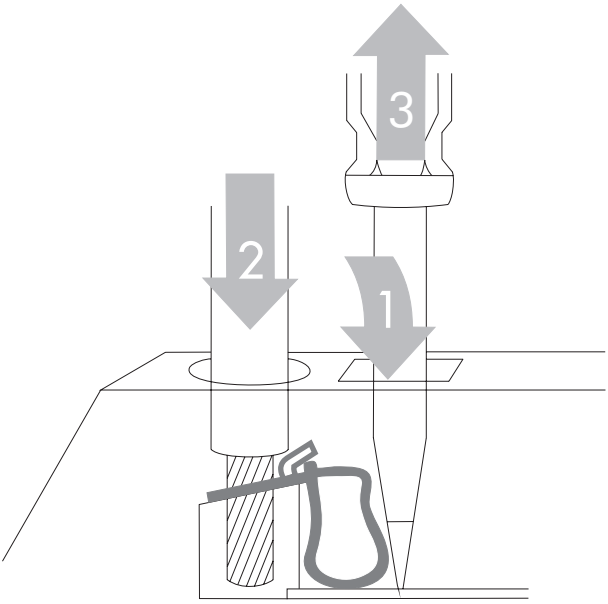
WARNING!
Risk of lethal electric shock!

High voltages are present in the device.

- Disconnect the Sunny Central.
- The connections should only be made under voltage-free conditions.

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 suitable size.

Handling the connection terminals (source: Wago)



5.2.7 DC connection

In the DC / inverter cabinet of the Sunny Central, there are NH fuses (except in the Sunny Central 500HE and Sunny Central 560HE) which allow string distribution boxes to be connected.

Number of the fused inputs in the Sunny Central

The number of fused DC inputs depends on the device type and is listed in the installation requirements.

ATTENTION!

Damage to the Sunny Central or PV generator through incorrect cabling.

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

ATTENTION!

Operational reduction through too low voltage capability!

Ensure that the DC cables are appropriately voltage-proof!

ATTENTION!

Operational reduction through poor sealing!

All cable insertions must be closed hermetically against the environment. This prevents the cooling air to be drawn past the air inlet filters.

The cables are fed through the socket and the base of the cabinet:

1. Open the base plates in the front of the cabinet and pull the cable into the inside of the cabinet.
2. For strain relief of the cables, fix the cable clamp rail with cable clips. The cable clips are included in the delivery.
3. The connection of the DC cables have to be made with cable lugs directly at the NH fuse holders.

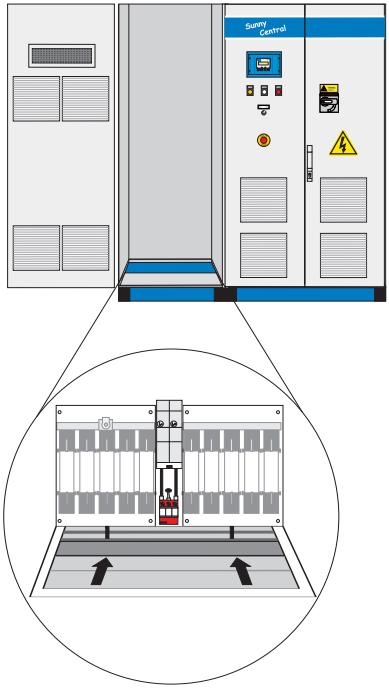
Dimensioning of the connection point

The layout of the connection point is described in the installation requirements.

The NH fuse holders are located in the lower area of the DC cabinet. Appropriate ring cable lugs have to be pressed onto the ends of the power cables.

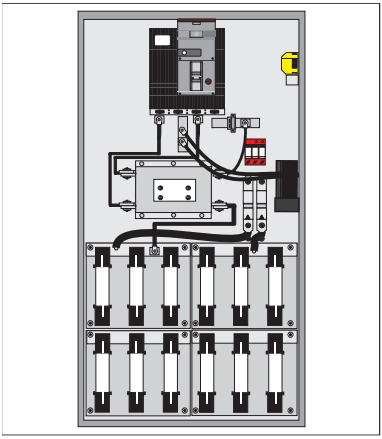
After all cables have been connected, the slideable plate with the adhesive seal tape can be re-inserted. The seal tape is included in the delivery and is to be stuck onto the front side of the slideable plates to seal the gap between the cables.

View of the slideable plates sheets in the DC cabinet Sunny Central 150



DC cabling Sunny Central 350 / Sunny Central 350HE

The DC input fuses in the inverter are usually arranged in one row. The DC fuses in the switch cabinets of the type Sunny Central 350 / Sunny Central 350HE are attached one behind the other and at different heights on two mounting plates. The special connection version of the DC fuses in the Sunny Central 350 / Sunny Central 350HE can be seen in the figure on the right.



ATTENTION!

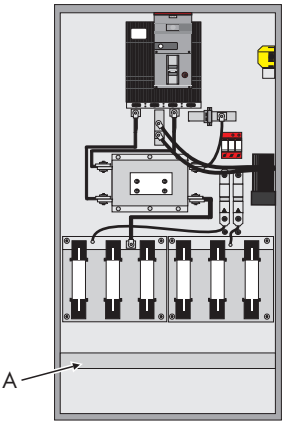
Possible damage to the cabling!

The rear cable clamp rail is installed behind the DC fuse unit located in the front.

Installation of the DC cabling:

1. For the installation of the DC cabling, the rear DC fuses must be installed first. Firstly, the front mounting plate with the DC protection unit on top must be completely dismantled. Now you can also see the concealed cable clamp rail (A).

   Right figure: View of the rear DC fuses on the mounting plate
2. Installation of DC cabling.
3. Install front mounting plate.
4. Install the remaining DC cabling.

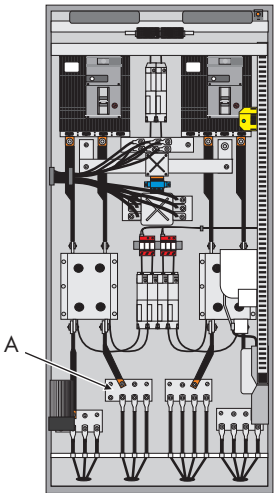


The inputs fused on the positive and negative sides are designed as NH fuses (except Sunny Central 500HE and Sunny Central 560HE) and are connected on the DC rails L+ and L-.

DC cabling Sunny Central 500HE / Sunny Central 560HE

In the Sunny Central inverter cabinets of the type 500HE and 560HE no DC input fuses are included. They are located outside the inverter in DC fuse collectors (Sunny Main Box), which are dimensioned dependent on the project. In the Sunny Main Box, the DC lines of the Sunny String boxes and the DC fuses are connected.

The DC main cables coming from the Sunny Main Box are connected to DC bus bars (A) in the Sunny Central.



5.2.8 Team Power Cabling

The required cables (Standard: 5m) for connecting the team cabling are included in the delivery.

In chapter 5.1.9 „Team cabling (optional)“ (44), the internal power cabling in the inverter is described for the team concept. To connect the inverters which are part of the team, the external team power cabling of the inverter has now to be carried out one under the other.

Realization of team cabling

When connecting the team configuration, it is obligatory to follow the circuit diagram included in the delivery.

ATTENTION!

Possible damage to the cabling!

The power cables of the team connection of the inverters must have a DC voltage resistance of a minimum of 1000 V DC and must be dimensioned for the maximum expected DC team current (at 100% nominal power).

The following table contains the corresponding information about DC team current.

Sunny Central	max. DC current [A] input	max. team current [A]	connection terminal WFF [mm²]
Sunny Central 100LV	430	224	185
Sunny Central 125LV	448	224	185
Sunny Central 150	354	177	185
Sunny Central 200	472	236	185
Sunny Central 250	591	296	185
Sunny Central 350	800	400	300
Sunny Central 500	2 x 591 (1182)	2 x 296	2 x 300
Sunny Central 560	2 x 591 (1182)	2 x 296	2 x 300

5.2.9 External messages and signals

Alongside the external team power cabling, appropriate signal and message connections between the team devices have to established.

Setting up the signal and message connections between both team devices.

When connecting the signal and message connections between both team devices, it is obligatory to follow the circuit diagram included in the delivery.

Overtemperature notification from the medium voltage transformer

Specific to the HE devices, it is possible to connect an overtemperature notification from the medium voltage transformer.

Remote deactivation unit

Special project-dependent installations can optionally be equipped with a remote deactivation unit in combination with the monitoring of the switching position.

When connecting the remote deactivation unit, it is obligatory to follow the circuit diagram included in the delivery.

5.2.10 Sensors and digital outputs

In the Sunny Central it is possible to connect a temperature sensor PT 100 and two further analog sensors (e.g. pyranometer, reference cell) to the Sunny Central Control panel. The corresponding connection customer-side possibilities are at the analog inputs Ain 3, Ain 4 and Ain 8. Further information about the connection and parameterization of analog sensors is contained in the Sunny Central user manual.

Assignment of analog and digital signals with Sunny Central Control

When connecting the analog sensors and for the digital signals, it is obligatory to follow the provided circuit diagram. The connection is made at the connection terminals. The connection for the four-conductor and two-conductor sensor has to be considered and if necessary essential measuring transformers have to be installed.

5.2.11 Shield Contact Handling Instructions

The external signal and bus cables must be shielded. The shield must contact the shield rail provided for this purpose, over a large surface area. The contact is made with the shield clamps included in the delivery.

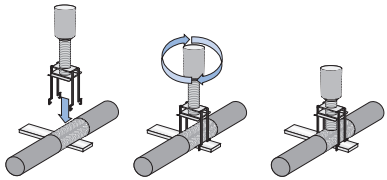
ATTENTION!

Damage of the shield clamps through incorrect handling

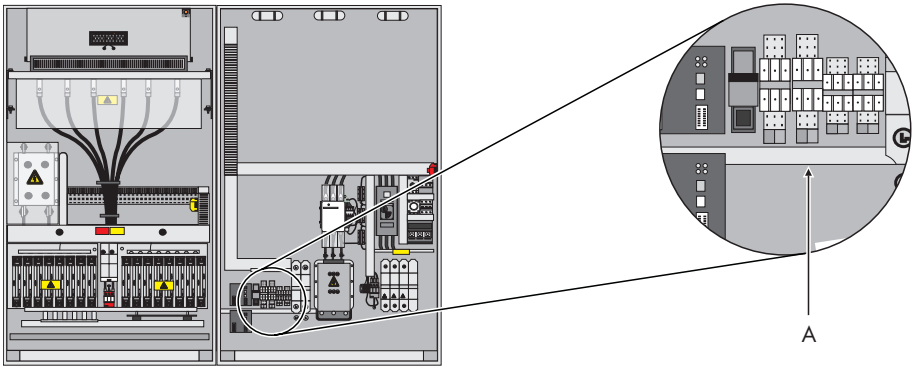
The shield clamps must only be tightened by hand and not through the use a of screwdriver.

Tightening the clamps with the use of a screwdriver can damage the cable insulation.

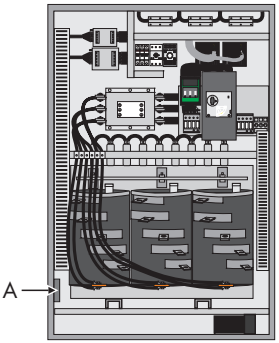
The correct handling of the shield clamps is shown in the figure on the right.



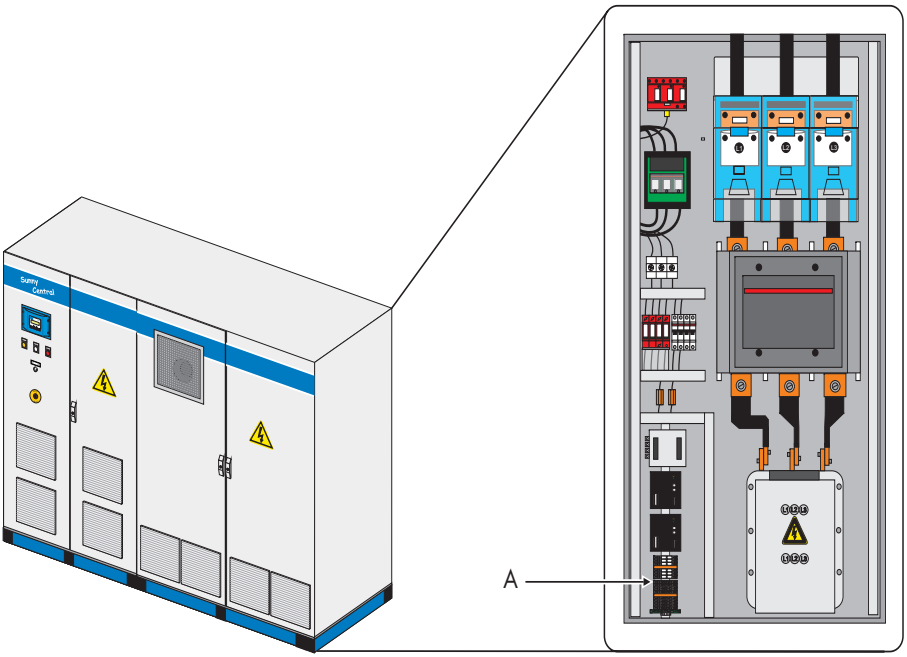
Shield rail (A) in the area of the external connection terminals in the Sunny Central 250



Shield rail (A) in the area of external connection terminals in the Sunny Central 350 AC cabinet on the left side panel



Shield rail (A) in the area of the external connection terminals in the Sunny Central 500HE and Sunny Central 560HE



5.2.12 Serial Interfaces

NET Interface

For communication with the Sunny Central Control for data transmission to a PC, modem or Sunny WebBox, the NET interface has to be used.

Position of the NET interface

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

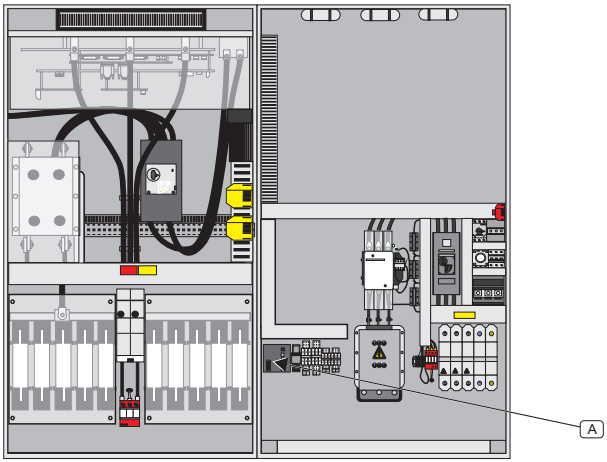
RS485 Data cable

The communication between the Sunny Central Control and the Sunny String Monitors (integrated string current monitoring) is conducted via a RS485 data line, on 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 components in the Sunny Central.

Position of the HUB

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

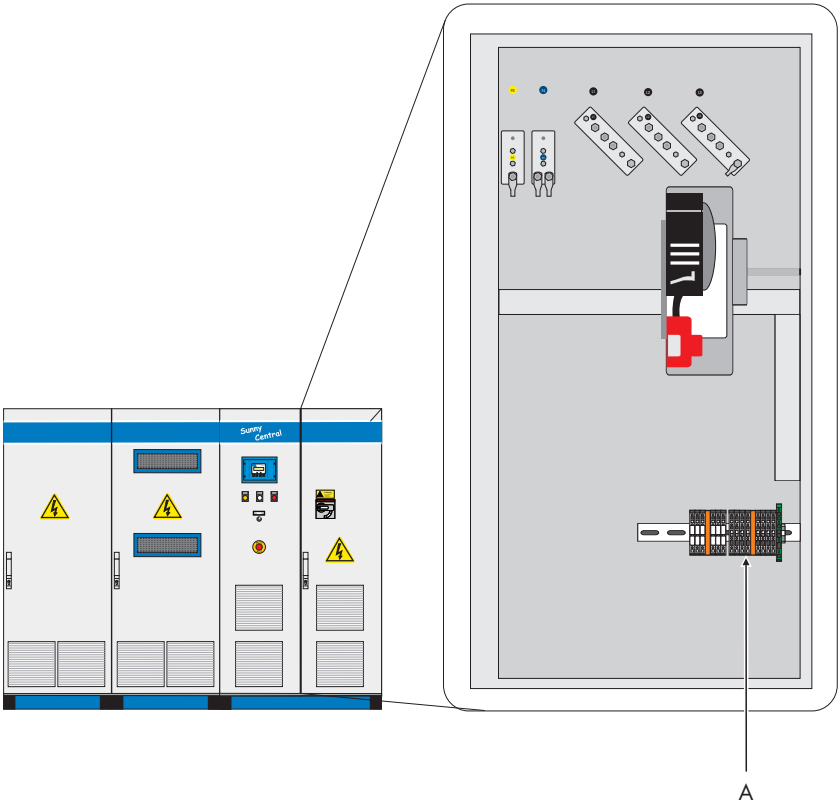
Connection of the RS485 data line in the Sunny Control 150



A RS485 HUB and NET interface

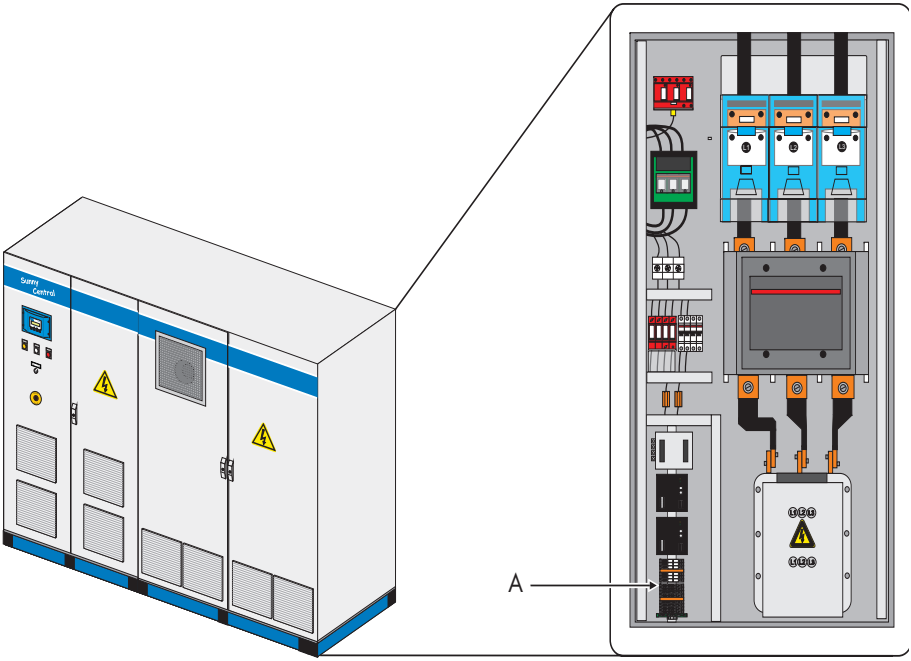
Connection of the RS485 data line in the Sunny Central 350 (Standard)

In the Sunny Central 350 (Standard), the HUB is located at an inconvenient position. For this reason, the terminals of the HUB are diverted to clamps (see figure below).



A Connection: RS485 bus for the string current monitoring

Connection of the RS485 data line in the Sunny Central 500HE / Sunny Central 560HE



A Connection: RS485 bus for the string current monitoring

Position of the HUB components

The exact position of the HUB components 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.

Connection of the data line with team function

In PV systems with inverters in team configuration, the communication between both Sunny Central Controls takes place in addition via the COM1 port.

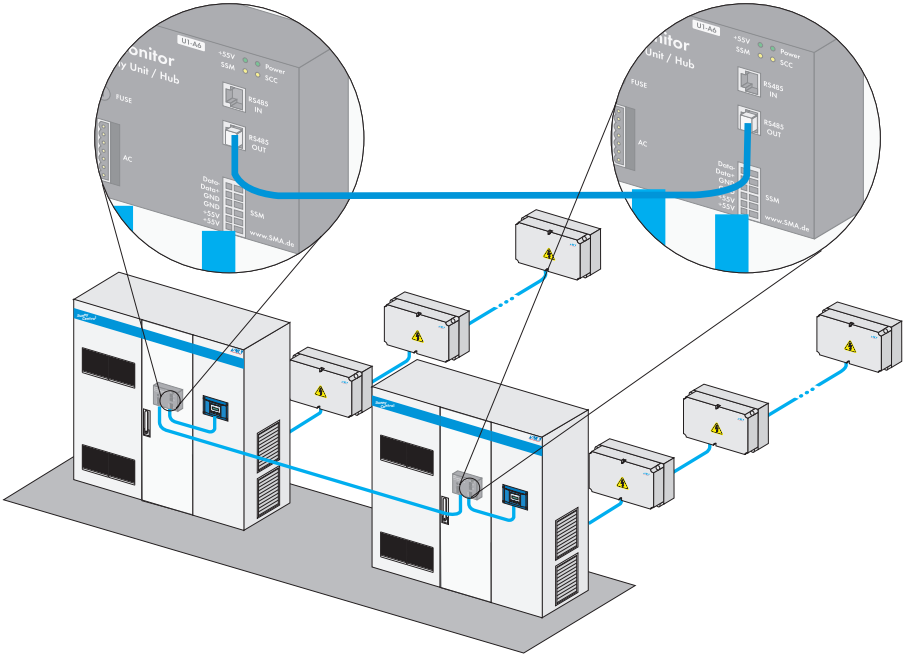
If using a Team configuration, termination is made in the Sunny Central Control. In Team systems, the Sunny Central Controls are preterminated at the factory.

Termination in the Sunny Central Control

If using a Team configuration, remove the jumper at the hub (RS485 OUT) and replace it with the CAT5 cable provided. Termination then takes place in the Sunny Central Control.

View of a team configuration of the RS485 data line

Connect the hubs of both Sunny Centrals in the Team with the CAT5 cable provided.



Technical description of the Sunny String Monitor

The provided documentation of the Sunny String Monitors contains a detailed description of the installation of the integrated string current monitoring.

5.2.13 Emergency-stop cabling

The Sunny Central is equipped ex-works with an internal emergency-stop switch. If an external emergency-stop is desired, it can be connected to terminal 2 and 3 of the terminal strips Z3-X3.

Connection of 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. For this, the bridge between terminal 2 and 3 has to be removed.

Emergency-stop chain

In the case that several Sunny Centrals are in operation in one installation, all of them have to be switched off when the emergency-stop switch is activated by one inverter (creation of an emergency-stop chain). For this all Sunny Central emergency-stop switches are connected in series.

ATTENTION!

Damage to the Sunny Central through missing emergency-stop function.

In installations with more than one inverter, the emergency shut-off circuits of the existing devices have to be connected with each other and be tested for correct functionality.

The emergency-stop chain may only be supplied with voltage from a single Sunny Central.

5.2.14 Surge protection

Position of the surge protectors

The exact position of the surge protectors varies according to the Sunny Central. With the help of the equipment identifier and the provided circuit diagram, the exact position of the surge protector can be determined.

6 Commissioning

Any warranty or guarantee claims are only valid when the commissioning gas been carried out by SMA or when the "Commissioning report for Sunny Central systems" provided by SMA is complete, signed and accessible to SMA.

Before commissioning, all work performed on the device should be thoroughly checked. In particular, the voltages on the DC and AC sides should be checked for conformance to the limits allowed on the inverter and polarity.

6.1 Requirements for commissioning

Before commissioning, the following requirements have to be filled for correct commissioning of the Sunny Central in accordance with the regulations.

The PV generator must be constructed and tested in accordance with VDE 0100 part 610 BGV A2 "Electrical Systems and Appliances". The grounding resistance is decisive for the safety of the complete system and must therefore be determined before initial commissioning.

Circuit breaker and motor overload switch

In the delivered state, all circuit beakers and motor overload switches in the Sunny Central are switched off.

6.2 Cabling Checks

When performing the cabling checks, the connections made between the switch cabinet units are first checked for correctness and proper installation.

In particular the following points must be checked:

- Correct order and tight mounting of the plugs of the transfer terminal strip
- Tight fixation and correct phase series of the transformer or sine filter connections
- Correct connection of the data and control lines at the power unit
- Correct connection of the data line for insulation monitoring
- Mounting location of the internal temperature sensor
- Internal power cabling for the team concept
- Are the PE rails of the cabinet components connected with each other?

6.2.1 Cabling Check AC Grid Connection

- The connection made to the feed-in cables is 3-phase.
- A right-hand rotary field must lie at L1, L2, L3.
- Measuring and recording the amount of the AC voltage.
- Make sure that the terminals are securely positioned.

Equipotential bonding

The Sunny Central HE inverter is connected to the equipotential bonding of the mounting locations respectively of the operation room. Make sure that the terminals are securely positioned.

AC auxiliary power supply connection

Check the connection of the separate cable for the external AC auxiliary supply voltage.

- If the power required is supplied externally and in three phases, a right-hand rotary field has to lay here as well.

6.2.2 Cabling Check DC Power Connections

The DC power connections are made via the main DC cables to the inverter.

- The voltage on the individual DC main cables should be identical and must never exceed the maximum DC voltage of the inverter.
- Make sure that the terminals are securely positioned.

ATTENTION!

Damage of the central inverter through too high DC voltage

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

- VPV ≤ 1000 V for Sunny Central Standard / HE with EVR option
- VPV ≤ 880 V for Sunny Central Standard / HE
- VPV ≤ 650 V for Sunny Central LV

Check the polarity of the individual DC main cables.

Incorrect polarity in one of the DC main cables can also damage the PV generator.

Cabling checks Team-connection

- In the case that two Sunny Central inverters work in the team, check also the team terminals in the devices for polarity and secure position.
- The cables are connected via the DC main cables between the team clamp in the Sunny Central team chief and the team contactor clamp in the Sunny Central team member.

6.2.3 Cabling Check Serial Interfaces

Checking of the external communication and the string current monitoring

- Check the cabling of the connection of the data lines at the Sunny String Monitor HUB.
- Check the connection of the NET interface.

6.2.4 Emergency-stop cabling

Check the external emergency-stop switch and the emergency-stop chain.

6.2.5 Settings for thermostats and hygrostat

In the device, there are adjustable thermostats for the activation of the switch cabinet fans and the overtemperature disconnection. The heating is activated via an adjustable hygrostat. All thermostats and the hygrostat are pre-adjusted before delivery.

Check the setting of the thermostats and the hygrostats

Compare the settings with the information in the circuit diagram. In case of any deviation, set the values as shown in the circuit diagram.

6.3 Switch On

If all tests and measurements have been performed, and all measured values lie within the acceptable range, then the device can be switched on for the first time.

1. Press the DC fuses with the provided fuse carrier into the fuse holder (for Sunny Central 500HE and 560HE these are to be found in the external Sunny Main Box).
2. Switch on all circuit breakers and motor overload switches in the Sunny Central inverter. The inverter is now completely connected on the AC and DC sides and can be switched on using the key switch.
3. Close all cabinet doors and turn the key switch to the right to the “Start” position.
4. The Sunny Central will now start automatically. First, the grid voltage and frequency parameters are checked. After approx. 20 seconds, the motorized DC breaker is activated automatically and connects the PV generator.

7 Appendix A: Transport instructions

Instructions for Transporting Sunny Central 100 LV to 560 HE inverters

WARNING!

Heavy weight of switch cabinet units!

Danger of tipping during transport!

- The cabinet units must always be transported in an upright position.
- The center of gravity of the Sunny Central is indicated on the outside of the packaging.

To avoid cases of damage, observe the following information on how to transport a Sunny Central:

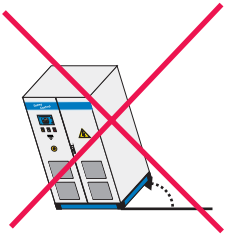
- The Sunny Central must not be re-loaded during transport. SMA Solar Technology AG has agreed on a general re-load prohibition with all its freight forwarders.
- All Sunny Centrals are labeled on the front and rear sides with the international center of gravity symbol.
- Observe all information concerning the transport of the Sunny Central. These stipulate that the Sunny Centrals may only be transported by means of a forklift or pallet truck with the broadside (front or back side) of the Sunny Central facing the lifting gear. Lifting the device at the sides (left or right) is forbidden.
- For the transport by crane, use an appropriate crane fork which is suitable for the weight of the Sunny Central. The crane fork is run through the openings at the base.
- Transporting the device at the top by using eyelets is only permitted under certain conditions. Read chapter „Overview of transport possibilities of the individual cabinets.“ (79) to know which Sunny Central may be transported using eyelets.

  An appropriate crane rack has to be mounted which guarantees a symmetrical loading of all four eyelets and ensures the lifting of the single cabinet component under a cable control angle of 90°.
- When transporting the Sunny Central, only use the original SMA or cabinet manufacturer eyelets. The eyelets are not included in the delivery, you can order these from SMA Solar Technology.
- All Sunny Centrals are delivered on high-quality pallets.
- The Sunny Central must not be tilted during transport.
- Only individual cabinet units can be transported.

7.1 Overview of transport possibilities

FORBIDDEN

"Tilting"

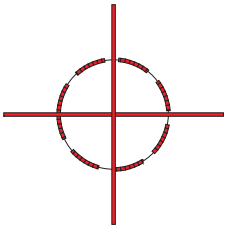


"suspending from eyelets"

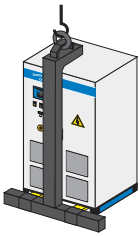
"loading from the side"

PERMITTED AND MUST BE OBSERVED

Center of gravity marking



"crane fork"



with "forklift/pallet truck"

Transport using a fork lift

All Sunny Centrals may be transported with a forklift.

Transport using a crane fork

All Sunny Centrals may be transported with a crane fork.

Transport using eyelets

Single cabinets are securely transported with eyelets and a crane rack. The transport eyelets are not included in the delivery. On request, you can order them free of charge.

In case of symmetrical load, the following admissible total loads are valid:

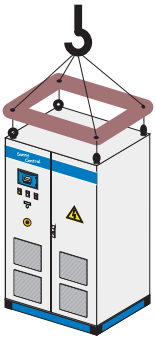
- with 45° cable control angle 4800 N,
- with 60° cable control angle 6400 N,
- with 90° cable control angle 13600 N

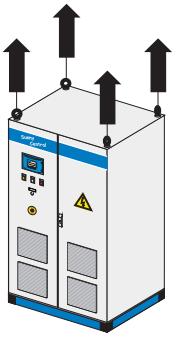
Transport eyelet PS 4568.000:

For the crane transport of a Sunny Central

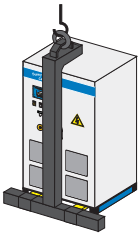
If not already included in the delivery, transport eyelets can be ordered free of charge at SMA Solar Technology AG.

Transport eyelets are only included in the delivery if ordered on request.





Overview of transport possibilities of the individual cabinets.

Inverter type	Transport using a fork lift 	Transport using a crane fork 	Transport using eyelets with crane rack 
Sunny Central 100 outdoor	yes	yes	no
Sunny Central 100 indoor	yes	yes	no
Sunny Central 100HE outdoor	yes	yes	no
Sunny Central 100HE indoor	yes	yes	no
Sunny Central 100LV	yes	yes	yes
Sunny Central 125 LV	yes	yes	yes
Sunny Central 150	yes	yes	yes
Sunny Central 200	yes	yes	yes
Sunny Central 200HE	yes	yes	yes
Sunny Central 250	yes	yes	no
Sunny Central 250HE	yes	yes	yes
Sunny Central 350	yes	yes	no
Sunny Central 350HE	yes	yes	yes
Sunny Central 500HE	yes	yes	no
Sunny Central 560HE	yes	yes	no

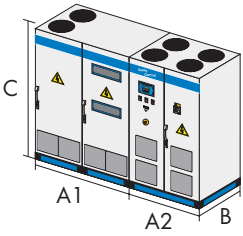
8 Contact

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

- Inverter type
- Type and number of modules connected
- Communication method
- Sunny Central Serial number
- Sunny Central failure or warning number
- Sunny Central display message

SMA Solar Technology AG
Sonnenallee 1
34266 Niestetal, Germany
Tel.: +49 (561) 95 22 - 299
Fax: +49 (561) 95 22 - 3299
SunnyCentral.Service@SMA.de
www.SMA.de

9 Appendix A - Mechanical data



9.1 Dimensions

Sunny Central	Length A1 (mm)	Length A2 (mm)	Width B (mm)	Height C (mm)
SC 100LV	800	1200	800	2100
SC 125LV	800	1200	800	2100
SC 150 Standard	800	1200	800	2100
SC 200 Standard	800	1200	800	2100
SC 200HE	800	1200	800	2100
SC 250 Standard	1200	1200	800	2100
SC 250HE	1200	1200	800	2100
SC 350 Standard	1600	1200	800	2100
SC 350HE	1600	1200	800	2100
SC 500HE	1600	1200	800	2100
SC 560HE	1600	1200	800	2100

A1: DC/inverter cabinet

A2: AC cabinet

9.2 Weight

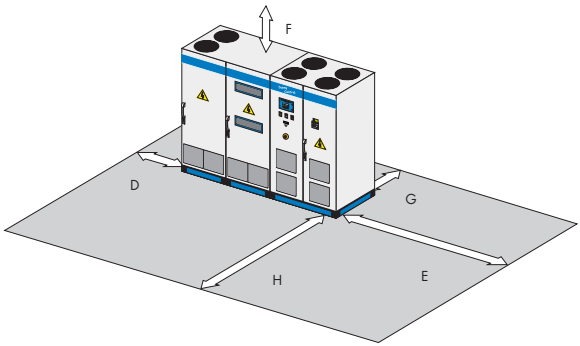
Sunny Central	Weight A1 (kg)	Weight A2 (kg)	Total weight (kg)
SC 100LV	570	890	1460
SC 125LV	570	890	1460
SC 150 Standard	500	1000	1500
SC 200 Standard	500	1100	1600
SC 200HE	570	330	900
SC 250 Standard	760	1300	2060
SC 250HE	760	350	1110
SC 350 Standard	1100	1700	2800
SC 350HE	700	760	1460

Sunny Central	Weight A1 (kg)	Weight A2 (kg)	Total weight (kg)
SC 500HE	820	1320	2140
SC 560HE	820	1320	2140

A1: DC/inverter cabinet

A2: AC cabinet

10 Appendix B - Minimum Clearance



Sunny Central	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)
SC 100LV	600*/ 100**	100	200	600*/ 50**	1100
SC 125LV air outlet (to the rear)	600*/ 100**	100	200	600*/ 50**	1100
SC 125LV air outlet (above)	100	100	400	10	1100
SC 150 Standard air outlet (to the rear)	600*/ 100**	100	200	600*/ 50**	1100
SC 150 Standard air outlet (above)	100	100	400	10	1100
SC 200 Standard air outlet (to the rear)	600*/ 100**	100	200	600*/ 50**	1100
SC 200 Standard air outlet (above)	100	100	400	10	1100
SC 200HE air outlet (to the rear)	600*/ 100**	100	200	600*/ 50**	1100
SC 200HE air outlet (above)	100	100	400	10	1100
SC 250 Standard air outlet (to the rear)	600*/ 100**	100	200	600*/ 50**	1100
SC 250 Standard air outlet (above)	100	100	400	10	1100

Sunny Central	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)
SC 250HE air outlet (to the rear)	600*/ 100**	100	200	600*/ 50**	1100
SC 250HE air outlet (above)	100	100	400	10	1100
SC 350 Standard	100**	100	400	50**	1100
SC 350HE	100**	100	400	50**	1100
SC 500HE	100**	100	400	50**	1100
SC 560HE	100**	100	400	50**	1100

* Distance to a closed building wall

** Distance to a building wall with air grills

11 Appendix C - Air volume

Sunny Central	DC cabinet m³/h	Inverter cabinet m³/h	AC cabinet m³/h	Total volume m³/h
SC 100LV	1300		2000	3300
SC 125LV	1300		2000	3300
SC 150 Standard	1300		2000	3300
SC 200 Standard	1300		2000	3300
SC 200HE	1300		1300	2600
SC 250 Standard	2200		2000	4200
SC 250HE	2200		1300	3500
SC 350 Standard	1300	2600	2600	6500
SC 350HE	1300	2600	1300	5200
SC 500HE	1300	3900	2600	7800
SC 560HE	1300	3900	2600	7800

12 Appendix D - Cable cross section and Torque

12.1 DC connection

Sunny Central	DC fuses		Max. cross section	Torque
SC 100LV	5	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 125LV	5	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 150 Standard	5	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 200 Standard	5	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 200HE	5	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 250 Standard	8	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 250HE	8	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 350 Standard	12	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 350HE	12	M10 [1	up to 240 mm², slim cable lug	30 - 35 Nm
SC 500HE	1 x Cu per pole	M12 [2	3 x 240 mm², slim cable lug per pole	74 Nm
SC 560HE	1 x Cu per pole	M12 [2	3 x 240 mm², slim cable lug per pole	74 Nm

[1 Screw at NH fuse holder

[2 Copper bus bar perforated

12.2 AC connection

Sunny Central	AC terminals		Max. cross section	Torque
SC 100LV	5 x WFF 185	M12 [3	up to 240 mm²	14 - 31 Nm
SC 125LV	5 x WFF 185	M12 [3	up to 240 mm²	14 - 31 Nm
SC 150 Standard	5 x WFF 185	M12 [3	up to 240 mm²	14 - 31 Nm
SC 200 Standard	5 x WFF 185	M12 [3	up to 240 mm²	14 - 31 Nm
SC 200HE	Isolator	M12 [4	up to 240 mm²	32 Nm
SC 250 Standard	5 x WFF 185	M12 [3	up to 240 mm²	14 - 31 Nm
SC 250HE	Isolator	M12 [4	up to 240 mm²	32 Nm
SC 350 Standard	3 x Cu	Cu M12 [2	3 x 240 mm² per phase	74 Nm
SC 350HE	3 x Cu	Cu M12 [2	3 x 240 mm² per phase	74 Nm
SC 500HE	Isolator	M16 [5	up to 300 mm²	210 Nm
SC 560HE	Isolator	M16 [5	up to 300 mm²	210 Nm

[1 Screw at NH fuse holder

[2 Copper bus bar perforated

[3 Bolt clamp

[4 Screw at fuse switch disconnector

[5 EriFlex bus bar perforated

Exclusion of liability

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- Operating the product in an unintended environment
- Operating the product whilst ignoring relevant, statutory safety regulations in the deployment location
- Ignoring safety warnings and instructions contained in all documents relevant to the product
- 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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