



Central Inverter
SUNNY CENTRAL 250U
Installation Guide



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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions for Sunny Central 250U PV inverter, that must be followed during installation and maintenance of the PV inverter.

The Sunny Central 250U is designed and tested according to international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the Sunny Central 250U. To reduce the risk of personal injury and to ensure the safe installation and operation of the Sunny Central 250U, you must carefully read and follow all instructions, cautions and warnings in this installation guide.

Warnings in this document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.



DANGER

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



WARNING

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



CAUTION

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

NOTICE

NOTICE is used to address practices not related to personal injury.

Other Symbols in this document

In addition to the safety and hazard symbols described on the previous pages, the following symbol is also used in this installation guide:



Information

This symbol accompanies notes that call attention to supplementary information that you must know and use to ensure optimal operation of the system.

Markings on this product

The following symbols are used as product markings with the following meanings.



Warning regarding dangerous voltage

The product works with high voltages. All work on the product must only be performed as described in its documentation.



Electric arc hazards

The product has large electrical potential differences between its conductors. Arc flashes can occur through air when high-voltage current flows. Do not work on the product during operation.



Beware of hot surface

The product can become hot during operation. Do not touch the product during operation.



Observe the operating instructions

Read the product's documentation before working on it. Follow all safety precautions and instructions as described in the documentation.



DC current



Earth Ground



AC current



UL1741 is the standard applied by Underwriters Laboratories to the Sunny Central 250U to certify that it meets the requirements of the *National Electrical Code*® and IEEE-929-2000. IEEE 929-2000 provides recommendations regarding the proper equipment and functionality necessary to ensure compatible operation when power generation is connected to the utility grid.

General Warnings



General Warnings

All electrical installations must be done in accordance with the local and *National Electrical Code*® ANSI/NFPA 70.

The Sunny Central 250U contains no user-serviceable parts except for the fans on the bottom of the enclosure and the filters behind the fans as well as the handle covers on the sides of the unit. For all repair and maintenance, always return the unit to an authorized SMA Service Center.

Before installing or using the Sunny Central 250U, read all of the instructions, cautions, and warnings on the Sunny Central 250U in this installation guide.

Before connecting the Sunny Central 250U to the electrical utility grid, contact the local utility company. This connection must be made only by qualified personnel.

Wiring of the Sunny Central 250U must be made by qualified personnel only.

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1 Notes on this Manual

This manual describes the installation and the commissioning of a Sunny Central 250U with 4 and 6 DC fuses. This manual does not cover any details concerning PV-modules. Information concerning the PV-modules is available from the manufacturer of the PV-modules.

1.1 Target Group

This manual is for the installer of a Sunny Central 250U. An installer is an electrician or technician that is trained to deal with the dangers and hazards involved in installing electric devices.

1.2 Validity

This manual is valid for the Sunny Central 250U with the date of manufacture 11/09 (November 2009) and later.

1.3 Syntax

In this document the Sunny Central 250U is referred to as "Sunny Central".

In this document SMA America Production, LLC is referred to in the following as SMA.

1.4 Structure of this Documentation

The Sunny Central's installation comprises several steps. Here we will describe the contents you will find in the sections of the installation instructions.

The instructions are divided into the following sections:

Section 2: Safety

In this section you will find general safety directions which you must observe throughout the entire installation process. Pay special attention to this section, so as to avoid personal and material damages.

Section 3: The Sunny Central

In this section you will see how to identify the Sunny Central. A short description of the Sunny Central's design and functions are given here.

Section 4: Unpacking

This section describes what to look out for upon receiving your Sunny Central, and who to turn to if your Sunny Central is damaged.

Section 5: Transport and Installation

This section shows you how to find the best installation site for your Sunny Central. It provides step-by-step instructions on how to transport and install the Sunny Central and connect the cabinets with each other electrically. Observe all safety precautions in this section to avoid material and personal damages.

Section 6: Attaching the Conduits

In this section you will learn where to insert the cables in the Sunny Central and where to punch the holes for the conduits.

Section 7: Connecting Optional Communication Devices

The Sunny Central can be equipped with different communication devices. This section explains how the communication devices in the Sunny Central are connected.

Section 8: Electrical Connection

This section describes how the Sunny Central is connected to the grid and to the PV modules, and what precautions must be observed in order to avoid material and personal damages. It provides information on the necessary cable sizes and the magnitude of the torque for the cable connection.

Section 9: Commissioning

This section explains, step-by-step, how to put the Sunny Central into operation, and how you can determine that the commissioning was successful.

Section 10: Opening the Sunny Central

This section describes how to open the Sunny Central and what precautions must be observed in order to avoid personal damages.

Section 11: Parameter

This section provides an overview of the parameters of the Sunny Central and their respective threshold values.

Section 12: Technical Data

In this section you will find the technical data for the Sunny Central's operation, the norms to which it conforms and the required cables and torques.

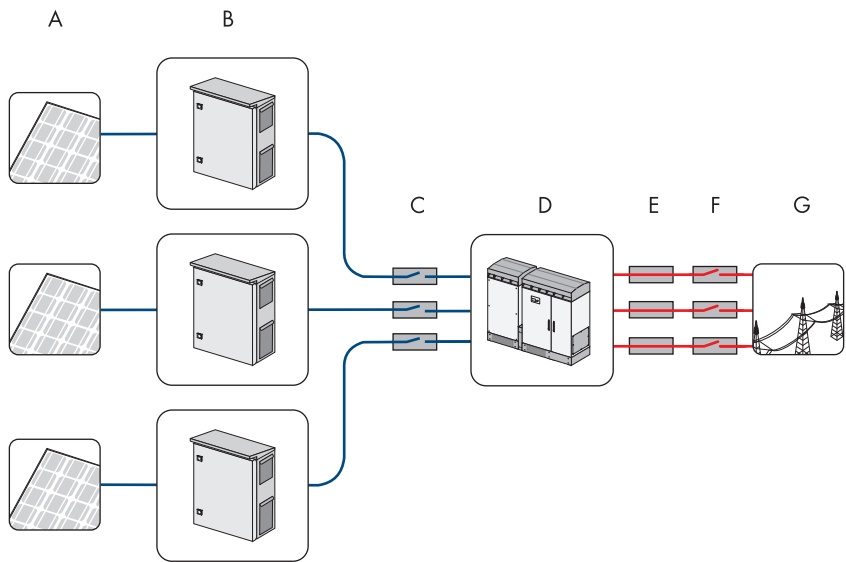
2 Safety

In this section you will find general safety directions which you must observe throughout the entire installation process. Pay special attention to this section, so as to avoid personal and material damages.

2.1 Appropriate Usage

The Sunny Central is a PV-inverter that converts the DC energy from PV-modules to AC energy. This energy is fed to the public grid afterwards. The Sunny Central 250U is designed for indoor and outdoor installation.

Principle of a PV-Power System with a Sunny Central



Position	Name
A	PV-modules
B	DC distribution with DC fuses (e.g., Sunny Central String-Monitor)
C	DC disconnect
D	Sunny Central
E	AC fuse
F	AC disconnect
G	Public grid


Any other application of the Sunny Central or installation of components and modifications which are not explicitly allowed endanger the safety and void the warranty as well as the operation permit.


It is prohibited to use the Sunny central for purposes other than those described here.


It is prohibited to connect voltage sources to the Sunny Central other than those consisting of PV-modules.

It is prohibited to modify the Sunny Central or to install components that are not explicitly recommended by SMA or sold by SMA for this purpose.

2.2 Safety Instructions

	DANGER
<p>High voltages are present in the live components of the low voltage grid. Death resulting from burning and electric shock.</p> <ul style="list-style-type: none">• Do not touch the live components of the Sunny Central or low-voltage grid.• Pay close attention to all safety precaution measures regarding the low voltage grid.	

	DANGER
<p>During operation, high voltages are present in the Sunny Central. Death resulting from electric shock.</p> <ul style="list-style-type: none">• Do not operate the Sunny Central with doors open. <p>Before commencing work on the Sunny Central:</p> <ul style="list-style-type: none">• Disconnect completely• Ensure that the device cannot be reconnected• Ensure that no voltage is present.• Ground and short-circuit• Cover any nearby live parts	

	DANGER
<p>Normally grounded conductors may be ungrounded and energized when a ground-fault is indicated. Risk of electric shock.</p> <ul style="list-style-type: none">• Test before touching.• Work on the Sunny Central must be carried out by qualified personnel.	

**WARNING**

Failure to follow the manual, the operating instructions and the safety precautions may lead to severe injury from electric shock.

- All work on the Sunny Central shall only be done as described in this manual.
- Pay attention to all safety instructions.
- Follow all operating instructions.
- If problems occur when performing the work described here, contact SMA.

**WARNING**

Operating a damaged Sunny Central may cause severe injury from electric shock.

- The Sunny Central shall only be used if it is technically faultless and safe to operate.
- Operate the Sunny Central only if there are no visible damages.
- Regularly check the Sunny Central for visible damage.
- Ensure that all safety features are accessible at all times and that their correct operation is tested regularly.

**CAUTION**

Cuts and scratches due to sharp edges inside the Sunny Central.

- When working on the Sunny Central wear protective gloves.

NOTICE

The components in the Sunny Central can be damaged by electrostatic discharge.

- When working on the Sunny Central and when handling the components observe all ESD safety regulations.
- Discharge electrostatic charge by touching the grounded Sunny Central enclosure.
- Only then is it safe to touch any electronic components.

**Storage of Handbooks**

Keep this documentation in the immediate vicinity of the Sunny Central. It must be accessible to service and maintenance personnel at any time.

Do not store the documentation or any other papers in the Sunny Central.

3 The Sunny Central

In this section you will see how to identify the Sunny Central. A short description of the Sunny Central's design and functions are given here.

3.1 System Overview

The Sunny Central is an inverter for indoor and outdoor. The enclosure is made of steel which has been zinc plated and coated and which conforms to the NEMA 3R protection rating. NEMA 3R means that the Sunny Central is protected against dust and water when it is closed.

Operating Principles

The PV-modules convert a portion of sunlight into electrical energy (direct current). Afterwards the Sunny Central converts the direct current into alternating current and feeds it into the public grid. This current may be used directly, or it may be sold to your energy provider.

3.2 The Sunny Central's Design

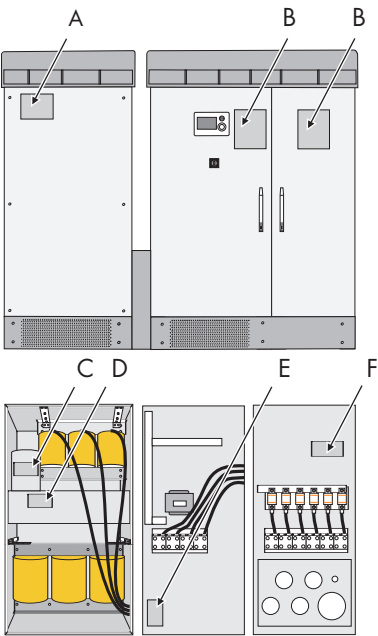
The Sunny Central is divided into three sections.



Position		
A	Magnetics Cabinet:	The Sunny Central's transformer is contained in the Magnetics Cabinet.
B	Control Cabinet:	The Control Cabinet contains the system control, the Sunny Display, the stop/start switch and the power units for converting direct current to alternating current.
C	Interface Cabinet:	All AC, DC and data cables are connected in the Interface Cabinet (see also Section 8.1 "Connection Area" (page 46)).

3.3 Location of the Safety Notices

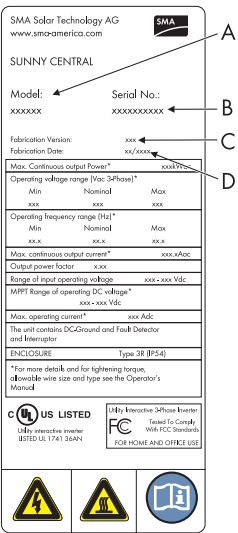
The figure to the right shows the location of the safety notices on the Sunny Central.



Position	Name
A	Magnetics Cabinet wall. General Warnings.
B	Control Cabinet door and Interface Cabinet door. Warning regarding high voltages in the Sunny Central.
C	Open Magnetics Cabinet, capacitor. Warning regarding high voltages. Capacitor and plate are not grounded.
D	Open Magnetics Cabinet. Beware of hot surfaces.
E	Open Interface Cabinet, left side. Type plate
F	Open Interface Cabinet, right side. Beware of hot surfaces.

3.4 Identifying the Sunny Central

You can identify the Sunny Central using the type plate (see figure on the right). The type plates are located inside of the Interface Cabinet and inside of the Magnetic Cabinet.



Position	Name
A	Type description of the Sunny Central
B	Serial number of the Sunny Central
C	Fabrication Version
D	Fabrication Date

3.5 Firmware

The firmware of the Sunny Central and of the display are shown on the display of the Sunny Central. The user manual of the Sunny Central describes how to obtain the firmware version.

4 Unpacking

This section describes what to look out for upon receiving your Sunny Central, and who to turn to if your Sunny Central is damaged.

4.1 Unpacking and Inspection

All SMA Sunny Centrals are thoroughly checked before they are packaged and shipped. Although they are shipped in sturdy packaging, damage can still occur during shipping and delivery. It is important to carefully inspect the shipping container and contents prior to installation. If you detect any external damage after unpacking, report the damage immediately to your SMA dealer and shipping company that delivered the unit. If it becomes necessary to return the Sunny Central, use the original packing material.

If you need assistance with a damaged Sunny Central, contact your SMA dealer or the SMA Serviceline. Contact information for the SMA Serviceline is provided below.

SMA Solar Technology America, LLC

4031 Alvis Court

Rocklin, CA 95677

Tel. +1 916 625 0870

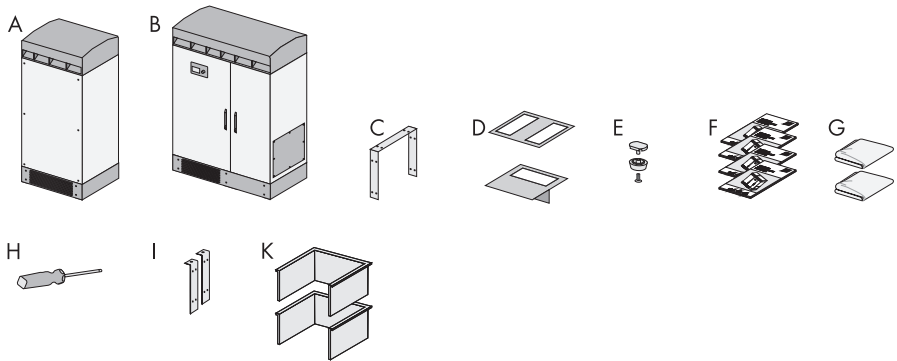
Tel. +1 877 697 6283 (Toll free, available for USA, Canada and Puerto Rico)

Fax +1 916 625 0871

Service@SMA-America.com

www.SMA-America.com

4.2 Scope of Delivery



Position	Name
A	Magnetics Cabinet
B	Interface and Control Cabinet
C	Cover for the cables between the cabinets of the Sunny Central and screws
D	Ventilation plates with air filters for installation in the base of the Sunny Central
E	Condensate drain
F	Installation Guide, User Manual, Circuit Diagram, Test Report, Commissioning Report
G	Abrasive webs
H	Torx screwdriver
I	Sealing splints
K	U-shaped plate

4.3 Storage

NOTICE

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

Damage to the Sunny Central possible.

- The Sunny Central must be closed during storage.
- If stored for 6 months or longer, make sure the storage area is dry.

5 Transport and Installation

This section explains how to find the best installation site for your Sunny Central. It provides step-by-step instructions on how to transport and install the Sunny Central and connect the cabinets with each other electrically. Observe all safety precautions in this section to avoid material and personal damages.

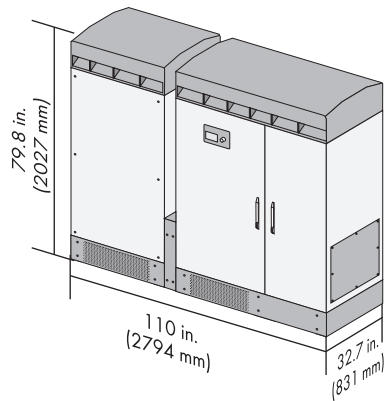
5.1 Choosing the Installation Site

5.1.1 Dimensions and Weight

The Sunny Central has a total weight of 4,200 lbs. (1905 kg). The left cabinet (Magnetics Cabinet) of the Sunny Central weighs 2,710 lbs. (1230 kg), and the right cabinet (Control and Interface Cabinet) weighs 1,490 lbs. (675 kg).

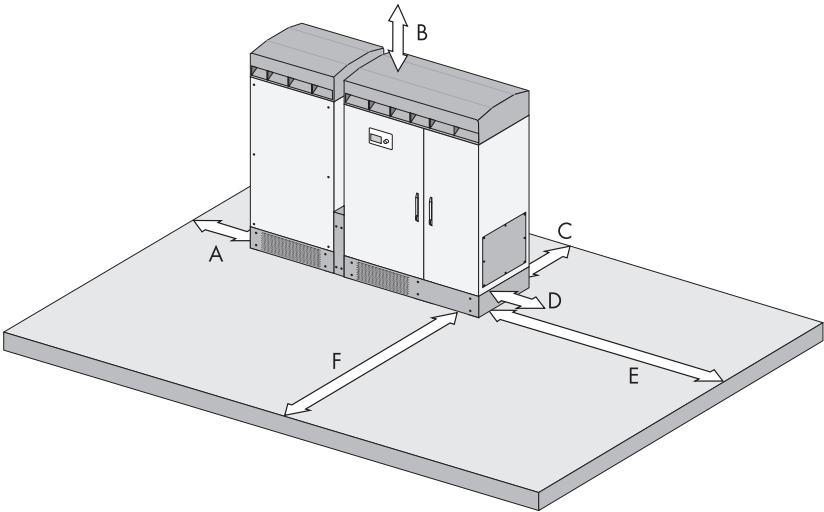
5.1.2 Ambient Conditions

- The installation location must be accessible at all times.
- The ambient temperature must be between -13°F and $+122^{\circ}\text{F}$ (-25°C and 50°C).
- Direct solar irradiation reduces the output power of the Sunny Central.
- For installing the Sunny Central in closed rooms an air supply of 2,355 CFM ($4,000\text{ m}^3/\text{h}$) is needed.
- For more information see section 13 "Technical Data" (page 69).



5.1.3 Minimum Clearance

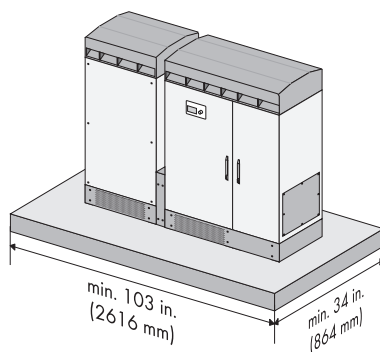
Observe the specified minimum clearances for the cables, ventilation and for opening the doors. An air supply of 2,355 CFM (4,000 m³ /h) is needed for installing the Sunny Central in closed rooms.



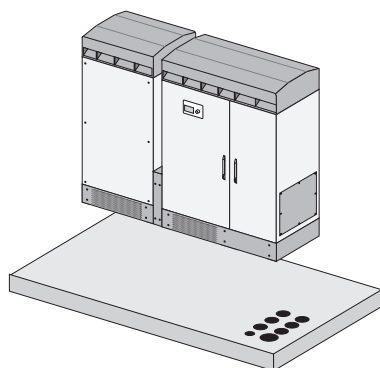
Position	Cables inserted from...	Minimum clearance	Recommended clearance
A	—	6 in. (152 mm)	20 in. (508 mm)
B	—	16 in. (406 mm)	—
C	—	6 in. (152 mm)	20 in. (508 mm)
D	below	6 in. (152 mm)	20 in. (508 mm)
E	the side	47 in. (1194 mm)	—
F	—	47 in. (1194 mm)	—

5.1.4 Characteristics of the Base

- The foundation must be made of concrete.
- The mounting surface must be level and strong enough to support the weight of the inverter. The evenness of the foundation must be less than 0.1 in. (2.5 mm) per meter.
- The width and depth of the base must be at least the same size as the Sunny Central.



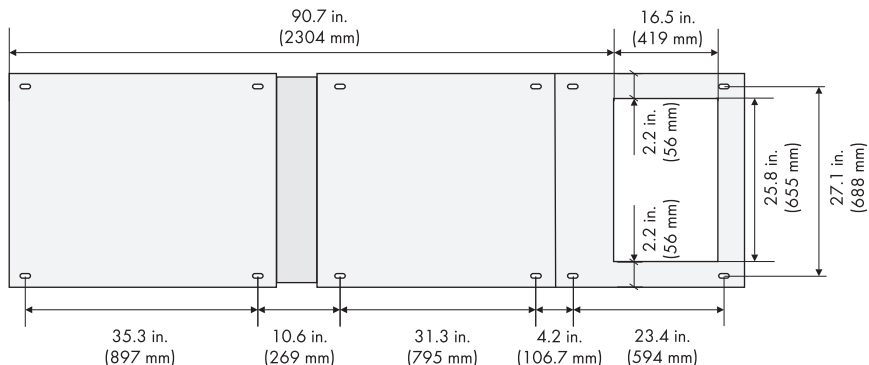
- To insert the cables from below, the cable conduits must be laid in the foundation (see section 6.2 "Insert Cables from below into the Sunny Central" (page 36)).



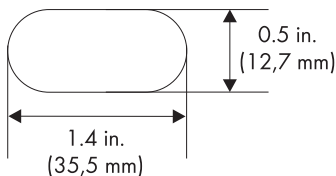
5.2 Preparation of the Base

The inverter must be secured to the foundation per local building codes. At the bottom of the Sunny Central there are 12 mounting holes for anchoring it to its base.

5.2.1 Position of the Mounting Holes



5.2.2 Size of the Mounting Holes



5.2.3 Drilling Holes into the Base

DANGER

Drilling into live wires.
Death resulting from electric shock.

- Check the installation location for electric cables laid in the base.

1. Measure the distances for the holes.
2. Mark the positions of the holes.
3. Drill the holes into the base on marked positions.
4. Put dowels into the drill holes.

5.3 Transporting the Sunny Central

Remove the kick plates before transporting the Sunny Central (see section 5.4.1 "Removing the Kick Plates from the Sunny Central" (page 25)).



WARNING

Sunny Central may tip over if improperly transported.

Bruises and fractures possible.

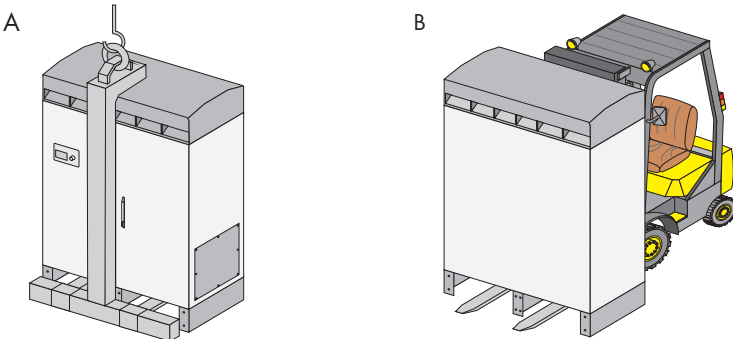
- Pay attention to the center of gravity of the Sunny Central (see section 5.3.2 "Center of Gravity of the Sunny Central" (page 25)).
- Transport the Sunny Central only as described in this manual.
- Any equipment used for the transport of the Sunny Central must be suitable for the weight of the Sunny Central.
- Do not tilt the Sunny Central during transport.

5.3.1 Equipment for Transport

The Sunny Central is shipped in two parts. The following equipment can be used for the transport of the Sunny Central:

- Crane with an according fork (A) for the transport of the Sunny Central.
- Forklift or pallet truck (B).

Example of Transporting the Sunny Central Cabinet

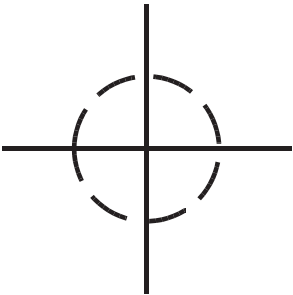


Any equipment used for the transport of the Sunny Central must be suitable for the weight of the Sunny Central. The left cabinet (Magnetics Cabinet) of the Sunny Central weighs 2,710 lbs.. and the right cabinet (Control and Interface Cabinet) weighs 1,490 lbs..

5.3.2 Center of Gravity of the Sunny Central

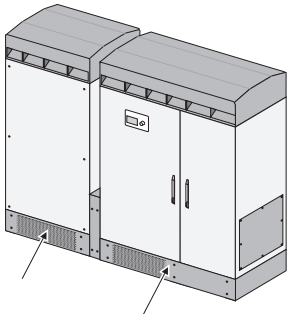
The center of gravity of the Sunny Central is marked on the packaging with the symbol on the right.

The center of gravity is not in the middle of the Sunny Central.



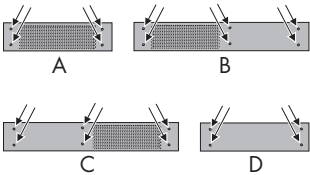
5.4 Installing the Sunny Central

5.4.1 Removing the Kick Plates from the Sunny Central



Kick plates are located on the front and back of the Sunny Central. The position of the kick plates is shown in the figure to the right.

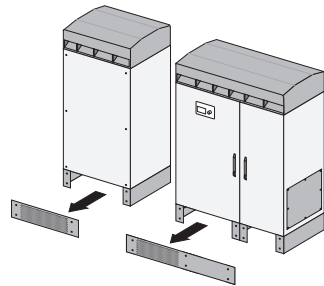
The kick plates are mounted on the cabinets of the Sunny Central by screws.



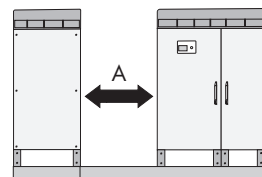
Position	Name
A	Magnetics Cabinet front side 4 screws in total. 2 screws on the right and 2 screws on the left.
B	Control and Interface Cabinet front side 6 screws in total. 2 screws on the right, 2 screws in the middle, and 2 screws on the left.

Position	Name
C	Interface and Control Cabinet rear side 6 screws in total. 2 screws on the right, 2 screws in the middle, and 2 screws on the left.
D	Magnetics Cabinet rear side 4 screws in total. 2 screws on the right, 2 screws on the left.

1. Remove kick plates on the front and on the rear of both cabinets of the Sunny Central using a torx screwdriver.
2. Remove the kick plates by pulling them toward you (see figure on the right).



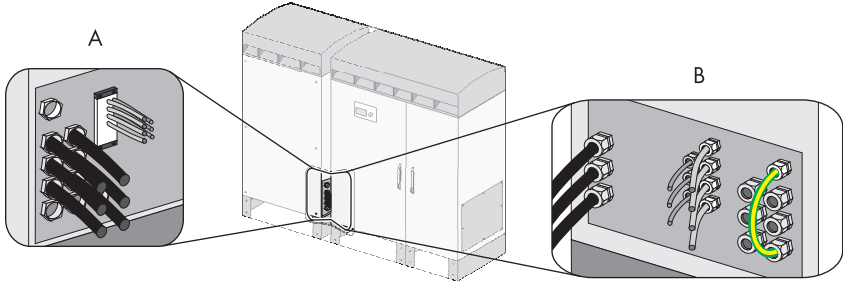
3. Load the cabinets on a forklift or a crane fork from the front (see section 5.3.1 "Equipment for Transport" (page 24)).
4. Transport the cabinets to the installation site. During transport, be sure to follow all the instructions provided in section 5.3 "Transporting the Sunny Central" (page 24).
5. Place the Control and Interface Cabinet of the Sunny Central on the base. The holes for the screws in the Sunny Central and the holes in the base must fit.
6. Install the Magnetics Cabinet with a clearance (A) of about 20 inches (508 mm).



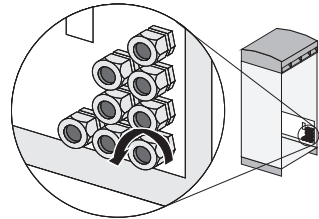
7. Open the Control Cabinet as described in section 10.1 "Opening the Control Cabinet" (page 60).
8. Open the Magnetics Cabinet as described in section 10.3 "Opening the Magnetics Cabinet" (page 61).

5.4.2 Inserting the Cables into the Cabinets

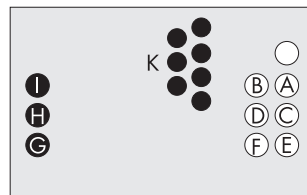
This section shows you how to connect the two cabinets of the Sunny Central with each other electrically. Cables are attached on the left side of the Control Cabinet and the right side of the Magnetics Cabinets, each of which you connect to the opposite cabinet. The cables are pulled into the inside of the Magnetics Cabinet or Control Cabinet via PG cable glands. The position of the cable openings in the Magnetics Cabinet (A) and the Control Cabinet (B) is shown in the figure below.



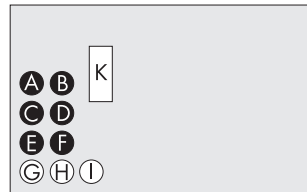
1. In a counterclockwise direction, open the three bottom PG cable glands in the Magnetics Cabinet and the six PG cable glands on the right side of the Control Cabinet. Keep opening the PG cable glands until you can pull the cables into the inside of the cabinets. Do not unscrew the PG cable glands. Figure to the right: Open the PG cable gland in the Magnetics Cabinet.
2. Feed the 3 AC cables from the rear of the Control Cabinet into the 3 lower holes at the front of the Magnetics Cabinet (figure to the right, position G, H, I).
3. Feed the 6 AC cables from the Magnetics Cabinet into the corresponding holes in the Control Cabinet (figure to the right, position A, B, C, D, E, F).
4. Feed the 2 sockets containing signal cables from the Control Cabinet into the Magnetics Cabinet (figure to the right, position K).



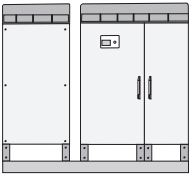
Control Cabinet



Magnetics Cabinet



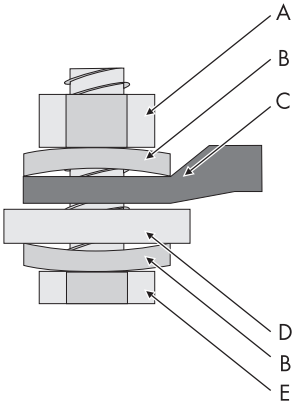
- 5. Place the Magnetics Cabinet to the desired location of the base. The holes for the screws in the Sunny Central and the holes in the base must fit.
- 6. Pull all the cables into the Magnetics Cabinet as far as they will go.
- 7. Tighten the PG cable glands in the Control Cabinet in a clockwise direction.



5.4.3 Connect the Cables in the Magnetics Cabinet

This section shows you how to connect cables W53, W54 and W55 to the copper busbars under the transformers in the Magnetics Cabinet.

Figure to the right: Layout for connecting a cable lug to the aluminum busbar in the Magnetics Cabinet.



Position	Name
A	Nut
B	Lock washer
C	Cable lug
D	Copper busbar
E	Screw head

NOTICE

When transporting and storing the Sunny Central, oxide layers may form on the contact surfaces of the cable connection.

Yield loss due to poor electrical conductivity.

1. Before connecting the cables, clean the contact surfaces.

Use only the non-woven abrasive delivered with the Sunny Central. Do not clean the surfaces with sandpaper.

Do not touch the contact surfaces after they have been cleaned.

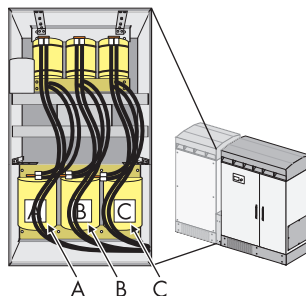
2. Place the cable gland with the 6 AC cables and the ground cable on the opening of the Magnetics Cabinet.

3. Connect cable W53 to copper busbar A.

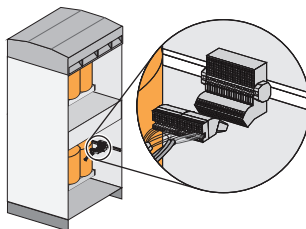
4. Connect cable W54 to copper busbar B.

5. Connect cable W55 to copper busbar C.

6. Tighten all terminal connection bolts with a torque wrench to 230 in-lbs.. (26 Nm).

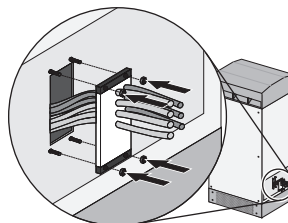


7. Connect the two plugs of the signal cables to sockets 1-10 and 11-20 in the Magnetics Cabinet.

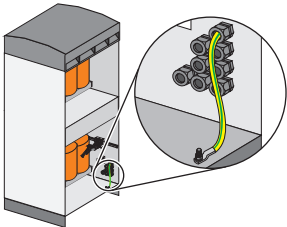


8. Place the cable gland on the opening.

9. Attach and tighten the four nuts.



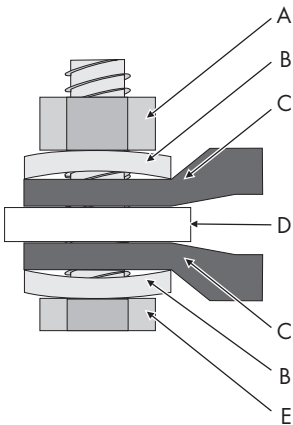
- 10. Connect the ground cable to the bolt in the Magnetics Cabinet and tighten it with a torque wrench.



5.4.4 Connecting the Cables in the Control Cabinet

This section shows you how to connect cables W50, W50.1, W51, W51.1, W52 and W52.1 to the copper busbars under the power units in the Control Cabinet.

Figure to the right: Layout for connecting a cable lug to the tin-plated copper busbar in the Control Cabinet.



Position	Name
A	Nut
B	Lock washer
C	Cable lug
D	tin-plated copper busbar
E	Screw head

NOTICE

When transporting and storing the Sunny Central, oxide layers may form on the contact surfaces of the cable connection.

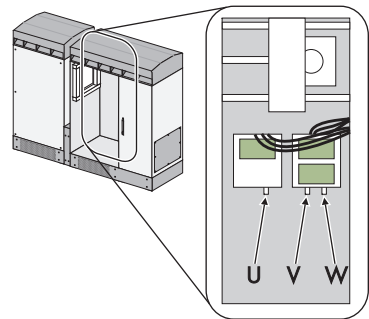
Yield loss due to poor electrical conductivity.

1. Before connecting the cables, clean the contact surfaces.

Use only the non-woven abrasive delivered with the Sunny Central. Do not clean the surfaces with sandpaper.

Do not touch the contact surfaces after they have been cleaned.

2. Connect cable W50 and W 50.1 to tin-plated copper busbar U.
3. Connect cable W51 and W 51.1 to tin-plated copper busbar V.
4. Connect cable W52 and W 52.1 to tin-plated copper busbar W.
5. Tighten all terminal connection bolts with a torque wrench to 230 in-lbs.. (26 Nm).

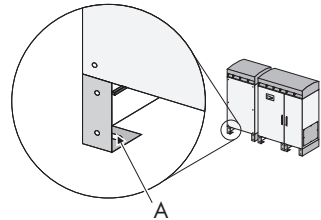


5.4.5 Attach the Sunny Central to the base

The mounting holes (A) are located on the inside of the Sunny Central's stands.

The holes for mounting the Sunny Central to the base are 1.34 in. x 0.55 in. Use appropriate mounting material.

Figure to the right: Mounting hole in the front left stand of the Magnetics Cabinet.

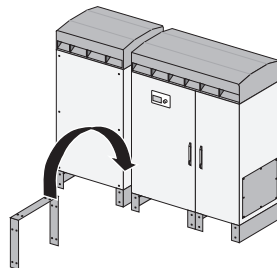


1. Insert screws in all 12 mounting holes of the Sunny Central (for the position of the mounting holes, refer to section 5.2 "Preparation of the Base" (page 23)).
2. Tighten screws.

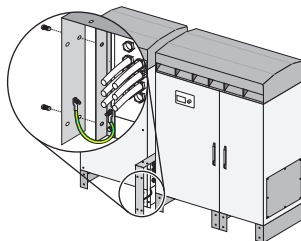
5.4.6 Install the Cover Between the Cabinets

The cover between the two cabinets is attached using a total of 12 screws. 4 screws on the front, 4 screws on the back and 4 screws on the top of the cover. A bolt is available on the inside. This bolt is used in order to ground the cover.

1. Place the cover between the Magnetics Cabinet and the Control Cabinet. The bolt must be in the front side of the Sunny Central.



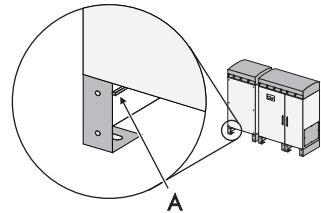
2. Connect the grounding cable with the bolt. Fasten tightly with the provided nut.
3. Tighten all 12 screws with a torx screwdriver.



5.4.7 Install Ventilation Plates

Rails for installing the ventilation plates are located on the stands of the Magnetics Cabinet and the Control Cabinet.

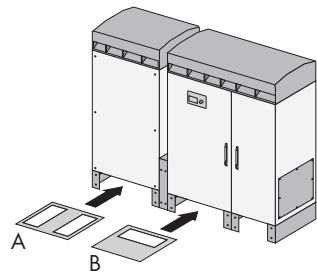
Figure to the right: Rail in the front left stand of the Magnetics Cabinet.



1. Place the ventilation plate with two grilles (A) onto the rails in the Magnetics Cabinet and push into the Sunny Central. The grilles in the ventilation plate must be on the right and left.
2. Place the ventilation plate with one grille (B) onto the rails in the Control Cabinet and push into the Sunny Central. The grille in the ventilation plate must be in the back.

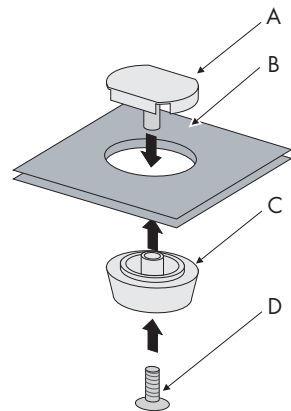
If properly installed, the ventilation plates should not protrude from the cabinets.

Tip: If a ventilation plate gets stuck when pushing it into the Sunny Central, hold it from the bottom and press the middle area upwards while pushing it in.



Moisture that may have seeped in can be removed via the condensate drain in the base of the Control Cabinet. Install the condensate drain as described here.

Figure to the right: Layout of the condensate drain in the base of the Control Cabinet.



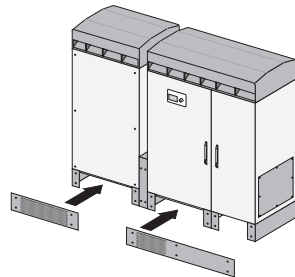
Position	Name
A	Top cover of the condensate drain
B	Base and ventilation plate of the Control Cabinet

Position	Name
C	Bottom cover of the condensate drain
D	Screw

1. Insert the top cover of the condensate drain into the hole in the base of the Control Cabinet.
2. Connect the bottom cover of the condensate drain with the top cover of the condensate drain from the bottom through the ventilation plate.
3. Use the screw to secure the covers of the condensate drain.

5.4.8 Attaching the Kick Plates to the Sunny Central

1. Attach the kick plates to front and back of the Sunny Central.
2. Tighten the screws on the kick plates with a torx screwdriver.

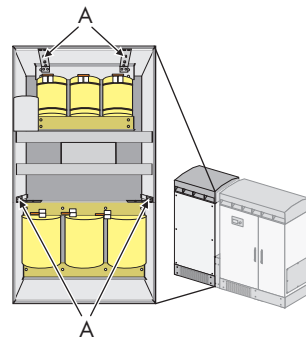


5.4.9 Remove Transport Locks

The transformer and choke in the Magnetics Cabinet are secured for transport with transport locks (A) on the cabinet. A transport lock is located on both the right and left side of the bottom transformer block and two transport locks are located on the front of the top choke block. Each transport lock is attached using a total of four screws.

Right figure: position of the transport locks (A)

1. Loosen the screws of the transport locks.
2. Remove the screws and the transport locks.
3. Close the Sunny Central.



6 Attaching the Conduits

In this section you will learn where to insert the cables in the Sunny Central and where to punch the holes for the conduits.

NOTICE

Moisture can seep through incorrect conduits and conduit hubs.

Damage to the electronics of the Sunny Central.

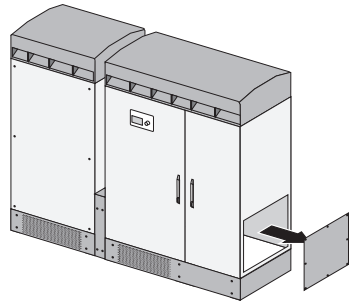
- For conduit hubs, use only UL Listed rainproof, or wet location hubs complying with UL 514B for entry into the enclosure.
- Adjust the diameter of the conduit hubs to match the diameter of the conduits.

The PV panel cables, the AC cables and the communication cables can be routed into the Sunny Central's Interface Cabinet from the right or from below. The two options are described below.

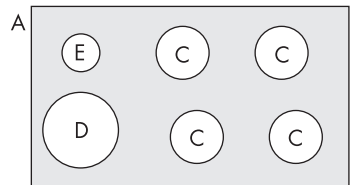
6.1 Insert Cables from the right into the Sunny Central

Insert the PV-generator cables, the AC cables and the data cables into the Sunny Central from the right. A metal sheet is attached to the Sunny Central for this purpose.

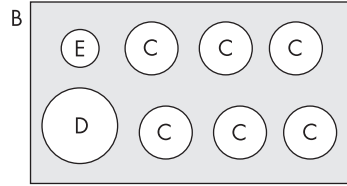
1. Remove the plate screws.
2. Put the screws and washers aside.
3. Remove plate.



4. Mark all the holes for the conduits. You need one conduit for the AC cables, one conduit for the communication cables and four /six conduits for the DC cables (one conduit for each DC input).
 - A: Example for a plate prepared for the connection of 4 DC strings.



- B: Example for a plate for the connection of 6 DC strings.
- C: Conduit for DC cable.
- D: Conduit for AC cable.
- E: Conduit for communication cable.

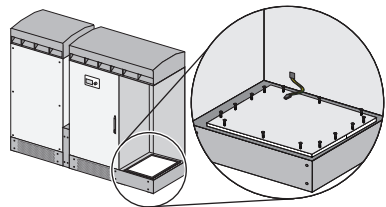


5. Punch holes for the conduits.
6. Check the seal of the plate.
7. Attach the plate to the Sunny Central.
8. Attach the screws and washers and tighten with a torque of 31 in-lbs..
9. Insert the conduits into the openings.
10. Attach the conduits with the appropriate hubs.

6.2 Insert Cables from below into the Sunny Central

Insert the PV-generator cables, the AC cables and the data cables into the Sunny Central from the bottom through the foundation.

1. Remove the ground cable (A) from the plate at the bottom of the Interface Cabinet.
2. Loosen the 16 screws on the plate at the bottom of the Interface Cabinet by turning them counterclockwise.

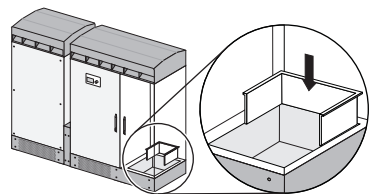


3. Remove the screws and the plate.

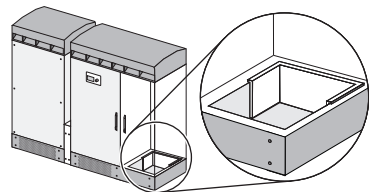
The screws will be used again.

The cable tunnel is encased in 2 u-shaped metal plates.

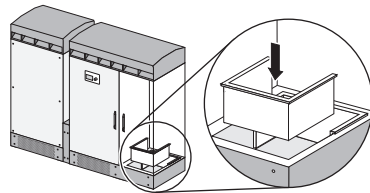
4. Place a u-shaped plate in the rear portion of the cable tunnel.



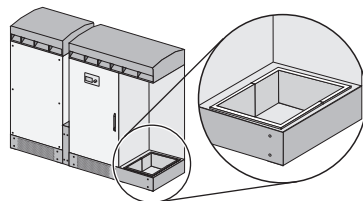
The holes in the narrow edge of the u-shaped plate must overlap the holes in the Interface Cabinet.



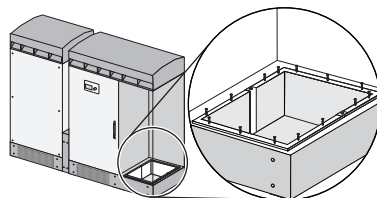
5. Place a u-shaped plate in the front portion of the cable tunnel.



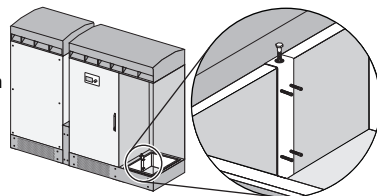
The holes in the narrow edge of the u-shaped plate must overlap the holes in the Interface Cabinet.



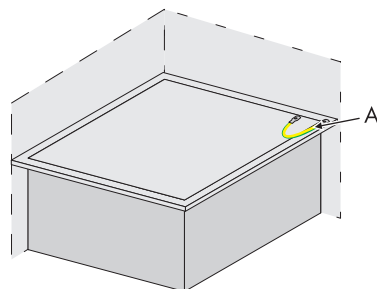
6. Place 14 screws in the holes (see the illustration on the right). Do not use the middle holes on the long side of the cable tunnel.
7. Tighten the screws evenly.



8. Place the sealing splints on the middle holes on the right and left of the cable tunnels.
9. Place 5 screws in each of the holes (see illustration on the right).
10. Tighten the screws evenly.



11. Connect the ground cable to the cable tunnel.
12. Seal the cable tunnel down to the foundation.
 - The cable tunnel is encased.



7 Connecting Optional Communication Devices

The Sunny Central can be equipped with a Sunny WebBox and/or a Sunny SensorBox. This section explains how the Sunny WebBox and the Sunny Sensor Box in the Sunny Central is connected.

NOTICE

The components in the Sunny Central can be damaged by electrostatic discharge!

- When working on the Sunny Central and when handling the components observe all ESD safety regulations.
- Discharge electrostatic charge by touching the grounded Sunny Central enclosure.
- Only then is it safe to touch any electronic components.

NOTICE

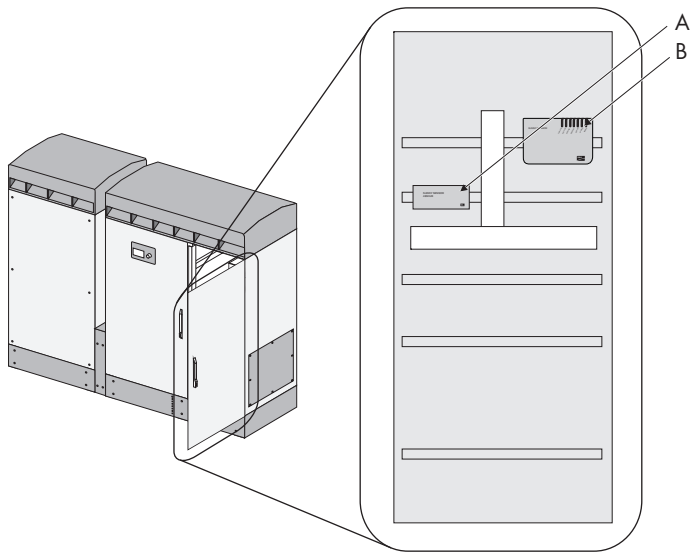
Seeping moisture during installation of the Sunny Central.

Damage to the electronics of the Sunny Central.

- Do not open the Sunny Central when it is raining or when a high humidity is present (> 95%).
- For conduit hubs, use only UL Listed rainproof, or wet location hubs complying with UL 514B for entry into the enclosure.

7.1 Position of the Communication Devices

The Sunny WebBox is located on the inside of the Interface Cabinet's door.



Position	Name
A	Sunny Sensor 485Hub (see section 7.2 "Connecting the Sunny SensorBox (optional)" (page 39)).
B	Sunny WebBox (see section 7.3 "Sunny WebBox (optional)" (page 41)).

7.2 Connecting the Sunny SensorBox (optional)

This Section describes how to connect the Sunny SensorBox to the Sunny Sensor 485Hub in the Sunny Central.

Data Cable

The data cable for the connection of the Sunny SensorBox to the Sunny Sensor 485Hub must meet the following requirements:

- The data cable must not be longer than 4,000 ft. (1.220 m).
- Use:
 - cables with a section of 2 x 2 x AWG 24
 - shielded twisted pair cables



Data Cable Recommendation

SMA also provides data cables. Please contact your electrician or wholesaler.

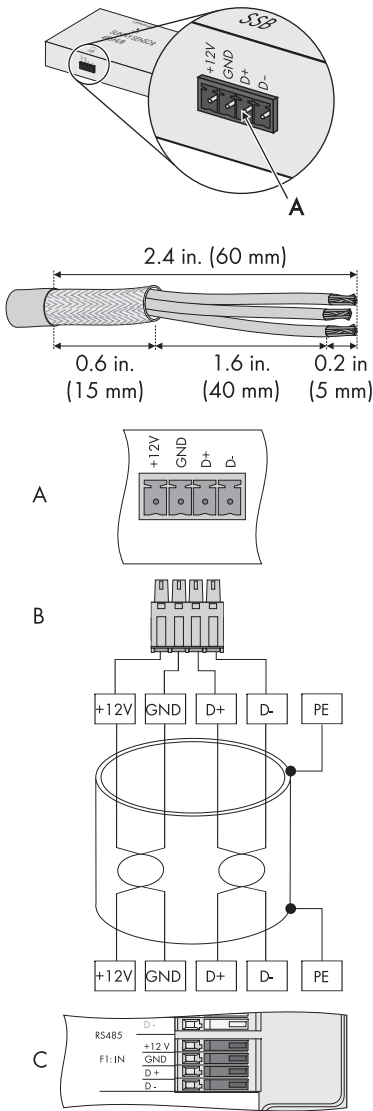
7.2.1 Connecting the Data Cable of the Sunny SensorBox

Connect the data cable to the socket (A) on the bottom of the Sunny Sensor 485Hub.

- 1. Open the Interface Cabinet as described in section 10.2 "Opening the Interface Cabinet" (page 61).
- 2. Route the data cables separately from AC and DC cables. Draw the data cable into the Sunny Central (see section 6 "Attaching the Conduits" (page 35)).
- 3. Remove the insulation of the data cable by approx. 2.4 in. (60 mm) and uncover the shield.
- 4. Uncover the wires about 1.8 in. (45 mm).
- 5. Strip the wires about 0.2 in. (5 mm).
- 6. Connect the wires to the connector as shown in the figure on the right.

Position	Name
A	Sunny Sensor 485Hub socket
B	Plug
C	Sunny SensorBox

- 7. Note down the wire color:
+12 V _____
GND _____
D+ _____
D- _____
- 8. Insert the plugs into the socket on the bottom of the Sunny Sensor 485Hub.
- 9. Close the Sunny Central.



The operating manual of the Sunny SensorBox shows you how to connect the data cable in the SensorBox and connect the sensors to the Sunny SensorBox.

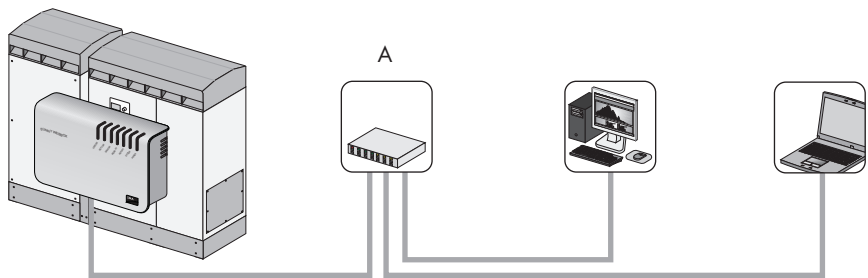
7.3 Sunny WebBox (optional)

For more information on the Sunny WebBox (e.g., operation) see its technical description. The technical description is included in the scope of delivery and is available for download at www.SMA-America.com.

The communication between the Sunny WebBox and the PC or the network is conducted via Ethernet. The Sunny WebBox is equipped with an integrated network connection, which enables it to be connected to any Ethernet network. The connection supports Ethernet and Fast-Ethernet networks. The speed adapts automatically to the connected switch, router or PC.

Sunny WebBox in a Network

The Sunny WebBox can be integrated into a network via a router or a switch. If the Sunny WebBox is permanently integrated into a network with Internet access, it can automatically transmit the data of your PV-system to Sunny Portal.



Position	Name
A	Switch or router

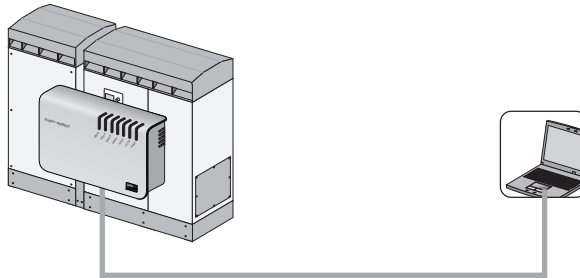
Data Cable

The data cable for the connection of the Sunny WebBox to a network must meet the following requirements:

- The data cable must not be longer than 330 ft. (100 m).
- Use:
 - High-quality, straight-through patch cables,
 - shielded twisted pair cables,
 - of category 5 (CAT 5) or higher.

Sunny WebBox Connected to a PC / Laptop

To read out the data, the Sunny WebBox can be connected to a PC or Laptop. This connection should not be made long-term; it only serves the purpose of reading the data.



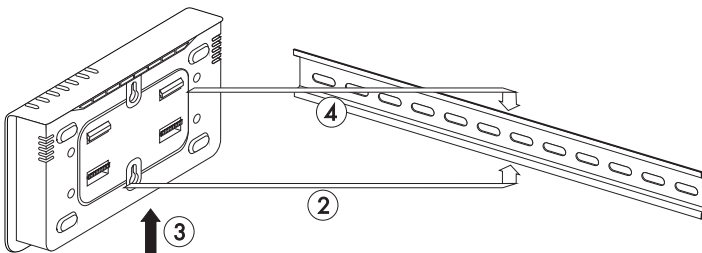
Cable

The cable for the connection of the Sunny WebBox to a PC / Laptop must meet the following requirements:

- The cable must not be longer than 330 ft. (100 m).
- Use:
 - High quality crossover cable,
 - shielded twisted pair cables,
 - of category 5 (CAT 5) or higher.

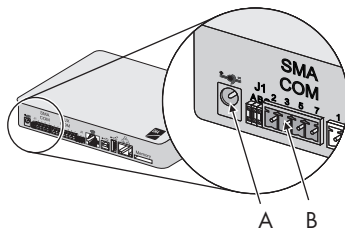
7.3.1 Installing the WebBox in the Sunny Central

1. Open the Interface Cabinet as described in section 10.2 "Opening the Interface Cabinet" (page 61).
2. Hook both lower brackets of the Sunny WebBox under the lower edge of the top hat rail.
3. Press the Sunny WebBox upwards.
4. Snap the top edge of the mounting rail into the top mounting brackets of the Sunny WebBox.



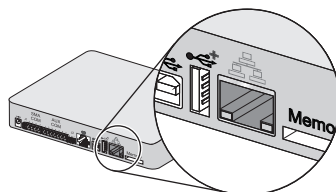
7.3.2 Connecting the Sunny WebBox to the Sunny Central

1. Plug the W215 connector into the SMA COM socket (B) of the WebBox.
2. Insert the power supply plug into socket (A) of the WebBox.



7.3.3 Connecting the Cable to the Sunny WebBox

The network connection on the Sunny WebBox is marked as displayed on the adjacent graphic. The same marking for the network connections is usually to be found on your switch, router, PC or Laptop. If this is not the case, please refer to the switch, router, PC or Laptop manual.



1. Route the cables separately from AC and DC cables. Draw the cable into the Sunny Central (see section 6 "Attaching the Conduits" (page 35)).
2. Plug the cable into the Sunny WebBox's socket.
3. Plug the cable into the socket of the switch, router, PC or Laptop.
4. Close the Interface Cabinet of the Sunny Central.

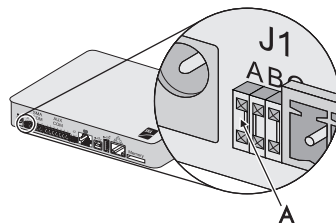
7.3.4 Termination

To ensure sufficient signal quality of the RS485 data bus, it must be terminated on both ends.

The Sunny WebBox is located at one of the end points of the RS485 data bus.

- Mount jumper to J1A.

The jumper is mounted upon delivery.



Signal biasing (jumper J1B and jumper J1C)

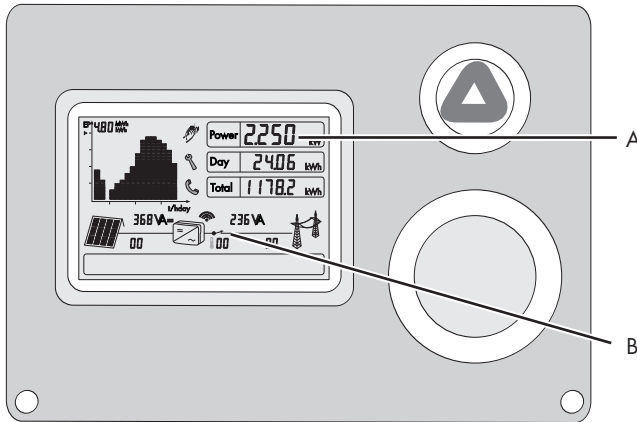
To ensure sufficient signal quality of the RS485 communication bus, a bias must be connected to the WebBox.

- Connect jumper to J1B and J1C.

Both jumpers are mounted upon delivery.

7.3.5 Change Display Settings

The Sunny Central is shipped with a Sunny Display by default.



The operating mode of the Sunny Display must be changed in order to additionally refit a Sunny WebBox. Proceed as follows:

1. Hold the knob and the button down for 5 seconds.
2. Turn the knob until the text line reads "SETTINGS".
3. Press knob once.
 - The Sunny Display changes to the "SETTINGS" menu.
4. Turn the knob until the text line reads "OPERATION MODE".
5. Press knob once.
 - The Sunny Display changes to the "OPERATION MODE" menu. The display shows the current operation mode.
6. Turn the knob until the text line reads "OP MODE WEBBOX".
7. Press knob once.
 - The display shows, e.g. current time and date of the Sunny WebBox.
8. Turn off the Sunny Central as described in section 10 "Opening the Sunny Central" (page 60) and turn it on again.

For more information concerning the operation of the Sunny Display please refer to the Sunny Central's user manual.

8 Electrical Connection

This section describes how the Sunny Central is connected to the grid and to the combiner boxes, and what precautions must be observed in order to avoid material and personal damages. It provides information on the necessary cable sizes and the magnitude of the torque for the cable connection.



DANGER

Normally grounded conductors may be ungrounded and energized when a ground-fault is indicated.

Risk of electric shock.

- Test before touching.

Work on the Sunny Central must be carried out by qualified personnel.

NOTICE

The components in the Sunny Central can be damaged by electrostatic discharge.

- When working on the Sunny Central and when handling the components observe all ESD safety regulations.
- Discharge electrostatic charge by touching the grounded Sunny Central enclosure.
- Only then it is safe to touch any electronic components.

NOTICE

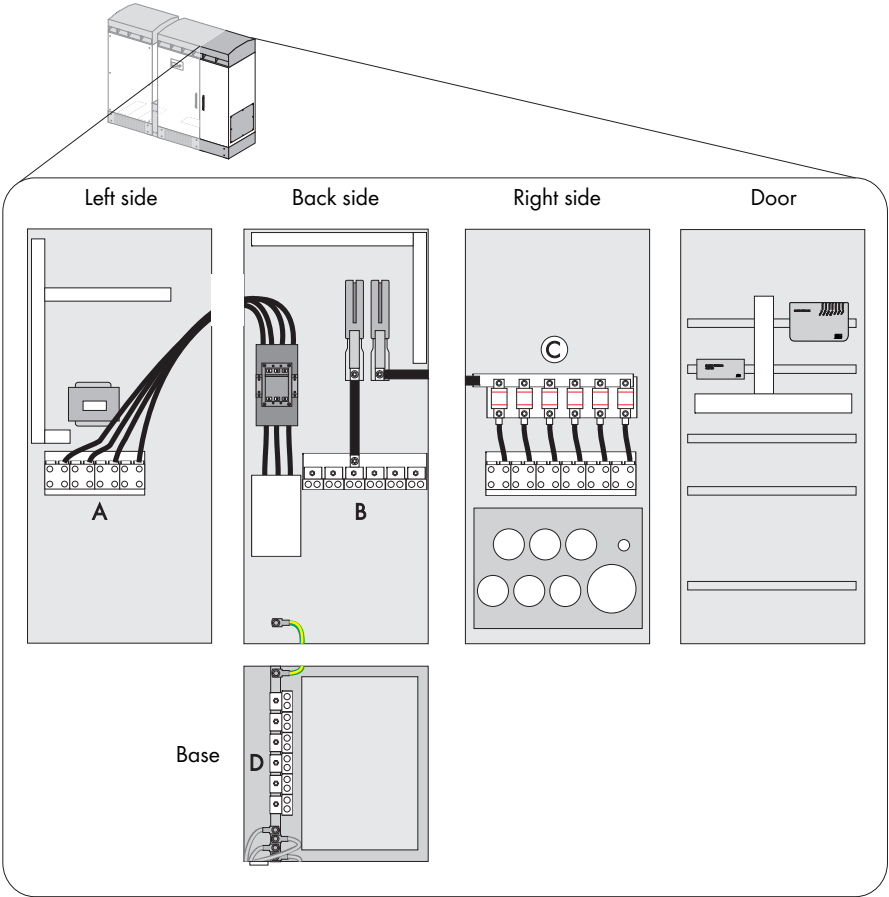
Seeping moisture may enter the Sunny Central during installation.

Damage to the electronics of the Sunny Central.

- Do not open the Sunny Central when it is raining or when a high humidity is present (> 95 %).
- For conduit hubs, only use UL Listed rainproof or wet location hubs complying with UL 514B for entry into the enclosure.

8.1 Connection Area

Sunny Central for the Connection of 6 DC strings



Position	Name
A	AC connection
B	Grounded DC connection (in figure above DC- connection)
C	Ungrounded DC connection (in figure above DC+ connection)
D	Ground connection

8.2 PE Connection

AC Connection

Number of AC Cables	Cable Size	Torque
1	3/0 AWG - 600 kcmil (85 mm ² - 304 mm ²)	500 in-lbs. (56 Nm)

PV-Modules

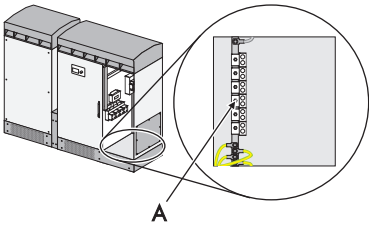
Sunny Central with 4 DC Fuses

Number of DC Strings	Cable Size	Torque
4	300 kcmil (152 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
8	2/0 AWG (67 mm ²)	

Sunny Central with 6 DC Fuses

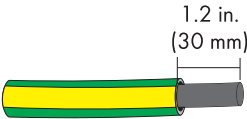
Number of DC Strings	Cable Size	Torque
6	4/0 AWG (107 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
12	2 AWG (33 mm ²)	

The illustration below shows a Sunny Central which is equipped for connection to 6 or 12 DC strings.



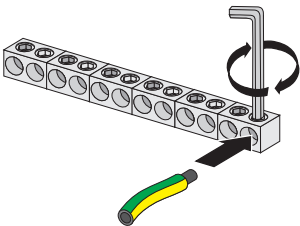
Position	Name
A	Screw terminals for grounding the AC cables. Position: Interface Cabinet, bottom left

- 1. Open the Sunny Central as described in section 10.2 "Opening the Interface Cabinet" (page 61).
- 2. Strip the cable by about 1.2 in. (30 mm).
- 3. Open the screw terminal completely.
- 4. Plug the copper inner conductor of the cable into the screw terminal.



- 5. Tighten the screw terminal using an Allen key. For required torque see tables above.

Connect all grounding cables of the modules as described above.



8.3 Connection of the PV-Modules

Do not connect the PV-modules until the optional communication cables have been connected (see section 7 "Connecting Optional Communication Devices" (page 38)). DC distribution boxes must be installed between the PV-modules and the Sunny Central, where the PV-module cables are gathered and led to the Sunny Central. There must be breakers in the distribution boxes which allow the disconnection of the DC side.

The PV-modules are negatively-grounded by the Sunny Central. The installer is responsible for the Photovoltaic System Grounding which must be installed per the requirements of Sections 690.41 through 690.47 of the National Electrical Code, ANSI/NFPA 70.

DANGER

Voltage is present in PV-modules exposed to light.

Death resulting from electric shock.

- 1. Cover the PV modules.
- 2. Switch off the fuses in the DC distribution boxes (e.g. Sunny Central String-Monitor) and secure them against reconnection.
- 3. Follow all safety precautions of the module manufacturer.

DANGER

Normally grounded conductors may be ungrounded and energized when a ground-fault is indicated.

Risk of electric shock.

- Test before touching.
- Work on the Sunny Central must be carried out by qualified personnel.

Technical Data for the Connection of the PV-Modules

Number of strings:	4 (8) or 6 (12)
DC input voltage:	330 V _{DC} ... 600 V _{DC}
Maximum DC current:	800 A

Technical Data for the Cables of the PV-Modules

Copper conductors only - use solid, or stranded copper only.

Connection of the PV-Modules

- The following cable sizes are minimum sizes.
- It is possible to insert combinations of different fuse sizes, but the maximum fuse sizes are 4 x 350 A or 6 x 250 A.

Sunny Central with 4 DC Fuses each 350 A max.

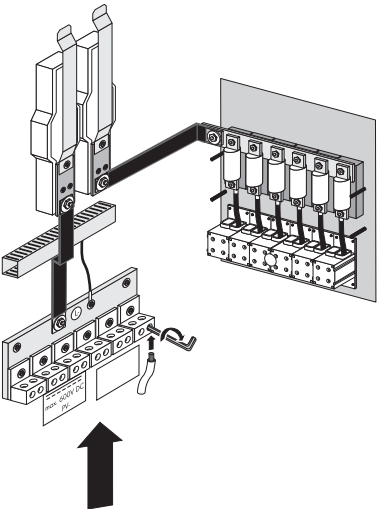
Number of DC Strings	Cable Size	Torque
4	300 kcmil (152 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
8	2/0 AWG (67 mm ²)	

Sunny Central with 6 DC Fuses each 250A max.

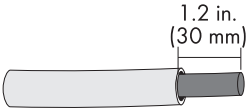
Number of DC Strings	Cable Size	Torque
6	4/0 AWG (107 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
12	2 AWG (33 mm ²)	

8.3.1 PV-Modules: DC- Connection - Negative Grounding

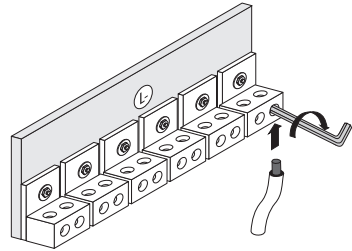
The illustrations on the right shows a Sunny Central which is equipped for connection to 6 or 12 DC strings.



1. Strip the cable by about 1.2 in. (30 mm).
2. Open the screw terminal completely.

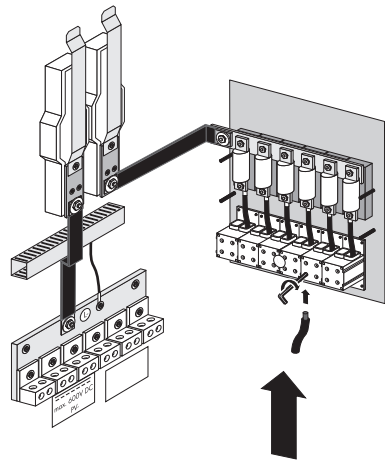


3. Plug the copper inner conductor of the cable into the screw terminal.
4. Tighten the screw terminal using an Allen key. The required torque is 315 in-lbs. (35 Nm).
5. Connect all DC- cables of the PV-modules as described above.

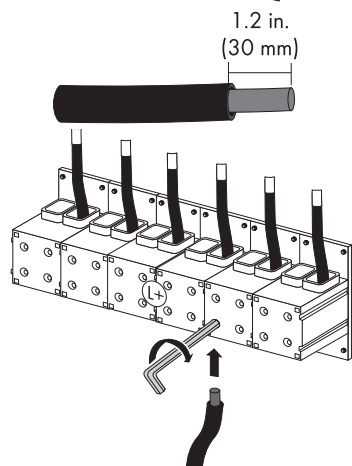


8.3.2 PV-Modules: DC+ Connection - Negative Grounding

The illustration on the right shows a Sunny Central which is equipped for connection to 6 or 12 DC strings.

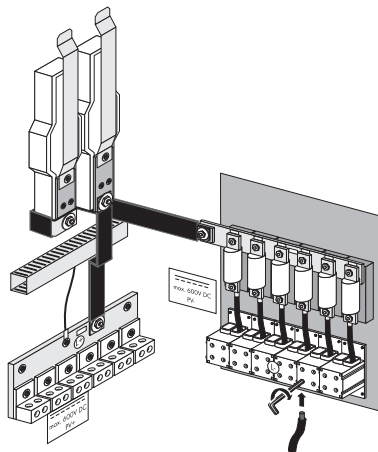


1. Strip the cable by about 1.2 in. (30 mm).
2. Open the screw terminal completely.
3. Plug the copper inner conductor of the cable into the screw terminal.
4. Tighten the screw terminal using an Allen key. The required torque is 315 in-lb. (35 Nm).
5. Connect all DC+ cables of the PV-modules as described above.

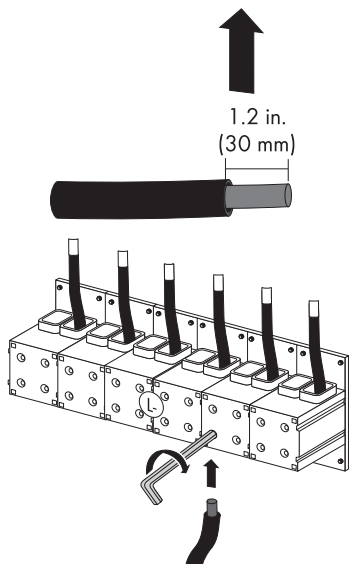


8.3.3 PV-Modules: DC- Connection - Positive Grounding

The illustration on the right shows a Sunny Central which is equipped for connection to 6 or 12 DC strings.

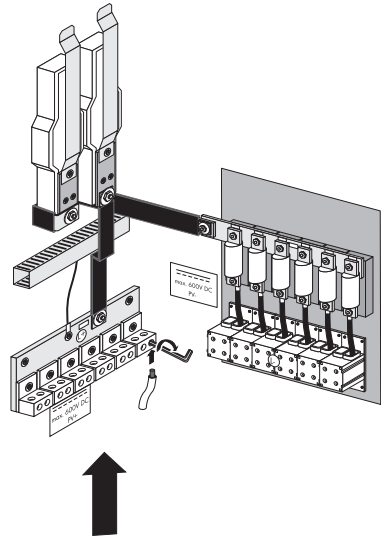


1. Strip the cable by about 1.2 in. (30 mm).
2. Open the screw terminal completely.
3. Plug the copper inner conductor of the cable into the screw terminal.
4. Tighten the screw terminal using an Allen key. The required torque is 315 in-lbs. (35 Nm).
5. Connect all DC- cables of the PV-modules as described above.



8.3.4 PV-Modules: DC+ Connection - Positive Grounding

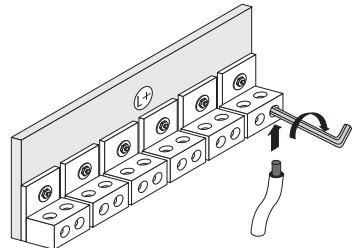
The illustration on the right shows a Sunny Central which is equipped for connection to 6 or 12 DC strings.




1. Strip the cable by about 1.2 in. (30 mm).



2. Open the screw terminal completely.
3. Plug the copper inner conductor of the cable into the screw terminal.
4. Tighten the screw terminal using an Allen key. The required torque is 315 in-lbs. (35 Nm).
5. Connect all DC+ cables of the PV-modules as described above.




8.4 AC Connection

**DANGER**

High voltages are present in the live components of the low voltage grid
Death resulting from burning and electric shock.

- Pay close attention to all safety precaution measures regarding the low voltage grid.
- Switch off the AC circuit breaker and secure it against accidental switching on.
- Ensure that no voltage is present.

**CAUTION**

Improper connection to the public grid may cause a fire.
Burns from fire.

- To reduce the risk of fire, connect only to a circuit provided with 450 A maximum branch-circuit overcurrent protection in accordance with the National Electrical Code, ANSI/NFPA 70.
- To reduce the risk of fire, do not connect to an AC load center (circuit breaker panel) having multiwire branch circuits connected.
- Overcurrent protection for the AC output circuit has to be provided by others.

The AC output circuits are isolated from the enclosure. The system grounding, if required by Section 250 of the National Electrical Code, ANSI/NFPA 70, is the responsibility of the installer.

Technical Data for the AC Connection

AC-connection cable	A, B, C, N and PE
Nominal AC voltage	480 V _{AC}
Maximum AC current	300.7 A


Technical Data for the AC Connection Cable (A, B, C, N)

Copper conductors only - use solid, or stranded copper only.

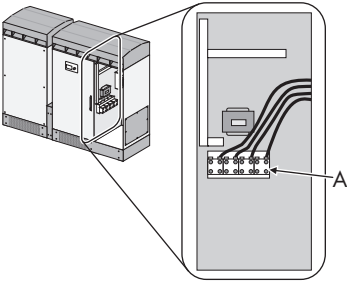
	Number of AC Cables	Cable Size	Torque
A, B, C	3	600 kcmil (304 mm²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
	6	250 kcmil (127 mm²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
N (277 V WYE)	0, 1 or 2	4 AWG – 600 kcmil (21 mm² - 304 mm²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque

8.4.1 Connecting AC wires to the Sunny Central

The AC cables are connected to the screw terminals (A) in the middle of the Interface Cabinet to the left

**DANGER**

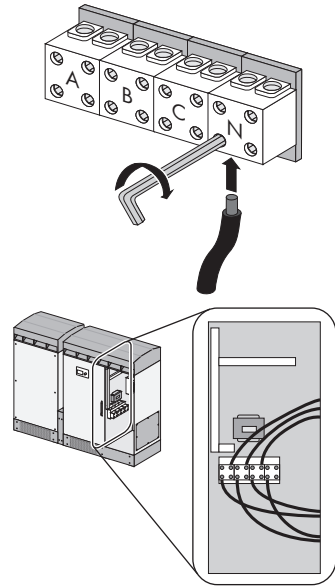
High voltages are present in the live components of the low voltage grid.
Death resulting from burning and electric shock.



1. Strip the cable by about 1.2 in. (30 mm).



2. Open the screw terminal completely.
 - For 277 V WYE grid open screw terminals A, B, C and N.
3. Plug the copper inner conductors of the cables into the screw terminal.
4. Tighten the screw terminal using an Allen key. The required torque is 315 in-lb. (35 Nm).
5. Check the AC connection for a possible clockwise phase sequence. For this purpose, hold the terminals of the phase sequence indicator onto the three phases of the AC connection in the Sunny Central. The indicator shows you whether there is clockwise phase sequence.



9 Commissioning

This Section explains, step-by-step, how to put the Sunny Central into operation, and how you can determine that the commissioning was successful.



DANGER

Electric shock due to improper startup of the Sunny Central!

Death resulting from burning and electric shock.

- All procedures described in this Section shall only be conducted by qualified personnel.
- If problems occur when performing the work described here, contact SMA.



Application to Energy Supply Company

Before you commission the Sunny Central, inform the relevant energy provider. You must submit the following information:


- Date of commissioning.
- Technical data of the plant.

9.1 Visual Inspection of the Sunny Central

1. Ensure that all AC and DC voltages are not connected to the inverter.
2. Wait 15 minutes for all internal power supplies to discharge.
3. Check voltage in order to ensure that all voltages have been removed
4. Inspect all large power cables and bus connections throughout the inverter to verify that they are tight.
5. Verify that all PV wires are connected with the proper polarity.
6. Verify that all PV wires are tightened to the proper torque specification.
7. Verify that the PV ground wires are connected to ground and are isolated from PV+ or PV-.
8. Verify that the AC neutral wire is connected to the AC Neutral terminal.
9. Verify that the AC phase wires are connected correctly.
10. Verify that all AC phase wires are tightened to the proper torque specification.
11. Verify that the AC ground wire is connected correctly.
12. Inspect the interior of the Magnetics Cabinet and insure that it is free of any tools, foreign objects, water, debris or documents.
13. Verify that the side panels of the Magnetics Cabinet are closed securely and latched.
14. Leave Control Cabinet and Interface Cabinet open for measurement purposes.
15. Inspect the interior of the Control Cabinet and Interface Cabinet to insure that they are free of any tools, foreign objects, water, debris or documents.

16. Ensure that the area around the Sunny Central is clear of any tools, foreign objects or debris.
17. Check the AC connection for a possible clockwise phase sequence. For this purpose, hold the terminals of the phase sequence indicator onto the three phases of the AC connection in the Sunny Central. The indicator shows you whether there is clockwise phase sequence.

9.2 Switching the Sunny Central On


DANGER

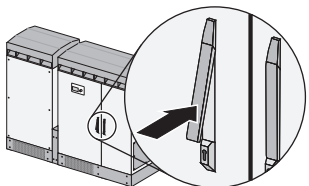
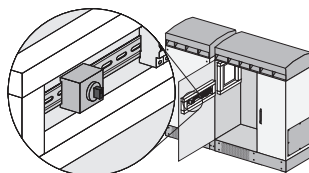
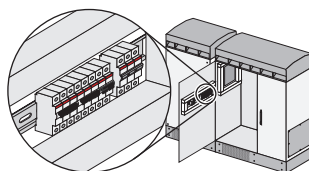
During operation, high voltages are present in the Sunny Central.

Death resulting from electric shock.

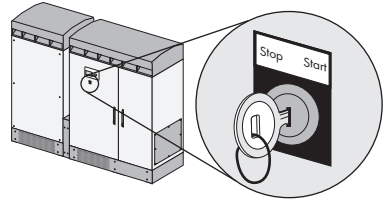
- Do not operate the Sunny Central with doors open.

A door stay is located at the bottom of the Interface Cabinet.

1. Push the door stay (A) upwards to unlock.
 2. Close the door of the Interface Cabinet.
 3. Close the Magnetics Cabinet.
-
4. Turn on the automatic circuit-breaker on the inside of the Control Cabinet's door.
-
5. Turn the stop/start switch on the inside of the Control Cabinet's door to the right until it reaches the start position.
 6. Shut the Control Cabinet door immediately.
-
7. Push the handle down toward the Sunny Central.
 - When the handle has been pushed down, the Sunny Central is closed.



8. Turn the stop/start switch on the Control Cabinet's door to the right until it reaches the start position.

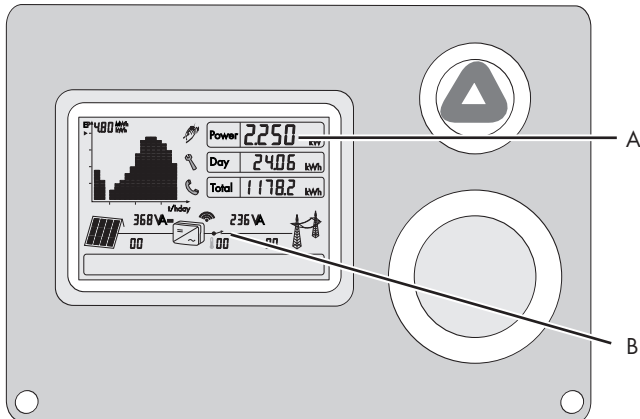
**DANGER**

During operation, high voltages are present in the Sunny Central. The key left in the lock allows unauthorized personnel to open the Sunny Central.

Death resulting from burning and electric shock.

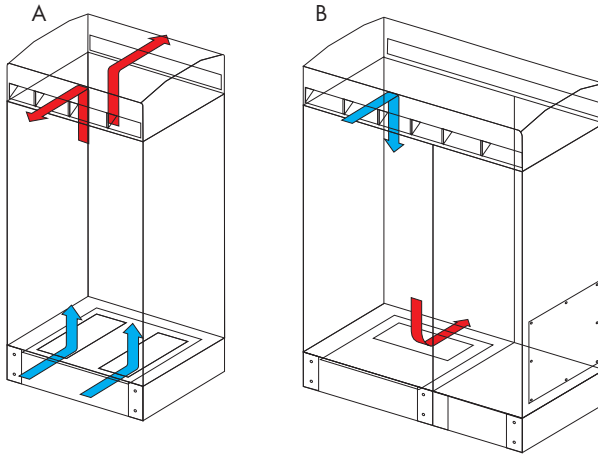
- Remove the keys from the locks of the door and from the lock of the stop/start switch.
- Keep the key in a safe place.

9. Switch on the fuses in the DC distribution boxes (e.g., Sunny Central String-Monitor).
10. Remove the cover of the PV-modules in the array.
11. Switch on the circuit breaker.
12. If there is enough radiation, the DC and AC switches switch on audibly.
13. The display shows the power of the Sunny Central (A) and the switch symbol (B) is closed.



9.3 Check the Ventilation

In operation the Sunny Central is cooled by fans in case the temperature exceeds a defined threshold.



Position	Name
A	In the Magnetics Cabinet, the air is sucked up from below in the front and expelled at the top in the back and front of the Sunny Central.
B	In the Control Cabinet, the air is sucked in from the top front and expelled at the bottom in the back.

Check the ventilation air flow using a sheet of paper.

1. Hold the piece of paper in front of the air shafts.
2. Check to see whether the sheet is blown away from or sucked toward the inverter.
3. Compare the air circulation with what is described in this section.

Result 1

The Sunny Central sucks in air and blows it out as described in this section. Commissioning has been successfully completed.

Result 2

The Sunny Central does not suck air in, nor does it blow it out as described in this section.

1. Shut down the Sunny Central.
2. Contact SMA (see Section 14 "Contact" (page 72)).

Result 3

The Sunny Central does not suck air in nor does it blow it out, at all.

1. Check to see whether the Sunny Central is in operation.
2. If the Sunny Central is in operation, shut it down.
3. Contact SMA (see section 14 "Contact" (page 72)).

10 Opening the Sunny Central



DANGER

Electric shock due to improper opening of the Sunny Central!

Death resulting from burning and electric shock.

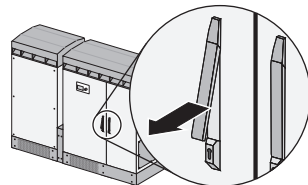
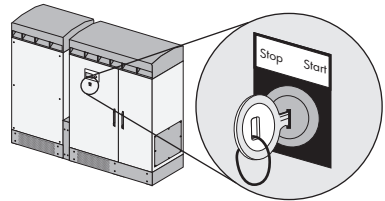
- All procedures described in this Section must be conducted by qualified personnel only.
- Observe the sequence described here when opening the Sunny Central.
- If problems occur while performing the work described here, contact SMA.

10.1 Opening the Control Cabinet

1. Turn the stop/start switch on the Control Cabinet's door to the left until it reaches the stop position.
2. The AC and DC switches in the Sunny Central switch off audibly.
3. Switch off the AC circuit breaker in the array and secure it against accidental switching on.
 - ☑ When the Sunny Central is disconnected, the display turns off.
4. Cover the PV-modules.
5. Switch off the fuses in the DC distribution boxes (e.g. Sunny Central String-Monitor) and secure them against reconnection.
6. Wait 5 minutes

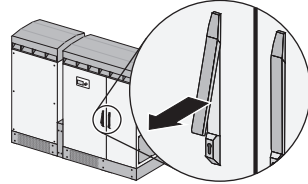
Reason: when the Sunny Central is switched off, voltage will remain in the internal capacitors for 5 minutes.

- ☑ The Sunny Central is deactivated and can be opened.
7. Put the key into the Control Cabinet's lock and open it.
 - ☑ The handle flips up.
 8. Grasp the handle from below and pull it up.
 - ☑ The door's catch is released and the door can be opened.
 9. Open the door.



10.2 Opening the Interface Cabinet

1. Switch off the Sunny Central as described in section 10.1 "Opening the Control Cabinet" (page 60).
2. Put the key into the Interface Cabinet's lock and open it.
 - ☑ The handle flips up.
3. Grasp the handle from below and pull it up.
 - ☑ The door's catch is released and the door can be opened.
4. Open the door.



CAUTION

The DC fuses in the Interface Cabinet become hot during operation.

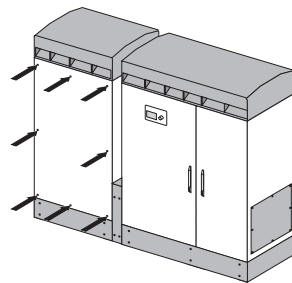
Danger of burn injury due to hot components.

- When working on the Sunny Central wear protective gloves.

5. Verify the absence of voltage with respect to ground at the AC clamp with an appropriate meter. If there is a voltage present, the installation must be checked.
6. Verify the absence of voltage with respect to ground at the DC clamp with an appropriate meter. If there is a voltage present, the installation must be checked.

10.3 Opening the Magnetics Cabinet

1. Switch off the Sunny Central as described in section 10.1 "Opening the Control Cabinet" (page 60).
2. Make sure that no voltage is present as described in section 10.2 "Opening the Interface Cabinet" (page 61).
3. Remove 8 screws from the front of the Magnetics Cabinet with a torx screwdriver.
4. Remove the wall by pulling it forward.





CAUTION

The transformers in the Magnetics Cabinet become hot during operation.

Danger of burn injury due to hot components.

- When working on the Sunny Central wear protective gloves.

11 Maintenance

The Sunny Central inverter must be maintained at regular intervals. Maintenance includes cleaning of cabinet interior, if necessary.

The maintenance interval depends on the location and the ambient conditions.

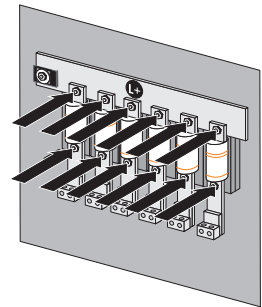
11.1 Sunny Central Maintenance Work

Maintenance work	Maintenance interval (recommended)
Check the screens at the air inlets and outlets and clean them if necessary.	6 months *
Check the fans.	6 months *
Check the air filters of the ventilation plate.	6 months *

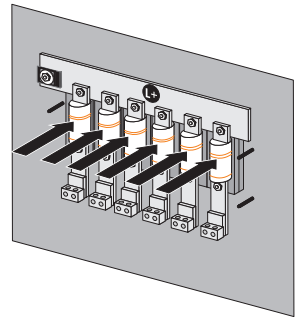
* The maintenance interval may need to be shortened, depending on the location or ambient conditions.

11.2 Replace DC fuse

1. Open the Interface Cabinet as described in section 10.2 "Opening the Interface Cabinet" (page 61).
The DC fuses are fastened with 2 screws each.
2. Remove the 2 screws of each DC fuse.
3. Remove the DC fuses.



4. Mount fuses vertically (spacer).
5. Attach the 2 screws of each DC fuse.
6. Tighten afterwards. Use the torque of 44 ft-lbs (60 Nm).
7. Close the Interface Cabinet.



12 Parameter

This section provides an overview of the parameters of the Sunny Central and their respective threshold values.

12.1 Parameter Description

The following table shows the parameters that are visible in the user and installer levels. Grayed out parameters are only displayed in installer mode.

Parameter name	Range	Default	Parameter Description
Ackn	---, Ackn, NoAckn	---	Acknowledge an error manually An error can be acknowledged remotely. See the Sunny Central's user manual.
CardFunc	---, ForcedWrite, StoEvtHis, StoFailHis	---	Saving ring memory with errors and events on SD card.
ChkGdFrqLo	57 ... 59.8 Hz	59.3 Hz	Minimum frequency for Sunny Central operation. If the frequency drops below the value given in ChkGdFrqLo, the Sunny Central will shut down after the time period given in ChkGdFrqLoT.
ChkGdFrqLoT	160 ms ... 300000 ms	160 ms	
ChkGdFrqMax	60.5 Hz ... 64.5 Hz	60.5 Hz	Maximum frequency for Sunny Central operation. If the frequency exceeds the value given in ChkGdFrqMax, the Sunny Central shuts down immediately.
ChkGdFrqMin	57 Hz ... 59.8 Hz	57 Hz	Minimum frequency for Sunny Central operation. If the frequency drops below the value given in ChkGdFrqMin, the Sunny Central shuts down immediately.
ChkGdVtgHi	288 Vrms ... 321.3 Vrms	304.7 Vrms	Maximum voltage for Sunny Central operation. The Sunny Central shuts down within 1 second in case the voltage exceeds the value defined in ChkGdVtgHi.

Parameter name	Range	Default	Parameter Description
ChkGdVtgLo	149.6 Vrms ... 265.9 Vrms	243.8 Vrms	Minimum voltage for Sunny Central operation. The Sunny Central shuts down within 2 seconds in case the voltage exceeds the value defined in ChkGdVtgLo.
ChkGdVtgMax	288 Vrms ... 332,4 Vrms	332,4 Vrms	Maximum voltage for Sunny Central operation. If the voltage exceeds the value defined in ChkGdVtgMax, the Sunny Central shuts down immediately.
ChkGdVtgMin	138,5 Vrms ... 265,9 Vrms	138,5 Vrms	Minimum voltage for Sunny Central operation. If the voltage drops below the value defined at ChkGdVtgMin, the Sunny Central shuts down immediately.
ChkGnFrqLo			Sunny Central operation with a generator. More information on parameter settings and operating the Sunny Central with a generator can be obtained from SMA.
ChkGnFrqLoT			
ChkGnFrqMax			
ChkGnFrqMin			
ChkGnVtgHi			
ChkGnVtgLo			
ChkGnVtgMax			
ChkGnVtgMin			
CtExtPwrKi			

Parameter name	Range	Default	Parameter Description
CntRs	---, FanHsCnt, FanTrf1Cnt, FanTrf2Cnt, FanCab1Cnt, FanCab2Cnt, GDCtcCut, PvCtcCnt	---	<p>Resetting the hours of operation.</p> <p>Individual meters can be reset (for example after having mounted a new fan).</p> <p>FanHsCnt: Deletes the total running time of the heatsink fan.</p> <p>FanTrf1Cnt: Deletes the total running time of the transformer fan 1.</p> <p>FanTrf2Cnt: Deletes the total running time of the transformer fan 2.</p> <p>FanCab1Cnt: Deletes the total running time of the interior fan 1.</p> <p>FanCab2Cnt: Deletes the total running time of the interior fan 2. Parameter is displayed but is without function.</p>
Dt	yyyymmdd		<p>Current Date.</p> <p>Here you can set the current date.</p>
Ofs_E-Total	0 kWh ... 214748364 kWh	0 kWh	<p>The Sunny Central's total energy yield.</p> <p>The change of the Ofs_E-Total parameter may be necessary when you exchange your Sunny Central and want to use the data from the old device.</p>
Ofs_FanCab1Cnt	0 h ... 2147483 h	0 h	<p>Total operating time of fan 1 in the Control Cabinet.</p> <p>The change of the Ofs_FanCab1Cnt parameter may be necessary if you exchange your Sunny Central and want to use the data from the old device.</p>

Parameter name	Range	Default	Parameter Description
Ofs_FanHsCnt	0 h ... 2147483 h	0 h	Total operating time of the heat sink fan in the Control Cabinet. The change of the Ofs_FanHsCnt parameter may be necessary if you exchange your Sunny Central and want to use the data from the old device.
Ofs_FanTrf1Cnt	0 h ... 2147483 h	0 h	Total operating time of transformer fan 1. The change of the Ofs_FanTrf1Cnt parameter may be necessary if you exchange your Sunny Central and want to use the data from the old device.
Ofs_FanTrf2Cnt	0 h ... 2147483 h	0 h	Total operating time of transformer fan 2. The change of the Ofs_FanTrf2Cnt parameter may be necessary if you exchange your Sunny Central and want to use the data from the old device.
Ofs_h_On	0 h ... 2147483 h	0 h	The Sunny Central's total number of hours of operation. The change of the Ofs_h_On parameter may be necessary when you exchange your Sunny Central and want to use the data from the old device.
Ofs_h_Total	0 h ... 2147483 h	0 h	Total number of operational hours with grid feeding The change of the Ofs_h_Total parameter may be necessary when you exchange your Sunny Central and want to use the data from the old device.
ParaLod	---, Set1, Set2, Factory	---	Loading parameters from SD card. Factory: Factory parameter settings are being loaded.
ParaSto	---, Set1, Set2	---	Saving parameter on SD card.
Plimit	0 kW ... 1000 kW	250 kW	Upper limit for AC output power. This parameter cannot be changed.

Parameter name	Range	Default	Parameter Description
Pmax	0 kW ... 250 kW	250 kW	Output limit of the Sunny Central Changing the parameter can reduce the output power of the Sunny Central.
PVPwrMinTr	0 kW ... 1200 kW	10 kW	MPP tracking
PVPwrMinTrT	1 s ... 1800 s	600 s	If the output exceeds the value PVPwrMinTr, the Sunny Central will wait for a period of time set in PVPwrMinTrT before it begins to seek the Maximum Power Point.
PVStrT	1 s ... 1800 s	90 s	Initial voltage of the Sunny Central.
PVVtgStr	0 V ... 1200 V	390 V	If the voltage increases over the value set at PVVtgStr, the Sunny Central will start after waiting for a period of time set at PVStrT.
Serial Number			Serial number of the Sunny Central. This parameter cannot be changed.
SpntGnMod			Sunny Central operation with a generator. These parameters are for operation with a generator. Contact SMA if you have questions regarding the operation of the Sunny Central with a generator.
SpntGnPwrMin			
SpntRemEna	—, Off, On	On	Shutting down the Sunny Central. With these parameters the Sunny Central can be shut down remotely.
Tm	hhmmss		Current Time. Here you can set the current time.

12.2 Changing Parameters

The changing of the parameters itself is described in the Sunny Central's User Manual.

13 Technical Data

PV-Generator Connection Data

DC input voltage	330 V ... 600 V
Input voltage, MPP range DC	330 V ... 600 V
DC starting voltage*	400 V
Max. input current	800 A
DC voltage ripple**	< 3 %

* adjustable

** peak to peak

Grid Connection Data

Nominal output power at 113 °F (45 °C)	250 kW
Nominal AC voltage	480 V
Operating range AC	422 V ... 528 V
AC nominal frequency	60 Hz
Operating range	59.3 ... 60.5 Hz
Maximum output current at 480 V _{AC}	300.7 A

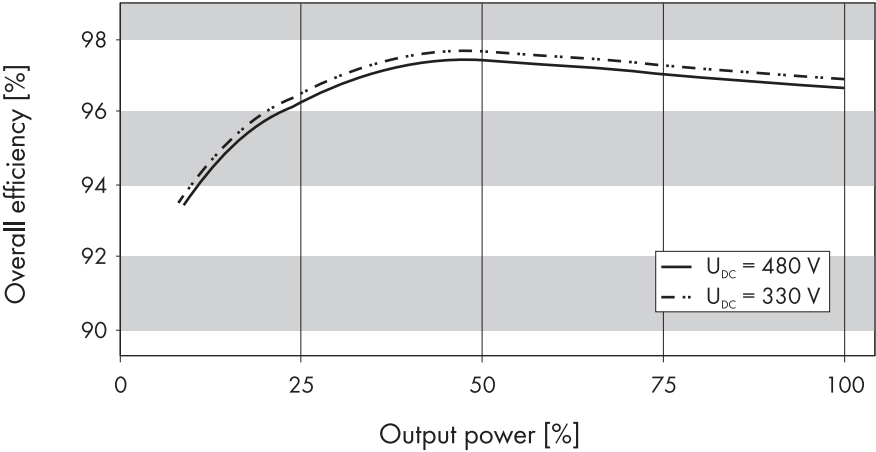
General Data

Width* x Height* x Depth*	109.7 in x 79.8 in x 32.7 in (2786 mm x 2027 mm x 831 mm)
Weight Sunny Central	4,200 lbs.. (1905 kg)
Weight Magnetix Cabinet	2,710 lbs.. (1230 kg)
Weight Control and Interface Cabinet:	1,490 lbs.. (676 kg)
Maximum operating altitude above sea level	13,000 ft. (3.962 m)
Power reduction at altitudes higher than maximum operating per 3,300 ft (1,005 m)	5 %
Ambient temperature without power reduction	– 13 °F ... 113 °F (– 25 °C ... 45 °C)
Ambient temperature with power reduction	– 13 °F ... 122 °F (– 25 °C ... 50 °C)
Output power at 122 °F (50 °C)	173.5 kW
Enclosure rating	NEMA 3R, zinc-plated, coated steel
Current THD**	< 5 %
Power factor at nominal power	> 0.99
Internal consumption in Standby-Mode	< 69 W
Internal consumption including fans	< 800 W

*including roof

**with respect to IEEE 1547

Efficiency



Maximum efficiency at 330 V*	97.5 %
Maximum efficiency at 480 V*	97.2 %
CEC efficiency	97 %

* auxiliary power and fans not included

Deviation

Voltage measurement	$\pm 5.6\text{ V}$
Frequency measurement	$\pm 0.06\text{ %}$
Disconnect time	$\pm 3\text{ %}$

13.1 Torques and Cable Sizes

Copper conductors only - use solid, or stranded copper only.

Connection of the PV-Modules

- The following cable sizes are minimum sizes.
- It is possible to insert combinations of different fuse sizes, but the maximum fuse sizes are 4 x 350 A or 6 x 250 A.

Sunny Central with 4 DC Fuses each 350 A max.

	Number of DC Strings	Cable Size	Torque
DC+, DC-, PE	4	300 kcmil (152 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
	8	2/0 AWG (67 mm ²)	

Sunny Central with 6 DC fuses each 250A max.

	Number of DC Strings	Cable Size	Torque
DC+, DC-, PE	6	4/0 AWG (107 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
	12	2 AWG (33 mm ²)	

Connection to the AC Grid

	Number of AC Cables	Cable Size	Torque
A, B, C	3	600 kcmil (304 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
	6	250 kcmil (127 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
N	1 or 2	4 AWG - 600 kcmil (21 mm ² - 304 mm ²)	All 194 °F (90 °C) copper wire, 315 in-lbs. (35 Nm) tightening torque
PE	1	3/0 AWG - 600 kcmil (85 mm ² - 304 mm ²)	500 in-lbs. (56 Nm)

14 Contact

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

- Inverter type
- Type and number of modules connected
- Communication method
- Serial number of the Sunny Central
- Failure or warning number of the Sunny Central
- Display of the Sunny Central

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15 Appendix - Celsius to Fahrenheit Conversion

The Sunny Central measures temperature in degree Celsius (e.g., set external temperature for derating).

Conversion from Degrees Celsius to Degrees Fahrenheit

- Formula:

$$F = (C * 9/5) + 32$$
 F: Degrees Fahrenheit, C: Degrees Celsius.
- Example for 30 °C

$$F = (30 * 9/5) + 32$$

$$F = (54) + 32$$

$$F = 86 \text{ °F}$$

Conversion from Degrees Fahrenheit to Degrees Celsius

- Formula:

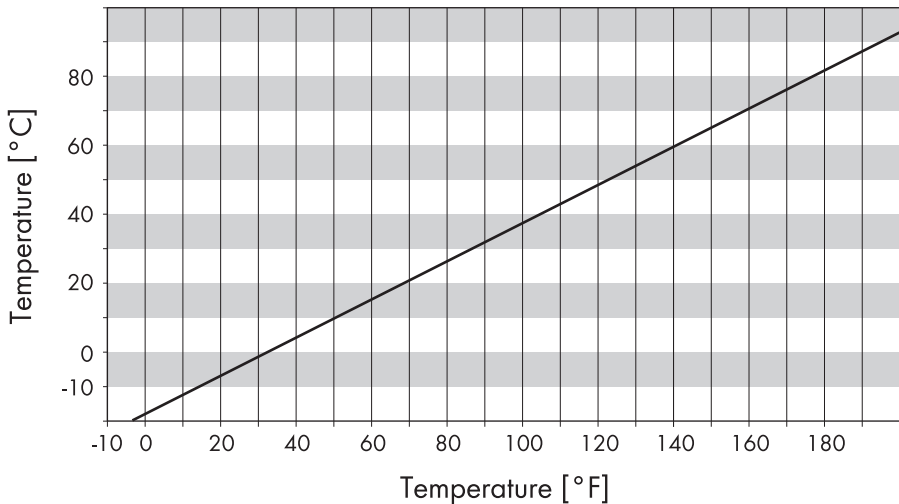
$$C = (F - 32) * 5/9$$
 F: Degrees Fahrenheit, C: Degrees Celsius.
- Example for 86 °F

$$C = (86 - 32) * 5/9$$

$$C = (54) * 5/9$$

$$C = 30 \text{ °C}$$

Diagram



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