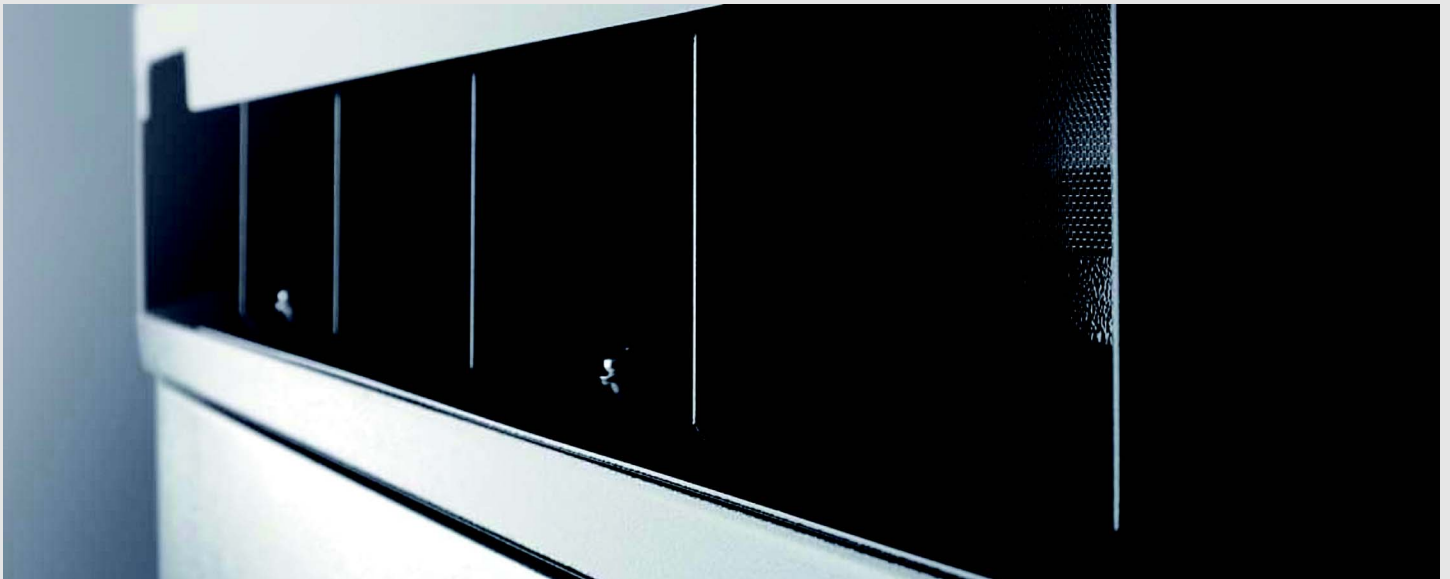


Installation requirements

for **SUNNY CENTRAL 500HE-US/SUNNY CENTRAL 500HE-CA**



Contents

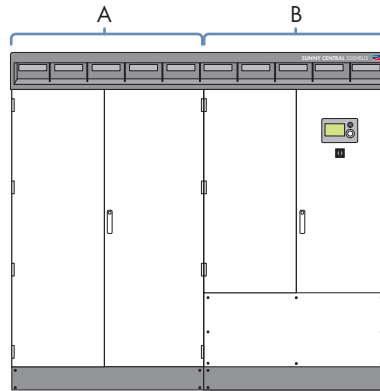
This document describes the requirements which have to be observed for the installation site of the Sunny Central 500HE-US or Sunny Central 500HE-CA outdoors as well as indoors in an enclosed station or room. The installation and the electrical connection of the Sunny Central are described in the installation guide.

The Sunny Central 500HE-US or Sunny Central 500HE-CA is a transformerless inverter. An external medium-voltage transformer is required for grid connection.

Please refer to the separate "Transformer Requirements for the Sunny Central 500HE-US/Sunny Central 500HE-CA" document for transformer specifications.

1 The Sunny Central

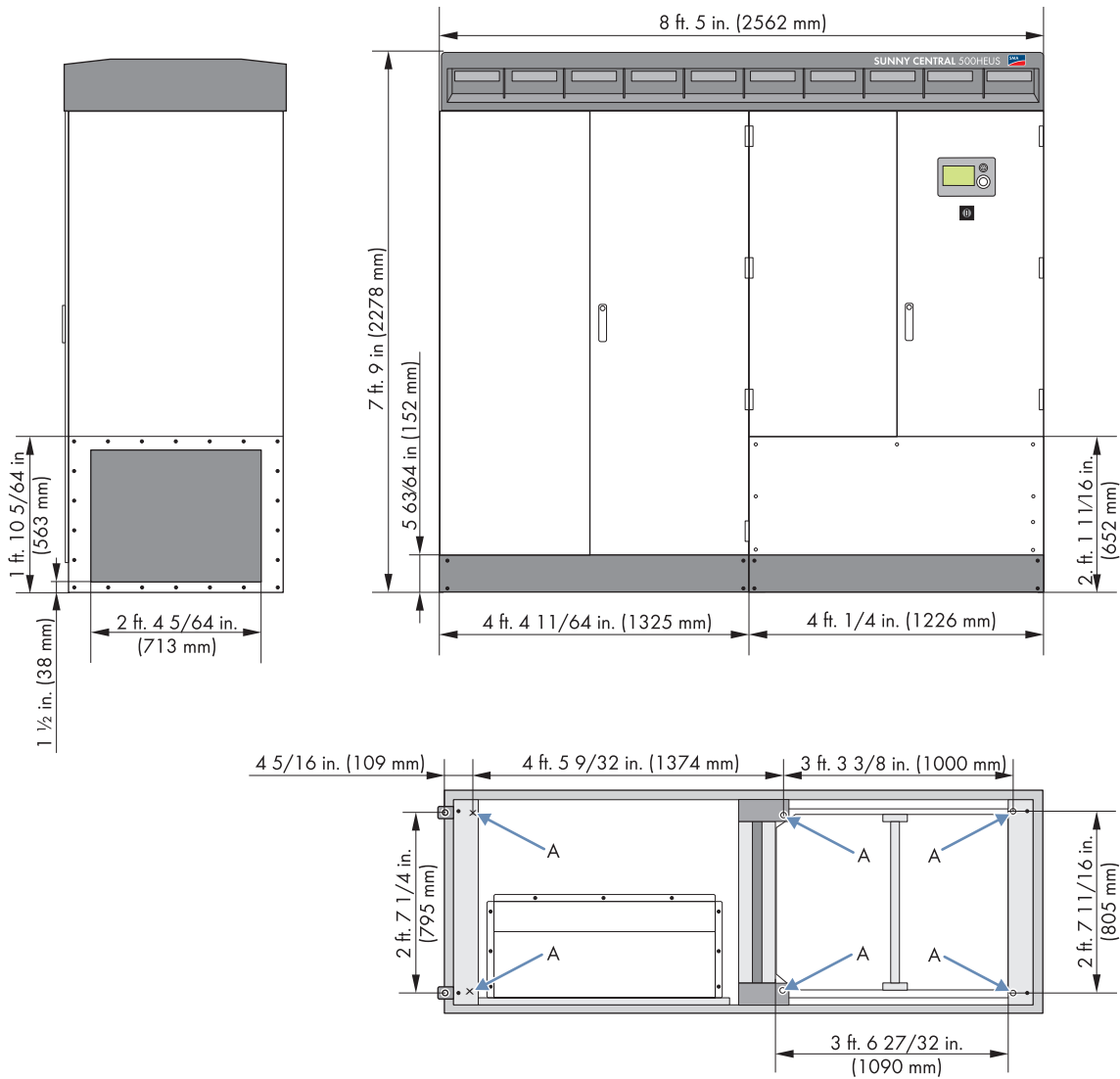
The Sunny Central is divided into 2 sections.



Position	Cabinet	Description
A	Power Cabinet	The power cabinet contains the power unit for converting direct current to alternating current.
B	Control and Interface Cabinet	All AC, DC and communication cables are connected in the control and interface cabinet. The control and interface cabinet contains: <ul style="list-style-type: none"> • system control • Sunny Display • stop/start switch • optional communication devices

2 Dimensions and weight

Width	Height	Depth	Weight
8 ft. 5 in. (2 562 mm)	7 ft. 9 in. (2 278 mm)	2 ft. 11 ⁷ / ₁₆ in. (900 mm)	3 970 lb. (1 800 kg)



3 Choosing the installation site

3.1 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 $+50^{\circ}\text{C}$).
- See section "Air intake and exhaust" below for air cooling requirements.
- Direct solar irradiation reduces the output power of the Sunny Central due to derating starting at lower ambient temperatures. Direct solar irradiation does not affect the lifetime of the Sunny Central. The inverter can be equipped with a double walling optionally to reduce the heat intake by direct solar irradiation. The width and depth of the Sunny Central increases by $2\frac{3}{64}$ in. (60 mm) each in this case.
- SMA recommend the use of the double walling option or external shading for frequently ambient conditions of more than $1\,000\text{ W/m}^2$ and Temperatures $>+104^{\circ}\text{F}$ ($+40^{\circ}\text{C}$) at the same time. Due to the additional energy intake by direct solar irradiation, derating may start although the ambient temperature stays below $+113^{\circ}\text{F}$ ($+45^{\circ}\text{C}$).
- If installed on the SMA MV Power Platform, the canopy version has to be chosen for temperatures $>+104^{\circ}\text{F}$ ($+40^{\circ}\text{C}$) and more than $1\,000\text{ W/m}^2$ at the same time to ensure proper long-term operation of the station subsidiary and the MV transformer.
- The Sunny Central continues feed-in at ambient temperatures above $+113^{\circ}\text{F}$ ($+45^{\circ}\text{C}$), but reduces its power to protect its components.

3.2 Minimum clearance

Minimum clearance 1 Sunny Central with Transformer

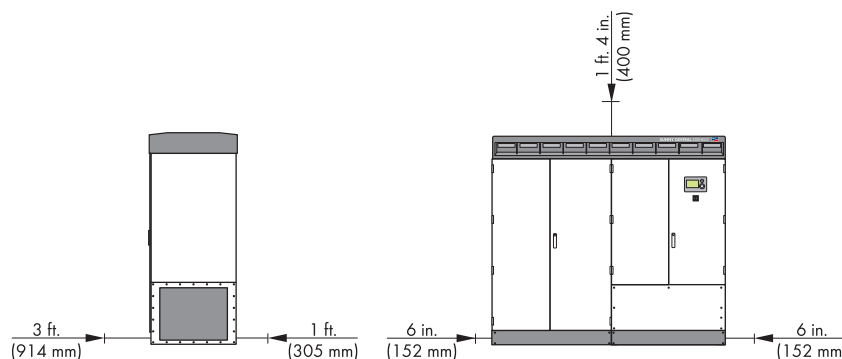
NOTICE:

Minimum clearances in front of the inverter are defined within ANSI/NFPA 70, section 110.34. Please check for specific requirements first.

NOTE: The working space in front of the inverter has to increase from 3 ft. to 3 ft. 6 in. (915 mm to 1 067 mm) for installation within an enclosed station or room.

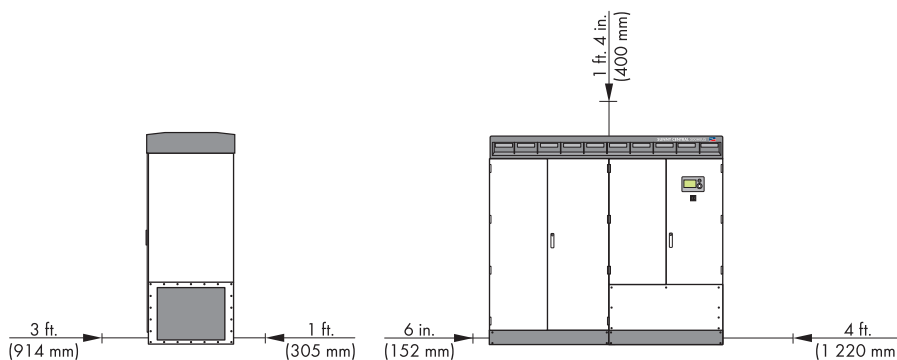
Version 1 - Cable inserts from below

Observe the specified minimum clearances for the cables, for ventilation and for opening the doors. See separate manual for transformer requirements.



Version 2 - Cable inserts from the side

Observe the specified minimum clearances for the cables, for ventilation and for opening the doors. See separate manual for transformer requirements.



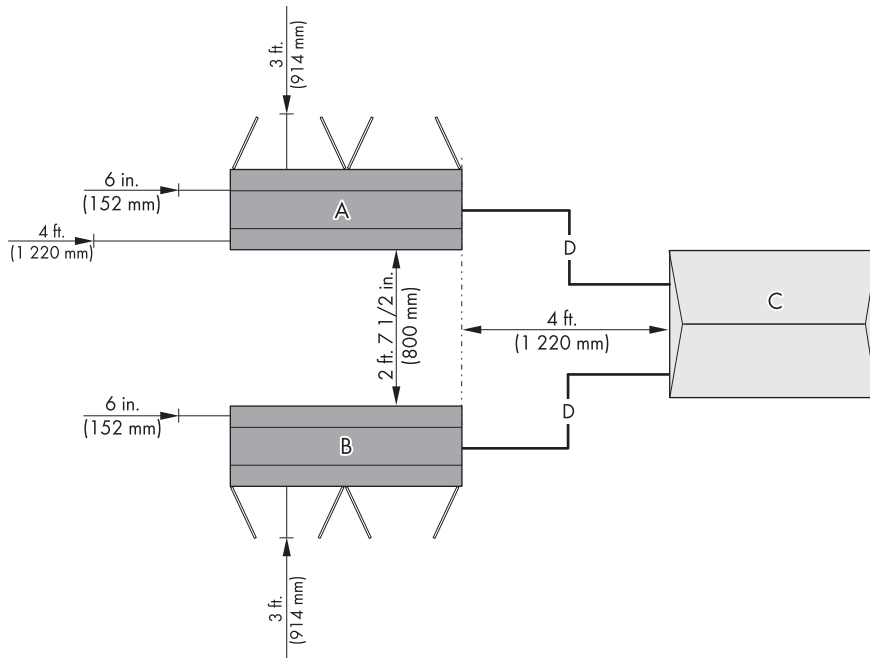
Minimum clearance 2 Sunny Central with Transformer

NOTICE:

Minimum clearances in front of the inverter are defined within ANSI/NFPA 70, section 110.34. Please check for specific requirements first.

Version 1 - Rear to rear installation

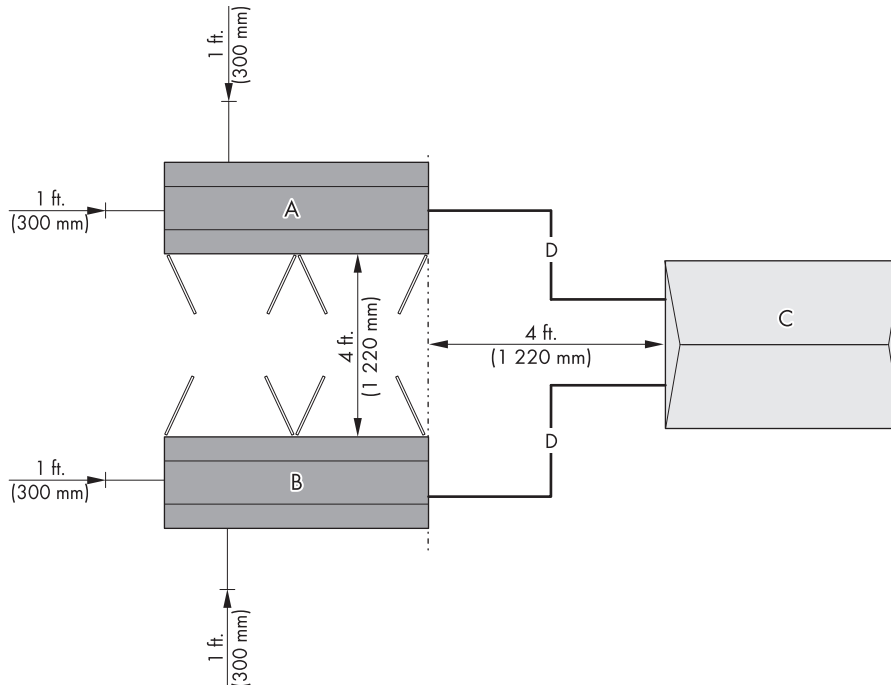
Observe the specified minimum clearances for the cables, for ventilation and for opening the doors. See separate manual for transformer requirements.



Position	Description
A	Sunny Central 1
B	Sunny Central 2
C	Medium-voltage transformer + Medium-voltage switchgear
D	Cable route between Sunny Central and transformer. The cables between the Sunny Central and the transformer must be not longer than 49 ft.

Version 2 - Face to face installation

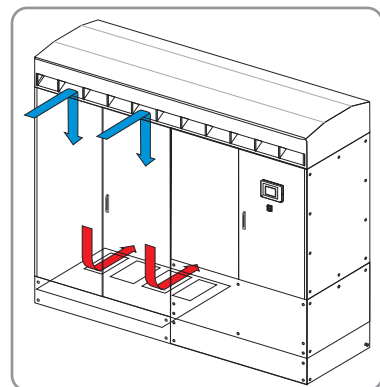
Observe the specified minimum clearances for the cables, for ventilation and for opening the doors. See separate manual for transformer requirements.



Position	Description
A	Sunny Central 1
B	Sunny Central 2
C	Medium-voltage transformer and medium-voltage switchgear
D	Cable route between Sunny Central and transformer. The cables between the Sunny Central and the transformer must be not longer than 49 ft.

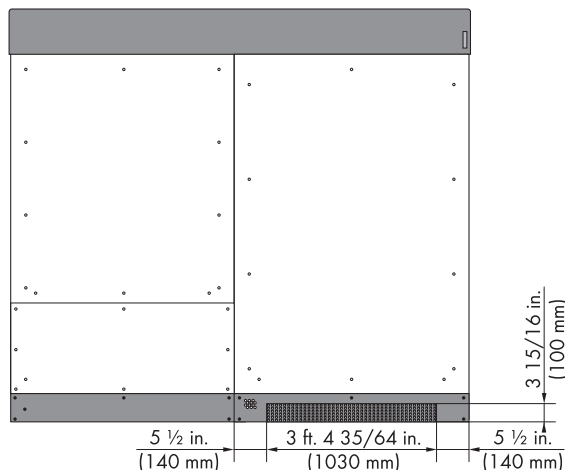
3.3 Air intake and exhaust

- The cooling air is sucked in at the top front of the inverter and is blown out at the bottom back side. The graphics shows the principal air circulation.



The Sunny Central requires 1 766 CFM (3 000 m³/h) of cooling air. It blows the exhaust air out through the openings in the base area of the inverter cabinet.

The following illustration shows the dimensions of the exhaust air opening.



If mounted in an enclosed station or room, an air channel has to be mounted on the air exhaust area to ensure that the heated air is blown out of the enclosed station or room.

The following pressure drops must not be exceeded in this case:

Decrease of pressure in case of air intake	Decrease of pressure in case of air outlet	Air volume
20 Pa	10 Pa	3 000 m ³ /h

It has to be ensured that the sealings are appropriate so that no exhaust air flows back into the enclosure. A short circuit of exhausted air flowing back in the air intake has to be avoided. If screens against insects or filters are installed, they will have to be removable for regular cleaning.

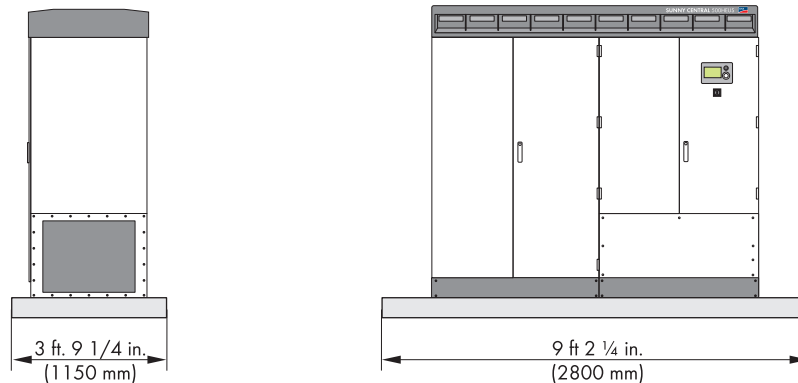
The maximum power losses of the Sunny Central 500HE-US/CA are 1 700 W. This additional heating as well as the energy intake by solar irradiation into the enclosure has to be taken into account for the enclosure design. The overtemperature derating may start at lower ambient temperatures than those stated in the data sheet due this additional intake.

It has to be ensured that the storage temperature inside the enclosure does not exceed 140°F (60°C) even if the inverter is shut down.

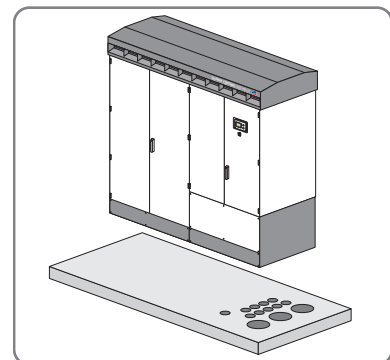
4 Base

4.1 Characteristics of the base

- The foundation must be made of concrete or of a metal frame (eg. SMA's MV Power Platform).
- The mounting surface must be level and strong enough to support the weight of the inverter. The evenness of the foundation must be better than 0,25%.
- The width and depth of the base must be at least the same size as the Sunny Central. The recommended minimum sizing dimensions are shown in the drawing below.



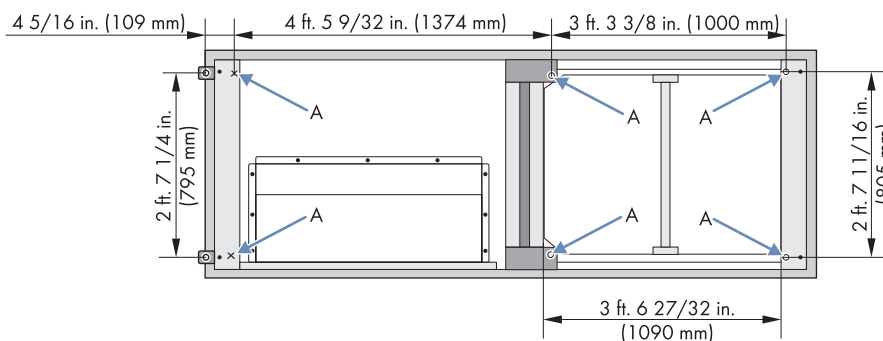
- To insert the cables from below, the cable conduits must be laid in the foundation.



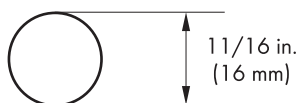
4.2 Preparation of the Base

The inverter must be secured to the foundation per local building codes. At the bottom of the Sunny Central there are 6 mounting holes (A) for anchoring it to its base.

Position of the Mounting Holes



Size of the Mounting Holes

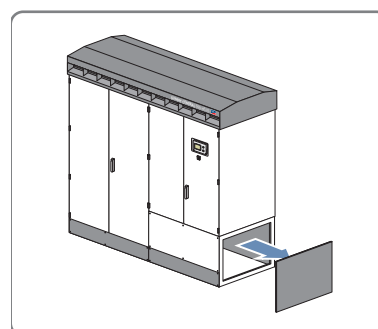


5 Attaching the Conduits

The DC cables, the AC cables and the communication cables can be routed into the Sunny Central interface cabinet from the right or from below. The 2 options are described below.

Insert Cables From the Right Into the Sunny Central

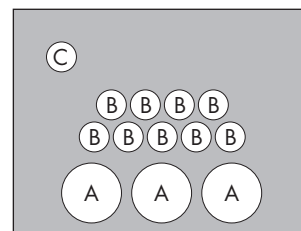
Insert the DC cables, the AC cables and the data cables into the Sunny Central from the right. A metal sheet is attached to the Sunny Central for this purpose.



NOTICE: Different AC cable lengths require specific AC cable arrangements. Refer to installation manual for further information.

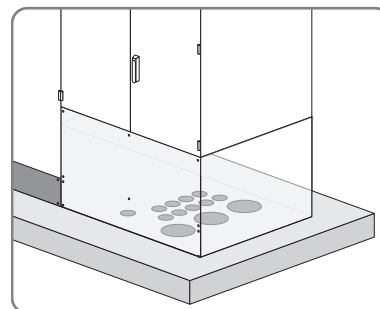
Right figure: Example of how the holes for the conduits are arranged for 9 DC inputs and 3 AC outputs per phase.

Position	Description
A	Conduit for AC cables.
B	Conduit for DC cables.
C	Conduit for communication cables.



Insert cables from below into the Sunny Central

Insert the DC cables, the AC cables and the communication cables into the Sunny Central from the bottom through the foundation.



6 Transport

The Sunny Central comprises a compact enclosure which can be transported with either a long lift truck, a forklift truck or a crane fork - transport with a crane with suitable lifting device is also possible. Note that the selected means of transportation must be suitable for the weight of the Sunny Central of 3 970 lb. In delivery condition, the panels in the base area are dismantled in order that the Sunny Central can be transported immediately. The stable frame construction enables transport without wooden pallets. Thus a freight vehicle with a maximum overall height of 13 ft. 1 1/2 in. (4 000 mm) is sufficient for transport.

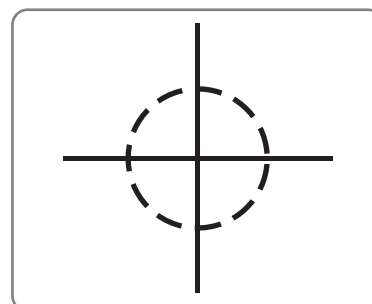
See installation manual for transport details and preparation of the Sunny Central for transport on site.

- Center of gravity

The symbol to the right indicates the center of gravity of the Sunny Central. It is to be found on the packaging and on the inverter. The center of gravity is not in the middle of the Sunny Central.

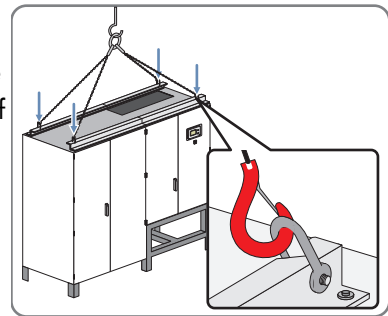
Position of Center of Gravity measured from left front corner of inverter:

- horizontal: 3 31/32 ft. (1 210 mm)
- vertical: 1 31/32 ft. (600 mm)
- depth: 1 ft . 6 1/2 in. (470 mm)



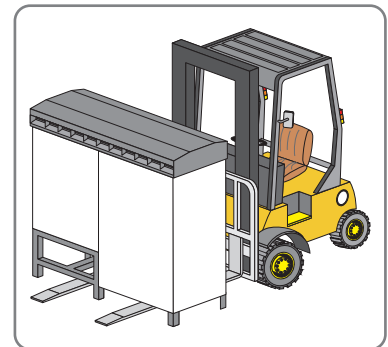
- Crane

The stable enclosure of the Sunny Central with the strengthened frame allows for simple transportation with a crane. You must remove the roof to reach the fixing points of the lifting device. Refer to the installation guide for information on the dismantling procedure.



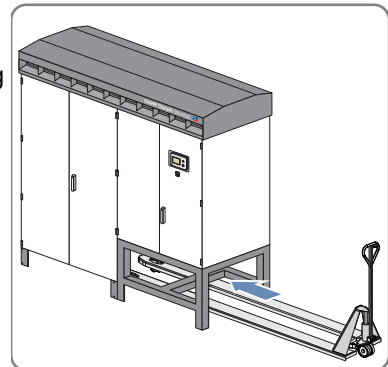
- Forklift truck

You can lift and transport the Sunny Central from the front and rear using a forklift truck.



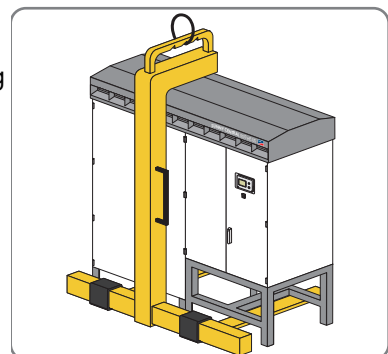
- Long lift truck

You can lift and transport the Sunny Central from the side using a long lift truck.



- Crane fork

You can lift and transport the Sunny Central from the front or rear using a crane fork.



7 Electrical Connection

7.1 DC, AC and PE cabling

You can connect all DC, AC and PE cables to optionally pre-mounted screw terminals or directly to the bus bar via cable lugs provided by the customer. The necessary connecting screws are delivered in both cases to ensure defined torque values.

Connect all cable using copper or aluminium conductors that are suitable for temperatures of +194°F (+90°C) and in accordance with National Electrical Code® ANSI/NFPA 70 or CEC C22.1-09 respectively.

The AC cabling between the inverter and the transformer must not exceed 49 ft. (15 m). All AC cables must have the same length.

The AC cabling must be suitable for the pulsed operation of the inverter. Therefore, it has to be specified to 390 Vrms, 800 Vpeak and a maximum voltage gradient of 500 V/μs.

The following explanation defines the AC cable arrangement:

Cable arrangement for AC cables shorter than 6 1/2 ft. (2 m)

Arrange the cables as shown in the following figure for all number of cables with length shorter than 6 1/2 ft. (2 m). The description is exemplary for an arrangement with 4 cables per phase. The distance between the cables should be twice the diameter of a single cable.

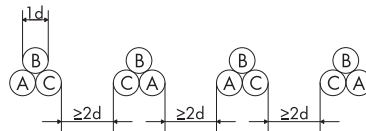


Figure 1: AC cable arrangement 1

Cable arrangement for AC cables longer than 6 1/2 ft. (2 m)

Arrange the cables as shown in the following figure For all number of cables with length longer than 6 1/2 ft. (2 m). The description is exemplary for an arrangement with 4 cables per phase.

For AC cable arrangement 1: the distance between the cables should be twice the diameter of of a single cable.



Figure 2: AC cable arrangement 2

Number of cables per phase	3	4	5	6
	AC cable arrangement 1	If possible: AC cable arrangement 2. else: AC cable arrangement 1	AC cable arrangement 1	If possible: AC cable arrangement 3. else: AC cable arrangement 1.



Figure 3: AC cable arrangement 3

7.2 Torques and Cable Sizes

The maximum cable size of 800 kcmil for each cable lug and 600 kcmil for the screw terminals. Each screw terminal can pick up 1 or 2 conductors. 2 cable lugs can be attached to each input terminal, so that 2 conductors maximum can be connected to each input terminal in both connection type cases.

Screw terminals or screws for mounting cable lugs are included in scope of delivery.

Cable lugs have to be UL listed compression lugs with two securement holes ($\frac{1}{2}$ in. (13 mm) in diameter) and a distance between the holes of $1 \frac{3}{4}$ in. (44 mm). Both holes have to be utilized in installation. The width of the lugs has to exceed the washer diameter of $1 \frac{1}{4}$ in. (32 mm) to ensure defined torque values listed below.

For individual cable sizing refer to article National Electrical Code® 310.

Required torques and cable sizes

Connection method	Cable size	Torque
Cable fixing in screw terminal	4 AWG ... 600 kcmil (25 mm ² ... 304 mm ²)	41.5 ft.-lbs. (56.5 Nm)
Cable lug, aluminum on copper busbar	4 AWG ... 800 kcmil (25 mm ² ... 405 mm ²)	27.5 ft.-lbs. (37 Nm)
Cable lug, copper on copper busbar	4 AWG ... 800 kcmil (25 mm ² ... 405 mm ²)	44.5 ft.-lbs. (60 Nm)

Cable requirements for DC, AC and PE connection

Maximum number of DC inputs:	9 x PV+, 9 x PV – , 9 x ground
Maximum number of DC fuses:	9 (sized 450 A maximum)
DC input voltage:	330 V ... 600 V
Maximum DC current:	1 600 A
DC conductors:	2 per input maximum
AC conductors:	6 per phase maximum
Nominal AC grid voltage:	200 V
Maximum AC current:	1 470 A

7.3 Optional External voltage supply

Besides the possibility to draw the energy consumption from the PV field, it is possible to connect the Sunny Central to an external 208 V voltage supply as well. The Sunny Central consumes up to 1 700 VA in operation. At installation sites, where the feed-in tariff per kWh does apply, it may be useful to connect the Sunny Central to an external voltage supply. The Sunny Central then draws the electricity for its internal power supply from the grid via the external voltage supply.

Fuses between external power supply and Sunny Central

The installer is responsible for installing the fuses between the external power supply and the Sunny Central. The Sunny Central has an internal circuit breaker with a short-circuit current limit of 16 A.

Cable requirements

Cable Size	Cable
12 AWG minimum	140°F (60°C) minimum, copper wire
14 AWG minimum	194°F (90°C) minimum, copper wire

Grid

For connecting the external voltage, a 208 V grid is required at the installation site.

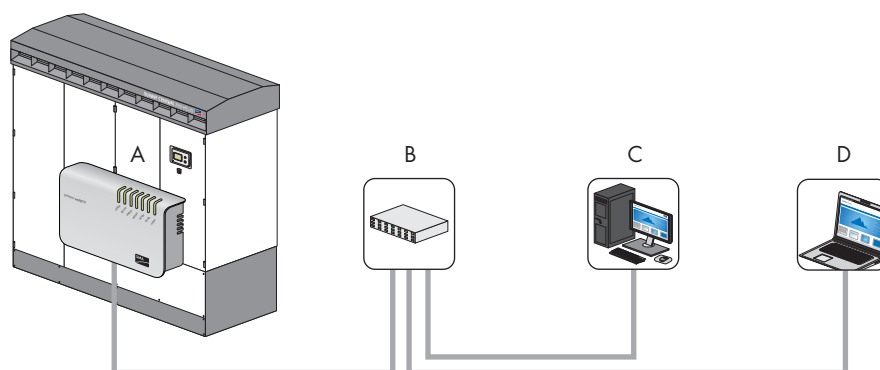
8 Communication devices

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.

8.1 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	Description
A	Sunny WebBox
B	Switch or routing switch
C	Computer
D	Laptop

8.2 Data cable

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

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

8.3 External setpoint setting

As a rule, the network operator sets external target values for the reactive power and active power. These are normally transmitted via a ripple control receiver. The Power Reducer Box receives the target values from the ripple control receiver and sends these to the Sunny Central by means of the Sunny WebBox. The Sunny Central applies the specifications of the network operator and feeds for example a specified reactive power into the power distribution grid. Ask your network operator which signal transmission is used.

If the target values are not transmitted via the Sunny WebBox and the Power Reducer Box, there are terminals in the Sunny Central to connect the external setpoint settings. The Sunny Central processes standard signals from 4 mA ... 20 mA. The Sunny Central contains 2 terminals for the reactive power setpoint specifications and 2 terminals for the active power setpoint specifications with a grip range of AWG 40 (0.08 mm) ... AWG 6 (4 mm).

9 Technical Data

9.1 Sunny Central 500HE-US/Sunny Central 500HE-CA

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

Solar Generator Connection Data

DC input voltage	V_{DC0}	330 V ... 600 V
MPP range at full power	V_{DC}	330 V ... 480 V
DC starting voltage (adjustable)	V_{DC}	390 V
Max. input current	I_{DCMax}	1 600 A
DC voltage ripple (peak to peak)	V_{SS}	< 3%

Inverter Output Data

Nominal output power*	P_{ACMax}	500 kW
Nominal AC voltage (3 phase without neutral)	V_{ACNom}	200 V
Operating range	V_{AC}	180 V ... 220 V
AC nominal frequency	f_{ACNom}	60 Hz
Operating range	f_{AC}	59.3 Hz ... 60.5 Hz
Maximum AC current (at 200 V)	I_{ACMax}	1 470 A

*at up to +113°F (+45°C)

General Data

Inverter technology		True sine wave, current source, high frequency PWM without galvanic insulation
Maximum operating altitude		13 000 ft. above sea level
Maximum operating altitude without power reduction		3 300 ft. above sea level*
Ambient temperatures without power reduction		- 13°F ... +113°F (- 25°C ... +45°C)
Ambient temperatures with power reduction		+113°F ... +122°F (+45°C ... +50°C)
Storage temperature		- 13°F ... +140°F (- 25°C ... +60°C)
Cooling		Temperature-controlled forced fans
Dimensions Width x Height x Depth**		8 ft. 5 in. x 7 ft. 9 in x 3 ft. 2 in. (2 562 mm x 2 278 mm x 965 mm)
Weight		approx. 3 970 lb.
Enclosure rating		NEMA 3R
Current THD***		< 5%
Power factor	cos φ	0.9 leading ... 0.9 lagging
Internal consumption Standby	P	< 110 VA
Internal consumption with fans	P	< 1 700 W

* at higher altitudes the power is reduced by 5% per 3 300 ft.

** including roof

*** with respect to IEEE 1547

Efficiency

Maximum efficiency	98,6%
CEC efficiency	98,0%

9.2 Measurement Accuracy

The Sunny Central is not equipped with a calibrated meter. The display values may deviate from the actual values and must not be used as a basis for invoicing. The measured values of the Sunny Central are required for the system management and to control the current to be fed to the grid.

Deviation

Voltage measurement	- 5.6 V ... +5.6 V
Frequency measurement	- 0.08 Hz ... +0.08 Hz
Disconnect time	- 4.5% ... +4.5%