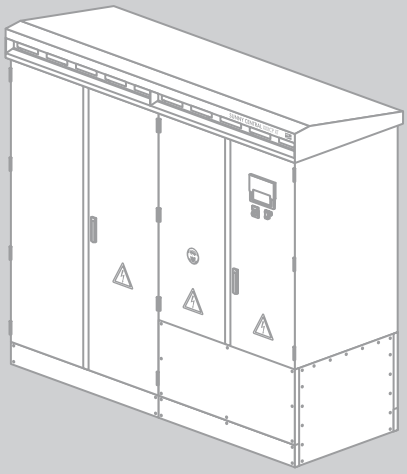
Installation at high altitudes

Design of Central Inverters for Mounting Locations above 2,000 m MSL

SUNNY CENTRAL xxxxCP XT



Content

This document describes the special characteristics of mounting locations above 2,000 m MSL (Mean Sea Level) and the effects on the design of central inverters of the CP XT production series.

When designing central inverters for mounting locations exceeding 2,000 m above MSL, the following effects must be taken into account:

- The maximum permissible DC voltage of the central inverter decreases.
- The maximum AC power of the central inverter decreases.

1 Impact of Altitude

In altitudes above 2,000 m MSL, special ambient conditions occur which have an impact on the operation of the central inverter. For these altitudes, there are special order options for the central inverter. You must also take into account the impact of the air density on the DC voltage and on the AC power of the central inverter when selecting the device type.

Reduced Insulation Effect of the Air Requires Lower DC Voltage

With increasing altitude, the air density reduces and thus the electric insulation effect of the air. Due to the reduced electric insulation effect of the air, creepage or partial discharge may result. In order to prevent such electrical discharges, the DC voltage must be reduced. The following table shows the maximum DC voltage and the maximum MPP voltage in relation to the mounting location above MSL. The specifications were determined taking into account the standard IEC 62109 and in accordance with the screening factors for air and creepage distances therein contained.

Mounting location above MSL	Max. DC voltage	Max. MPP voltage
0 m to 2,000 m	1,000 V	850 V
2,001 m to 2,500 m	1,000 V	850 V
2,501 m to 3,000 m	964 V	850 V
3,001 m to 3,500 m	901 V	800 V
3,501 m to 4,000 m	852 V	800 V

Reduced Cooling Effect of the Air Requires a Reduction of the AC Power

Due to the reduced air density, the cooling effect of the air also diminishes. Due to the reduced cooling of the central inverter, the maximum AC power of the inverter decreases. The following table shows the maximum ambient temperatures at which the central inverter can reach its maximum and nominal power.

Mounting location above MSL	Max. ambient temperature for reaching the following AC power:	
	Maximum power	Nominal power
0 m to 2,000 m	+ 25°C	+ 50°C
2,001 m to 2,500 m	+ 21°C	+ 46°C
2,501 m to 3,000 m	+ 18°C	+ 43°C
3,001 m to 3,500 m	+ 15°C	+ 40°C
3,501 m to 4,000 m	+ 12°C	+ 37°C

Result: Reduced AC Power of the Central Inverter

All these conditions result in a reduction of the AC power of the central inverter at mounting locations above 2,000 m MSL.

The table serves as an initial estimation for a possible design in terms of the nominal AC power of the central inverter. When selecting an appropriate central inverter, you must also take into account the modified maximum DC voltage at height installation.

Required AC nominal power	Altitude	≤ 2,000 m	≤ 2,500 m	≤ 3,000 m	≤ 3,500 m	≤ 4,000 m
	Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V
	Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
500 kW		SC 500CP XT	SC 630CP XT	SC 630CP XT	SC 630CP XT	SC 630CP XT
630 kW		SC 630CP XT	SC 720CP XT	SC 720CP XT	SC 720CP XT	SC 720CP XT
720 kW		SC 720CP XT	SC 760CP XT	SC 760CP XT	SC 800CP XT	SC 800CP XT
760 kW		SC 760CP XT	SC 800CP XT	SC 800CP XT	SC 850CP XT	SC 850CP XT
800 kW		SC 800CP XT	SC 850CP XT	SC 850CP XT	SC 900CP XT	SC 900CP XT
850 kW		SC 850CP XT	SC 900CP XT	SC 900CP XT	SC 1000CP XT	SC 1000CP XT
900 kW		SC 900CP XT	SC 1000CP XT	SC 1000CP XT	SC 1000CP XT	SC 1000CP XT
1000 kW		SC 1000CP XT	–	–	–	–

2 Technical Data

In this section you will find the technical data for central inverters of type SC xxxCP XT which differ depending on the mounting location above MSL.

2.1 Sunny Central 500CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2, 500	2,501 to3,000	3,001 to 3, 500	3,501 to 4, 000
Nominal AC power	500 kW	480 kW	470 kW	465 kW	460 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,069 A	1,028 A	1,014 A	996 A	986 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,250 A	1,203 A	1,186 A	1,165 A	1,153 A
Max. AC current	1,176 A	1,131 A	1,116 A	1,096 A	1,084 A
Continuous AC power	550 kW	529 kW	522 kW	513 kW	507 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.2 Sunny Central 630CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2,500	2,501 to3,000	3,001 to 3,500	3,501 to 4,000
Nominal AC power	630 kW	605 kW	595 kW	585 kW	580 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,155 A	1,111 A	1,096 A	1,076 A	1,065 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,350 A	1,299 A	1,281 A	1,258 A	1,245 A
Max. AC current	1,283 A	1,222 A	1,206 A	1,284 A	1,171 A
Continuous AC power	693 kW	666 kW	655 kW	644 kW	638 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.3 Sunny Central 720CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2,500	2,501 to3,000	3,001 to 3,500	3,501 to 4,000
Nominal AC power	720 kW	690 kW	680 kW	670 kW	660 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,283 A	1,234 A	1,218 A	1,196 A	1,183 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,400 A	1,347 A	1,329 A	1,305 A	1,291 A
Max. AC current	1,411 A	1,358 A	1,339 A	1,315 A	1,301 A
Continuous AC power	792 kW	759 kW	748 kW	737 kW	726 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.4 Sunny Central 760CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2,500	2,501 to3,000	3,001 to 3,500	3,501 to 4,000
Nominal AC power	760 kW	730 kW	720 kW	705 kW	700 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,283 A	1,234 A	1,218 A	1,196 A	1,183 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,400 A	1,347 A	1,329 A	1,305 A	1,291 A
Max. AC current	1,411 A	1,358 A	1,339 A	1,315 A	1,301 A
Continuous AC power	836 kW	803 kW	792 kW	776 kW	770 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.5 Sunny Central 800CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2,500	2,501 to3,000	3,001 to 3,500	3,501 to 4,000
Nominal AC power	800 kW	770 kW	755 kW	745 kW	735 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,283 A	1,234 A	1,218 A	1,196 A	1,183 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,400 A	1,347 A	1,329 A	1,305 A	1,291 A
Max. AC current	1,411 A	1,358 A	1,339 A	1,315 A	1,301 A
Continuous AC power	880 kW	842 kW	831 kW	819 kW	809 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.6 Sunny Central 850CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2,500	2,501 to3,000	3,001 to 3,500	3,501 to 4,000
Nominal AC power	850 kW	820 kW	810 kW	795 kW	790 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,283 A	1,234 A	1,218 A	1,196 A	1,183 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,400 A	1,347 A	1,329 A	1,305 A	1,291 A
Max. AC current	1,411 A	1,358 A	1,339 A	1,315 A	1,301 A
Continuous AC power	935 kW	902 kW	891 kW	875 kW	869 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.7 Sunny Central 900CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2,500	2,501 to3,000	3,001 to 3,500	3,501 to 4,000
Nominal AC power	900 kW	865 kW	850 kW	835 kW	830 kW
Max. ambient temperature at nominal AC power	50°C	47°C	43°C	40°C	37°C
Nominal AC current	1,283 A	1,234 A	1,218 A	1,196 A	1,183 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,400 A	1,347 A	1,329 A	1,305 A	1,291 A
Max. AC current	1,411 A	1,358 A	1,339 A	1,315 A	1,301 A
Continuous AC power	990 kW	951 kW	935 kW	919 kW	908 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

2.8 Sunny Central 1000CP XT

Size	Mounting location above MSL (in m)				
	0 to 2,000	2,001 to 2, 500	2,501 to3,000	3,001 to 3, 500	3,501 to 4, 000
Nominal AC power	1,000 kW	960 kW	945 kW	930 kW	920 kW
Max. ambient temperature at nominal AC power*	40°C	37°C	33°C	30°C	27°C
Nominal AC current	1,426 A	1,372 A	1,353 A	1,329 A	1,315 A
Max. MPP voltage	850 V	850 V	850 V	800 V	800 V
Max. DC current	1,635 A	1,573 A	1,552 A	1,529 A	1,507 A
Max. AC current	1,568 A	1,508 A	1,488 A	1,461 A	1,446 A
Continuous AC power	1,100 kW	1,057 kW	1,043 kW	1,024 kW	1,014 kW
Max. ambient temperature at continuous AC power	25°C	21°C	18°C	15°C	12°C
Max. DC voltage	1,000 V	1,000 V	964 V	901 V	852 V

* Consider the modified temperature behavior of the SC1000CP XT.