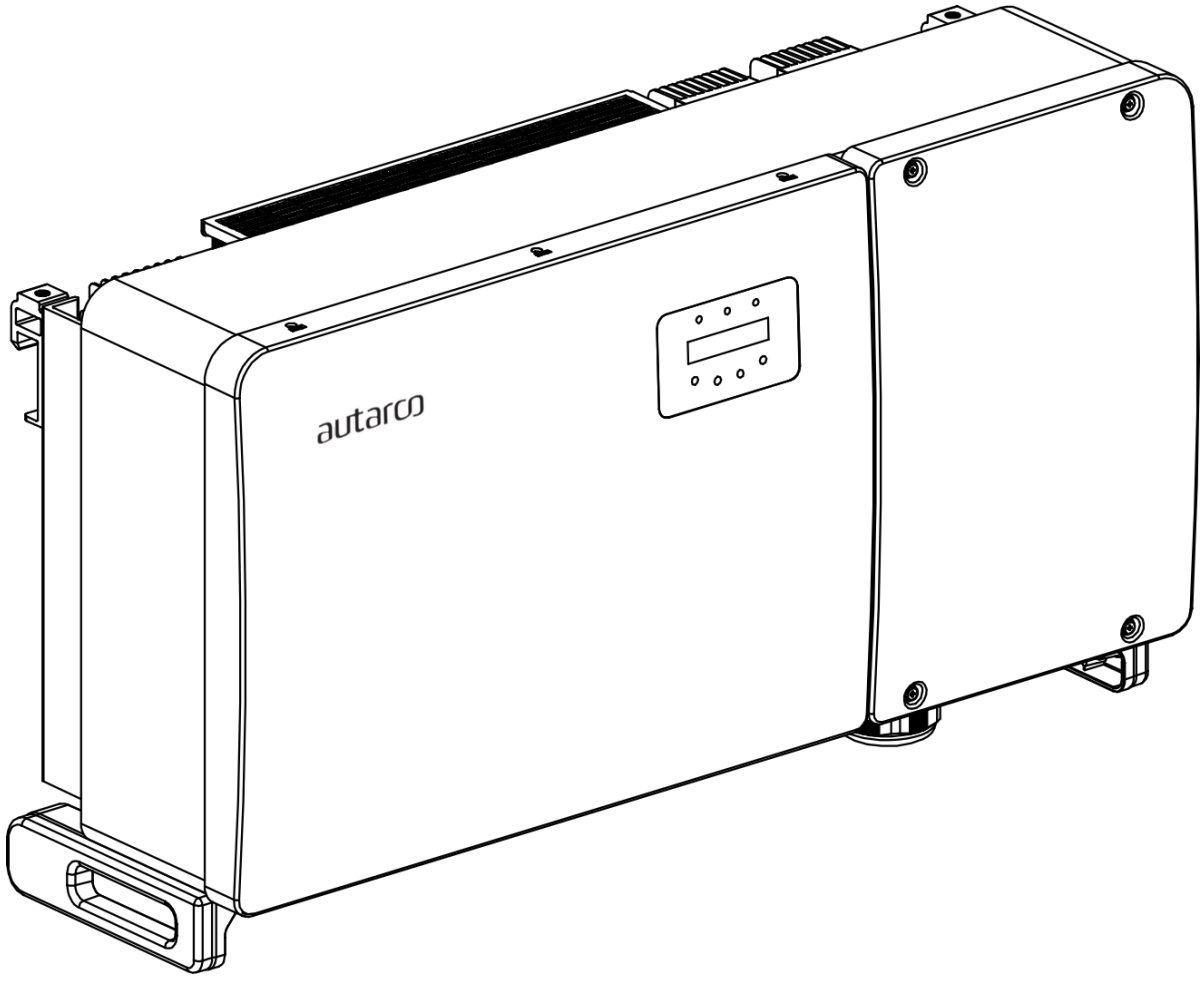
Installation and Operation Manual

Solar Inverters OX series



Contact Information

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Other Information

This manual is an integral part of the unit. Please read the manual carefully before installation, operation or maintenance. Keep this manual for future reference.

Product information is subject to change without notice. All trademarks are recognized as the property of their respective owners.

Table of Contents

1. Introduction

1.1 Read this first

This manual contains important information for use during installation and maintenance of the OX series Autarco inverter.

To reduce the risk of electrical shock, and to ensure the safe installation and operation of the OX series Autarco inverters, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

WARNING! Indicates safety instruction, which if not correctly followed, can result in injury or property damages.

RISK OF ELECTRIC SHOCK! Indicates safety instructions, which if not correctly followed, could result in electric shock.

HOT SURFACE! Indicates safety instructions, which if not correctly followed, could result in burns.

1.2 Target Audience

This manual is intended for anyone who uses Autarco OX series inverter. Before any further action, the operators must first read all safety regulations and be aware of the potential danger to operate high-voltage devices. Operators must also have a complete understanding of this device's features and functions.

ATTENTION! Qualified personnel means a person with valid license from the local authority in:

- Installing electrical equipment and PV power systems (up to 1000 V).
- Applying all applicable installation codes and using Personal Protective Equipment.
- Analyzing and reducing the hazards involved in performing electrical work.

WARNING! Do not use this product unless it has been successfully installed by qualified personnel in accordance with the instructions in chapter 4 "Installation".

1.3 Product versions covered by this document

The main purpose of this user manual is to provide instructions and detailed procedures for installing, operating, maintaining, and troubleshooting the OX series of Autarco inverters which includes the following models:

- S2.OX80000(S)
- S2.OX90000(S)
- S2.OX100000(S)
- S2.OX110000(S)
- S2.OX110000-HV(S)

The “S2.” In the product code means the product is a grid-tied inverter.

The item code or SKU will include an additional number at the end. The final number references the default grid standard and colour of inverter. For example, S2.OX80000S.1 is the 80kW model with Dutch grid standard as default and Autarco blue cover.

If the product has an “S” at the end it comes with integrated DC switches.

The HV version of the inverter is meant for direct connection to a transformer or industrial installation with the appropriate voltage. The AC-connections in these inverters are 3-phase and ground.

If the product code is followed by “.L” it is capable of power line communication (PLC). Please note regular communicating sticks will not work with this device.

The product is also possible with Anti-PID functionality. However this is not necessary if used with Autarco’s solar modules which are anti-PID-resistant.

Please keep this user manual available at all times in case of emergency.

2. Preparation

2.1 Safety instructions

DANGER! Do not touch any internal components whilst the inverter is in operation.

DANGER! Do not stand close to the inverter during severe weather conditions such as lighting, etc.

Make sure you completely cover the surface of all PV arrays with opaque (dark) material before wiring them or make sure the DC circuit breaker or equivalent DC isolator is disconnected.
This is because photovoltaic (PV) arrays create electrical energy when exposed to light, and could cause a hazardous condition.

The OX series inverter must only be operated with PV arrays of protection class II, in accordance with IEC 61730, class A.

WARNING! The PV inverter will become hot during operation; please don't touch the heat sink or peripheral surface during or shortly after operation.

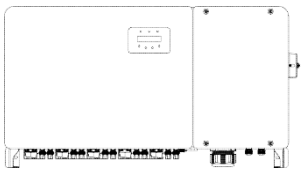
NOTICE! Do not directly connect AC output of the inverter to any private AC equipment. The PV inverter is designed to feed AC power directly into the public utility power grid.

NOTICE! The MC4 connectors supplied in the box with the inverter are to be used to make the connections with the inverter. (Staubli MC4M-PV-KST4-6II-UR / MC4F-PV-KST4-6II-UR)

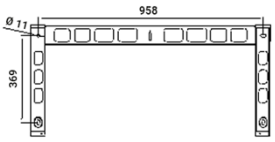
WARNING! The installation, service, recycling and disposal of the inverters must be performed by qualified personnel in compliance with national and local standards and regulations.
Please contact your dealer to get the information of authorized repair facility for any maintenance or repairmen.

Any unauthorized actions including modification of product functionality of any form will affect the validation of warranty service; Autarco may deny the obligation of warranty service accordingly.

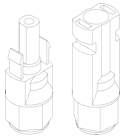
2.2 Package contents



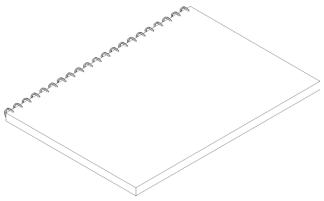
Autarco OX series inverter



Mounting bracket
+ screws



18 or 20 xMC4 connector
pairs (S4.MC4F/MC4M)



Instruction manual

2.3 Internal DC switch

Please verify whether your Autarco OX series inverter is equipped with internal DC switches. This switch can be found on the bottom of the inverter. If there isn't an internal DC switch it is important to apply an external DC disconnector in order to completely disconnect the solar PV module strings from the inverter.

2.4 Explanations of symbols on inverter

 10min	**DANGER - HIGH ELECTRIC VOLTAGE** This device is directly connected to public grid. All work to the inverter shall be carried out by qualified personnel only. There might be residual currents in inverter for up to 10 minutes because of large capacitors.
	**ATTENTION** This device is directly connected to electricity DC generators and the public AC grid.
	**DANGER – HOT SURFACES** The components inside the inverter will get hot during operation, DO NOT touch aluminum housing during operating.
	**ATTENTION** In case of any work to the inverter, always refer to this manual for detailed product information.
	**ATTENTION** This device SHALL NOT be disposed of in residential waste. Please go to Chapter 9 "Recycling and Disposal" for proper treatments.
	**CE MARK** This equipment conforms to the basic requirements of the EU guideline governing low voltage and electromagnetic compatibility.

3. Product information

3.1 Overview

Autarco OX series grid tied inverters are state of the art, high efficiency, robust and reliable grid tied inverters at the best price quality ratio available. They are easy to install and carry a standard 5 year product warranty. Our rigorous quality control and testing facilities guarantee Autarco inverters meet the highest quality standards possible. These inverters are the key to our international track record of delivering extremely reliable solar power solutions.

Key features:

- Maximum efficiency of 98.8%
- Wide MPPT voltage range
- Low turn off voltage
- High enclosure protection class IP65
- Intelligent redundant fan-cooling
- Standard ten year product warranty
- Multiple monitoring options
- Optional integrated DC switch

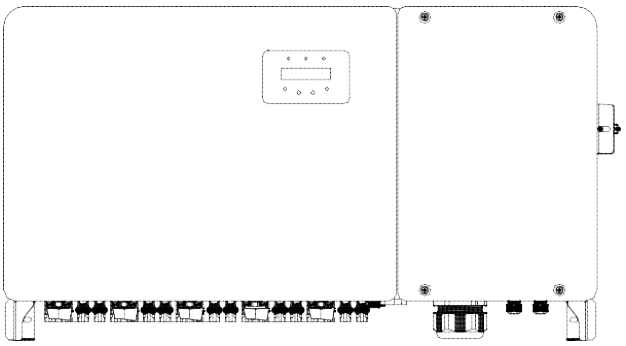
For full specifications please see chapter 11 “Product specifications”.

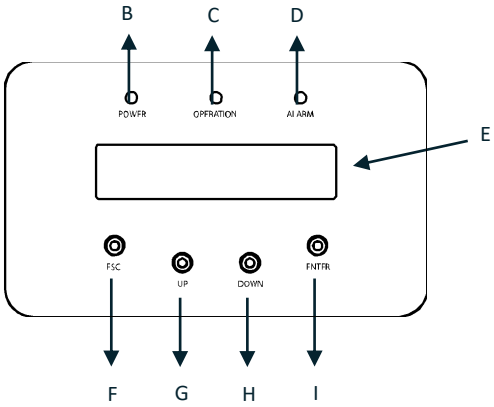
3.2 Product identification

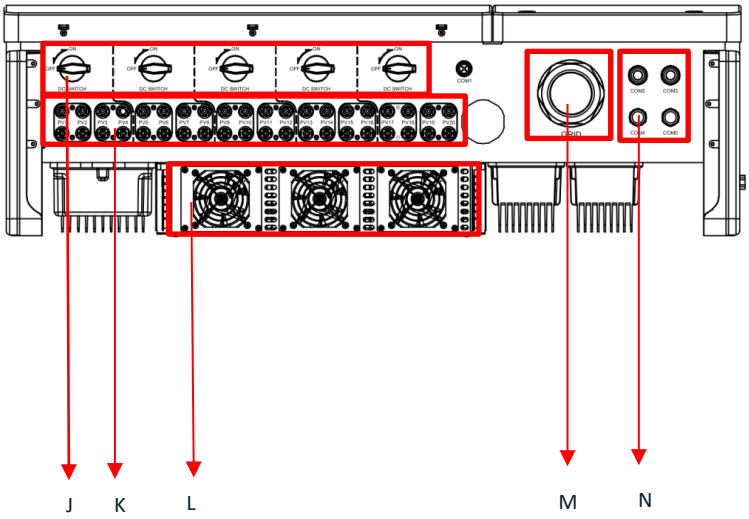
You can identify the inverter by the serial number (S/N) sticker on the side of the inverter. Important electrical specification can also be found on the label which can be found on the left ? right side of the inverter housing. Do not remove the label or the serial number as this voids the product warranty.

3.3 Product overview

Layout: drawing arrows are not aligned yet







A: Inverter cover
B: LED light – POWER
C: LED light – OPERATION
D: LED light – ALARM
E: LCD display 2x16 characters
F: Escape key
G: Up key
H: Down key
I: Enter key
J: DC switches (optional)
K: DC inputs MPPT 1-4
L: External Intelligent Fans*
M: AC terminal block and cover
N: Communication ports

4. Installation

4.1 Safety

DANGER! Do not install the inverter near flammable or explosive items.

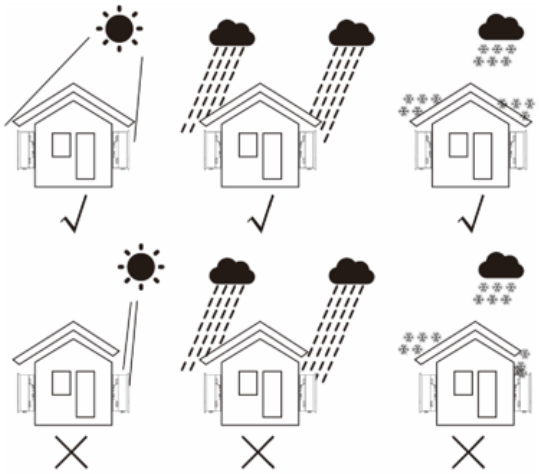
WARNING! The installation must be performed by qualified personnel and in compliance with national and local standards and regulations.
This inverter will be connected to a high voltage DC power generator and AC grid. Inappropriate installation may also jeopardize the life span of the inverter.

The installation site must have good ventilation conditions. Direct exposure to intense sunshine is not recommended.

4.2 Appropriate Mounting Location

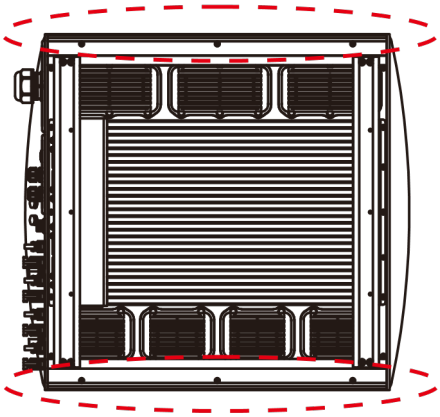
The heat sink can reach a temperature of 75^{o}C under operation.

- Make sure the mounting wall is strong enough to hold the weight of the inverter.
- The ambient temperature of the installation site should be between -25 ^{0}C and +60 ^{0}C.
- Make sure of sufficient ventilation at installation site; insufficient ventilation may reduce the performance of the electronic components inside the inverter and shorten the life span of the inverter.
- The inverter has fans that will intelligently cool the inverter if the internal components exceed 100^{0}C. The fan noise can exceed 50dB; installation is not recommended in public areas.



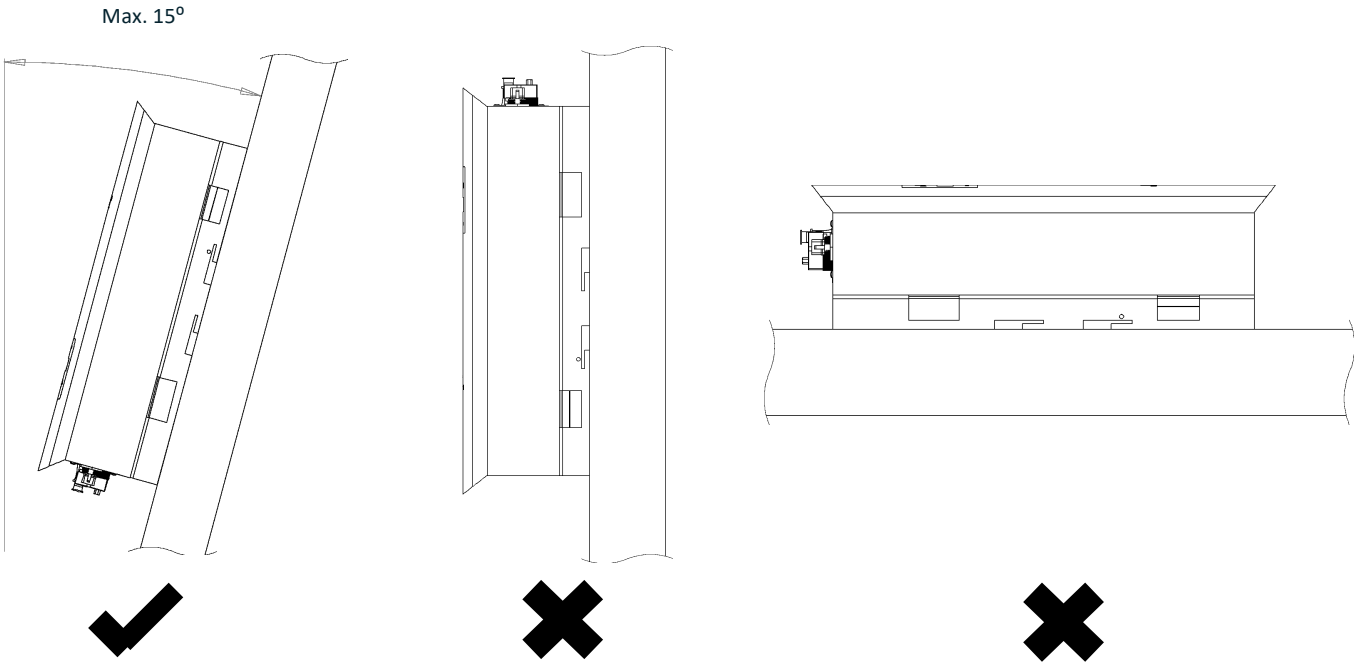
4.3 Mounting instructions

Two people are required to remove the inverter from the carton and install the inverter. Handles are formed into the heatsink for ease of handling the inverter.



▲ Figure 4.2 Inverter handles

- The inverter is suitable for outdoor and indoor installation.
- Vertical installation is recommended, with a maximum inclination of 15° backwards.

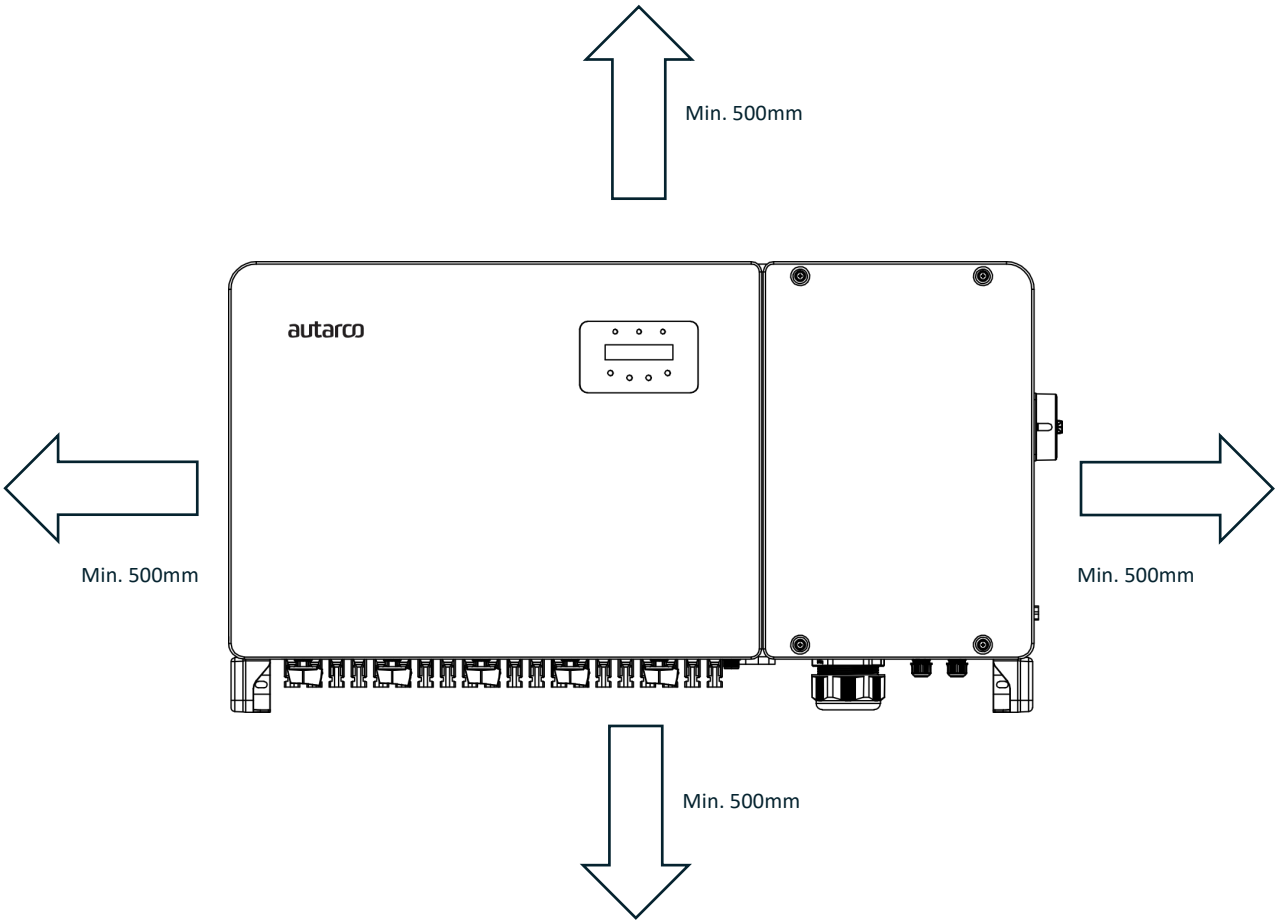


4.4 Safety clearance

CAUTION! Make sure heat sinks are out of reach.

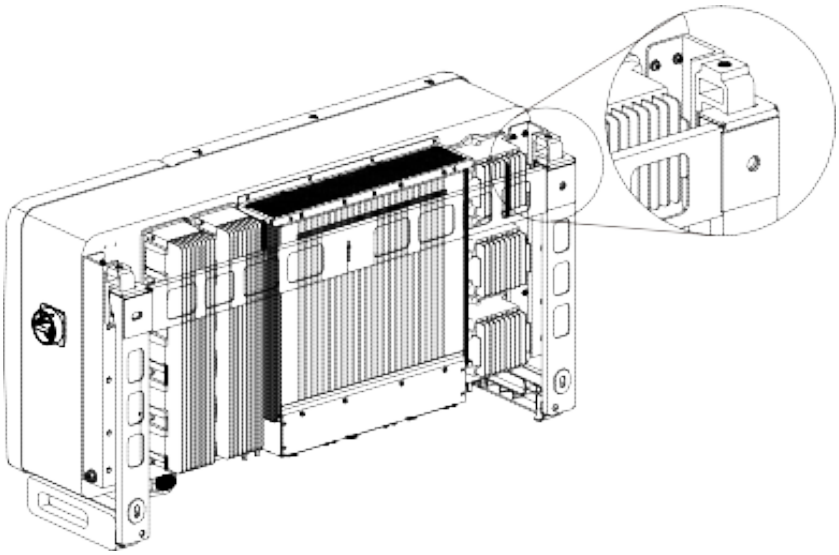
WARNING! When installing multiple inverters, make sure there is sufficient clearance between them. Staggered installation may be recommended. High temperatures may affect performance.

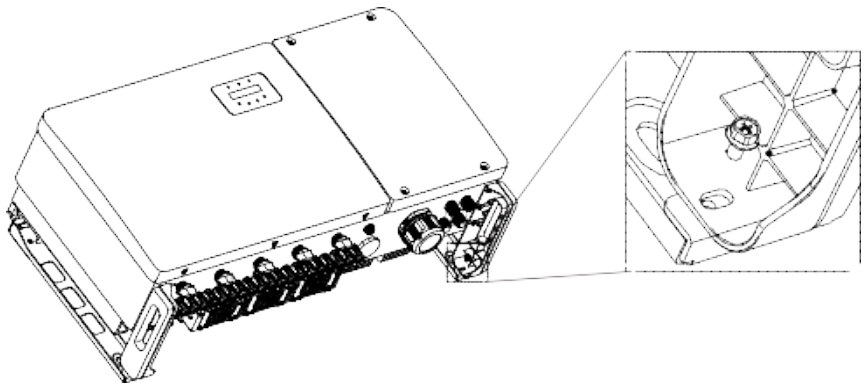
Observe the following minimum clearances to walls and other inverters



4.5 Mounting procedure

Step 1 — Mount the wall bracket onto the mounting wall with appropriate screws plugs
Step 2 — Lower the inverter onto the bracket
Step 3 — Use screws in the packaging to fix the bottom of the inverter to the mounting bracket





5. Electrical installation

DANGER! This inverter will be connected to a high voltage DC power generator and AC grid. The installation must be performed by qualified personnel and in compliance with national and local standards and regulations

5.1 Grounding

DANGER! Never connect or disconnect the connectors under load.

NOTICE! The AC connection to the electrical distribution grid must be performed only after receiving authorization from the utility that operates the grid.

NOTICE! Make sure to set the correct grid standard as part of system commissioning, see chapter 6.6.

There are two options for ground protection: through grid terminal connection and external heat sink connection.

If AC terminal is used to connect ground, please refer to the contents of 5.3.2.

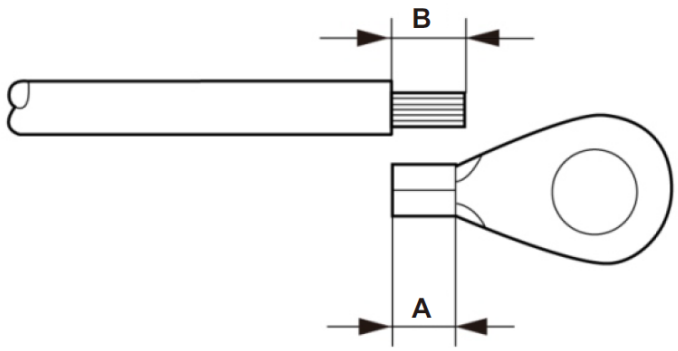
If the heat sink is used to connect the ground, please follow the steps below.

1) Prepare the grounding cable: recommended to use the 16-35mm² outdoor copper-core cable.
2) Prepare OT terminals M6

IMPORTANT! For multiple inverters in parallel, all inverters should be connected to the same ground point to eliminate the possibility of a voltage potential existing between inverters grounds.

WARNING! No matter what kind of grounding connection is adopted, it is strictly forbidden to connect the ground of the inverter with the lightning protection of the building, otherwise Autarco will not be responsible for any damage caused by lightning.

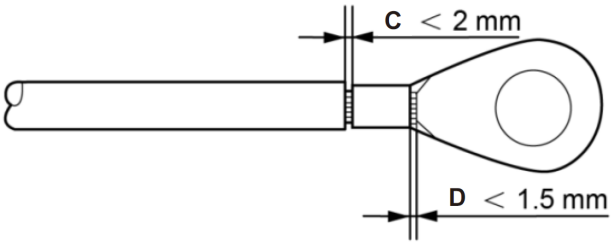
3) Strip the grounding cable insulation to the suitable length as shown in Figure 5.7.



▲ Figure5.7 suitable length

IMPORTANT! B (insulation stripping length) is 2-3mm longer than A (OT cable terminal crimping area)

4) Insert the stripped wire into the OT terminal crimping area, and use the hydraulic clamp to crimp the terminal to the wire (as shown in Figure 5.8).

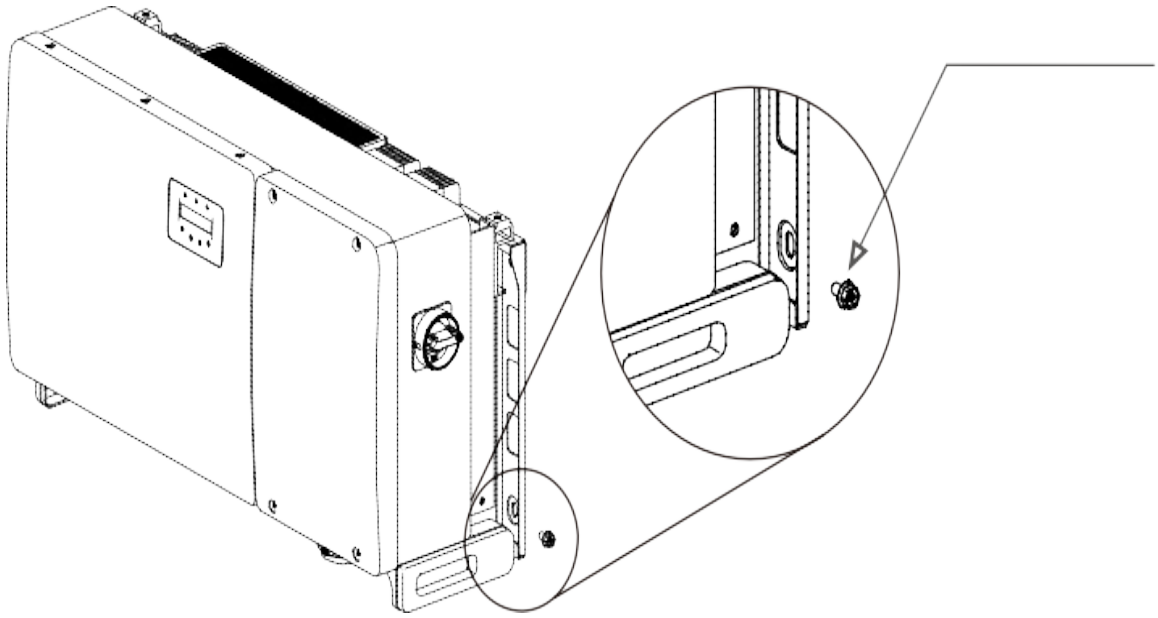


▲ Figure5.8 strip wire

IMPORTANT! After crimping the terminal to the wire, inspect the connection to ensure the terminal is solidly crimped to the wire.

5) Remove the screw from the heat sink ground point

6) Use the screw of the ground point to attach the grounding cable. Tighten the screw securely. Torque is 3Nm (as shown as in Figure 5.9).



IMPORTANT! In order to improve the corrosion resistance of the grounding terminal, we recommend that the external grounding terminal is coated with silica gel or zinc paint for protection after installation of the grounding cable.

5.2 AC connection

DANGER! Never connect or disconnect the connectors under load.

NOTICE! The AC connection to the electrical distribution grid must be performed only after receiving authorization from the utility that operates the grid.

The AC cable used must be dimensioned in accordance with any local and national directives on cable dimensions which specify requirements for the minimum conductor cross-section. Cable dimensioning factors are e.g.: nominal AC current, type of cable, type of routing, cable bundling, ambient temperature and maximum specified line losses.

We recommend 38-185 mm^2 105 ℃ cable with resistance lower than 1.5 ohm.
Please make sure the resistance of cable is lower than 1.5 ohm. If the wire is longer than 20m, it's recommended to use 150-185mm cable. Refer to local electrical codes for wire sizing.

NOTE: There is no need to connect N to AC side for the OX series three-phase inverter, the ground wire can be connected to the grounding hole on the right side of the inverter heat sink.

Cable specification		Copper-cored cable
Traverse cross sectional area (mm^2)	Range	35~185
	Recommended	70
Cable outer diameter (mm)	Range	38~56
	Recommended	45

NOTE: Prepare M6 OT terminals

The steps to assemble the AC grid terminals are listed as follows:

A) Strip the end of AC cable insulating jacket about 300mm then strip the end of each wire (as shown in figure 5.17).

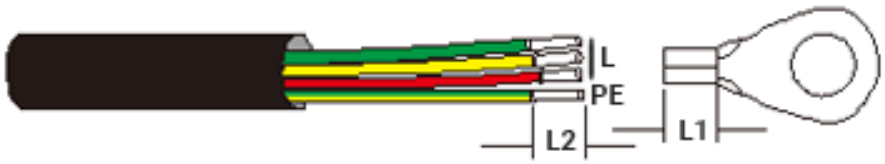


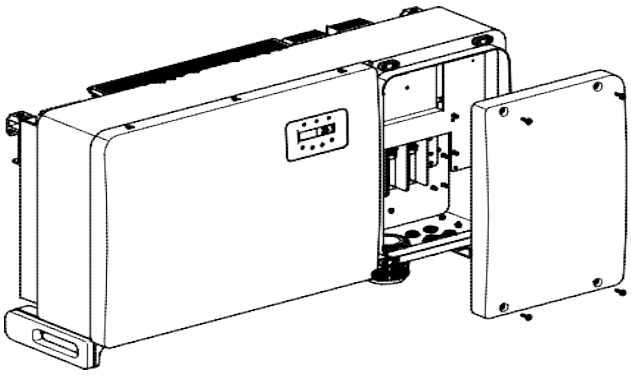
Figure 5.17 Strip AC cable

NOTE: L2 (insulation stripping length) is 2mm-3mm longer than L1 (OT cable terminal crimping area)

Strip the insulation of the wire core, insert into the cable crimping area of the OT terminal, then use a hydraulic crimp tool to crimp it firmly. The wire must be covered with heat shrinkable tube or insulating tape. When using the heat shrinkable tube sleeve the heat shrinkable tube over the wire before crimping the OT terminal.

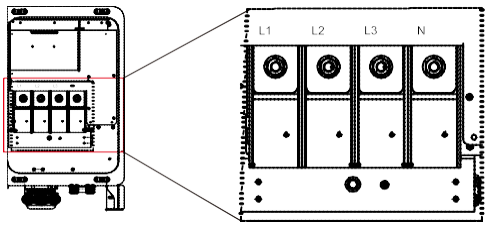
B) Remove the 4 screws on the AC terminal cover and remove the cover

C) Remove the screw under terminal slide and pull out the terminal.

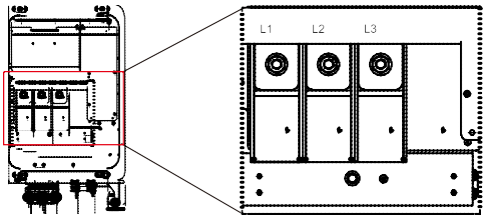


D) Insert the cable through cap nut, water proof bushing and AC terminal cover into the AC terminal and use a socket wrench to tight the screws. The torque is 4-6Nm (as shown in figure 5.20).

Wiring with neutral (S2.OX80000S.1)



Wiring without Neutral (S2.OX110000S-HV)



E) Push the AC terminals along the rail to the inside of the inverter then tighten the screws under rack. Tighten the 4 screws of AC terminal cover and tighten the AC entry cap nut (as shown in figure 5.21).

NOTICE! It is important that the AC wires are connected to the right terminals as indicated by the “L”, “N” and “Earthing” symbols on each AC connector.
In some countries a second protective conductor is required as a matter of principle. In each case, observe the applicable regulations for the site.

The AC connection to the electrical distribution grid must be performed only after receiving authorization from the utility that operates the grid.

Always use separate fuses for consumer load. Use dedicated circuit breakers with load switch functionality for load switching.

DANGER! No consumer load should be applied between the mains circuit breaker and the inverter.

5.3 Additional Protections

To protect the inverter's AC grid connection conductors, Autarco recommends installing breakers that will protect against overcurrent. The following table defines OPCD ratings for each model;

Inverter	Rated Voltage (V)	Rated Output (kW)	OPCD: Current for protection device (A)
S2.OX80000(S)	400V	80	160
S2.OX90000(S)	400V	90	160
S2.OX100000(S)	400V	100	200
S2.OX110000(S)	400V	110	200
S2.OX110000-HV(S)	540V	110	160

The Autarco inverter is equipped with an integrated Residual Current Protective Device (RCPD) and Residual Current Operated Monitor (RCOM). The RCOM will detect the leakage current and compare it with the expected value, if the leakage current exceeds the permitted range, the RCPD will disconnect the inverter from the AC load.

If regulations in the country of installation stipulate an external Residual Current Device (RCD), you must use a device with a tripping threshold of 600 mA or more. A type “A” RCD can be used in accordance with our “Manufacturer’s declaration for usage of residual current devices”. Contact Autarco for advice.

5.4 DC connections

Please always use the MC4 connectors from the inverter box to connect strings to the inverter.

DANGER! Never connect or disconnect the connectors under load.

OX series inverters have four MPP trackers. The DC characteristics of each model is shown in the table below:

Inverter	MPP trackers	Max DC power	Max DC voltage	Max. DC current per MPPT
S2.OX80000(S)	9	96000W	1100V	26.0A
S2.OX90000(S)	10	108000W		
S2.OX100000(S)	10	120000W		
S2.OX110000(S)	10	132000W		
S2.OX110000-HV(S)	10	132000W		

DANGER! Do not connect the strings with an open circuit voltage greater than the Max DC voltage of the inverter.

To connect the PV generator to the inverters we use 4mm² or 6mm² PV cable and MC4 connectors. For details on how to assemble MC4 connector please refer our MC4 connector manual.

DANGER! For protection against electric shock, MC4 connectors must be isolated from the PV array while being assembled or disassembled.

DC connections must not be unplugged while under load. They can be placed in a no-load state by switching off the DC/AC converter or breaking the DC circuit interrupter. Plugging while under voltage is permitted.

CAUTION! MC4 connectors are watertight IP67 but cannot be used permanently under water. Do not lay the MC4 connectors directly on the roof surface.

If any tools or parts are used in the MC4 connector assembly other than those listed in the MC4 connector manual, neither safety nor compliance with the technical data can be guaranteed.

5.5 Inverter commissioning sequence

Turn ON	**Turn OFF**
1. Connect AC side (if not connected yet) 2. Connect DC side (if not connected yet) 3. Switch ON both the DC switches 4. Switch ON the AC switch	1. Switch OFF the AC switch 2. Switch OFF both the DC switches

6. Operation

6.1 LED indicator lights

There are three LED status indicator lights in the front panel of OX series inverters. The left POWER light (red) indicates power status of the inverter. The middle OPERATION light (green) indicates the operation status. The right ALARM light (yellow) indicates the alarm status. Table 3.1 explains their meanings.

Light	Status	Description
POWER (red)	ON	The PV array provides power to the inverter
	OFF	The PV array does not provide power to the inverter
OPERATION (green)	ON	The inverter is feeding AC power to the grid
	OFF	The inverter is not feeding AC power to the grid
	FLASHING	The inverter is initializing
ALARM (yellow)	ON	There is a fault. Refer to the inverter display and chapter 10 of this manual for details
	OFF	The inverter is operating normally

When inverter DC switch and AC switch have been turned on the inverter will start initializing. After approx. 3 minutes the inverter will start normal operation with the inverter display showing GENERATING.

6.2 Inverter display

NOTICE! During normal operation, make sure the optional integrated DC switch is switched “on”.

The display content consists of 2 lines. During regular operation the display shows the current power and operation status alternatively for 10 seconds. Pressing the UP or DOWN buttons will manually cycle through these two displays. Pressing the ENTER button gives access to the main menu which has four sub menus:

- Information, described in detail in chapter 6.3.
- Settings, described in detail in chapter 6.4.
- Advanced information, described in detail in chapter 6.5.
- Advanced settings, described in details in chapter 6.6.

By pressing UP or DOWN keys you can cycle through these sub menus and click ENTER to go into the submenu.

6.3 Information

The OX series inverters main menu provides access to operational data and information. The information is displayed by selecting "Information" from the main menu.

By default the inverter display will scroll through the information states below. You can also press UP or DOWN keys to manually scroll through. Pressing the ENTER key will lock or unlock the current display.

(locked)

(scrolling)

P ressing the ESC key returns to the main menu.

State	Description
V_DC01 *%VALUE% V* I_DC01 *%VALUE%* A	Shows the input voltage (V) of the MPPT1 Shows the input current (A) of the MPPT1
V_DC02 *%VALUE% V* I_DC2 *%VALUE%* A	Shows the input voltage (V) of the MPPT2 Shows the input current (A) of the MPPT2
V_DC03 *%VALUE% V* I_DC03 *%VALUE%* A	Shows the input voltage (V) of the MPPT3 Shows the input current (A) of the MPPT3
V_DC04 *%VALUE% V* I_DC04 *%VALUE%* A	Shows the input voltage (V) of the MPPT4 Shows the input current (A) of the MPPT4
V_DC05 *%VALUE% V* I_DC05 *%VALUE%* A	Shows the input voltage (V) of the MPPT5 Shows the input current (A) of the MPPT5
V_DC06 *%VALUE% V* I_DC06 *%VALUE%* A	Shows the input voltage (V) of the MPPT6 Shows the input current (A) of the MPPT6
V_DC07 *%VALUE% V* I_DC07 *%VALUE%* A	Shows the input voltage (V) of the MPPT7 Shows the input current (A) of the MPPT7
V_DC08 *%VALUE% V* I_DC08 *%VALUE%* A	Shows the input voltage (V) of the MPPT8 Shows the input current (A) of the MPPT8
V_DC9 *%VALUE% V* I_DC9 *%VALUE%* A	Shows the input voltage (V) of the MPPT9 Shows the input current (A) of the MPPT9
V_DC10 *%VALUE% V* I_DC10 *%VALUE%* A	Shows the input voltage (V) of the MPPT10 Shows the input current (A) of the MPPT10
V_A *%VALUE% V* I_A *%VALUE%* A	Shows the voltage (V) of the grid L1 Shows the current (A) of the grid L1
V_B *%VALUE% V* I_B *%VALUE%* A	Shows the voltage (V) of the grid L2 Shows the current (A) of the grid L2
V_C *%VALUE% V* I_C *%VALUE%* A	Shows the voltage (V) of the grid L3 Shows the current (A) of the grid L3
Status: *%VALUE%* Power: *%VALUE%* W	Shows the status of the inverter Shows current output power (W) of the inverter For any status other than “Generating” and “Initializing” please refer to chapter 10 for troubleshooting
Rea_Power: *%VALUE%* Var App_Power: *%VALUE%* VA	Shows the real power generated Shows the apparent power generated
Grid frequency F_Grid *%VALUE%* Hz	Shows current frequency (Hz) of the grid
Total Energy *%VALUE%* kWh	Shows total energy output (kWh)
This Month: *%VALUE%* kWh Last Month: *%VALUE%* kWh	Total energy output in this month (kWh) Total energy output of last month (kWh)
Today: *%VALUE%* kWh Yesterday: *%VALUE%* kWh	Total energy output in this day (kWh) Total energy output of yesterday (kWh)
Inverter S/N	Serial ID of the inverter

Export_P: %VALUE% W Export_I: %VALUE% A	Shows the exported power Shows the exported current
Work Mode: DRM Number:	Demand response mode (only relevant for some markets) The demand response number (1-8) of the inverter
I_DC01 %VALUE% A I_DC02 %VALUE% A	Shows the input current (A) of the DC input 1 Shows the input current (A) of the DC input 2
I_DC03 %VALUE% A I_DC04 %VALUE% A	Shows the input current (A) of the DC input 3 Shows the input current (A) of the DC input 4
I_DC05 %VALUE% A I_DC06 %VALUE% A	Shows the input current (A) of the DC input 5 Shows the input current (A) of the DC input 6
I_DC07 %VALUE% A I_DC08 %VALUE% A	Shows the input current (A) of the DC input 7 Shows the input current (A) of the DC input 8
I_DC09 %VALUE% A I_DC10 %VALUE% A	Shows the input current (A) of the DC input 9 Shows the input current (A) of the DC input 10
I_DC11 %VALUE% A I_DC12 %VALUE% A	Shows the input current (A) of the DC input 11 Shows the input current (A) of the DC input 12
I_DC13 %VALUE% A I_DC14 %VALUE% A	Shows the input current (A) of the DC input 13 Shows the input current (A) of the DC input 14
I_DC15 %VALUE% A I_DC16 %VALUE% A	Shows the input current (A) of the DC input 15 Shows the input current (A) of the DC input 16
I_DC17 %VALUE% A I_DC18 %VALUE% A	Shows the input current (A) of the DC input 17 Shows the input current (A) of the DC input 18
I_DC19 %VALUE% A I_DC20 %VALUE% A	Shows the input current (A) of the DC input 19 Shows the input current (A) of the DC input 20

6.4 Settings

The following options are available under the Settings submenu:

Set Time and Date	Press UP/DOWN keys to set change element Press ENTER key to move to next element Press ESC key to save date and return
Set Address	Assign a number (##) to the inverter to distinguish between multiple inverters when using parallel communication with WIFI-BOX or GPRS-BOX Press UP/DOWN keys to set change number Press ENTER key to save the setting Press ESC key to return.  Changing the Address when using WIFI-STICK or LAN-STICK may result in monitoring to stop working.
Restore Settings	Delete alarm messages that have been generated

6.5 Advanced info

WARNING! Access to this section of the menu is for Autarco qualified and accredited technicians only. Unauthorized access will void the product and system warranty.

Screen can be scrolled through with UP/DOWN keys to see the information as per the table below. Press ENTER key to enter a submenu. Press ESC key to go back to the main menu.

Alarm Messages	The display shows the 100 latest alarm messages (see Figure 7.6). Press UP/DOWN keys to cycle through alarm messages Press ESC key to return
Running Message	This function is for maintenance personnel to get running message such as internal temperature, Standard NO. etc. Screens can be scrolled manually by pressing the UP/DOWN keys.
Version	The screen shows the operating software version of the inverter
Daily Energy	The function is for checking the energy generation for selected day. Press DOWN key to move the cursor to day, month and year, press UP key to change the digit. Press ENTER after the date is fixed. Press UP/DOWN key to move one date from another.
Monthly Energy	The function is for checking the energy generation for selected month. Press DOWN key to move the cursor, press UP key to change the digit. Press ENTER after the month/year is fixed. Press UP/DOWN key to move one date from another.
Yearly Energy	The function is for checking the energy generation for selected year. Press DOWN key to move the cursor, press UP key to change the digit. Press ENTER after the month/year is fixed. Press UP/DOWN key to move one date from another.
Daily Record	The screen shows history of changing settings. Only for maintenance personnel.
Communication data	The screen shows information interpretable to qualified technicians only
Warning Message	Internal data of the inverter

6.6 Advanced Settings

WARNING! Access to this section of the menu is for Autarco qualified and accredited technicians only. Unauthorized access will void the product warranty and any kWh Guarantee.

Screen can be scrolled through with UP/DOWN keys to see the information as per the table below. Press ENTER key to enter a submenu. Press ESC key to go back to the main menu.

Many of these settings can be viewed and controlled via Helios if a digital O&M enabled monitoring device is used.

<table>
<tr><td rowspan="3">Select grid standard</td><td colspan="2">WARNING! Set GRID OFF (see below) before changing this setting.

Press UP/DOWN keys to cycle through available standards

Press ENTER key to save the setting - Press ESC key to cancel and return

When selecting User defined the following upper and lower values have to be set for voltage and frequency:</td></tr>
<tr><td>OV-G-V1: 300---480V
OV-G-V1-T: 0.01---9s
OV-G-V2: 300---490V
OV-G-V2-T: 0.01---1s
UN-G-V1: 173---336V
UN-G-V1-T: 0.01---9s
UN-G-V2: 132---319V
UN-G-V2-T: 0.01---1s</td><td>OV-G-F1: 50.2-63Hz
OV-G-F1-T: 0.01---9s
OV-G-F2: 51-63Hz
OV-G-F2-T: 0.01---9s
UN-G-F1: 47-59.5Hz
UN-G-F1-T: 0.01---9s
UN-G-F2: 47-59Hz
UN-G-F2-T: 0.01---9s</td></tr>
<tr><td colspan="2">Press UP/DOWN keys to scroll through these values
Press ENTER key to edit the selected value
Press UP/DOWN keys to change the selected value
Press ENTER key to save and return
Press ESC key to cancel and return

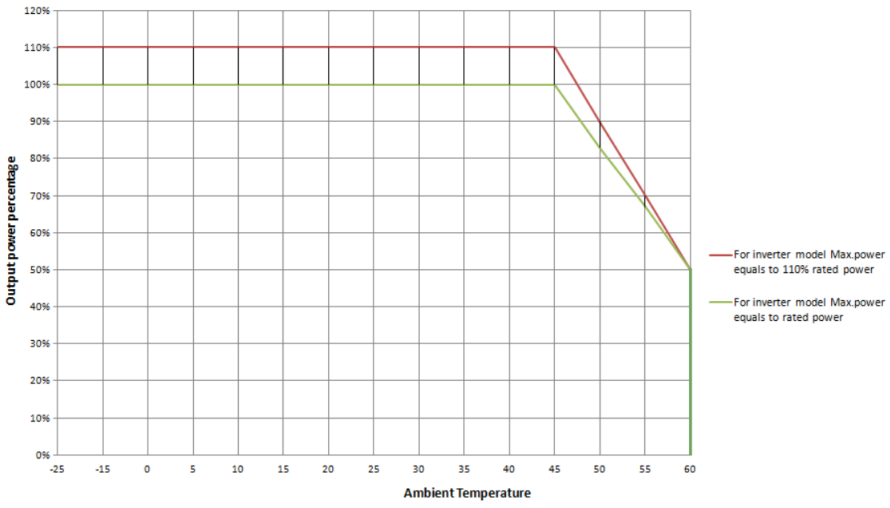
WARNING! Set GRID ON (see below) before new standard is activated.</td></tr>
</table>

	 WARNING! Please note that the User-Def standard is not to be used without the agreement of the local grid authority.
Grid ON/OFF	Press UP/DOWN keys to cycle through grid ON/OFF options Press ENTER key to save Press ESC key to return
Clear Energy	Reset the inverters total kWh output to zero.  Using this function without previous approval from Autarco will void any existing kWh Guarantees.
New Password	Change the password to enter Advanced Info and Advanced Settings. Enter the current password before setting a new password. Press the DOWN key to move the cursor, Press the UP key to change the digit. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.
Power Control	Inverter output active power and reactive power control can be set through this menu if the grid is unbalanced: 1. Set output power 2. Set reactive power 3. Out_P with restore 4. Rea_P with restore 5. Select PF curve
Calibrate Energy	Maintenance or replacement could clear or cause a different value for total energy. Use this function to allow user to revise the value of total energy to the same value as before. Press the DOWN key to move the cursor, Press the UP key to revise the value. Press the ENTER key to execute the setting. Press the ESC key to return to the previous menu.
Special Settings	Special settings can switch off functions temporarily for testing purposes. These tests should only be done by qualified Autarco personnel or trained installers when requested to do so. Submenu includes: 1. Grid Filter Set 2. Relay_Protect Set 3. ILeak_Protect Set 4. GROUND_Protect Set 5. GRID INTF.02 Set 6. MPPT Parallel Mode 7. Cnst. Voltage Mode 8. V/FRT Set 9. IgZero_COMP. Set 10. PI Set 11. IgADCheckPRO Set 12. NoSmallPulse Set 13. VarCompensation 14. AFCI Set
STD Mode Settings	STD Mode Settings are used when demand response is required by grid operators. 1. Working Mode Set 2. Power Rate Limit 3. Freq Derate Set 4. 10mins Voltage Set 5. Power Priority 6. Initial Settings

	7. Voltage PCC Set
Restore Settings	Restore Settings resets the inverter to factory defaults.
HMI Updater	Selecting HMI Updater will show the current software version the LCD screen is based on.
Internal EPM Set	Internal power export management. 1. Mode 2. Backflow power 3. Fail safe ON/OFF
External EPM Set	External power export management. 1. 5G-EPM 2. Others-EPM
Restart HMI	This function is used to restart the HMI software.
Debug parameter	Shows debug parameters.
Fan test	Test intelligent fan
DSP Update	Selecting DSP Update will show the current internal software version.
Compensation Set	This function is used to calibrate inverter output energy. It will not impact the energy count for inverter with RGM. 1. Power parameter 2. Voltage parameter ⚠ Using this function without previous approval from Autarco will void any existing kWh Guarantees.
I/V Curve	Used to create I/V curves for all DC inputs. 1. Set I/V curve 2. I/V curve scan

6.7 Temperature derating

The output power of the inverter varies with ambient temperature, as shown in the figure below.



6.8 External fan

The inverter's external fans switch on automatically when cooling via the heat sink is no longer sufficient. When the inverters core temperature reaches 70°C, the fan will be activated. It will switch off once the core temperature is below 60°C.

Installation is recommended either in covered open-air spaces or inside in spaces with enough ventilation. Failing to do so will impact the maximum performance of the inverter.

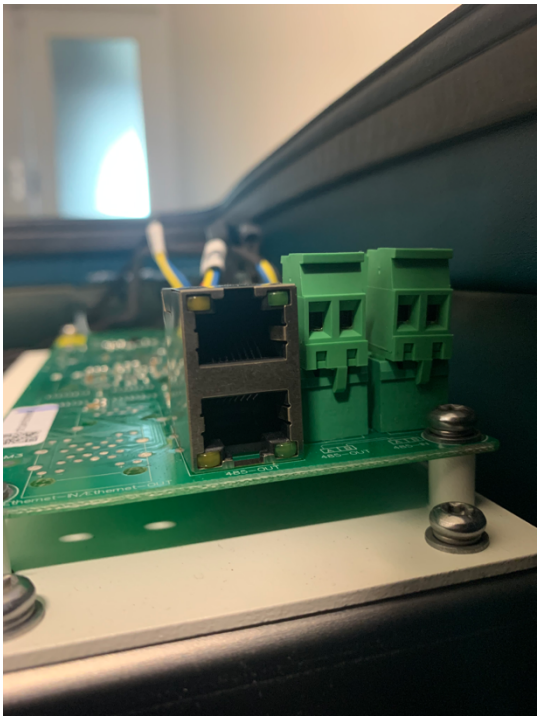
7. Monitoring setup and system registration

7.1 Communication Ports

The OX inverters have the following communication ports:

- COM1: Green 4 pin connector for WiFi/Cellular datalogger.
- COM2 and COM3: Cable glands and cover with following connection points behind:
    - 2 x RJ45 connections
    - 1 x RS485 terminal block

COM2 and COM3 are RJ-45 connectors suitable for connecting multiple inverters in daisy chain configuration and connecting them to a WIFI-box, GPRS-box or other data logger.

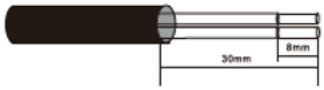


1 2 3 4

NO.	Port definition	Description
1	RS485A1 IN	RS485A1,RS485 differential signal+
2	RS485B1 IN	RS485B1,RS485 differential signal-
3	RS485A2 OUT	RS485A2,RS485 differential signal+
4	RS485B2 OUT	RS485B2,RS485 differential signal-

Connection of Terminal board.
a. Strip the insulation and shield to a suitable length. Use diagram below as a guide.

b. Remove the cap nut from the waterproof cable glands labeled COM2 and COM3 at the bottom of the inverter. Remove the plug from the fitting.



c. Pass the cable through the cap nut for each port. COM2(RS485 IN) COM3(RS485 OUT).
d. Pull down the terminal block on user interface board.

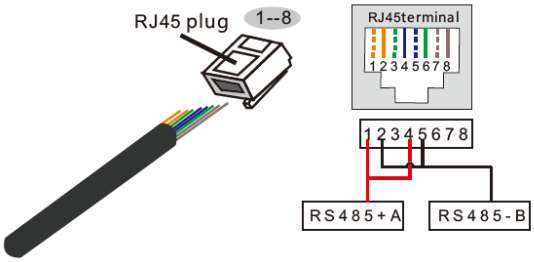
7.2 Monitoring Devices

Products that end in "-D" are enabled for digital O&M features.

Product	Port	Communication Method	Connection To:	# Inverters per product	Parallel Connection
S2.WIFI-STICK	COM1	WIFI	Router	1	N
S2.LAN-BOX	COM2 & COM3	WIFI OR LAN	Router	10	Y, Cabled (RJ45)
S2.ETHERNET-STICK	COM1	Cabled (RJ45)	Router	1	N
S2.ZWAVE-STICK	COM1	Z-wave	Z-wave Gateway	1	N
S2.GPRS-STICK	COM1	Sim Data	Cellular network	1	N
S2.GPRS-BOX	COM2 & COM3	Sim Data	Cellular network	10	Y, Cabled (RJ45)
PC or Data Logger	COM2 Terminal block	Local	PC or Data Logger	1	N

Steps for using RJ45 connections for RS485 Communications:

1. Use a network wire stripper to st yer off the communication cable. Using the standard wire sequence referenced in TIA/EIA 568B, separate the wires in the cable. Use a network cable tool to trim the wire. Flatten the wire in the order shown in the figure below.



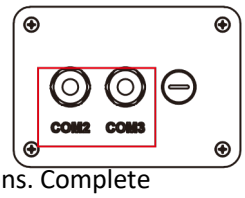
Correspondence between the cables and the stitches of plug

Pin 1: white and orange ; Pin 2: orange
Pin 3: white and green ; Pin 4: blue
Pin 5: white and blue ; Pin 6: green
Pin 7: white and brown ; Pin 8: brown

Pin 1 with 4 and 2 with 5 are used for communication connection

Pin 1 and 4 are connected with RS485+A
Pin 2 and 5 are connected with RS485 - B

2. Insert the wire into the RJ45 connector then crimp the connector with the crimping tool.
3. Removethe cap nut from the waterproof cable glands labeled COM2 and COM3 at the bottom of the inverter. Remove the plug from the fitting.
4. Insert the RJ45 connector into the RJ45 port in the inverter maintenance chamber.
5. Replace the cap nuts for COM2/3 and tighten firmly.



Please refer to related instructions of communication products for further installation instructions. Complete monitoring setup at https://my.autarco.com/

7.3 Registration

If you plan to request a kWh Guarantee for your system, please ensure that the following is completed and recorded on site before you leave;

- Inverter and Module Serial Numbers (unless a specific order was made for the system in which case this is automatically recorded)
- Monitoring Device is connected to local network or communication method
- Photos of
  - PV Array
  - Inverter
  - AC Wiring and Connection

8. Maintenance

CAUTION! Do not touch the heat sink when the inverter is in operation. Turn OFF the inverter (see section 5.5) and allow for cooling down before cleaning.

CAUTION! Never use any solvents, abrasives or corrosive materials to clean the inverter.

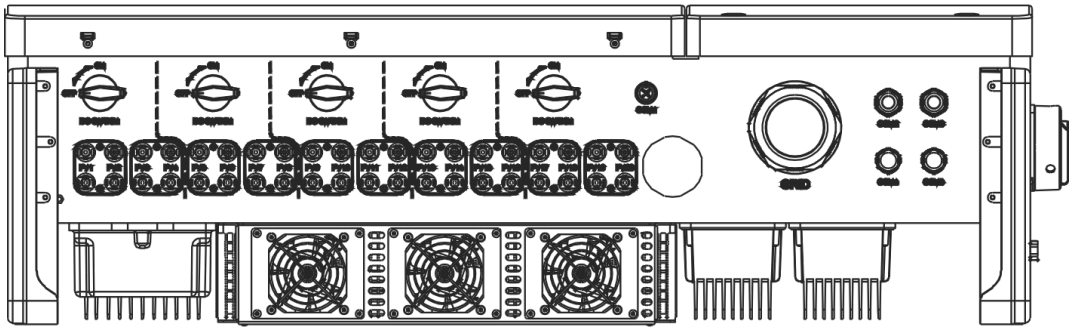
The OX series inverters require general maintenance to be performed once per year. Impurities such as dust and dirt accumulation on the heat sink may negatively affect the inverter's ability to dissipate heat. Any dirt or dust can be removed with a cloth or soft brunch.

8.1 Fan Maintenance

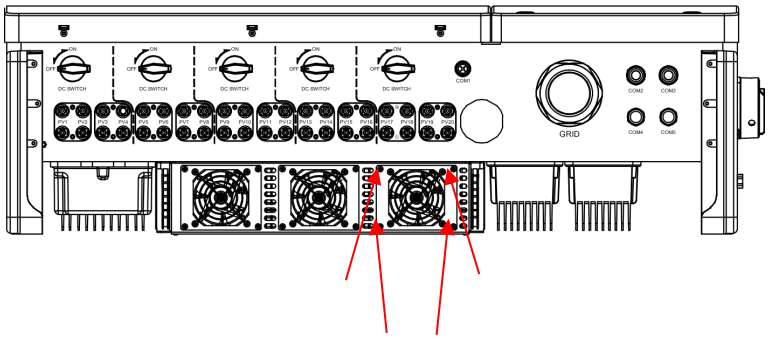
If the fan does not work properly, the inverter will not be cooled effectively and inverter efficiency may be reduced.

Broken fans should be replaced following process below:

1. Disconnect the AC power.
2. Turn the DC switch to "OFF" position.
3. Wait for 15 minutes at least.

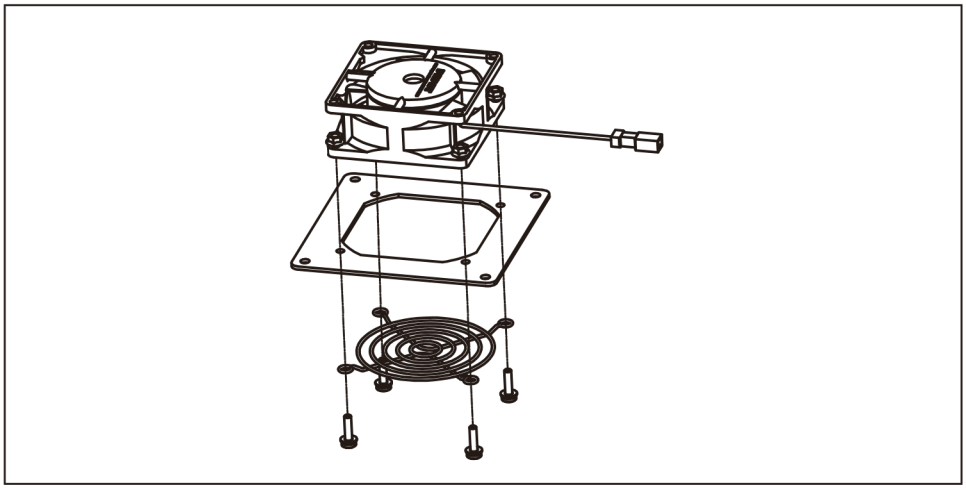


4、 Remove the 4 screws on the fan plate and pull out the fan assembly slowly.



5、 Disconnect the fan connector carefully and take out the fan.

6、 Clean or replace the fan. Assemble the fan on the rack.



7、 Connect the electrical wire and reinstall the fan assembly. Restart the inverter.

The fans must be tested at least once per year and cleaned if necessary by qualified personnel.

9. Disposal

To comply with European Directive 2002/96/EC on waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility. Ignoring this EU Directive may have severe effects on the environment and your health.

10. Troubleshooting

10.1 General

Display message	Action
Blank screen	● Check that all switches are in the ON position (including internal DC switch if present) ● Check AC and DC power supply. If DC power is greater than 10W and string voltage greater than 200V the inverter should start. ● If switches are on and AC and DC power supplies is available please contact installer.

10.2 Internal component fault

Error type	Display message	Error code	Error description	Action
Over BUS DC voltage	OV-BUS	1021	Internal fault	1. Restart inverter (up to three times). 2. If error persists contact installer.
Under BUS DC voltage	UN_BUS	1012	Internal fault	
BUS balance fault	UNB2_BUS	1024	Internal fault	
System initial fault	INI-PRO	1031	Internal fault	
Relay fault	Relay_PRO	1035	Internal fault	
DSP_B fault	DSP_B_PRO	1036	Internal fault	
DC injection	DCInj_PRO	1037	Internal fault	
12V under voltage fault	12Power_PRO	1038	Internal fault	

10.3 Grid errors

Error type	Display message	Error code	Error description	Action
Over voltage	OV-G-V	1010	Grid voltage exceeds the standard set in the inverter	1. Wait to see if the grid voltage returns within limits. 2. If problem persists, check whether the grid standard is set correctly in Advanced Setting). 3. Check V_AC, grid voltage, in Information display of inverter (see 6.4) and perform independent measurement of grid voltage to confirm that the inverter reading is correct. If the measured voltage is outside the local grid standard limits, please contact your local utility as it may require monitoring and adjustment 4. With agreement from utility it is possible to set a user defined voltage range (see 6.7).
Under voltage	UN-G-V	1011	Grid voltage is below the standard set in the inverter	
Over frequency	OV-G-F	1012	Grid frequency exceeds the standard set in the inverter.	1. Wait to see if the grid frequency returns within limits. 2. If a problem persists, check whether the grid standard is set correct in Advanced Settings (see 6.7). 3. Check grid frequency, in Information display of inverter (see 6.4) and perform independent measurement of grid frequency to confirm that the inverter reading is correct. If the measured frequency is outside the local grid standard limits, please contact your local utility as it may require monitoring and adjustment. 4. With agreement from utility it is possible to set a user defined frequency range (see 6.7).
Under frequency	UN-G-V	1013	Grid frequency is below the standard set in the inverter.	
Grid impedance	G-IMP	1014	High grid impedance	1. Wait to see if the grid returns within limits. 2. If problem persists please contact your local utility as it may require monitoring and adjustment.
No Grid	NO Grid	1015	The inverter cannot detect a grid.	1. Check your AC power connections, fuses and switches. 2. Restart the inverter. 3. Call your local grid to resolve the black out.

10.4 System and design fault

Error type	Display message	Error code	Error description	Action
Over DC voltage	OV-DC	1020	The DC input of the solar strings exceeds the inverters limits.	1. Restart inverter (up to three times). 2. Contact installer to: a. Perform independent measurement of string voltage to confirm that the inverter reading is correct. 3. Rewire strings so that string voltage is within accepted range.
Over temperature	TEM-PRO	1032	The internal temperature of inverter exceeds limits.	1. Check location of inverter. Ensure it has adequate ventilation and is not exposed to direct sunlight. 2. Contact installer to replace inverter in case problem persists.
Short circuit fault	SHORT-PRO	1030	A short circuit has been detected in the system.	1. Restart inverter (up to three times). 2. Call installer to: a. Check for pinched, crimped or otherwise damaged cables and connections. b. Check all switches for short circuit. 3. If error persists contact Autarco for replacement inverter.
Ground fault	GROUND-PRO	1033	Current flow detected through ground conductor.	1. Restart inverter (up to three times). 2. Call installer to: a. Check if there is any current on the ground conductor using a clamp meter. b. Check for pinched, crimped or otherwise damaged cables and connections. 3. If error persists contact Autarco for replacement inverter.
Current leakage	ILeak_PRO	1034	A current leak has been detected.	1. Restart inverter (up to three times). 2. Call installer to: a. Check if there is any current on the ground conductor using a clamp meter. b. Check for pinched, crimped or otherwise damaged cables and connections. 3. If error persists contact Autarco for replacement inverter.

11. **Product specifications**

	S2.OX80000S	S2.OX90000S	S2.OX100000S	S2.OX110000S	S2.OX110000S-HV
Input					
Max. DC voltage (V)	1100				
MPPT voltage range (V)	180-1000				
Turn on voltage (V)	195				
Turn off voltage (V)	195				
Number of MPP trackers	9	10			
Max. DC current per MPPT (A)	40				
Number of DC connections per MPPT	2				
Total number of strings	18	20			
DC connection type	MC4				
Output					
Nominal AC power (W)	80000	90000	100000	110000	110000
Max. AC power (W)	88000	99000	110000	121000	121000
Nominal AC current (A)	121.6	137.0	152.0	167.1	117.6
Max. AC current (A)	133.7	150.4	167.1	183.8	129.4
Power connection	Three phase				
Grid voltage range	According to EN50438 VDE 0126-1-1, UL1741, G59/3, AS4777				
Grid frequency range	According to EN50438 VDE 0126-1-1, UL1741, G59/3, AS4777				
Power factor (at rated output power)	0.8 …1… 0.8				
Harmonic distortion at nom. output	<3%				
AC connector	OT Terminal connectors				
Overvoltage category	OVC II (MAINS), OVC II (PV) AC & DC				
Power consumption					
Nighttime power consumption (W)	< 1				
Standby power consumption (W)	6				
Efficiencies					
Max. efficiency	98.70%				99.0%
Euro efficiency	98.30%				98.5%

	S2.OX80000S	S2.OX90000S	S2.OX100000S	S2.OX110000S	S2.OX60000S-HV
Safety protection					
Internal overvoltage protection	Yes				
DC Insulation monitoring	Yes				
Earth fault protection	Yes				
Grid monitoring	According to VDE 0126-1-1, UL1741, G83/2, AS4777				
Earth fault current monitoring	According to VDE 0126-1-1, UL1741, G83/2, AS4777				
DC current monitoring	According to VDE 0126-1-1, UL1741, G83/2, AS4777				
Islanding protection	According to VDE 0126-1-1, UL1741, G83/2, AS4777				
CE- compliant	According to EN61000-6-2, EN61000-6-4, AS3100, IEC62109				
General data					
Dimensions (W x H x D) (mm)	1050 x 567 x 286.5				
Weight	82kg				
Installation environment	Indoor or outdoor				
Mounting	Wall bracket				
Operating temperature range (°C)	-25°C to 60°C				
Max. relative humidity	100%				
Maximum altitude	4000m				
IP protection rating	IP65 according to EN60529				
Isolation type	Transformerless				
Cooling concept	Convection with smart fan-cooling				
Noise level (dB)	<50				
LED indicators	3				
LCD display	20 x 2 character				
Communication interfaces	4 pins RS485 connector 2 RJ45 connector 2 group of terminal block				
Optional interfaces	Wi-Fi, GPRS, Z-Wave, LAN				
Standard warranty	5 years extendable to 15 years				
Integrated DC switch	Optional				