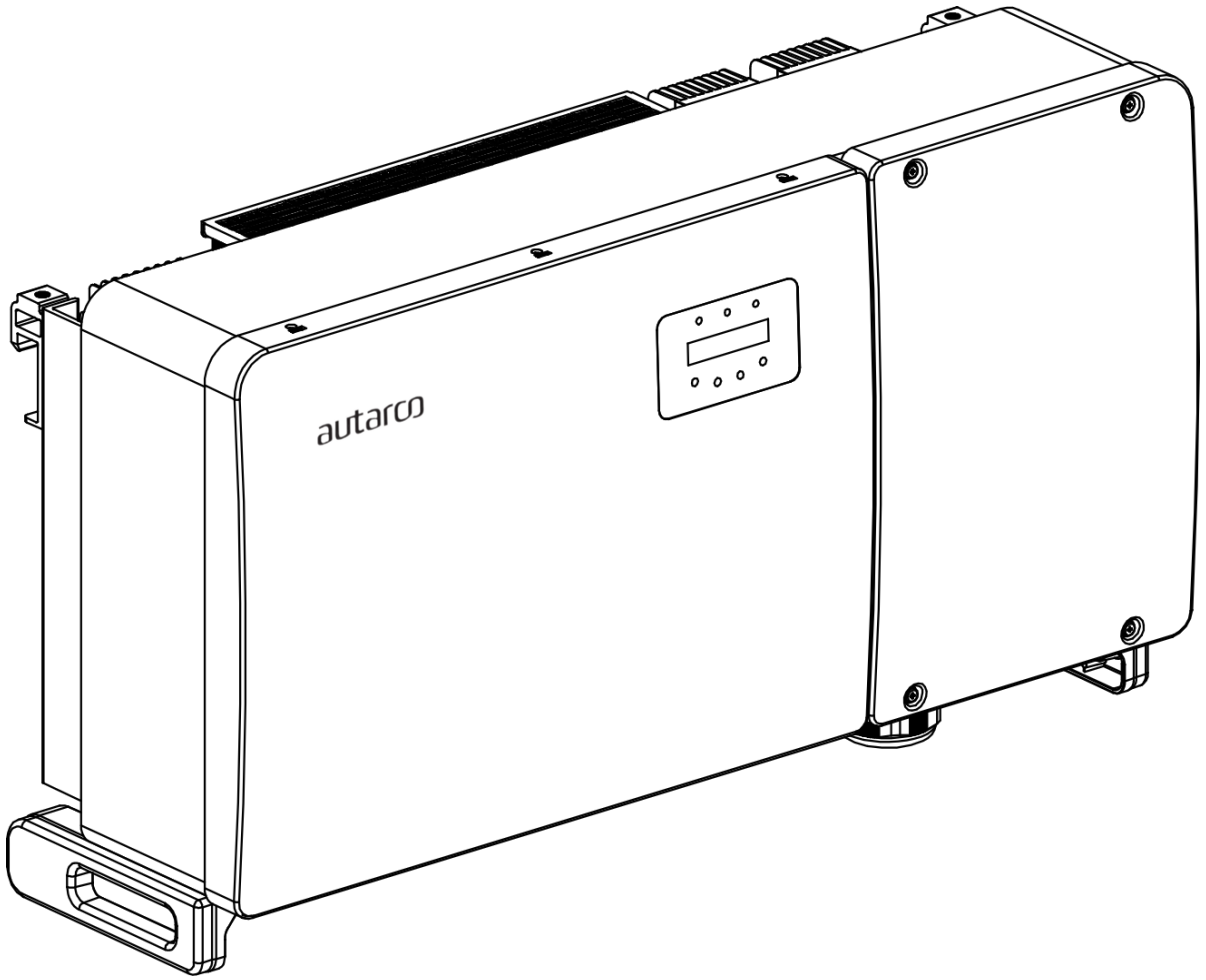
autarco

# Installation and Operation Manual

## Solar Inverters OX series






IM-S2.OX-EN-V2.4

**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 instructions, which if not correctly followed, could result in injury, death or property damages.

Indicates important safety instructions, which if not correctly followed, could result in damage to or the destruction of the inverter.

RISK OF ELECTRIC SHOCK! Indicates important 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 5 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.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.

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.

DANGER! 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.

WARNING! 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.

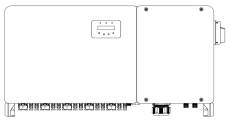
NOTICE! Do not directly connect AC output of the inverter to any private AC equipment. The PV inverter is designed to feed AC power directly into the public utility power grid.

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 facilities for any maintenance or repairmen.

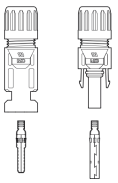
Any unauthorized actions including modification of product functionality of any form will affect the validation of warranty service; Autarco may deny the obligation of warranty service accordingly.

## 2.2 Package contents



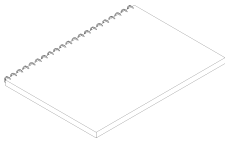
Autarco OX series inverter

Mounting bracket
+ screws



Group 1: 18 x MC4 connector pairs (S4.MC4F/MC4M)

Group 2: 20 x MC4 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 switch in order to completely disconnect the solar PV module strings from the inverter.

## 2.4 Explanations of symbols on inverter


**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 10 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:

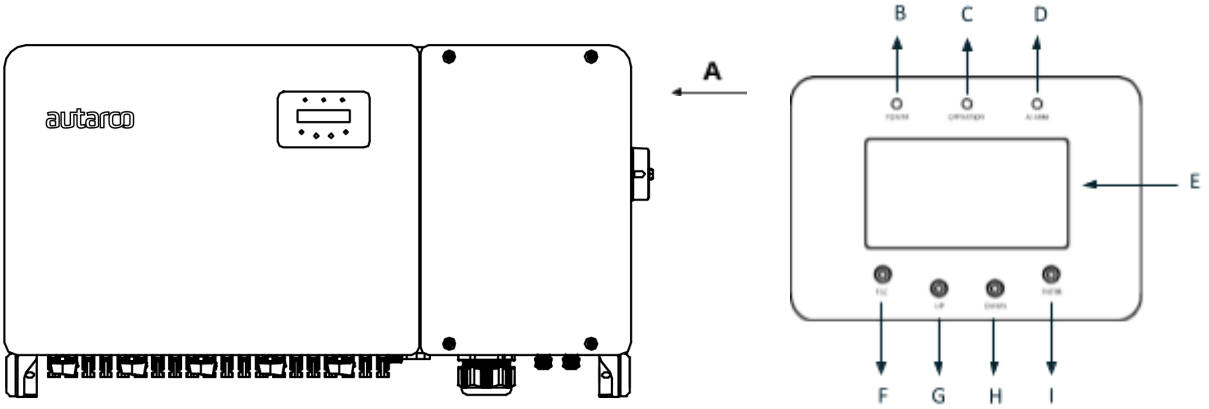
- Maximum efficiency of 98.7%
- Wide MPPT voltage range
- Low turn off voltage
- High enclosure protection class IP66
- Intelligent redundant fan-cooling
- Standard 5 year product warranty, extendable to 15 years
- Multiple monitoring options
- Integrated DC switch
- Optional AC switch

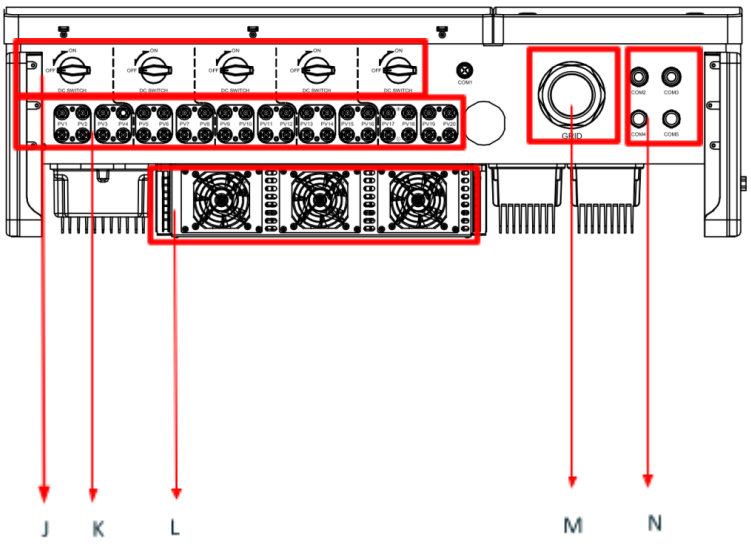
For full specifications please see chapter 12 Product specifications.

## 3.2 Product identification

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

## 3.3 Product overview




| | |
|---|---|
| A | Inverter cover |
| B | LED light - POWER |
| C | LED light - OPERATION |
| D | LED light - ALARM |
| E | Display |
| F | Escape key |
| G | Up key |
| H | Down key |
| I | Enter key |
| J | DC switches |
| K | DC inputs |
| L | Meter |
| M | AC output |
| N | DRM |

The inverters of the OX series do not all share the same dimensions. Therefore this manual divides specifications for the two variations, referred to as group 1 and group 2.

Group 1 includes the models:
- OX80000(S)
- OX110000-HV(S)

Group 2 includes the models:
- OX100000(S)
- OX110000(S)

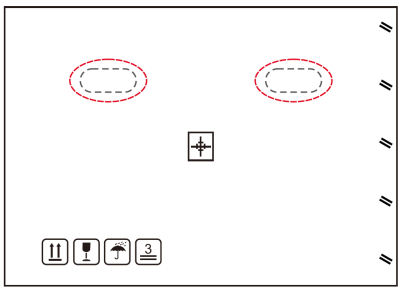
See dimensions in chapter 5.4 Mounting & dimensions

# 4 Handling

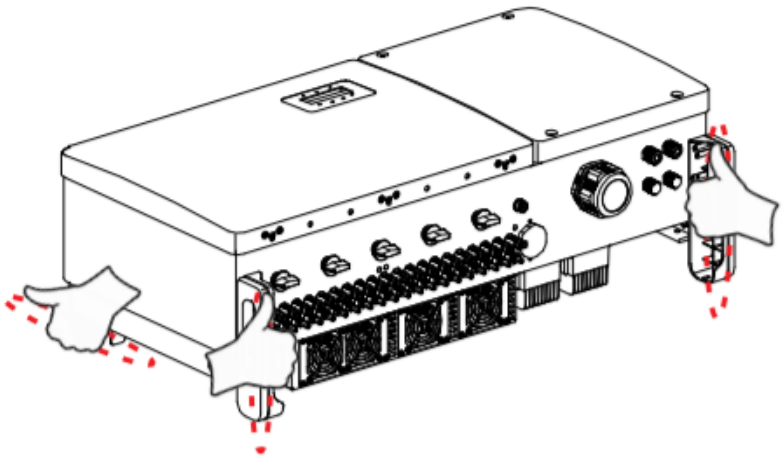
## 4.1 Product handling

Instructions for handling the inverter:

1. The red circles denote cut outs on the product package. Push the cut outs to form handles for moving the inverter.



2. Open the carton, then two people handle both sides of the inverter through the area denoted dotted line.



Due to the weight of the inverter, bruises or bone fractures could occur when incorrectly lifting and mounting the inverter. When mounting the inverter, take the weight of the inverter into consideration. Use a suitable lifting technique when mounting.

# 5 Installation

## 5.1 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.

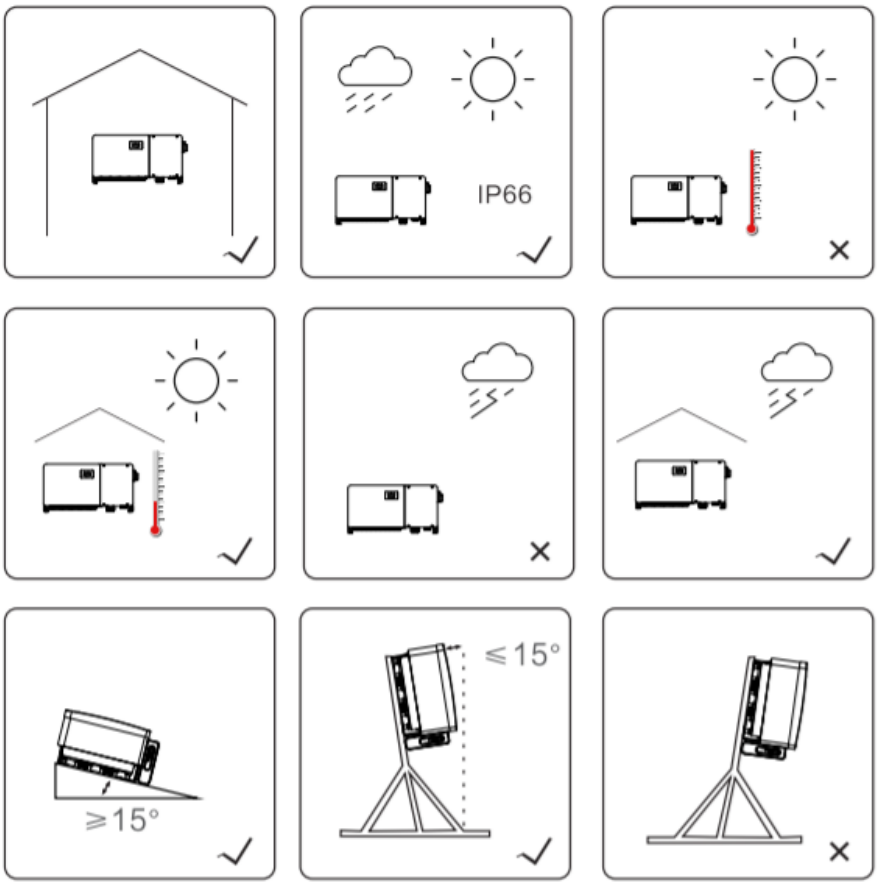
## 5.2 Appropriate mounting location

The heat sink can reach a temperature of 75$^{0}$C under operation.

Location and environmental requirements:

- 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 lifespan 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.

Examples of correct and incorrect installations below.

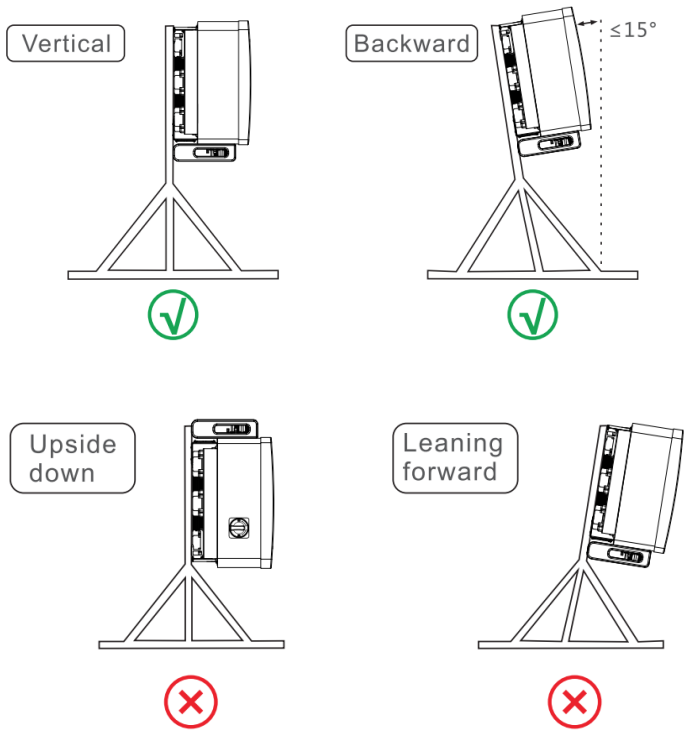



## 5.3 Mounting instructions

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.

- The inverter is suitable for outdoor and indoor installation.
- Vertical installation is recommended, with a maximum inclination of $15^0$ backwards.

In case of vertical mounting, examples of correct and incorrect installations below.

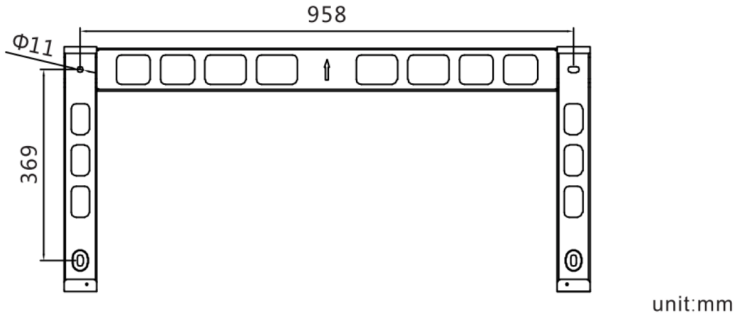



## 5.4 Mounting and dimensions

The inverter can be mounted to the wall or metal array racking. The mounting holes should be consistent with the size of the bracket or the dimensions.

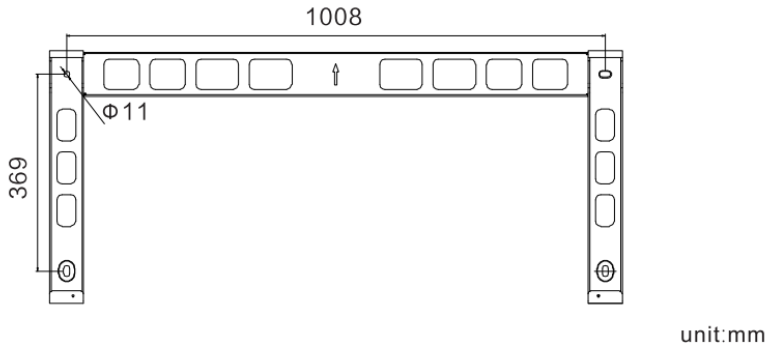
Dimensions inverters group 1:

- OX80000(S)
- OX110000-HV(S)



Dimensions inverters group 2:

- OX100000(S)
- OX110000(S)

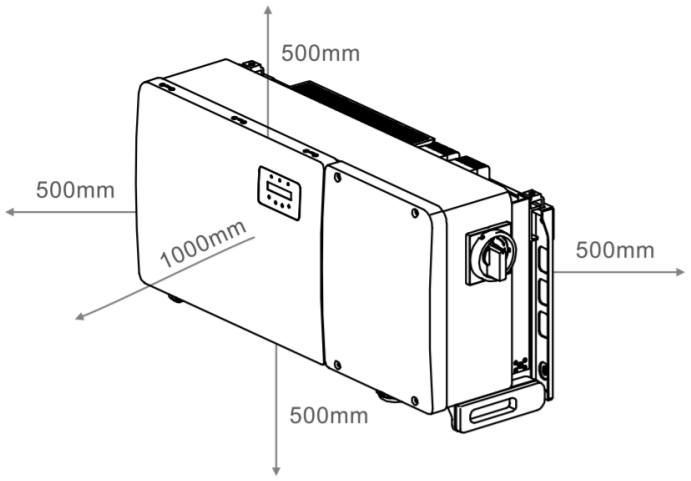



## 5.5 Safety clearance

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.

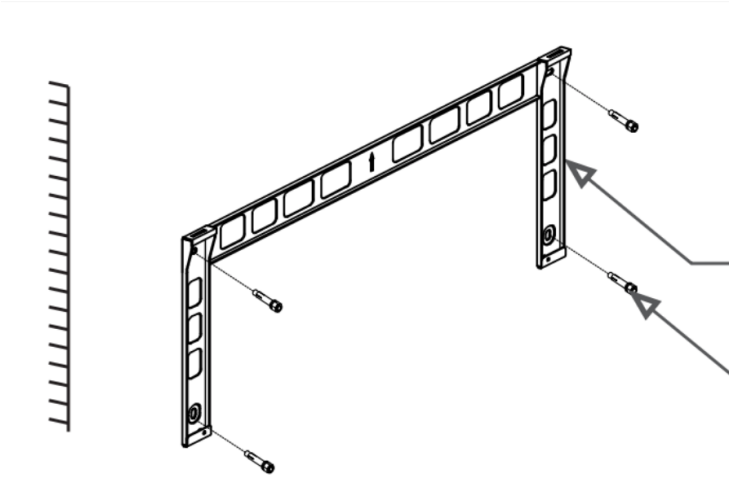
Observe the following minimum clearances to walls and other inverters:



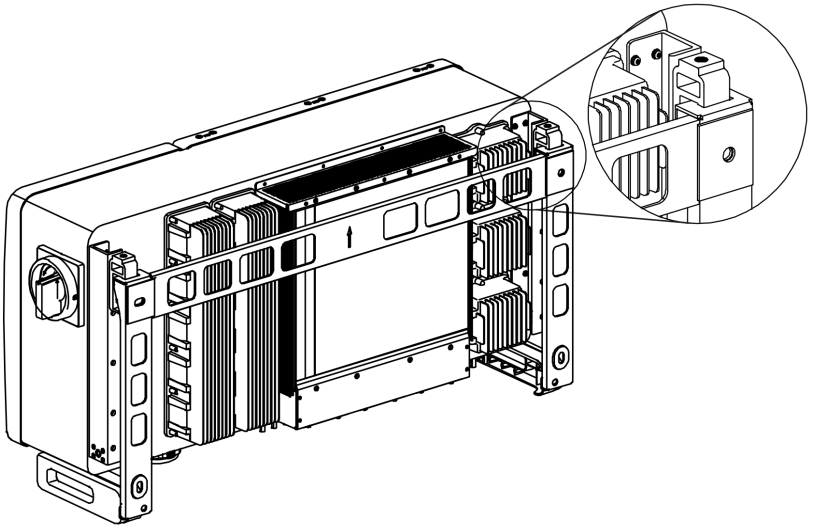
## 5.6 Mounting procedure

### 5.6.1 Wall mounting

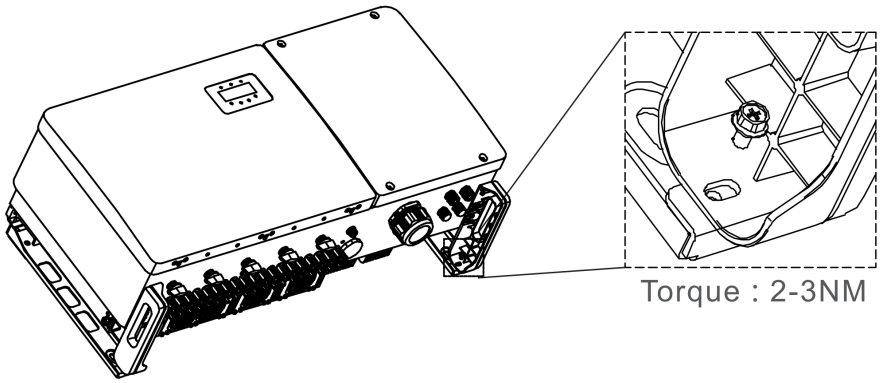
1. Mount the wall bracket onto the mounting wall with appropriate screws plugs



2. Lower the inverter onto the bracket

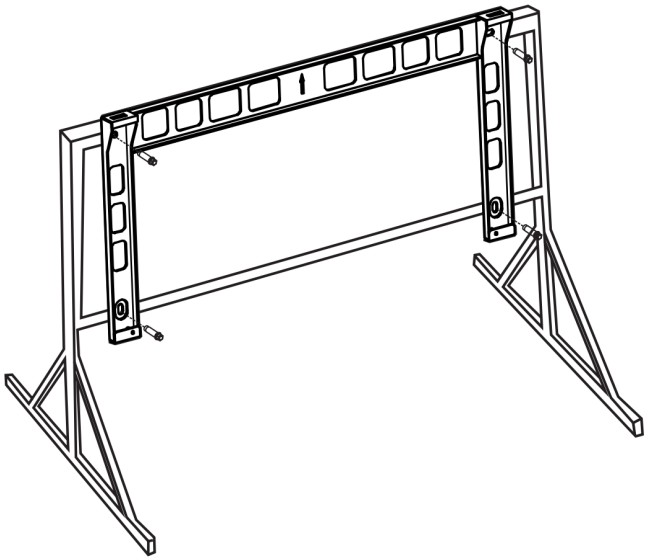


3. Use screws in the packaging to fix the bottom of the inverter to the mounting bracket

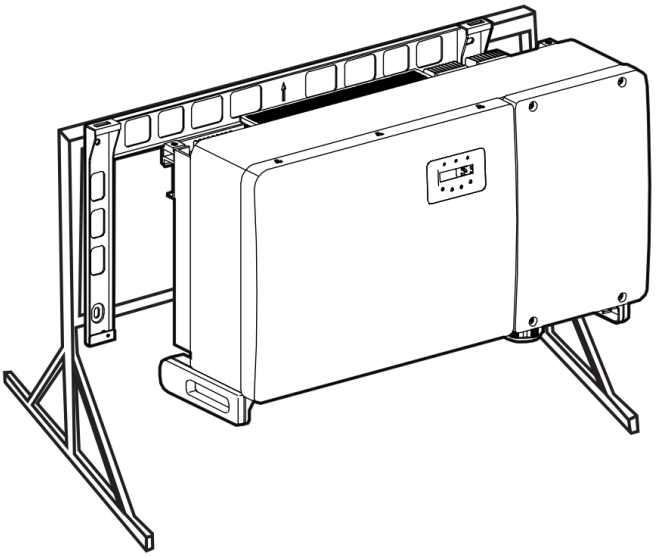



### 5.6.2 Rack mounting

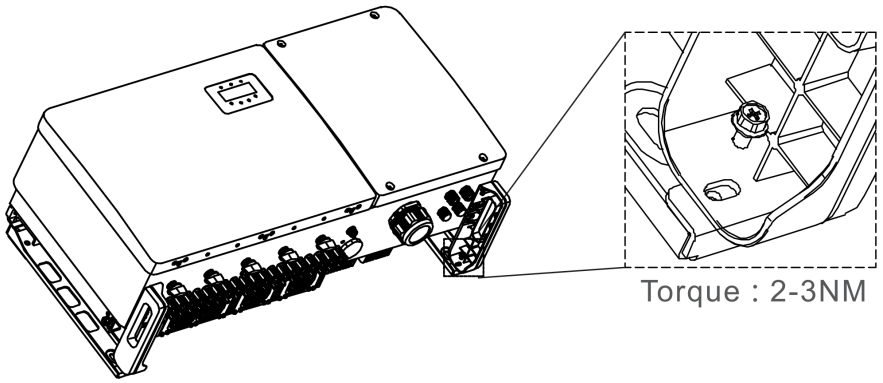
1. Mount the wall bracket onto the mounting rack with appropriate screws plugs



2. Lower the inverter onto the bracket



3. Use screws in the packaging to fix the bottom of the inverter to the mounting bracket



# 6 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

## 6.1 Electrical Connections

The top cover doesn't need to be opened during DC electrical connection (MC4 connector). The labels located at the bottom of the inverter are described below in the table. All electrical connections meet local and national standards.

| Parts | Connection | Cable size | Torque |
|---|---|---|---|
| DC terminal | PV strings | 4-6mm² | NA |
| Ground terminal | AC ground | 25-50mm² | 10-12N.m |
| Grid terminal | Grid | 50-185mm² | 10-20N.m |
| RS-485 terminal | Communication cable | 0.3-4mm² | 0.6N.m |
| RJ45 terminal | Communication cable | Network Cable | NA |
| COM terminal | Wi-Fi/Cellular stick | NA | NA |
| DC surge protection device | NA | NA | NA |

The electrical connection of the inverter must follow the steps listed below:

1. Switch the AC switch OFF.
2. Switch the DC switch OFF.
3. Connect the inverter to the grid.
4. Assemble PV connector and connect to the inverter.

## 6.2 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 7.6 Advanced Settings.

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

If **AC terminal (grid terminal)** is used to connect ground, please refer to the contents of chapter 6.3 AC Connection.

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

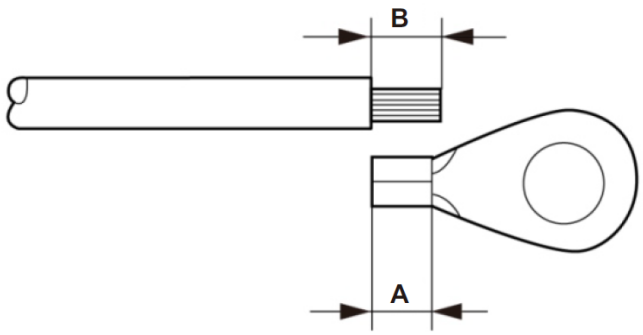
1. Prepare the grounding cable: recommended to use the 25-50mm² outdoor copper-core cable. The grounding cable should be at least half the size of the AC wiring.

2. Prepare OT terminals M10

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.

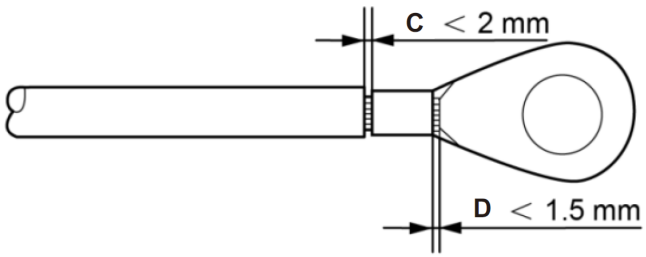
WARNING! No matter what kind of grounding connection is adopted, it is forbidden to connect the ground of the inverter with the lightning protection of the building, otherwise Autarco will not be responsible for any damage caused by lightning. If connecting to lightning protection is required by the regulations, then a PV-box with surge protection shall be added.

3. Strip the grounding cable insulation to the suitable length as shown in figure below.



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

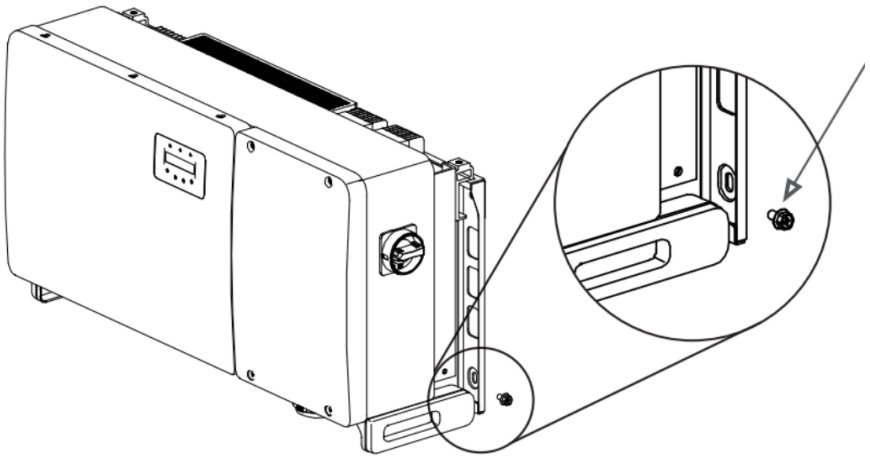
4. Insert the stripped wire into the OT terminal crimping area, and use the hydraulic clamp to crimp the terminal to the wire as shown in the figure below.




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 to the heat sink. Tighten the screw securely. Torque is 10-12Nm (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.

## 6.3 AC Connection (grid 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.

WARNING! An overcurrent protection device (OCPD) must be used between the inverter and 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 35-185 $mm^2$ 105 ℃ cable with resistance lower than 1.5 ohm.

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

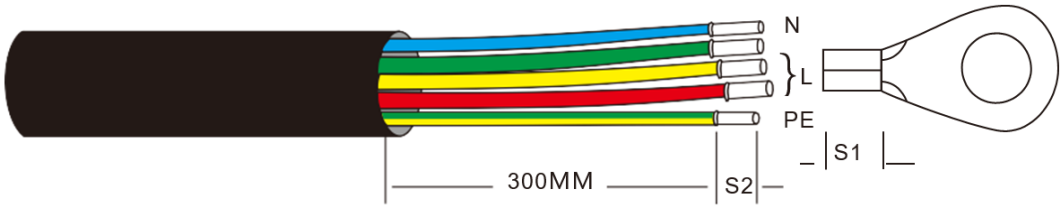
NOTE: There is no need to connect N to AC side for the OX series three-phase inverter, the ground wire can be connected to the grounding hole on the right side of the inverter heat sink.

| 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: Use  M10 OT terminals

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

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

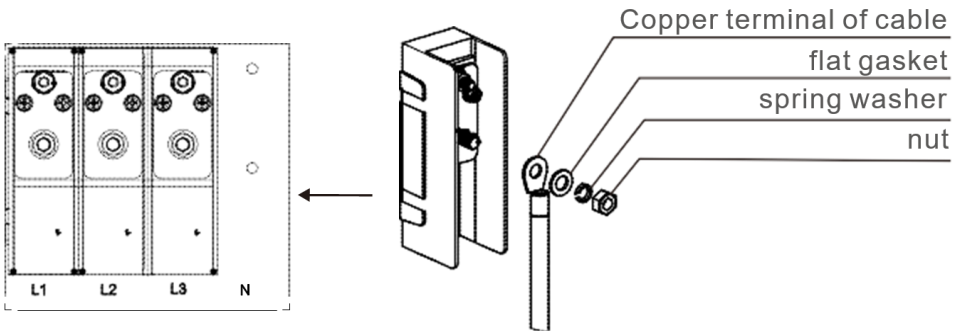



NOTE: S2 (insulation stripping length) is 2mm-3mm longer than S1 (OT cable terminal crimping area)

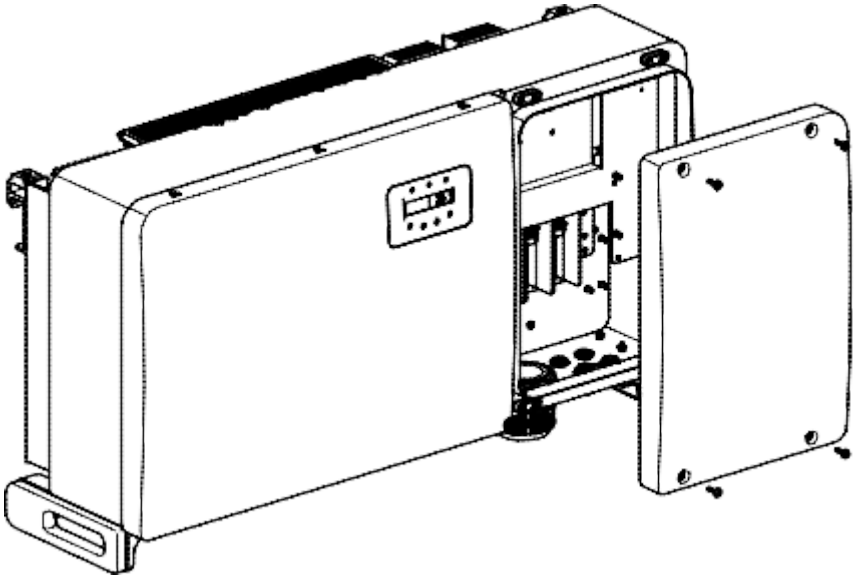
2. Strip the insulation of the wire core, insert into the cable crimping area of the OT terminal, then use a hydraulic crimp tool to crimp it firmly. The wire must be covered with heat

shrinkable tube or insulating tape. When using the heat shrinkable tube, sleeve the heat shrinkable tube over the wire before crimping the OT terminal.

NOTE: If chosing aluminum alloy cable, you must use a copper aluminum transfer terminal in order to avoid direct contact between the copper bar and the aluminum alloy cable. (Please select a copper aluminum transfer terminal based on your cable specification.)



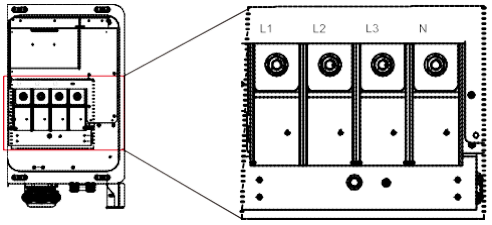

3. Leave the AC breaker disconnected to ensure it does not close unexpectedly\
4. Remove the 4 screws on the AC terminal cover and remove the cover.
5. Remove the screw under the terminal slide and pull out the terminal.



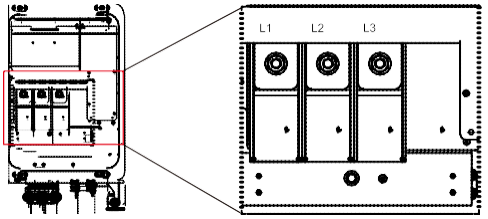
6. Insert the cable through cap nut, waterproof bushing and AC terminal cover into the AC terminal and use a socket wrench to tighten the screws. The torque is 10~20Nm.

Group 1:

Wiring with Neutral (S2.OX80000(S))

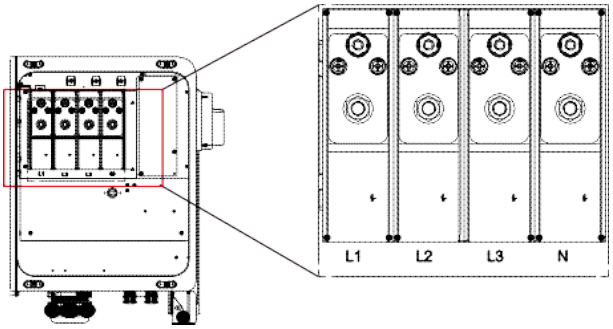



Wiring without Neutral (S2.OX110000(S)-HV)




Group 2:

Wiring with Neutral (S2.OX100000(S) and S2.OX110000(S))




It is also possible to wire without Neutral

NOTICE! It is important that the AC wires are connected to the right terminals as indicated by the “L”, “N” and “Ground” 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.

## 6.4 Additional Protections

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

| Inverter | Rated Voltage (V) | Rated Output (kW) | OCPD: Current for protection device (A) |
|---|---|---|---|
| S2.OX80000(S) | 400V | 80 | 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.

## 6.5 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.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 to 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.

## 6.6 Inverter commissioning sequence

| Turn ON | Turn OFF |
|---|---|
| 1. Connect AC side (if not connected yet)<br>2. Connect DC side (if not connected yet)<br>3. Switch ON the DC switches<br>4. Switch ON the AC switch | 1. Switch OFF the AC switch<br>2. Switch OFF the DC switches |

# 7 Operation

## 7.1 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. The table below 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 the 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.

## 7.2 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 7.3 Information.
- Settings, described in detail in chapter 7.4 Settings.
- Advanced information, described in detail in chapter 7.5 Advanced info.
- Advanced settings, described in detail in chapter 7.6 Advanced Settings.

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

## 7.3 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.

Below symbols are then displayed.

(locked)

(scrolling)

Pressing the ESC key returns to the main menu.

| State | Description |
|---|---|
| V_DC01 *%VALUE% V*<br>I_DC01 *%VALUE%* A | Shows the input voltage (V) of the MPPT1<br>Shows the input current (A) of the MPPT1 |
| V_DC02 *%VALUE% V*<br>I_DC2 *%VALUE%* A | Shows the input voltage (V) of the MPPT2<br>Shows the input current (A) of the MPPT2 |
| V_DC03 *%VALUE% V*<br>I_DC03 *%VALUE%* A | Shows the input voltage (V) of the MPPT3<br>Shows the input current (A) of the MPPT3 |
| V_DC04 *%VALUE% V*<br>I_DC04 *%VALUE%* A | Shows the input voltage (V) of the MPPT4<br>Shows the input current (A) of the MPPT4 |
| V_DC05 *%VALUE% V*<br>I_DC05 *%VALUE%* A | Shows the input voltage (V) of the MPPT5<br>Shows the input current (A) of the MPPT5 |
| V_DC06 *%VALUE% V*<br>I_DC06 *%VALUE%* A | Shows the input voltage (V) of the MPPT6<br>Shows the input current (A) of the MPPT6 |
| V_DC07 *%VALUE% V*<br>I_DC07 *%VALUE%* A | Shows the input voltage (V) of the MPPT7<br>Shows the input current (A) of the MPPT7 |
| V_DC08 *%VALUE% V*<br>I_DC08 *%VALUE%* A | Shows the input voltage (V) of the MPPT8<br>Shows the input current (A) of the MPPT8 |
| V_DC9 *%VALUE% V*<br>I_DC9 *%VALUE%* A | Shows the input voltage (V) of the MPPT9<br>Shows the input current (A) of the MPPT9 |
| V_DC10 *%VALUE% V*<br>I_DC10 *%VALUE%* A | Shows the input voltage (V) of the MPPT10<br>Shows the input current (A) of the MPPT10 |
| V_A *%VALUE% V*<br>I_A *%VALUE%* A | Shows the voltage (V) of the grid L1<br>Shows the current (A) of the grid L1 |
| V_B *%VALUE% V*<br>I_B *%VALUE%* A | Shows the voltage (V) of the grid L2<br>Shows the current (A) of the grid L2 |
| V_C *%VALUE% V* | Shows the voltage (V) of the grid L3 |

| | |
|---|---|
| I_C *%VALUE%* A | Shows the current (A) of the grid L3 |
| Status: *%VALUE%*<br>Power: *%VALUE%* W | Shows the status of the inverter<br>Shows current output power (W) of the inverter<br><br>For any status other than “Generating” and “Initializing” please refer to chapter 10 for troubleshooting |
| Rea_Power: *%VALUE%* Var<br>App_Power: *%VALUE%* VA | Shows the real power generated<br>Shows the apparent power generated |
| Grid frequency<br>F_Grid *%VALUE%* Hz | Shows current frequency (Hz) of the grid |
| Total Energy<br>*%VALUE%* kWh | Shows total energy output (kWh) |
| This Month: *%VALUE%* kWh<br>Last Month: *%VALUE%* kWh | Total energy output in this month (kWh)<br>Total energy output of last month (kWh) |
| Today: *%VALUE%* kWh<br>Yesterday: *%VALUE%* kWh | Total energy output in this day (kWh)<br>Total energy output of yesterday (kWh) |
| Inverter S/N | Serial ID of the inverter |
| Export_P: %VALUE% W<br>Export_I: %VALUE% A | Shows the exported power<br>Shows the exported current |
| Work Mode:<br>DRM Number: | Demand response mode (only relevant for some markets)<br>The demand response number (1-8) of the inverter |
| I_DC01 %VALUE% A<br>I_DC02 %VALUE% A | Shows the input current (A) of the DC input 1<br>Shows the input current (A) of the DC input 2 |
| I_DC03 %VALUE% A<br>I_DC04 %VALUE% A | Shows the input current (A) of the DC input 3<br>Shows the input current (A) of the DC input 4 |
| I_DC05 %VALUE% A<br>I_DC06 %VALUE% A | Shows the input current (A) of the DC input 5<br>Shows the input current (A) of the DC input 6 |
| I_DC07 %VALUE% A<br>I_DC08 %VALUE% A | Shows the input current (A) of the DC input 7<br>Shows the input current (A) of the DC input 8 |
| I_DC09 %VALUE% A<br>I_DC10 %VALUE% A | Shows the input current (A) of the DC input 9<br>Shows the input current (A) of the DC input 10 |
| I_DC11 %VALUE% A<br>I_DC12 %VALUE% A | Shows the input current (A) of the DC input 11<br>Shows the input current (A) of the DC input 12 |
| I_DC13 %VALUE% A<br>I_DC14 %VALUE% A | Shows the input current (A) of the DC input 13<br>Shows the input current (A) of the DC input 14 |
| I_DC15 %VALUE% A<br>I_DC16 %VALUE% A | Shows the input current (A) of the DC input 15<br>Shows the input current (A) of the DC input 16 |
| I_DC17 %VALUE% A<br>I_DC18 %VALUE% A | Shows the input current (A) of the DC input 17<br>Shows the input current (A) of the DC input 18 |
| I_DC19 %VALUE% A | Shows the input current (A) of the DC input 19 |

| | |
|---|---|
| I_DC20 %VALUE% A | Shows the input current (A) of the DC input 20 |

## 7.4 Settings

The following options are available under the Settings submenu:

| | |
|---|---|
| Set Time and Date | Press UP/DOWN keys to set change element<br>Press ENTER key to move to next element<br>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<br><br>Press UP/DOWN keys to set change number<br>Press ENTER key to save the setting<br>Press ESC key to return.<br><br>⚠ Changing the Address when using WIFI-STICK or LAN-STICK may result in monitoring to stop working. |

## 7.5 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).<br>Press UP/DOWN keys to cycle through alarm messages<br>Press ESC key to return |
| Running Message | This function is for maintenance personnel to get running message such as internal temperature, Standard NO. etc.<br>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.<br>Press DOWN key to move the cursor to day, month and year, press UP key to change the digit.<br>Press ENTER after the date is fixed.<br>Press UP/DOWN key to move one date from another. |
| Monthly Energy | The function is for checking the energy generation for selected month.<br>Press DOWN key to move the cursor, press UP key to change the digit. |

| | |
|---|---|
| | Press ENTER after the month/year is fixed.<br>Press UP/DOWN key to move one date from another. |
| Yearly Energy | The function is for checking the energy generation for selected year.<br>Press DOWN key to move the cursor, press UP key to change the digit.<br>Press ENTER after the month/year is fixed.<br>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 |

## 7.6 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.

| | |
|---|---|
| Select grid standard |  WARNING! Set GRID OFF (see below) before changing this setting.<br><br>Press UP/DOWN keys to cycle through available standards<br><br>Press ENTER key to save the setting - Press ESC key to cancel and return<br><br>When selecting User defined the following upper and lower values have to be set for voltage and frequency: |

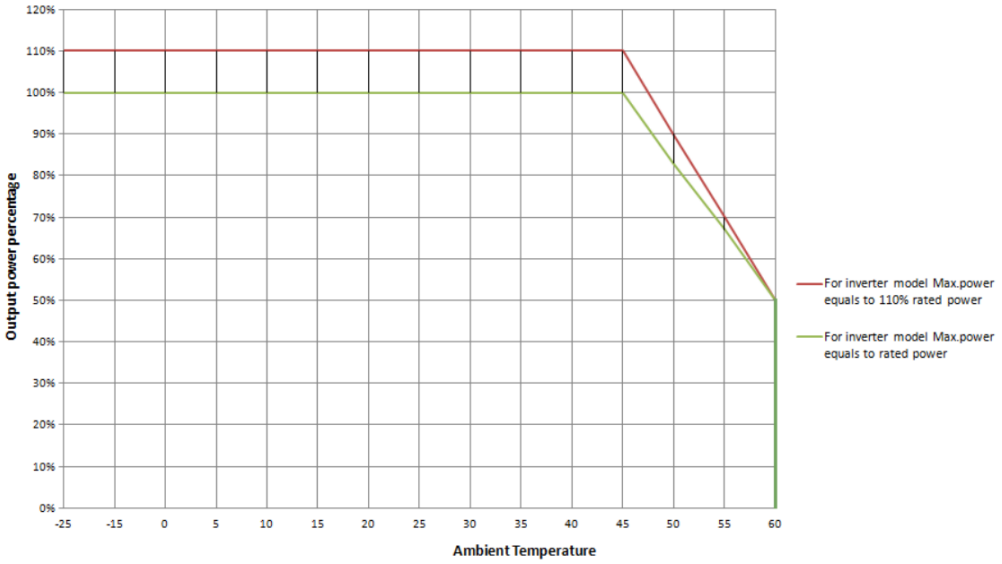
| | |
|---|---|
| | OV-G-V1: 300---480V<br>OV-G-V1-T: 0.01---9s<br>OV-G-V2: 300---490V<br>OV-G-V2-T: 0.01---1s<br>UN-G-V1: 173---336V<br>UN-G-V1-T: 0.01---9s<br>UN-G-V2: 132---319V<br>UN-G-V2-T: 0.01---1s<br>OV-G-F1: 50.2-63Hz<br>OV-G-F1-T: 0.01---9s<br>OV-G-F2: 51-63Hz<br>OV-G-F2-T: 0.01---9s<br>UN-G-F1: 47-59.5Hz<br>UN-G-F1-T: 0.01---9s<br>UN-G-F2: 47-59Hz<br>UN-G-F2-T: 0.01---9s |
| | Press UP/DOWN keys to scroll through these values<br>Press ENTER key to edit the selected value<br>Press UP/DOWN keys to change the selected value<br>Press ENTER key to save and return<br>Press ESC key to cancel and return<br><br>⚠ WARNING! Set GRID ON (see below) before new standard is activated.<br><br>⚠ 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<br>Press ENTER key to save<br>Press ESC key to return |
| Clear Energy | Reset the inverters total kWh output to zero.<br><br>⚠ 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:<br>1. Set output power<br>2. Set reactive power<br>3. Out_P with restore<br>4. Rea_P with restore<br>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.<br>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:<br>1. Grid Filter Set<br>2. Relay_Protect Set<br>3. ILeak_Protect Set<br>4. GROUND_Protect Set<br>5. GRID INTF.02 Set<br>6. MPPT Parallel Mode<br>7. Cnst. Voltage Mode<br>8. V/FRT Set<br>9. IgZero_COMP. Set<br>10. PI Set<br>11. IgADCheckPRO Set<br>12. NoSmallPulse Set<br>13. VarCompensation<br>14. AFCI Set |
| STD Mode Settings | STD Mode Settings are used when demand response is required by grid operators.<br>1. Working Mode Set<br>2. Power Rate Limit<br>3. Freq Derate Set<br>4. 10mins Voltage Set<br>5. Power Priority<br>6. Initial Settings<br>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.<br>1. Mode<br>2. Backflow power<br>3. Fail safe ON/OFF |
| External EPM Set | External power export management.<br>1. 5G-EPM<br>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.<br>1. Power parameter<br>2. Voltage parameter<br>⚠ 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.<br>1. Set I/V curve<br>2. I/V curve scan |

## 7.7 Temperature derating

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




## 7.8 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.

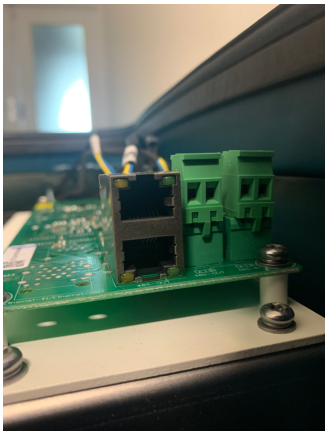
# 8 Monitoring setup and system registration

## 8.1 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.

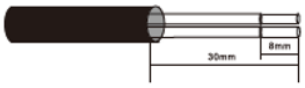



1 2 3 4

| 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

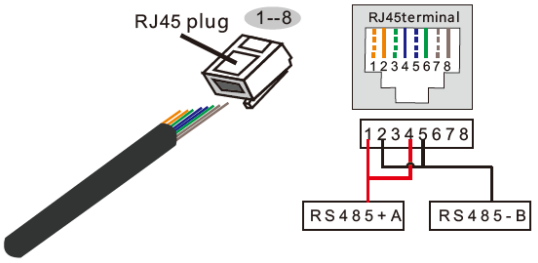
## 8.2 Monitoring Devices

| Product | Port | Communication Method | Connection To: | # Inverters per product | Parallel Connection |
|---|---|---|---|---|---|
| S2.WIFI-STICK-D* | COM1 | WiFi | Router | 1 | N |
| 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 |

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

Steps for using RJ45 connections for RS485 Communications:

1. Use a network wire stripper to strip the insulation layer 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 must be done via MyAutarco.

## 8.3 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

# 9 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.

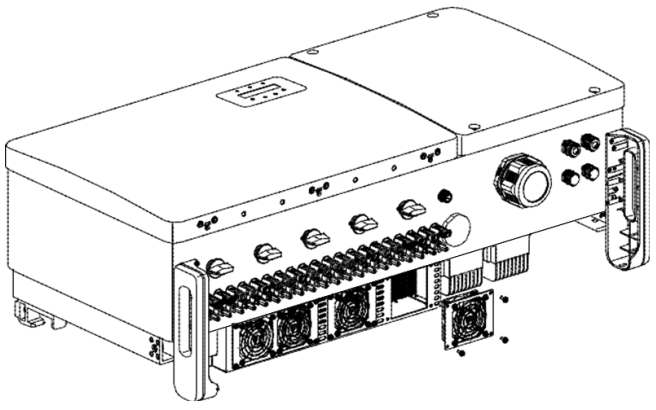
The OX series inverters require general maintenance to be performed once per year. Impurities such as dust and dirt accumulation on the heat sink may negatively affect the inverter's ability to dissipate heat. Any dirt or dust can be removed with a cloth or soft brunch.

## 9.1 Fan Maintenance

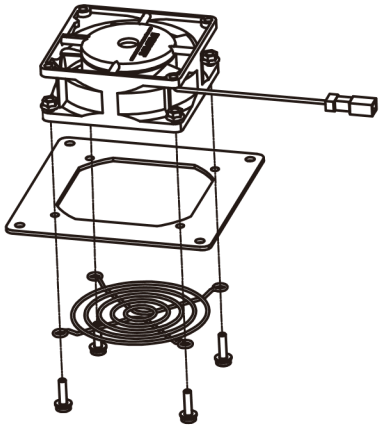
If the fan does not work properly, the inverter will not be cooled effectively and inverter efficiency may be reduced.

Broken fans should be cleaned or replaced following process below:

1. Turn off the 'Grid ON/OFF' switch on the inverter LCD (Advanced Settings).
2. Disconnect the AC power.
3. Turn the DC switch to "OFF" position.
4. Wait for 15 minutes at least.



5. Remove the 4 screws on the fan plate and pull out the fan assembly slowly.
6. Disconnect the fan connector carefully and take out the fan.
7. Clean or replace the fan. Assemble the fan on the rack.



8. 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.

# 10 Recycling and 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.

# 11 Troubleshooting

## 11.1 General

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

## 11.2 Alarm messages: internal components, system and design fault)

| Alarm Message | Failure description | Solution |
|---|---|---|
| No power | Inverter no power on LCD | 1.Check PV input connections<br>2.Check DC input voltage (single phase >120V, three phase >350V)<br>3.Check if PV+/- is reversed |
| LCD show initia-lizing all the time | Can not start-up | 1.Check if the connector on main board or power board are fixed.<br>2.Check if the DSP connector to power board are fixed. |
| OV-DC01/02/03/04 | Over DC voltage | 1.Reduce the module number in series |
| OV-BUS | Over DC bus voltage | 1.Check inverter inductor connection 2.Check driver connection |
| UN-BUS01/02 | Under DC bus voltage | |
| DC-INTF<br>OV-DCA-I | DC input overcurrent | 1.Restart inverter<br>2. Identify and remove the string to the fault MPPT<br>3.Change power board |
| OV-TEM | Over Temperature | 1.Check inverter surrounding ventilation.<br>2.Check if there's sunshine direct on inverter in hot weather. |
| INI-FAULT | Initialization system fault | 1.Restart inverter or contact installer. |
| DSP-B-FAULT | Comm. failure between main and slave DSP | |

| | | |
|---|---|---|
| 12Power-FAULT | 12V power supply fault | |
| PV ISO-PRO 01/02 | PV isolation protection | 1.Remove all D C input, reconnect and restart inverter one by one.<br>2.Identify which string cause the fault and check the isolation of the string. |
| ILeak-PRO 01/02/03/04 | Leakage current protection | 1.Check A C and D C connection<br>2.Check inverter inside cable connection. |
| RelayChk-FAIL | Relay check fail | 1.Restart inverter or contact installer. |
| DCinj-FAULT | High DC injection current | |
| AFCI self-detection (model with AFCI module) | AFCI module self-detect fault | 1.Restart inverter or connect technician. |
| Arcing protection (model with AFCI module) | Detect arc in DC circuit | 1. Check inverter connection whether arc exists and restart inverter. |
| Reve-DC | One of the DC string is reversely connected | 1. Please check the inverters' PV string polarity, if there are strings reversely connected wait for the night when the solar irradiance is low and the PV string current down below 0.5A. Turn off the two DC switches and fix the polarity issue. |
| Screen OFF with DC applied | Inverter internally damaged | 1.Do not turn off the DC switches as it will damage the inverter.<br>2.Please wait for the solar irradiance reduces and confirm the string current is less than 0.5A with a clip-on ammeter and then turn off the DC switches.<br>3.Please note that any damages due to wrong operations are not covered in the device warranty. |

## 11.3 Alarm messages: grid errors

| Alarm Message | Failure description | Solution |
|---|---|---|
| OV-G-V01/02/03/04 | Over grid voltage | 1.Resistant of A C cable is too high. Change bigger size grid cable.<br>2.Adjust the protection limit if it's allowed by electrical company. |
| UN-G-V01/02 | Under grid voltage | 1. Use user define function to adjust the protection limit if it's allowed by electrical company. |
| OV-G-F01/02 | Over grid frequency | |
| UN-G-F01/02 | Under grid frequency | |
| G-IMP | High grid impedance | |
| NO-GRID | No grid voltage | 1.Check connections and grid switch.<br>2.Check the grid voltage inside inverter terminal. |
| GRID-INTF01/02 | Grid interference | 1.Restart inverter<br>2.Change power board |
| OV-G-I | Over grid current | |
| IGBT-OV-I | Over IGBT current | |
| IGFOL-F | Grid current tracking fail | 1.Restart inverter or contact installer. |
| IG-AD | Grid current sampling fail | |

# 12 Product specifications

| | S2.OX80000S | S2.OX100000S | S2.OX110000S | S2.OX110000S-HV |
|---|---|---|---|---|
| **Input** | | | | |
| Max. DC voltage (V) | 1100 | | | |
| MPPT voltage range (V) | 180-1000 | | | |
| Turn on voltage (V) | 195 | | | |
| Number of MPP trackers | 9 | 10 | | |
| Max. DC current per MPPT (A) | 26 | | | |
| Number of DC connections per MPPT | 2 | | | |
| Total number of strings | 18 | 20 | | |
| DC connection type | MC4 | | | |
| **Output** | | | | |
| Nominal AC power (W) | 80000 | 100000 | 110000 | 110000 |
| Max. AC power (W) | 88000 | 110000 | 121000 | 121000 |
| Nominal AC current (A) | 121.6 | 152.0 | 167.1 | 117.6 |
| Max. AC current (A) at 380V | 133.7 | 167.1 | 183.8 | x |
| Max. AC current (A) at 400V | 129.4 | 158.9 | 174.8 | 129.4 at 540V |
| Power connection | Three phase | | | |
| Grid voltage range | According to G98 or G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1, VDE 0126 / UTE C 15 / VFR:2019,CEI 0-21, C10/11, NRS 097-2-1, TOR,EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530 | | | |
| 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) | < 2 | | | |
| **Efficiencies** | | | | |
| Max. efficiency | 98.70% | | | 99.0% |
| Euro efficiency | 98.30% | | | 98.5% |

| | S2.OX80000S | S2.OX100000S | S2.OX110000S | S2.OX110000S-HV |
|---|---|---|---|---|
| **Safety protection** | | | | |
| Internal overvoltage protection | Yes | | | |
| DC Insulation monitoring | Yes | | | |
| Earth fault protection | Yes | | | |
| Grid monitoring | Yes | | | |
| Earth fault current monitoring | Yes | | | |
| DC current monitoring | Yes | | | |
| Islanding protection | Yes | | | |
| CE- compliant | According to EN61000-6-2, EN61000-6-4, AS3100, IEC62109 | | | |
| **General data** | | | | |
| Dimensions (W x H x D) (mm) | 1050*567*314.5 | 1065*567*344.5 | | 1050*567*314.5 |
| Weight | 82kg | 84kg | | 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) | <65 | | | |
| 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 | Standard | | | |