autarco

Hybrid Solar Inverters

XLH Series

Installation and Operation Manual

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.

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1 Introduction

1.1 Read this first

This manual contains important information for use during installation and maintenance of the XLH series Autarco inverters. To reduce the risk of electrical shock, and to ensure the safe installation and operation of Autarco inverters, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.

DANGER! Indicates safety instruction, which if not correctly followed, will result in death, injury, or property damages.

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

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

ATTENTION! Indicates safety instruction, or valuable tip, which if not correctly followed, could result in minor or moderate injuries.

NOTE! Provides valuable tips for optimal installation and operation.

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 is using Autarco XLH series inverters. 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 mean a person with valid license from the local authority in:

- Installing electrical equipment and PV power systems (up to 1500 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 XLH series of Autarco inverters which includes the following models:

- S2.XLH29900
- S2.XLH30000
- S2.XLH40000
- S2.XLH50000

The item code or SKU will include an additional number at the end.
Please keep this user manual available at all times in case of emergency.

2.1 Safety instructions

DANGER! Do not touch any internal components whilst the inverter is in operation or until 5 minutes after disconnection from the utility grid, PV array, and battery.

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.

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

WARNING! The PV inverter can reach up to 75C; please don't touch the heat sink or peripheral surface during or shortly after operation.

WARNING! Do not directly connect the 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.

WARNING! AC Backup port of XLH inverters is not allowed to connect to the grid.

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.

To reduce the risk of fire, over-current protective devices (OCPD) are required for circuits connected to the inverter. The DC OCPD shall be installed per local requirements. All photovoltaic source and output circuit conductors shall have isolators that comply with the NEC Article 690, Part II.

Operator must put on the technicians' gloves during the whole process in case of any electrical hazards.

Please refer to the specification of the battery before configuration.

Do not connect PV array positive (+) or negative (-) to ground, doing so could cause serious damage to the inverter.

Risk of electric shock, do not remove the cover. There are no serviceable parts inside, refer servicing to qualified and accredited service technicians.

WARNING! Only devices compliant with EN 69050 may be connected to the RS485 and USB interfaces.

Note! PV modules used with the inverter must have an IEC 61730 Class A rating.

Note! That the max. operation altitude of the inverter is 4000m, however max. input PV voltage will start to derate when above 2000m, the following table shows the relationship between elevation and voltage.

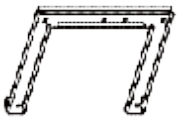
Elevation (m)	Voltage (Vdc)
2000	1000
2700	1000
3000	981
3500	925
4000	875

2.2 Packing list

Please ensure that the following items are included in the packaging with your machine:

1x Inverter

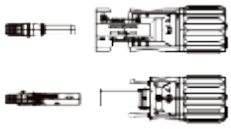
1x Back Plate



4x Fastening screw

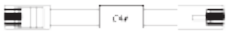
5x Expansion bolt

8x DC Connector



13x OT Terminal

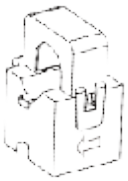
1x 3m Can cable



1x Battery terminal

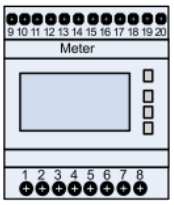
2x Handle

3x CT



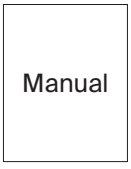
11x RJ45 Connector

1x Eastron Meter



1x GPRS Antenna

1x Installation Manual



2.3 Tools required for installation

Technician Screwdriver	Torqx T20 Scredriver	Wire Strippers 12AWG to 6AWG	Wire strippers 20AWG to 10AWG
			

LUG Crimping Tool	1 x CAN cable	Multimeter (AC/DC amps)	Drill and Impact Driver
			

Torque Screwdriver	MC4 Crimping Tool
	

2.4 Internal DC switch

Your Autarco XLH series inverter is equipped with an internal DC switch. This switch can be found on the left side of the inverter.

2.5 Notice of Use

The inverter has been constructed according to the applicable safety and technical guidelines. Use the inverter in installations that meet the following specifications ONLY:

1. Permanent installation is required.
2. The electrical installation must meet all the applicable regulations and standards.
3. The inverter must be installed according to the instructions stated in this manual.
4. The inverter must be installed according to the correct technical specifications.

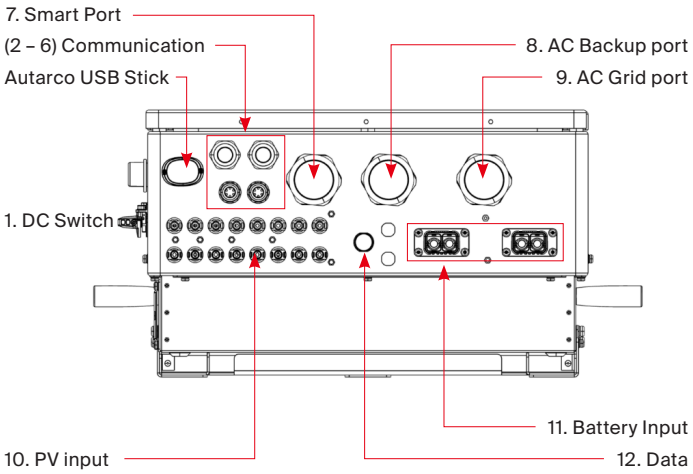
2.6 Notice of Disposal

This product shall not be disposed of with household waste.
They should be segregated and brought to an appropriate collection point to enable recycling and avoid potential impacts on the environment and human health.
Local rules in waste management shall be respected.

2.7 Explanations of symbols on inverter

	**DANGER - HIGH ELECTRIC VOLTAGE** This device is directly connected to the 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 aluminium 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.

2.8 Inverter connection points



#	Description
1.	Disconnect switch for the DC side
2.	Connecting Autarco logger for communication
3.	RS485, CAN communication cables and parallel cables
4.	RS485, CAN communication cables and parallel cables
5.	Communication cables for 14PIN terminal block
6.	Communication cables for 14PIN terminal block
7.	Conduit for AC generator connection
8.	Conduit for AC backup loads connection
9.	Conduit for AC grid connection
10.	Conduit for PV strings
11.	Conduit for Battery connection
12.	Extends the range of the inverter GPRS signal (Not applicable to the USA, Australia, Europe)

3 Product information

3.1 Overview

Autarco XLH series hybrid inverters are state of the art, high efficiency, robust and reliable inverters. They are easy to install and carry a standard 5-year product warranty, extendable up to 15 years. 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.

For full specifications: please see chapter 10, “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 right side of the inverter housing. Do not remove the label or the serial number as this will void the product warranty.

3.3 Product overview

3.3.1 Product intelligent functions

- Support peak shaving control in both grid and generator condition.
- Generator connectivity with multiple input methods and automatic generator On/Off control.
- UPS level switching time (<10ms) supporting critical loads all the time.
- 99% High PV charge efficiency to prevent excess PV loss.
- 6 customizable charge/discharge time settings to gain more revenue from customer side.
- Multiple working modes to meet different use case scenarios.
- Controllable and Upgradeable via the Autarco InstallerApp to avoid site visits.

3.3.2 Single system

The single system consists of PV module, battery, hybrid inverter, CT or smart meter.
The PV Module converts solar energy into electric energy, which is then converted by the inverter to

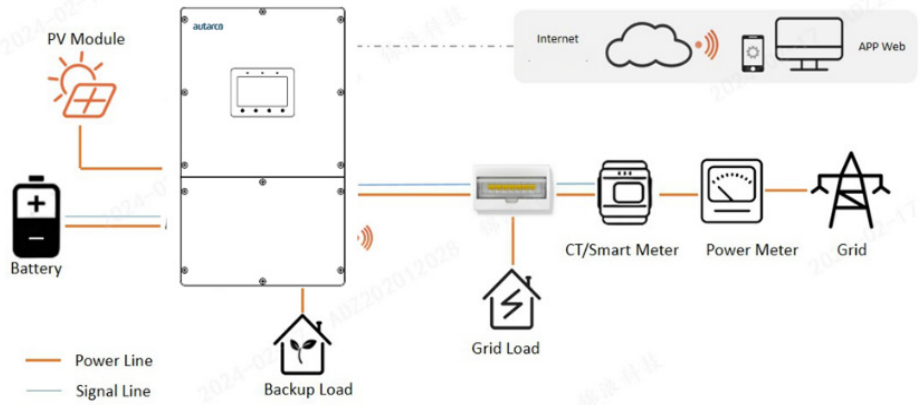
- charge the battery
- power loads
- feed into the grid.

User can connect heat pump, existing PV plant, generator and ATS.
The system has four working modes: self-use mode, feed in priority mode, off-grid mode and peak-shaving mode.

Note

- In the event of a power outage on the grid, the system will seamlessly transition into off-grid mode, providing power exclusively to essential backup loads.
- When the grid recovers, the system switches back to the on-grid operation.
- Supports heat pump start-stop and power control, only when it has a SG Ready label.

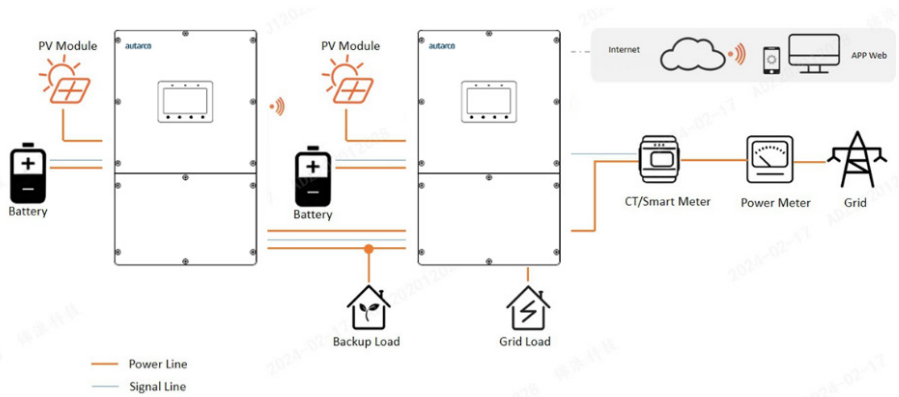
3.1 Connection schematic overview



3.3.3 Parallel system

User can add inverters and batteries to increase capacity. The system supports up to 6 inverters in parallel. Each battery connects to the inverter with an independent CAN line and is managed by the inverter connected to it.

3.2 Connection schematic overview of parallel system



Note

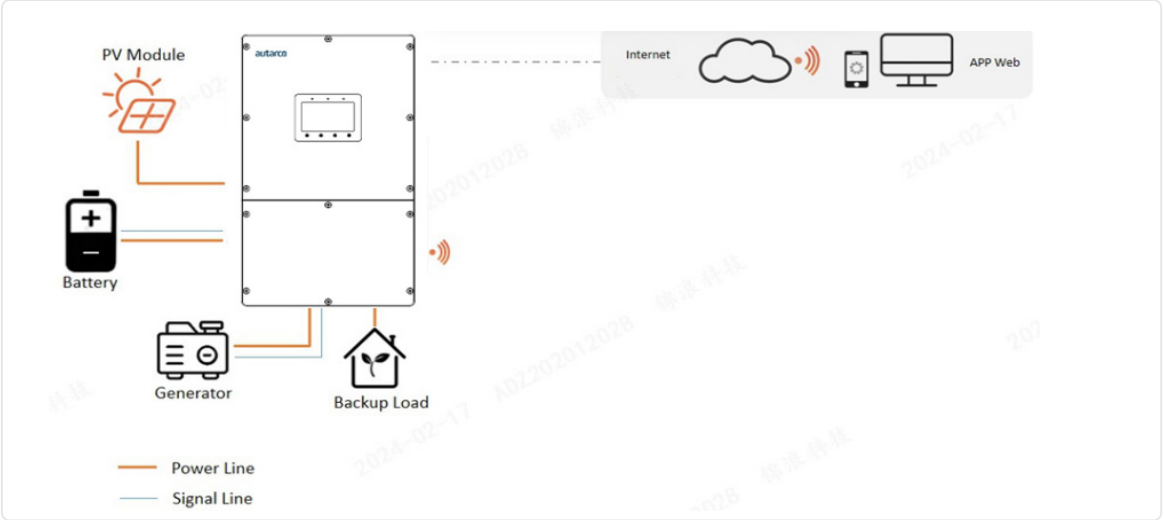
- CTs or Smart meter, Control signal of Heat Pump, Control signal of Generator or ATS should be connected to the master inverter.
- CTs delivered with the device can only support a system of up to 50 kW. If a higher power parallel system is required, you need to purchase additional CTs. Depending on secondary current of the replacement CTs, the recommended setup is: 5A Meter+300A/5A CT, MODEL: SDM630MCT V2+ESCT-T50.
- Parallel connection of different models is not supported.(For example 12K and 15K can't be connected in parallel)
- Parallel connection of battery input port is not supported.
- The AC backup port can be connected in parallel, and the single-phase output power is 1/2 of the total rated power.
- The length and specification of the cable connecting the backup load to each inverter needs to be the same to ensure that the current is evenly distributed and prevents one of the inverters from being damaged by excessive current. In parallel-system scenarios, it is advisable to ensure uniform specifications and capacities for batteries on both the master and slave inverters.
- In cases where there is a disparity, it is recommended to connect the battery with a larger capacity to the master inverter. Connecting a higher-capacity battery to a slave inverter may result in incomplete discharge during high- load scenarios.

3.3.4 System with a generator

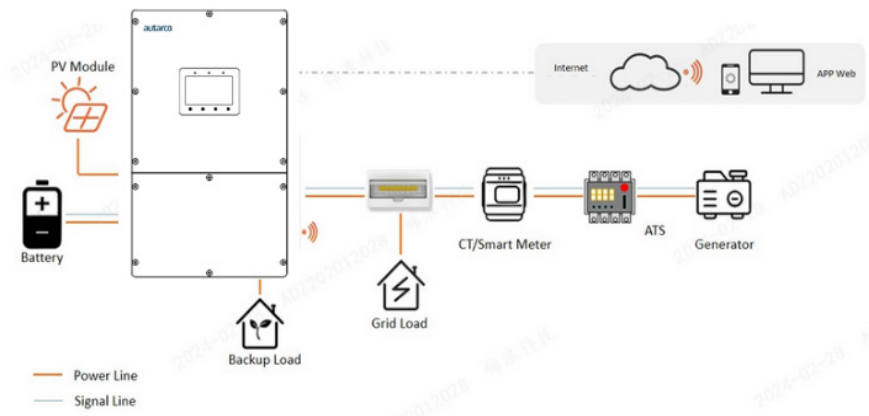
The access of Diesel Generator is in the off-grid scenario.
When the battery power is below a set value and a power outage occurs in the grid, the system will start the generator to power the load and charge the battery.
Generator 's work logic is as follows:

1. when the grid is not available and the battery is discharged to GEN_Start_SOC, the generator starts to power the load and charges the battery to GEN_Exit_SOC, then the generator stops.
2. If the load power is higher than the generator rated power, the battery will be discharged to power the load until Overdischarge_SOC, then generator may shutdown due to overload and the load will be powered off.
3. If the generator fail to start in point 1, the battery will be discharged until it reaches Overdischarge_SOC
4. If the system goes into the end of point 3, the battery will not discharge before it is charged to Overdischarge_SOC+ Overdischarge_Hysteresis_SOC (set by user).

3.3 Connection schematic overview of system with a generator connected to the generator port



3.4 Connection schematic overview of system with a generator connected to ATS



Caution

When the generator is connected, it is essential to correctly select the generator position on the APP, otherwise it may cause system failure or damage to the generator.

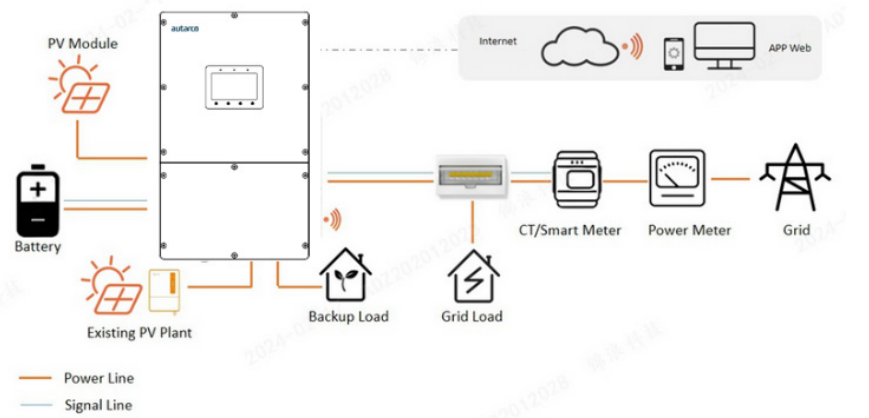
Note

- In single system, a diesel generator can be connected via both AC-Gen port and ATS. In case of AC-Gen port connection, it will only supply power to the backup load; if it is necessary to supply power to the grid side, connection through an ATS is recommended.
- In parallel-system scenarios, connecting a diesel generator via an ATS is recommended.
- When the system is connected to the generator, it cannot be connected to an on-grid inverter, because of a risk of damaging the generator.
- If the generator is connected through an ATS on the grid side(Figure 3.4), then smart meter is required.

3.3.5 System with an 3rd party on-grid inverter (AC coupled)

Generally, the access of on-grid inverter is for the retrofit of a existing PV plant. The XLH inverter supports access of both Autarco on-grid inverter and third-party on-grid inverters.

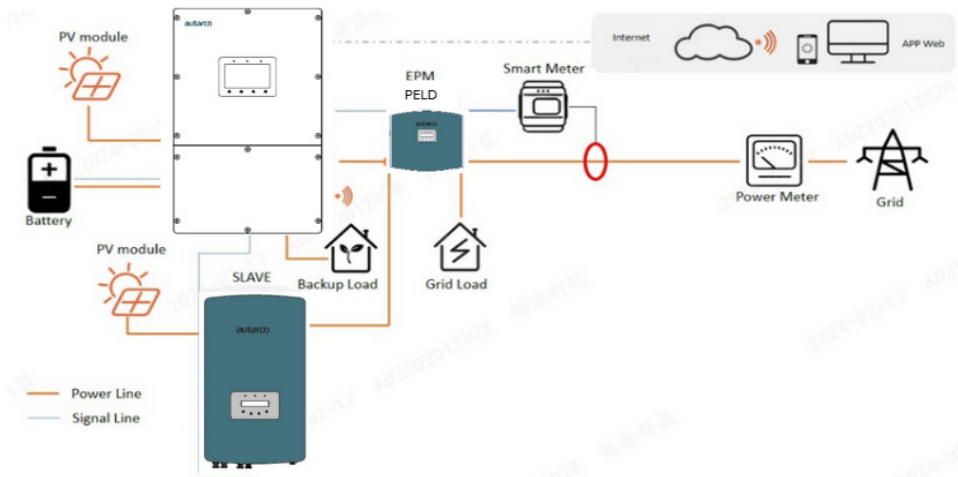
3.5 Connection schematics of a system with another on-grid inverter



- Third-party on-grid inverter can be connected via AC-Gen port and AC-Backup port.
- With third-party on-grid inverter connected to the system, it is recommended that: The on-grid inverter has lower AC power compared to the rated AC power of the XLH inverter.
- In an on-grid scenario, when the third-party on-grid inverter is connected, the system cannot control the output power of the third-party on-grid inverter, so Feed-in limitation cannot be realized.
- In off-grid scenario, the third-party on-grid inverter must be configured with the correct grid code and equipped with over-frequency load shedding and under-frequency load rising functionalities. These features allow the system to dynamically adjust the frequency, effectively controlling the output power of the grid-tied inverter.

3.3.6 System with an Autarco on-grid inverter (paralleled) // feature coming soon

3.6 Connection schematics of a system with another on-grid inverter



Note
An Autarco on-grid inverter can be connected with the hybrid inverter in parallel . To achieve feed-in limitation, it is necessary to add PELD.

3.5 Password Reset

- If the owner or installer wishes to reset the inverter password, please long press the Inverter indicator for 5s.
- If the reset command is successfully triggered, the status indicator will turn blue and blink for 3s at the frequency of 0.5s, then restore to the original state of the indicator.
- If the command fails to be triggered, the status indicator will be yellow and blink for 3s at the frequency of 0.5s,then restore the original state of the indicator.
- If the command is successfully triggered, the Bluetooth password can be reset in the APP.

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.

ATTENTION! The installation site must have good ventilation conditions. Direct exposure to intense sunshine is not recommended. Energy production may be lower than expected.

NOTE! Nothing should be placed on or against the inverter.

4.2 Appropriate Mounting Location

ATTENTION! The heat sink can reach a temperature of 75°C under operation.

ATTENTION! The installation wall must be made of non-flammable material

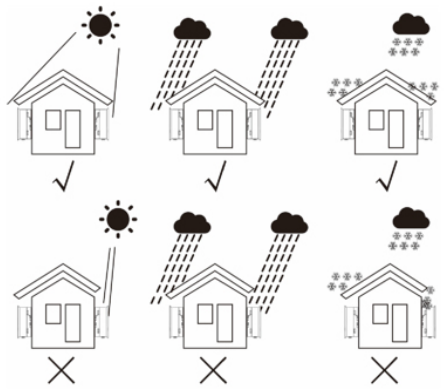
- Make sure the mounting wall is strong enough to hold the weight of the inverter, at least 4 times the inverter weight.
- The ambient temperature of the installation site should be between -20 °C and +60 °C.
- Install vertically with a maximum incline of + 15 degrees, exceeding this may derate power output.
- Make sure of ample 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°C. The fan noise should not exceed 60dB.

4.3 Mounting instructions

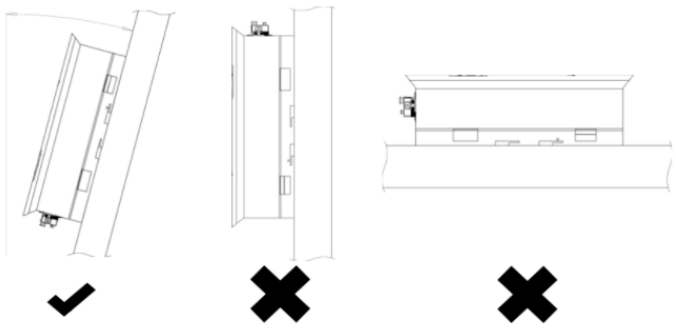
ATTENTION! Two people are required to remove the inverter from the carton and install the inverter.

- The inverter is suitable for outdoor and indoor installation.
- Adequate ventilation must be provided.
- Nothing shall be stored on or placed against the inverter
- If multiple inverters are installed on site, a minimum clearance of 500mm should be kept.
- Installation of the inverter in a location exposed to direct sunlight should to be avoided between each inverter and all other mounted equipment.
- The bottom of the inverter should be at least 1000mm above of the ground or floor.
- Direct exposure to sunlight could cause:
  - Power output limitation (with a resulting decreased energy production by the system).
  - Premature wear of the electrical/electromechanical components.
  - Premature wear of the mechanical components (gaskets) and user interface.

4.1 Recommended Installation locations



4.2 Vertical installation is recommended, with a maximum inclination of 15° backwards



4.4 Safety clearance

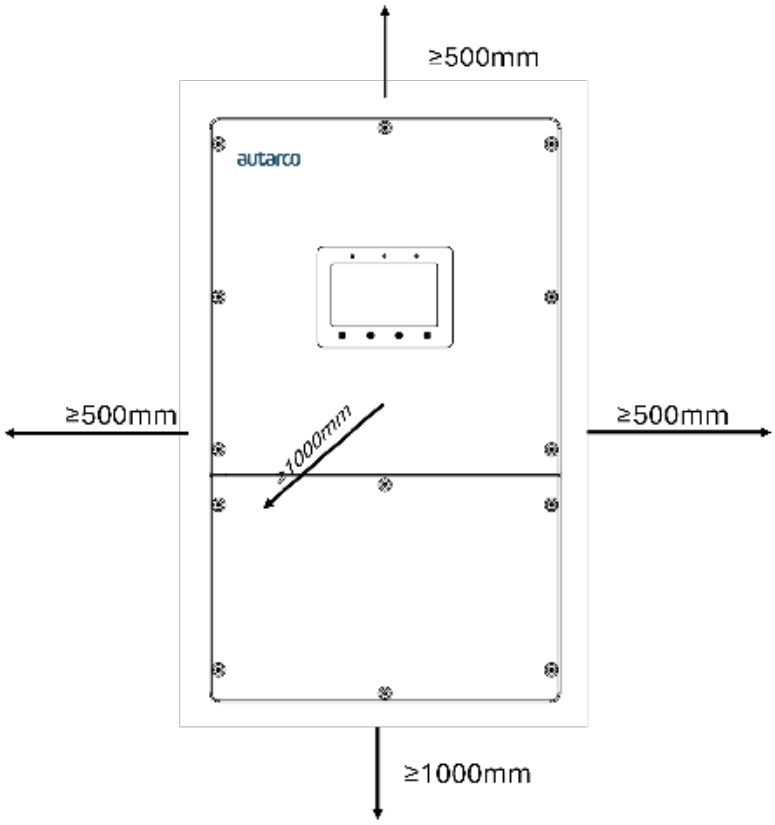
CAUTION! Make sure heat sinks are out of reach of children.

WARNING! When installing multiple inverters, make sure there is sufficient clearance between them. High temperatures may affect performance. Make sure inverter controls are reachable in case of emergency.

ATTENTION! Visibility of the LED indicator lights should be considered.

Observe the following minimum clearances to walls and other inverters. Front clearance shall be 1000 mm.

4.3 Inverter mounting clearance

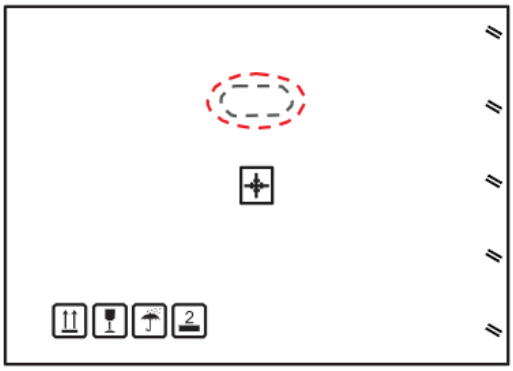


4.5 Product Handling

Please review the list of instructions below for handling the inverter:

- The red circles below denote cutouts on the product package - one per side.
- Push in the cutouts to form handles for moving the inverter *(see Figure 4.4).*
- Two people are required to remove the inverter from the shipping box. Use the handles integrated into the heat sink to remove the inverter from the carton.
- When setting the inverter down, do it slowly and gently. This ensures that the internal components and the outer chassis do not take any damage.
- There are two black mounting handrails on the machine, they are removable and convenient for installation *(see Figure 4.5).*
- 5. The position of handrails installation as the red mark in *Figure 4.5.*

4.4

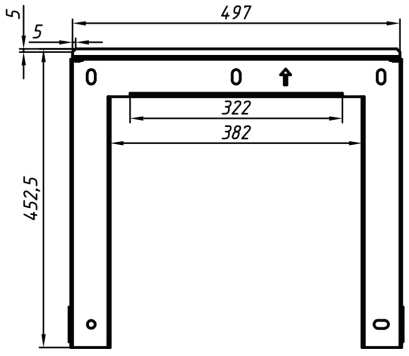


4.5

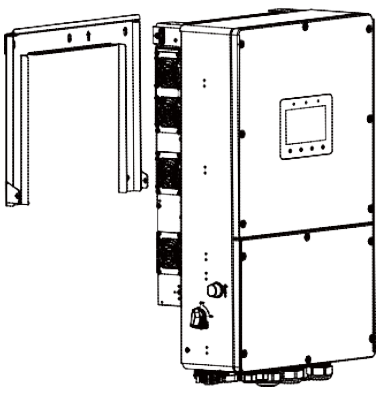
4.6 Mounting procedure

1. Mount the wall bracket onto the mounting wall with appropriate screws plugs.
2. Lift up the inverter and align the back bracket on the inverter with the convex section of the mounting bracket.
3. Hang the inverter on the mounting bracket and make sure the inverter is secure

4.6 Inverter wall mounting bracket



4.7 Wall Mount Bracket



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.

Elevation (m)	Voltage (Vdc)	Connection Points
PV Cables	DC connection from solar modules to the inverter (strings)	From the PV array to the DC+ and DC- terminals in the inverter
Battery Cables	Battery DC connection to the inverter	From the battery (+) and (-) terminals to the inverter BAT+ and BAT- terminals
AC Grid Cables	Inverter AC connection to the main service panel	From the OCPD in the main service panel to the AC-GRID L1, L2, L3 terminals
Backup Cables	Inverter AC connection to the backup subpanel	From the backup loads subpanel OCPD to the inverter AC-BACKUP L1, L2, L3 terminals
Ground Cables	Grounding conductors for the system	From the main service panel ground bar to the ground bar inside the inverter wire box
Meter cable	Communication between inverter & Meter	From meter to terminal HM. For more details, refer to the chapter Installing the energy meter
Battery communication cable	Communication between the inverter & the battery	From battery to terminal BMS. For more details, refer to the chapter Installing the battery

5 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 6.3.*

Step 1 Locate the external ground connection is provided at the both sides of inverter.

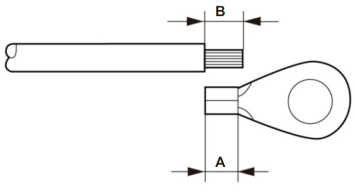
Step 2 Prepare the grounding cable: recommended to use the 16-35mm^2 outdoor copper-core cable.

Step 3 Prepare OT terminals, M5. Recommended torque 3.5 Nm

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 a building, otherwise Autarco will not be responsible for any damage caused by lightning.

Step 4 Strip the grounding cable insulation to the suitable length as *shown in Figure 5.1.*

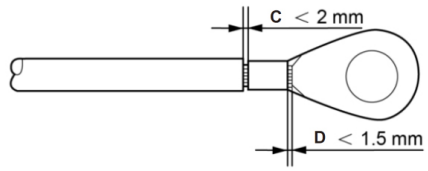
5.1 Suitable length



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

Step 5 Insert the stripped wire into the OT terminal crimping area and use a hydraulic clamp-tool to crimp the terminal to the wire *(as shown in Figure 5.2).*

5.2 Strip wire

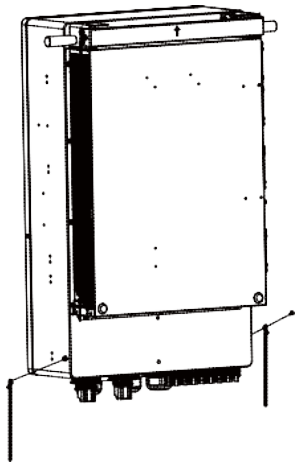


IMPORTANT! After crimping the terminal to the wire, inspect the connection to ensure the terminal is solidly crimped to the wire.

Step 6 Remove the screw from the heat sink ground point.

Step 7 Use the screw of the ground point to attach the grounding cable *(as shown as in Figure 5.3)*. Tighten the screw securely. Torque is 3.5 Nm.

5.3 Connect eternal grounding conductor



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

5.2 DC connections

Always use the MC4 connectors from the inverter box to connect strings to the inverter.

DANGER! Never connect or disconnect the connectors under load.

Please ensure the following before connecting the inverter:

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

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 leave MC4 connectors directly on the roof surface, but always tie them up.

CAUTION! If DC inputs are accidently reversed or inverter is faulty or not working properly, it is NOT allowed to turn off the DC switch. Otherwise, it may cause DC arc and damage the inverter or even lead to a fire disaster. The correct actions are:

- Use a clip-on ammeter to measure the DC string current.
- If it is above 0.5A, please wait for the solar irradiance reduces until the current decreases to below 0.5A.
- Only after the current is below 0.5A, you are allowed to turn off the DC switches and disconnect the PV strings.
- To eliminate the possibility of failure, please disconnect the PV strings after turning off the DC switch to avoid secondary failures due to continuous PV energy on the next day.

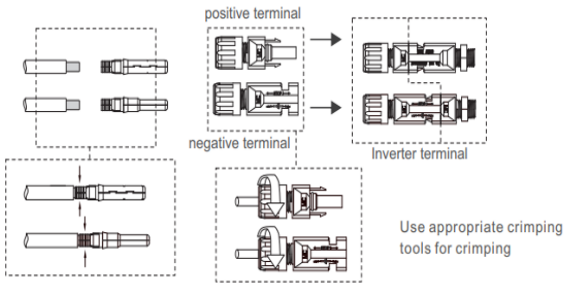
Please note that any damages due to wrong installation are not covered in the device warranty.

ATTENTION! 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.

- Make sure the voltage of the PV string will not exceed the max DC input voltage (1000 Vdc). Violating this condition will void the warranty.
- Make sure the polarity of the PV connectors is correct.
- Make sure the DC-switch, Battery, AC-BACKUP, and AC-Grid are all in their off-states.
- Make sure the PV resistance to ground is higher than 20K ohms.

Please follow the picture below to assemble the MC4 connectors. To connect the PV generator to the inverters we use 4mm^2 or 6mm^2 PV cable and MC4 connectors. For details on how to assemble MC4 connector please refer to our MC4 connector manual. The wire should be stripped out by 7mm before assembling the MC4 connectors

5.4 DC Solar Cable connection



5.3 Battery Connection

DANGER! Before installing the battery cables, be sure that the battery is turned off. Use a multimeter to verify that the battery voltage is 0Vdc before proceeding. Consult the battery product manual for instructions on how to turn it off.

NOTE! The battery fuse in the inverter wire box is replaceable. But can be only replaced by authorized Autarco Dealer. BAT fuse1 and fuse2 specification are 1000V 100A. The suggested specification of external BAT circuit breaker for each battery is 80A.

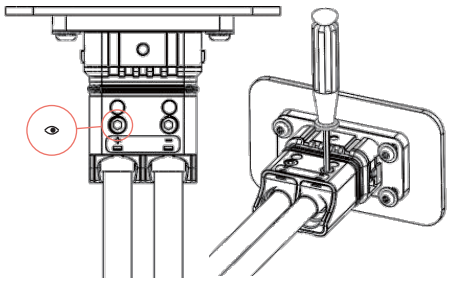
A quick connector is used for the battery connection. The battery cable cross section range must be between 10 mm2 - 25 mm2. Use a flat blade 3 mm screwdriver for this installation.

Step 1 Insert the cable into the rubber core according + and – indications. Use the observe cable placement from the top via special hole (see Figure 5.5). Once the cable is in place, attach the cable torque of the crimping screwdriver is 4 ± 0.1Nm *(figure 5.5)*

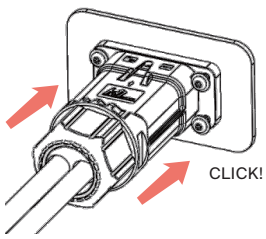
Step 2 Insert the rubber core until you hear the “click” sound *(figure 5.6)*

Step 3 Complete the installation. *(figure 5.7)*

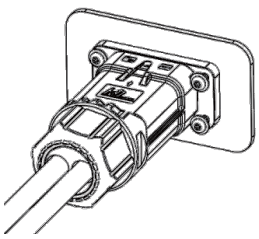
5.5



5.6

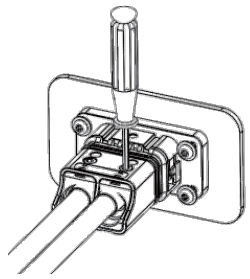


5.7



Disassembling Use a screwdriver to align the unlocking position, press and hold the main body and pull back to complete the removal.

5.8



5.4 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.

Before installing the AC cables, be sure that the OCPDs (breakers) are turned off.
Use a multimeter to verify that the AC voltages are 0Vac before proceeding.

5.4.1 AC Grid, Backup & Generator port connection

There are 3 AC out terminals: AC Grid Port is used to connect to the grid, AC Backup Port is to connect to the critical load circuit, and the Generator port is used for connecting a backup AC power supply. The installations steps for all 3 connection are identical.

5.9 AC output terminals

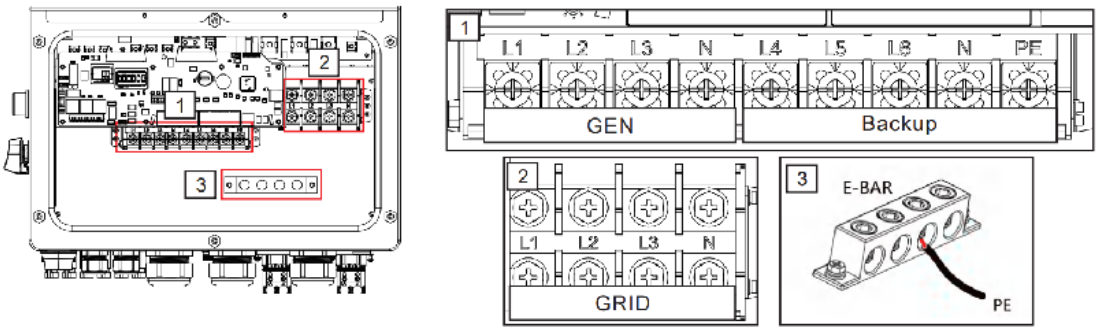


Table 5.1 AC Grid & Backup port connection characteristics

Port	AC Grid	AC Backup/ Gen	Earth Bar
Wire Size	0AWG/1AWG	3AWG/4AWG	2AWG
Torque	28.2 Nm	28.2 Nm	20.3Nm
Recommended cross section	50 mm2	20-25 mm2	33 mm2

Inside the inverter wire box ''L1', ''L2'', ''L3'', ''N'' and ''PE'' are printed next to each port. The 3 live wires are connected to L1, L2 and L3 terminals respectively. The ground wire connects to PE. The neutral wire connects to the N.

1. Bring the AC cables for the backup loads panel (backup) and the main service panel (grid) into the inverter wire box. The backup loads panel should not be electrically connected to the main service panel.
2. Strip 13mm from the ends of each cable. Crimp the R-type connectors onto the ends.
3. Remove the terminal bolts, insert them into the connectors, then use a torque wrench to tighten the bolts down.
4. Please refer to the terminal labels to connect the AC wires to the correct terminals.

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.

WARNING! It is important that the AC wires are connected to the right terminals as indicated by the "L1", ''L2'', ''L3'', "N" and "Ground" symbols on each AC connector. Damage to the inverter by wrong connections are not covered under warranty ! In some countries a second protective conductor is required. In each case, observe the applicable regulations for the site.

WARNING! 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.

DANGER! The maximum temperature for connecting AC terminals is 85 °C.

5.5 Smart Meter installation

Hybrid Solar Inverters

Autarco's XLH series hybrid inverter must be connected with the supplied Eastron meters to fulfill the control logic of the self-consumption mode, export power control, monitoring, etc.
An Eastron 3ph meter (With CT): SDM630MCT is provided as default in the inverter box.

CAUTION! Make sure the AC cable is totally isolated from AC power before connecting the smart meter or CT.

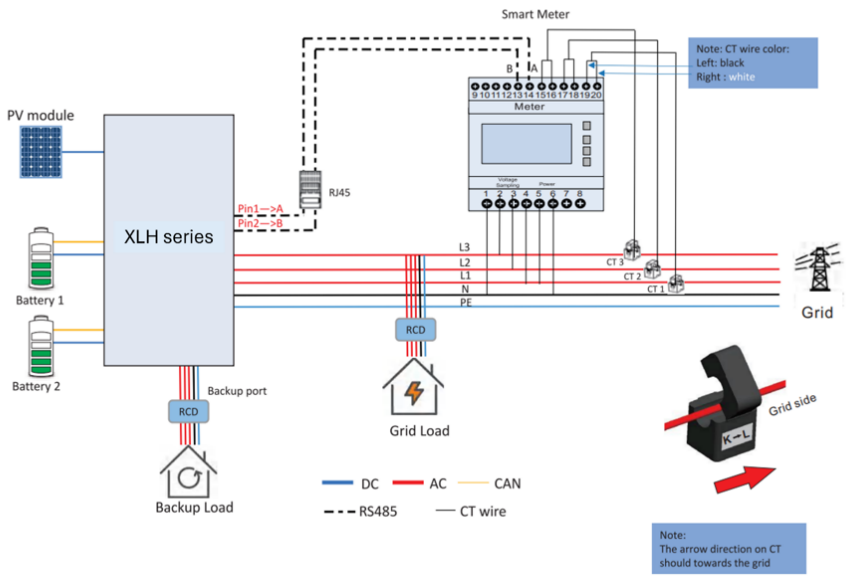
The CT provided in the product box is compulsory for hybrid system installation. It can be used to detect the grid current direction and provide the system operating condition to hybrid inverter.

CT Model: 120A/40mA_0.5%, ESCT-TA16 120A/40mA

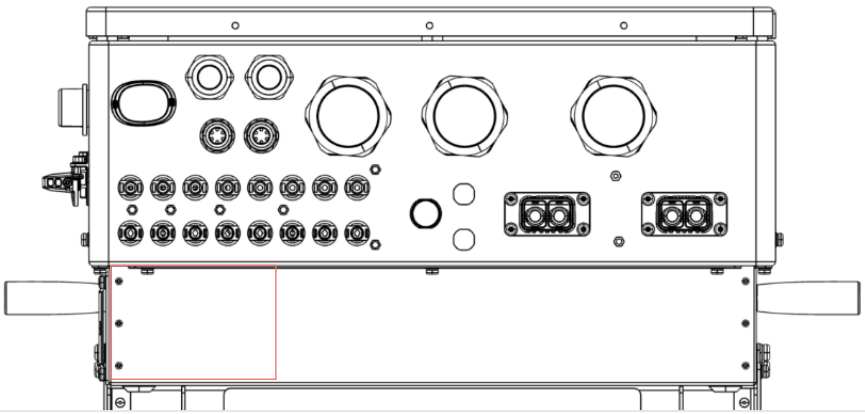
CT Cable: Size – 2.3mm2, Length - 1m

Please install the meter as specified in the diagram below

5.10 Connection of the smart meter



5.11 Communication ports



The Autarco XLH series inverter uses RS485 cable to communicate with the Meter and the CAN-bus to communicate with the battery's Battery Management System (BMS).

NOTE! The CAN cable enables the communication between the inverter and the LFP battery, please check for latest model compatibility before installation.

Table 5.2 Inverter communication ports

Port	Port	Description
COM	USB	Used for Autarco stick connection
COM1	4 hole watertight cable gland	Used for RJ45 connection inside wiring box
COM2	4 hole watertight cable gland	Used for RJ45 connection inside wiring box
COM3	6 hole watertight cable gland	Used for 14 pin terminal block connection inside wiring box
COM4	6 hole watertight cable gland	Used for 14 pin terminal block connection inside wiring box

Wiring steps for COM1-COM4:

Step 1 Loose the cable gland and remove the watertight caps inside the cable gland based on the number of the cables and keep the unused holes with watertight cap.
Step 2. Lead the cable into the holes in the cable gland. (COM1-COM2 Hole Diameter: 6mm, COM3-COM4 Hole Diameter: 2mm)
Step 3. Connect the cable to the corresponding terminals inside the wiring box.
Step 4. Reassemble the cable gland and ensure there is no bending or stretching of the cables inside the wiring box.

NOTE! The 4- hole fastening rings inside the cable gland are with openings on the side. Please separate the gap with hand and squeeze the cables into the holes from the side openings.

5.6.3 Communication Port Definition

5.12 Pre-made BMS cable in Inverter package (cable Length: 3 meters)

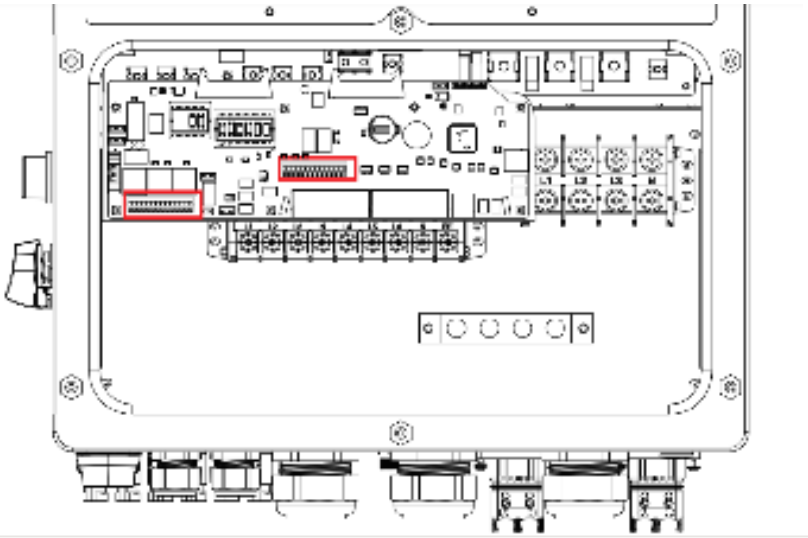


Table 5.3 Inverter communication terminal description

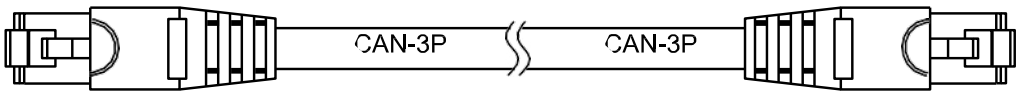
Port	Type	Function
PAR-A	RJ45	(Optional) Parallel operation communication port.
PAR-B	RJ45	(Optional) Parallel operation communication port.
BMS	RJ45	Used for CAN communication between inverter and Lithium battery BMS.
Meter	RJ45	(Optional)Used for RS485 communication between inverter and the smart meter.
EMS	RJ45	Used for CAN communication between inverter and 3rd party external device or controller
DRM	RJ45	(Optional) To realize demand response or logic interface function, this function may be required in UK and Australia.
DIP Switch	-	When a single inverter is running, DIP switch 1 and 2 shall be both at the bottom position. When multiple inverters are paralleled, DIP switch: The first and the last inverter has 2 DIP switches enabled (Both Pin1 & Pin2)
HM	Terminal Block	Pin 1 & Pin 6 (From Left to Right) Used for CT wire connection.
A	Terminal Block	Pin 7 & Pin 8 (From Left to Right) Used for Generator start- stop signal.
G-S	Terminal Block	Pin 9 & Pin 10 (From Left to Right) Reserved.
ATS380V	Terminal Block	Pin13 (L) Pin14(N) (From Left to Right)380V ATS signal.

5.6.4 BMS Port connection

Take out the pre-made CAN cable from the package and connect one end to battery CAN port and then connect another end to the inverter BMS port. Please lead the CAN cable through the COM1 or COM2 port of the inverter and connect to the BMS terminal with RJ45 connector.

Cable Length: 3 meters.

5.13 Pre-made BMS cable in Inverter package (cable Length: 3 meters)



NOTE! Pin definition of the BMS Port is as follows:

EIA/TIA 568B.
CAN-H on Pin 4: Blue
CAN-L on Pin 5: Blue/White

Procedure for connecting the CAN-cable:

1. Take out the CAN cable (terminal marks ‘CAN’ on one end and ‘to Meter’ on the other end).
2. Unscrew the swivel nut from CAN port.
3. Insert the RJ45 terminal with CAN label into the CAN port, then fasten the swivel nut.
4. Connect the other end to the battery.

NOTE! For CAN cable pin 4 (blue) and pin 5 (white-blue) are used for the communication. Check with the battery supplier which pins they use. This may be different per vendor.

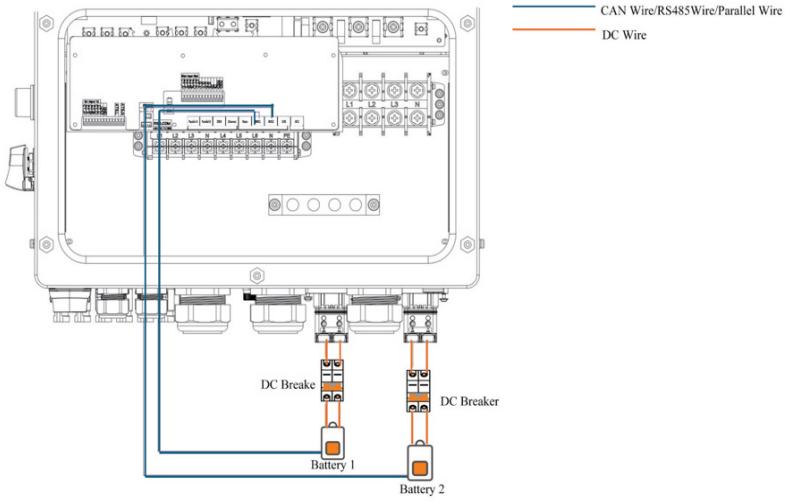
5.6.4.1 Lithium battery wiring

Inverter supports the 3 wirings methods to connect to lithium battery. If only one battery is connected, it **MUST be connected to DC 1 port on inverter**, and the communication cable **MUST be connected to BMS 1 port on the inside terminal block.**

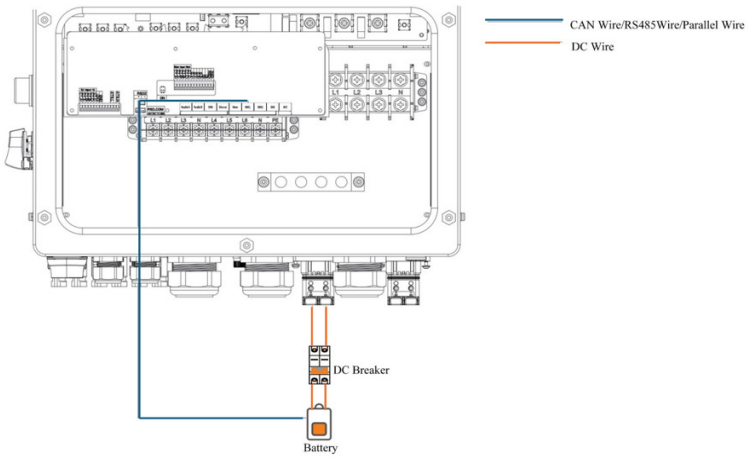
NOTE! In order to fully charge the battery, additional requirements apply:
For this series of product, the compatible battery voltage is 150-800V, but if full battery charging is expected, the requirements from the table below should be met. For example, when the battery voltage is between 400V-500V, the charging current can reach to the maximum value of 70A, and when battery voltage between 500V-800V, the single channel charging capacity can reach up to 35kW.

No.	DC voltage (V)	DC current (A)	Battery Power (kW)
1	150	30	4.5
2	200	38	7.6
3	300	54	16.2
4	400	70	28
5	500	70	35
6	550	64	35
7	600	58	35
8	700	50	35
9	800	44	35

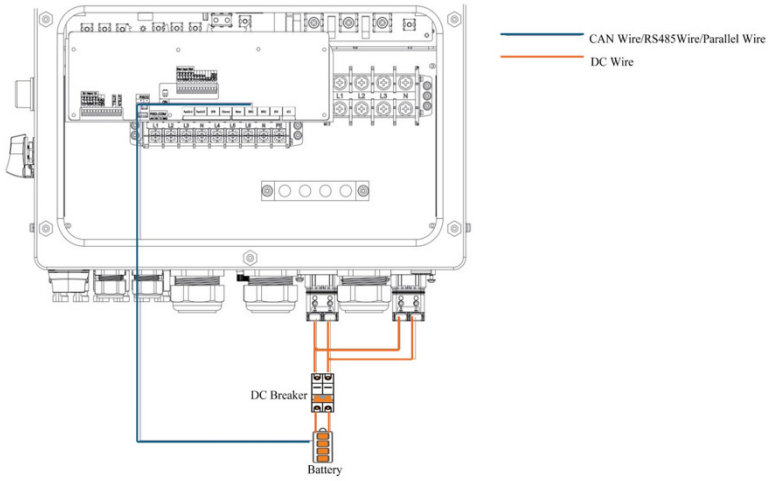
5.14 ...



5.15 ...



5.16 ...

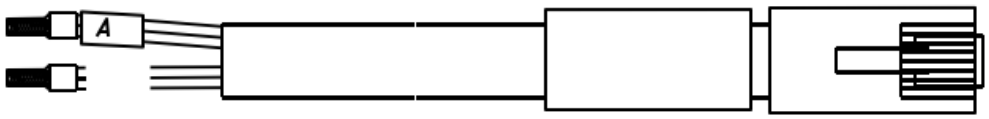


5.6.5 Meter Port connection

Take out the pre-made Meter cable from the package and connect RJ45 end to inverter Meter port and then connect another end with loose RS485 A & B pins to the meter RS485 terminal. Please lead the Meter RS485 cable through the COM1 or COM2 port of the inverter and connect to the Meter terminal with RJ45 connector.

Cable Length: 5 meters.

5.17 Pre-made meter cable in Inverter package (cable Length: 5 meters)



ATTENTION!

- Make sure the AC cable is totally isolated from AC power before connecting the Smart meter and CT.
- CT orientation must be correct, otherwise the system will not work correctly.

NOTE!

Pin definition of the Meter Port is as follows:

EIA/TIA 568B.
RS485A on Pin 1: Orange/white
RS485B on Pin 2: Orange

Procedure for connecting the RS485 cable:

1. Take out the RS485 cable (terminal marks 'RS485' on one end and 'to Battery' on the other end).
2. Unscrew the swivel nut from RS485 port.
3. Insert the Two-pin terminal with RS485 label into the RS485 port, then fasten the swivel nut.
4. Connect the other end to the Meter.

5.6.6 DRM Port Connection (Optional)

Autarco inverters support remote shutdown function to remotely control the inverter to power on and off through logic signals.

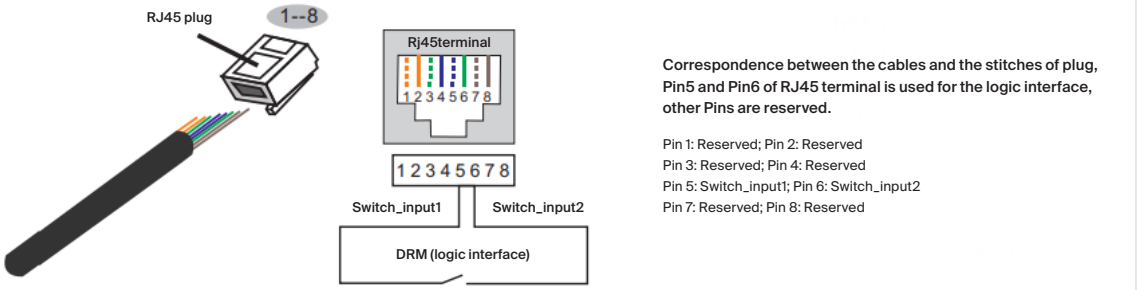
The logic interface is required by some local regulations that can be operated by a simple switch or contactor When the switch is closed the inverter can be operated normally. When the switch is opened, the inverter will reduce its output power to zero within 5 seconds.

Pin 5 and Pin 6 of an RJ45 terminal are used for the logic interface connection.

Table 5.4 DRM Port

Signal	Function
Short Pin5 and Pin6	Inverter Generates
Open Pin5 and Pin6	Inverter Shutdown in 5s

5.18 Strip the insulation later and connect to RJ45 plug



NOTE! To use this function, please contact Autarco if this function is supported in your country.

5.6.7 RS485 Port Connection (Optional)

If a 3rd party external device or controller needs to communicate with the inverter, the RS485 port can be used. Modbus RTU protocol is supported by Autarco inverters. To acquire latest protocol document, please contact Autarco local service or Autarco sales team.

NOTE! Pin definition of the RS485 Port is as follows:

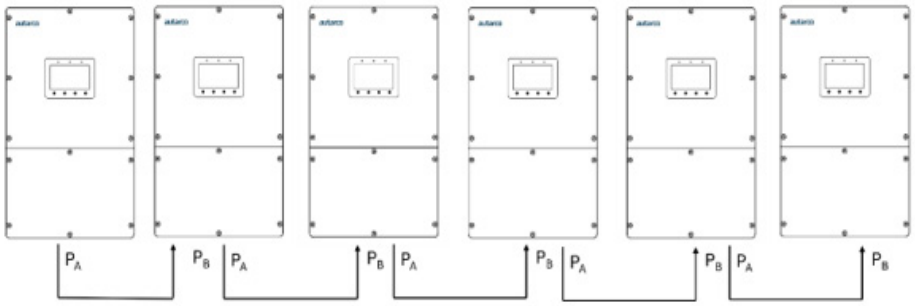
EIA/TIA 568B.
RS485A on Pin 4: Blue
RS485-B on Pin 5: Blue/White

5.6.8 Parallel Terminal Connection (Optional)

Up to 6 units of the inverter can be connected in parallel.
Please connect the paralleled inverters in daisy chain by using P-A and P-B terminals.
Standard CAT5 with shielding layers internet cable can be used.

WARNING! Follow inverter configuration, *Section 5.7* before making any inverter parallel connections!

5.19 Parallel Terminal Connection

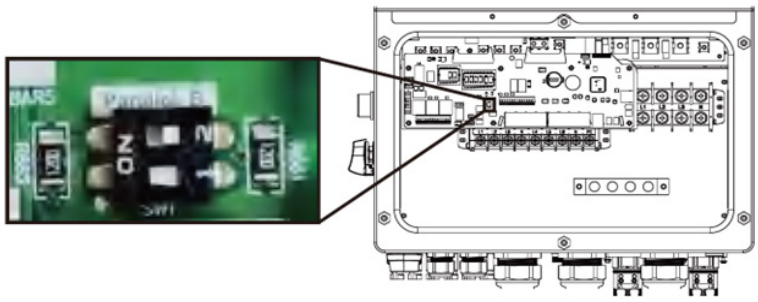


Procedure for connecting inverters in parallel:

1. Connect parallel inverters in daisy chain, using CAT5 shielded cables, on PA & PB terminals, as indicated in *figure 5.23*.

2. Only the first and last inverter (Inverter 1 & Inverter 2) must have both their DIP switches enabled (both PIN 1 & PIN 2)

5.20 DIP Switches must be turned ON, only for the first and last inverter for parallel functionality



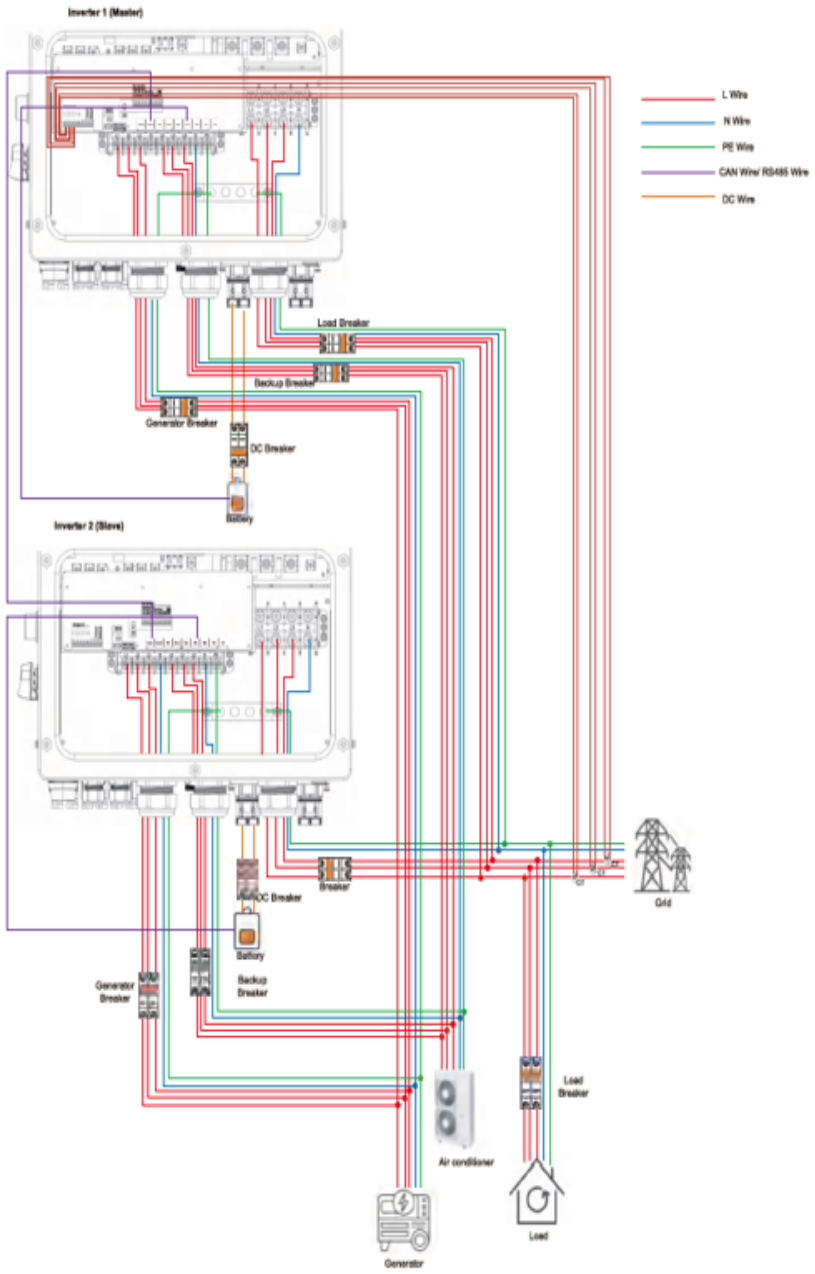
NOTE! The parallel communication cable should be standard STP (Shielded Twisted Pair) CAT5 network cable. Currently cable length of 3~5m is supported between two inverters. If use case with different cable length is demanded, please contact the Autarco Customer Support.

NOTE! If there is a need of the parallel communication with a different parallel cable instead of the one found in the box, the shielding cable should follow the wire sequence as follows:
Orange white, orange, green white, green, blue,
white blue, white brown, brown.

NOTE! Single inverter noise is less than 65 dB(A), when using multiple inverters be aware that this level can be increased.

5.7 Parallel System Wiring

5.21 Parallel system wiring



Refer to Figure 5.25 for an overview on parallel system wiring.

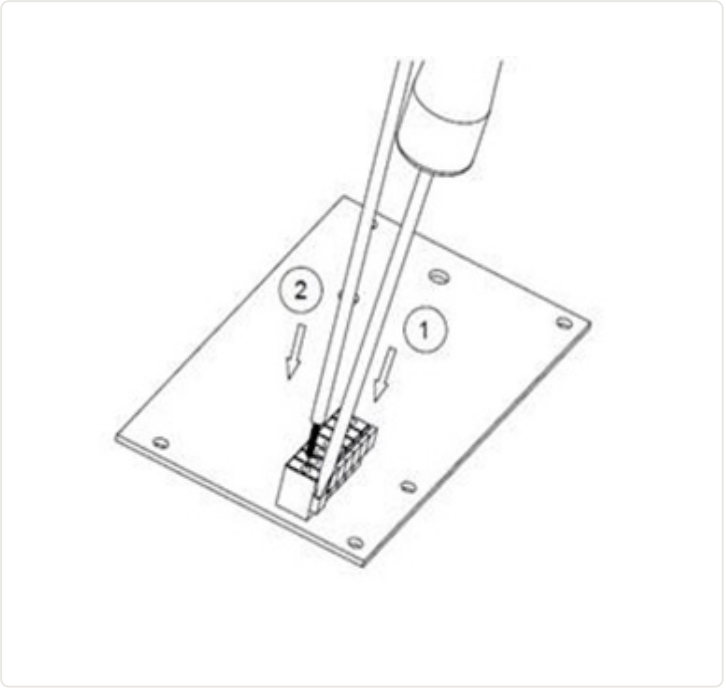
5.8 14-pin communication terminal block

The XLH series is equipped with a 14-pin communication port which can be used for communication with a heat pump, generator or ATS.

Terminal Block Connection Steps:

Step 1 Lead the wires through the hole in COM3 port (Hole Diameter: 2 mm)
Step 2 Strip the wires to achieve 9mm length
Step 3 Use slot type screwdriver to press the block on the top
Step 4 Insert the exposed copper part of the cable into the terminal.
Step 5 Remove the screwdriver and the terminal will clamp down on the exposed copper part.
Step 6 Give the cable a gentle tug to ensure that it is firmly secured.

5.22 Placing a cable in the 14-pin communication block

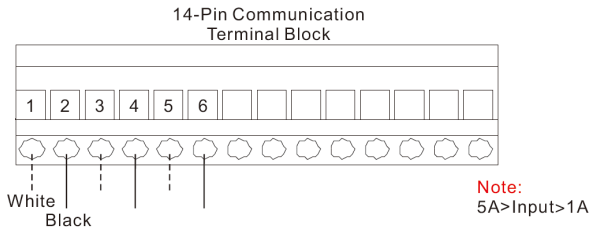


5.8.1 CT Terminal Connection

CT connection is an alternative way to measure consumption, without the smart meter. Before connecting the inverter this way, please check if this is allowed in the country of the installation. Autarco recommends smart meter connection as the CT only connection is not supported via Helios and the InstallerApp.

The CT provided in the inverter package has BLACK (S2) and WHITE (S1) wires. The BLACK wire needs to connect to the Pin 2, Pin 4, Pin6 of the terminal block and the WHITE wire needs to connect to the Pin 1, Pin3, Pin5 of the terminal block as in the following diagram.

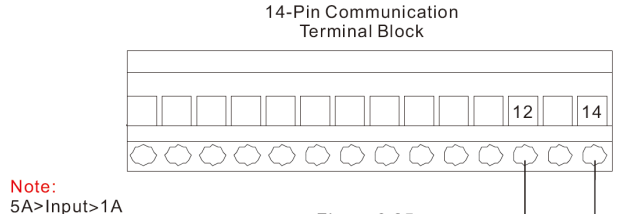
5.23 Direct CT connection diagram



5.8.2 ATS380V Terminal Connection

The ATS380V terminal will output 220V AC voltage when inverter is connected to the grid and when inverter is connected to the generator, it will output 0V.

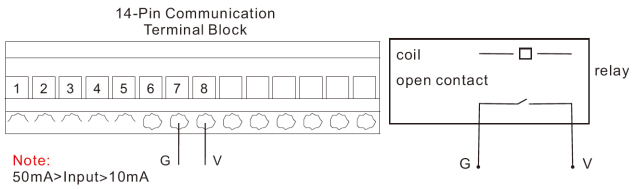
5.24 ATS380V connection diagram



5.8.3 G-V terminal connection

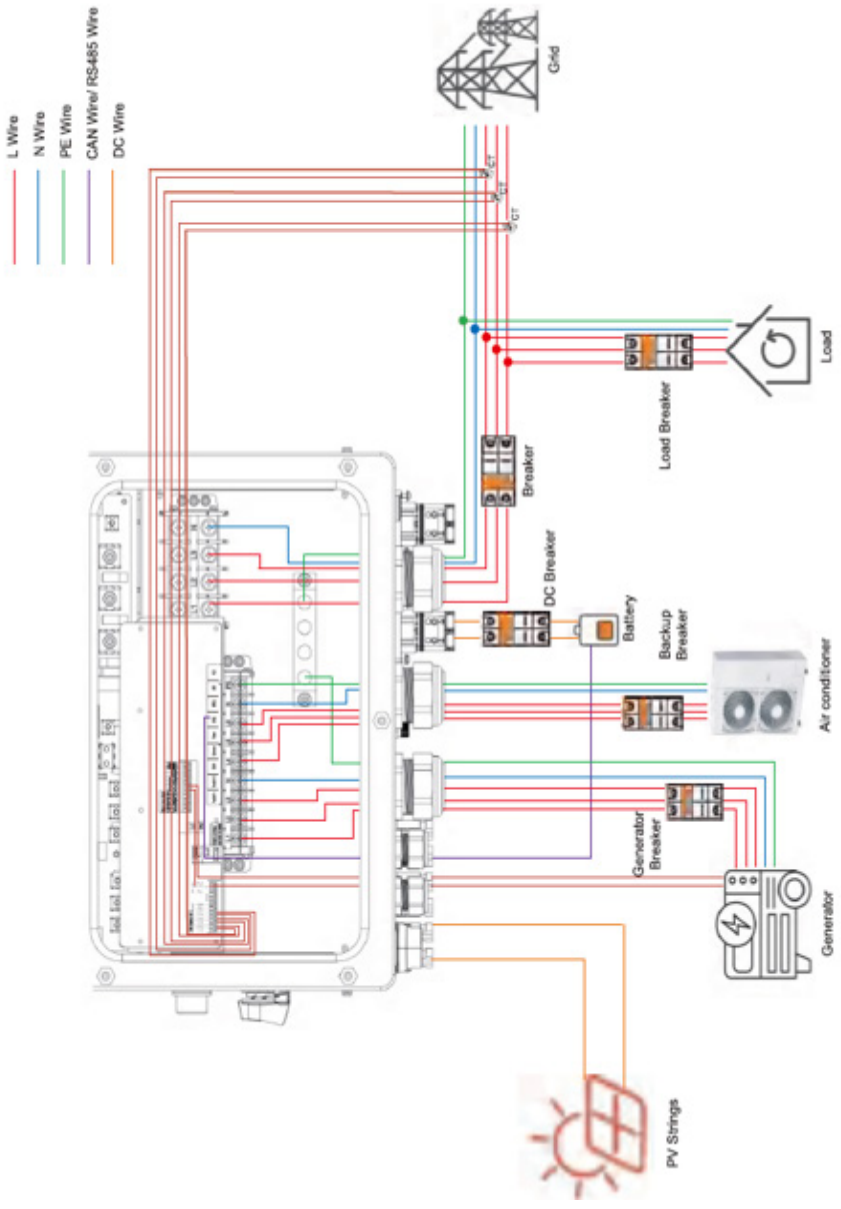
The G-V terminal is a voltage-free dry contact signal for connecting with generator's NO relay to start up the generator when necessary.
When generator operation is not needed, Pin7 and Pin8 is in open circuit.
When generator operation is needed, Pin7 and Pin8 is in short circuit.

5.25 G-V terminal connection

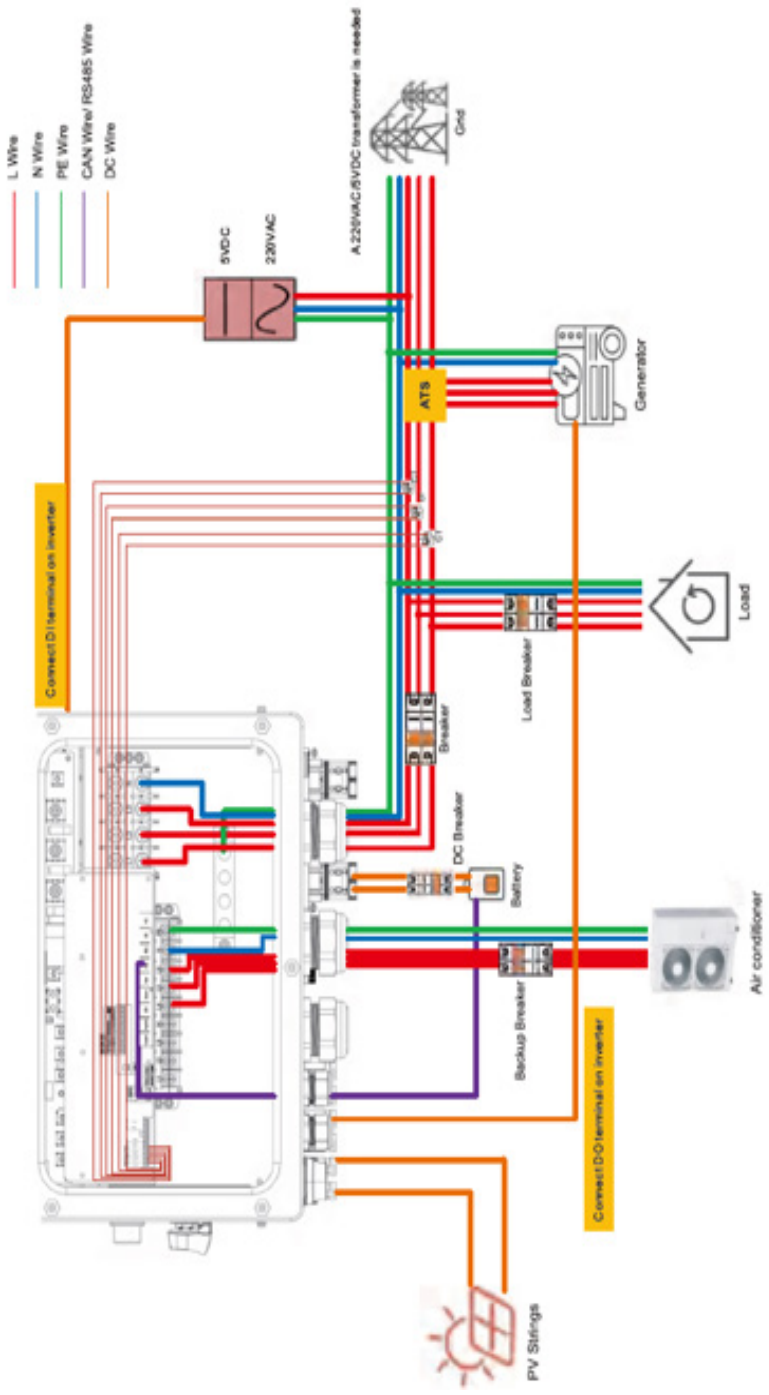


1. The backup PE must be directly connected to the PE copper bar of the power distribution box, rather than the inverter shell.
2. The generator itself needs to be grounded, connected to the electric box, and connected to the inverter generator port.
3. When the generator is working, disconnecting the grid breaker or leakage current protector on the side, will cut off the power box immediately.

5.26 Diesel generation without an ATS connection diagram



5.27 Diesel generation without an ATS connection diagram



5.10 Inverter remote monitoring

Hybrid Solar Inverters

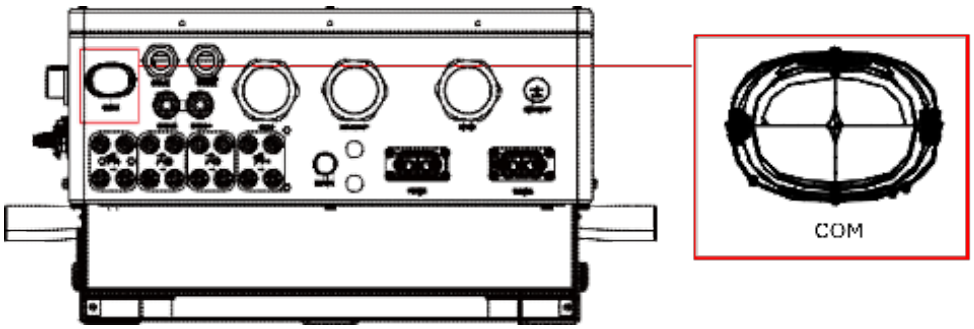
The inverter can be monitored via Wi-Fi, LAN or 4G. All Autarco communication devices are optional and can be purchased separately. Dust cover is provided the inverter package in case the port is not used.

For connection instructions, please refer to the respective Autarco Monitoring Device installation manuals.

The USB type COM port at the bottom of the inverter can connect to Autarco's USB data loggers to realize the commissioning via InstallerApp and remote monitoring via MyAutarco. Please see below, list of compatible Autarco data loggers compatible with this device:

- S2.4G-STICK-D.U1
- S2.LAN-STICK-D.U1
- S2.WIFI-STICK-D.U1

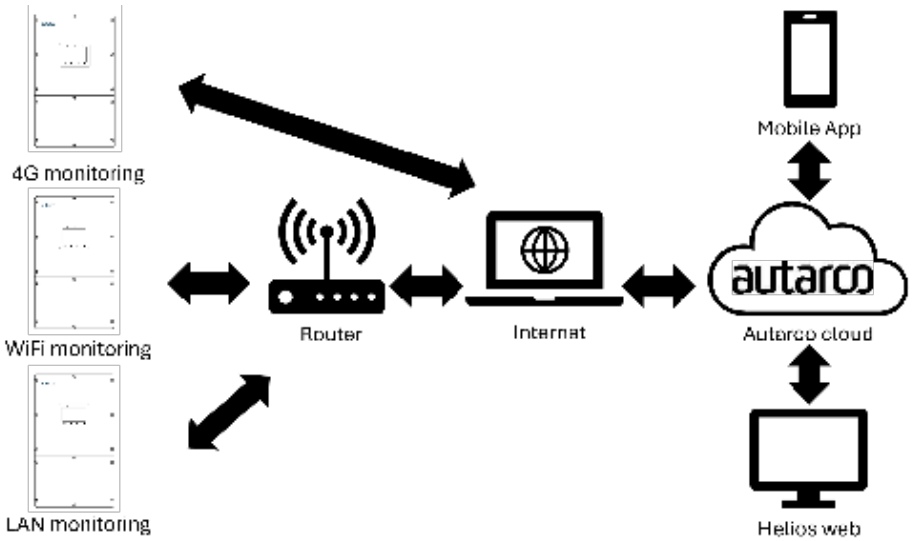
5.28 USB Type COM Port



WARNING! The USB type COM port is only allowed to connect Autarco data loggers.

It is forbidden to be used for other purposes

5.29 Inverter wireless communication function



6.1 Preparation & Commissioning

ATTENTION! Autarco's installer app is mandatory for installing your XLH inverter!

Before switching on the inverter, please make sure that:

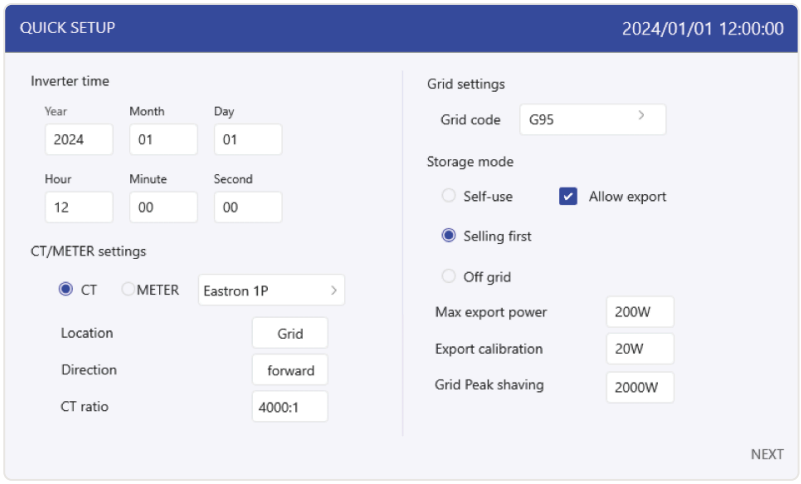
- You have downloaded and installed Autarco's Installer App.
- The device is accessible for safe operation, maintenance, and service.
- Check and confirm that the inverter is properly installed.
- There is sufficient space for ventilation.
- No tools or other materials are left on the inverter or the battery.
- Autarco compatible USB Communication device is inserted in the COM port.
- A reliable WIFI / LAN / 4G connection is available for system configuration.
- Bluetooth Antenna has been connected to the Antenna port of the inverter.
- All accessories, inverter and battery are connected correctly.
- Cables are routed in a safe place and protected against any mechanical damage.
- Warning signs and labels are affixed.

Table 6.1 Inverter commissioning sequence

Turn ON inverter	Turn OFF inverter
1. Connect AC side and AC- back-up.	1. Switch OFF the AC switch.
2. Select grid standard	2. Switch OFF the DC switches.
3. Configure all parameters	3. Switch OFF the Battery breaker.
4. Check polarity of the battery and turn on its DC-switch	
5. Turn on solar DC side	
6. Check that the inverter initialises	

The inverter has been designed in accordance with international grid tied standards for safety, and electromagnetic compatibility requirements. Before delivering to the customer the inverter has been subjected to several tests to ensure its optimal operation and reliability.

If this is the first time the inverter has been commissioned, you will need to first go through the Quick Settings. Once this has been done, these settings can be changed later.
Inverter Time → Meter Setting → Grid Code → Storage mode → Battery Model



Inverter time:

→ Set inverter time and date

CT/Meter setting:

→ Select the CT or Meter, Autarco provides Eastron 3 phase meter, it is self-identifiable.
→ Set installation location: Grid side / Load side / Grid+PV inverter;
→ CT direction: When CT installed pointing to the grid, select “Forward”;
→ In case the CTs were installed pointing to the other direction, the sampling current of CT can be reversed by selecting“Reversal” to correct it.
→ Set CT ratio: default 60 (Autarco provide ESCT-T50-300A/5A CT), if the user install their own CT,
→ then need to set the CT ratio manually. If the system connected to Meter, then CT ratio need
→ to be set on Meter.

Grid code:

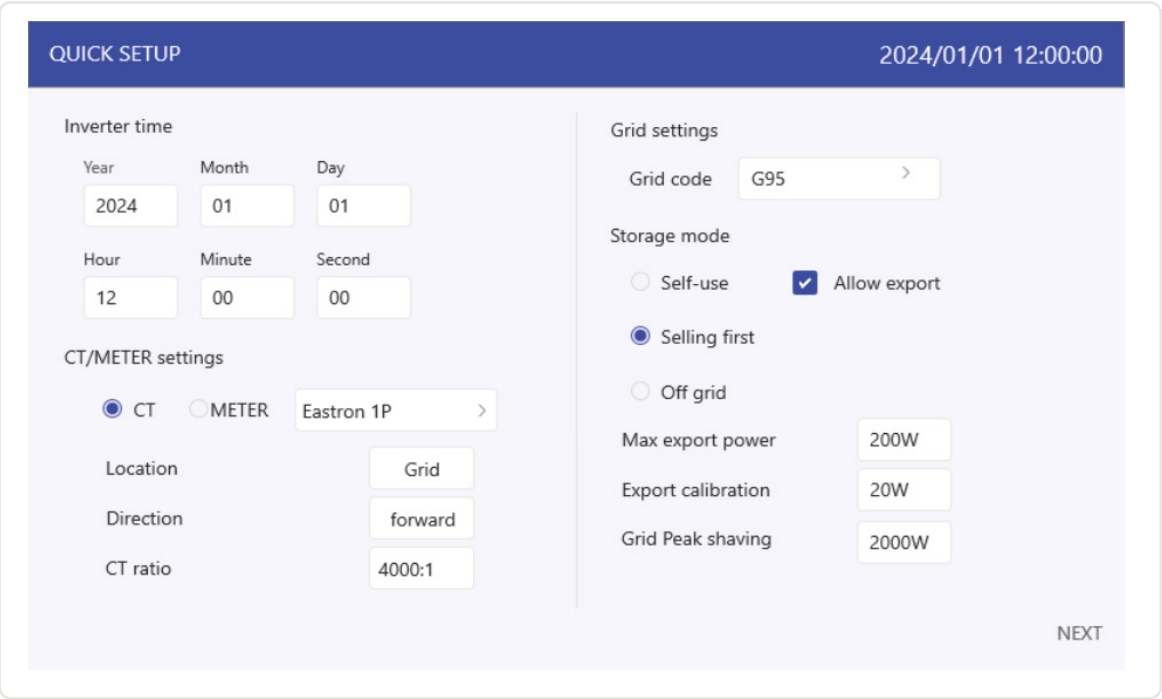
→ Select grid code that meet the local regulations.

Storage mode:
ALL modes first priority is to use the available PV power to support loads. The different modes determine what the second priority, or use of the excess PV power, will be.

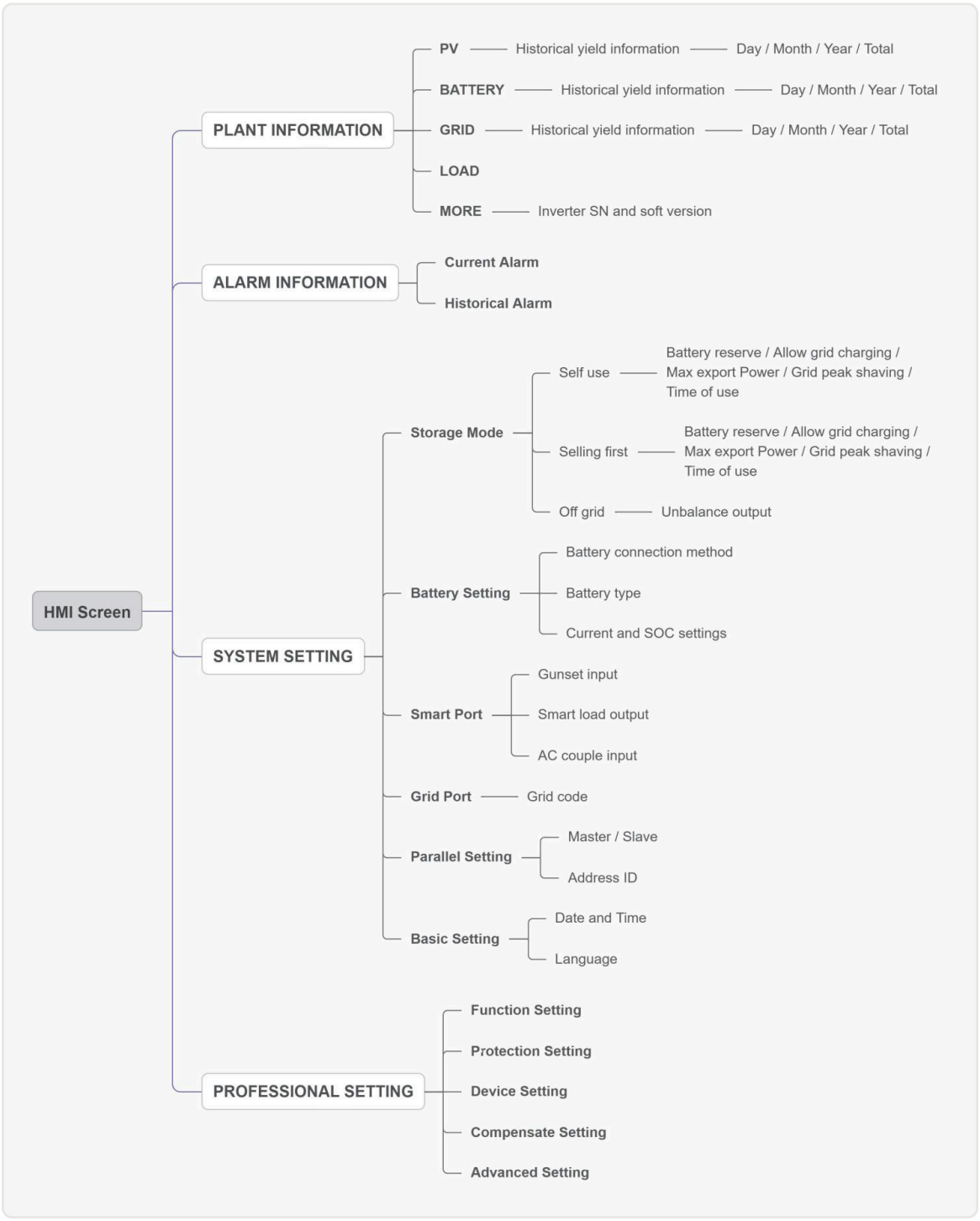
All modes were explained in detail in the chapter 6.4

6.2.1 Battery Settings

→ Select Battery connection method: 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC; for the possible connection methods *please refer to 5.6.3.1 Lithium battery wiring*.
→ Select battery brand (if the connected battery is not on the list, please select “General_LiBat_HV”.
→ Set Max charging/discharging current.
→ If there are two batteries and share the same settings, please tick the box of “Batt2 Settings follow Batt 1”.



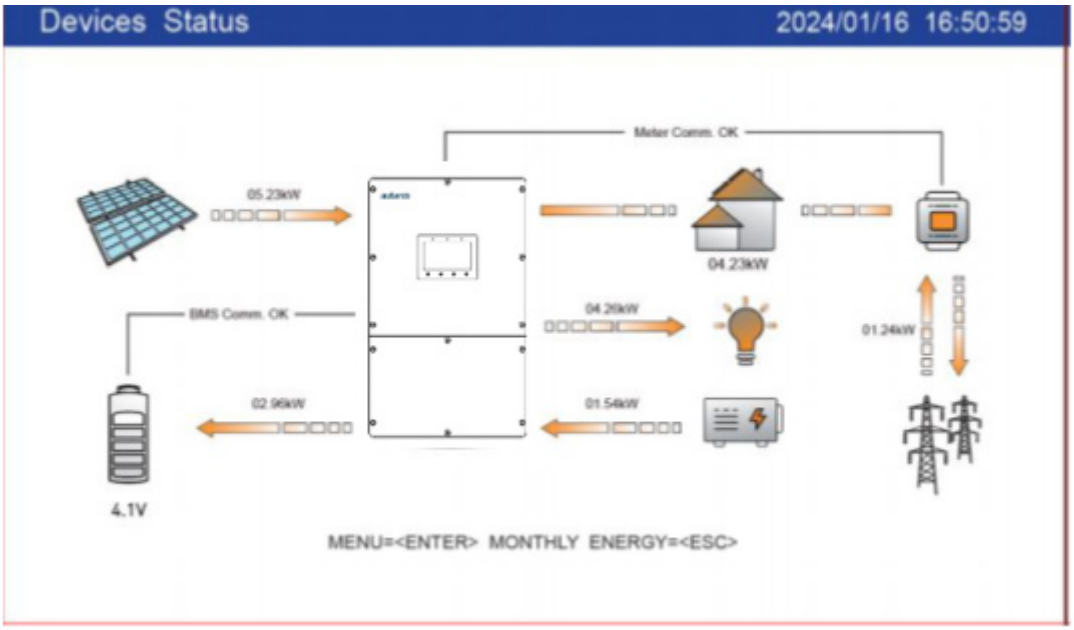
6.2.2 HMI screen settings overview



6.2.3 Detailed HMI Setting

Step 1 Enter Home page

After quick setting, press “ENTER”, the screen displays the home page.



The screen will be automatically turn off after being idle for a few minutes to save power, click any operation button (ESC/UP/DOWN/ ENTER) to restart the screen, then press Enter into the main operation interface.

Step 2 Enter “SYSTEM SETTING” interface

Press Down button, then press ENTER into the SYSTEM SETTING interface.

Step 3 Set “Storage Mode”

Use UP or DOWN key to select the desired mode, then press ENTER.

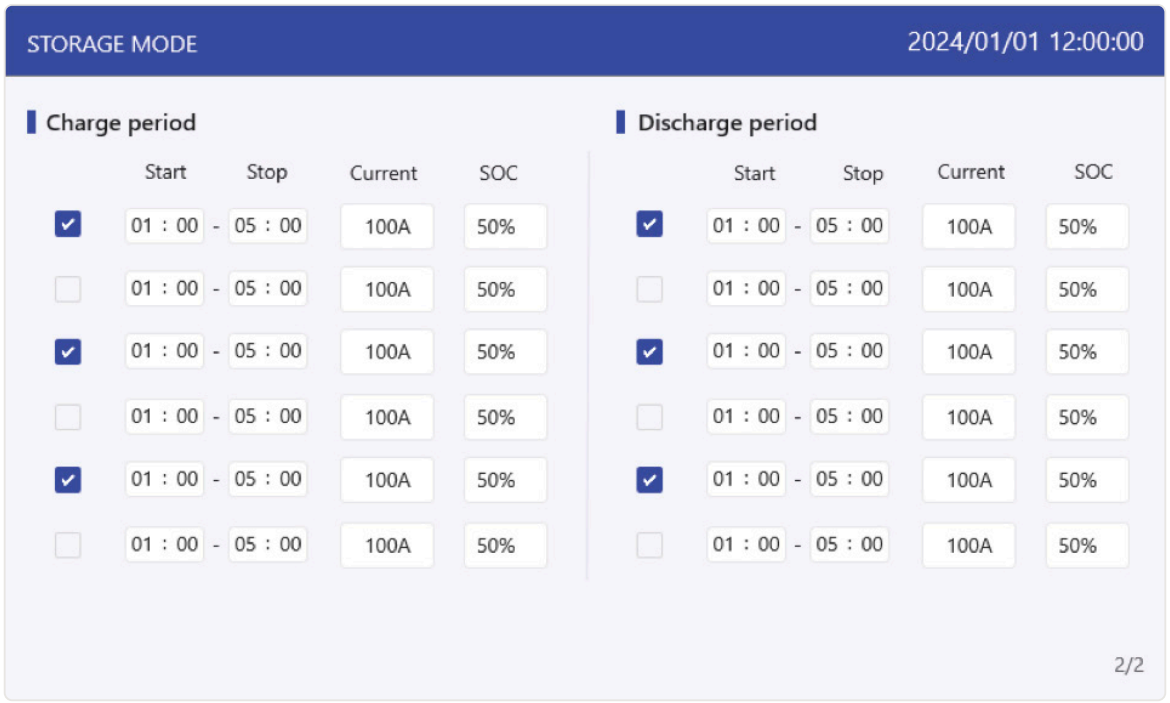
The Mode description *please refer to 6.4*

Settings	Description
Battery reserve	Range: 5~95%, default: 80%, settable. Whenever extra AC or DC power is available, it will be used to always keep the battery at least at the chosen SOC. If an inverter will detect off-grid state, the reserve
Allow grid charging	Allow grid charging the battery when this setting is enabled.
Max export power	Default: 1.1 times of rated power. Notice: if feed-in is not allowed, set Max export power to 0.
Export calibration	Range : -500w-500w, default 20w, settable. To compensate the deviation of CT/Meter in practical application.
Grid peak shaving	Default enable, default 2 times of rated power. Limit the power drawn from the grid to prevent from exceeding regulatory requirements or the power line capacity. It works only when the “battery reserve” turned on.

Step 4 Set “Time of use” under each mode (optional step)

Time of Use is for manual control of the battery charging/discharging. Each mode discussed in step 3 can be customized. User can define when the battery is allowed to charge and discharge power and at what rate, established by the max allowed current.

1. Charge period: battery charges with set current value until the desired SOC is reached. Checking the box next to the time slot enables this time of use.
2. Discharge period: battery discharges with set current value until the minimum indicated SOC is reached. Checking the box next to the time slot enables this time of use.



Step 5 Set “Battery Setting”

Settings	Description
Max charge current	Maximal current which the inverter can use to charge the battery
Max discharge current	Maximal current which the inverter can use to discharge the battery
Over discharge	– SOC of the battery at which the battery will stop discharging. This is a safety feature to protect the health of the battery. – Possible setting range: 5-40%, by default set to 20%.
Recovery	– Setting which helps to avoid the inverter repeatedly charging and discharging the battery close to the tipping point (i.e. over discharge SOC). – This setting defines the range of SOC in respect to over discharge level, at which the battery won’t stop charging between over discharge and recovery SOCs. – Possible setting range: +1% Over discharge - +20 Over discharge
Force charge	– SOC of the battery at which the battery will start charging. This is a safety feature to protect the health of the battery – NOTE: charging of the battery will only happen if the “charging from the grid” setting is enabled, or electricity generation is higher than consumption – Possible setting range: 4% - over discharge SOC
Max charge SOC	Charge cut-off SOC, battery stops charging when reach the Max Charge SOC

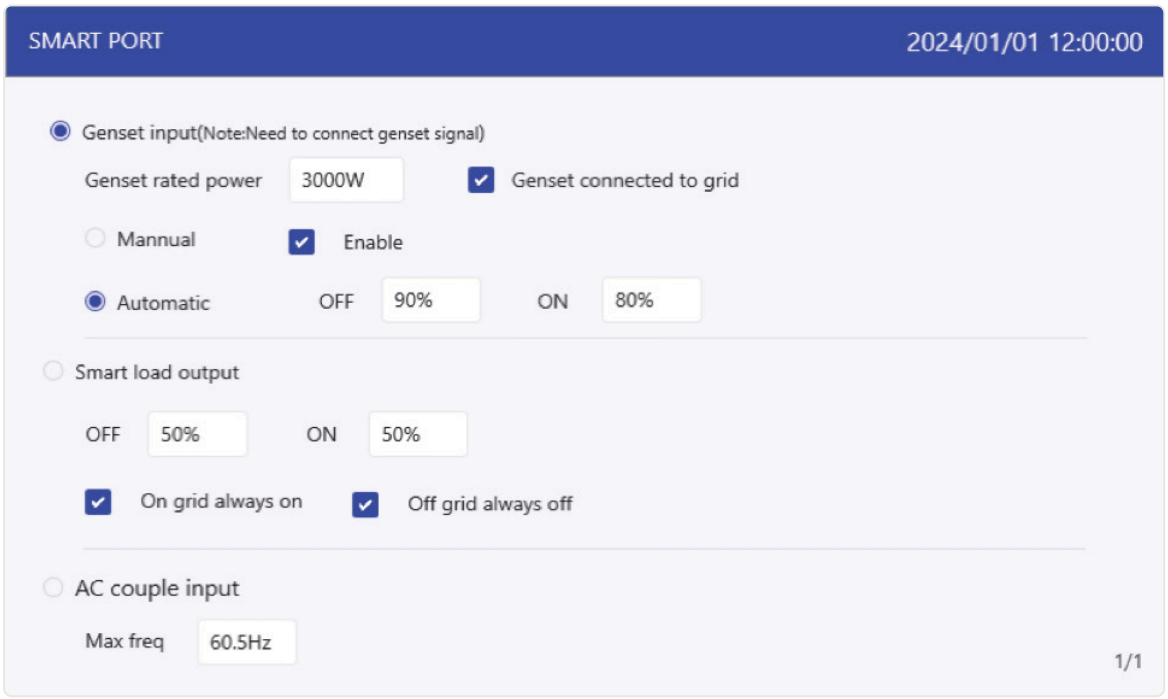
Step 6 Set “Grid Port”

Select grid code that meet the local regulations.

Three level of Over-voltage / under-voltage / Over-frequency / under-frequency are default based on grid code, there is no need to set the parameters in manual.

Step 7 Set "Smart Port" (optional step for systems with generators)

For Generator connection, select "Genset input";
For Smart load like heat pump connection, select "Smart load output"
For on-grid inverter connection, select "AC coupled"



Genset

The user need to input the "Genset rated power" according to the manual.
OFF: Generator stops charging SOC, settable, range: 35~100%;
ON: Generator start charging SOC; settable, range: 1~95%;

AC coupled

Max Freq: On-grid inverter stops charging frequency, settable,
If grid Level 1 over-frequency threshold <55Hz,
Range: Level 1 over-frequency threshold~ Level 1 over-frequency threshold+ 0.1Hz~54Hz;
If grid Level 1 over-frequency threshold <65Hz,
Range: Level 1 over-frequency threshold~ Level 1 over-frequency threshold+ 0.1Hz~65Hz;

Step 8 Set parallel system

Set Master and Slave inverters,
Set Master ID as: 1
The first slave inverter ID as: 2
The second slave inverter ID as: 3, etc.

6.3 Installer App

Autarco's Installer app is available on both Android and iOS devices. Here are three ways you may download and install the app:

- Visit www.autarco.com to download the latest version of our app.
- You can search "**Autarco**" in Google Play or Apple App Store to find the latest version of our app.
- You may scan the QR code below to download the Installer App.

Available on the App Store

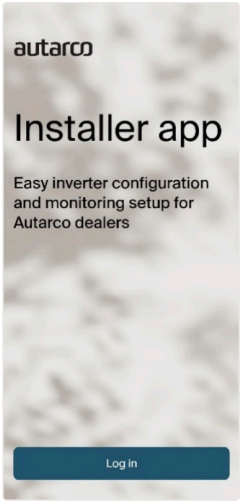
ANDROID APP ON Google Play

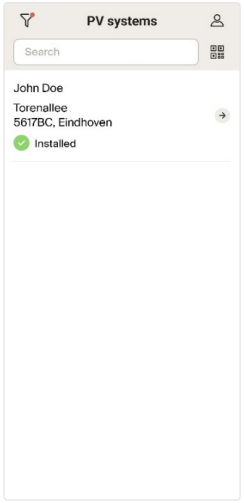
6.4 Monitoring Setup

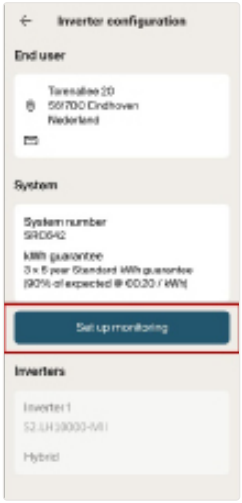
Step 1 Login to the Autarco Installer app.
Available on both iOS & Android devices.

Step 2 Select the system being installed, and clock on "Set up monitoring", to set up the monitoring for your system and perform initial inverter configuration.

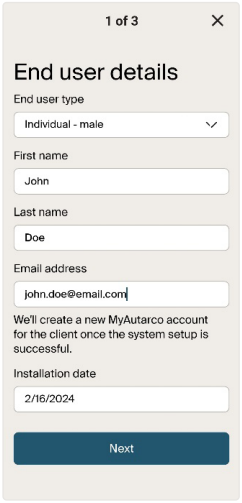
ATTENTION! The system must be designed on Helios already, otherwise configuration cannot proceed.



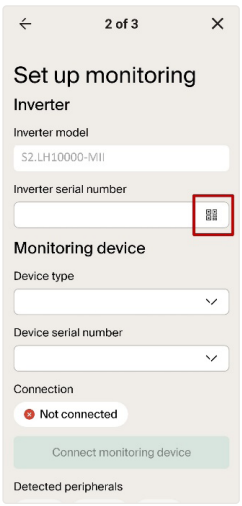


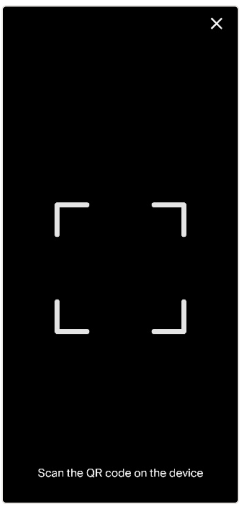


Step 3 Enter end user details under monitoring setup. Click “Next” when done.

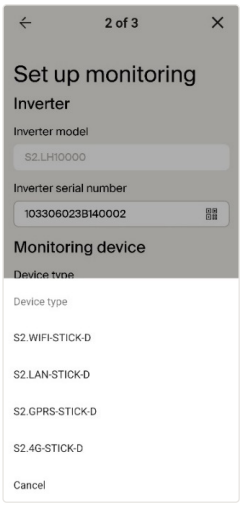


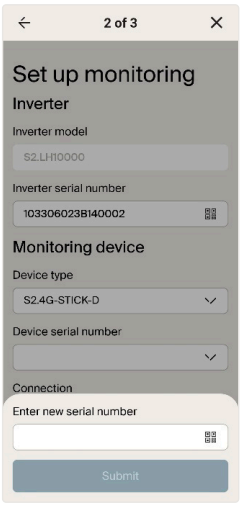
Step 4 Press the QR Code button and scan the inverter QR code (Sticker on left side) to retrieve its serial number. Autarco app will display the inverter model selected in Helios during project design.

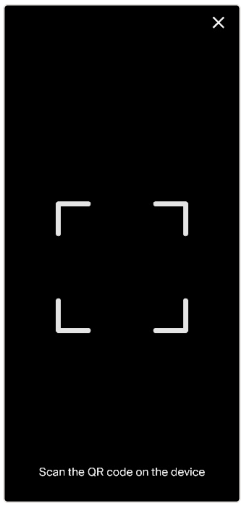




Step 5 Select the monitoring stick connected to the inverter and scan its QR code to retrieve the serial number. Monitoring can be setup via 4G / WIFI / LAN. Please follow Autarco’s monitoring stick manuals for further instructions.

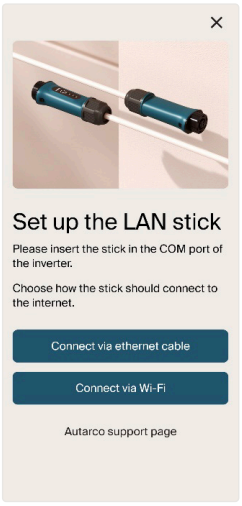




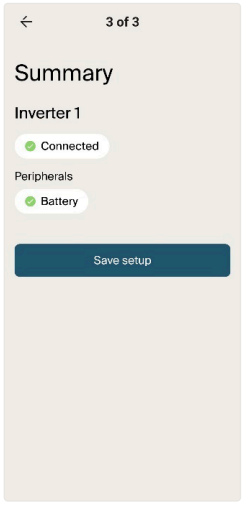


ATTENTION! To continue inverter configuration, you must -

- Ensure a compatible Autarco monitoring stick is connected to the inverter's COM port.
- Ensure a reliable WIFI / LAN / 4G network is present.

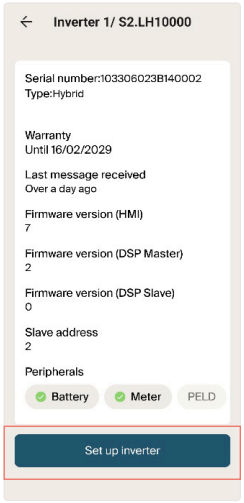


Step 6 Once the monitoring device is connected, you may click "Next" and "Save setup".

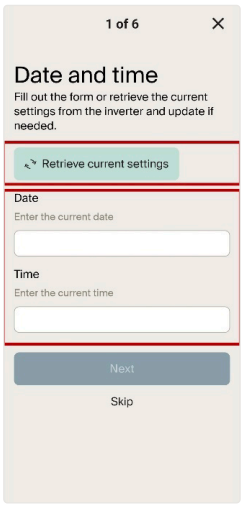


The monitoring setup is complete, and your system is online!
Follow section 6.3 to configure your inverter for the first time.

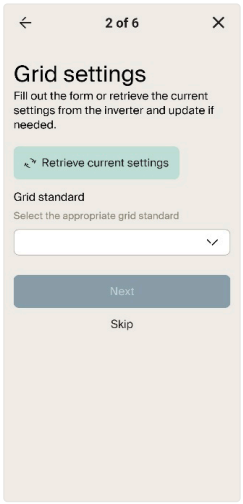
You can view inverter details in the app. Press “Set up inverter” to configure it for the first time.

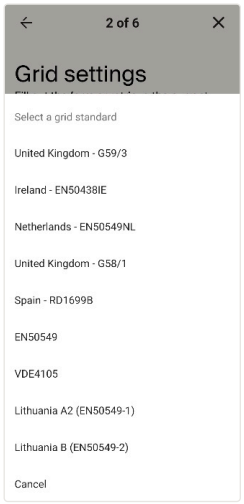


Step 1 Configure the Date and Time for your inverter. You may at any point retrieve the inverter’s current settings.

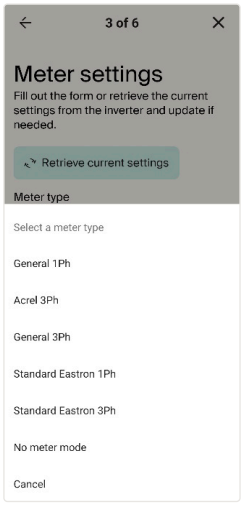


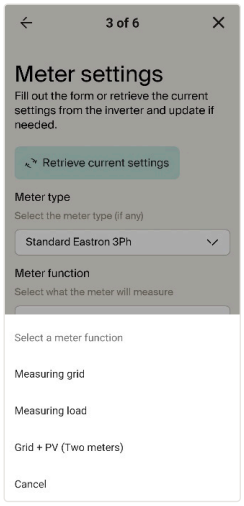
Step 2 Select the necessary grid code standard required for your installation. Selection must be based on local network requirements.

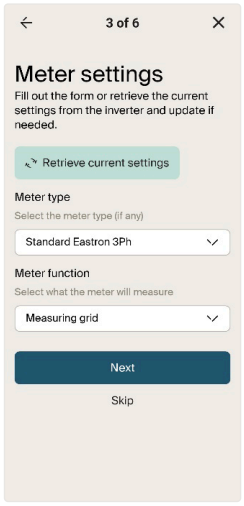




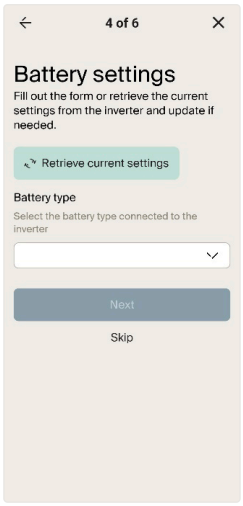
Step 3 Select the right “Meter type” & “Meter function” for your installation.
Selection must be based on the meter type you are actually connecting to the inverter.
If there is no meter connected at this moment, please select “No meter” to avoid alarms.
We suggest to select “Meter in grid” and install the meter at the system’s grid connection point.



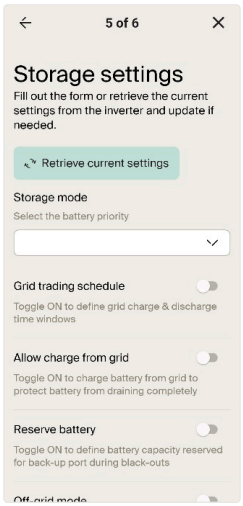


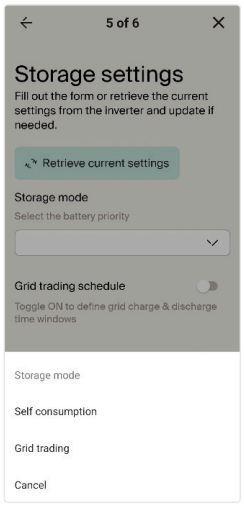


Step 4 Select the “Battery type” that will be connected to the system.
If there is no battery connected at this moment, select “No Battery”, to avoid alarms

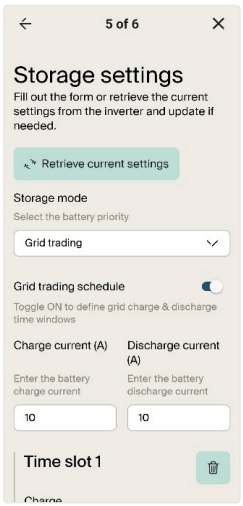


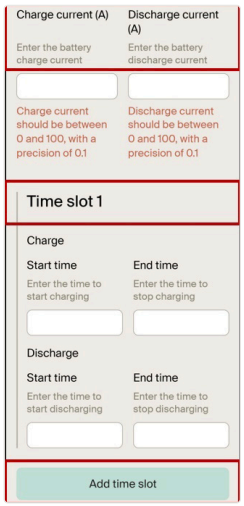
Step 5 Set inverter storage settings. Set inverter storage mode between “Self consumption” & “Grid trading”. Refer to Section 6.4 for an explanation on all operating modes.





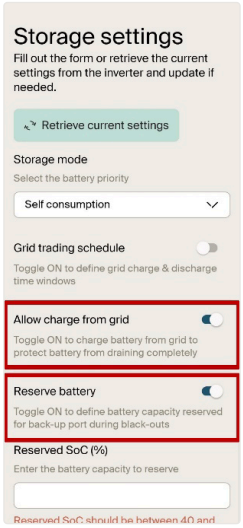
Step 5a Turn on and use “Grid trading schedule” if manual control of battery charging and discharging is required with respect to time. Set the charge and discharge current (A) for your battery. You may set up to 3 time slots in the grid trading schedule by pressing “Add time slot”.

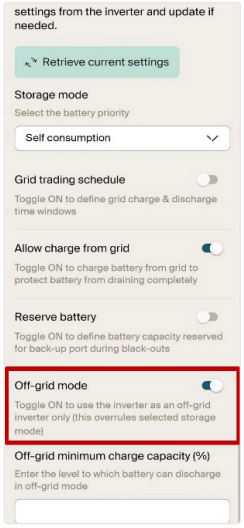




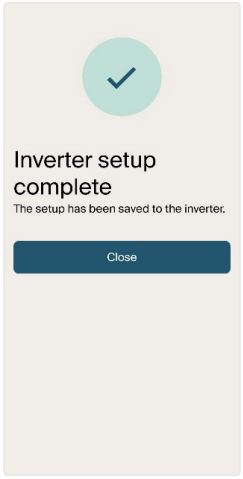
Step 5b “Allow charge from grid” must be turned on (If turned off, the inverter will not be able to charge the battery when it reaches force charge SOC, and battery may be depleted to 0% SOC). You may turn on and set “Reserved SoC (%)”, if your area experiences frequent black-outs.

Step 5c If you wish to use the inverter in off-grid mode, please turn on “Off-grid mode”, and set the “Off-grid minimum charge capacity (%)”. Further explanation for this mode follows in *Section 6.4.*





Step 6 Your inverter setup is complete!



6.6 Operating modes

As seen in *Section 6.3*, the inverter can operate in various operational logics, suiting individual needs.

ATTENTION! Symbols (I) (II) (III) depict “Power consumption” priority.

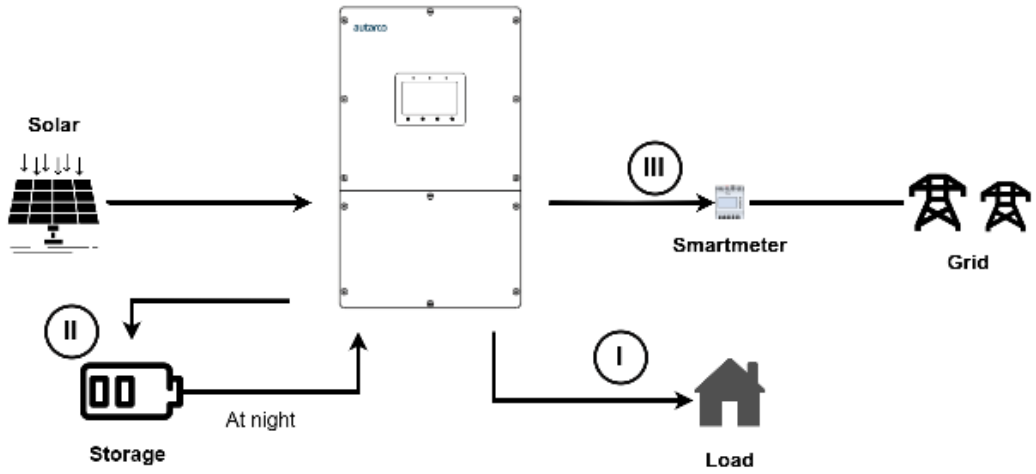
6.6.1 Self-use mode

This mode stores excess PV power into the battery. If the battery is charged, or there is no battery, the excess PV power will be exported back to the grid/utility company. If the system is set to not export any power, then the inverter will curtail the PV power (derate the inverter output power).

Figure 6.1 depicts the power consumption priority for this mode. The PV power generation is preferentially supplied to the load, and the excess power is used to charged to battery. After the battery is fully charged, the excess power is sent to the grid; the battery is discharged to the load at night.

This mode supports 6 customizable charge/discharge time settings.

6.1 Self-use mode priority



6.6.2 Grid-trading mode

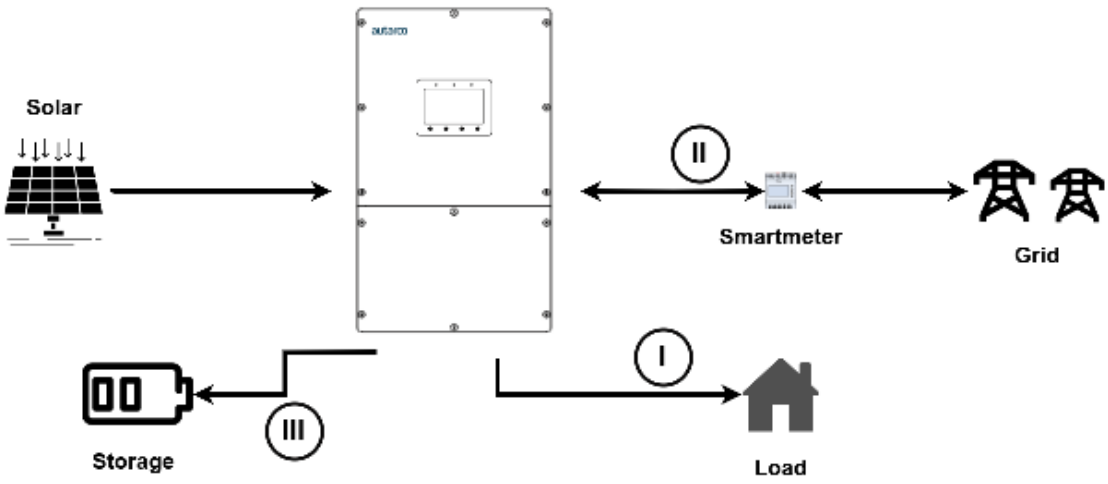
Grid Trading (or Feed- in Priority) Mode ensures that when domestic loads are supplied, the system will export any excess PV power back to the grid. If the export power quota has been met, then the remaining PV power will be stored in the battery.

ATTENTION! This mode should not be used if export power is going to be set to zero.

Figure 6.2 depicts the power consumption priority for this mode. The PV power generation is preferentially supplied to the load, the excess power is first supplied to the grid, and the battery keeps the basic charge of the battery.

This mode supports 6 customizable charge/discharge time settings.

6.2 Grid trading mode priority



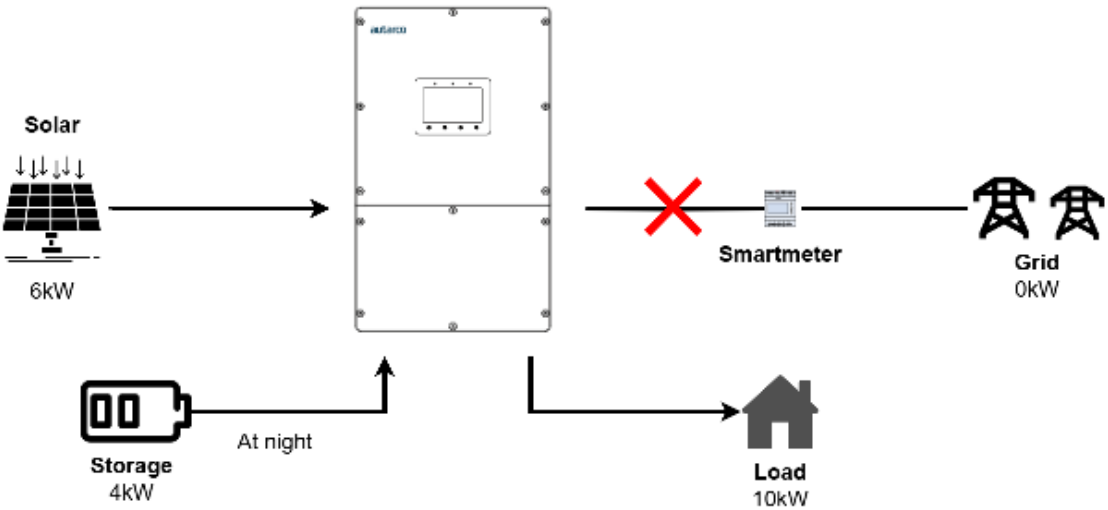
6.6.3 Off-grid mode

Off-grid mode must only be used by systems that are not electrically connected to the grid at all. This mode is almost like Self-Use Mode, but the PV power will be curtailed if the battery is sufficiently charged, and the domestic load demand is lower than the amount of available PV power.

Figure 6.3 depicts the power consumption priority for this mode.

Passive start: When the grid is lost, inverter enters the off-grid mode passively, and the backup port is off-grid output purely.

6.3 Off-grid mode priority



6.6.4 Reserve or Backup mode

The reserve or backup mode may be opened in the Self-Use or Grid-Trading Mode.

This mode ensures that the battery is not drained past the Reserve SoC mark. The battery will cycle between 100% and the Reserve SOC.

In case grid power is lost, the battery will have the Reserve SOC at the very least to carry the home through unexpected outage.

6.6.5 Grid Trading Schedule (Time of Use)

Grid Trading Schedule is used to customize when and by how much the battery may be allowed to charge or discharge. If the grid trading schedule is turned on, the inverter will only follow this schedule to determine when to charge or discharge the battery.

We recommend enabling “Allow charge from grid”.

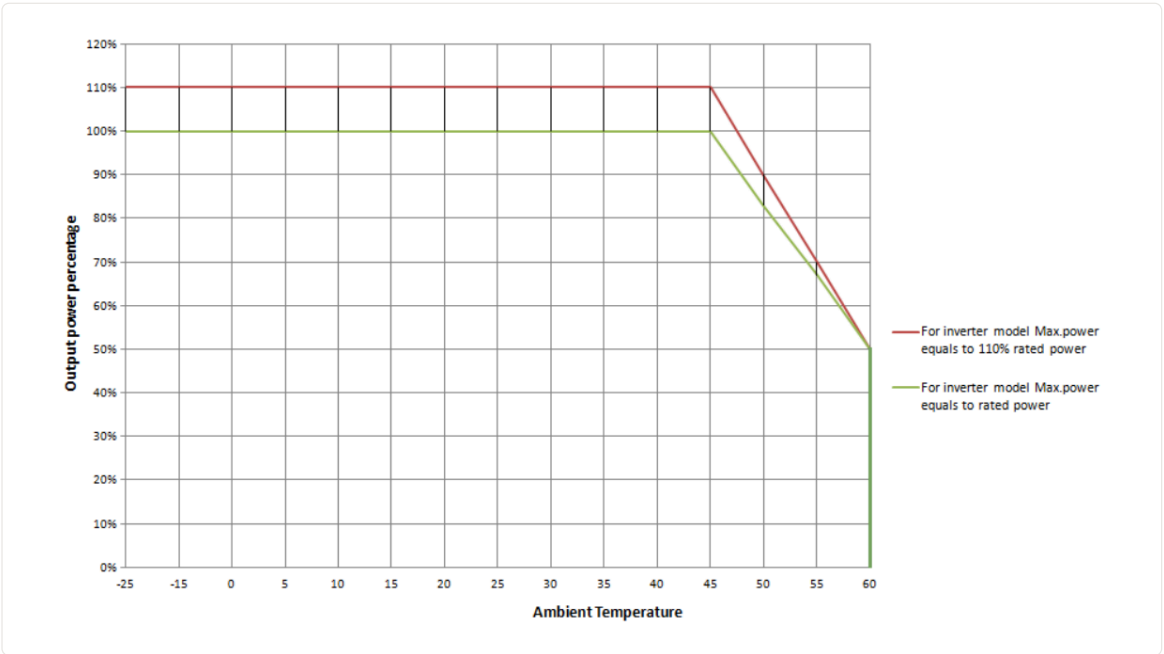
NOTE! Once enabled, the inverter will use grid power to charge the battery only under two circumstances:

1. The battery drains to the Force Charge SOC.
2. Time of Use is enabled and there is not enough PV power available during the charge window to meet the established current rate.

Grid Trading Schedule is for manual control of the battery charging/discharging.
If this setting is turned off, charging/discharging is automatically regulated by the inverter.

6.7 Temperature derating

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



7 Maintenance

CAUTION! Do not touch the heat sink when the inverter is in operation. Turn OFF the inverter *(see section 6.1)* and allow for cooling down before cleaning or maintenance.

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

The XLH 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 brush.

8 Disposal

To comply with European Directive 2002/96/EC on waste Electrical and Electronic Equipment (WEEE) 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 public health.

Message Name	Information Description	Troubleshooting Suggestion
Off	Control device to shutdown	Turn on the device in the ON/OFF Setting.
LmtByEPM	The device's output is under controlled	1. Confirm whether the inverter is connected to an external EPM/meter to prevent reverse current. 2. Confirm whether the inverter is controlled by an external third-party device. 3. Confirm whether the power setting of the inverter power control is limited. 4. Verify settings in section 6.6.7 and check your meter readings.
LmtByDRM	batter Function ON	No need to deal with it.
LmtByTemp	Over temperature power limited	No need to deal with it, the device is in normal operation.
LmtByFreq	Frequency power limited	
LmtByVg	The device is in the Volt-Watt mode	1. Due to the requirements of local safety regulations, when the grid voltage is high, the Volt-watt working mode is triggered, which generally does not need to be dealt with. 2. Inverter factory test errors causing this mode to open, if you need to close, you can close this mode in LCD, set the process: Main menu → Advanced Settings → Password 0010 → STD mode settings → Working Mode → Working mode: NULL → Save and exit.
LmtByVar	The device is in the Volt-Var mode of operation	1. Due to the requirements of local safety regulations, when the grid voltage is high, the Volt-watt working mode is triggered, which generally does not need to be dealt with. 2. Inverter factory test errors causing this mode to open, if you need to close, you can close this mode in LCD, set the process: Main menu → Advanced Settings → Password 0010 → STD mode settings → Working Mode → Working mode: NULL → Save and exit.
LmtByUnFr	Under frequency limit	No need to deal with it.
Standby	Bypass run	
StandbySynoch	Off grid status to On grid status	
GridToLoad	Grid to load	
Surge Alarm	On-site grid surge	Grid side fault, restart the device. If it is still not eliminated, please contact the manufacturer's customer service.
OV-G-V01	Grid voltage exceeds the upper voltage range	1. Confirm whether the power grid is abnormal. 2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
UN-G-V01	Grid voltage exceeds the lower voltage range	
OV-G-F01	Grid frequency exceeds the upper frequency range	
UN-G-F01	Grid frequency exceeds the lower frequency range	
G-PHASE	Unbalanced grid voltage	
G-F-GLU	Grid voltage frequency fluctuation	
NO-Grid	No grid	
OV-G-V02	Grid transient overvoltage	
OV-G-V03	Grid transient overvoltage	Restart the system, confirm if that the fault continues.
IGFOL-F	Grid current tracking failure	1. Confirm whether the power grid is abnormal. 2. Confirm that the AC cable is properly connected. 3. Restart the system and check if the fault persists.
OV-G-V05	Grid voltage RMS instanta- neous overvoltage fault	
OV-G-V04	Grid voltage exceeds the upper voltage range	
UN-G-V02	Grid voltage exceeds the lower voltage range	
OV-G-F02	Grid frequency exceeds the upper frequency range	
UN-G-F02	Grid frequency exceeds the lower frequency range	
NO-Battery	Battery is not connected	1. Check on information page 1 – Verify the battery voltage is within standards. 2. Measure battery voltage at plug.
OV-Vbackup	Inverting overvoltage	1. Check whether the backup port wiring is normal 2. Restart the system, confirm that the fault continues.

Message Name	Information Description	Troubleshooting Suggestion
Over-Load	Load overload fault	Backup load power is too large, or some inductive load startup power is too large, need to remove some backup load, or remove the inductive load on the backup.
BatName-FAIL	Wrong battery brand selection	Confirm whether the battery model selection is consistent with the actual one.
CAN Fail	CAN Fail	Can failure is a failure of communication between inverter and battery. Check cable conditions. Check to ensure you have it plugged in on the CAN port of the battery and inverter. Check that you are using the right cable. Some batteries require a special battery from the battery manufacturer.
OV-Vbatt	Battery overvoltage detected	Verify battery voltage is within standards. Measure battery voltage at inverter connection point. Contact your battery manufacturer for further service.
UN-Vbatt	Battery undervoltage detected	Restart the system and check if the fault persists. If it is still not eliminated, please contact the manufacturer's customer service.
Fan Alarm	Fan alarm	Check if the internal fan is working correctly or jammed.
OV-DC01 (1020 DATA:0001)	DC 1 input overvoltage	1. Check if the PV voltage is abnormal 2. Restart the system, confirm that the fault continues
OV-DC02 (1020 DATA:0002)	DC 2 input overvoltage	
OV-BUS (1021 DATA:0000)	DC bus overvoltage	Restart the system, confirm that the fault continues.
UN-BUS01 (1023 DATA:0001)	DC bus undervoltage	
UNB-BUS (1022 DATA:0000)	DC bus unbalanced voltage	
UN-BUS02 (1023 DATA:0002)	Abnormal detection of DC bus voltage	
DC-INTF. (1027 DATA:0000)	DC hardware overcurrent (1, 2, 3, 4)	Check if the DC wires are connected correctly without loose connection.
OV-G-I (1018 DATA:0000)	A phase RMS value overcurrent	3. Confirm that the grid is abnormal. 4. Confirm that the AC cable connection is not abnormal. 5. Restart the system, confirm that the fault continues.
OV-DCA-I (1025 DATA:0000)	DC 1 average overcurrent	Restart the system, confirm that the fault continues.
OV-DCB-I (1026 DATA:0000)	DC 2 average overcurrent	
GRID-INTF. (1030 DATA:0000)	AC hardware overcurrent (abc phase)	
DCInj-FAULT (1037 DATA:0000)	The current DC component exceeds the limit	6. Confirm that the grid is abnormal. 7. Confirm that the AC cable connection is not abnormal. 8. Restart the system, confirm that the fault continues.
IGBT-OV-I (1048 DATA:0000)	IGBT overcurrent	Restart the system, confirm that the fault continues.
OV-TEM (1032 DATA:0000)	Module over temperature	9. Check whether the surrounding environment of the inverter has poor heat dissipation. 10. Confirm whether the product installation meets the requirements.
RelayChk-FAIL (1035 DATA:0000)	Relay failure	Restart the system, confirm that the fault continues.
UN-TEM (103A DATA:0000)	Low temperature protection	11. Check the working environment temperature of the inverter. 12. Restart the system to confirm if the fault continues.
PV ISO-PRO01 (1033 DATA:0001)	PV negative ground fault	13. Check whether the PV strings have insulation problems. 14. Check whether the PV cable is damaged.
PV ISO-PRO02 (1033 DATA:0002)	PV positive ground fault	

Message Name	Information Description	Troubleshooting Suggestion
a-FAULT (1038 DATA:0000)	12V undervoltage failure	Check current leakage to ground. Verify your grounding. Verify all wires are in good condition and not leaking current to ground.
ILeak-PRO01 (1034 DATA:0001)	Leakage current failure 01 (30mA)	
ILeak-PRO02 (1034 DATA:0002)	Leakage current failure 02 (60mA)	
ILeak-PRO03 (1034 DATA:0003)	Leakage current failure 03 (150mA)	
ILeak-PRO04 (1034 DATA:0004)	Leakage current failure 04	
ILeak_Check (1039 DATA:0000)	Leakage current sensor failure	
GRID-INTF02 (1046 DATA:0000)	Power grid disturbance 02	15. Confirm whether the grid is seriously distorted. 16. Check whether the AC cable is connected reliably.
OV-Vbatt-H/ OV-BUS-H (1051 DATA:0000)	Battery overvoltage hardware failure / VBUS	17. Check if the battery circuit breaker is tripping. 18. Check if the battery is damaged.
OV-ILLC (1052 DATA:0000)	LLC hardware overcurrent	19. Check whether the backup load is overloaded. 20. Restart the system, confirm that the fault continues.
INI-FAULT (1031 DATA:0000)	AD zero drift overlink	Restart the system, confirm that the fault continues.
DSP-B-FAULT (1036 DATA:0000)	The master-slave DSP communication is abnormal	
AFCI-Check (1040 DATA:0000)	AFCI self-test failure	
ARC- FAULT (1041 DATA:0000)	AFCI failure	Verify connections are tight within your PV system. Arc fault settings can be changed in advanced settings if further adjustment is necessary.

NOTE! If the inverter displays any alarm message as listed above: please turn off the inverter and wait 5 minutes before restarting it. If the fault persists, contact your installer or Autarco.

Before contacting us, please have the following information available:

- Inverter serial number.
- Name of the installer or distributor of the inverter.
- The description of the problem together with necessary information, pictures, attachment.
- Type of battery installed and system configuration.
- Installation date.
- PV array information (no. of panels, capacity, no. of strings, etc.)
- Information on the fault.

Technical Data	S2.XLH29900	S2.XLH30000
Input DC (PV side)		
Recommended max. PV power	59.8kW	60kW
Max. input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Full load MPPT voltage range	360-850V	
Max. input current	40A/40A/40A	
Max. short circuit current	60A/60A/60A	
MPPT number/Max input strings number	3/6	
Max input power per MPPT	18kW	
Battery		
Battery Type	LFP	
Battery Voltage range	150 - 800Vdc	
Maximum charging Power	32.1kW	33kW
Maximum Charge/discharge current	70A*2	
Communication	CAN/RS485	
Output AC (Grid-side)		
Rated output power	29.9kW	30kW
Max. apparent output power	29.9kVA	6kVA
Rated grid voltage	3/N/PE, 220V/ 380V–400V	
The grid voltage range	304-460V	
Rating grid frequency	50 Hz/60 Hz	
AC grid frequency range	45-55 Hz/ 55-65Hz	
Rating grid output current	45.4A/43.2A	45.6A/43.3A
Max. output current	45.4A/43.2A	45.6A/43.3A
Power factor	> 0.99 (0.8 leading to 0.8 lagging)	
THDi	< 3%	
Max passthrough current	90.8A/86.4A	91.2A/86.6A
Rated input voltage	3/N/PE, 220V/380V –400V	
Rated input frequency	50 Hz/60 Hz	
Input Generator		
Max input power	29.9kW	30kW
Rated input current	45.4A/43.2A	45.6A/43.3A
Rated input frequency	50 Hz/60 Hz	
Output AC (Back-up)		
Rated output power	29.9kW	30kW
Peak apparent output power	1.6 x rated power, 2 seconds	
Back-up switch time	< 10ms	
Rated output voltage	3/N/PE, 220V/380V – 400V	
Rated frequency	50 Hz/60 Hz	
Rated output current	45.4A/43.2A	45.6A/43.3A
Max. allowable phase imbalance	33%	
THDv(@linear load)	<2%	
Efficiency		
Max. efficiency	97.8%	
EU efficiency	97.4%	
BAT charged by PV Max. efficiency	98.5%	
BAT charged/discharged to AC Max. efficiency	97.5%	
MPPT efficiency	99.9%	

Technical Data	S2.XLH29900	S2.XLH30000
	Protection	
Anti-islanding protection	Yes	
Output over voltage protection	Yes	
Insulation resistor detection	Yes	
Residual current detection	Yes	
Output over current protection	Yes	
Short circuit protection	Yes	
Integrated AFCI (DC arc-fault circuit protection)	Optional	
Integrated DC switch	Optional	
DC reverse polarity protection	Yes	
PV overvoltage protection	Yes	
Battery reverse protection	Yes	
	General data	
Dimensions(W/H/D)	530*880*290mm	
Weight	73kg	
Topology	Transformerless	
Self-consumption (Night)	<25 W	
Operation temperature range	-25°C+60°C	
Relative humidity	0-95%	
Ingress protection	IP66	
Noise emission	<65 dB(A)	
Cooling concept	Intelligent fan cooling	
Max. operation altitude	4000m	
Grid connection standard	G99, VDE-AR-N 4105 / VDE V 0124, CEI 0-21, C10/11, EN 50549-1/EN 50549-10, NRS 097-2-1, TOR, MEA, PEA, VDE 0126 / UTE C 15/VFR:2019, EIFS 2018.2, NTS 631/RD 1699/RD 244 / UNE 206006 / UNE 206007-1, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, PORTARIA Nº 140, DE 21 DE MARÇO DE 2022	
Safety/EMC standard	IEC 62109-1/-2 ,EN 61000-6-2/-4	
	Features	
PV connection	MC4 connector	
Battery connection	Terminal connector	
AC connection	Terminal Block	
Display	LED + Bluetooth + APP	
Communication	CAN, RS485, Ethernet, Cellular, LAN, WiFi	
Warranty	5 years (extend to 20 years)	

Technical Data	S2.XLH50000
	Input DC (PV side)
Recommended max. PV power	96kW
Max. input voltage	1000V
Rated voltage	600V
Start-up voltage	180V
MPPT voltage range	150-850V
Full load MPPT voltage range	360-850V
Max. input current	40A/40A/40A
Max. short circuit current	60A/60A/60A
MPPT number/Max input strings number	4/8
Max input power per MPPT	18kW
	Battery
Battery Type	LFP
Battery Voltage range	150 - 800Vdc
Maximum charging Power	55kW
Maximum Charge/discharge current	70A*2
Communication	CAN/RS485
	Output AC (Grid-side)
Rated output power	50kW
Max. apparent output power	50kVA
Rated grid voltage	3/N/PE, 220V/ 380V–400V
The grid voltage range	304-460V
Rating grid frequency	50 Hz/60 Hz
AC grid frequency range	45-55 Hz/ 55-65Hz
Rating grid output current	76.0A/72.2A
Max. output current	76.0A/72.2A
Power factor	> 0.99 (0.8 leading to 0.8 lagging)
THDi	< 3%
Max passthrough current	152A/144.4A
Rated input voltage	3/N/PE, 220V/380V –400V
Rated input frequency	50 Hz/60 Hz
	Input Generator
Max input power	50kW
Rated input current	76.0A/72.2A
Rated input frequency	50 Hz/60 Hz
	Output AC (Back-up)
Rated output power	50kW
Peak apparent output power	80kW, 2s
Back-up switch time	< 10ms
Rated output voltage	3/N/PE, 220V/380V – 400V
Rated frequency	50 Hz/60 Hz
Rated output current	76.0A/72.2A
Max. allowable phase imbalance	33% rated power
THDv(@linear load)	<2%
	Efficiency
Max. efficiency	97.8%
EU efficiency	97.4%
BAT charged by PV Max. efficiency	98.5%
BAT charged/discharged to AC Max. efficiency	97.5%
MPPT efficiency	99.9%

Technical Data	S2.XLH50000
	Protection
Anti-islanding protection	Yes
Output over voltage protection	Yes
Insulation resistor detection	Yes
Residual current detection	Yes
Output over current protection	Yes
Short circuit protection	Yes
Integrated AFCI (DC arc-fault circuit protection)	Yes
Integrated DC switch	Yes
DC reverse polarity protection	Yes
PV overvoltage protection	Yes
Battery reverse protection	Yes
	General data
Dimensions(W/H/D)	530*880*290mm
Weight	73kg
Topology	Transformerless
Self-consumption (Night)	<25 W
Operation temperature range	-25°C+60°C
Relative humidity	0-95%
Ingress protection	IP66
Noise emission	<65 dB(A)
Cooling concept	Intelligent redundant fan-cooling
Max. operation altitude	4000m
Grid connection standard	G99, VDE-AR-N 4105 / VDE V 0124, CEI 0-21, C10/11, EN 50549-1/EN 50549-10, NRS 097-2-1, TOR, MEA, PEA, VDE 0126 / UTE C 15/VFR:2019, EIFS 2018.2, NTS 631/RD 1699/RD 244 / UNE 206006 / UNE 206007-1, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, PORTARIA Nº 140, DE 21 DE MARÇO DE 2022
Safety/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-2/-4 EN 55011
	Features
PV connection	MC4 connector
Battery connection	Terminal connector
AC connection	Terminal Block
Display	LED + Bluetooth + APP
Communication	CAN, RS485, Ethernet, Optional:Cellular, LAN, WiFi
Warranty	5 years (extend to 20 years)

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