Revision 1.3 / Apr 2023

REVO

CONTENTS

1 Notes on this Manual

1.1 Products Covered

This manual is an integral part of the REVO family of inverters, It describes the assembly, installation, commissioning, maintenance and failure/warning information . Please read it carefully before operating.

REVO5KL	REVO8KL

Naming rules, For example: REVO8KL

- "8K or 5K" means "output power 8kw or 5kw " .
- "L" means "low battery voltage"

Store this manual where it will be always accessible.

1.2 Target Group

This manual is intended for qualified electricians. The tasks are described in usual electrical terms which shall be easy to understand by a registered electrician, it is recommended that installations are only carried over by qualified personnel.

1.3 Symbols Used

The following signs are used throughout the document:

Danger!

"Danger" indicates a hazardous situation which, if not avoided, will result in death or serious injury.

Warning!

"Warning" indicates a hazardous situation which, if not avoided, could result in death or serious injury.

Caution!

"Caution" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Note!

"Note" provides tips that are valuable for the optimal equipment operation.

2 Safety

2.1 Important Safety Instructions

Danger!

- Danger to life due to high voltages in the inverter!
- All work must be carried out by a qualified electrician.
- Incorrect Installation can lead to Injury or Death

Caution!

- Inverter Heat Sinks can become very hot and produce injuries when touched!
- During operation, the upper cover of the enclosure and the enclosure body may become hot.
- Only touch the lower enclosure lid during operation

Caution!

- Possible injury because of the effects of radiation, a small amount of Magnetic fields and radiation is produced by the inverter during operation.
- Do not stay closer than 20 cm to inverter for a prolonged length of time.

Note!

- Grounding the PV generator
- Comply with the local requirements for grounding the PV modules and the PV generator. It is recommends connecting the generator frame and other electrically conductive surfaces in a manner which ensures continuous conduction and ground these in order to have optimal protection of system and persons.

Warning!

- Ensure input DC voltage ≤Max. DC voltage. Over voltage may cause Permanent damage to inverter which will not be included in warranty!

Warning!

- Authorized service personnel must disconnect both AC and DC power from inverter before attempting any maintenance/cleaning or working on any circuits connected to inverter.

Warning!

- Do not open the top cover of the inverter when the device is under loads.

Warning!

- Risk of electric shock! The inverter shall be always treated as Live, the voltages and currents produced by the inverter have the capability to produce injuries or death. Always make sure that any wiring on the inverter happens while the inverter Rapid Shut Down button is on the OFF position.

- When operating equipment, in addition to following the general precautions outlined at this document, follow the specific safety requirements applicable in your city/country.
- Only the accessories supplied together with the inverter shall be used. 3rd party accessories may generate potential safety risks including risk of fire, electric shock, or injuries to person.
- Make sure that existing wiring is in good condition and that the wire gauge correspond to the ones recommended at this manual. Undersized wire gauge can be dangerous and cause potentially an electrical fire.
- Do not disassemble any parts of inverter which are not mentioned in installation guide. It contains no user-serviceable parts. See the Warranty section for instructions on obtaining after sale service assistance for your unit. Attempting to service the inverter yourself may result in a risk of electric shock or fire and will void your warranty.
- This unit is not suitable for installation near flammable Liquids/Gases or explosive materials.
- The equipment should be installed away from corrosive substances/environment.
- Coastal installation: while the equipment is rated for IP65 coastal installations require the use multicore jacketed cable to allow adequate seal by the cable grommets. Condensation may occur inside of the equipment if Cable grommets allow moisture inside of the unit. The unit external coating is not rated for coast front installation directly subject to Sea Spray.
- Outdoor installations: It is not recommended to install the equipment outdoor particularly at hot and sunny locations. Direct sun will increase considerably the temperature inside of the unit and will reduce its useful life.
- Authorized service personnel must use insulated tools when installing or working with this equipment. High DC voltage is present inside the inverter, this could result on personal injuries if not handled correctly.
- Never touch either the positive or negative pole of the PV input Terminals, potentially dangerous voltages could be present. It is strictly forbidden to short both terminals of the

PV inputs, this could cause an explosion.

- The unit contains capacitors that remain charged to a potentially lethal voltage after the MAINS, Battery and PV supply has been disconnected. Always treat the DC terminals at the inverter as live.
- Hazardous voltage will be present for up to 5 minutes after disconnection from power supply.
- When working at the wiring box of the inverter, it is very important to wait at least 5 before working with the connections inside the wiring box, this will allow the electrolyte capacitors inside the device to discharge and will make the device safe to use.
- Surge protection devices (SPDs) are mandatory for PV installation

WARNING !

Over-voltage protection with surge arresters should be provided when the PV power system is installed.
The grid connected inverter is not fitted with built in SPDs in both PV input side and MAINS input side.

- Lightning can cause a damage either from a direct strike or from surges due to a nearby strike if no adequate surge protection is installed.
- Induced surges are the most likely cause of lightning damage in majority or installations, especially in rural areas where electricity is usually provided by long overhead lines. Surge protection must be included on both the PV array inputs and the AC wiring connected to the inverter.
- Specialist advice in lightning protection should be consulted during the installation design. A lightning protection system (LPS) will utilize its own separate circuit to discharge a direct lightning strike and is never connected to the standard earthing protections of the equipment.
- To protect the DC inputs to the system, a surge suppression device (SPD type 2) should be fitted at the combiner box in between the solar array and the inverter, if the voltage protection level (VP) of the surge arresters is greater than 1100V, an additional SPD type 3 will be required.
- To protect the AC input to the system, surge suppression devices (SPD type2) should be fitted at the main incoming point of AC supply (at the consumers cutout), located between the inverter and the utility main feeding point/meter.
- All the DC wiring should be installed to provide as short a run as possible, and positive and negative cables of the Solar String or main DC supply should be bundled together. Avoiding the creation of loops in the system. These loops can cause communication issues within the equipment.
- Spark gap devices are not suitable to be used in DC circuits, specialized DC circuit breakers must be used for the Battery circuits.

➢ Anti-Islanding

The utility defines an Islanding event a situation where an embedded generator (in this case an inverter) which is grid-connected remains energize and producing and injecting power onto the Electrical Grid after this has been de-energized. This is a potentially dangerous situation for maintenance personnel and the public in general and it is strictly forbidden by utilities.

The REVO series of inverters provide Active Frequency Drift (AFD) protection to make sure that the energy exports onto the grid are suspended in the event of an islanding event. The operation of this feature complies with local and international requirements of time of response in the event of an islanding event.

➢ PE Connection and Leakage Current

•The end-use application shall monitor the protective conductor by residual current operated protective device (RCD) with rated fault current Ifn≤240mA which automatically disconnects the device in case of a fault.

The device is intended to connect to a PV generator with a capacitance limit of approx. 700nf.

WARNING !

High leakage current!

Earth connection is essential before connecting supply.

Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic.

➢ Battery Safety Instructions

The REVO series of hybrid inverters is designed to operate with low voltage battery systems (48-60vdc), please refer to section 4.3 for more information regarding the specific parameters concerning the battery such as battery type, nominal voltage, nominal capacity etc.

As chemical batteries may contain a significant amount of potential energy, the following precautions should be observed during battery installation to avoid potential electric shocks or short-circuits which could result on series injury, equipment damage or both:

1: Do not wear watches, rings or similar metallic items while performing battery connections.

2: Use insulated tools.

3: Use rubber shoes and gloves.

4: Do not place metallic tools and similar metallic parts on the batteries. Accidents can occur if a metal tool shorts by accident the battery terminals.

5: Always Switch off the battery connection to the inverter before working on the batteries..

2.2 Explanation of Symbols

This section gives an explanation of all the symbols shown on the inverter and on the type label.

Symbols on the Type Label

	CSA certified
	This symbol indicates that you should wait at least 5mins after disconnecting the inverter from the utility grid and from the PV panel before touching any inner live parts.
	keep dry! The package/product must be protected from excessive humidity and must be stored under cover.
	Refer to the operating instructions.
	fragile - The package/product should be handled carefully and never be tipped over or slung.
	Products should not be disposed as household waste.
	No more than six identical packages being stacked on each other
	Components of the product can be recycled.
	Danger of hot surface!
	Danger of high voltage and electric shock!
	Caution! Failure to observe a warning indicated in this manual may result in injury

3. Introduction

3.1 Basic features

The REVO Series of inverters is a Solar high-frequency inverter which can convert solar energy to AC energy and store/discharge energy to/from a battery bank. The inverter comes with a host of energy priority modes which allows efficient energy usage, this includes energy self-consumption, battery energy according to time of use, energy exports to the Utility grid and many more. Working modes are configured to respond to available solar energy and user preferences. Off grid operation is possible and the unit can provide power for emergency use during power outages by using the energy from battery and Solar feeds.

The REVO Series of inverters is capable of paralleling both in single and 3 phase for larger system applications.

3.2 System Diagram

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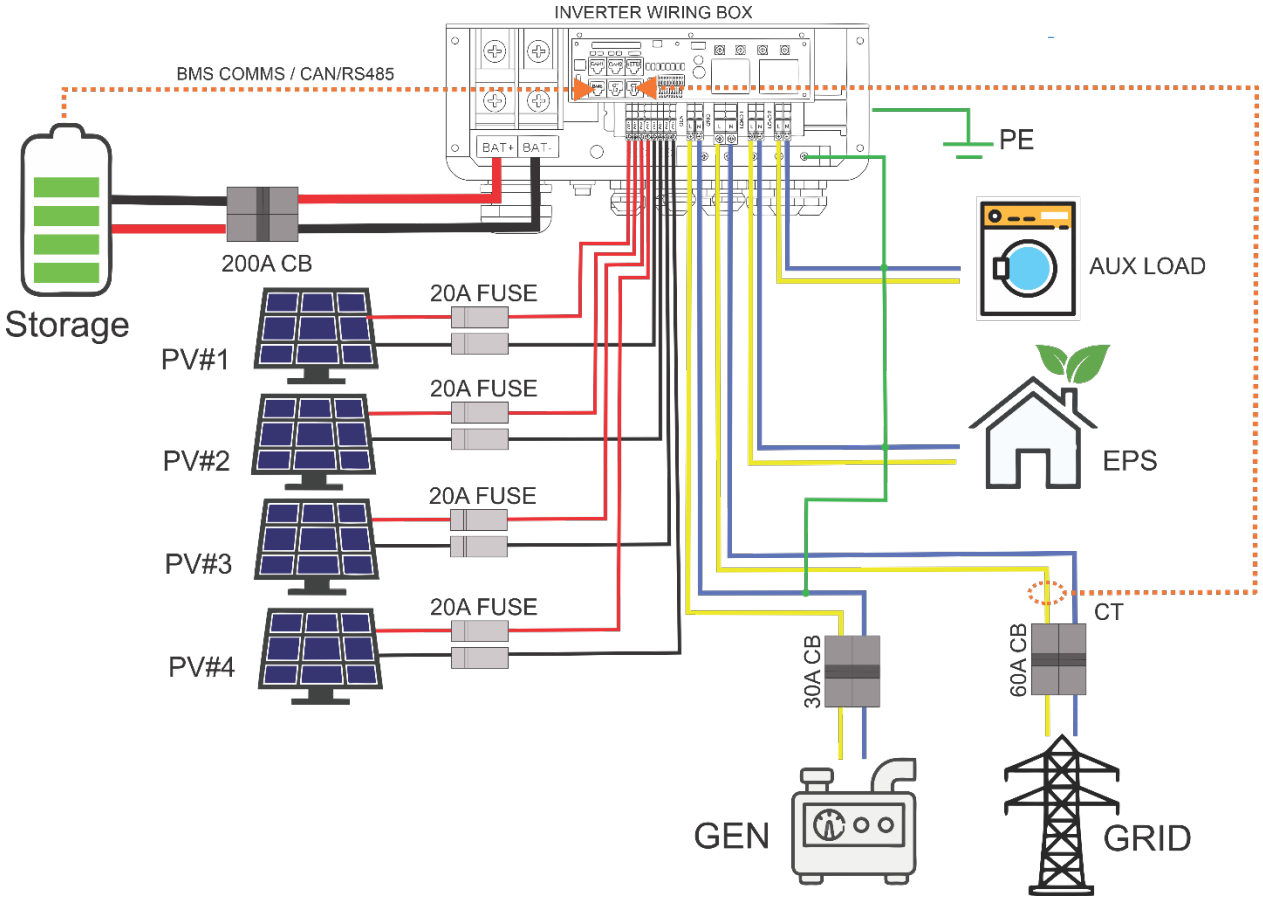
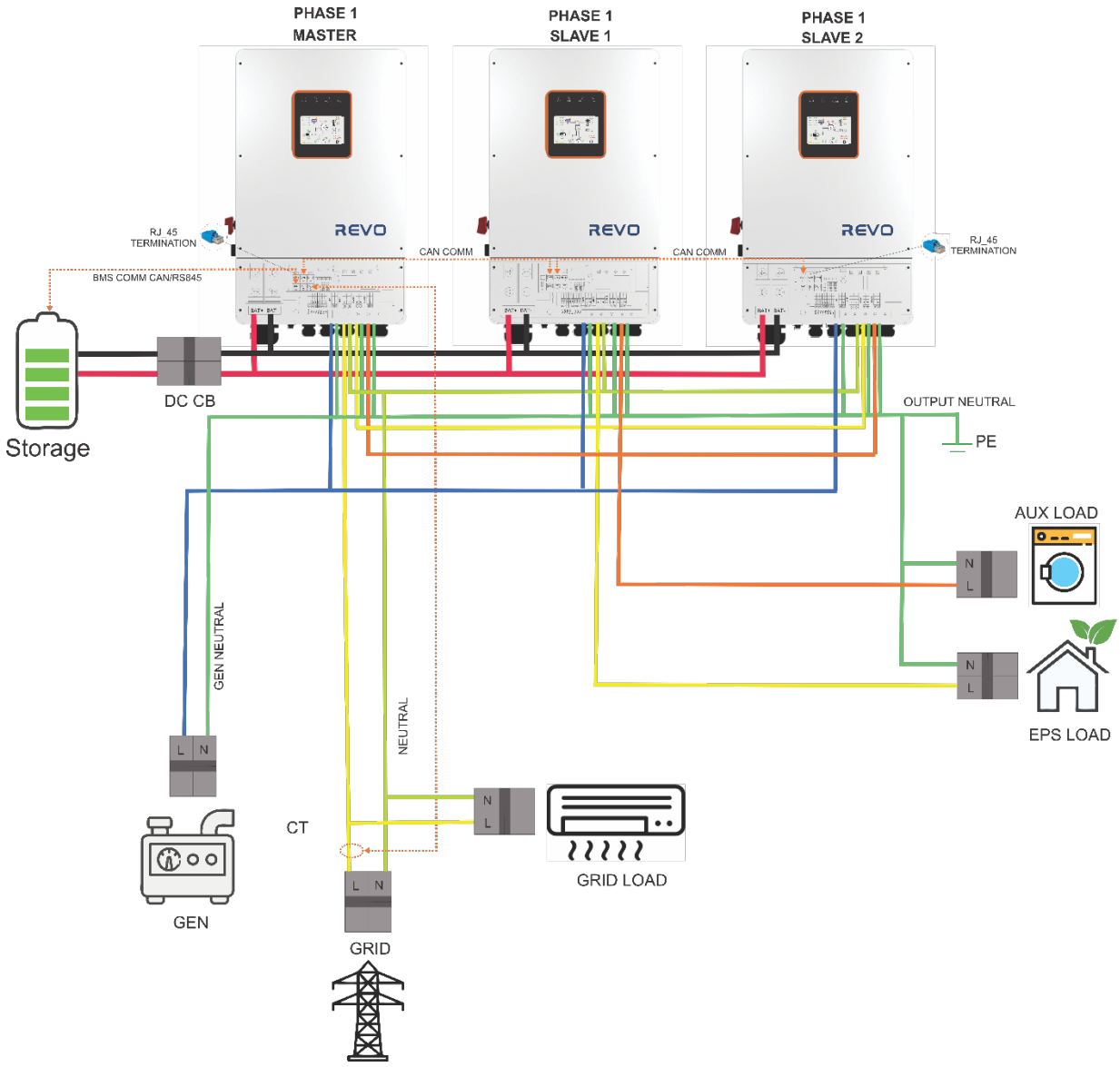
3.21 Single Phase wiring Diagram

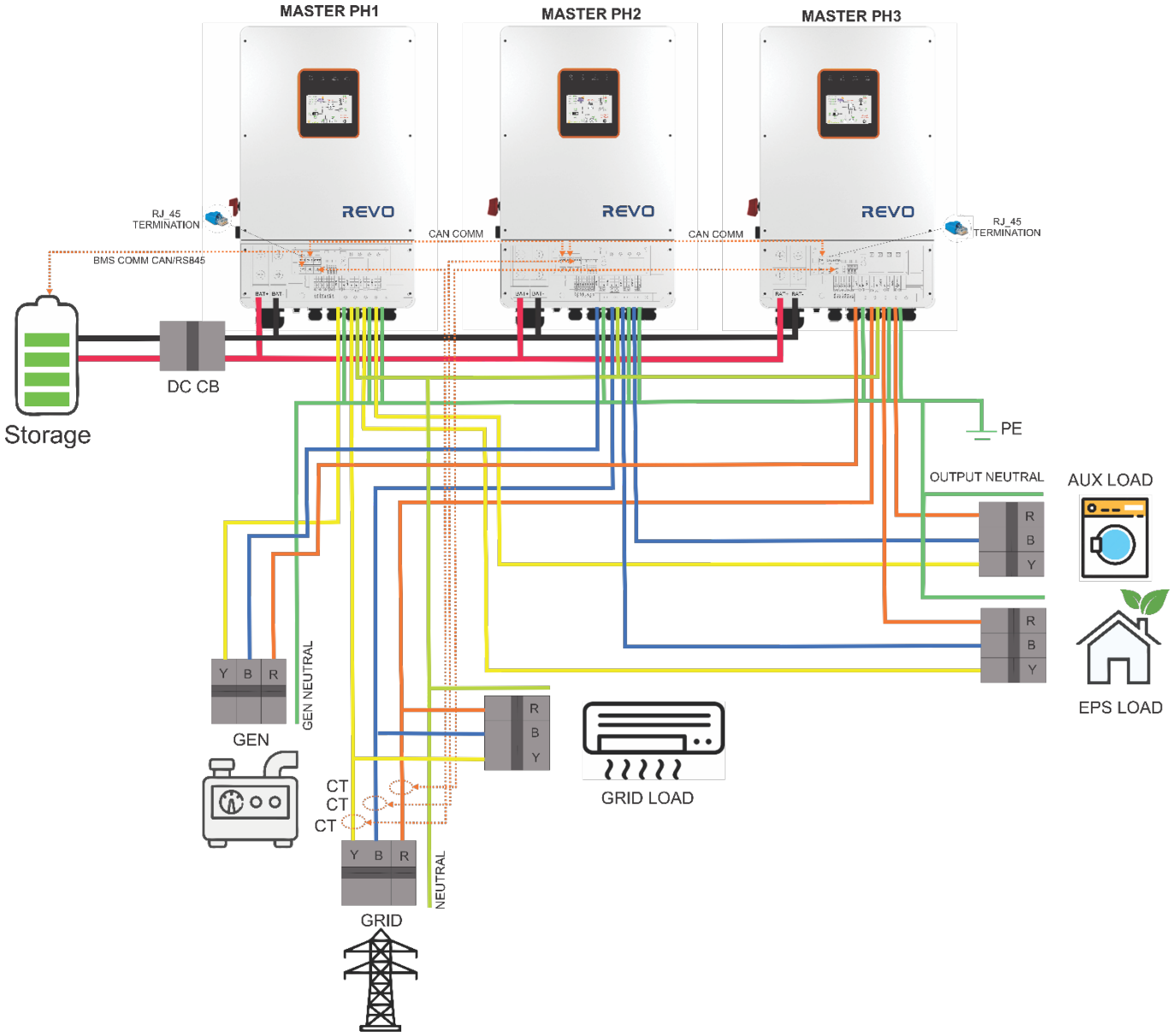


3.2.2 Single Phase Parallel / Multi-unit Wiring Diagram



- If the current per phase exceeds the rating of the supplied Current Transformers, adequate size current transformers need to be used. Alternatively, a compatible RS485 meter can be used connected to the Meter RS485 port at the wiring box of the Master Inverter oh Phase 1.
- Please note that during Grid-Tied to Off-Grid operations there is a small gap on grid relays operation, therefore the max AC pass through current is limited to 60 Amps per phase with multi-Unit applications. Higher currents can cause grid relays to be damaged.
- A maximum of 3 inverters can be connected in Single phase configuration.
- Output Neutral and Generator neutrals must be bonded to earth to make sure neutral voltage is zero while operating in off grid mode. Depending on applicable grid code the bonding can be permanent, or a relay can be used using the appropriate Dry Contact signal for Grid Off.

3.2.3 3 Phase Parallel / Multi-unit Wiring Diagram



- If the current per phase exceeds the rating of the supplied Current Transformers, adequate size current transformers need to be used. Alternatively, a compatible RS485 meter can be used connected to the Meter RS485 port at the wiring box of the Master Inverter of Phase 1.
- AC Energy sources must always have the same phase rotation, in this case Clockwise rotation (0-120-240 degrees).
- A maximum of 6 inverters can be connected in 3 phase configuration (2 inverters per phase)
- Output Neutral and Generator neutrals must be bonded to earth to make sure neutral voltage is zero while operating in off grid mode. Depending on applicable grid code the bonding can be permanent, or a relay can be used using the appropriate Dry Contact signal for Grid Off.

3.3 Work Modes

Work mode: Self-Usage (Maximum Energy Harvest)

1. **When PV, Grid and Battery are available**:
    a. Solar Energy provides power to the loads as first-priority, if solar energy is sufficient to power all connected loads, excess solar energy will be used to charge the Battery. If Exports are allowed any further excess will be feed to the grid.
    b. Solar Energy provides power to the loads as first-priority, if solar energy is not sufficient to power all connected loads and SOC> Grid Support SOC both battery and PV will supply the loads until such time the SOC reaches grid support SOC.
    c. Solar Energy provides power to the loads as first-priority if solar energy is not sufficient to power all connected loads and SOC<= Grid Support SOC both Grid and PV will supply the loads while the battery is kept at the Grid Support SOC (Effectively keeping a reserve on the battery bank on the Grid support SOC point to supply energy on the event of a grid failure).
2. **When PV and Grid are available (without battery)**:
    a. Solar Energy provides power to the loads as first-priority, if solar energy is sufficient to power all connected loads, excess solar energy will be used to be feed to the grid.
    b. Solar Energy provides power to the loads as first-priority if solar energy is not sufficient to power all connected loads Grid and PV will supply the loads at the same time.
3. **Off-Grid Only PV+battery or only Battery available**:
    a. Solar Energy provides power to the loads as first-priority, if solar energy is sufficient to power all connected loads, excess solar energy will be used to recharge the battery.
    b. Solar Energy provides power to the loads as first-priority, if solar energy is not sufficient to power the load both battery and PV will supply loads until such time Cut Off SOC is reached.
    c.

Work mode: Battery Priority (Battery Recharge Priority)

1. **When PV, Grid and Battery are available**:
    a. Solar energy will charge batteries as priority up to the maximum value allowable by the BMS or current limit set on the Battery settings page. If there is Solar energy excess after battery recharge this will be supplied to the loads. If exports are enabled and there I still any excess energy this can be feed to the grid or export to the CT.
    b. Solar energy will charge batteries as priority up to the maximum value allowable by the BMS or current limit set on the Battery settings page. If there is still Solar energy excess this will be supplied to the loads. If this excess is not sufficient to power the loads the Grid and the excess Solar energy will power the loads together.
    c. Solar Energy provides power to the loads as first-priority if solar energy is not sufficient to power all connected loads and SOC<= Grid Support SOC both Grid and PV will supply the loads while the battery is kept at the Grid Support SOC (Effectively keeping a reserve on the battery bank on the Grid support SOC point to supply energy on the event of a grid failure).
2. **When Grid and battery are available (without Solar feed)**:
    a. Grid will recharge batteries until full and supply loads.
    b. After batteries are full grid will continue to supply loads and battery does not discharge.
3. **Off-Grid All conditions. PV+Battery or Battery available**:
    a. Solar Energy provides power to the loads as first-priority, if solar energy is sufficient to power all connected loads, excess solar energy will be used to recharge the battery.
    b. Solar Energy provides power to the loads as first-priority, if solar energy is not sufficient to power the load both battery and PV will supply loads until such time Cut Off SOC is reached.

Work mode: Peak Shaving (Time Based Charge and Discharge Schedule)

General: 6 Times slots available for Charge/No Charge/Discharge per day.

1. **When PV, Grid and Battery are available**:
    a. During charge times (Solar Production times or Low Grid Tariff times), solar energy will charge battery as priority, excess energy will be used to power the loads. If exports enabled any additional excess will be exported to the Grid.
    b. During charge times (Solar Production times or Low Grid Tariff times), solar energy will charge battery as priority, excess energy will be used to power the loads. If excess solar energy is not sufficient to power the loads Grid and Solar energy will both supply the loads together.
    c. During discharge times (Peak Tariff times), solar energy if available will provide power to loads as priority, if there is excess power this will be used for battery charge. If Solar is insufficient to power loads battery and solar will power loads together. If solar is unavailable battery will discharge to avoid grid usage and will cover all the load demands.
    d. During No Charge/No Discharge periods solar energy will be used to supply the loads as a priority and any excess will be exported to the grid (if energy exports are enabled).
2. **When Battery and Grid are available (No Solar feed)**:
    a. During charge times grid will charge battery and supply the loads at the same time.
    b. During discharge times battery will supply all loads and if exports are enabled battery power will be exported to the grid up to the desired export setting.
    c. During discharge times, if power demands exceed maximum battery allowed output both grid and battery will supply the loads.
3. **Off-Grid Only PV and Battery available**:
    a. Solar Energy provides power to the loads as first-priority, if solar energy is sufficient to power all connected loads, excess solar energy will be used to recharge the battery.
    b. Solar Energy provides power to the loads as first-priority, if solar energy is not sufficient to power the load both battery and PV will supply loads until such time Cut Off SOC is reached

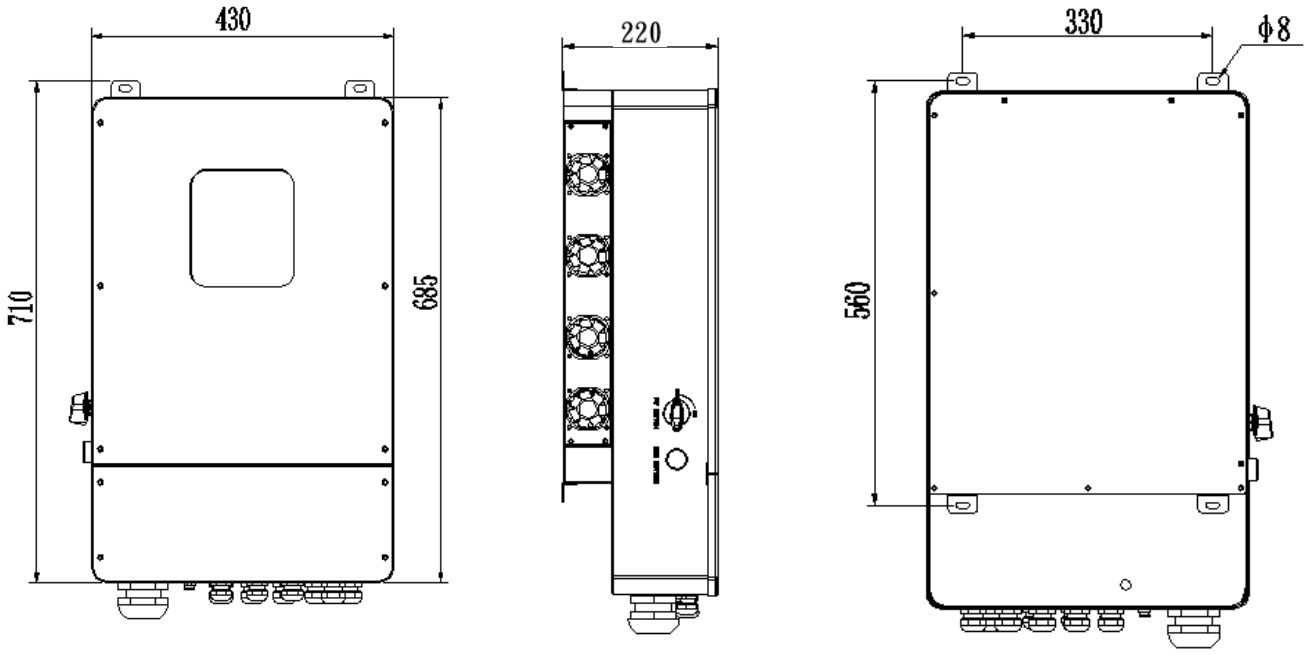
Work mode: Time of Use (Time Based Grid Support Schedule)

General: 6 Times slots available for individual grid support assignment.

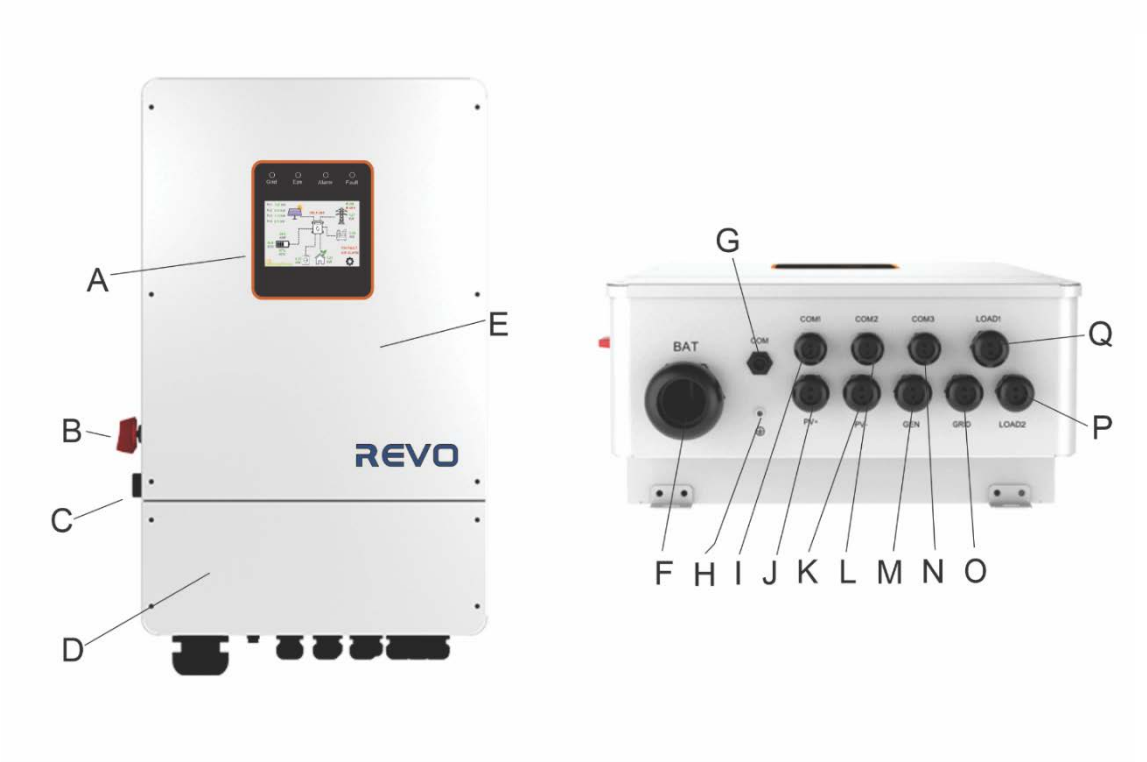
1. **Grid Support Behavior per Time Slot**:
    a. Each 24 hrs period is divided on 24 hrs configurable periods.
    b. At each time slot an individual Grid Support SOC can be selected. When the grid is available battery will never drop below this setting.
    c. The Energy priority is identical to the Self Usage mode. Refer to Self-Usage mode section.
    d. Each time slot can select if Grid charge is permissible or not.
    e. Each time slot can select if Generator usage is permissible or not. Generator page settings will control if generator can charge batteries and at which rate. Refer to generator section for more information.
    f. Maximum inverter Output can be selected for each time slot, it is recommended to be kept at inverter nominal output Power rating (ie: 8000 Watts for REVO8KL)
    g. All 6 times slots need to be configured and the time slots need to cover the entire 24 hrs period.
    h. Grid Recharge will commence each time that SOC drops below the Grid Support SOC for the specific time Slot and will stop once reached the Grid recharge stop SOC parameter.
    i. Excess Solar energy will be exported if available as per the Self Usage logic described above after the SOC has reached the Grid Support SOC selected for the specific time Slot.

3.4 Dimensions and weights

Make sure the inverter is intact during transportation. If there is any visible damage, such as cracks, please contact your supplier immediately. Inverter weights 41kg, it is recommended for at least 2 people to lift the equipment for handling and Installation.

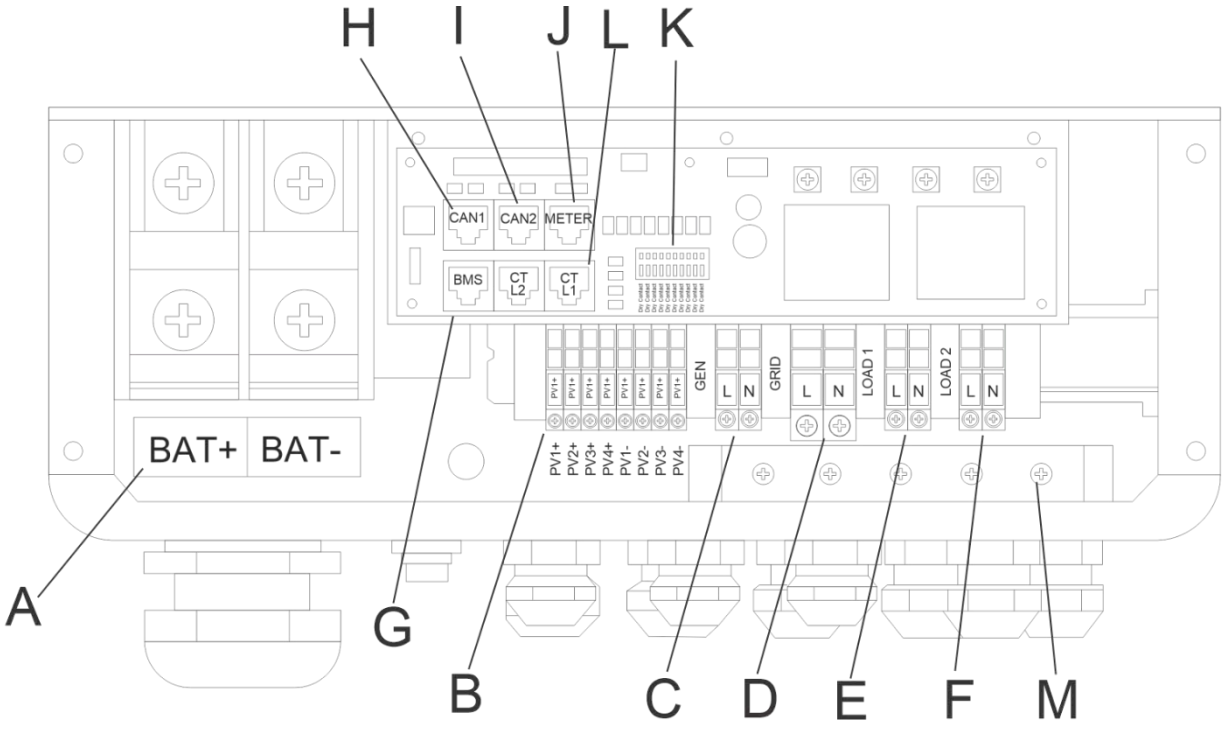


3.5 External Components



A	Battery Connections
B	PV Inputs (4 Inputs)
C	Generator Input Connection
D	Grid Input Connection
E	Load 1 Input Connection
F	Load 2 Input Connection
G	BMS CAN/RS485 RJ45 Connection
H	CAN Communication – Inverter Parallel
I	CAN Communication – Inverter Parallel
J	External Meter Communication RS485
K	Dry Contacts (Refer to Dry Contact Section)
L	CT Connection ports (Only L1 to be used)
M	Earthing Bar

3.6 Wiring Box Details



Item	Description
A	Battery Connections
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I	CAN Communication – Inverter Parallel
J	External Meter Communication RS485
K	Dry Contacts (Refer to Dry Contact Section)
L	CT Connection ports (Only L1 to be used)
M	Earthing Bar

4. Technical Parameters/Specifications

Technical specification	REVO5KL	REVO6KL	REVO8KL	REVO10KL
Input (PV)				
Max. power(kW)	7.5	9	12	13
Max. DC voltage (V)	500			
MPPT voltage range(V)	120~500			
Max.Input single MPPT(A) / Short Circuit (A)	12A/15A			
MPPT tracker/strings	4/1			
AC Input				
Grid Input - Max. Passthrough Current (A)	50A			
Ac Input voltage(V)	230 (single phase) / 400 (3 phase parallel)			
Frequency (Hz)	50 Hz			
Generator Input - Max. Passthrough Current (A)	50A			
AC output				
Rated output power(kVA)	5	6	8	10
Max. output current(A) / Passthrough (A)	24/50	28.8/50	38.3/50	47.8/50
Ac output voltage(V)	230 (single phase) / 400 (3 phase parallel)			
Frequency (Hz)	50			
PF	0.8lagging-0.8leading			
THDi	< 3%			
AC output topology	Single Phase / 3 Phase (Parallel)			
Battery				
Battery voltage range(V)	40~58			
Max. charging voltage(V)	58			
Max. charge/discharge current(A)	120/120	135/135	190/190	210/210
Battery type	lithium /Lead-acid			
Communication interface	CAN/RS485			
EPS output				
Rated power(kVA)	5	6	8	10
Rated output voltage(V)	230 (single phase) / 400 (3 phase parallel)			
Rated output current(A)	24	28.8	38.3	47.8
Rated frequency(Hz)	50			
Automatic switching time(ms)	<20			
THDu	< 2%			
Overload capacity	125%,60S/150%,1S			
General data				
IEC Max. efficiency	≥98.2%			
UL North american efficiency	≥97.2%			
Ingress protection	IP65/NEMA 3R			
Noise emission(dB)	<25	<29	<29	<29
Operation temperature	-25℃ ~ 60℃			
Cooling	Natural			
Relative humidity	0 ~95% (non-condensing)			
Altitude	2,000m(>2,000 Derating)			
Dimensions W *D *H (mm)	430*220*710			
Weight(kg)	41			
Isolation transformer	No			
Self-consumption(W)	<3			
Display and communication				
Display	LCD, touch screen			
Interface:RS485/Wifi/4G/ CAN/DRM	Yes WIFI Included (Solarman)			
Safety standard	UL1741SA all options, UL1699B, CSA 22.2			
EMC	FCC Part 15, Class B			
On-grid	UL 1741:2021, IEEE 1547.1, UL1699B, South Africa NRS097-2-1			
Parallel configuration				
Single phase parallel	4PCS per phase - MAX 50 AMPS			
3 Phase parallel	2PCS per phase - 6PCS TOTAL / MAX 50 AMPS per phase			

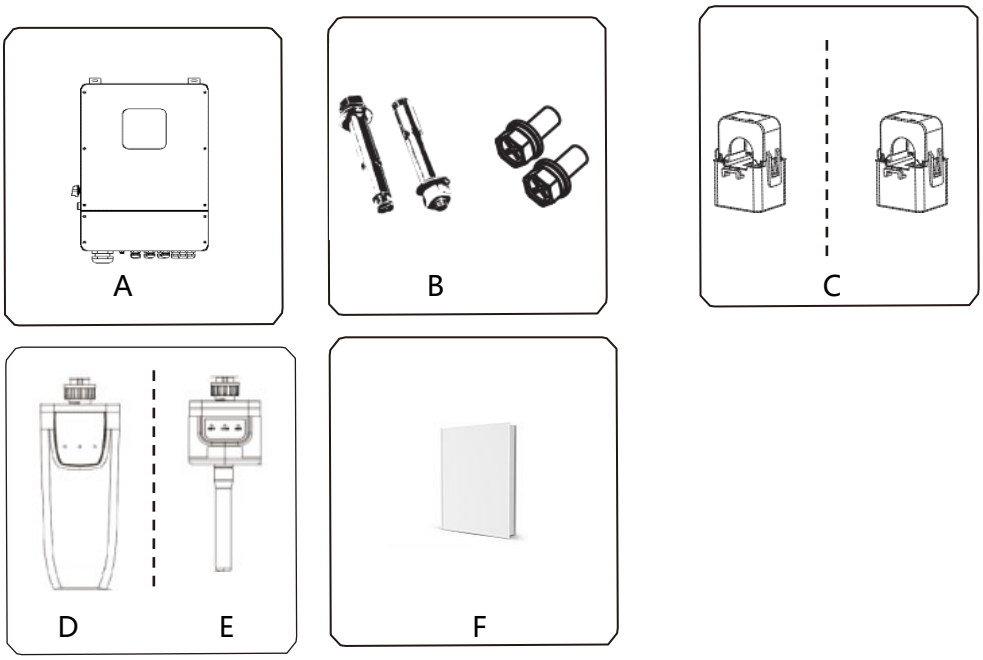
5. Installation

5.1 Check for Physical Damage

Make sure the inverter packaging does not show signs of water ingress of impacts. If there is any visible damage, such as packaging tearing or signs of impacts, please contact your supplier immediately.

5.2 Packing List

Open the box and unpack the unit from its protective packaging, please check the accessories first to make sure all are included. The packing list shown as below.

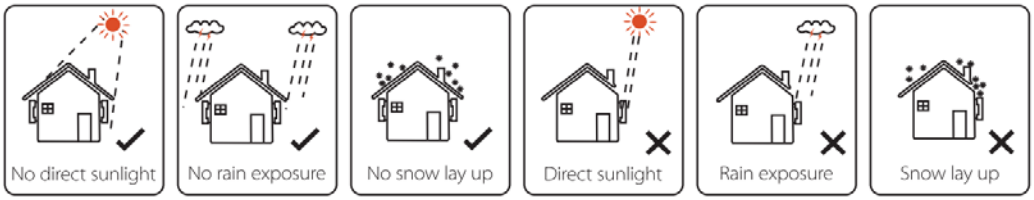


Object	Description
A	Inverter
B	Expansion screws and pan-head screws
C	CT
D	GPRS module (optional)
E	WiFi module
F	User manual

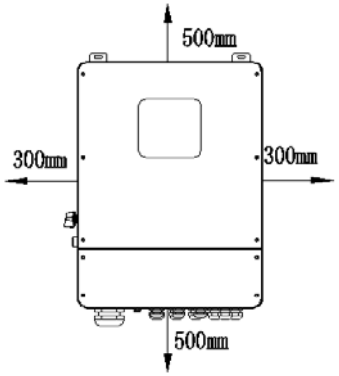
5.3 Installation Precautions

- Installation Precautions: Make sure the installation site meets the following conditions:
- ◆ Is not recommended to install directly under sunlight, this can generate equipment over heating and shorten the lifespan of the unit considerably.
- ◆ Inverter is not suitable to be installed near Flammable materials.
- ◆ Never install at an area with potential explosive gases.
- ◆ If ambient reaches temperatures below 0 degC, always install indoors.
- ◆ Never installed directly facing the shore (Sea water salt spray). Equipment is not designed for resistance to corrosive liquids or Sea Water spray.
- ◆ Inverter max power will be de-rated on altitudes above 2000m ASL.
- ◆ Max Non-Condensing Humidity (<95%).
- ◆ Good ventilation is fundamental, never install inside Kitchen Cupboards, closets, etc.
- ◆ Allowable temperature range: -20℃ to +60℃.
- ◆ The wall selected for installation should meet the following conditions:
  1. solid brick/concrete, or mounting surface of equivalent strength.
  2. For Dry Wall or similar type of walls special anchors must be used (Do not use the ones supplied on the equipment packaging).

Please AVOID direct sunlight, rain exposure, snow laying up during installation and operation.



- **Min Recommended Ventilation - Space Requirements**

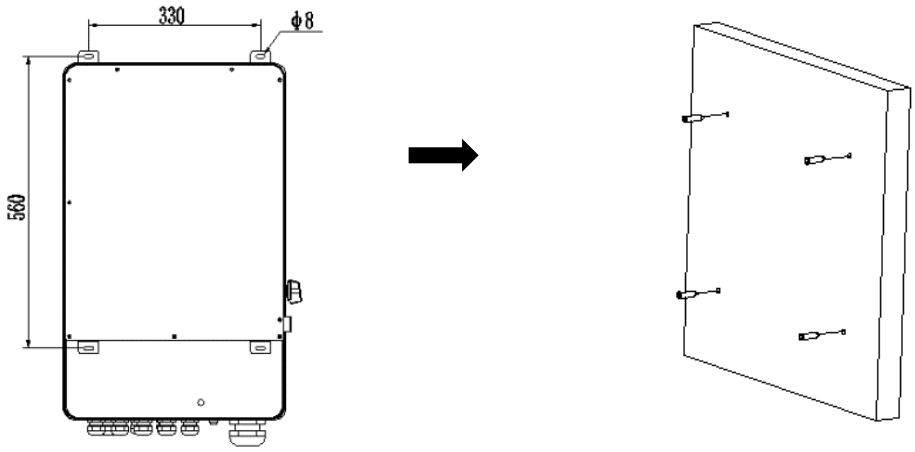


Position	Min.size
Left	300mm
Right	300mm
Top	500mm
Bottom	500mm
Front	1000mm

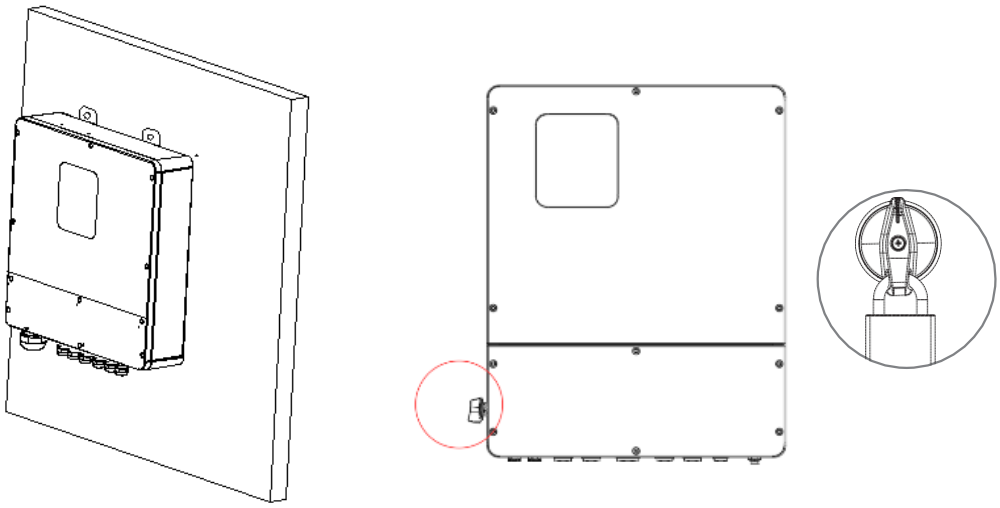
➢ Physical Installation:

Tools required for installation.
Installation tools: Electric Drill, Hammer, Screwdriver (flat head and Philips head), adjustable wrench, ratchet socket set, Allen Key, etc.

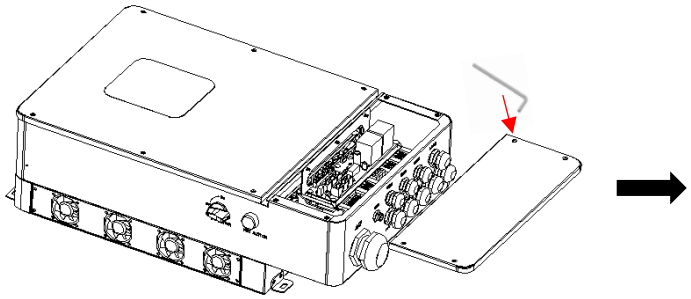
Step 1: Drill 4 holes in the wall according to the distances at the figure below, depth will be at least 50~60mm or as long as necessary for the supplied wall anchors. Use a hammer to fit the expansion bolt into the holes.



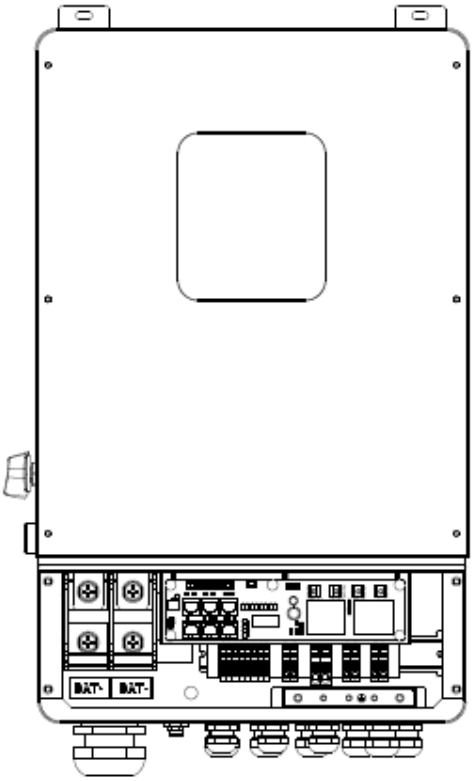
Step 2: Lift the inverter and align the holes of the inverter with the expansion bolt, Fix the inverter to the wall.
Step 3: Tighten the nuts on the expansion bolts，and install an anti-theft lock on DC switch of the inverter



Step 4: Remove the wiring cover screws with an Allen Wrench and remove the cover. Apply slight pressure with a flat head screwdriver on the sides of the wiring cover to release the gasket pressure and remove the waterproof cover. The wiring box comes with pre-installed with Conduit fittings/glands, Conduit fittings are provided for 1 inch conduit. If conduit to be used is not 1 inch in size, an appropriate conduit adaptor should be used.



Step 5: Install the conduits and fasten the joints. Please note that this cable connections will affect the inverter IP65 rating and improper/loose connections will allow dust and moisture to enter he inverter.



6. Electrical Connection

6.1 PV connection (Solar Inputs)

The REVO series of inverters is equipped with 4 independent PV inputs. Before starting the electrical wiring of the Solar strings please calculate carefully the expected operational voltages of the Solar Inputs. **The Open-circuit voltage of each solar input once adjusted by minimum expected site temperature should be less than the Max. allowable Inverter DC input voltage; Normal operating voltage (Vmp adjusted by Max expected temperature) shall be within the allowable MPPT voltage range as per the equipment datasheet**.

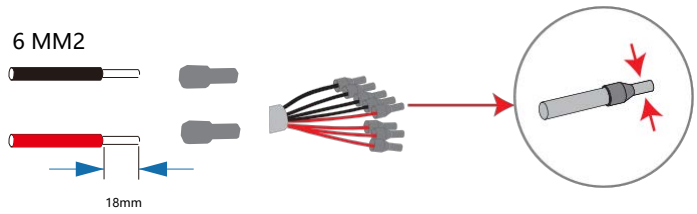
Warning!

- PV voltage can be very high and needs to be treated carefully.
- Always verify correct PV Strings Polarity prior to connection to the inverter, failure to do so can cause damages to the inverter and or to the Solar PV modules diodes.
- Never disconnect a Solar String from the inverter before opening the PV Isolator on the inverter, or isolating the String at the combiner. Failure to do this could originate a DC current arc at the connector, potentially damaging both connectors as well as potential operator injuries.
- Both positive and negative polarities are connected to the inverter without the need of Positive or negative ground arrangements on the solar inputs. The Solar inputs are floating, not grounded.
- Combiner box earth needs to be connected to Inverter chassis for Ground Fault Monitoring to be effective. Inverter chassis must be connected to the system main earth connection.

Step1. String Wiring.

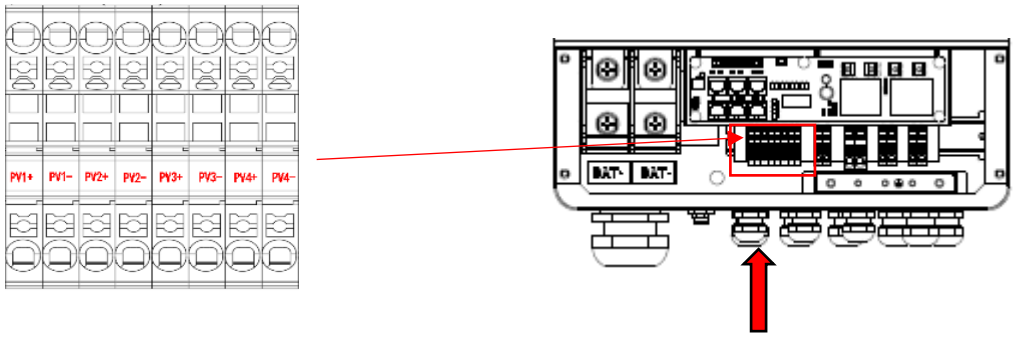
1.1 An adequate conductor rated for the PV string Voltage must be used. It is recommended to use 1000VDC UV stable cable for these connections. 6mm2 Solar cable is recommended for up to 13Amps Isc. 10mm2 cable gauge will be required for larger current up to 20Amps per input.

1.2 Remove 18mm of insulation from the end of wire and install a cable lug



Step2. Slide the PV input cables via the conduit ports and Connect PV cables to PV terminals.

It is recommended to tighten connections hand tight, do not apply excessive torque to the connector block, otherwise the risk of stripping the connector is possible.



Step3. Close PV isolator on the side of the inverter and verify all the strings have voltage at the PV terminals of the wiring box and that the string polarity is correct.

Please note that the usage of adequate fuses and surge arrestors on the PV inputs is mandatory for warranty purposes.

6.2 Grid/Generator Connection

Step1. Check the grid voltage.

1.1 Check the grid voltage and compare with the permissive voltage range (Please refer to technical data). Verify that grid Neutral to earth voltage is close to zero,

1.2 For 3 Phase operations verify the Phase-to-Phase voltage to be according to the local grid requirements and that the phase rotation correspond to a Clockwise rotation. Feed the inputs on the same clockwise rotation, ie: Master Ph1 at 0 deg Phase, Master Ph2 at 120 deg phase and the Master of Ph3 to the 240 deg phase.

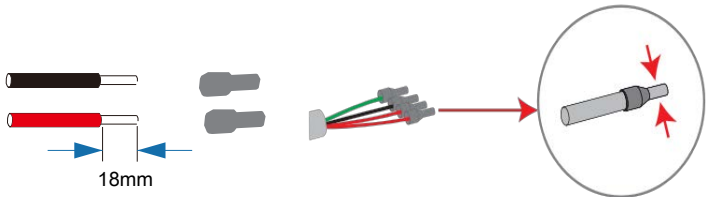
1.2 Open the Main Grid Isolation breaker and verify that grid voltage is zero before starting live connections on the inverter. Never make a connection with live conductors.

Step2. Conductor Size selection

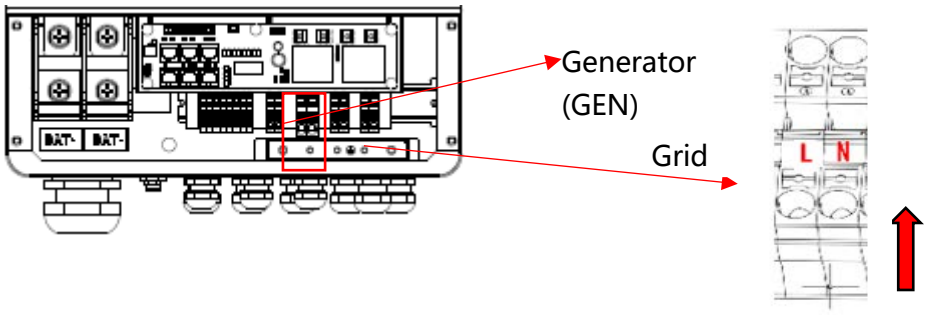
Use the right pin terminal from the accessory box. Press the connectors on cable conductor core tightly.

Model	REVO5KL	REVO6KL	REVO7K6L	REVO8KL
Cable	4MM2		6MM2	

Step3. Choose the appropriate cable lug to terminate the conductors according to its size. (Remove 18mm of insulation from the end of wire.)



Step4. Loosen the Grid input cable gland and slide the AC input wires through the grid port, Connect and tighten grid feed cables to Grid input terminals.



6.3 Back-up outputs: Load1 (EPS) and Load2 (Auxiliary Load)

The Inverter both on and off grid operation modes, while the equipment can supply power to both loads upstream and downstream the inverter when gris is available, two separate backup load outputs are provided to continue to supply power on the event of a power, these two outputs are described below:

- **Load 1 (EPS -Emergency Power Supply):** this output will supply power to dedicated loads for as long as necessary until the battery reaches its cutoff point.
- **Load 2 (Non-Essential Backup loads or Auxiliary Loads):** this output will supply power to the Auxiliary loads until a predetermined value of battery voltage or State of charge at which time the loads will be curtailed (EPS loads will remain active until battery reaches cut-off point)

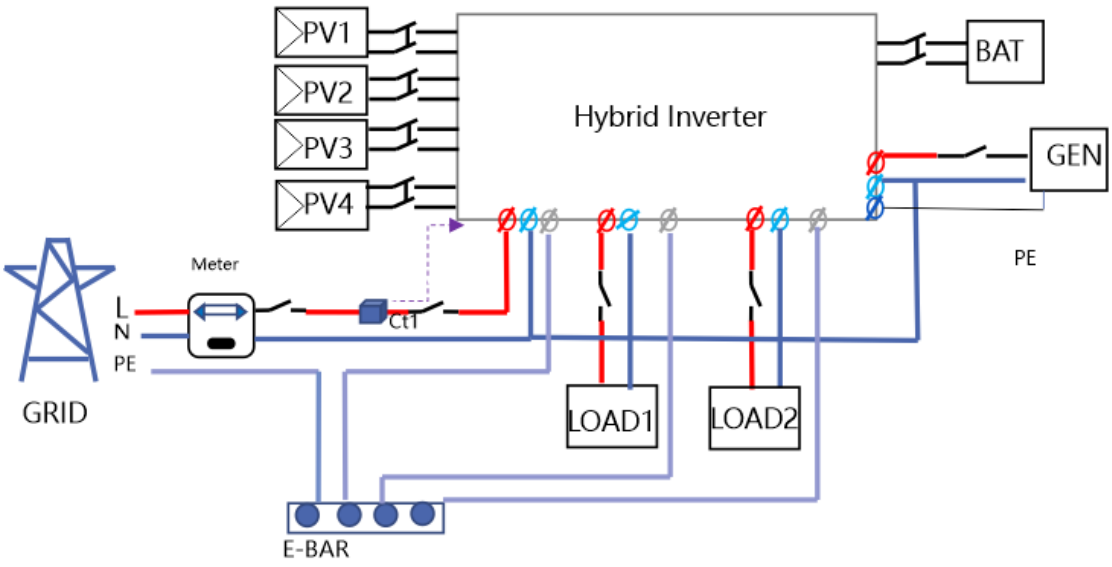
Important notes on usage of Load 1 and Load 2 ports:

Battery-less Applications: Typical equipment Installation involves the usage of a Solar Input and batteries. Nevertheless, it is possible to use the inverter on grid tied mode (without batteries) in which case the backup function must be always disabled. **Damages due to failure to disable Backup mode when running operating without batteries are not be covered under the standard warranty agreement.**

Maximum Load allowable: The inverter maximum rating depends on several factors including ambient temperature and the nature of the loads to be supported. Some loads as motors can overwhelm the inverter output and generate equipment damages. Always consider the peak current requirements of any motors to be connected to the inverter and make sure the startup peak current is always less than the inverter maximum current output. While the inverter has overload protection it must be always avoided to connect loads which will have low power factor since the reactive power capacity of the equipment is limited. Damages due to incorrect loads pairing t the inverter are not covered under the standard warranty policy

Neutral Wiring: The inverter has various modes of operation concerning neutral conductor configuration, both for Grid Tied and Off Grid situations.

- **Grid Tied mode:** During grid tied operations the input and output neutrals to the inverter are connected, the grid feed neutral should have been earthed at the main supply point and therefore the neutral will be grounded at the inverter output.
- **Off Grid Mode:** During off grid operations both the Live phase inputs and neutral are disconnected from the grid feed (Anti Islanding Feature), therefore a floating neutral is possible on the inverter output. To avoid this, two options are available; the output neutral can be permanently grounded (if the local wiring rules allow this and if there are no RCD devices connected upstream the inverter); or a bonding relay can be installed to connect the output Neutral to earth. This relay will be powered by the grid feed, neutral and earth will be connected on the Normally closed contacts of the relay. **Failure to bond the output Neutral with any of these methods could cause low voltage on the inverter output which could damage both the inverter and end user appliances**. None of this is covered under the standard warranty for the equipment.
- **Generator input Neutral:** Generator input neutral should **always be earthed** to the main grid supply earthing point.



➢ Back-Up: Load1 and Load2 Connection:

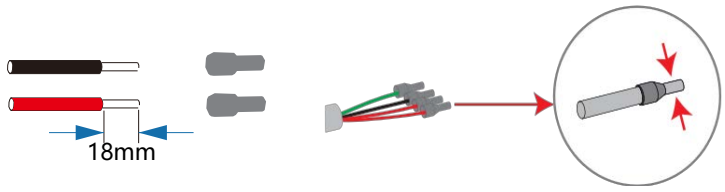
When using the Backup Output ports (Load 1 and Load 2) always install an adequate size circuit breaker to each of the Outputs. Recommended circuit breakers for single inverter installation are supplied at the table below.

Model	REVO5KL	REVO6KL	REVO7K6L	REVO8KL
Micro-breaker	32A		40A	

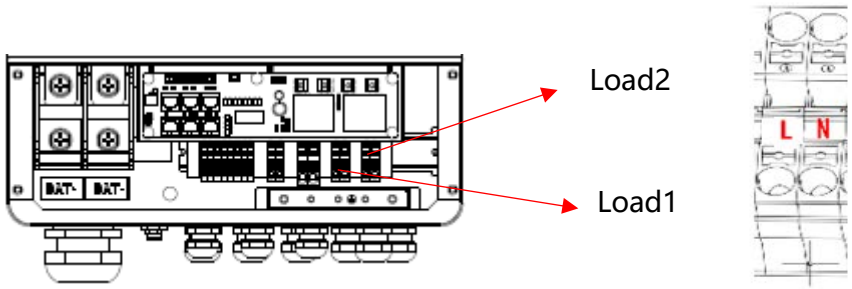
Note: The absence of an AC breaker on the back-up loads output side will lead to inverter damage if a short circuit occurs on the load side.

Step1. Install adequate cable lugs to the Load wiring. The recommended cable gauge for each inverter model is supplied at the table below.

Model	R5KLNA	R6KLNA	R7K6LNA	R8KLNA
Cable	4MM2		6MM2	



Step2. Connect the cables to the BACK-UP port: Load1 and Load2 port of the inverter.



➢ Requirements for BACK-UP load

Warning!

Make sure the BACK-UP loads power rating is within the inverter output rating, otherwise the inverter can trip on overload. If an overload trip occurs adjust the loads to make these fit within the inverter maximum output, clear the fault and restart the inverter. For non-linear loads, please make sure the inrush power is within the inverter output range, failure to do so can cause equipment damages.

6.4 Battery Connection

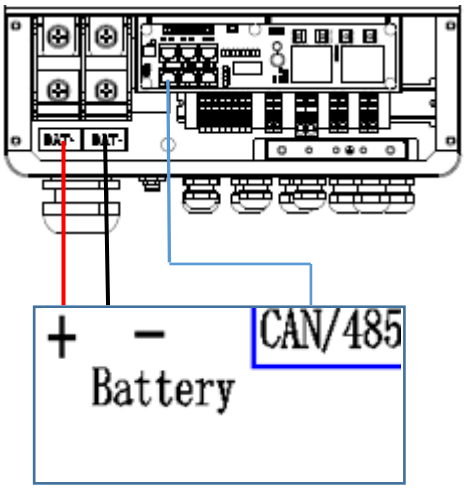
The REVO Hybrid series of inverters are designed for a nominal battery bus of 48V and predominantly usage of lithium batteries. Before choosing a battery, please note the maximum voltage of battery cannot exceed 58V and the battery communication should be compatible with Hybrid inverter via CAN or RS485. If in doubt of battery compatibility, please review the compatible battery list with your supplier/distributor.

➢ **Battery breaker**

Before connecting the battery, please install DC breaker to make sure inverter can be securely disconnected during maintenance and that the battery is protected for any potential inverter failures on the DC conversion section (Inverter DC input Short circuit). It is recommended to install as well adequate DC fuses on the Battery wiring as a failsafe to circuit breaker failures. This is a mandatory law requirement at certain countries, if in doubt check your local requirements before installing the equipment.

Model	REVO5KL	REVO6KL	REVO7K6L	REVO8KL
Current[A]	160A		250A	

➢ **Battery connection diagram**



- Always make sure that the battery bank is wired diagonally to guarantee a balanced charge and discharge of the battery bank.
- Please note that the BMS communication cable shall not be wired together with the main DC wiring from the battery bank to avoid cross talk on the CAN communication bus to the battery.
- BMS communication cable shall be a twisted pair cable with appropriate RF shielding.

➢ **BMS PIN Definition**

Communication interface between inverter and battery can be either RS485 or CAN with a RJ45 connector.

	PIN	1	2	3	4	5	6	7	8
CAN	Definition	X	X	X	BMS_CANH	BMS_CANL	X	X	X
RS485	Definition	X	X	X	X	X	GND	BMS_485A	BMS_485B

Very important: When using RS485 protocol, please note that PIN2 must be disconnected!

Note!

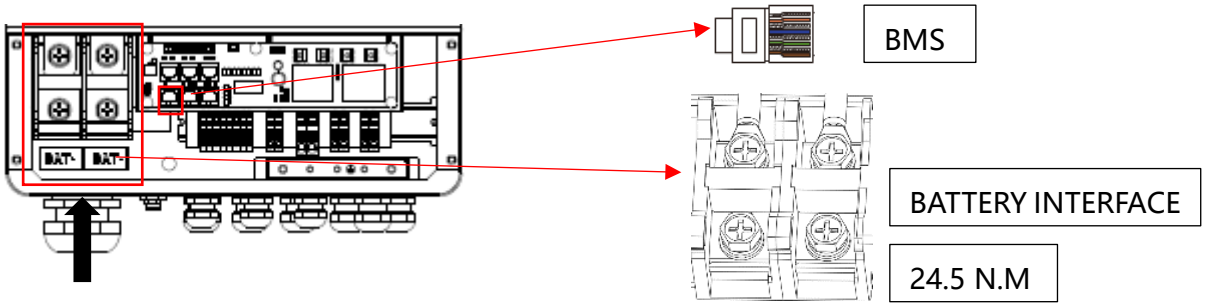
The battery communication can only work when the battery BMS is compatible with the inverter as per the list of approved batteries, if in doubt please ask.

➢ **Power Connection Battery**:

Step1

Choose the appropriate cable gauge size for the maximum DC current rating of the inverter, min recommended size is 25mm2 or 2 AWG. Always use a cable lug of the appropriate size for the battery cable connected to the inverter. Make sure the cable lug is crimped securely using an adequate crimping tool with the right socket. It is recommended to always cover the cable lug with heat shrink to avoid moisture to get in between cable and cable lug. Inverter battery connection port uses an M8 bolt for cable lug fastening.

Step2. Insert the battery cables through the battery port at the wiring box. Connect battery cables to battery terminals. Do not exceed the recommended tightening torque (25.4 NM).



Very Important Note!
Reverse polarity on the battery connection will damage the inverter, this instance is not covered under the inverter standard warranty. Always carefully verify battery polarity before making the battery wiring connection at the inverter.

6.5 Meter Connection

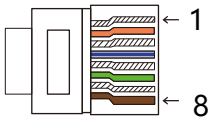
In applications where either the metering point distance is too far from the inverter (making impractical the usage of CT) or where the metering with CTs is not conducive, a compatible meter can be used to monitor the grid usage for the system.

Note!

Please note that the meter communication only works when meter is compatible with the inverter. If in doubt consult with your distributor/supplier about the compatible meters list for the inverter.

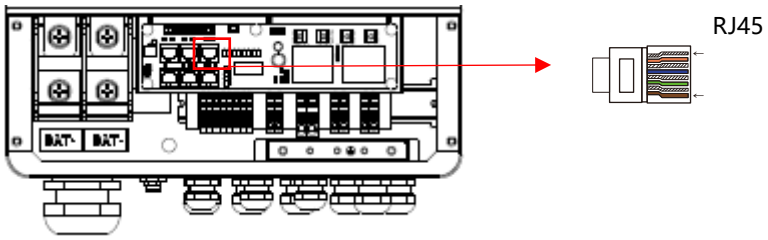
➢ Meter PIN Definition

The communication interface between inverter and meter is RS485 with a RJ45 connector provided inside the wiring box of the inverter.



1	2	3	4	5	6	7	8
IGRID_AP_I	IGRID_AN_I	IGRID_BN_I	IGRID_CP_I	IGRID_CN_I	IGRID_BP_I	RS485_A	RS485_B

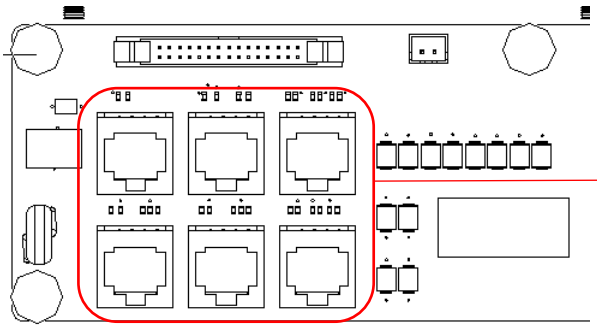
Step1. Make RJ45 wire, slide the Meter communication wire through the com port。



Step2. Connect one side of the cable into Meter port inside of inverter wiring box RJ45 port and the other side into the RS485 port of the meter. Please consult the CAN and RS485 communication of the manual for more details on Communication ports connection at the inverter.

6.6 Inverter Communication ports

A series of RJ45 connectors can be found inside the wiring box for Internal Inverter communications. The list and location of the communication ports can be found on the image/Table below.



CAN1	CAN2	RS485_METER
BMS-485 BMS-CAN	CT L2	CT L1

CAN (1&2): These RJ45 ports are used for CAN type Inverter-to-Inverter communication (parallel operations). Refer to Paralleling section for more details onto the communication requirements. The CAN communication is performed via a daisy chain in between all the devices.

RS485: RJ45 connection for RS485 communication with Grid Meter.

BMS Connection: RJ45 connector to be used for Battery Management System communication to the inverter.

CT L2: not used / **CT L1:** Connection port for Current transformer used for inverter Grid feed metering.

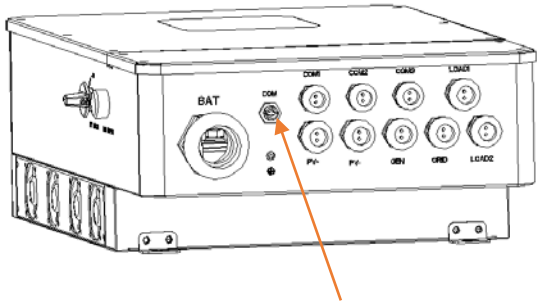
Recommended wiring: regular ethernet CAT 6 cable can be used for all CAN and RS485 communications (below 100 mtrs length). Is CTs cable requires to be extended always use a twisted pair cable like the one supplied with the CT.

Recommended Communication cable routing: Is always recommended to route communication cables away from DC power cables. DC wiring can produce strong electromagnetic interference on RS485 and CAN communications.

6.7 WiFi Remote Monitoring

The Inverter is supplied with a WIFI dongle to allow remote monitoring via the **Revolink** online monitoring platform (www.pro.revolink.co.za). The supplied WIFI dongle is installed via its waterproof connector at the bottom of the wiring box. Please note that each inverter on a multi-unit (parallel) installation requires its own WIFI dongle and each of these must be registered and associated to the same site.

1) WIFI Dongle Connection:



COM port for Dongle Installation

WIFI Dongle

2) WiFi Connection:

Step1. Plug Wifi dongle into the COM port at the bottom of the inverter.
Step2. Connect to the WIFI dongle Access point WIFI and link the dongle to the Internet.
Follow detail procedure for WIFI dongle setup available at Appendix 1.
Step3. Login at Revolink cloud website (**www.pro.revolink.co.za**) and create a user account.

6.8 Dry Contacts Use

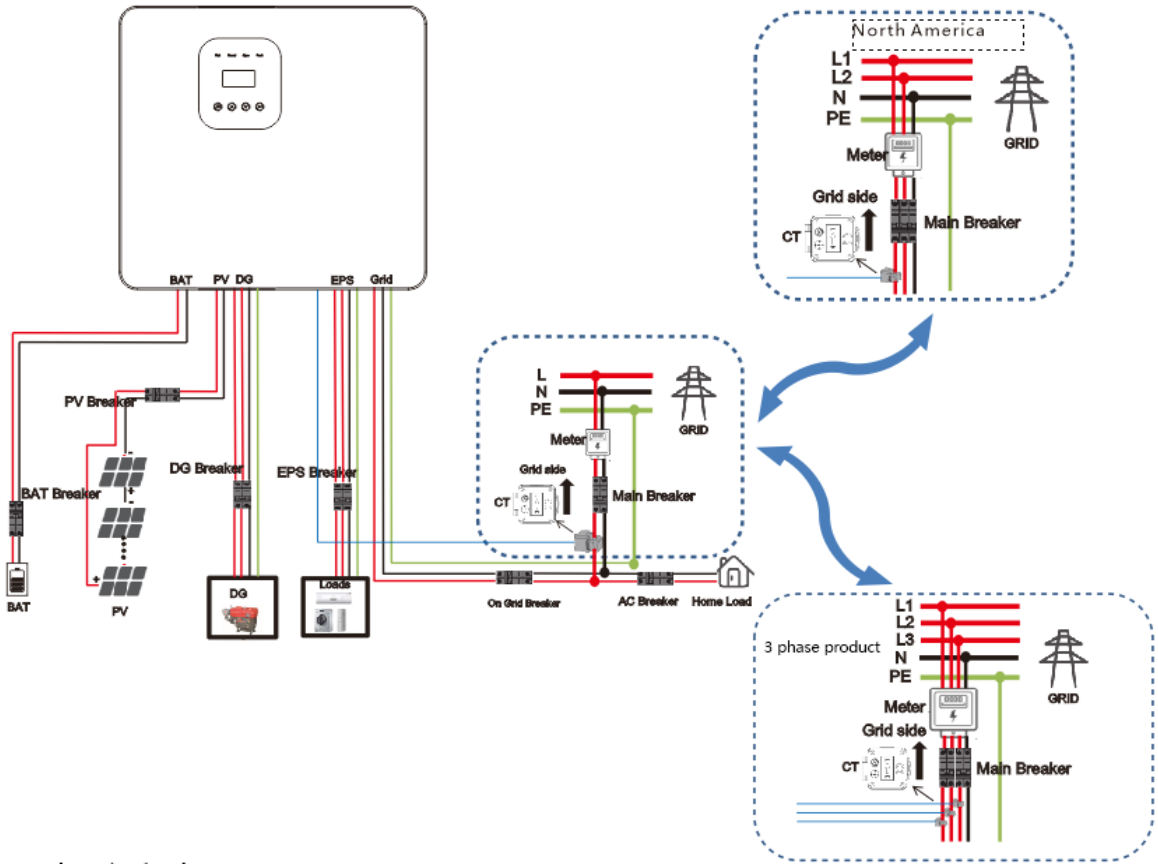
A Dry contacts terminal bar is included inside the wiring box to allow auxiliary operations to take place such as: Generator ON/OFF, Grid ON/OFF Indication and others.

Preset Dry Contacts:

Functionality	Dry Contact Pair
Generator Auto ON/OFF	DRY0_1A-1C NO DRY0_1A-1B NC
Grid ON/OFF	DRY0_2A-2C NO DRY0_2A-2B NC

The supplied digital inputs have a maximum limit of 3A for AC applications and 1A for DC applications. The +12V and GND COM terminals provide 12 VDC permanently up to 1A for auxiliary applications.

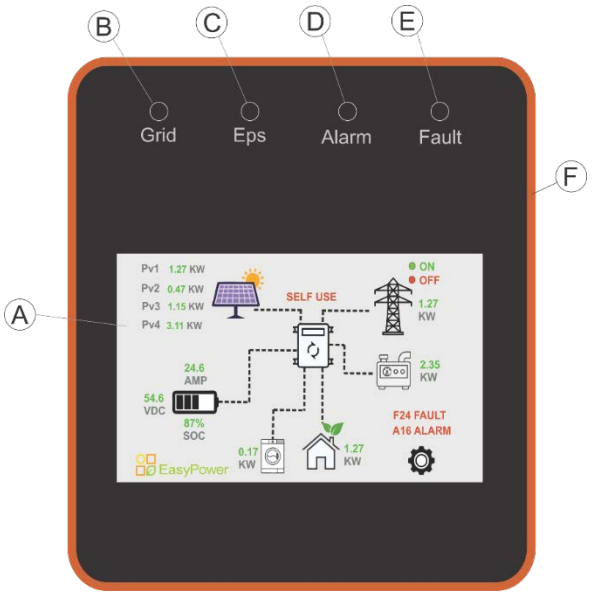
6.9 CT Installation instructions



1)	**Standard Connection:** The wiring of the current transformer is illustrated at the figure above, the CT current transformer Arrow always points towards the GRID, The CT RJ45 connector is connected at the provided L1 CT RJ45 connection point in the Inverter Wiring box. **As with any CT installation maximum current to be measured shall never exceed the CT rating otherwise internal inverter damage is possible.**
2)	**Parallel Operations:** A Current transformer will be installed and connected to each Master inverter on the system measuring the main grid supply to the system, In the case of 3 Phase system one CT will be installed on each master inverter to measure total current of each phase.
3)	**Third Party CT use:** If the combined current per phase exceeds the supplied CT a large CT ratio unit can be used as long as it has the same secondary transformer current output as the one supplied. The new CT ratio needs to be input at the corresponding inverter to which the CT is connected in the inverter Parallel Settings section.

7. LCD Operation

7.1 Main Display



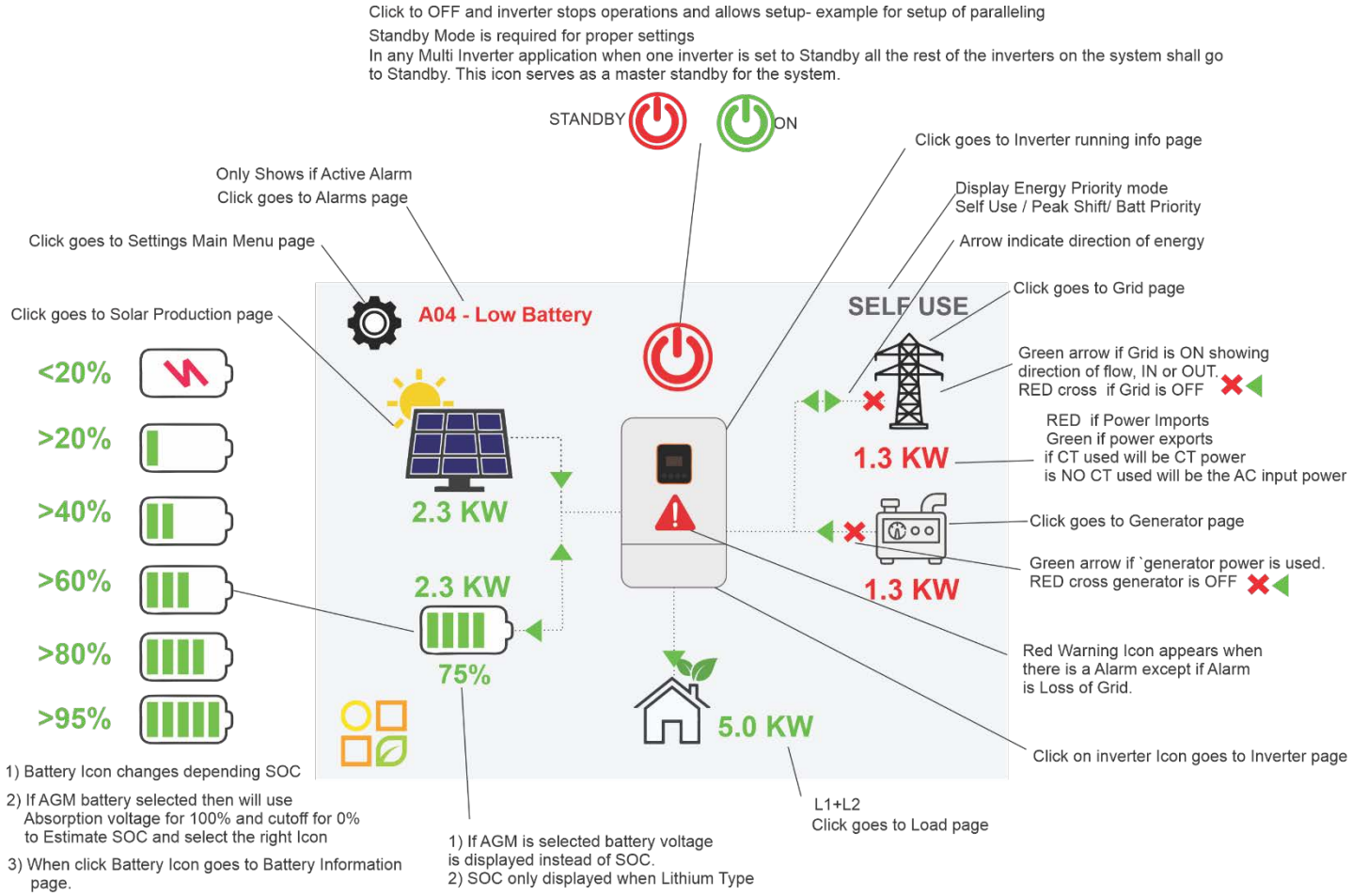
Object	Name	Description
A	LCD Screen	LCD Touch screen Display
B	Indicator LED	GRID indicator: when lit in green the inverter is in grid mode. Off: The inverter is in not in grid mode.
C		EPS indicator: lit in green: The inverter is in off-grid mode. Off: The inverter is in not in off-grid mode.
D		Alarm Indicator: lit in Yellow: The inverter has an active Warnings.
E		Fault Indicator: when lit in red: The inverter has an active fault. Off: The inverter has no errors or faults.
F	COVER	Weatherproof Cover protector for Touch Screen

7.2 LED Indicator Legend (Example)

	Grid (Green)	EPS (Green)	Alarm (Yellow)	Fault (Red)
Initialization	off	off	off	off
Stand-by	off	off	off	off
Grid mode	on	off	off	off
Off-Grid	off	on	off	off
Bypass of mains	off	on	on	off
Fault	off	off	off	on

7.3 Main Screen Functionality

The LCD is touch screen, shows the overall information of the inverter, a detailed description of the function of the main screen icons can be found at the table below. The screen allows complete programming to the unit and is the main means of the control for the REVO series of inverters.



Energy flow is described by arrows pointing on the direction of energy flow. Red crosses are employed to indicate when an input is absent (Voltage zero) as is the case of the Grid and Generator inputs. Grid Imports are Considered negative and grid Export are considered positive.

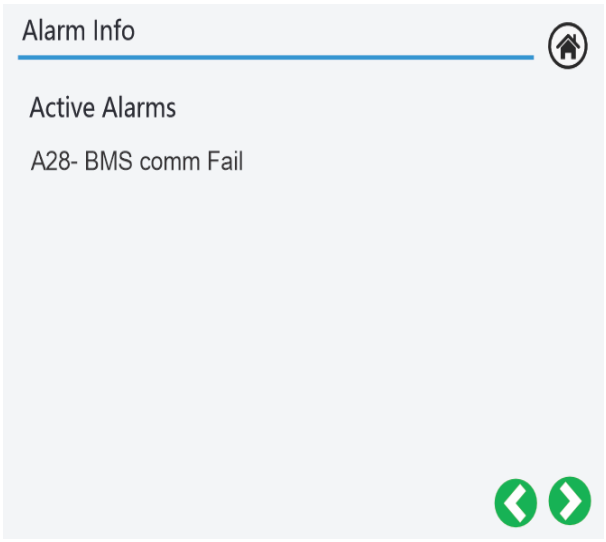
Description of Main Screen Icons Functionalities:

1. **ON/OFF Standby Icon:** This Icon allows you to set the Inverter onto Stand-By or Operational state. When at a parallel system it does set the entire system to Stand-By or Operational status. Inverter setting changes should always be made while inverters are in standby. Always set the system to standby on the master inverter of phase 1. This inverter will be identified by a solid line underlining the ON/OFF/STANDBY ICON.
2. **Inverter Icon:** when pressed will open the Inverter production display window. A warning sign will appear on the inverter when a warning or fault is active.
3. **Battery Icon:** Display battery state of charge or voltage depending on battery type as well as battery load/charge. The Icon indicates visually by the number of Bars inside the battery the estimated battery state of charge. When pressed it will open the battery information window with more detailed information on the battery operation.
4. **Solar Input Icon:** Display real time the aggregated solar production for the 4 Solar Inputs. When pressed it will display the Solar production page which contains detailed information of each of the 4 solar inputs and accrued production information.
5. **Grid Icon:** Display real time Grid input port information, Imports/Exports. When pressed it will display the Grid Detailed information page which contains all the relevant information with regards to real time grid parameters as Voltage/Frequency/Current, accumulated imports/exports, etc.
6. **Load icon:** Display real time combined loads from the Load 1 and Load 2 ports. When pressed it will display the detailed load page indication the Load electrical parameters as Voltage, Current and accumulated consumption figures.
7. **Generator Icon:** Display real time the generator feed into the inverter when active. When pressed it will display the generator detailed information page which contains Voltage, Current and accumulated consumption figures from the Generator Port.
8. **Settings Icon:** When pressed it will open the Main Menu for Inverter Settings.

7.4 LCD operation Menus Tree

7.5 LCD Interface – Information Section

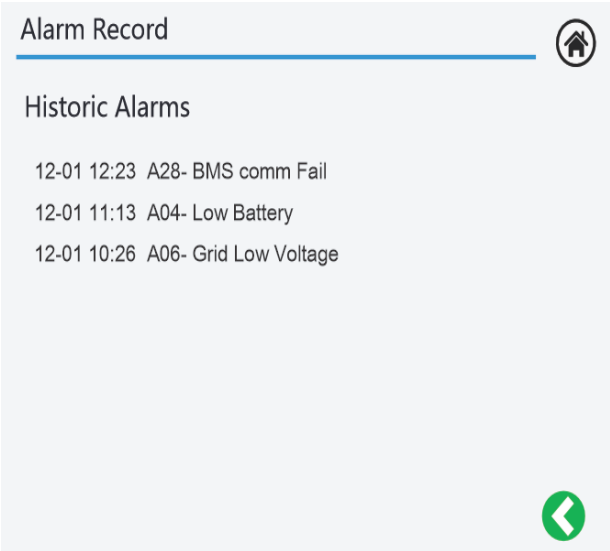
7.5.1 Alarm Info



Any active alarm or warning is displayed at the alarm info page. Please refer to the Alarms/Faults and warnings section for more information on Warnings/Faults.

Refer to section 10 for more details on faults and warnings.

7.5.2 Alarm Record

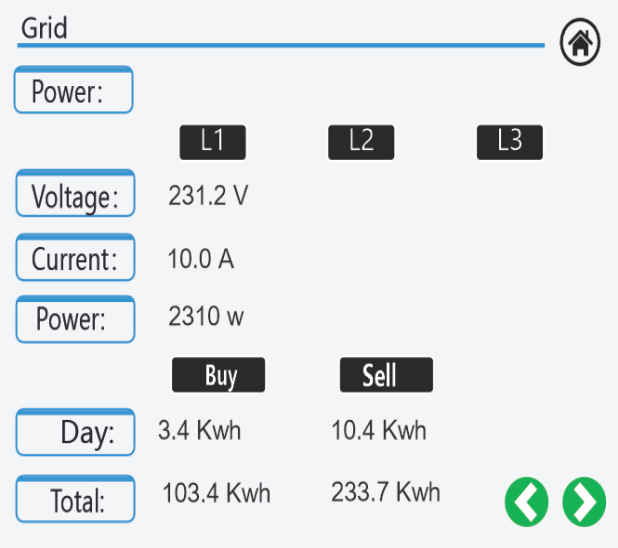


Warnings and faults are recorded on the equipment memory and displayed at the Alarm History page. All alarm records are erased during Factory Reset or firmware updates.

Records are listed chronologically, more detailed listing of events can be searched at Solarman Elite cloud interface or phone app.

Refer to section 10 for more details on faults and warnings

7.5.3 Grid Info



Energy exports to the grid is positive, and energy imports are negative at the Grid Display.

- In 3-Phase systems Master Inv Phase 1 will show information for all 3 phases and totals for the entire system.
- In single phase parallel systems each inverter shows its individual information.

- Power: Real time grid power in watts
- Voltage: Real time Grid Voltage in Volts
- Current: Real time Grid Current in Amps

Buy:

Day: Statistics of the imports from the grid into the inverter for the day (KWH)

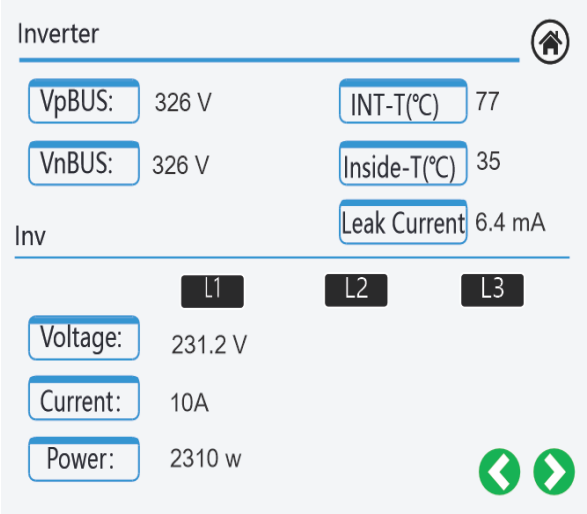
Total: Statistics of total imports accumulated from the grid to the inverter (KWH)

Sell:

Day: Statistics of the exports to the grid for the inverter for the day (KWH)

Total: Statistics of total exports accumulated from inverter to grid (KWH)

7.5.4 Inverter Info



VpBUS: Real-time voltage of bus capacitor of the inverter

VnBUS: Real-time voltage of bus capacitor of the inverter

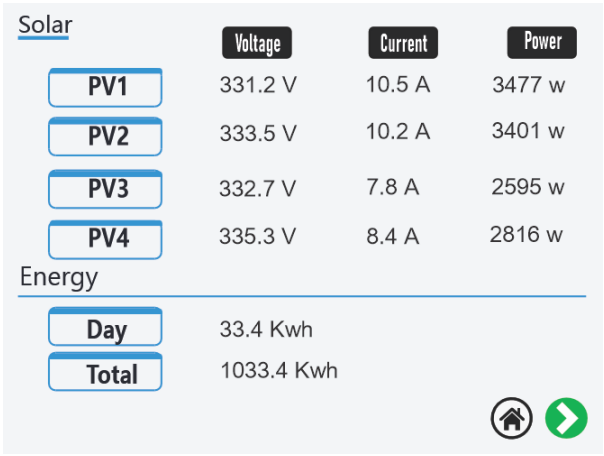
INT-T: DC/AC temperature

Inside-T: Internal ambient temperature.

Leak Current: Real-time leak current of the inverter.

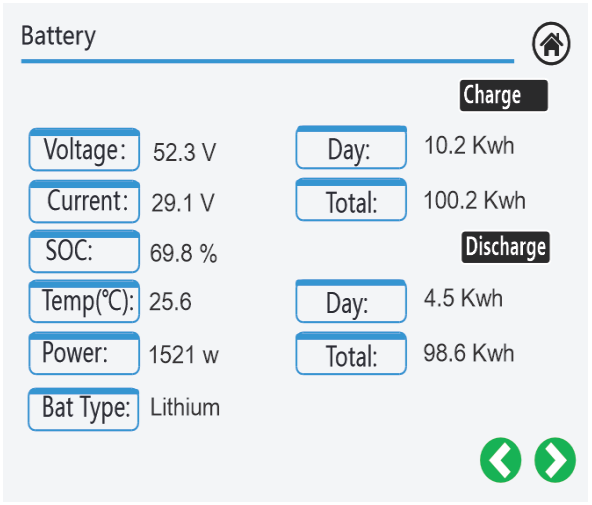
- Voltage: L1 phase real-time voltage
- Current: L1 phase real-time current
- Power: L1 phase real-time power

7.5.4 Solar Info



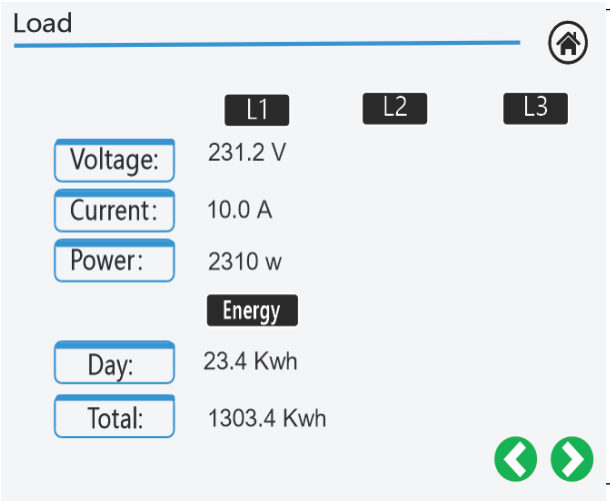
PV1 input: voltage/current/power
PV2 input: voltage/current/power
PV3 input: voltage/current/power
PV4 input: voltage/current/power
Day: PV power generation on the day (KWH)
Total: Total accumulated PV generation (KWH)

7.5.5 Battery Info



Voltage: Battery real-time voltage
Current: Battery real-time current
SOC: Battery state of charge
Temp: Battery temperature
Power:Battery power
Day: Statistics of battery charge and discharge in a day
Total: Battery charge and discharge total energy statistics

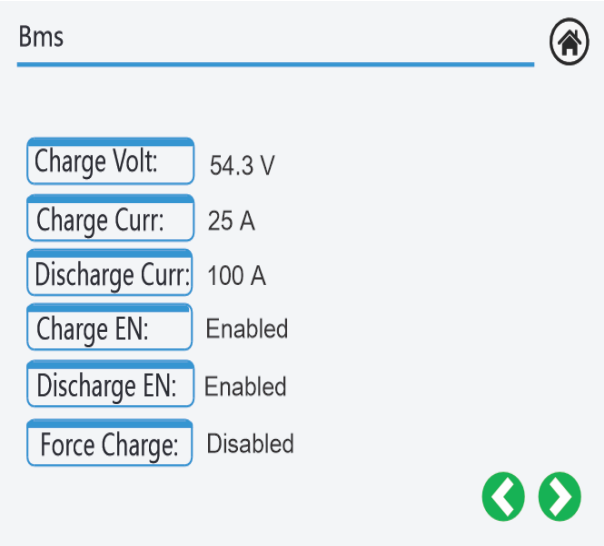
7.5.6 Load Info



Voltage: load real-time voltage
Current: load real-time current
Power: load real-time power

Day: Statistics of the energy flowing into the load on the day
Total: Statistics of all energy flowing into the load

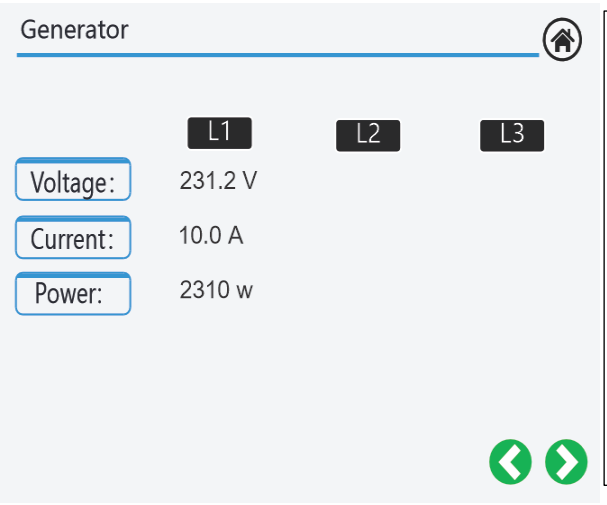
7.5.7 BMS Info



If battery setup for Lithium Ion and BMS is detected and communication established, BMS information is displayed on this screen. The BMS information is used by the inverter to manage the charge and discharge of the battery bank automatically.

- Charge Volt: Battery required charge Voltage.
- Charge Current: Battery required charge current.
- Discharge Current: Battery
- Charge EN: Enabled/Disabled
- Discharge EN: Enabled/Disabled
- Force Charge: Enabled/Disabled

7.5.8 Generator Input Info

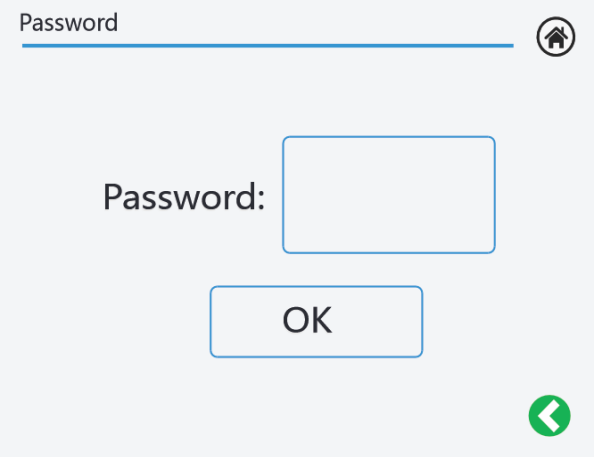


Generator Input Information

- Voltage: Generator input voltage
- Current: Generator input current
- Power: Generator input power

Warning: Please note generator Neutral input must always be grounded to earth.

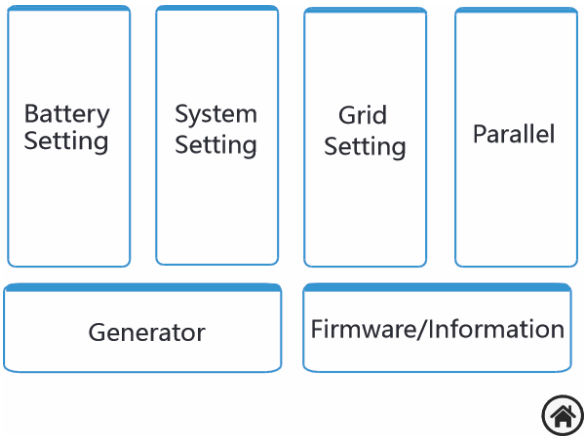
7.6 LCD Interface - Inverter settings



Click Settings on the home page (small cog icon) to access the password input page, the default password is "11111"

Warning: Incorrect inverter configuration can damage the equipment. Settings shall be only input by a qualified technician trained on the usage of the equipment.

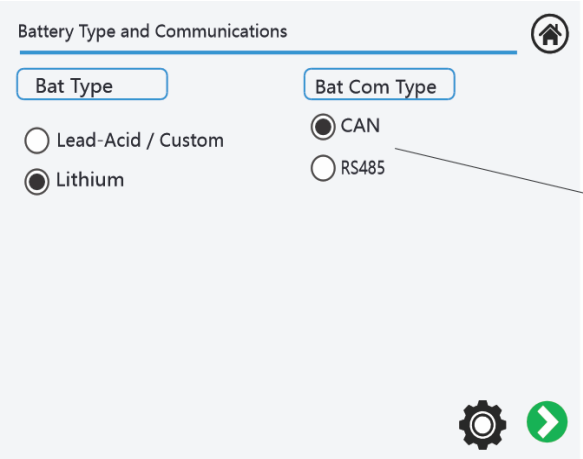
7.6.2 Main Settings Setup



Main Settings Menu
→ Battery Setting
→ System Setting
→ Grid Setting
→ Parallel
→ Generator
→ Firmware/Information

A variety of controls allows inverters settings adjustment. **Setting changes must always be made while inverter is on Standby**. Inverter system can be set to standby by pressing the icon on the Main screen or by pushing the button on the left side of the inverter labeled as Rapid Shutdown. **After a setting has been changed it must be applied by pressing the Check Mark** Icon on the bottom of the screen.

7.6.3 Battery Settings



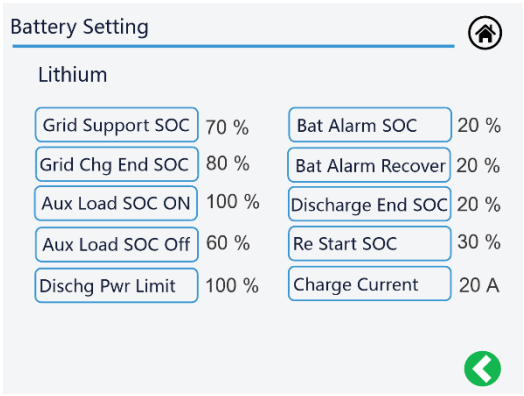
Bat Type: Select battery type

Bat Com Type: Select battery communication CAN/RS485

Click to tick the "✓" to really set confirm the setting.

7.6.3.1 Battery Settings and Energy Priority:

The battery setting menus are setup differently depending on the battery selection type for the inverter, two different menus exist for this purpose.



Grid Support SOC: Max discharge SOC of battery when grid is available for Self-Consumption, Battery priority modes. It does act as a Grid recharge Start SOC point if grid recharge is allowed. (Grid Recharged enabled/disabled on Advanced settings)

Grid Charge End SOC: battery SOC to stop grid recharge.

Aux Load SOC ON: Auxiliary load output start SOC.

Aux Load SOC Off: Auxiliary load stop SOC

Dischrg Pwr Limit: Inverter Battery draw output limit. BMS limits the maximum draw from the battery, but this parameter can be used to derate the maximum inverter output manually. Is recommended to be kept at 100%.

Bat Alarm SOC: Low battery alarm start SOC

Bat Alarm Recover: Low battery alarm stop SOC

Discharge End SOC: SOC point for inverter battery cutoff

Re Start SOC: Inverter restart SOC point after reaching cutoff.

Charge Current: Max combined (Grid+Solar) battery charge current. Please note that the maximum current on the system will be whichever is the smallest (BMS max current or this parameter).

The image below shows an example of SoC settings applied to an example with Self-Consume working mode. Please note that Time of Use and Peak Shaving modes behave differently and have preset logic value or different value tables which overrides the SOC settings on the battery settings page. Differences for Peak Shaving and Time of Use modes can be found below.

Peak Shaving: Battery will always charge to full and only stop when slot timer lapses or 100% is achieved during charge periods. Battery will always discharge to Battery cutoff point and only stop if slot timer lapses or Discharge End SOC has been reached.

Time of Use: SOC setting of each time slot will override the Grid Support setting from the Battery settings page although will behave the same way for the specific time slot.

Auxiliary Load Start: Auxiliary load relay closing SOC. Recommend to keep at 100% for Aux load to be available at all times.

Grid Charge End: Stop SOC for Grid recharge for all operating modes Except Peak Shaving.

Grid Support SOC: Maximum Battery discharge SOC when grid is available for Self Use mode. Note the Time of Use SOC settings overide this parameter when active on its respective time slot.This parameter is as well the Grid Recharge Start SOC point when Grid recharge is enabled.

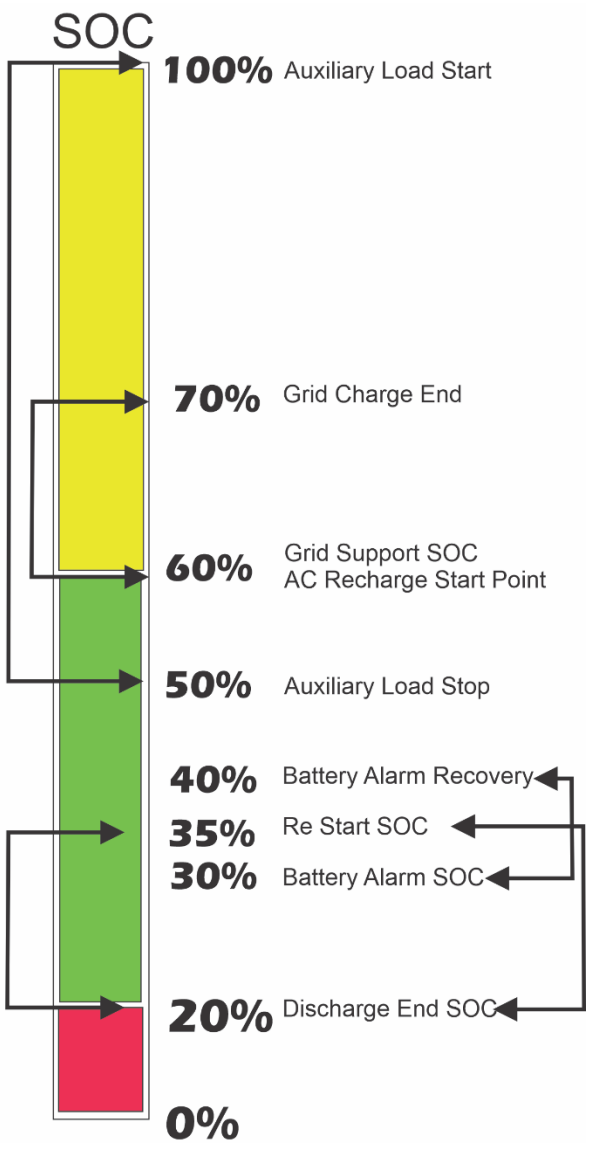
Auxiliary Load Stop: Auxiliary load relay opening SOC when grid is not Available.

Battery Alarm Recovery: Low battery Alarm stop point.

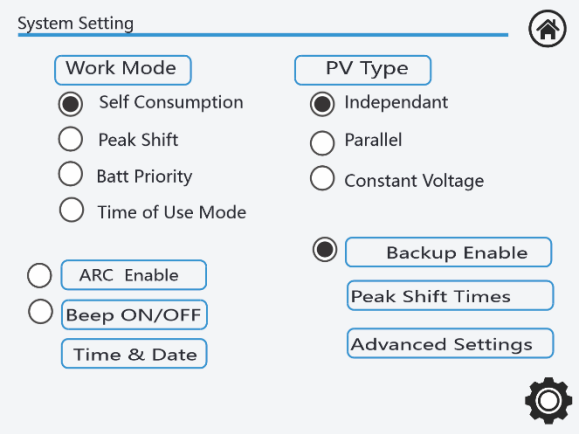
Re Start SOC: Inverter AC power production restart point after battery Cutoff.

Battery Alarm SOC: Low battery Alarm start point.

Battery Alarm SOC: Low Battery Cutoff, AC output is stopped until battery recharges to Re start SOC point. Grid Recharge and Solar recharge is enabled at all times.



7.6.4 System Setting



Backup Enable: If battery has reached its internal cutoff point and internal battery contactor has opened the inverter will send instructions to the battery BMS to close battery contactor and force the battery recharge. Not available in all brands of battery consult distributor.

Work Mode: Select the inverter energy priority work mode, Peak shift and Time of Use modes have independent time slow tables for detailed settings. Time of Use tables are inside Advanced settings section.

PV Type:

INDEPENDENT: The default Setting recommended for field use.

PARALLEL: Parallel input for MPPT Not recommended for field use.

CONSTANT VOLTAGE: not for field use, used for Laboratory repairs usage of constant voltage power supply. MPPT function does not operate.

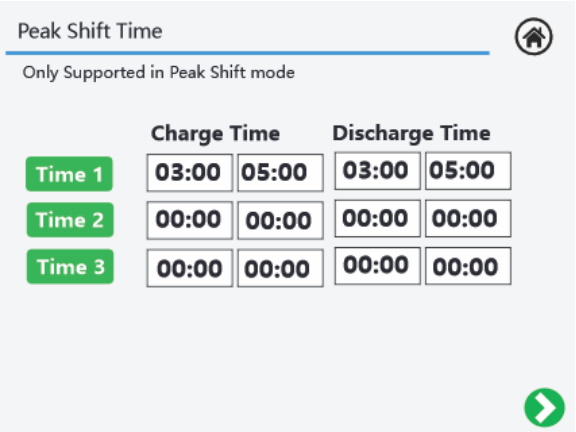
ARC Enable: AFCI function enabled or disabled. AFCI is the detection of arcing on Solar strings inputs.

Peak Shift Times: Open Pak shift time slots table.

Beep ON/OFF: enable/Disable beep when alarms or faults present.

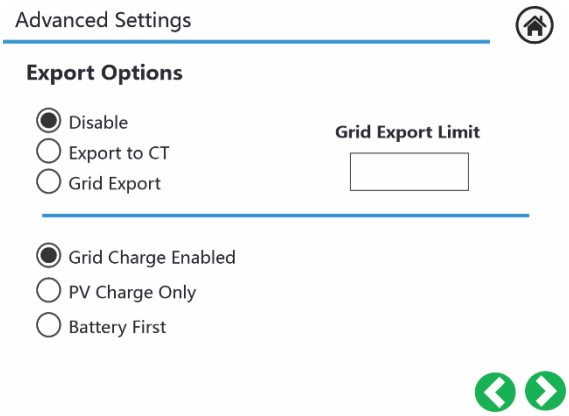
Time & Date: Opens Time and date selection menu.

Advanced Settings: open Advanced settings menu, please note that Antiexport/Export settings and TOU settings are contained inside the Advanced Settings menu.



Peak Shift Table: Each time slot can be defined as one of 2 modes: Charge / Discharge Time. Any period not selected will be considered a No Charge and No discharge time and battery will not be used. three-time ranges are executed in sequence.

Note that in Peak Shift mode battery reserve for grid failures is not a consideration and battery will be used in full for charge and discharge for optimal energy costs savings.



Grid Charge Enabled: master parameter to enable or disable Grid recharge on all modes. Recommend Enable.

PV Charge Only: Will force inverter to only use PV for Battery recharge.

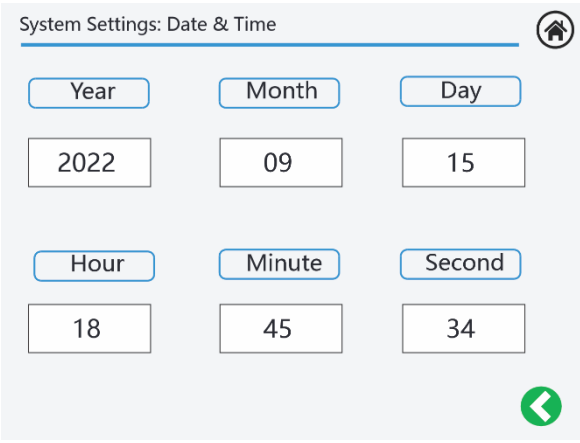
Battery First: regardless of Mode forces battery to be set as first energy priority for Solar charge.

Disable: Enable of Disable Grid Exports. When disabled inverter is always on an Anti-Export mode and will not feed electricity back via the grid feeding input port.

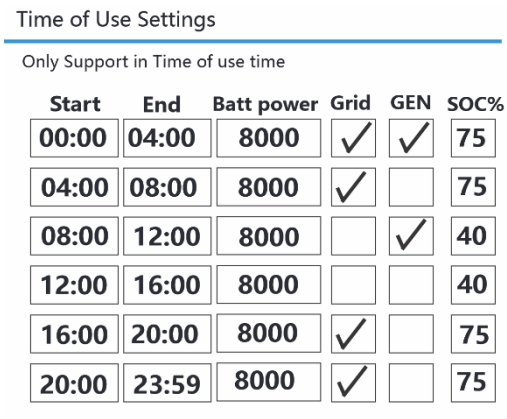
Export to CT: This mode can be super-imposed to All modes. Any solar energy surplus will be exported back via the grid input port until such point that the CT measurement matches the CT Limit Power setting.

Grid Export: This mode can be super-imposed to All modes. Any solar energy surplus will be exported back via the grid input port until such point that the CT measurement matches the CT Limit Power setting.

Grid Export Limit: This is the power target the inverter will use to control export to CT. If Grid export is selected this value becomes the exported power value as measured at the Grid input port.



This interface is used to set date and time. Date and time settings are important for adequate operation of the Advanced Work modes and Peak Shaving Modes which operate around timers.



Time of Use Logic: The time of use mode allows a customized Self Consumption experience with up to 6 time slots per day to adjust both the Grid Support SOC point (SOC), Grid and generator usage for battery recharge and maximum inverter output.

Start: Start of the time slot, all time slots must cover the entire 24 hrs period.

End: End of the time slot.

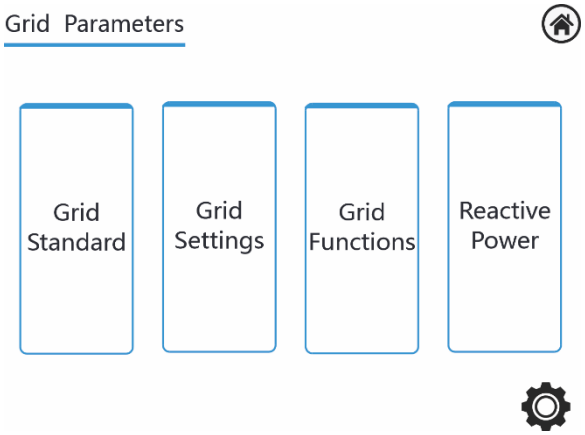
Batt power: Maximum battery power to be used during the period, if PV plus battery is not sufficient Grid will be used to complement the power to the loads.

Grid: Enable of disable the Grid usage for Battery charging during this time slot.

Gen: Enable or disable the usage of the generator during this time slot. Please note that battery charge from generator is enabled at the generator page.

SOC: This is the Grid Support SOC corresponding to this time slot, battery will not be discharged past this point when grid is available, grid will recharge battery (if enabled) during this time if SOC drops below the SOC selected for the time slot.

7.6.6 Grid Settings

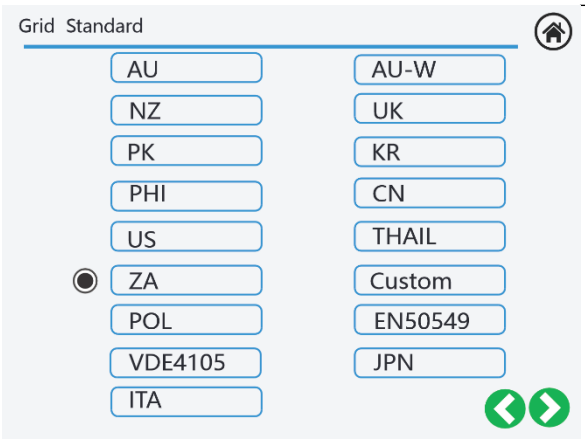


Grid Standard: Allows the selection of the grid standard per country.

Grid Settings: Grid Protection Parameters

Grid Functions: Advanced Grid Response Functions

Reactive Power: Reactive power settings



This interface is used to select Grid standard.

Select the desired grid standard.

1:AU-(Australia): 240V/415V/50Hz

2:AU-W(Western Australia): 240V/415V/50Hz

3:NZ- New Zealand : 240V/415V /50Hz

4:UK-United Kingdom 230V/50HZ

5:PK- 230V/50HZ

6:KR-Korea: 220V/380V/60Hz

7:PHI-Philippines: 110V/220V/60HZ

8:CN-China: 220V/380V/50HZ

9:US-CA—America:

120V/240V 208V/240V/60Hz

10:THAIL 220/380V/50HZ

11:ZA 230/50HZ

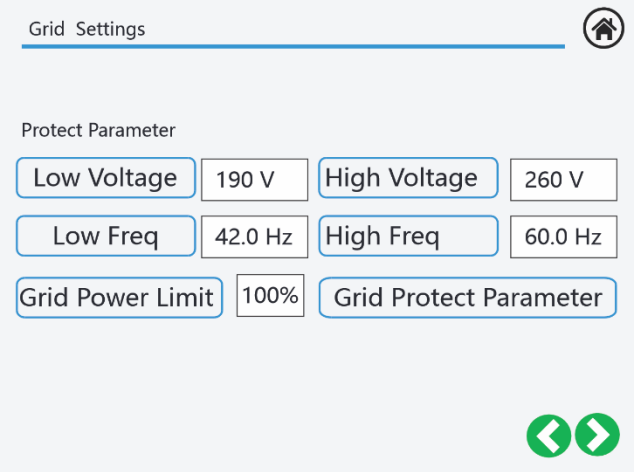
12:CUSTOM-User defined

13:POL 230V/380V/50HZ

14:EN50549 217V/220V/240V
380V/400V 50HZ/60HZ

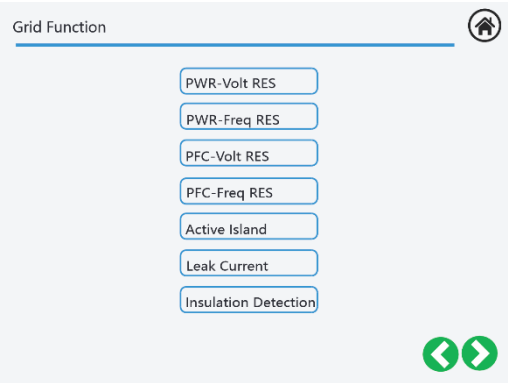
15:VDE4105—Germany: 230V/380V/50Hz

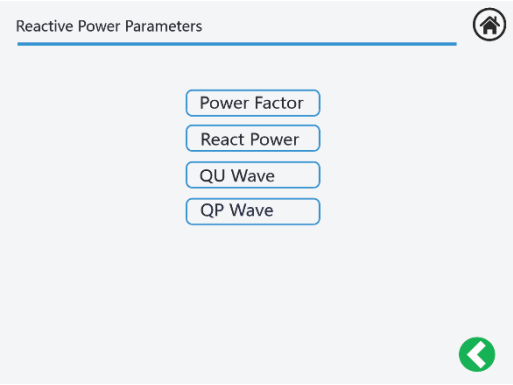
If the country used is not one of the above options, consult the distributor.



Grid protection parameters are Automatically updated on the Protect parameter page once a grid code has been selected.

Low Voltage: Min acceptable grid voltage
High Voltage: Max acceptable grid voltage
Low Frequency: Min acceptable grid frequency
High Frequency: Max acceptable grid frequency.
Grid Power Limit: Max grid power limit as a percentage of inverter rating.
Grid Protect Parameters: Additional set of variable protection tables. Please Note that the grid reconnection timer is located inside this Submenu.

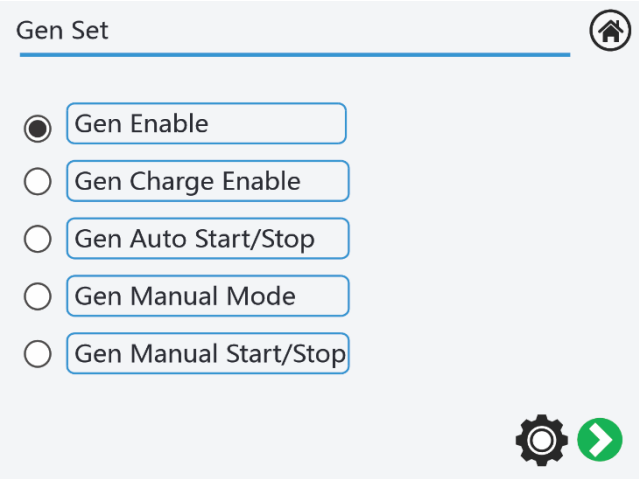




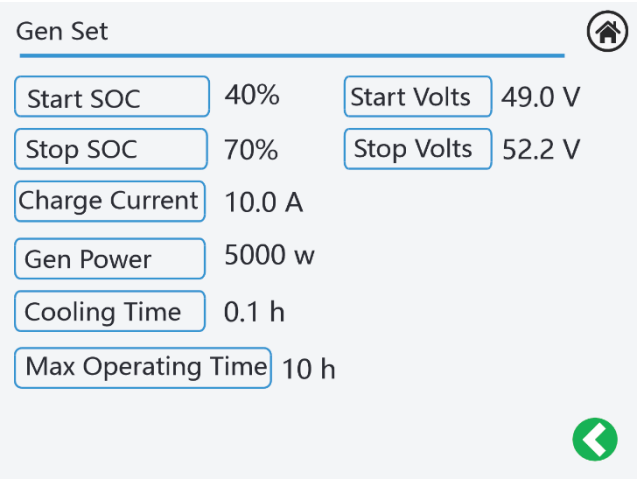
Grid Function: All basic functions are enabled by default, consult distributor before changing any of the parameters on this list.

Reactive Power Parameters Type: Non installer settings. Do not change these parameters without consulting with distributor first.

7.6.7 Generator

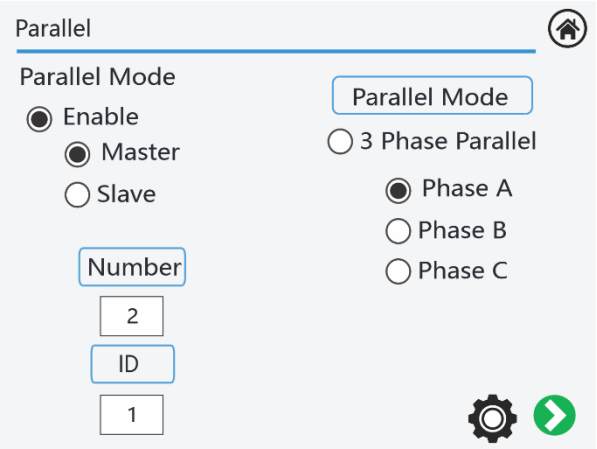


Gen Enable: This parameter enables or disable the usage of the generator input port.
Gen Charge Enable: This parameter enable or disable battery charge from generator
Gen Auto Start/Stop: This parameter enable the Digital Output to to provides a 12VDC signal for a relay (Review Inputs/Outputs section)
Gen Manual mode: enable manual mode to allow manual generator 12VDC Output singal.
Gen Manual Start/Stop: trigger generator 12VDC output signal manually ON/OFF

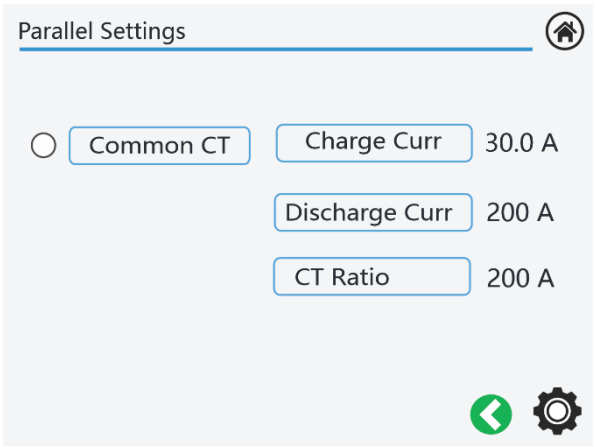


Start SOC: Generator start SOC
Stop SOC: Generator stop SOC
Charge Current: maximum current to be draw for Battery charging when using generator input. Keep in mind that both load and battery charge will be provided by generator on Gen mode.
Gen Power: Generator power rating.
Cooling Time: Once the Stop SOC has been reached the Generator input relay opens but the generator 12VC ON signal will remain ON until the Cooling time has lapsed and then Gen is powered off.
Max Operating Time: Maximum continuous generator run time.

7.6.8 Parallel

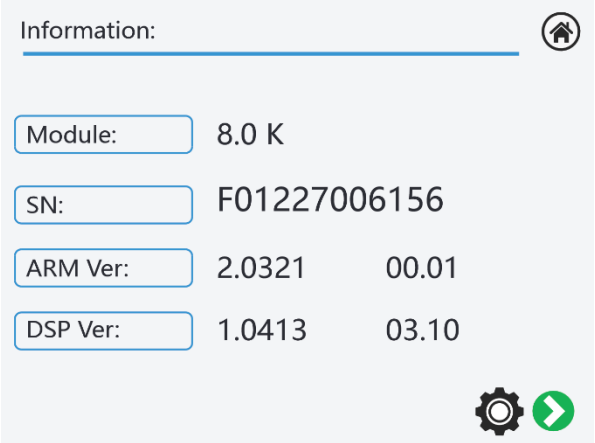


Parallel Enable: Enable or Disable the parallel function in between inverters.
Master/Slave: Each Inverter on the group needs to be configured to be a master or slave.
Parallel mode: Allows to select 3Phase paralleling and assign a specific phase for each inverter. Clockwise phase rotation is required in between phases A/B/C.
Number: Total number of inverters on the system.
ID: Inverter ID for Communication, use a sequential numbering starting from ID 1.



Common CT: Where a single CT is preferable to measure Grid Input for a multi-inverter system.
Charge Current: max multi-inverter charge current for Battery bank. This maximum value is distributed evenly among all inverters on the system and is the total system never exceed charge current.
Discharge Current: Maximum multi-inverter total battery discharge current.
CT Ratio: External CT rating.

7.6.9 Firmware



Module: Inverter model

SN: Inverter Serial Number

ARM Ver: ARM software version

DSP Ver:DSP software version

Factory Reset: The factory reset function requires the entire system to be set to standby via the side button on the side of the inverter.

Factory reset does not re-install any of the software but resets certain parameters employed by the inverter for operation. Most user settings are kept in place during factory reset,

8. Advanced Working Modes

The REVO hybrid inverter has a number of advanced mode functions which makes the inverter a very capable system for many grid-tied and Off-grid scenarios.

8.1 Advanced Modes: REVO can export surplus PV energy to household loads connected on the grid side as well as to the grid/utility itself. For these two operational modes has been designed, this and other advanced parameters explained below.

8.1.1 Export to CT: In this mode the system will export any surplus energy via the grid input port and up to the position of the external CT (Current transformer). Surplus energy is any Solar energy produced over and above the required by the loads. Exports take place only once the battery SOC has reached at least the Grid Support SOC setting as explained on the battery parameters.

This option is still aimed at self-consumption since the target current at the target CT is 0 amps, therefore any surplus energy will be used to power loads upstream the inverter grid input but no export past the external CT will take place.

Pre-Paid Meter Notes: The control loop on the inverter is adequate to meet most international standards for Anti-Export requirements nevertheless fast changes on Solar production and load can produce occasional very small exports past the CT location and potentially past the Utility Meter. Depending on your utility meter programming some utilities have opted to trip the internal relay on the meter if an export is detected. This situation may disable the utility meter until such time the Utility resets this back to operation.

8.1.2 Grid Export: In this mode the system will export any surplus energy via the grid input port up to the grid Export setting value. Only surplus Solar energy can be exported and only after battery charge, loads or both have been satisfied depending on the energy priority.

8.1.3 Grid Charge Enable: Enable and disable the Grid recharge on all operating modes.

8.1.4 PV Only: Only PV Used to charge battery, No grid will be used for battery charge.

9. Troubleshooting section

Please refer to the Solutions below and contact the local distributor if the problem remains unsolved. The following table lists some of the basic problems that may occur during the actual operation as well as their corresponding basic solutions.

Fault diagnosis table

Content	Codes	Explanation	Solutions
DischgOverCur	00	Battery discharge over current. Battery load is too large.	(1) Automatic restart, restart time 1 minute. (2) Check whether the load is in compliance with the specification. (3) Cut off all the power and shut down the inverter; disconnect the load and plug in to restart inverter, then check
Over Load	01	Inverter load larger that maximum allowable (PV,BAT).	(1) Check whether the load follows the maximum power rating of the inverter. (2) Cut off all the power and shut down all the inverters; disconnect the load and plug in to restart inverters, then check whether the load is short circuited if the fault has been eliminated.
BatDisconnect	02	Battery Disconnect. (Battery voltage not identified)	(1) Check whether the battery is connected. (2) Check if battery wiring port is open circuited.
Bat Under Vol	03	Battery voltage/SOC is lower than the set value. Both off grid and on grid discharge are forbidden.	(1) Verify the battery voltage is within operating range. (2) If the battery voltage is too low, charge using the PV or grid. (3) Battery under capacity,it is a normal warning. When the battery capacity is not sufficient.(SOC<100%-OFFGRID DOD)
Bat Low capacity	04	Battery voltage/SOC is lower than the set value. On grid discharge is forbidden.	(1) It is a normal warning. When the battery capacity is not sufficient capacity.(SOC<100%-ONGRID DOD)
Bat Over Vol	05	The battery voltage is	(1) Verify the battery voltage is within operating

		greater than the maximum permitted voltage.	range. (2) Restart the inverter and wait until it functions normally.
Gird low vol	06	Grid voltage is abnormal.	(1) Verify the AC voltage is within operating range and the grid side AC cables are securely connected. (2) Restart the inverter and wait until it functions normally.
Grid over vol	07		
Grid low freq	08	Grid Frequency is abnormal.	(1) Verify the AC Frequency is within operating range and the grid side AC cables are securely connected. (2) Restart the inverter and wait until it functions normally.
Grid overFreq	09		
Gfci over	10	Inverter 's internal ground fault current detection exceeds standard because of the grounded fault.	(1) Check PV+ or PV- wiring (which must be ungrounded) (2) Exposed PV conductors + rain can also cause. Check that the neutral line and Ground are not double-bonded (common with portable generators).
Bus under vol	13	Internal DC Bus voltage is lower than normal.It is often caused because of battery' s shutdown.	(1) Check the input mode setting is correct. (2) Restart the inverter and wait until it functions normally.
Bus over vol	14	Internal DC Bus voltage is over maximum value.It is often caused because of battery' s high voltage or poor grid .	(1) Check the input mode setting is correct. (2) Restart the inverter and wait until it functions normally.
Inv over cur	15	The inverter current exceeds the normal value.	(1) Check the wiring and restart the inverter and wait until it functions normally.
Chg over cur	16	Battery charge current over than the maximum current.	(1) Restart the inverter and wait until it functions normally.

Inv under vol	18	Inverter AC voltage is abnormal.It may be caused by heavy load or wrong wiring.	(1) Check if the INV voltage is abnormal. (2) Restart the inverter and wait until it functions normally.
InvFreqAbnor	20	Inverter frequency is abnormal	(1) Check if the INV frequency is abnormal. (2) Restart the inverter and wait until it functions normally.
Igbt temp high	21	The inverter 's inside temperature is higher than the allowed value	(1) Cut off all the power of the inverter and wait one hour, then turn on the power of the inverter. Check if there is something covered on the heatsink of the inverter.
Bat over temp	23	Battery temperature is higher than the allowed value.	(1) Disconnect the battery and reconnect it after an hour.
Bat UnderTemp	24	Battery temperature is low than the allowed value.	(1) Check the ambient temperature near the battery to see if it meets the specifications.
BMS comm.fail	27	Communication between lithium battery and inverter is abnormal.	(1) Check the cable, crystal, Line sequence. (2) Checking the Battery switch. (3) Ensure the battery communication cable is securely connected to both the battery and the port on the inverter.
Fan fail	28	Fan fail	(1) Check whether the Inverter temperature is abnormal. (2) Check whether the fan runs properly.(If you can see it)
Arc Fault	31	PV Arc Fault	(1) Verify the PV module connections are secure, then clear the fault. (2) It can be a lousy PV connector/connection. And sometimes a false alarm due to powerful lightning storms.

Bus soft fail	32	The inverter may be damaged	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
Inv soft fail	33		
Bus short	34		
Inv short	35		
PV iso low	37	PV+ /PV- to PE insulation is low.	(1) Check if the PE line is connected to the inverter and is connected to the ground.
Bus Relay Fault	38	The inverter may be damaged	(1) Restart the inverter and wait until it functions normally. (2) Contact customer service if error warning continues.
Grid Relay Fault	39		
EPS Rly fault	40		