User Manual

for THB Series Hybrid Inverter



Applicable models

THB-29.9KW
THB-30KW
THB-37.5KW
THB-40KW
THB-49KW
THB-50KW
THB-60KW
THB-30KW-LV
THB-35KW-LV

Applicable System

Three phase system

Version 1.0, Release Date:09,2026

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1.1 Product Overview

The WHES THB series is designed for commercial hybrid systems.
The inverter can work with maximize self-consumption and provide backup power if the grid fails and there is not enough PV power to cover load demand.
The WHES THB series consists of the following inverter models:
29.9kW, 30kW, 37.5kW, 40kW, 49kW, 50kW, 60kW, 30kW-LV, 35kW-LV

NOTE
WHES AFCI 2.0 Function meets the INMETRO Ordinance No.515 regulation. This product supports AFCI2.0 function as an optional funcition for customers. By default the AFCI function is not supported.

NOTE
Only on Brazil and Chile market are sold with AFCI2.0 as default configuration. If you want to use it, please refer to the manual to enable the AFCI function.

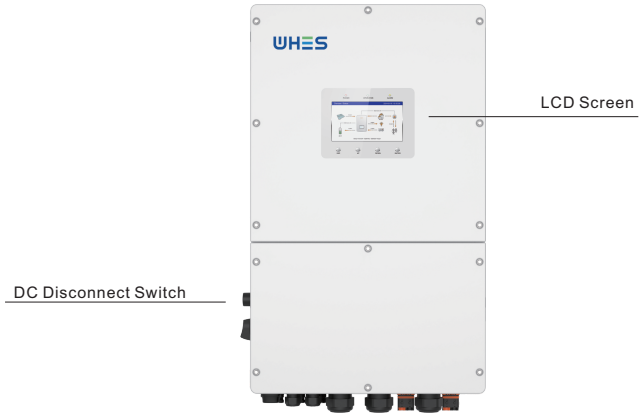


Figure 1.1 Front side view

This inverter is suitable for the three-phase grid systems as below(according to IEC 60364)

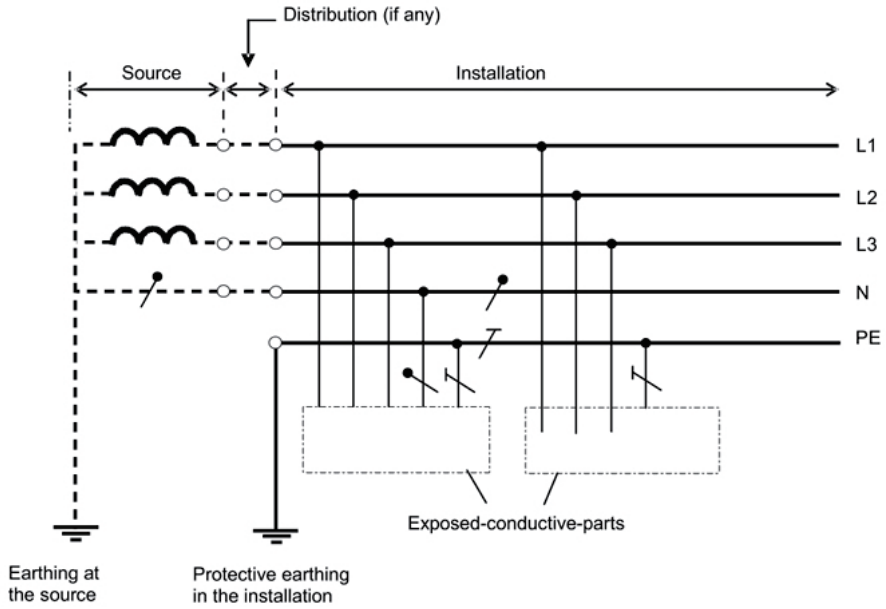


Figure 1.2 TT System

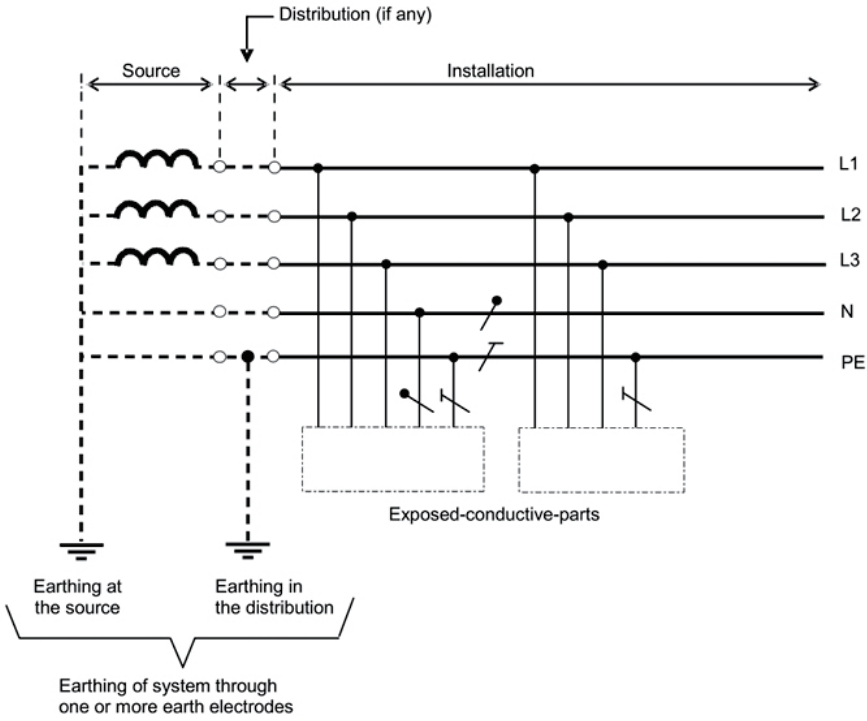


Figure 1.3 TN-S System

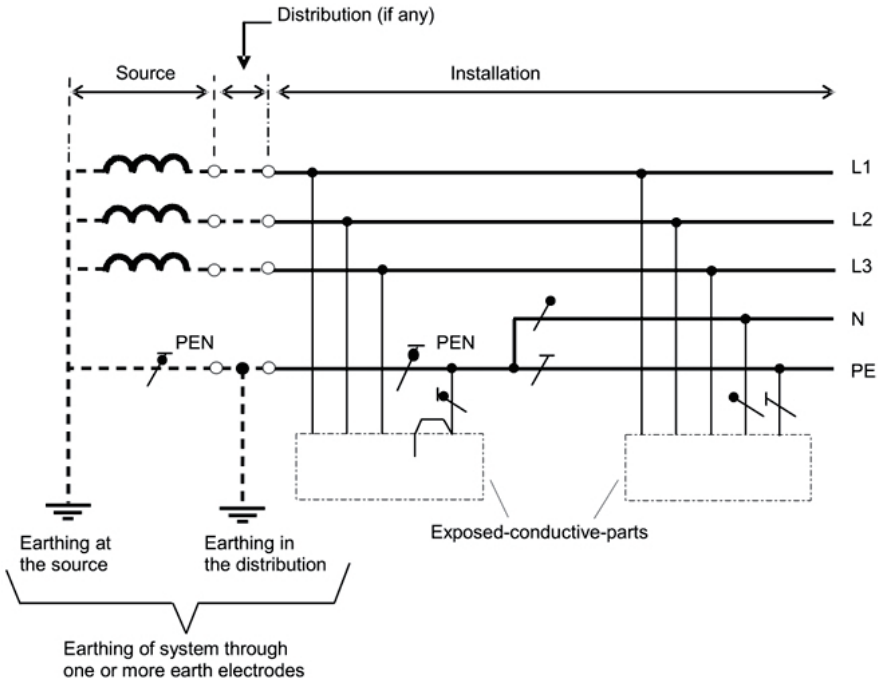


Figure 1.4 TN-C-S System

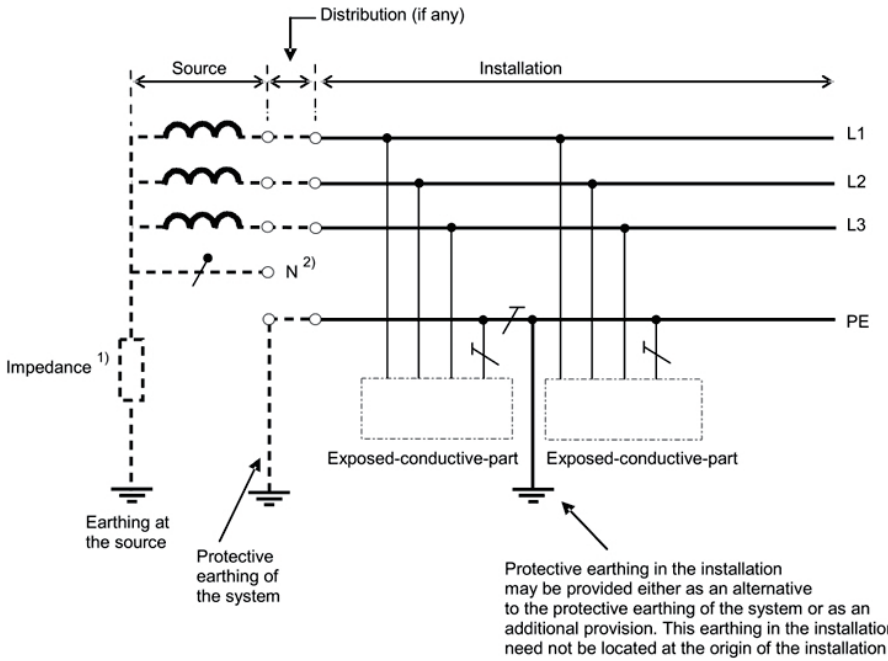
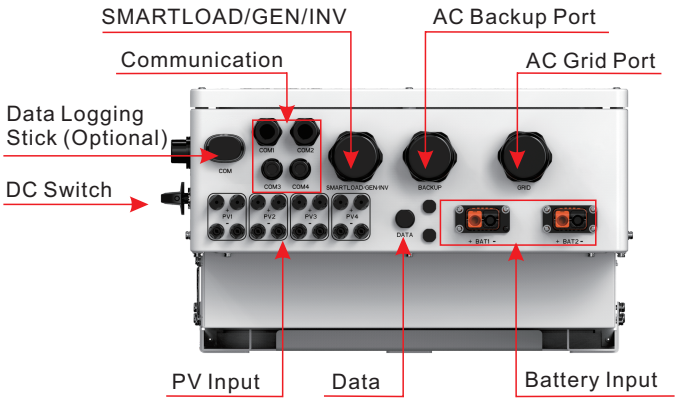


Figure 1.5 IT SYSTEM (3Phase; L-L: 230V/220V is only applicable for models with (-LV))

1.2 Inverter Wire Box and Connection Points

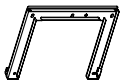


Name	Description
1. DC Switch	This is the DC disconnect switch for the PV
2. COM	WHES data logger gets connected here-only USB version of the loggers will work
3. COM1	RS485 and CAN communication cables and parallel cables should go through these
4. COM2	RS485 and CAN communication cables and parallel cables should go through these
5. COM3	Communication cables for 14PIN terminal block should go through these
6. COM4	Communication cables for 14PIN terminal block should go through these
7. SMARTLOAD/GEN/INV	Conduit for AC conductors to generator should be connected here
8. Backup	Conduit for AC conductors to backup loads panel should be connected here
9. Grid	Conduit for AC conductors to the main service panel should be connected here
10. PV Module Input	Conduit for PV conductors should be connected here
11. Battery Connection	Conduit for Battery conductors should be connected here
12. DATA	Reserved
13. ON/OFF	This button is on machine left side, used for inverter power on/off

1.3 Packaging

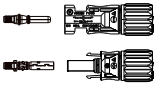
Please ensure that the following items are included in the packaging with your machine:


Inverter x1


Back plate x1


Fastening screw x4


Expansion Bolt x5


DC connector x8

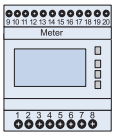

OT terminals x13



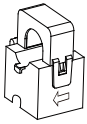
CAN cable(3m) x1


Battery terminal x2

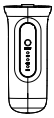

Handle x2



Eastron Meter x1


CT x3


RJ45 connector x11



S2-WL-ST Stick x1



Manual x1

If anything is missing, please contact your local WHES distributor.

NOTE

CT default Length : 4m, and the its extension not supported.
CT model: ESCT-T50-300A/5A
CT Cable: Size – 2.3mm², Length - 4m
Meter model: SDM630MCT V2 (Eastron 3-phase meter)

1.4 Tools Required for Installation


Technician Screwdriver


Torqx T20 Screwdriver


Wire Strippers 12AWG to 6AWG


Wire Strippers 20AWG to 10AWG


LUG Crimping Tool


Channel Locks


Multimeter (AC/DC amps)


Drill and Impact Driver


Torque Screwdriver


MC4 Crimping Tool

1.5 Cable and terminal requirements

Terminal type	Battery	Backup	Smart port	Grid	PE
Recommend copper cable diameter	20-25mm²	20-25mm²	20-25mm²	35mm²	33mm²
Max. cable diameter	25mm²	25mm²	25mm²	50mm²	33mm²
OT terminal	—	M6	M6	M8	M5
Quantity	—	4	4	4	3
Cable Lug	—	R22-6	R22-6	R38-8	—
Torque	4.1N.m	3.4N.m	3.4N.m	5.1N.m	28N.m

1.6 External breaker and RCD for single unit

Item	Backup/Smart Port Breaker		Grid Port Breaker		External RCD	Recommended Fuse (Battery)	Recommended Breaker (Battery)
	(30-35)K-LV	(29.9-60)K	(30-35)K-LV	(29.9-60)K			
Rated Voltage (Ue)	≥ 230 Vac	≥ 400 Vac	≥ 230 Vac	≥ 400 Vac	—	≥ 1000 Vac	≥ 1000 Vac
Rated Current (In)	≥ 100 A (30kW) ≥ 115 A (35kW)	≥ 60 A (29.9K) ≥ 60 A (30K) ≥ 75 A (37.5kW) ≥ 80 A (40kW) ≥ 95 A (49kW) ≥ 95 A (50kW) ≥ 115 A (60kW)	≥ 190 A (30kW) ≥ 190 A (35kW)	≥ 115 A (29.9K) ≥ 115 A (30K) ≥ 145 A (37.5kW) ≥ 155 A (40kW) ≥ 190 A (49kW) ≥ 190 A (50kW) ≥ 115 A (60kW)	—	≥ 125 A	≥ 105 A
Altitude	0–4000 m (no derating)	0–4000 m (no derating)	0–4000 m (no derating)	0–4000 m (no derating)	—	0–2000 m (no derating)	0–2500 m (no derating)
Temperature	-25°C ~ 60°C (no freq reduction)	-25°C ~ 60°C (no freq reduction)	-25°C ~ 60°C (no freq reduction)	-25°C ~ 60°C (no freq reduction)	—	-25°C ~ 60°C (no derating)	-40°C ~ 60°C (no derating)
Residual Current (IΔn)	—	—	—	—	≥ 300 mA (15K~30K) ≥ 10 mA/KVA (30K~50K)	—	—
Instantaneous Trip Current (Ii)	≥ 250 A	≥ 250 A	—	—	—	—	≥ 125 A

Recommended battery fuse & breaker values apply per port.

For parallel connection (1batt2DC), double the parameters.

For parallel system, Please note:

1. The rated current (In) / Residual Current (IΔn) * N(where N is the number of units in parallel)
2. RCD should be installed at the busbar, not at individual backup ports.

2.1 Safety

The following types of safety instructions and general information appear in this document as described below:



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 operation of your product.



WARNING: Risk of fire

Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in an area containing flammable materials or gases.
- Do not install the inverter in a potentially explosive atmosphere.

2.2 General Safety Instructions

WARNING
Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.

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

WARNING
Electrical installations must be done in accordance with local and national electrical safety standards.



WARNING
Do not touch any internal parts until 5 minutes after disconnection from the utility grid, PV array, and battery.

WARNING
To reduce the risk of fire, over-current protective devices (OCPD) are required for all 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.
All WHES inverters feature an integrated DC disconnect switch.

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

CAUTION
The PV conductors are energized with high voltage DC when the PV modules are exposed to sunlight.

CAUTION
The surface temperature of the inverter can reach up to 75℃.
To avoid risk of burns, do not touch the surface of the inverter while it is operating. The inverter must be installed out of direct sunlight exposure.

NOTE
PV modules used with inverter must have an IEC 61730 Class A rating.

WARNING
Operations must be accomplished by a licensed electrician or a person authorized by WHES.

WARNING
Installer must wear personal protective equipment during the entire installation process in case of electrical hazards.

WARNING
The AC Backup Port of the inverter cannot be connected to the grid.

WARNING
Please refer to the product manual of the battery before installation and configuration to the inverter.

CAUTION
If you want to use PV simulator for inverter test, please switch on the PV DC switch of inverter before turning on PV simulator. And if you want to power off the tested system, you should turn off the PV simulator first and after that you can turn off the inverter. Otherwise it will causes the machine explosion on site.

WARNING
If a transformer is required on the backup load side, the user must install a soft-start device at the backup port.

CAUTION
WHES don't recommend using the battery to instead of the real PV connection for any test, otherwise it will causes the machine explosion on site.

NOTE
Please Notice that Max.operation altitude 4000m, but Max. input PV voltage will derate when above 2000m, the following table shows the relationship between elevation and voltage.

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

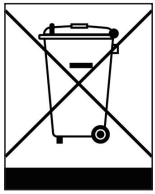
Systems using this product shall be designed and built in accordance with the NEC & local electrical codes & standards.

2.3 Notice for 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 be compliant with all local and national regulations & standards.
3. The inverter must be installed according to the instructions stated in this manual.
4. The inverter must be installed according to the inverter technical specifications.

2.4 Notice for Disposal



This product shall not be disposed as household waste.
It must be segregated and brought to an appropriate disposal facility to ensure proper recycling.
This is to be done in order to avoid negative impacts on the environment and human health.
Local waste management rules shall be observed and respected.

2.5 Notice for Transporation

For the transportation demands of integrating with battery or install inverter in container, WHES only support separate transport, and the battery pack should be placed in the freight cabinet follow the battery manufacturer's rule, and the inverter should be placed on its own tray, we also dont support the machine is transported in the cabinet in the form of back-hanging.

3.1 Select a Location to Install the Inverter

When selecting a location for the inverter, the following criteria should be considered:

- Protect from direct rain and snow.
- Avoid direct sunlight to prevent power derating from overheating.
- Ensure ambient temperature ≤40°C.

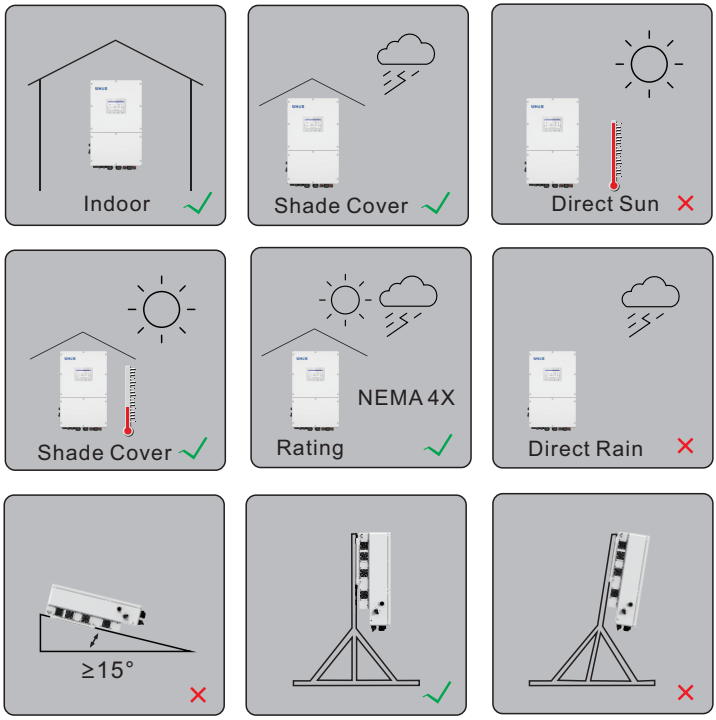


Figure 3.1 Recommended Installation locations

NOTE:

Installation of the inverter in a location exposed to direct sunlight should to be avoided.

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.

WARNING: Risk of fire

Despite careful construction, electrical devices can cause fires.

- Do not install the inverter in areas containing highly flammable materials or gases.
- Do not install the inverter in potentially explosive atmospheres.
- The mounting structure where the inverter is installed must be fireproof.

When selecting a location for the inverter, consider the following:

CAUTION: Hot Surface

- The temperature of the inverter heat-sink can reach 75℃.

The ambient temperature and relative humidity of the installation environment should meet the following requirements:

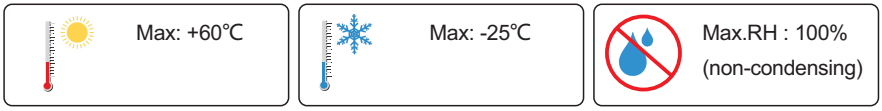


Figure 3.2 Installation environment conditions

3.1.1 Air circulation

Do not install in small, closed rooms where air cannot freely circulate.
To prevent overheating, always ensure that the air flow around the inverter is not blocked.

3.1.2 Living area

Do not install in a living area where the prolonged presence of people or animals is expected. Depending on where the inverter is installed (for example: the type of surface around the inverter, the general properties of the room, etc.) and the quality of the electricity supply, the sound level from the inverter can be quite high.

3.2 Product Handling

1. Push in pre-cut cutouts to form carrying handles (Figure 3.3).
2. Lift the inverter from the carton using the heat-sink integrated handles.
3. Mount the two black handrails to the inverter sides at the marked positions (Figure 3.4).

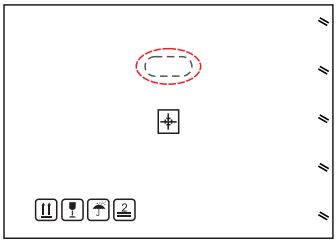


Figure 3.3

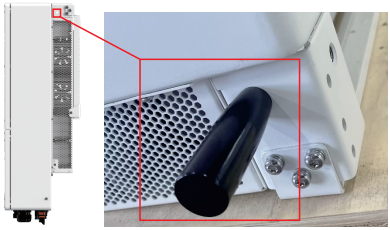


Figure 3.4

3.3 Mounting the Inverter

1.Mount on a wall or structure capable of supporting the inverter's weight.
2. Mount vertically, with backward incline ≤ 15°. Exceeding this may cause power derating.
3. Maintain minimum clearances as below(Figure 3.5)
4. Ensure LCD screen lights remain visible.
5. Provide adequate ventilation; do not obstruct airflow.



Load bearing surface:
Made of non-inflammable materials

Max. load bearing capacity ≥ 4 times of inverter weight



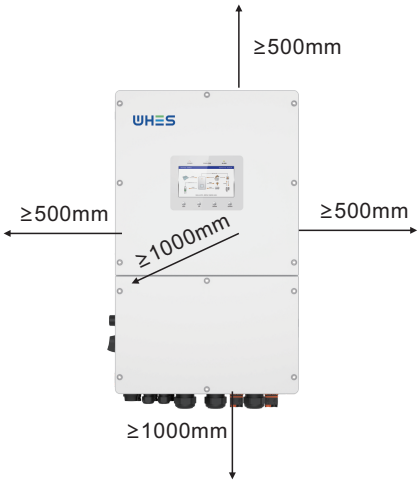


Figure 3.5 Inverter Mounting Clearances

NOTE
Nothing should be stored on the top of or placed against the inverter.

Dimensions of mounting bracket:

unit:mm

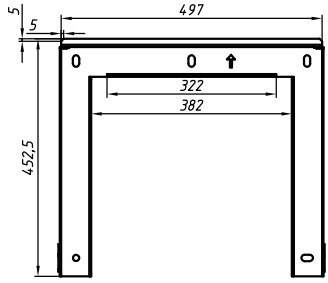


Figure 3.6 Inverter wall mounting

Mounting Steps

1. Mark bracket mounting holes at selected height; for brick walls, ensure hole positions suit expansion bolts.
2. Lift the inverter to align the rear bracket with the mounting bracket's convex section, and hang it in place. Verify it is securely seated (Figure 3.7).

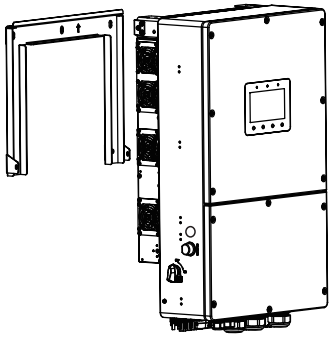


Figure 3.7 Wall mount bracket

3.4 Ground Cable Installation

The external ground connections are provided on the both sides of inverter.

Prepare OT terminals: M5. Use proper tooling to crimp the lug to the terminal.

Connect the OT terminal with ground cable to the right side of inverter. The torque is 3.5N.m.

M5 Screw removed
Torque: 3.5N.m

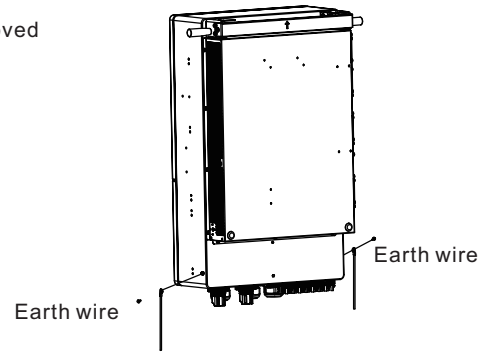


Figure 3.8 Connect the external grounding conductor

IMPORTANT

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

1. Strip the ground cable insulation to a suitable length. (see Figure 3.9)
2. Crimp a ring connector onto the cable and then connect it to the chassis ground terminal.

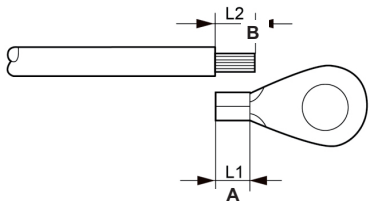


Figure 3.9 External Grounding Conductor Terminal

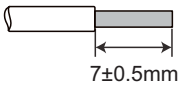
3.5 PV Cable Installation

Before connecting inverter, please make sure the PV array open circuit voltage is within the limit of the inverter.

Before connection, please make sure the polarity of the output voltage of PV array matches the“DC+”and“DC-”symbols.

Please use approved DC cable for PV system.

1. Select a suitable DC cable and strip the wires out by 7±0.5mm. Please refer to the table below for specific specifications.



Cable type	Cross section（mm²）	
	Range	Recommended value
Industry generic PV cable	4.0~6.0 (12~10AWG)	4.0（12AWG）

Figure 3.10

2. Take the DC terminal out of the accessory bag, turn the screw cap to disassemble it, and take out the waterproof rubber ring.

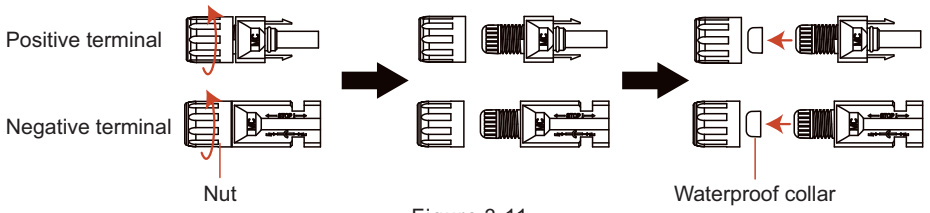


Figure 3.11

3. Pass the stripped DC cable through the nut and waterproof rubber ring.

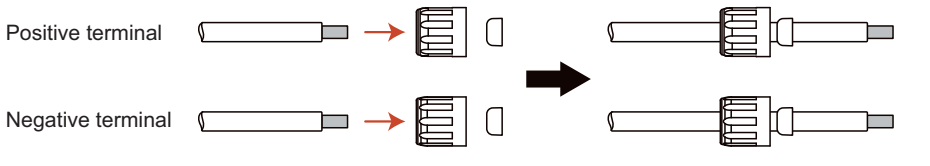


Figure 3.12

4. Connect the wire part of the DC cable to the metal DC terminal and crimp it with a special DC terminal crimping tool.

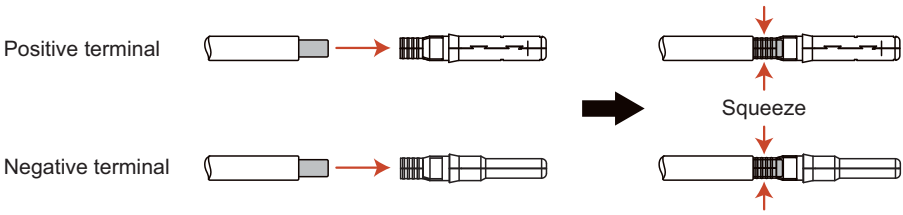


Figure 3.13

5. Insert the crimped DC cable into the DC terminal firmly, then insert the waterproof rubber ring into the DC terminal and tighten the nut.

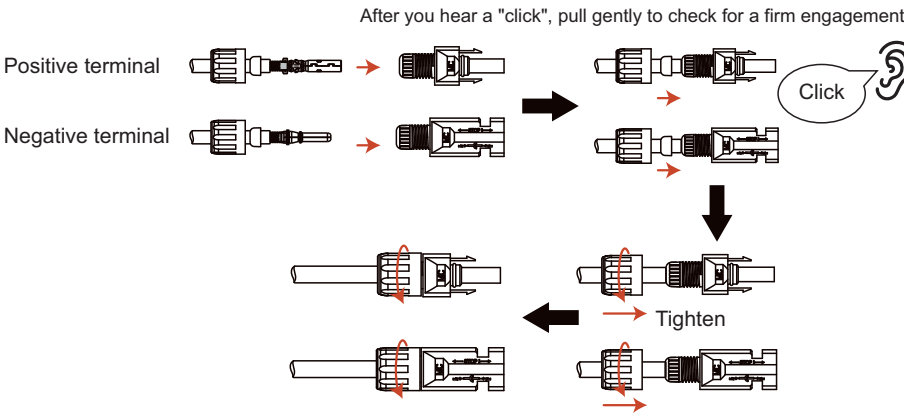


Figure 3.14

6. Measure PV voltage of DC input with multimeter, verify DC input cable polarity.

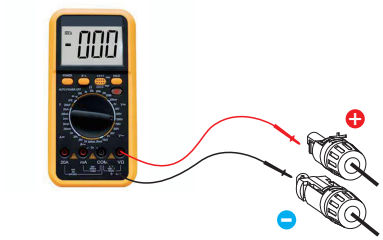


Figure 3.15

7. Connect the wired DC terminal to the inverter as shown in the figure, and a slight "click" is heard to prove the connection is correct.

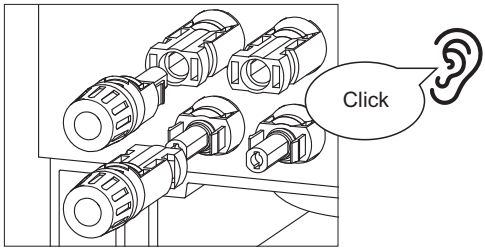


Figure 3.16

NOTE

DC Switch Safety Instructions

Do not turn off the DC switch if DC input polarity is reversed or the inverter is faulty—doing so may cause arcing, equipment damage, or fire.

Correct Procedure:

1. Measure the DC string current with a clamp meter.
2. If current >0.5 A, wait for irradiance to drop until current falls below 0.5 A.
3. Then turn off the DC switch and disconnect PV strings.
4. After shutdown, fully disconnect PV strings to prevent residual energy from causing secondary faults.

NOTE

Damage resulting from improper operation is not covered under warranty.

3.6 Battery Cable Installation

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.

Inverter supports the 3 wirings methods to connect to lithium battery.

If you have only one battery, you MUST connect it to DC 1 port on inverter, and communication cable MUST be connected to BMS 1 port on the inside terminal block.

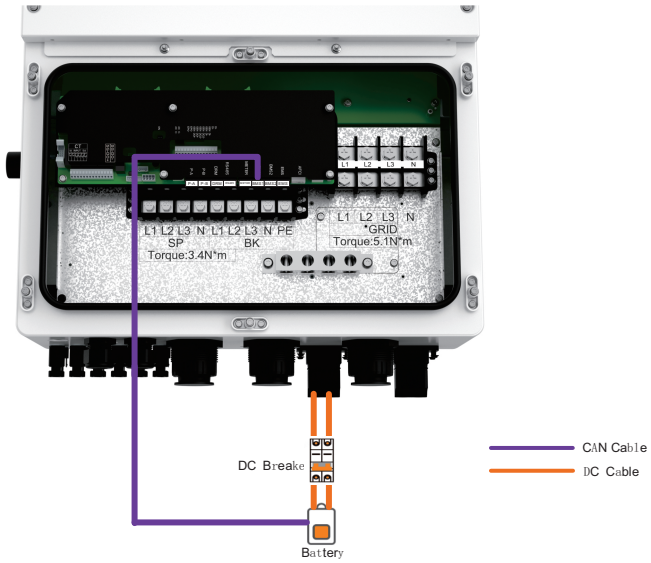


Figure 3.17

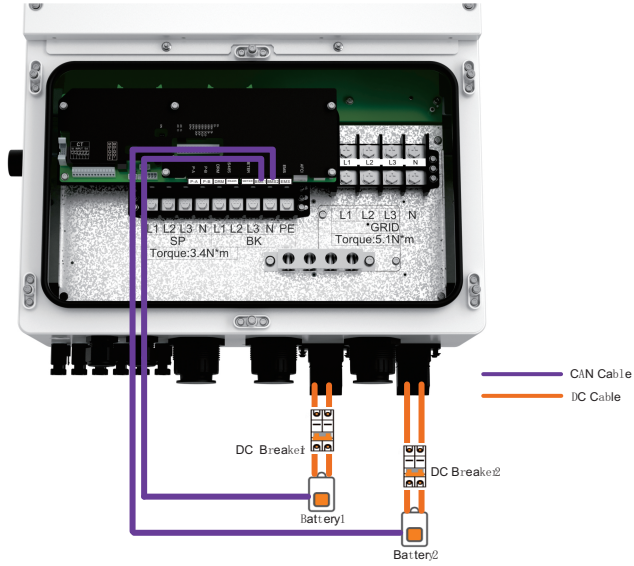


Figure 3.18

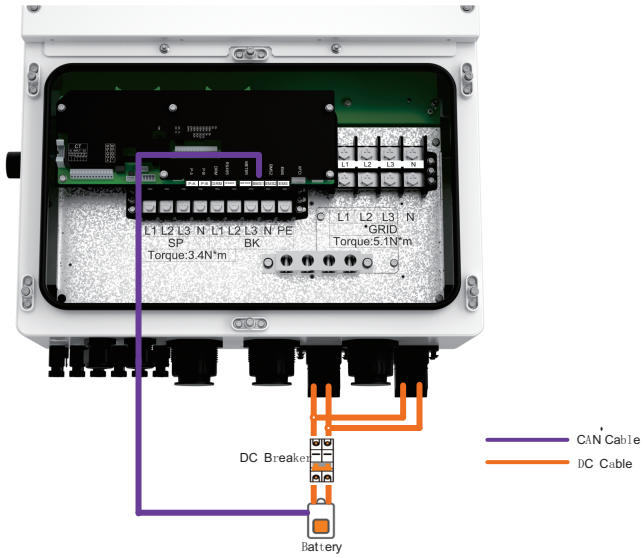


Figure 3.19



NOTE:

For this battery wiring mode, the communication wire must be connected to the BMS 1 port of inverter.



NOTE:

The condition for battery fully charging:
For this series of product, the compatible battery voltage should from 150-800V, but if you want the battery fully charging, you should know the condition(as the below table) for that.

Battery curve		(29.9-50)K			60K		
NO.	Battery voltage	Battery Current	Single battery power	Two-way battery power	Battery Current	Single battery power	Two-way battery power
1	150V	30A	5kW	9kW	30A	5kW	9kW
2	215V	70A	15kW	30kW	70A	15kW	30kW
3	288V	70A	20kW	40kW	70A	20kW	40kW
4	324V	80A	26kW	52kW	84A	27kW	54kW
5	330V	80A	26kW	53kW	84A	28kW	55kW
6	400V	80A	32kW	55kW	84A	33.6kW	63kW
7	500V	70A	35kW	55kW	70A	35kW	63kW
8	550V	64A	35kW	55kW	64A	35kW	63kW
9	600V	58A	35kW	55kW	58A	35kW	63kW
10	700V	50A	35kW	55kW	50A	35kW	63kW
11	800V	44A	35kW	55kW	44A	35kW	63kW



Figure 3.20 Battery connection types

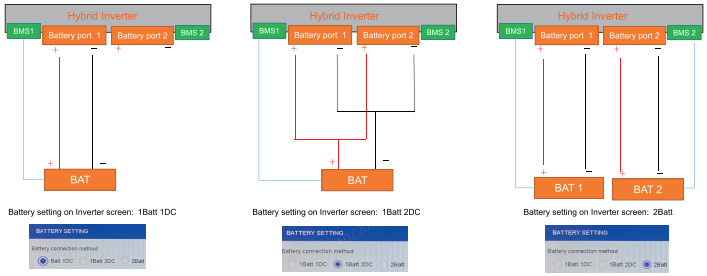
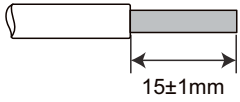


Figure 3.21 Battery connection diagram and corresponding HMI setting

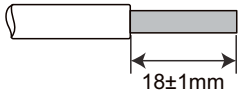
3.6.1 Installation Steps

Dimension of stripping line inside machine



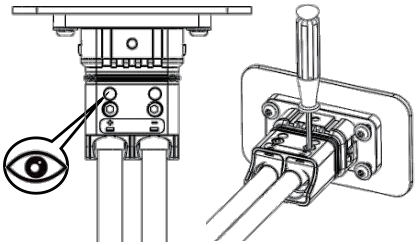
Cable type	Cross section（mm²）
Battery cable	10.0~25.0 MAX

Dimension of stripping line outside machine

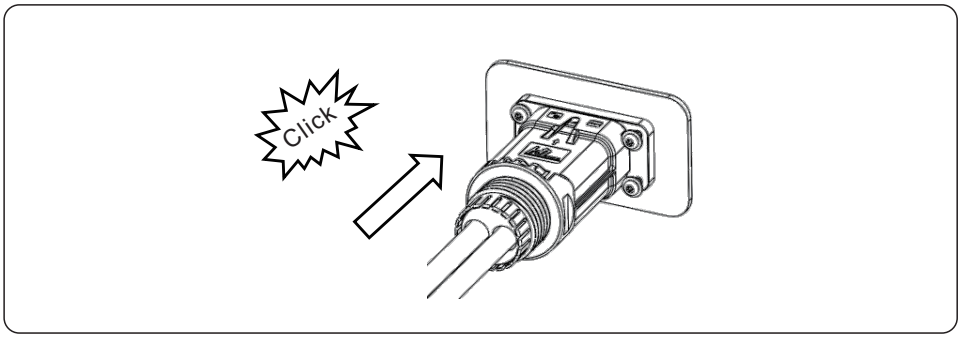


Cable type	Cross section（mm²）
Battery cable	10.0~25.0 MAX

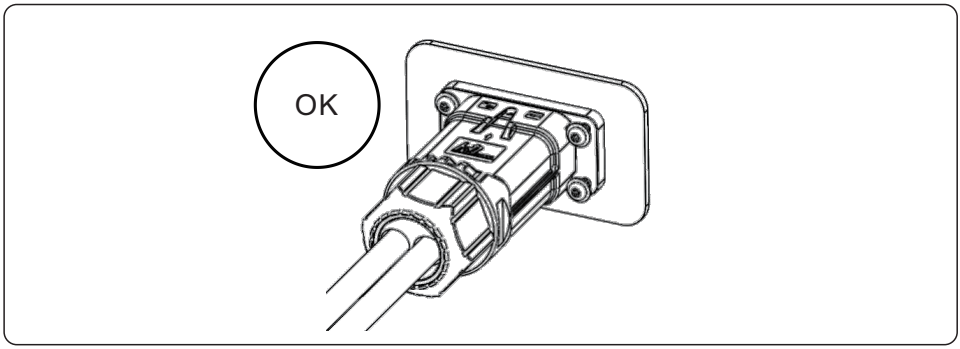
1. Insert the cable into the rubber core according to the line sequence, observe the perspective hole, the cable is in place, and the torque of the crimping screwdriver is 4 ± 0.1N. M.



2. Insert the main body into the rubber core and hear the "click" sound.

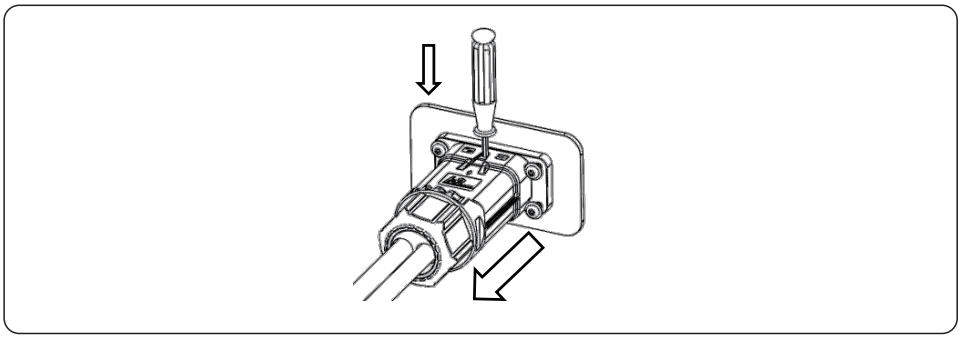


3. Complete the installation.



3.6.2 Disassembly Steps

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



3.7 AC Wiring

DANGER

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.

There are three sets of AC output terminals and the installation steps for both are the same. The maximum temperature for connecting AC and battery terminals is 85°C.

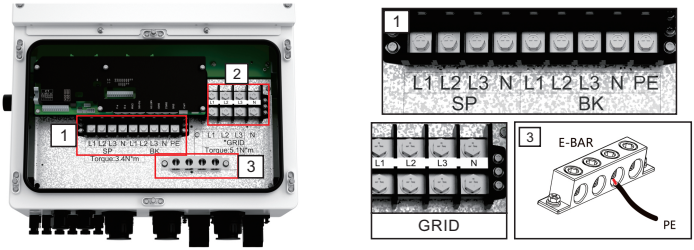


Figure 3.22 AC output terminals

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. Cable Gland are recommended torque for installation is 7-7.5 N.m. In order to ensure waterproof effect, the operator regularly checks whether the installation is tight.



NOTE:

The requirement of load on inverter's backup port and smart port:

1. Resistive load & RCD load: single phase Resistive load cannot exceed 100% inverter rated single phase power, the RCD load cannot exceed 60% inverter rated power.

2. Motor load: customer should be careful about the impulse power when start the load, ensure the impulse power cannot exceed the overload curve power and time restriction.

3 RLC load: total power of load cannot exceed inverter rated power, the instantaneous peak current (peak impulse current) during load switching shall not exceed twice the rated current of the inverter, and the minimum power factor shall not be lower than 0.8

4 Mixed Load: Excluding the RLC load, the motor load and RCD load should be reduced proportionally.

5. Isolation transformer: If starting with a transformer, it is necessary to pay attention to the inrush current not exceeding twice the rated current and the inrush power not exceeding the overload curve limit requirements; otherwise, a soft start function needs to be added to the transformer.

3.8 Meter/CT Connection

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

3.8.1 Meter Installation

Meter model: Eastron-SDM630MCT_V2

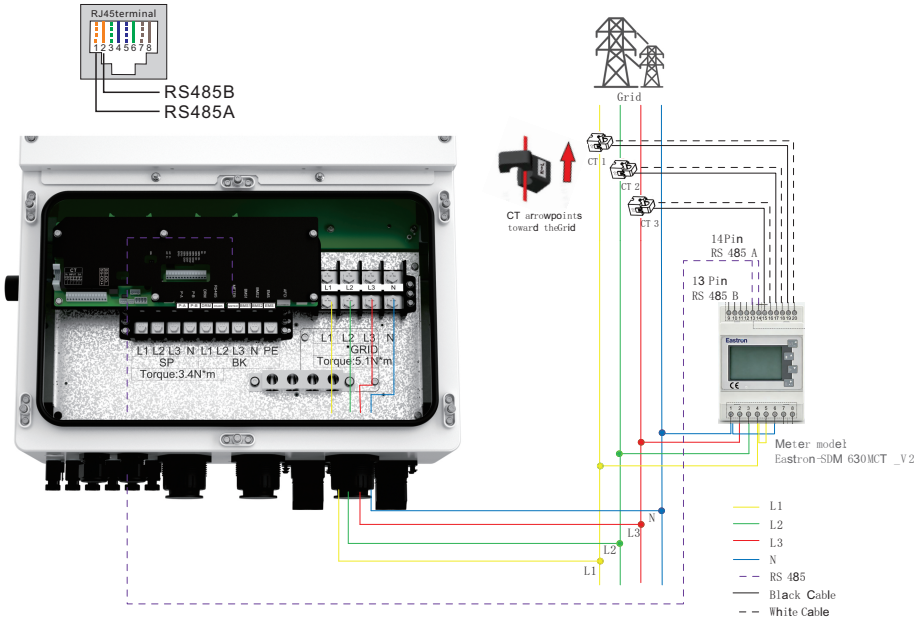


Figure 3.23

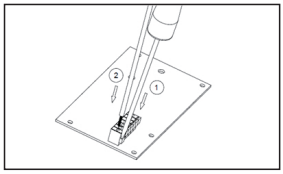
3.8.2 CT Installation

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: ESCT-T50-300A/5A
CT Cable: Size – 2.3mm2, Length - 4m, its extension not supported.

Please install the CT on the hot line at the system grid connection point and the arrow on the CT needs to point to the grid direction.
Lead the CT wires through the COM3 port at the bottom of the inverter and connect the CT wires to the 14pin communication terminal block.

CT Wire	14 PIN Communication Terminal Block
White	Pin 1 (From Left to Right)
Black	Pin 2 (From Left to Right)
White	Pin 3 (From Left to Right)
Black	Pin 4 (From Left to Right)
White	Pin 5 (From Left to Right)
Black	Pin 6 (From Left to Right)

Terminal Block Connection Steps:
Step 1. Lead the wires through the hole in COM3 port (Hole Diameter: 2 mm)
Step 2. Strip the wires for 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.



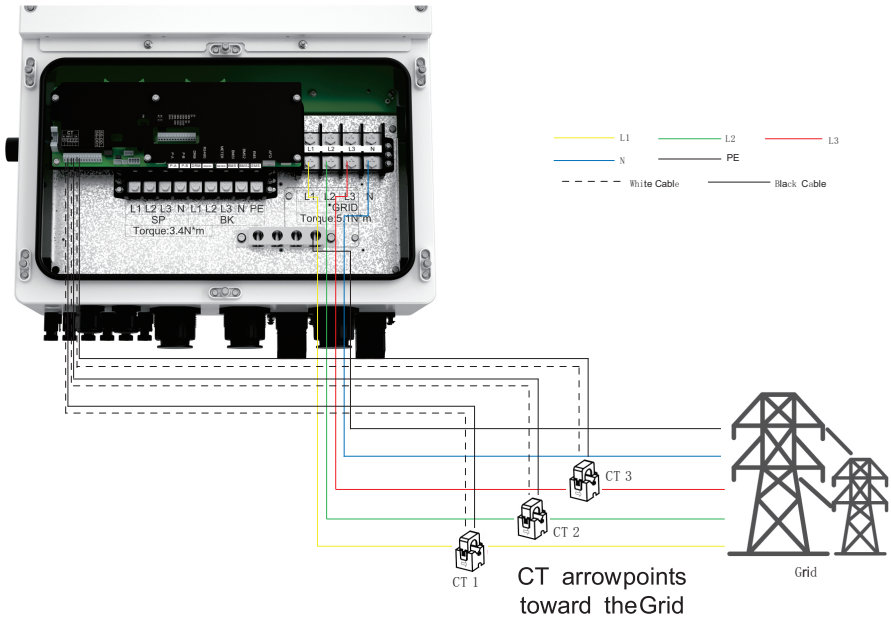

L1 L2 L3 N L1 L2 L3 N PE
SP
BK
Torque:3.4N*m
L1 L2 L3 N
GRID
Torque:5 N*m
L1
L2
L3
N
PE
White Cable
Black Cable
CT 3
CT 2
CT 1
Grid
CT arrowpoints
toward theGrid

Figure 3.24

3.9 Inverter Communication

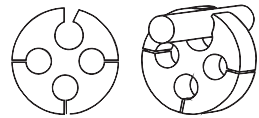
3.9.1 Communication Ports



Port	Port Type	Description
COM	USB	Used for WHES data logger 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 for COM1 and COM2 are with openings on the side.
Please separate the gap with hand and squeeze the cables into the holes from the side openings.



3.9.2 Communication Terminals

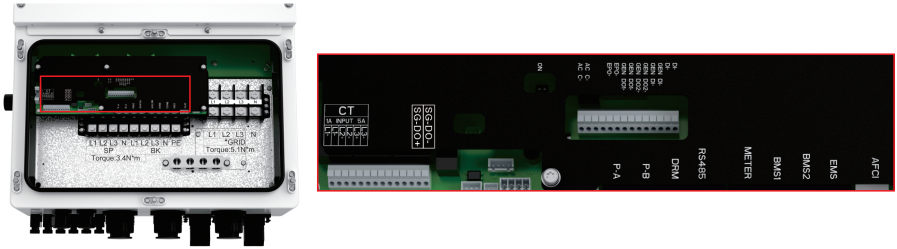


Figure 3.25 Communication terminals

Terminal	Type	Description	Reference
EMS	RJ45	Used for 3rd party Energy management system connection through RS485.	3.9.6
BMS2/ BMS1		Battery BMS2/BMS1 CAN communication.	3.9.3
METER		(Optional) Used for RS485 communication between inverter and the smart meter.	3.9.4
RS485		RS485 port for 3rd party external device or controller.	3.9.6
DRM		(Optional) To realize Demand Response or Logic Interface function, this function may be required in UK and Australia.	3.9.5
P-A/P-B		(Optional) Parallel operation communication port.	7.5
CT_L1+	Communication Terminal Block1	L1 (Phase A) CT Connection.	3.9.7
CT_L1-			
CT_L2+		L2 (Phase B) CT Connection.	
CT_L2-			
CT_L3+		L3 (Phase C) CT Connection.	
CT_L3-			
AC C+	Communication Terminal Block2	Used for controlling external relay to realize export limit in AC-coupled scenario (12V on/off signal).	3.9.8.1
AC C-			
EPO+		Emergency stop external switch.	3.9.8.2
EPO-			
GEN DO1+		Generator dry contact start/stop.	3.9.8.3
GEN DO1-			
GEN DO2+		Generator dry contact start/stop.	3.9.8.3
GEN DO2-			

Terminal	Type	Description	Reference
GEN DI+	Communication Terminal Block2	Used for external adaptor(DC12V/5V) power supply.	3.9.8.4
GEN DI-			
DI+		Used for external ATS dry contact signal transmission.	3.9.8.5
DI-			

3.9.3 BMS Terminal Connection

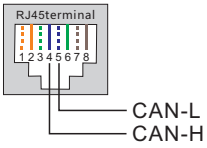
CAN communication is supported between inverter and compatible battery models.
Please lead the CAN cable through the COM1 or COM2 port of the inverter and connect to the BMS terminal with RJ45 connector.

Inverters of this series type support that customers using the batteries with different capacity and with different specification, but WHES recommend that using the batteries with same specification is better for the whole inverter system work excellently.



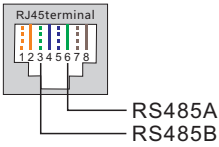
NOTE:

Before connecting CAN cable with the battery, please check whether the communication pin sequence of the inverter and the battery match;
If it does not match, you need to cut off the RJ45 connector at one end of the CAN cable and adjust the pin sequence according to the pin definitions of both inverter and battery.
Pin definition of the inverter BMS Port is following EIA/TIA 568B.
CAN-H on Pin 4: Blue
CAN-L on Pin 5: Blue/White



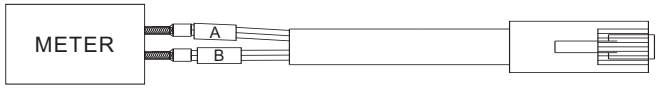
NOTE:

Before connecting RS485 cable with the battery, please check whether the communication pin sequence of the inverter and the battery match;
If it does not match, you need to cut off the RJ45 connector at one end of the RS485 cable and adjust the pin sequence according to the pin definitions of both inverter and battery.
Pin definition of the inverter BMS Port is following EIA/TIA 568B.
RS485A on Pin 6: Green
RS485B on Pin 3: Green/White



3.9.4 Meter Terminal Connection

Please lead the Meter RS485 cable through the COM1 or COM2 port of the inverter and connect to the Meter terminal with RJ45 connector.

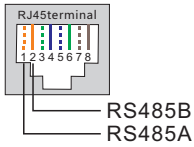


NOTE:

Pin definition of the Meter Terminal is following EIA/TIA 568B.

RS485A on Pin 1:Orange/white

RS485B on Pin 2:Orange



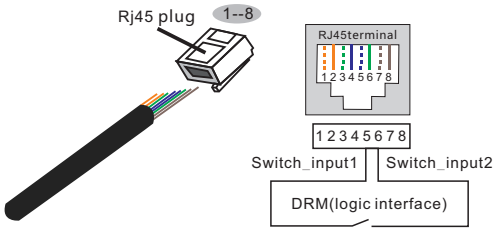
3.9.5 DRM Port Connection (Optional)

3.9.5.1 For Remote Shutdown Function

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

The DRM port is provided with an RJ45 terminal and its Pin5 and Pin6 can be used for remote shutdown function.

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



Correspondence between the cables and the stitches of plug, Pin5 and Pin6 of RJ45 terminal is used for the logic interface, other Pins are reserved.

Pin 1: Reserved; Pin 2: Reserved

Pin 3: Reserved; Pin 4: Reserved

Pin 5: Switch_input1; Pin 6: Switch_input2

Pin 7: Reserved; Pin 8: Reserved

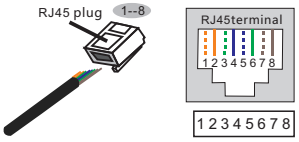
Figure 3.26 Strip the insulation layer and connect to RJ45 plug

3.9.5.2 For DRED Control Function (For AU and NZ Only)

DRED means demand response enable device. The AS/NZS 4777.2:2020 required inverter need to support demand response mode(DRM).
This function is for inverter that comply with AS/NZS 4777.2:2020 standard.
A RJ45 terminal is used for DRM connection.

Pin	Assignment for inverters capable of both charging and discharging	Pin	Assignment for inverters capable of both charging and discharging
1	DRM 1/5	5	RefGen
2	DRM 2/6	6	Com/DRM0
3	DRM 3/7	7	V+
4	DRM 4/8	8	V-

NOTE:
WHES hybrid inverter is designed to provide 12V power for DRED.



Correspondence between the cables and the stitches of plug
Pin 1: white and orange ; Pin 2: orange
Pin 3: white and green; Pin 4: blue
Pin 5: white and blue; Pin 6: green
Pin 7: white and brown; Pin 8: brown

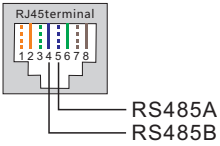
Figure 3.27 Strip the insulation layer and connect to RJ45 plug

3.9.6 EMS/RS485 Connection (Optional)

3.9.6.1 EMS Connection

If third party EMS needs to communicate with the inverter.
Modbus RTU protocol is supported by WHES inverter.
To acquire latest protocol document, please contact WHES local service team or WHES sales.

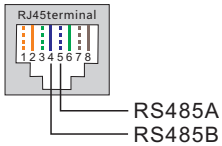
NOTE:
Pin definition of the RS485 Port is following EIA/TIA 568B.
RS485A on Pin 5: Blue/White
RS485B on Pin 4: Blue



3.9.6.2 RS485 Connection (Optional)

If third party controller device needs to communicate with the inverter.
Modbus RTU protocol is supported by WHES inverters.
To acquire latest protocol document, please contact WHES local service team or WHES sales.

NOTE:
Pin definition of the RS485 Port is following EIA/TIA 568B.
RS485A on Pin 5: Blue/White
RS485B on Pin 4: Blue



3.9.7 Communication Terminal Block 1 – CT Connection

NOTE:
The voltage accuracy of the machine is 0.5%, and the CT current accuracy is 0.5%, so the total accuracy of inverter is 1%(voltage + current).

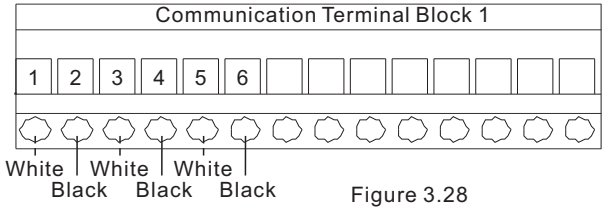


Figure 3.28

NOTE:
Pin1 – CT L1+: White
Pin2 – CT L1-: Black
Pin3 – CT L1+: White
Pin4 – CT L1-: Black
Pin5 – CT L1+: White
Pin6– CT L1-: Black

3.9.8 Communication Terminal Block 2

Terminal Block Connection Steps:

Step 1. Lead the wires through the hole in COM4 port (Hole Diameter: 2 mm)

Step 2. Strip the wires for 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.

3.9.8.1 AC Coupled Relay Control Terminal (AC C+ / AC C-)

This terminal is used for AC Coupled application with PV inverters on the smart port when system level export limit is required.

It is designed to connect with external controllable relay or breaker.

When hybrid inverter detects the system level export limit is about to be breached, it will initiate 12V on/off signal from this AC C+/AC C- terminal to the external controllable relay or breaker to shut down the AC connection of the PV inverters.

For detailed instructions, please contact WHES technical support or service team for clarification.

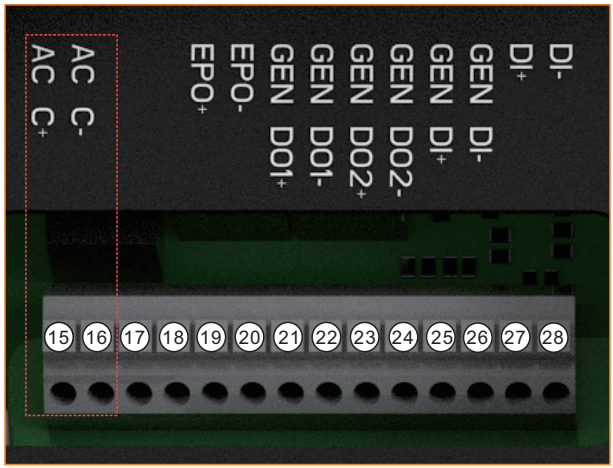


Figure 3.29

3.9.8.2 Emergency Power Off (EPO) External Switch

An external emergency power off switch can be added to the system.
Pins 19 (EPO+) and 20 (PTO-) are for both rapid shutdown and emergency power off.
Connecting an external switch to these two pins allows the system to be put into EPO mode.
After installing an external switch, run a 2-core cable between it and the inverter.
Connect the two cores from the switch to pins 19 and 20 as shown below.
Initiating EPO for the primary inverter will also initiate EPO for the secondary.

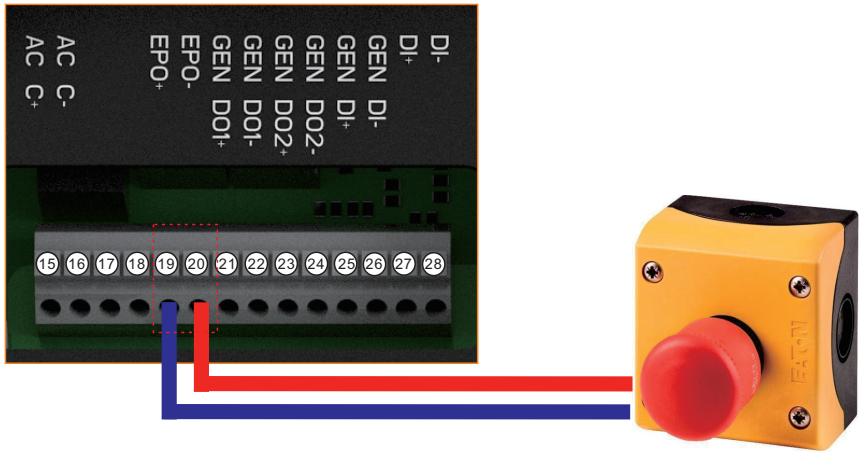


Figure 3.30

3.9.8.3 Generator Dry Contact Terminal Connection

The two GEN DO1 terminals are for a voltage-free dry contact signal for connecting to a generator's NO relay which starts up the generator whenever necessary.
When generator operation is not required, Pins 21 (GEN DO1+) and 22 (GEN DO1-) are in open circuit. When generator operation is needed, Pins 21 and 22 are in closed circuit.
The two GENDO2 terminals are the same control logic as GENDO1.

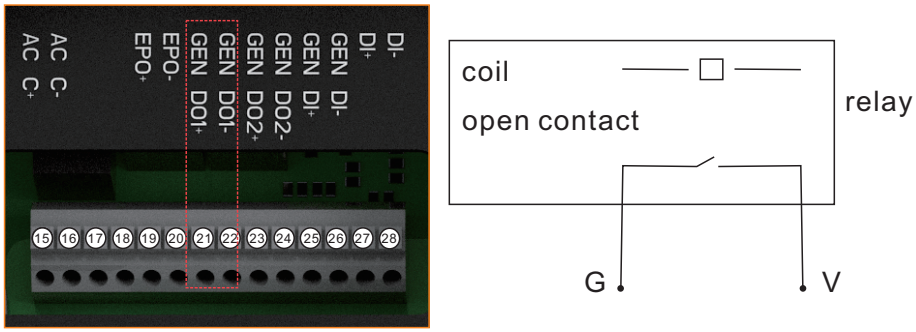


Figure 3.31

NOTE:
50mA>Input>10mA

3.9.8.4 Generator DI Terminal Connection

The GEN-DI on the inverter is dedicated to connect to an adapter(220Vac~5/12Vdc) on the grid side. This adapter will follow the available/unavailable status with the grid by providing 5/12V or 0V to the inverter so that the inverter knows when the grid is down or comes back and acts accordingly.

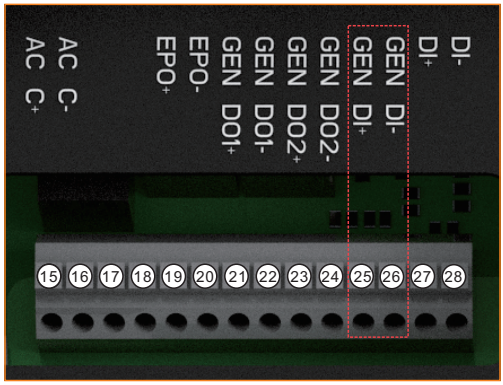


Figure 3.32

3.9.8.5 DI Terminal Connection

The DI terminal on the inverter is dedicated to connect to the ATS on the dry contact point, when the grid is down, the ATS will close the circuit of the dry contact, then the inverter can identify and enter generator operation mode. When the grid comes back, the dry contact will be open.

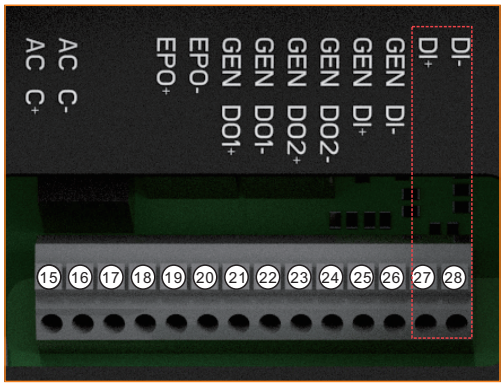


Figure 3.33

3.10 Inverter Remote Monitoring Connection

The inverter can be remotely monitored via WiFi, LAN or 4G.
The USB type COM port at the bottom of the inverter can connect to different kinds of WHES data loggers to realize the remote monitoring on SolarEnergy platform.
To install WHES data loggers, please refer to corresponding user manuals of WHES data loggers.
The WHES data loggers are optional and can be purchased separately.
Dust cover is provided the inverter package in case the port is not used.

WARNING:
The USB type COM port is only allowed to connect WHES data loggers.
It is forbidden to be used for other purposes.



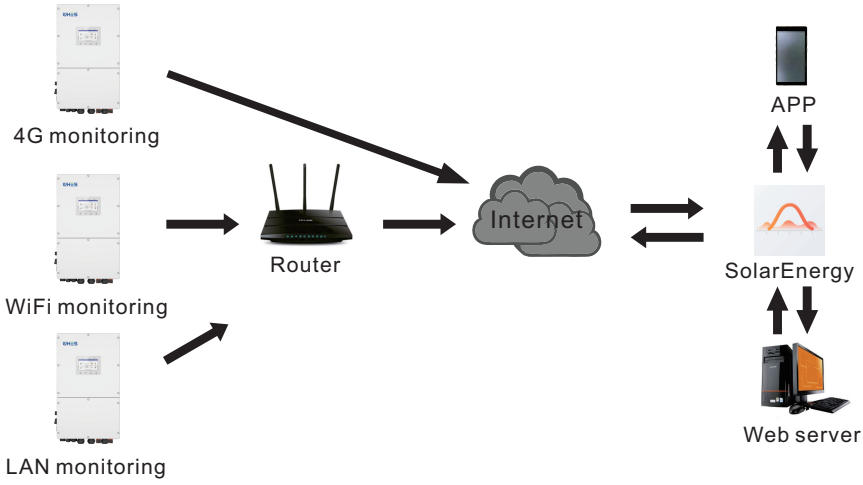


Figure 3.34 Wireless communication function

4.1 HMI Screen

There are 3 indicators and 4 operation button on the WHES Series Inverter.

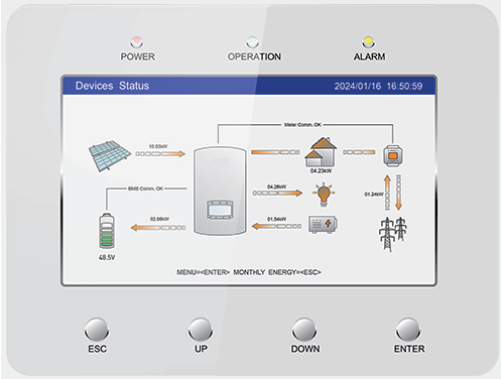


Figure 4.1

Description of indicators:

Indicators	Status	Description
POWER	Red light solid on	Normally powering
	OFF	Not working
OPERATION	Green light solid on	Normally powering
	OFF	No operation
ALARM	Yellow light solid on	Alarm
	OFF	Normal

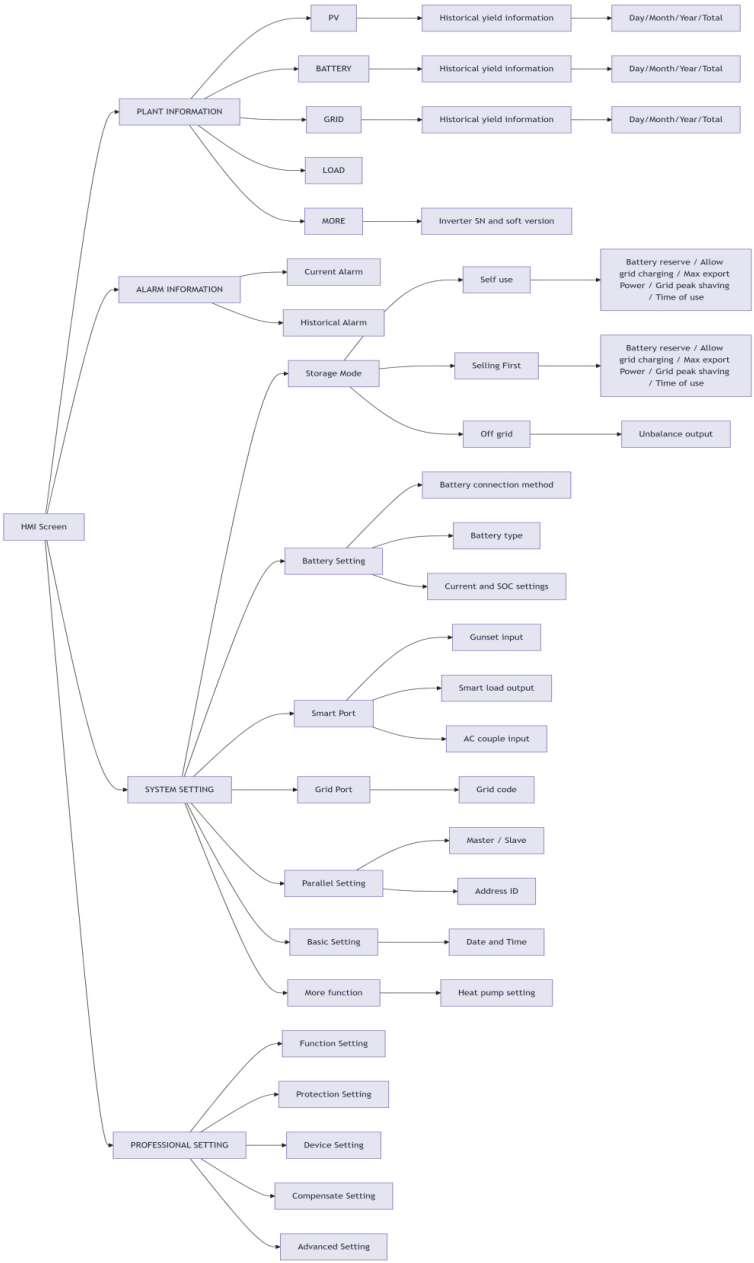
Description of buttons:

Button	Description
ESC	“Escape”, allows the user to exit, or cancel the operation.
UP	Upwards key, allows the user to increase the value or move forward to the next option.
DOWN	Downwards key, allows the user to decrease the value or move backward to the previous option.
ENTER	Running or executing command .

NOTE:

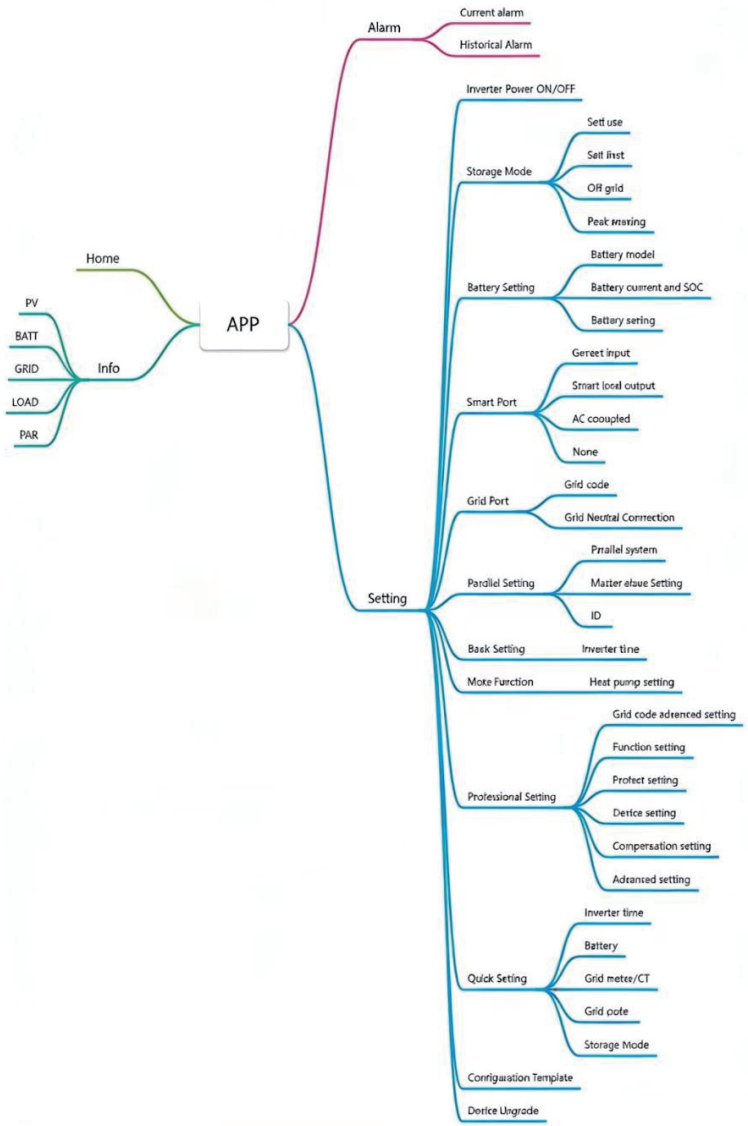
The screen will be automatically turn off after being idle for a few minutes to save power, click any operation button(“ESC”/“UP”/“DOWN”/ “ENTER”) to restart the screen, then press“Enter”into the main operation interface.

4.2 HMI screen operation system overview



4.3 APP Local debugging interface structure

This inverter supports local debugging on SolarEnergy. Comnunication type: Bluetooth.
The local debugging interface structure is as below:



4.4 Inverter built-in Bluetooth description

Bluetooth: BDR、EDR、BLE
frequency band(s) in which the radio equipment operates:2.402-2.480GHZ
Maximum transmitting power: 8dBm

5.1 Pre-Commissioning

- Make sure that no high voltage conductors are energized.
- Check all conduit and cable connection points ensure they are tight.
- Verify that all system components have adequate space for ventilation.
- Follow each cable to ensure that they are all terminated in the proper places.
- Ensure that all warning signs and labels are affixed on the system equipment.
- Verify that the inverter is secured to the wall and is not loose or wobbly.
- Prepare a multimeter that can do both AC and DC amps.
- Have an Android or Apple mobile phone with Bluetooth capability.
- Install the SolarEnergy APP on the mobile phone and register a new account.
- There are three ways to download and install the latest APP.

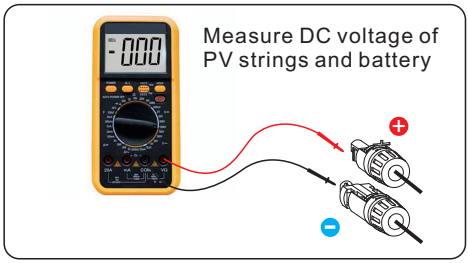
  1.You can visit www.SolarEnergy.com.

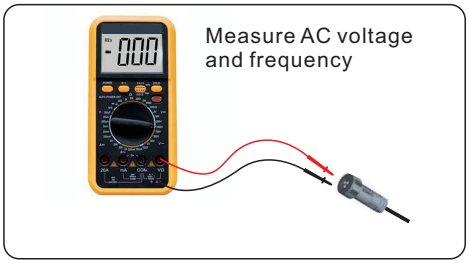
  2.You can search"SolarEnergy"in Google Play or APP Store.

  3.You can scan this QR code to download SolarEnergy.

5.2 Power ON

Step 1: With the DC switch off, energize the PV strings and then measure DC voltage of the PV strings to verify that the voltage and polarity are correct. Turn on the battery and check the battery voltage and polarity as well.





Step 2: Turn on the OCPD for the system and then measure the AC voltages line to line and line to neutral. The backup side of the system will be off until commissioning is complete. Turn the OCPD back off for now.

Step 3: Turn the DC switch on and then the OCPD(AC breaker) for the system.

This inverter can be powered on by PV only, battery only and Grid only.

When the inverter is powered on,the five indicators will be lighted at once.

5.3 Power OFF

Step 1: Turn off the AC breaker or AC disconnect switch to disable AC power to the inverter.

Step 2: Turn off the DC switch of the inverter.

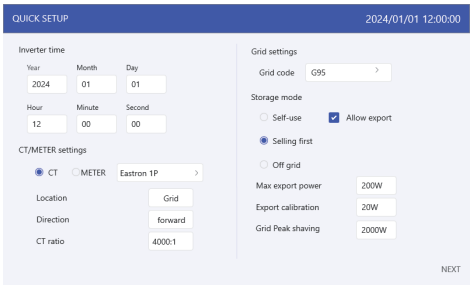
Step 3: Turn off the battery breaker.

Step 4: Use a multimeter to verify that the battery and AC voltages are 0V.

5.4 HMI Screen Setting

5.4.1 HMI Quick Setting

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



1. Inverter time:
Set inverter time and date, default follow the phone.

2. CT/Meter setting:
Select the CT or Meter, WHES provide Eastron 3 phase meter, it is self-identifiable.
Set installation location: Grid side / Load side / Grid+PV inverter;
CT direction: When CT installed correctly, select “Forward”; when CT installed direction wrong, the sampling current of CT will be reversed when calculating the power, select “Reversal” to correct it.
Set CT ratio: default 120 (WHES provide AKH-0.66-K-80*40-600A), 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.

3. Grid code:
Select grid code that meet the local regulations.

4. 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.
Self-use / Selling first / Off-grid are exclusive, the user could select only one mode.

5. Battery setting:

Select Battery connection method : 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC; the connection method please refer to 3.13 Lithium battery wiring.

Select battery brand (if the connected battery is not on the list, please select “General_LiBat_HV”).

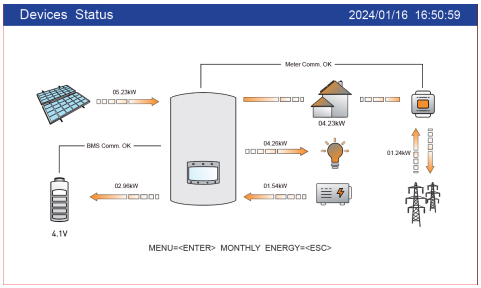
Set Max charging/discharging current.

If there are two batteries and share the same settings, please tick the box of “Batt2 Settings follow Batt 1”.

5.4.2 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"

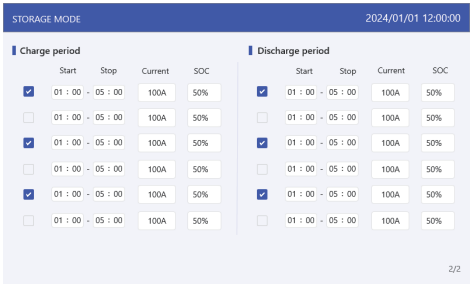
Use "UP" or "DOWN" key to select the desired mode, then press "ENTER".



Step 4: Set "Time of use" under each mode (Skip this step if no need)

Time of Use is for manual control of the battery charging/discharging. It is for customizing when the battery is allowed to charge and discharge power and at what rate, established by a current(amperage)setting.

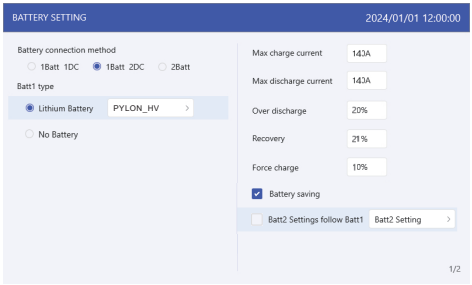
1. Charge period: battery charges with set current value until the charging cut-off voltage (settable), checking the box to control whether enable this charging period.
2. Discharge period: battery discharges with set current value until the discharging cut-off voltage (settable), checking the box to control whether enable this discharging period.



NOTE:

The set current value is the maximum current for charging/discharging the battery. However, the actual charging and discharging current may not reach this value due to the influence of other factors, such as the maximum charging/discharging power limitation of the inverter, the battery BMS limitation, etc.

Step 5: Set "Battery Setting"



Settings	Description
Max charge current	Max charge current, settable.
Max discharge current	Max discharge current, settable.
Over discharge	Range: 5~40%, default 20%, when battery SOC < over discharge, it will stop discharging.
Recovery	Range: set Over discharge value +1% ~ set Over discharge value +20%; The battery can discharge when the SOC/Voltage reaches the set value. Avoid repeated changes in the charging and discharging status of the battery.
Force charge	The battery will be charged to the over discharge SOC/Voltage when it reaches this setting.
Max charge SOC	The maximum SOC/Voltage that the battery can be charged to. Default 100%.

Description of battery mode settings

NOTICE:

Force charge SOC < Over discharge SOC < Recovery SOC, otherwise the setting might be error.

Step 6: Set "Grid Port"

(Skip this step if grid code is already set in quick setting)

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"

(Skip this step if the system is not connected to generators)

When it is connected to Generator, select "Gunset input";

When it is connected to smart load like heat pump, select "Smart load output"

When it is connected to Grid-tied inverter, select "AC coupled"



Genset

The user need to input the "Genset rated power" by manual.

OFF: Generator stops charging SOC, settable, range:35%~100%;

ON: Generator start charging SOC; settable, range:1%~95%;

AC coupled:

Max Freq: Grid-tied 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 primary and secondary machine,

Set primary ID as: 1

secondary machine ID as: 2

.secondary machine ID as: 3

..... and so on.

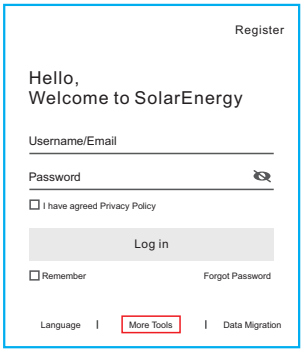


5.5 APP Setting

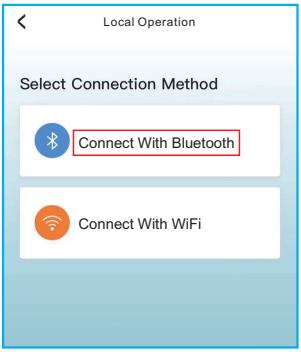
5.5.1 Log in the APP via Bluetooth

Step 1: Connect with Bluetooth.

Turn on Bluetooth switch on your mobile phone and then open the SolarEnergy APP.
Click “More Tools”->”Local Operation”->”Connect with Bluetooth”





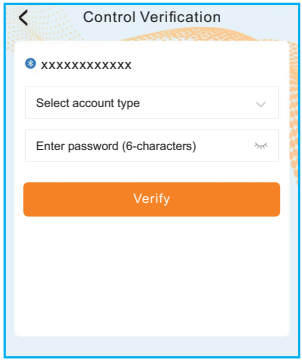


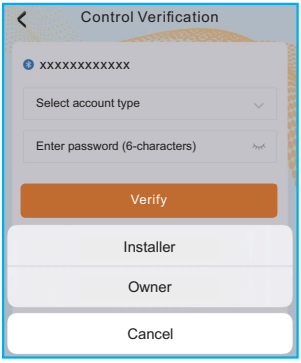
Step 2: Select the Bluetooth signal from the inverter. (Bluetooth Name: Inverter SN)

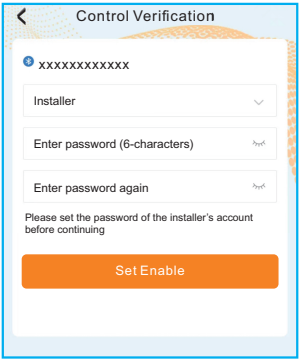


Step 3: Login account.

If you are the installer, please select the account type as Installer. If you are the plant owner, please select the account type as owner. Then set your own initial password for control verification. (The first log-in must be finished by installer in order to do the initial set up)







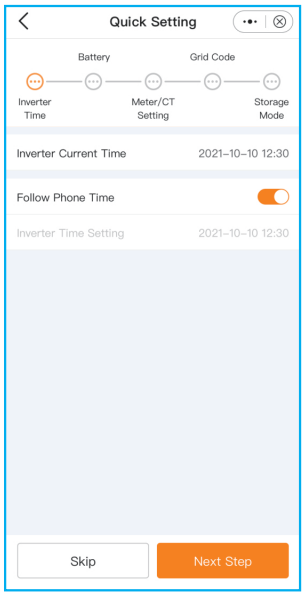
5.5.2 APP Quick Setting

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

(1)Inverter time:

Set inverter time and date, tap the slider next to “Follow Phone Time”, then tap “Next step” at the bottom right corner.

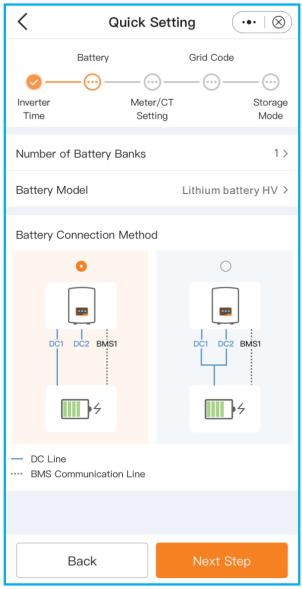


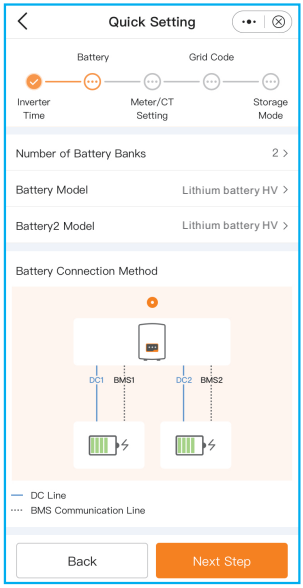
(2)Battery:

•Select number of battery banks : 1-2 ;

•Select battery model: if the connected battery brand is not on the list, please select "Lithium battery HV"

•Select battery connection method.

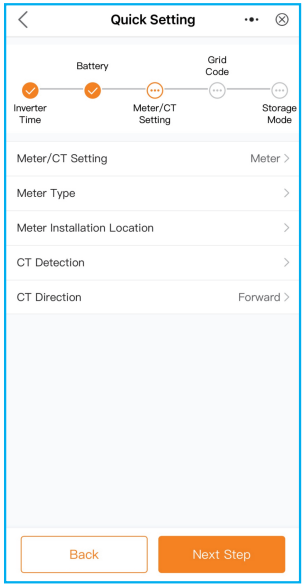


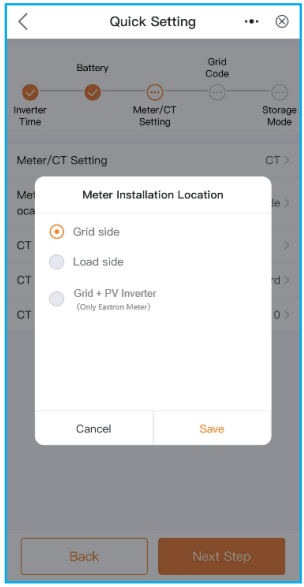


(3)CT/Meter setting:

- Select CT or Meter;
- Set Meter type (WHES provide Eastron 3 phase meter, it is self-identifiable).
- Set Meter installation location: Grid side / Load side / Grid+PV inverter;
- Set CT ratio: default 60 (WHES 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.
- CT direction: When CT installed correctly, select “Forward”; when CT installed direction wrong, the sampling current of CT will be reversed when calculating the power, select “Reversal” to correct it.



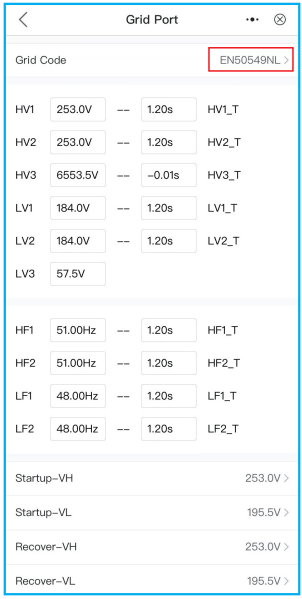


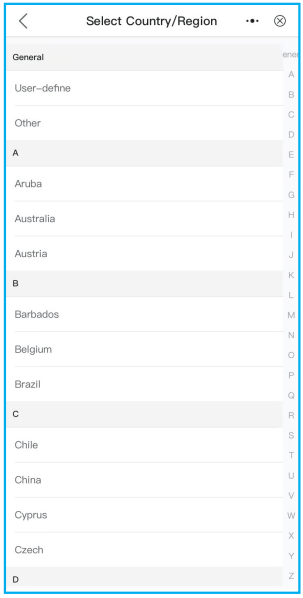


(4)Grid code:

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.

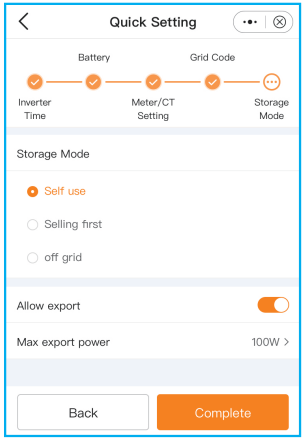




(5)Storage mode:

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.

Self-use / Selling first / Off-grid are exclusive， the user could select only one mode.



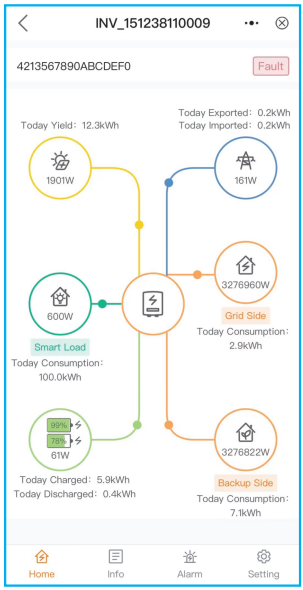
Once quick setting finished, tap “Complete”, the APP enter the homepage.

5.5.3 Home

This screen display energy production and consumption, as well as its flow. It shows the following data:

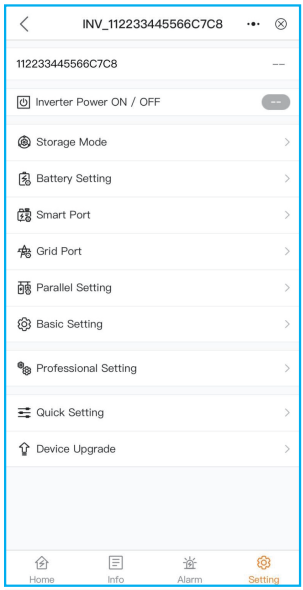
- Today yield of PV
- Today Imported/Exported of Grid
- Today Charged/Discharged of Battery
- Today Consumption of Grid-side load
- Today Consumption of Back-up load
- Today GEN yield.

At the bottom of page are four sub menus: Home, Info, Alarm and Settings.



5.5.4 Routine Setting

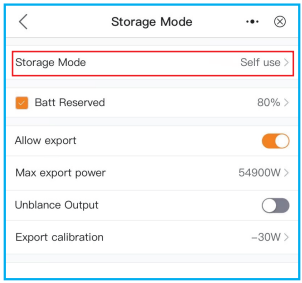
Under this page, the user could find quick setting and other detailed settings as follows:

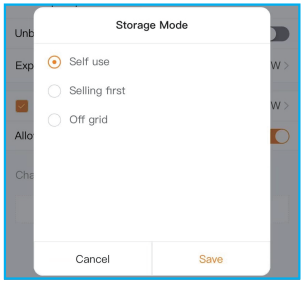


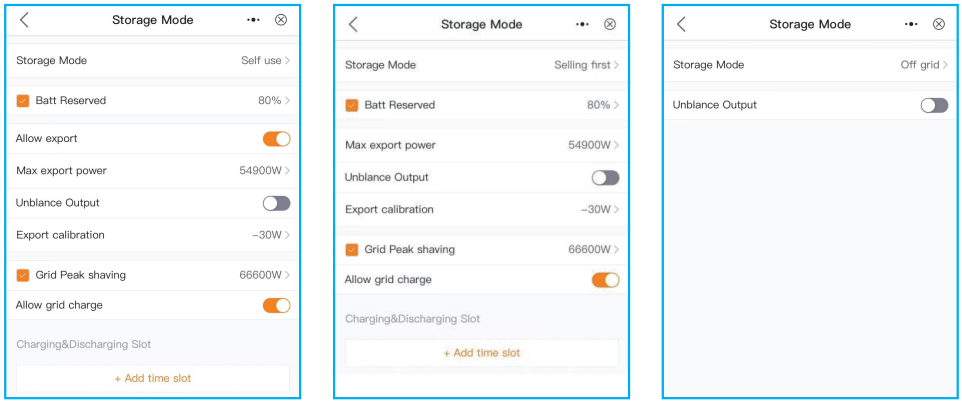
1. Storage mode

a. Select storage mode:

- Self-use / Selling first / Off-grid, these three modes are exclusive, the user could select only one mode. The modes definition could refer to 5.5.2“Quick setting”
- The Mode description please refer to Chapter 7.





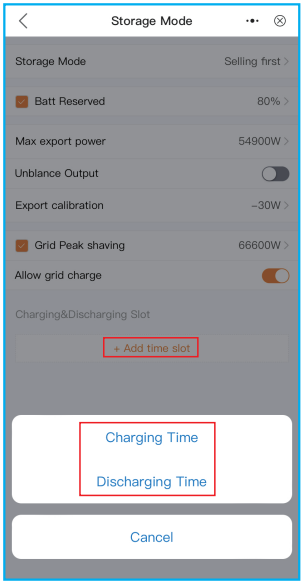


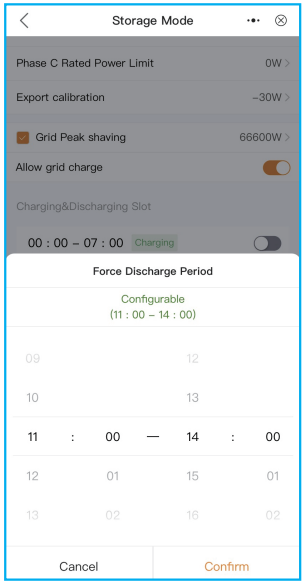
Please notice:
“Allow export" can only be set in “Self use” mode;
“Add time slot” can only be set in grid-connected mode (Self use” mode and “ Selling first” mode).

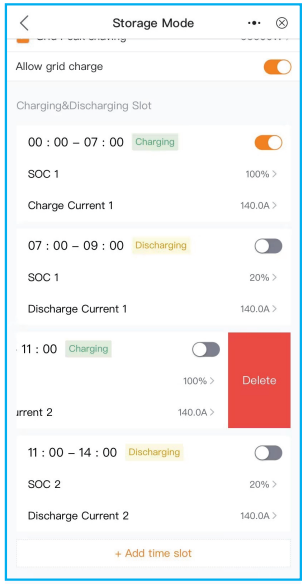
b. Set mode operations:

NOTE:
WHES's export power control function is based on the sampling results from the smart meter or smart CT. Due to the sampling interval limitation, when the system's load consumption has sudden changes, small amount of export overshooting is expected. For strict zero injection applications, it is suggested to install external backflow trip device as additional protection for injection.

c. Add time slot:







Charge SOC: battery charging stops when reach the set SOC;
Discharge SOC: battery discharging stops when reach the set SOC.

NOTICE:

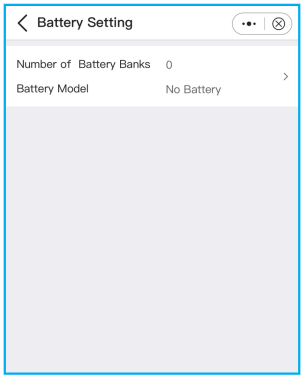
- Slide the switch to on, the battery charge/discharge with set charge/ discharge current by following the set period
- Slide to the left of screen, the user could delete the current period setting.

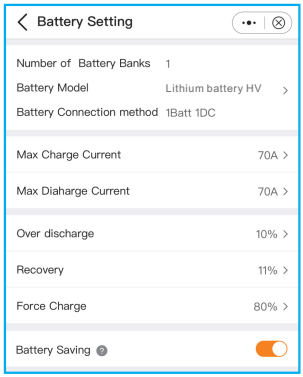
2. Battery setting

a. Set " Number of Battery Banks" and "Battery Model"

b. Set "Battery Connection Method" : 1 Batt 1 DC / 1 Batt 2 DC / 2 Batt 1 DC;

c. Set battery parameters





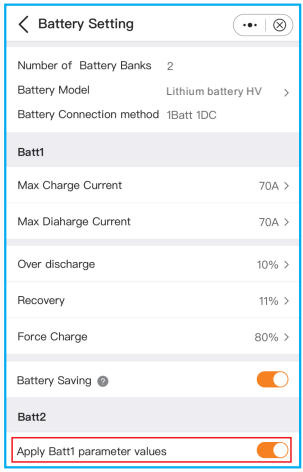
Settings	Description
Max charge current	Max charge current, settable.
Max discharge current	Max discharge current, settable.
Over discharge	Range : 5~40%, default 20%, when battery SOC < over discharge, it will stop discharging.
Recovery	Range : set Over discharge value +1% ~ set Over discharge value +20%; Battery won't stop charging until it reaches Recovery SOC value, reserve the return difference value to avoid the battery repeatedly cross jump between charging and discharging.
Force charge	Range : 4%~ set Over discharge value, when battery SOC < force charge SOC, the grid will charge the battery.

Battery setting

NOTICE:

Force charge SOC < Over discharge SOC < Recovery SOC, otherwise the setting might be error.

d. If two battery banks share the same setting, then turn the “Apply Batt1 parameter values” on. It will match the settings of battery bank 1 automatically.



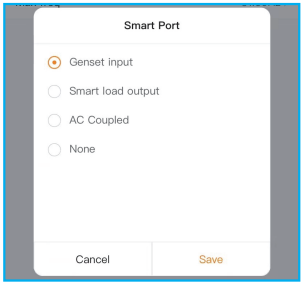
3. Smart port

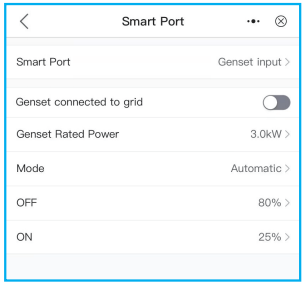
Select smart port type

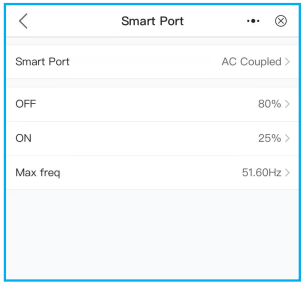
•When it is connected to Generator, select “Genset input”;

•When it is connected to smart load like heat pump, select “Smart load output”

•When it is connected to Grid-tied inverter, select “AC coupled”







Genset Rated Power: manual input.

OFF: Generator stops charging SOC, settable, range:35~100%;

ON：Generator start charging SOC; settable, range:1~95%;

AC coupled:

OFF: Grid-tied inverter stops charging SOC, settable, range:35~100%;

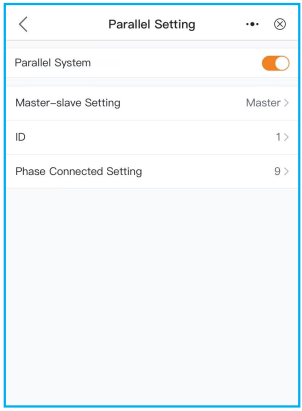
ON: Grid-tied inverter start charging SOC; settable, range:1~95%;

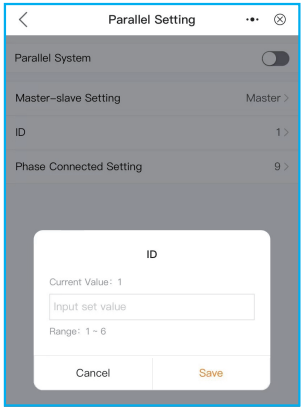
4. Grid port

Please refer to “5.5.2 APP Quick setting”

5. Parallel setting

When there are ≥ 2 inverters in parallel, turn the slider on
Set primary and secondary machine,
Set primary ID as: 1
secondary machine ID as: 2
.secondary machine ID as: 3
..... and so on.





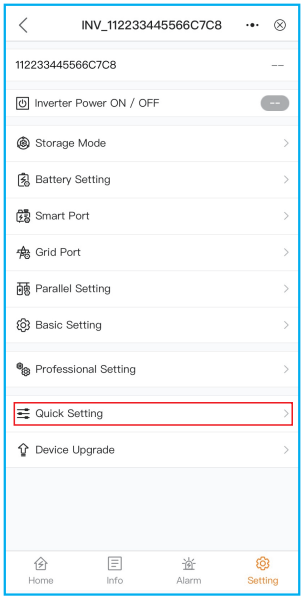
6. Basic setting

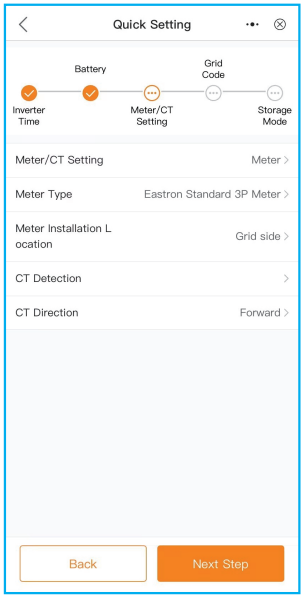
Set inverter time and date, tap the slider next to “Follow Phone Time”, then tap “Save”.

7. CT/Meter setting

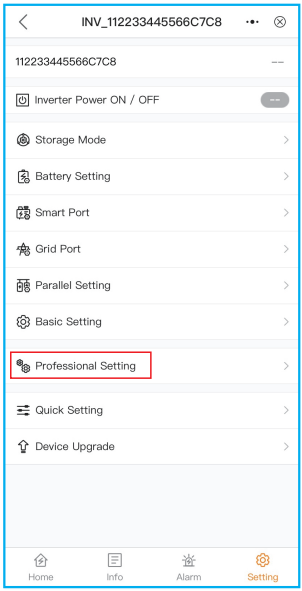
There are two ways for CT/Meter setting, detailed setting please refer to “5.5.2 APP Quick setting”.

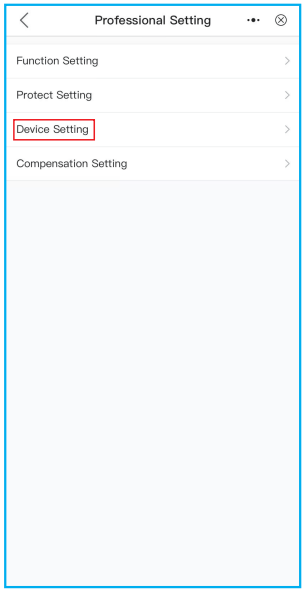
Method 1: Quick setting

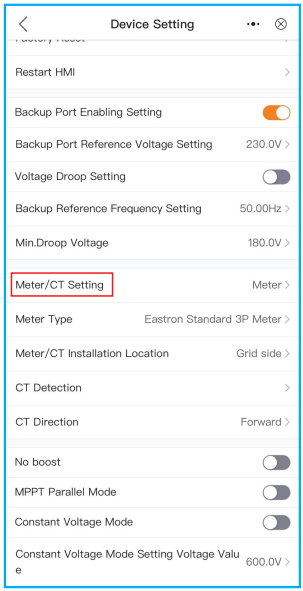




Method 2: Setting --- Professional Setting -- Device Setting --Meter/CT Setting

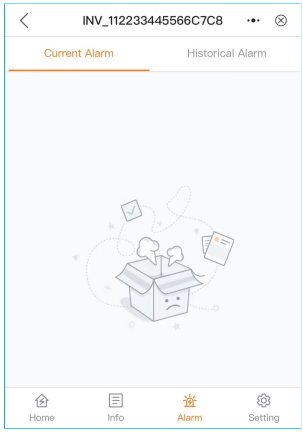






5.5.5 Alarm

The alarm page can display the current alarm and the historical alarms.



5.5.6 Information

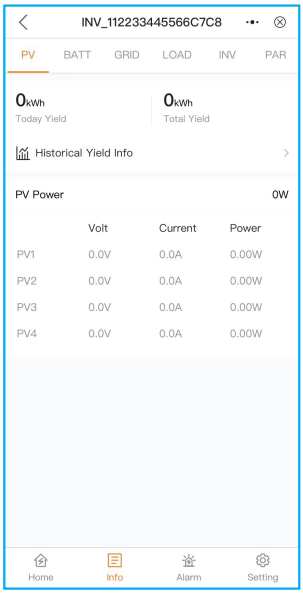
The use could Query information of PV / Battery / GRID / LOAD / INVERTER.
PV : it display each PV module Power/Voltage/Current, as well as historical yield information calculated by monthly / yearly / total, displayed with graphics;

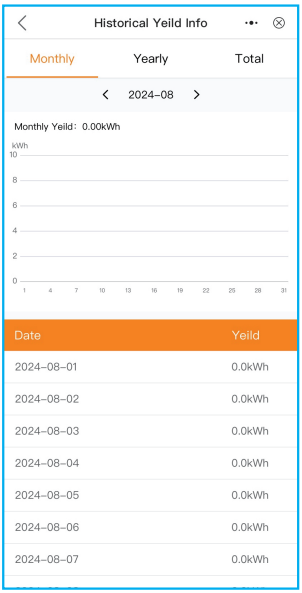
BATT: it display battery Power/Voltage/Current/SOC/SOH/Max.charging current / Max.discharging current, as well as historical battery charging and discharging information calculated by monthly / yearly / total, displayed with graphics;

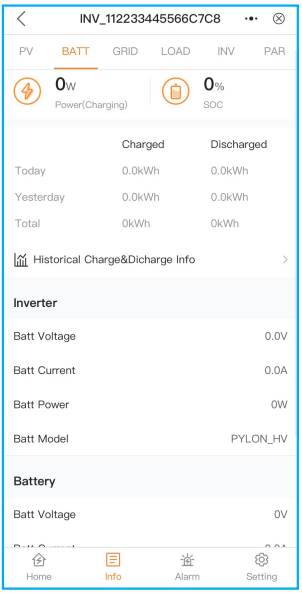
GRID: it display Active power / voltage/ current of L1/L2/L3, as well as historical exported/ imported information calculated by monthly / yearly / total, displayed with graphics;

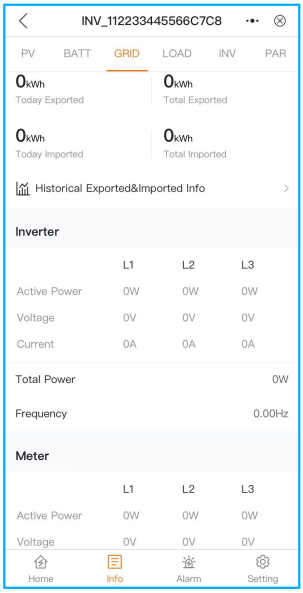
LOAD: it displays power/voltage of grid load, power/voltage/current of backup load;

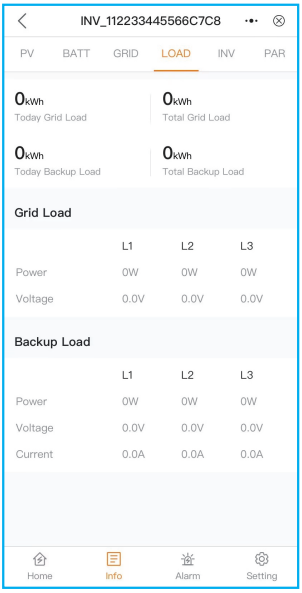
INV: it displays inverter SN/model number, and software version.

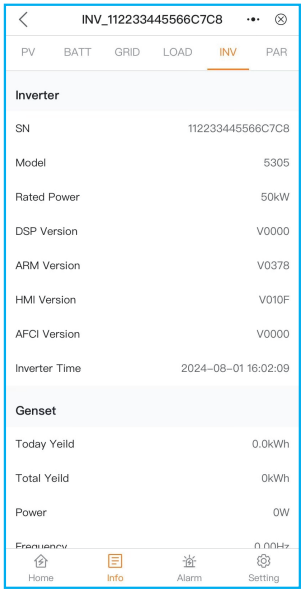






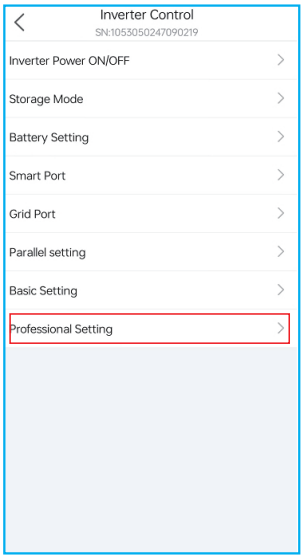


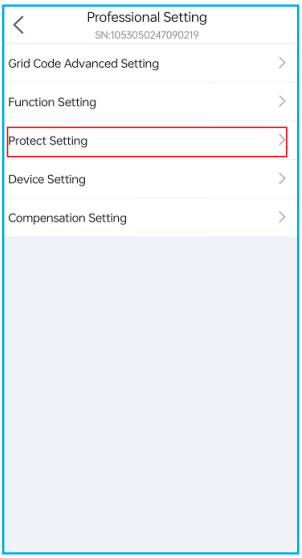


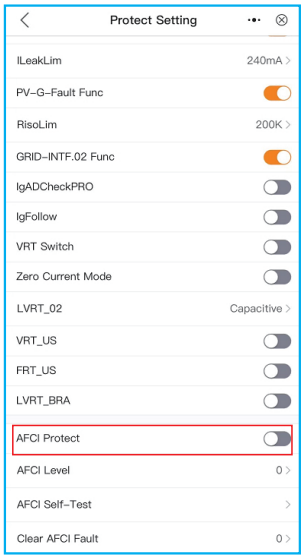


5.5.7 How to enable AFCI function

If you want to enable AFCI function for your inverter, just using the WHES APP and follow the below procedure: Professional Setting —> Protect Setting —> AFCI Protect







WHES Series inverter does not require any regular maintenance. However, cleaning the heatsink will help the inverter dissipate heat and increase the lifetime of inverter. The dirt on the inverter can be cleaned with a soft brush.



CAUTION:
Do not touch the surface when the inverter is operating. Some parts may be hot and could cause burns. Turn OFF the inverter and let it cool down before you do any maintenance or cleaning of inverter.

The Screen and the LED status indicator lights can be cleaned with cloth if they are too dirty to be read.



NOTE:
Never use any solvents, abrasives, or corrosive materials to clean the inverter.

6.1 Smart O&M

In order to improve our products and provide you with higher quality services, this device has a built-in data logging module for collecting relevant information during operation (such as power generation data, fault data)
Kindly note, this built-in data logging module is only implemented in our specific models that are sent to specific areas.

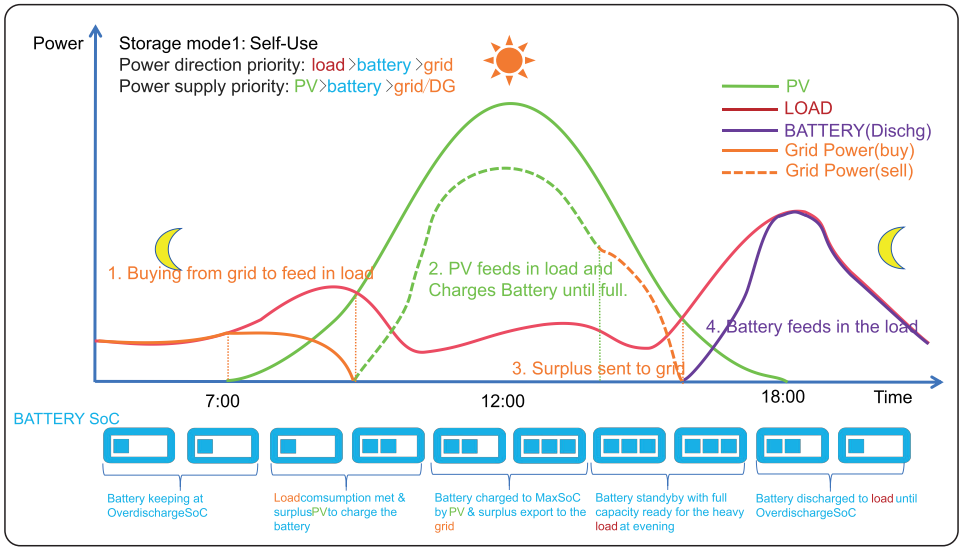
Commitment:

1. We will only collect, use and process your device information for the purpose of improving our products and services.
2. We will take all reasonable and feasible measures to ensure that no irrelevant information is collected and we will protect your device information.
3. We will not share, transfer or disclose the collected device information with any company, organization or individual.
4. When we stop operating products or services, we will stop collecting your device information in a timely manner.
5. If you do not want to provide such information, you can notify our company to turn off this function, which will not affect your normal use of other functions of the product.

7.1 Storage mode description

Self-Use mode

WHES Series inverter does not require any regular maintenance. However, cleaning the heatsink will help the inverter dissipate heat and increase the lifetime of inverter. The dirt on the inverter can be cleaned with a soft brush.



How to set Self-Use mode?

APP: setting--storage mode-self use

1. Self-Use Mode is activated without any specific times set for the battery to be charged/discharged, and the battery reserve is not switched on.

Note: WHES recommends activating the 'Allow Grid Charge' option. Once the battery reaches the Forcecharge SOC, it will use the grid to charge the battery, preventing it from being deep discharged.

2. The Self-Use Mode provides you with the option to set a Battery reserve value. Please toggle the switch to activate the battery reserve mode.

3. The Self-Use Mode provides you with the option to set whether allow power output to the grid and the max value.

4. If there is an error with your meter or CTs, open "Export power calibration" to calibration;

In addition, you can set a small negative value(like:-50W)to ensure that no power is sent to the grid to achieve Zero export Power.

5.When your load is unbalanced in the three-phase distribution, turn on unbalanced output.

6. You can set the value of Grid peak shaving, Limit the power that inverters can obtain from the grid to prevent exceeding regulatory requirements or the power line capacity due to excessive power.

7. With the Add time slot, you can customize 6 stages of charging and 6 stages of discharging in one day.

Under each mode , user could set other functions based on their requirements.

Settings	Description
Batt saving	Lithium battery: default 80%, adjustable range This function recommended to be enabled in weak grid area or where grid outages occur frequently. When enabled: battery SOC < set battery reserve SOC, battery will stop discharging and charged from PV/Grid.
Allow export	Allow power output to the grid in Self-use mode. If you do not want to send power to the grid, do not turn it on discharging and charged from PV/Grid.
Max export power	Limit the maximum power sold to the grid.
Export power calibration	To compensate the deviation of CT/Meter in practical application; Value: Settable. Please note: The parallel system should be set at 0.5% of the total capacity of the parallel system; otherwise, the anti-reverse flow performance requirements cannot be met.
Unbalanced output	Allow three-phase output imbalance.
Grid peak shaving	Limit the power that inverters can obtain from the grid to prevent exceeding regulatory requirements or the power line capacity due to excessive power. When the grid supplies power to the load while charging the battery, it will limit the power used to charge the battery, so that the total power does not exceed the set value. If the grid only supplies power to the load and does not charging the battery, it is not limited by the setting value.
Allow grid charging	Allow the battery to be charged by the grid.
Charge/ Discharge Slot	When the time is between Start and Stop, the system will charge/ discharge the battery according to the set Current until the set “SOC/voltage" is reached.

Selling first mode

Load priority: load>grid>battery

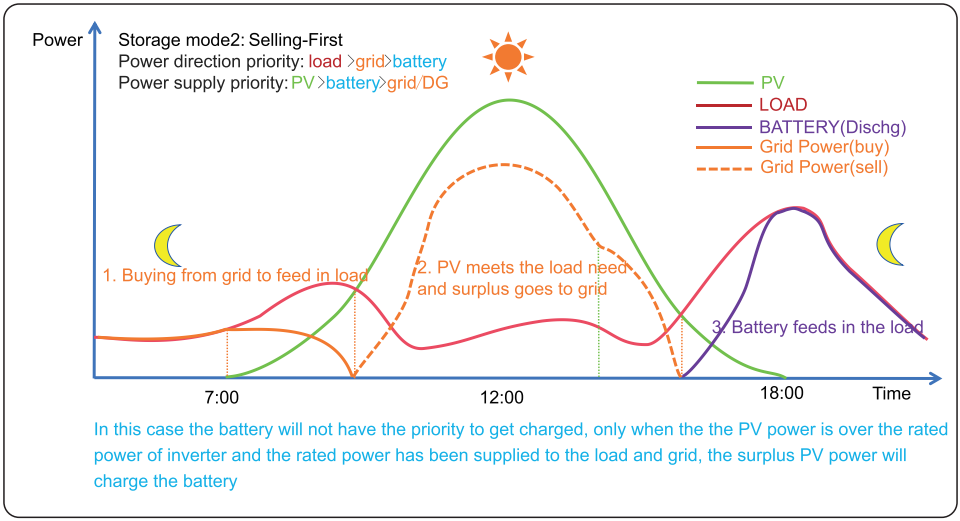
Power supply priority: PV>battery>grid>DG

This mode applies to the area that has high feed-in tariff and export control. The PV power will prioritize supplying energy to the load. Then any surplus is directed into the grid.

If there is a feed-in limitation, the excess power will charge the battery.

•Supports TOU setting in this mode.

•Supports Battery Reserve function in this mode.



How to set selling first mode?

APP: setting--storage mode--selling first.

Off-Grid mode

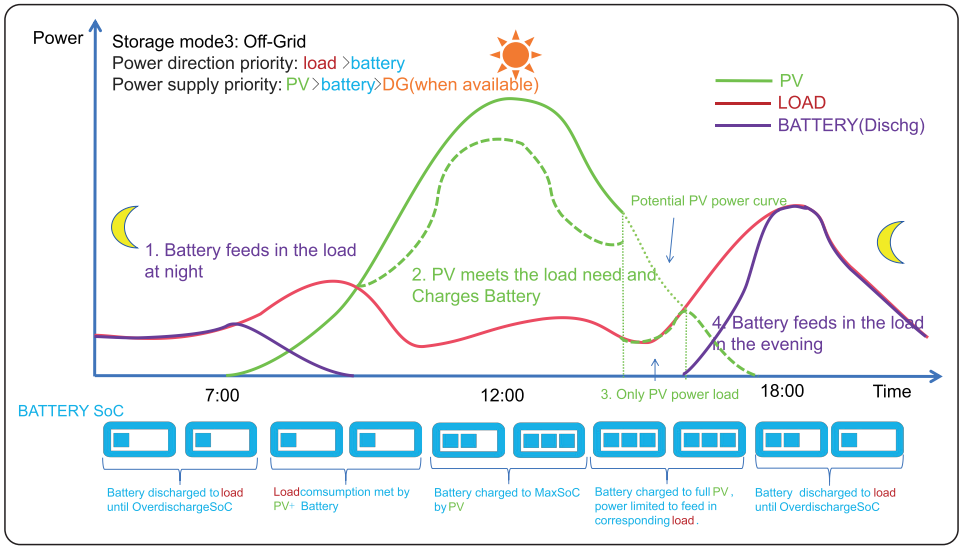
Load priority: load>battery

Power supply priority: PV>battery>DG

•This mode applies to the area not covered by the grid or when the system is not connected to the grid.

•When a power outage is detected in a grid-tied system, the system will automatically enter in the off-grid, supplying only the backup load.

•The user can also manually set this mode, supplying only the backup load.



How to set Off-Grid mode?

APP: setting--storage mode--off-grid

When there is need for Off-grid use, make sure that the rated power of the Backup load is within the inverter backup rated output power range of the inverter. Otherwise, the inverter will report an Overload Fault alarm(Fault code: 1057). The inverter will automatically clear the fault when the 1057 overload faults occur. When it keeps alarming there for this fault, turn off some loads to meet the rated backup output power range of the inverter, and then restart the inverter for a response.

For inductive loads such as refrigerators, air conditioner, washing machine, etc., ensure that the start power in total does not exceed the Backup peak power of the inverter.

Type of load	Equipment	Start power
Resistive load	Lamp	Rated power
	Fan	
	Hair dryer	
Inductive load	Refrigerator	3-5 times rated power
	Air conditioner	3-6 times rated power
	Washing machine	3-5 times rated power
	Microwave oven	3-5 times rated power

Peak shaving mode

Step1:

Setting--Grid peak shaving(turn on and set the limit value)

Step2:

Setting--Professional(password: 0010)--Function Setting--peak shaving.

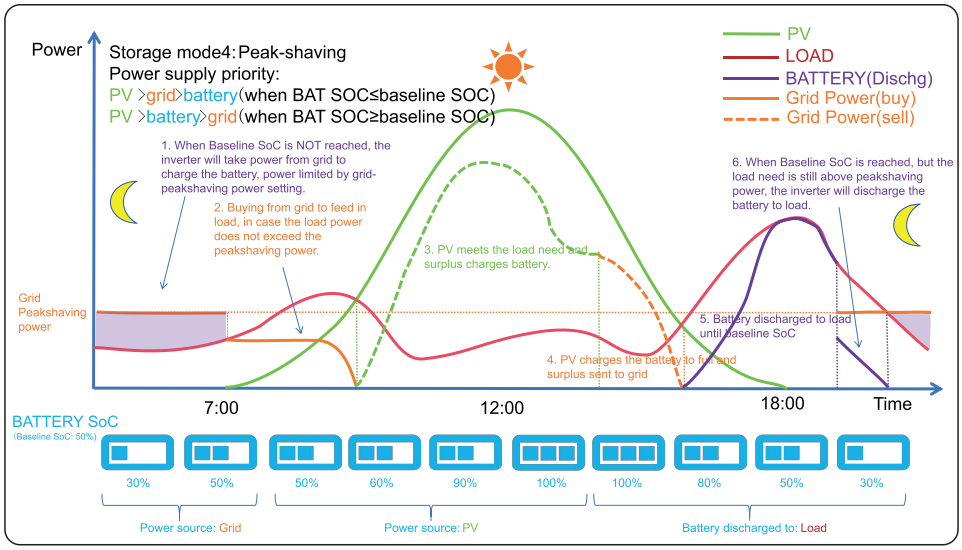
In this mode, Power supply priority:

PV>grid>battery>DG(when BAT SOC≤baseline SOC);

PV>battery>grid>DG(when BAT SOC≥baseline SOC);

on the premise that the power supplied by the grid does not exceed the set value(P_max), the system will be trying to charge the battery to Peak SOC.

If(P_discharge+P_max+PV<P_load), it will exceed the set value(P_max)to support the load.



Settings	Description
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	To compensate the deviation of CT/ Meter in practical application . The parallel system should be set at 0.5% of the total capacity of the parallel system; otherwise, the anti-reverse flow performance requirements cannot be met.
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.

7.2 Time Of Use

Set “Time of use” under each mode (Skip this step if no need)

Time of Use is for manual control of the battery charging/discharging. It is for customizing when the battery is allowed to charge and discharge power and at what rate , established by a current (amperage)setting.

This function has prior logic to other storage modes.

1 . Charge period: battery charges with set current value until the charging cut-off voltage (settable), checking the box to control whether enable this charging period.

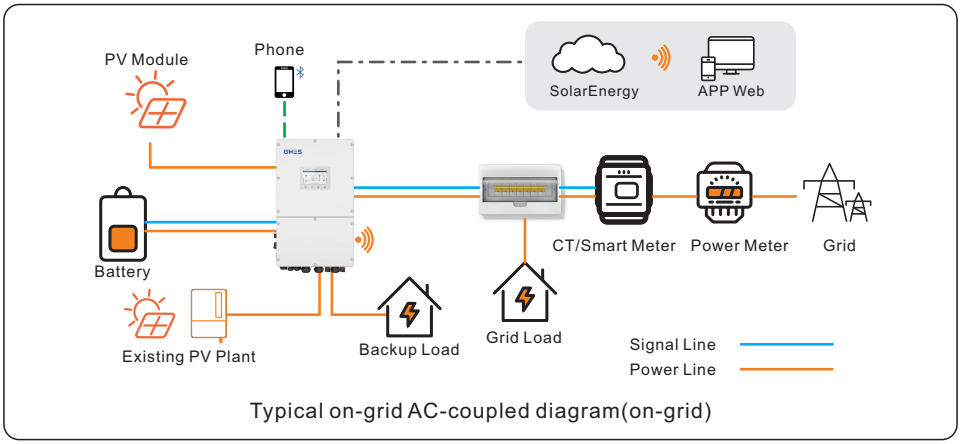
2 . Discharge period: battery discharges with set current value until the discharging cut-off voltage (settable) , checking the box to control whether enable this discharging period.



7.3 AC coupling system

Generally, the access of grid-tied inverter is for the retrofit of a existing PV plant.
The hybrid inverter support access of both WHES grid-tied inverter and third-party grid-tied inverter.
And hybrid support two ways of connection of grid-tied inverter (Smart port and grid side)

1. Access of grid-tied inverter(Smart port)



Typical on-grid AC-coupled diagram(on-grid)

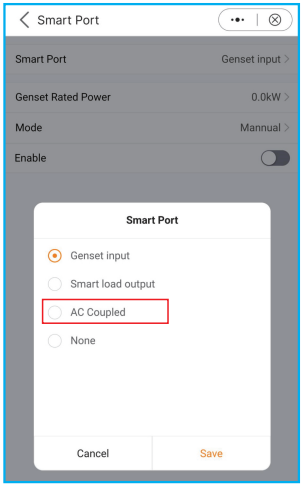
(1)Requirements of grid-tied inverter
•Rated power of grid-tied inverter ≤ Hybrid rated power;
•Only support three phase grid-tied inverter. Single phase grid-tied inverter not supported;

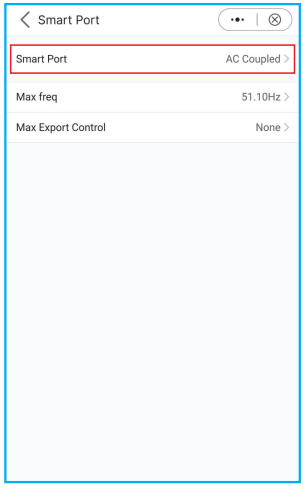
(2)Control logic
•On-grid scenario: Hybrid and grid-tied inverter are grid follower, hybrid cannot control the output power of the grid-tied inverter, it controls the smart port relay between hybrid and grid-tied inverter to achieve 0 export(When battery SOC > fixed SOC, hybrid will turn off the smart port relay to stop the output of grid-tied inverter).

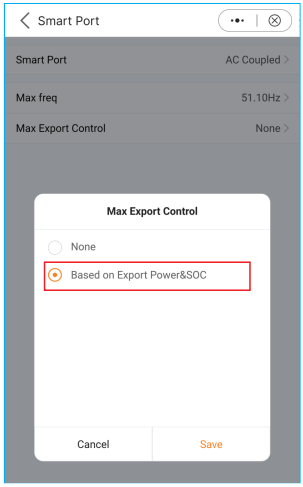
•Off-grid scenario: Hybrid acts as grid former and control the output of the grid-tied inverter by adjusting the frequency, the third-party grid-tied inverter must be configured with the correct grid code and equipped with over-frequency load shedding and under-frequency load rising functionalities.

(3)Setting path

【Smart port-----AC coupled----Max export control----Based on export power&SOC】



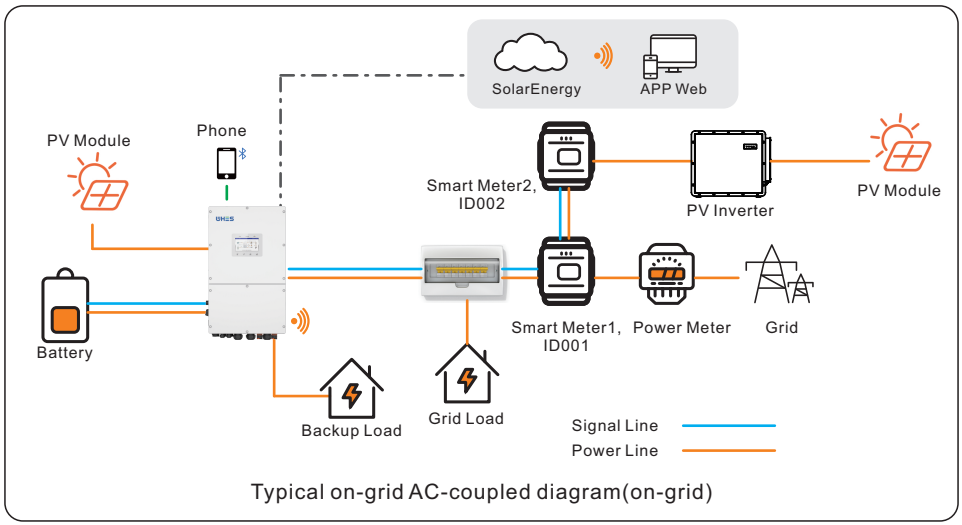




Access of third-party grid-tied inverter(Grid side)

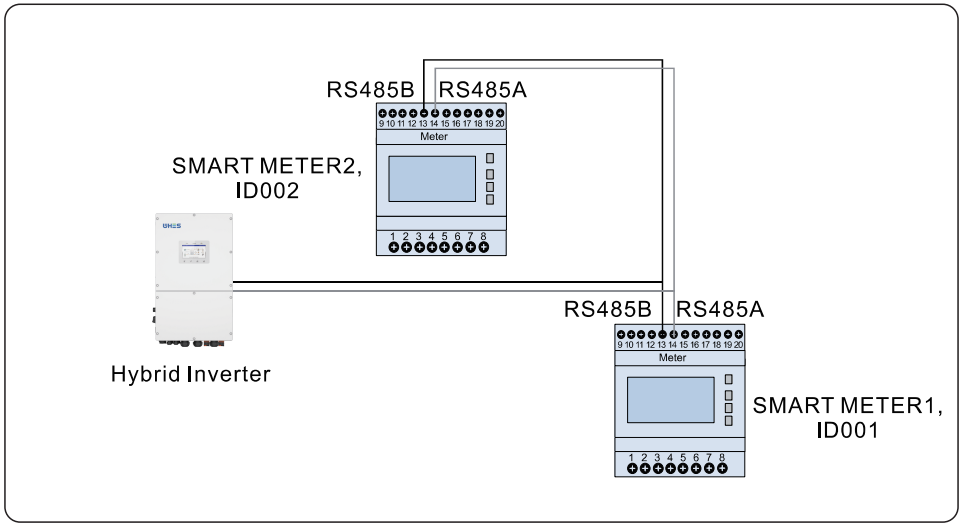
Working with grid-tied inverter and monitor the grid-tied inverter output via meter. The output power of the grid-tied inverter can be displayed on SolarEnergy use the same meters in parallel.

Meter1 address: 001 (grid side), meter2 address: 002 (PV inverter).



Typical on-grid AC-coupled diagram(on-grid)

For specific dual-meter wiring, please refer to the diagram below.



Procedure:

Step 1: Select the Professional Setting

Step 2: Select the Device Setting

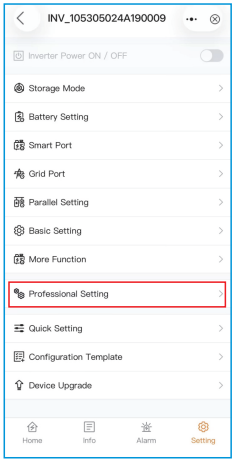
Step 3: Select the Meter/CT Setting---- Meter

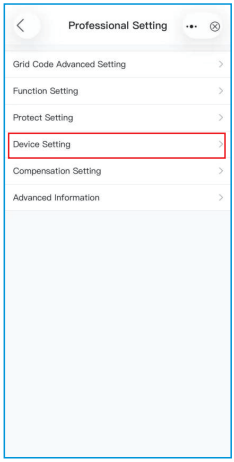
Select the Meter Type---- Meter

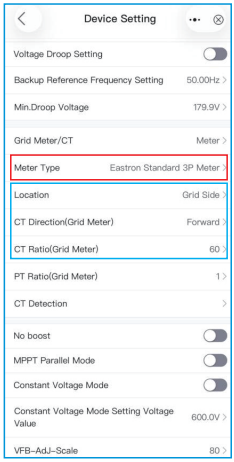
Select the Meter/CT Installation Location----Grid +PV Inverter

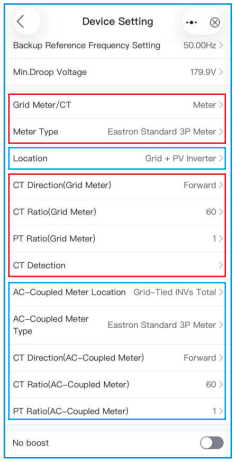
NOTE:

If there is need for the hybrid inverter to control the whole AC-Coupled system to reach zero export, WHES Grid-tied inverter must be used for communication.









7.4 Generator integrated system

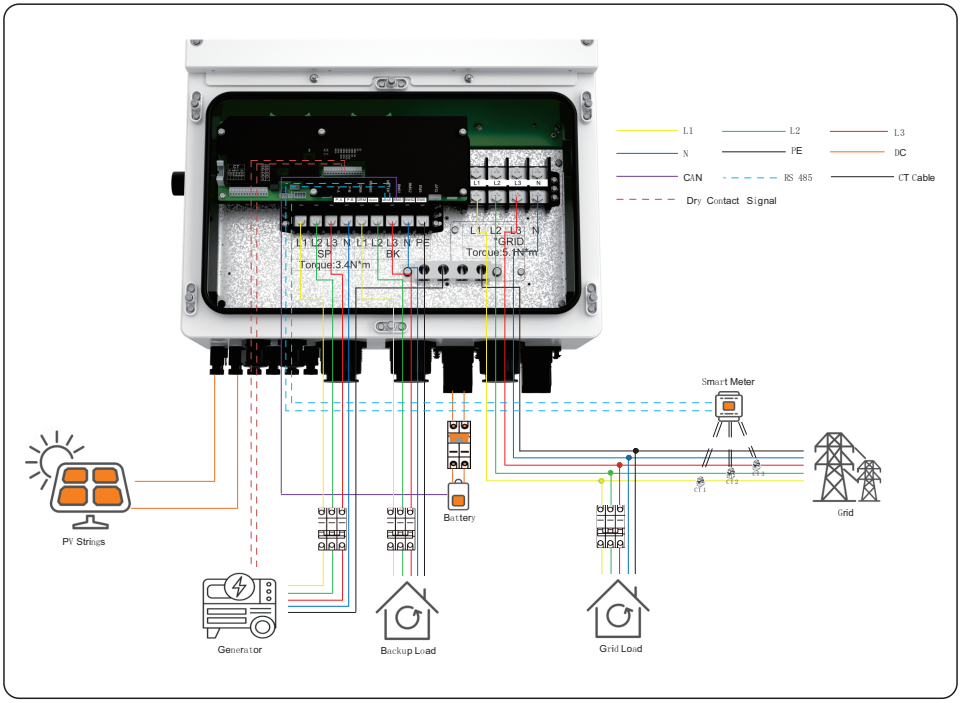
1. The backup PE must be directly connected to the PE copper bar of the power distribution box, rather than the inverter shell.
2. The generator itself needs to be grounded, connected to the electric box, and connected to the inverter generator port.
3. When the generator is working, disconnect the Grid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

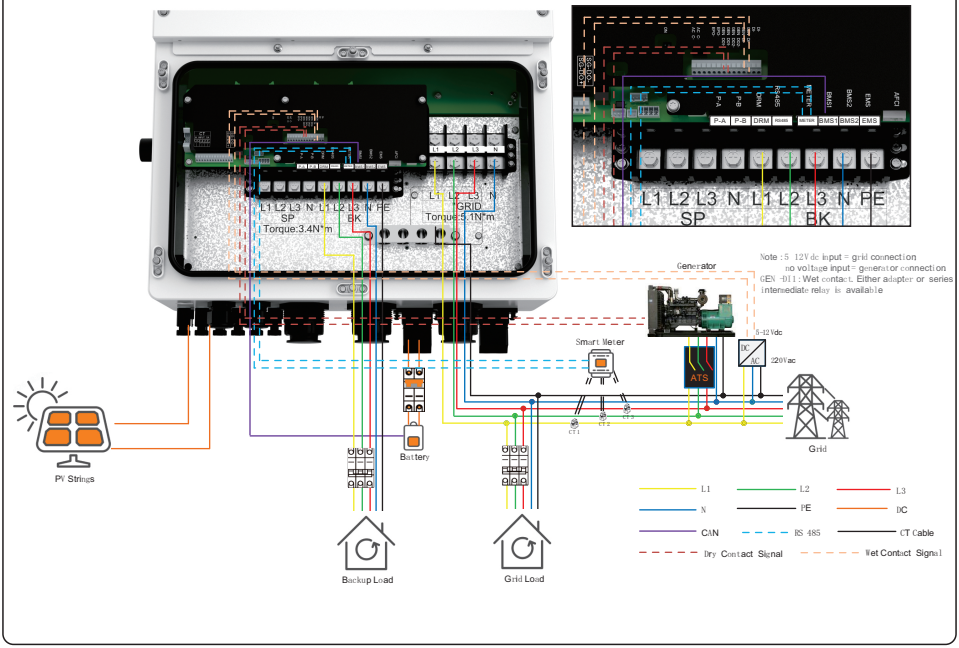


NOTE:
1. When generator connected at grid port, no generator capacity limit;
2. When generator connected at smart port, generator power range: 20%~100%*P_rated; Eg(10-50kW generator power for 50k model)



NOTE:
Ensure correct phase sequence when connecting the generator to the inverter! Mismatch (e.g., inverter Phase A to generator Phase B/C) will trigger an alarm and prevent generator start.


L1
L2
L3
N
PE
DC
CAN
RS 485
CT Cable
Dry Contact Signal
L1 L2 L3 N L1 L2 L3 N PE
SP
Torque:3.4N*m
BK
L1 L2 L3 N
GRID
Torque:5.1N*m
Smart Meter
CT1
CT2
CT3
PV Strings
Battery
Grid
Generator
Backup Load
Grid Load



NOTE:

The N wire of Generator cannot be grounded. (except for 60k and 35k)

Generator setting

APP: setting--Smart Port

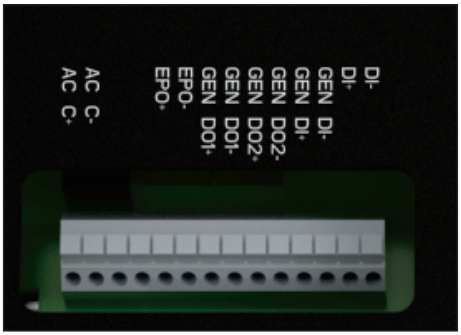
A. Select Genset input when genset connect to the grid side, enable genset connected to grid.

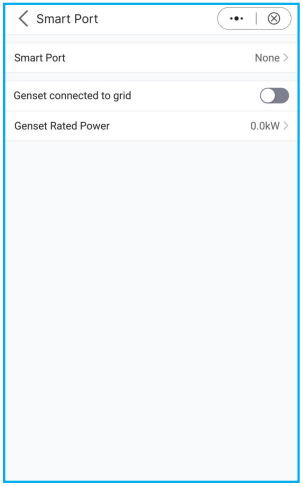
B. Set the Genset rated power.

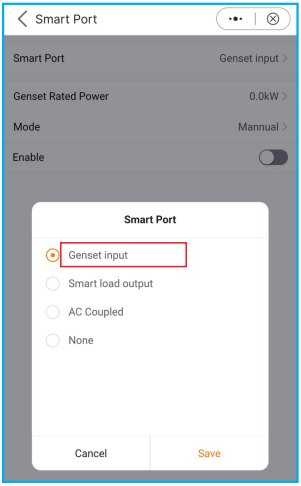
C. When you want to manually control the start and stop of the generator, enable needs to be selected.

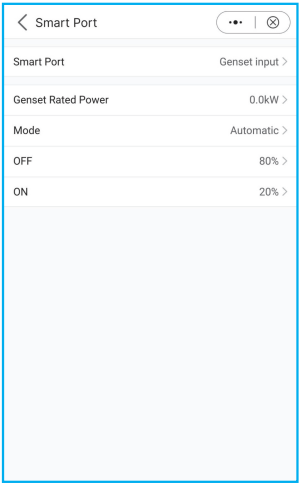
D. When you want the generator to automatically start and stop according to the battery SOC, please select the Automatic.

The generator will start when the battery SOC drops to the ON SOC, and stop when the SOC reaches the OFF value.









Generator communication connection(GEN-DO1/GEN-DO2/GEN-DI/DI)

The GEN-DO1, GEN-DO2 are DO ports. You can use this ports to output dry contact signal to generator to control the generator start or stop automatically.

Both GEN-DO1 & GEN-DO2 are normally open and only close when generator startup logic is triggered.

The GEN-DI on the inverter is dedicated to connect to an adapter(220Vac~5/12Vdc) on the grid side. This adapter will follow the available/unavailable status with the grid by providing 5/12V or 0V to the inverter so that the inverter knows when the grid is down or comes back and acts accordingly.

The DI is a DI port. This port is designed to connect to the ATS dry contact. When the grid fails, the ATS will close the dry contact circuit; the inverter detects this signal and enters generator operation mode. When grid power is restored, the dry contact opens, and the inverter switches back accordingly.

7.5 Parallel system

1.Before doing the parallel mode, please upgrade all the inverter to the latest version(ARM&DSP).

2.Check if the inverters are the same model. Eg, match a 60kW inverter with 60kW inverter.

Do not install inverters in parallel mode from different model!

3.When there are up to 6pcs of inverters working in parallel mode, the on-grid to off-grid switching time is less than 20ms. When there are up to 7~10pcs of inverters working in parallel mode, external switching devices such as STS must be installed to prevent damage to the inverters' relays.

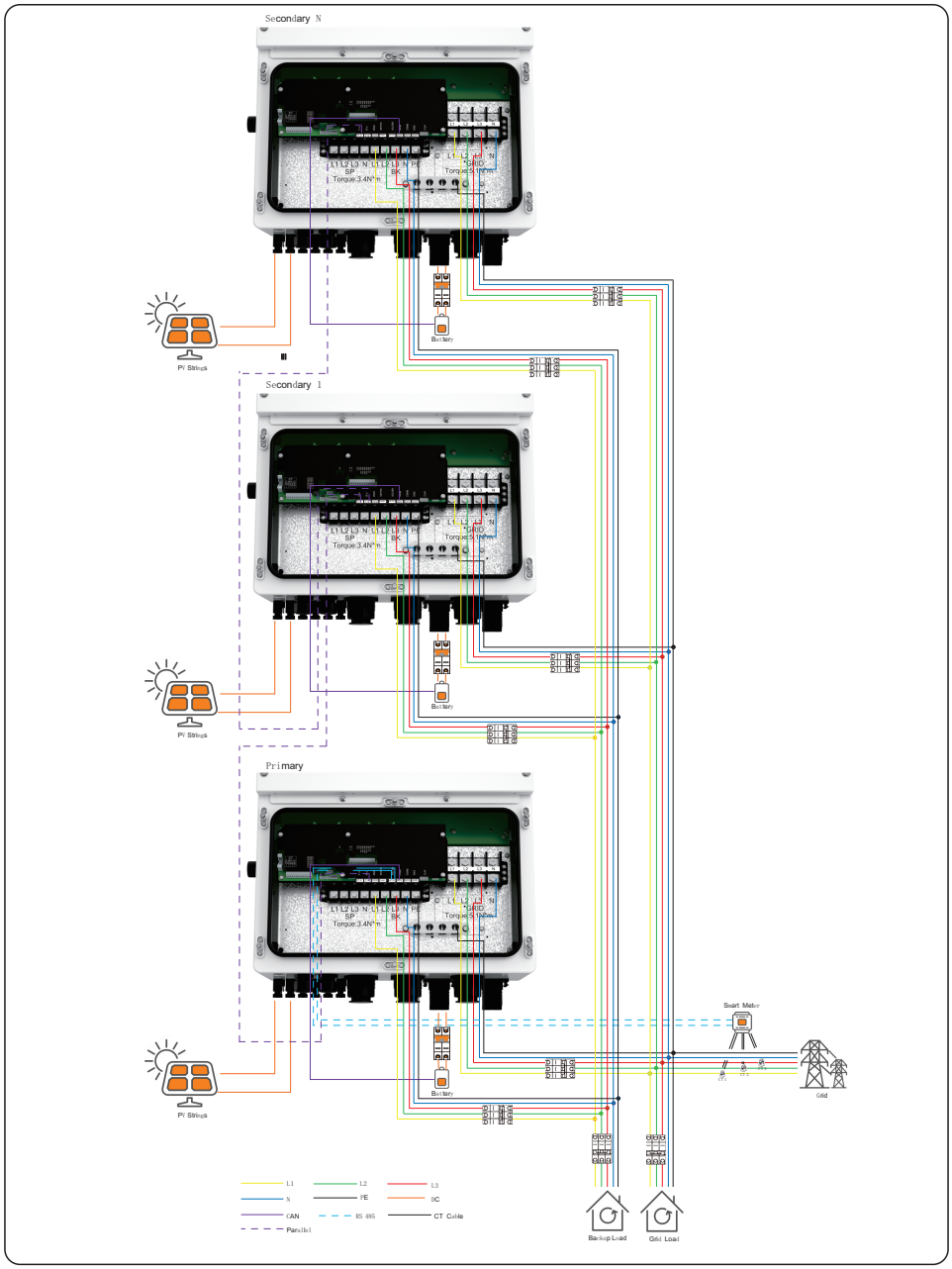
4.It is recommended that the specification and total capacity of battery on the primary and secondary inverter be same; If it's different, connect the battery of larger capacity to the primary inverter, if the battery with larger capacity is connected to a secondary inverter , may fail to fully discharge in heavy load scenarios.

5.Parallel connection of Battery port is not supported between each inverter, each inverter should have its own battery connected independently.

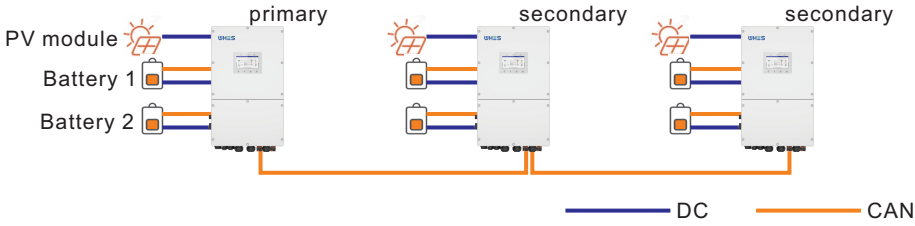
6.When the current on each phase of the grid side is over 300A, for which indicates sum of the load and the inverter system output capacity, customers need to equip their own CT, which can meet the secondary side current of 5A.

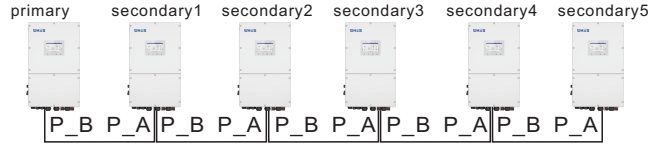
7.Max. total parallel distance: <60m

We recommend that the backup load of the parallel system be configured at 90% of the system's rated power.


Secondary N
Secondary 1
Primary
Pv Strings
Battery
Smart Meter
Grid
Backup Load
Grid Load
L1
L2
L3
N
PE
DC
CAN
RS 485
CT Cable
Parallel

Up to 6 units of the inverter can be connected in parallel, if you have demand for 7-10 pcs in parallel mode, you should ask local WHES technology support.
Please connect the paralleled inverters by using P-A and P-B terminals.
Standard CAT5 with shielding layers internet cable can be used.
1. ALL inverter MUST be connected to their own HV battery.
2. NOT support two or more inverters connect to the same one battery.

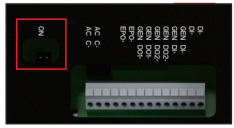




Parallel Terminal Connection

NOTE:
The primary is set with an ID of 1, secondary1 should have an ID of 2, secondary2 should have an ID of 3, and so on.
In a parallel system, if the battery number configuration is not one-to-one sufficient, only the secondary machine can be left unconnected, while the primary machine must be connected to the battery.
And the battery which one has the highest capacity we recommend you connect it to primary machine is better for system stability.

NOTE:
If the parallel machine is connected to the first and last consoles of the parallel connection, you need to put the DIP switch on the ARM board to “ON” position, and all the middle machines’ DIP switch should be put to “OFF” position.

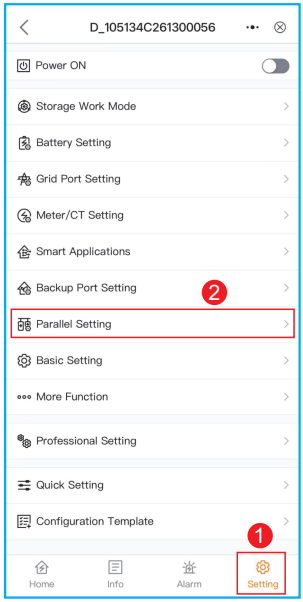


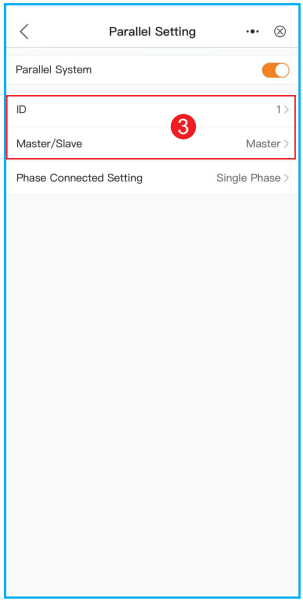
Procedure:

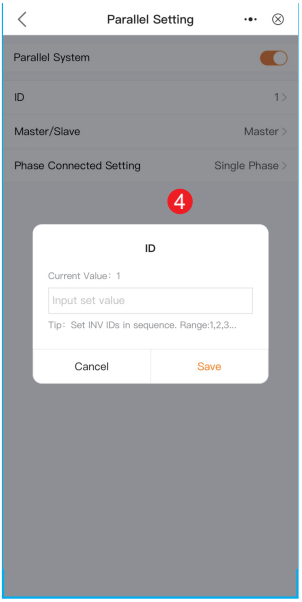
Step 1.Select Parallel setting

Step 2.Set the primary ID to 1

Step 3. Set the Salver ID to 2,3,4 ....and so on....







NOTE:

When under parallel system(inverter amount > 2), the AC cable length difference from inverter grid/backup port to the busbar should not exceed 10%.

NOTE:

If the inverter amount ≥2 in parallel mode on site , you must set the parallel mode on WHES app for each inverter in case of avoiding the damage to inverter when power on, the specific setting method can refer to the chapter.

NOTE:

Except the battery settings, all the operation parameters can be synchronized by the primary inverter to all the secondary inverters.
The battery settings need to be set up separately because each inverter might have different battery conditions.

Message Name	Information Description	Troubleshooting Suggestion
Off	Control device to shutdown	1. 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	DRM Function ON	1. No need to deal with it.
LmtByTemp	Over temperature power limited	1. 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	1. No need to deal with it.
Standby	Bypass run	
StandbySynoch	Off grid status to On grid status	
GridToLoad	Grid to load	

Message Name	Information Description	Troubleshooting Suggestion
Surge Alarm	On-site grid surge	1. 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	1. 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 instantaneous 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.
Over-Load	Load overload fault	1. 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.

Message Name	Information Description	Troubleshooting Suggestion
BatName-FAIL	Wrong battery brand selection	1. Confirm whether the battery model selection is consistent with the actual one.
CAN Fail	CAN Fail	1. 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	1. 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	1. 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	1. 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	1. 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)	1. Check if the DC wires are connected correctly without loose connection.
OV-G-I (1018 DATA:0000)	A phase RMS value overcurrent	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
OV-DCA-I (1025 DATA:0000)	DC 1 average overcurrent	1. 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)	

Message Name	Information Description	Troubleshooting Suggestion
DCInj-FAULT (1037 DATA:0000)	The current DC component exceeds the limit	1. Confirm that the grid is abnormal. 2. Confirm that the AC cable connection is not abnormal. 3. Restart the system, confirm that the fault continues.
IGBT-OV-I (1048 DATA:0000)	IGBT overcurrent	1. Restart the system, confirm that the fault continues.
OV-TEM (1032 DATA:0000)	Module over temperature	1. Check whether the surrounding environment of the inverter has poor heat dissipation. 2. Confirm whether the product installation meets the requirements.
RelayChk-FAIL (1035 DATA:0000)	Relay failure	1. Restart the system, confirm that the fault continues.
UN-TEM (103A DATA:0000)	Low temperature protection	1. Check the working environment temperature of the inverter. 2. Restart the system to confirm if the fault continues.
PV ISO-PRO01 (1033 DATA:0001)	PV negative ground fault	1. Check whether the PV strings have insulation problems. 2. Check whether the PV cable is damaged.
PV ISO-PRO02 (1033 DATA:0002)	PV positive ground fault	
12Power-FAULT (1038 DATA:0000)	12V undervoltage failure	1. 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	1. Confirm whether the grid is seriously distorted. 2. Check whether the AC cable is connected reliably.
OV-Vbatt-H/ OV-BUS-H (1051 DATA:0000)	Battery overvoltage hardware failure / VBUS	1. Check if the battery circuit breaker is tripping. 2. Check if the battery is damaged.

Message Name	Information Description	Troubleshooting Suggestion
OV-ILLC (1052 DATA:0000)	LLC hardware overcurrent	1. Check whether the backup load is overloaded. 2. Restart the system, confirm that the fault continues.
INI-FAULT (1031 DATA:0000)	AD zero drift overlink	1. Restart the system, confirm that the fault continues.
DSP-B-FAULT (1036 DATA:0000)	The primary-secondary DSP communication is abnormal	
AFCI-Check (1040 DATA:0000)	AFCI self-test failure	
ARC- FAULT (1041 DATA:0000)	AFCI failure	1. Verify connections are tight within your PV system. Arc fault settings can be changed in advanced settings if further adjustment is necessary.

Table 8.1 Fault message and description

NOTE:
If the inverter displays any alarm message as listed in Table 8.1; please turn off the inverter and wait for 5 minutes before restarting it .
If the failure persists, please contact your local distributor or the service center.

Please keep ready with you the following information before contacting us.

1. Serial number of WHES three phase inverter;
2. The distributor/dealer of WHES three phase inverter (if available);
3. Installation date.
4. The description of the problem together with necessary information, pictures, attachment.
5. The PV array configuration (e.g. number of panels, capacity of panels, number of strings, etc.);
6. Your contact details.

Technical Data	THB-29.9KW	THB-30KW
Input DC (PV side)		
Max Usable PV Input Power	59.8kW	60kW
Recommended Max PV array size	59.8kW	60kW
Max. input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Max. input current	3*42A	
Max. short circuit current	3*60A	
MPPT number/Max input strings number	3/6	
Max Current Per DC Input	42A	
Battery		
Battery Type	Li-ion	
Battery Voltage range	150 - 800V	
Maximum charge / discharge power of each port	32.1kW	33kW
Max. charge / discharge current	80A*2	
No. of Battery Input	2	
Communication	CAN/RS485	
Output AC(Back-up)		
Rated output power	29.9kW	30kW
Max. apparent output power	1.6 times of rated power, 2 seconds 1.5 times of rated power, 10 seconds	
Back-up switch time	<10ms	
Rated output voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated frequency	50 Hz/60 Hz	
THDv(@linear load)	<2%	
Input AC (Grid side)		
Max. AC passthrough current	90.8A/86.4A	91.2A/86.6A

Technical Data	THB-29.9KW	THB-30KW
Input AC (Generator)		
Max. input power	29.9kW	30kW
Rated input current	45.4A/43.2A	45.6A/43.3A
Rated input voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated input frequency	50Hz/60Hz	
Output AC(Grid side)		
Rated output power	29.9kW	30kW
Max. apparent output power	29.9kVA	30kVA
Rated grid voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated grid frequency	50Hz/60Hz	
Rated grid output current	45.4A/43.2A	45.6A/43.3A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	
Efficiency		
Max. efficiency	97.7%	
EU efficiency	97.3%	
Battery charged efficiency	98.5%	
Battery discharged efficiency	97.5%	
Protection		
Surge protection	DC Type II / AC Type II	
Output over current protection	Yes	
Insulation resistance monitoring	Yes	
Residual current detection	Yes	
Integrated PV switch	Yes	
DC reverse-polarity protection	Yes	
Protection class / Over voltage category	I / PV II, battery II, AC III	
Integrated AFCI 2.0	Optional	

9. Specifications

Technical Data	THB-29.9KW	THB-30KW
General data		
Dimensions(W/H/D)	530*880*290mm	
Weight	76kg	
Topology	Transformerless	
Operation temperature range	-25℃ ~ +60℃	
Relative humidity	0-100%	
Ingress protection	IP66	
Cooling concept	Intelligent redundant fan-cooling	
Max.operation altitude	4000m	
Grid connection standard	G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1/ EN 50549-10, VDE 0126 / UTE C 15/VFR:2019, NTS 631/RD 1699/RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, MEA, PEA,PORTARIA Nº 140, DE 21 DE MARÇO DE 2022	
Safty/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-2/-4, EN 55011	
Features		
PV connnection	MC4 Quick connection plug	
Battery connnection	Terminal connector	
AC connection	Terminal Block	
Display	7.0" LCD display & Bluetooth + APP	
Communication	CAN, RS485-115200, optional: Wi-Fi, cellular, LAN	
Warranty	5 years (Extendable to 20 years)	

Technical Data	THB-37.5KW
Input DC (PV side)	
Max Usable PV Input Power	75kW
Recommended Max PV array size	75kW
Max. input voltage	1000V
Rated voltage	600V
Start-up voltage	180V
MPPT voltage range	150-850V
Max. input current	4*42A
Max. short circuit current	4*60A
MPPT number/Max input strings number	4/8
Max Current Per DC Input	42A
Battery	
Battery Type	Li-ion
Battery Voltage range	150 - 800V
Maximum charge / discharge power of each port	35kW
Max. charge / discharge current	80A*2
No. of Battery Input	2
Communication	CAN/RS485
Output AC(Back-up)	
Rated output power	37.5kW
Max. apparent output power	1.6 times of rated power, 2 seconds 1.5 times of rated power, 10 seconds
Back-up switch time	<10ms
Rated output voltage	3/N/PE, 220V/380V
Rated frequency	60 Hz
THDv(@linear load)	<2%
Input AC (Grid side)	
Max. AC passthrough current	114.0A

Technical Data	THB-37.5KW
Input AC (Generator)	
Max. input power	37.5kW
Rated input current	57.0A
Rated input voltage	3/N/PE, 220V/380V
Rated input frequency	60Hz
Output AC(Grid side)	
Rated output power	37.5kW
Max. apparent output power	37.5kVA
Rated grid voltage	3/N/PE, 220V/380V
Rated grid frequency	60Hz
Rated grid output current	57.0A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)
THDi	<3%
Efficiency	
Max. efficiency	97.7%
EU efficiency	97.4%
Battery charged efficiency	98.5%
Battery discharged efficiency	97.5%
Protection	
Surge protection	DC Type II / AC Type II
Output over current protection	Yes
Insulation resistance monitoring	Yes
Residual current detection	Yes
Integrated PV switch	Yes
DC reverse-polarity protection	Yes
Protection class / Over voltage category	I / PV II, battery II, AC III
Integrated AFCI 2.0	Optional

Technical Data	THB-37.5KW
General data	
Dimensions(W/H/D)	530*880*290mm
Weight	76kg
Topology	Transformerless
Operation temperature range	-25℃ ~ +60℃
Relative humidity	0-100%
Ingress protection	IP66
Cooling concept	Intelligent redundant fan-cooling
Max.operation altitude	4000m
Grid connection standard	PORTARIA Nº 140/PORTARIA Nº 515
Safty/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-2/-4, EN 55011
Features	
PV connnection	MC4 Quick connection plug
Battery connnection	Terminal connector
AC connection	Terminal Block
Display	7.0" LCD display & Bluetooth + APP
Communication	CAN, RS485-115200, optional: Wi-Fi, cellular, LAN
Warranty	5 years (Extendable to 20 years)

Technical Data	THB-40KW	THB-49KW
Input DC (PV side)		
Max Usable PV Input Power	80kW	98kW
Recommended Max PV array size	80kW	98kW
Max. input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Max. input current	4*42A	
Max. short circuit current	4*60A	
MPPT number/Max input strings number	4/8	
Max Current Per DC Input	42A	
Battery		
Battery Type	Li-ion	
Battery Voltage range	150 - 800V	
Maximum charge / discharge power of each port	35kW	
Max. charge / discharge current	80A*2	
No. of Battery Input	2	
Communication	CAN/RS485	
Output AC(Back-up)		
Rated output power	40kW	49kW
Max. apparent output power	1.6 times of rated power, 2 seconds 1.5 times of rated power, 10 seconds	
Back-up switch time	<10ms	
Rated output voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated frequency	50 Hz/60 Hz	
THDv(@linear load)	<2%	
Input AC (Grid side)		
Max. AC passthrough current	121.6A/115.4A	149.0A/141.4A

Technical Data	THB-40KW	THB-49KW
Input AC (Generator)		
Max. input power	40kW	49kW
Rated input current	60.8A/57.7A	74.5A/70.7A
Rated input voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated input frequency	50Hz/60Hz	
Output AC(Grid side)		
Rated output power	40kW	49kW
Max. apparent output power	40kVA	49kVA
Rated grid voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated grid frequency	50Hz/60Hz	
Rated grid output current	60.8A/57.7A	74.5A/70.7A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	
Efficiency		
Max. efficiency	97.7%	
EU efficiency	97.3%	
Battery charged efficiency	98.5%	
Battery discharged efficiency	97.5%	
Protection		
Surge protection	DC Type II / AC Type II	
Output over current protection	Yes	
Insulation resistance monitoring	Yes	
Residual current detection	Yes	
Integrated PV switch	Yes	
DC reverse-polarity protection	Yes	
Protection class / Over voltage category	I / PV II, battery II, AC III	
Integrated AFCI 2.0	Optional	

9. Specifications

Technical Data	THB-40KW	THB-49KW
General data		
Dimensions(W/H/D)	530*880*290mm	
Weight	76kg	
Topology	Transformerless	
Operation temperature range	-25℃ ~ +60℃	
Relative humidity	0-100%	
Ingress protection	IP66	
Cooling concept	Intelligent redundant fan-cooling	
Max.operation altitude	4000m	
Grid connection standard	G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1/ EN 50549-10, VDE 0126 / UTE C 15/VFR:2019, NTS 631/RD 1699/RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, MEA, PEA,PORTARIA Nº 140, DE 21 DE MARÇO DE 2022	
Safty/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-2/-4, EN 55011	
Features		
PV connnection	MC4 Quick connection plug	
Battery connnection	Terminal connector	
AC connection	Terminal Block	
Display	7.0" LCD display & Bluetooth + APP	
Communication	CAN, RS485-115200, optional: Wi-Fi, cellular, LAN	
Warranty	5 years (Extendable to 20 years)	

Technical Data	THB-50KW	THB-60KW
Input DC (PV side)		
Max Usable PV Input Power	100kW	
Recommended Max PV array size	100kW	
Max. input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Max. input current	4*42A	
Max. short circuit current	4*60A	
MPPT number/Max input strings number	4/8	
Max Current Per DC Input	42A	
Battery		
Battery Type	Li-ion	
Battery Voltage range	150 - 800V	
Maximum charge / discharge power of each port	35kW	
Max. charge / discharge current	80A*2	84A*2
No. of Battery Input	2	
Communication	CAN/RS485	
Output AC(Back-up)		
Rated output power	50kW	60kW
Max. apparent output power	1.6 times of rated power, 2 seconds 1.5 times of rated power, 10 seconds	
Back-up switch time	<10ms	
Rated output voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated frequency	50 Hz/60 Hz	
THDv(@linear load)	<2%	
Input AC (Grid side)		
Max. AC passthrough current	152.0A/144.4A	152.0A/152.0A

Technical Data	THB-50KW	THB-60KW
Input AC (Generator)		
Max. input power	50kW	60kW
Rated input current	76.0A/72.2A	91.2A/86.6A
Rated input voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated input frequency	50Hz/60Hz	
Output AC(Grid side)		
Rated output power	50kW	60kW
Max. apparent output power	50kVA	60kVA
Rated grid voltage	3/N/PE, 220V/380V 3/N/PE, 230V/400V	
Rated grid frequency	50Hz/60Hz	
Rated grid output current	76.0A/72.2A	91.2A/86.6A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	
Efficiency		
Max. efficiency	97.7%	
EU efficiency	97.3%	
Battery charged efficiency	98.5%	
Battery discharged efficiency	97.5%	
Protection		
Surge protection	DC Type II / AC Type II	
Output over current protection	Yes	
Insulation resistance monitoring	Yes	
Residual current detection	Yes	
Integrated PV switch	Yes	
DC reverse-polarity protection	Yes	
Protection class / Over voltage category	I / PV II, battery II, AC III	
Integrated AFCI 2.0	Optional	

9. Specifications

Technical Data	THB-50KW	THB-60KW
General data		
Dimensions(W/H/D)	530*880*290mm	
Weight	76kg	
Topology	Transformerless	
Operation temperature range	-25℃ ~ +60℃	
Relative humidity	0-100%	
Ingress protection	IP66	
Cooling concept	Intelligent redundant fan-cooling	
Max.operation altitude	4000m	
Grid connection standard	G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1/ EN 50549-10, VDE 0126 / UTE C 15/VFR:2019, NTS 631/RD 1699/RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, MEA, PEA,PORTARIA Nº 140, DE 21 DE MARÇO DE 2022	
Safty/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-2/-4, EN 55011	
Features		
PV connnection	MC4 Quick connection plug	
Battery connnection	Terminal connector	
AC connection	Terminal Block	
Display	7.0" LCD display & Bluetooth + APP	
Communication	CAN, RS485-115200, optional: Wi-Fi, cellular, LAN	
Warranty	5 years (Extendable to 20 years)	

Technical Data	THB-30KW-LV	THB-35KW-LV
Input DC (PV side)		
Max Usable PV Input Power	60kW	70kW
Recommended Max PV array size	60kW	70kW
Max. input voltage	1000V	
Rated voltage	600V	
Start-up voltage	180V	
MPPT voltage range	150-850V	
Max. input current	3*42A	
Max. short circuit current	3*60A	
MPPT number/Max input strings number	3/6	
Max Current Per DC Input	42A	
Battery		
Battery Type	Li-ion	
Battery Voltage range	150 - 800V	
Maximum charge / discharge power of each port	33kW	35kW
Max. charge / discharge current	80A*2	
No. of Battery Input	2	
Communication	CAN/RS485	
Output AC(Back-up)		
Rated output power	30kW	35kW
Max. apparent output power	1.6 times of rated power, 2 seconds 1.5 times of rated power, 10 seconds	
Back-up switch time	<10ms	
Rated output voltage	3/(N)/PE, 127V/220V 3/(N)/PE, 133V/230V	
Rated frequency	50 Hz/60 Hz	
THDv(@linear load)	<2%	
Input AC (Grid side)		
Max. AC passthrough current	152.0A/152.0A	152.0A/152.0A

Technical Data	THB-30KW-LV	THB-35KW-LV
Input AC (Generator)		
Max. input power	30kW	35kW
Rated input current	78.7A/75.3A	91.8A/87.8A
Rated input voltage	3/(N)/PE, 127V/220V 3/(N)/PE, 133V/230V	
Rated input frequency	50Hz/60Hz	
Output AC(Grid side)		
Rated output power	30kW	35kW
Max. apparent output power	30kVA	35kVA
Rated grid voltage	3/(N)/PE, 127V/220V 3/(N)/PE, 133V/230V	
Rated grid frequency	50Hz/60Hz	
Rated grid output current	78.7A/75.3A	91.8A/87.8A
Power Factor	>0.99 (0.8 leading - 0.8 lagging)	
THDi	<3%	
Efficiency		
Max. efficiency	96.3%	
EU efficiency	95.5%	
Battery charged efficiency	97.4%	
Battery discharged efficiency	95.8%	
Protection		
Surge protection	DC Type II / AC Type II	
Output over current protection	Yes	
Insulation resistance monitoring	Yes	
Residual current detection	Yes	
Integrated PV switch	Yes	
DC reverse-polarity protection	Yes	
Protection class / Over voltage category	I / PV II, battery II, AC III	
Integrated AFCI 2.0	Optional	

9. Specifications

Technical Data	THB-30KW-LV	THB-35KW-LV
General data		
Dimensions(W/H/D)	530*880*290mm	
Weight	76kg	
Topology	Transformerless	
Operation temperature range	-25℃ ~ +60℃	
Relative humidity	0-100%	
Ingress protection	IP66	
Cooling concept	Intelligent redundant fan-cooling	
Max.operation altitude	4000m	
Grid connection standard	G99, VDE-AR-N 4105 / VDE V 0124, EN 50549-1/ EN 50549-10, VDE 0126 / UTE C 15/VFR:2019, NTS 631/RD 1699/RD 244 / UNE 206006 / UNE 206007-1, CEI 0-21, C10/11, NRS 097-2-1, TOR, EIFS 2018.2, IEC 62116, IEC 61727, IEC 60068, IEC 61683, EN 50530, MEA, PEA,PORTARIA Nº 140, DE 21 DE MARÇO DE 2022	
Safty/EMC standard	IEC/EN 62109-1/-2, IEC/EN 61000-6-2/-4, EN 55011	
Features		
PV connnection	MC4 Quick connection plug	
Battery connnection	Terminal connector	
AC connection	Terminal Block	
Display	7.0" LCD display & Bluetooth + APP	
Communication	CAN, RS485-115200, optional: Wi-Fi, cellular, LAN	
Warranty	5 years (Extendable to 20 years)	

Frequently Asked Questions

Q1: Why I have "CAN Fail" Alarm on the inverter?
A:"CAN Fail" indicates the CAN communication between inverter and battery is lost.
Please double check if your CAN cable is correctly connected and if your battery is power on.

Q2: Why I have "BATName-Fail" Alarm on the inverter ?
A: Please check in the "Battery Setting->Battery Model" setting and confirm you selected the correct battery option as the nameplate of your battery module.

Q3:Why I have "MET-SLT-Fail" Alarm on the inverter?
A: Please check in the "Meter Setting->Meter Type" setting and confirm you selected the correct meter option corresponding to your smart meter.

Q4:Why the power values on the screen are fluctuating very fast?
A: If your loads are changing drastically, the inverter will adjust its power accordingly. If you confirm the loads are stable while the inverter power is changing very fast, please double check your meter CT's direction and make sure the arrow is towards grid.

Q5: Why I have "OV-ILLC" Alarm on the inverter ?
A: OV-ILLC indicates there is an overcurrent issue on the internal LLC circuit. It could be transient status during extreme condition such as overload. If it happens constantly or too frequent and the extreme conditions have been excluded, please contact WHES service team.

Q6: Why I have "OV-BATT-H" Alarm on the inverter ?
A: OV-BATT-H indicates over voltage issue on the hardware of battery circuit. It could be caused by high battery voltage at full SOC, battery suddenly switching off, etc. If it happens constantly or too frequent and the extreme conditions have been excluded, please contact WHES service team.

Q7: Why I have "No-Battery" Alarm on the inverter?
A: Please double check if the battery power cables have been correctly connected and the battery breaker (on battery or external) has been turn on. If you don't want to connect the battery for now, please select the "No battery" option in "Battery Setting->Battery Model" to prevent the alarm to show up.

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Please adhere to the actual products in case of any discrepancies in this user manual.
If you encounter any problem on the inverter, please find out the inverter S/N
and contact us, we will try to respond to your question ASAP.