AOHAI

Installation Operation Manual

AOHAI Technology

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The system chart of Inverter:

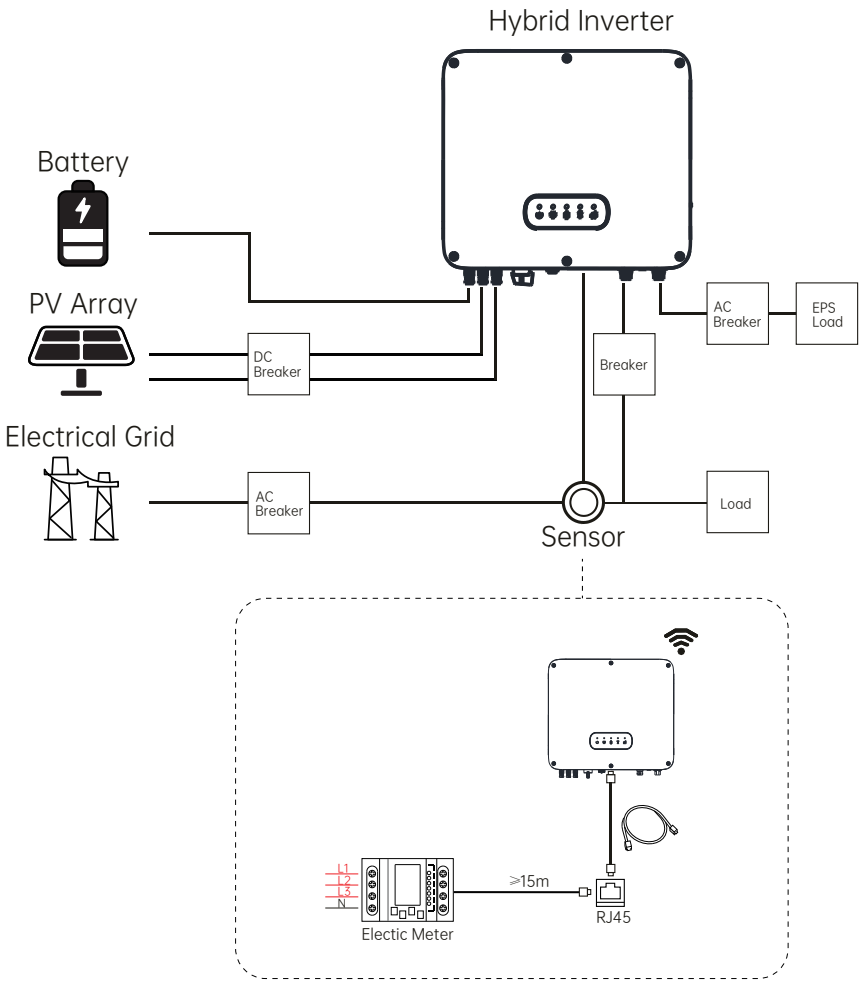


Figure 1.1

As shown above, a complete grid-connected system of the inverter consists of PV modules, inverter, battery, utility grid and other components.

ATTENTION	● As the system refers to battery use, we must make sure ventilation of the service environment and temperature control in order to prevent the danger of battery explosion. Battery recommended installation environment must be strictly in accordance with the specification, meanwhile the temperature should be controlled in the 0-40℃ of indoor ventilation and the humidity should be 5%-85%. If the chosen PV modules need a positive or negative ground connection, please contact AOHAI for technical support before installation.

1.2 Purpose Use

  CAUTION	● Risk of high voltage! ● Relevant operation for professional personnel. ● Children, the disabled and laypeople, please do not approach. ● Supervise and make sure children don't play near the installation position of energy storage machine.
  CAUTION	● Risk of burns on the parts shell of the inverter! ● During the work, cover, shell around, radiator are likely to be hot.
  CAUTION	● Inverter exists radiation,which may affect health! ● Don't stay a long time within 20cm range from inverter.

 CAUTION	● The inverter ground connection. ● Please ensure the inverter's ground connection reliable to make sure people's safety.

1.3 Symbols Introduction On The Inverter

Symbol	Description
	Caution: risk of danger!
	Caution: Risk of electrical shock!
	Caution : hot surface!

	Danger to life due to high voltage in the inverter.There is residual voltage in the inverter, the inverter requires 5 minutes to discharge.Please wait 5 minutes before you open the upper lid or the DC lid.
	Protective conductor terminal
	Direct Current(DC)
	Alternating Current(AC)
	The machine complies with the requirements of the applicable CE guidelines
	Refer to the operating instructions

2. Brief Introduction

2.1 Preface

This manual will provide the users who use the AOHAI AH-4~10KTH-G1 Series of Shenzhen Aohai Digital Power Co., LTD(Short for AOHAI as below) with the detailed product information and the installation instructions. Please read this manual carefully and put this manual on some place where is convenient to install, operation and obtain. In case of any modificatins made by AOHAI Technology, we will not notify the user.

2.2 Target Group

AOHAI AH-4~10KTH-G1 inverter must be installed by professional electrical personnel who have obtained the certification of the relevant departments. We have two kinds of energy storage machine for different batteries one is for lithium battery and the other is for lead-acid battery;We suggest customer should decide which kind of energy storage machine they want, AOHAI can provide only lithium battery with energy storage machine, customer can choose lead-acid energy storage machine with no battery provided by AOHAI while they can buy these batteries from market easily. Especially if customer chooses energy storage system with lithium battery(which must be provided by AOHAI) but used for lead-acid battery or used lead-acid battery for lithium battery model, it will be dangerous. We recommend using AOHAI officially certified batteries to ensure safety, performance, and optimal user experience. If users choose to use batteries from other brands, please contact AOHAI customer service first. Otherwise, any issues that arise will be the user's responsibility. Installer can install energy storage machine of AOHAI AH-4~10KTH-G1 Series rapidly and troubleshoot, build communication system through reading this manual carefully.If you have any questions in the process of installation, you can login in www.digitalpoweraohai.com and leave some message.Or you can send an email to our service email contact@aohaiglobal.com.

2.3 Product Description

AOHAI AH-4~10KTH-G1 Series is used to store energy generated by the photovoltaic cell panels or energy from grid if it is allowed in the battery, also energy can be sent to power grid through AH-4~10KTH-G1 for self consumption or when Grid power is lost, AH-4~10KTH-G1 can be used as backup power.

The inverter has six kinds of types:

- AH-4KTH-G1
- AH-5KTH-G1
- AH-6KTH-G1
- AH-7KTH-G1
- AH-8KTH-G1
- AH-10KTH-G1

NOTE	• We describe this series as "the inverter" as below.

Overview:

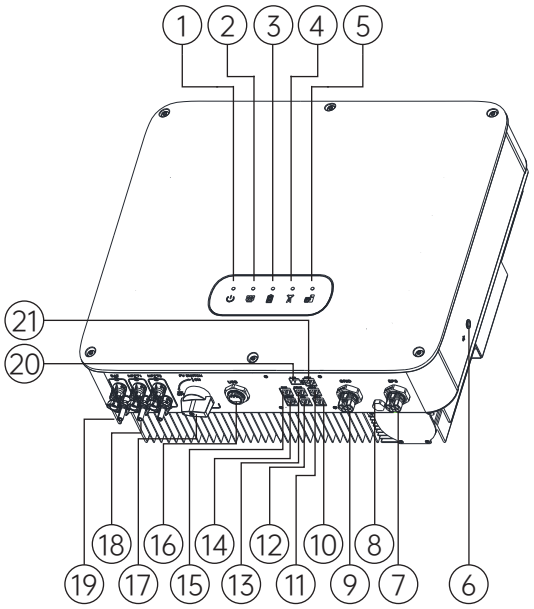


Figure 2.1

Position	Description
1	Status indicator light
2	PV indicator light
3	Battery indicator light
4	Grid indicator light
5	Load indicator light
6	Ground point
7	EPS output(off grid connection)
8	Breathable valve
9	AC Grid (on grid connection)
10	RS485 communication interface(Reserved)
11	RS485 communication interface of meter2(Reserved)
12	NTC: Lead-acid temperature sensor terminal
13	RJ45 interface of DRMs(used only in Australia)
14	RS485 communication interface of meter1
15	CAN communication interface of Lithium battery
16	USB interface
17	PV switch
18	PV input

19	Battery terminal
20	Dry contact
21	RS485 communication interface of meter2(Reserved)

2.4 Safety Instructions

1. Please be clear which kind of battery system you want, lithium battery system or lead acid battery system, if you choose the wrong system, the inverter can't work normally.
2. Please read this manual carefully before the installation, the company has the right not to provide quality assurance, If not according to the instructions of this manual for installation and cause equipment damage.
3. All the operation and connection please consort to professional electrical or mechanical engineer.
4. During installation, please don't touch the other parts within the box.
5. All the electrical installation must comply with the local electrical safety standards.
6. If equipments need to maintain, please contact with local specific system installation and maintenance personnel.
7. Using the equipment to connect to grid needs to obtain the permission of local power supply department.
8. When installing PV modules in the daytime, please turn off the PV switch, otherwise it will be dangerous as high terminal voltage of modules in the sunshine.

3. Product Description

3.1 Marks Of The Inverter

Marks of the inverter:

Mark	Meaning	No Fault	Fault	Upgrading	Warning
	Status	The green light stays on	The red light stays on	The green light blinking	The green light blinking

Mark	Meaning	Voltage on Port	Power on Port	Upgrading
	PV Array	The green light stays on blinking	Light keeps green	The green light blinking
	Battery	The green light blinking	Light keeps green	The green light blinking

	Utility	The green light blinking	Light keeps green	The green light blinking
	Load	The green light blinking	Light keeps green	The green light blinking

3.2 Label Explanation

Label contains the following information: for example AH-10KTH-G1 shows as below:

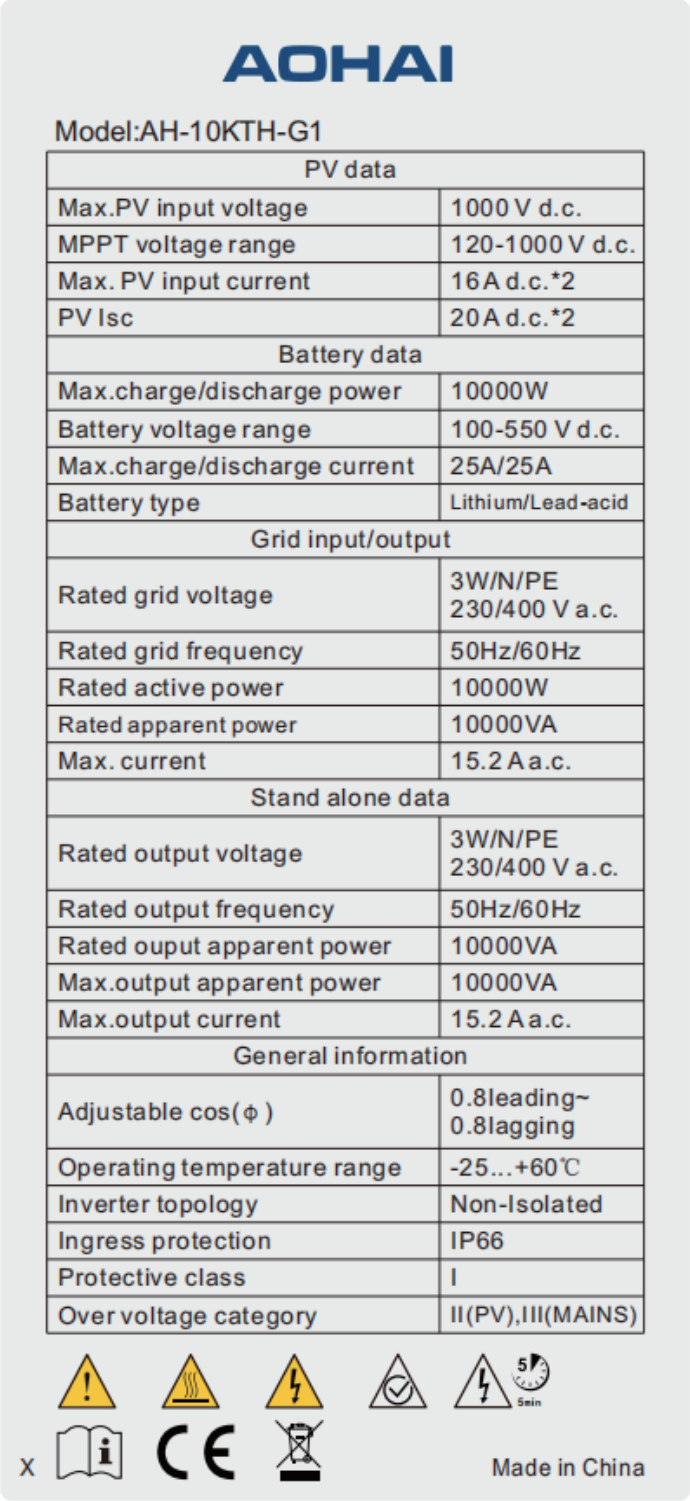


Figure 3.1

Description Of Label:

The type of product	AH-10KTH-G1
PV data	-
Max. PV voltage	1000 V d.c.
PV voltage range	120~1000 V d.c.
Max. input current	16A*2
PV Isc	20A*2
Battery data	-
Max. charging/ discharging power	10000W
Battery voltage range	100~550 V d.c.
Max. charge/ discharge current	25A/25A
Type of battery	Lithium / Lead-acid
Grid input/output	-
Rated grid voltage	3W/N/PE 230/400 V a.c.
Rated output frequency	50Hz/60Hz
Rated ouput apparent power	10000VA
Max.output apparent power	10000VA
Max.output current	15.2 A a.c.
General information	-
Adjustable cos(φ)	0.8ind…0.8cap
Operating temperature range	-25...+60℃
Inverter topology	Non-Isolated
Ingress protection	IP66
Protective class	I
Over voltage category	II(PV),III(MAINS)

3.3 Size And Weight

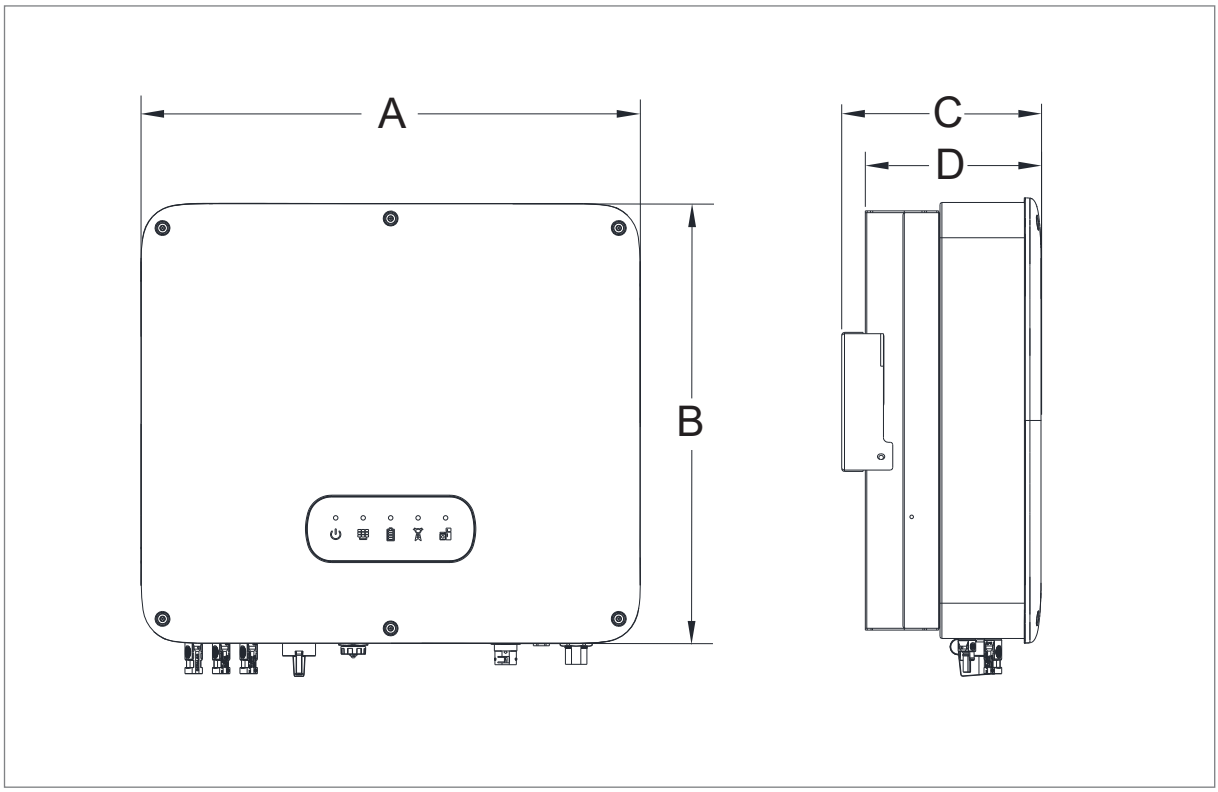


Figure 3.2

Description:

	A(mm)	B(mm)	C(mm)	D(mm)
AH-4~10KTH-G1	545mm	480mm	220.5mm	195mm

3.4 The Advantage Of The Unit Of Inverter

Features below:

- Integrated design.
- Can increase self consumption.
- It has a peak shaving and valley filling mode.
- Intelligent management: Adjustable working modes.
- Use safety batteries.
- Easy to install.
- Two MPPT inputs.

4. Unpacking And Inspection

Before unpacking, please check whether there are any visible external damages. After unpacking, please check whether there are damages or missing of the parts, if it happen,please contact with supplier.

The inverter and accessories are shown as follows:

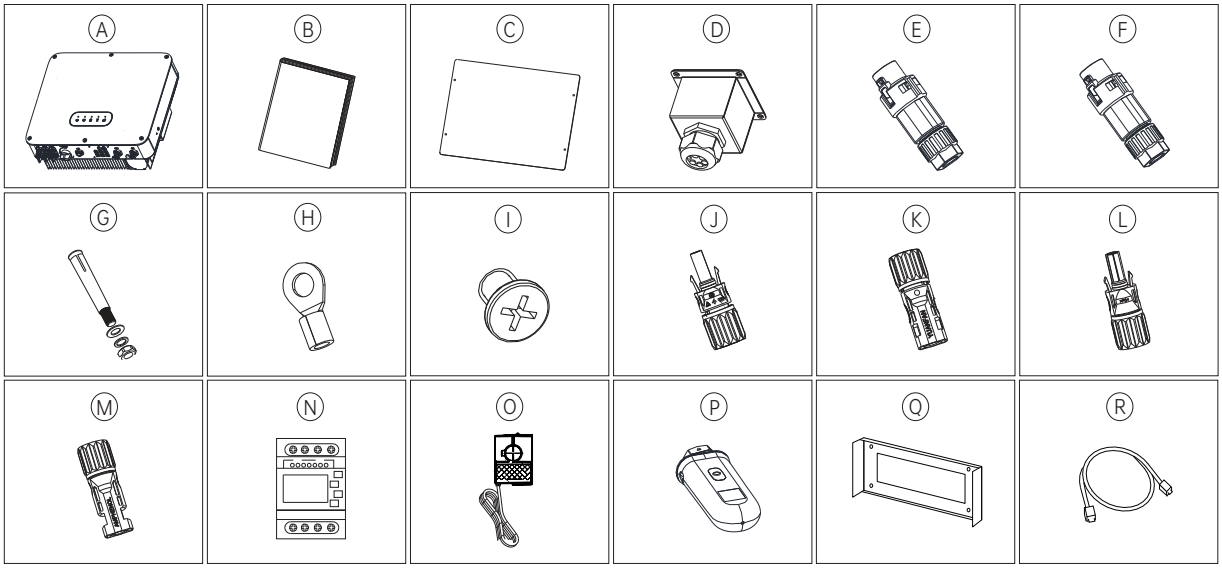


Figure 4.1

Item	Item	Description
A	1	The inverter
B	1	Hybrid Quick Guide
C	1	Paper board(installation guide)
D	1	Waterproof cover
E	1	AC Grid connector
F	1	EPS output connector (blue connector)
G	4	M6 setscrew
H	1	Ground terminal
I	4	M4 setscrew
J/K	2/2	MC4 connector(black connector)
L/M	1/1	MC4 connector (blue connector)
N	1	Electic Meter
O	3	CT
P	1	WiFi
Q	1	Mounting Bracket
R	1	Electic meter communication cable

5. Installation

5.1 Basic Installation Requirements

A. The installation location must be suitable for the inverter's weight for a long period time.

B. The installation location must confirm with dimension of the inverter.

C. Do not install the unit on structures constructed of flammable or thermolabile materials.

D. The Ingress Protection rate is IP66 and the pollution degree is PD2. Please refer to the below:

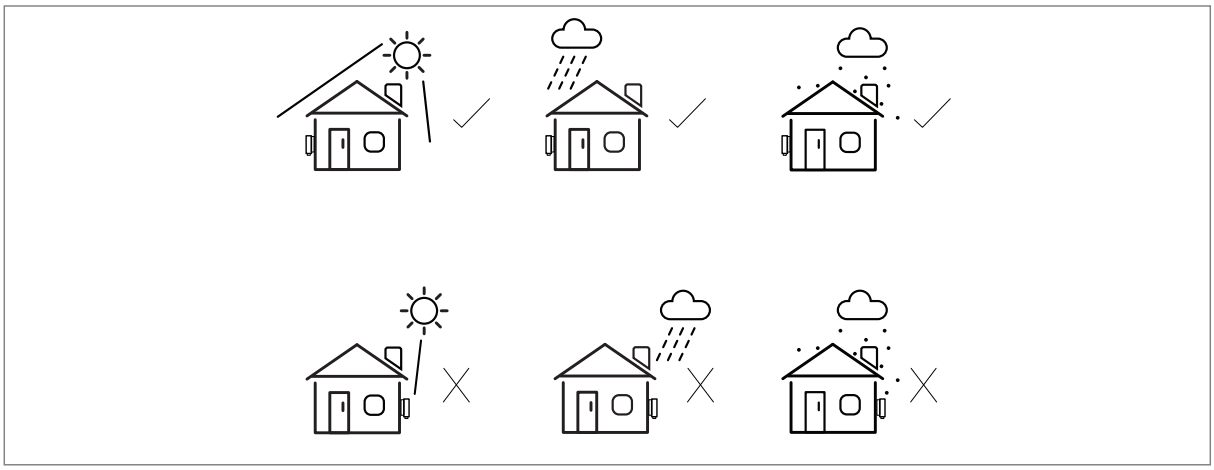


Figure 5.1

E. Battery installation option is not far away from the position of the inverter, the length between the inverter and battery should not be more than 3m.

F. The ambient temperature should be -25℃~60℃.

G. The inverter can be installed in vertical or lean back on plane, Please refer to the below:

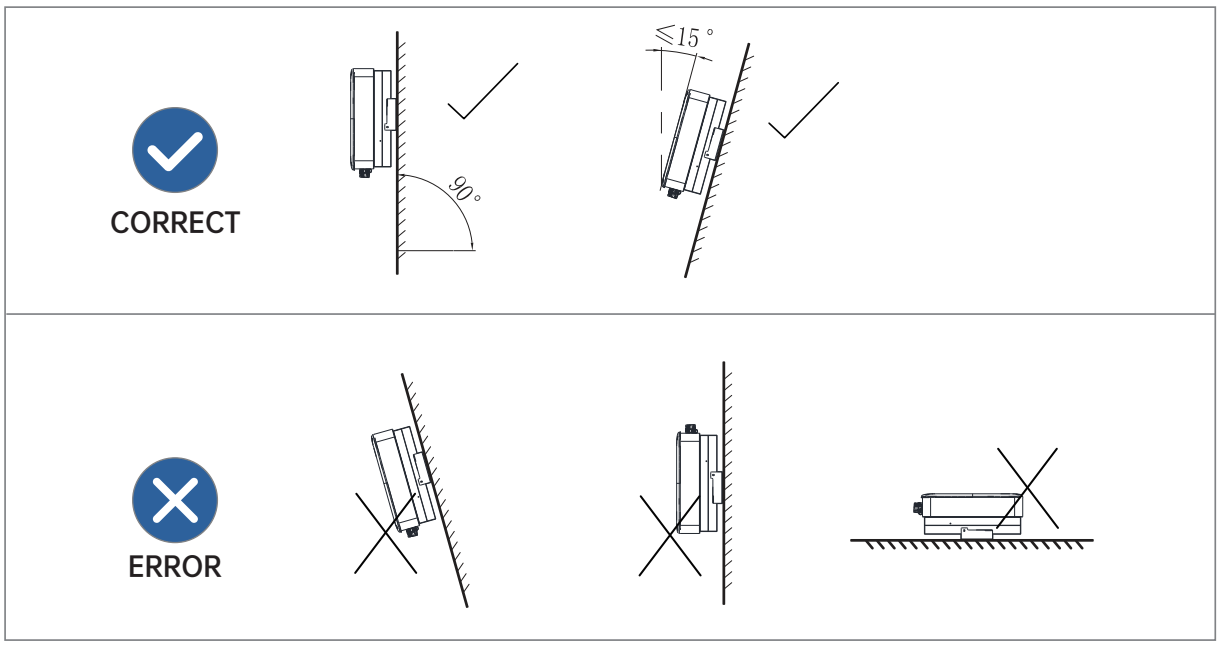


Figure 5.2

H. Installation position shall not prevent access to the disconnection means.

I. In order to ensure machine can run normally and easy to operate, please pay attention to provide adequate space for the inverter, Please refer to below:

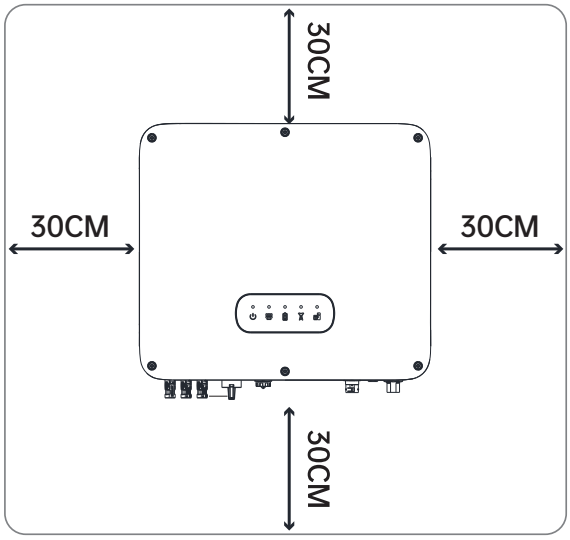


Figure 5.3

J. Do not install the machine near television antenna or any other antennas and antenna cables.

K. Don't install the machine in the living area.

L. Be sure that the machine is out of the children's reach.

M. Taking the battery fixing space into account, about the dimensions please refer to user manual.

N. The inflammable and explosive dangerous goods must not be placed around battery in case of serious danger.

5.2 Installation Requires Tools And RJ45 Terminal Sequence Of The LAN Line

When installing，we need to use tools as follow，prepare the following tools before installing:

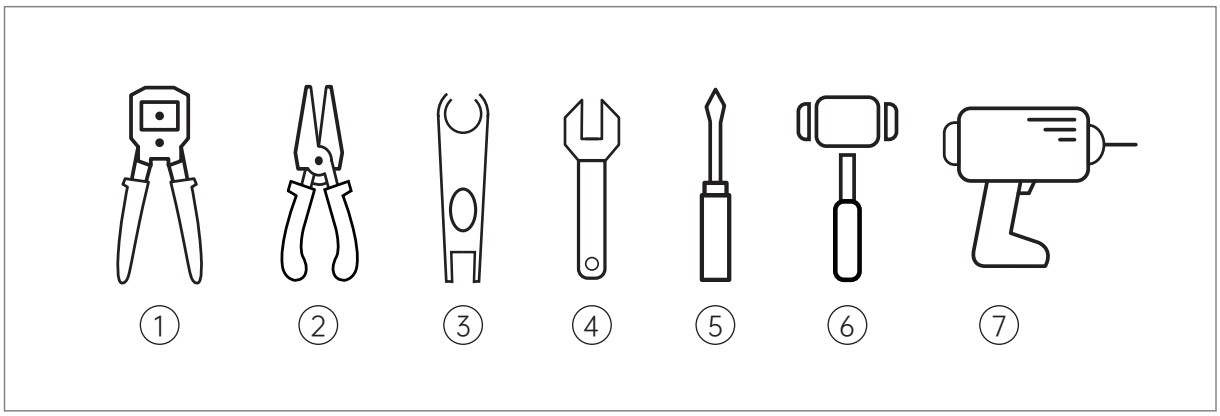


Figure 5.4

Position	Description
1	Press the RJ45 terminal
2	Press battery terminal connector
3	Disconnect PV terminal
4	Unscrew nut
5	Unscrew screw
6	Knock expansion screw
7	Drill holes on the wall

LAN line RJ45 sequence as follow:stalling:

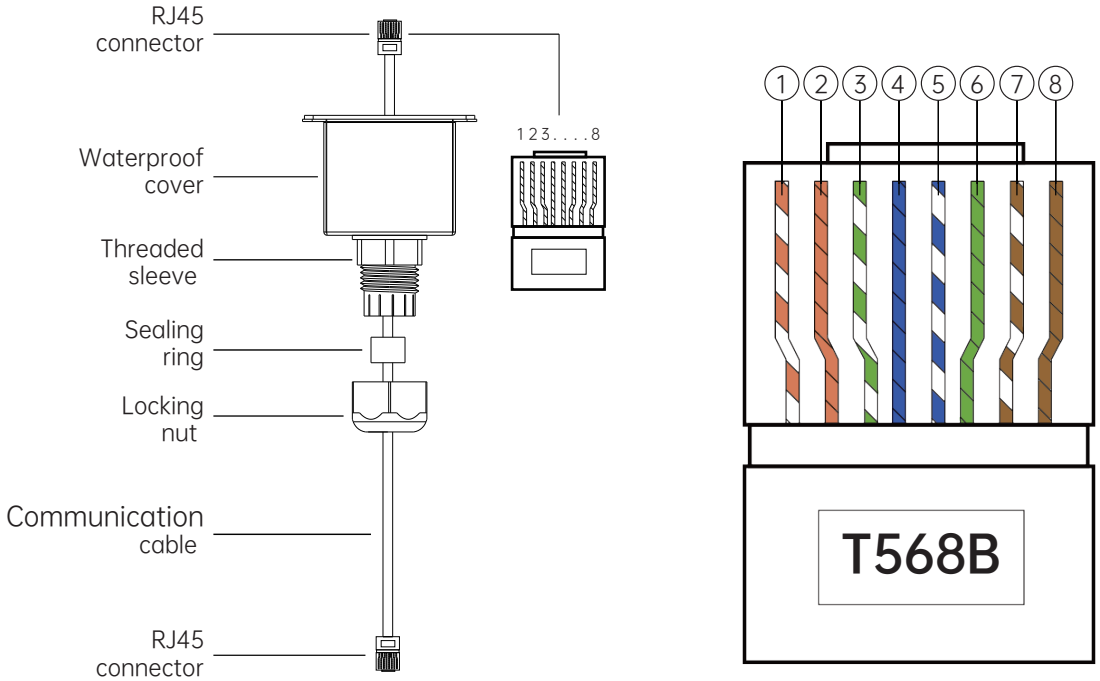


Figure 5.5

Definition of RJ45 connector pin:

NO.	CAN	METER	COM	DRMS	485-1/485-2	485-3
1	/	RS485B	DRY+	DRM1/5	RS485B	RS485B
2	/	RS485A	/	DRM2/6	RS485A	RS485A
3	/	/	DRY-	DRM3/7	/	/
4	CANH	/	/	DRM4/8	/	/
5	CANL	/	/	REF	/	/
6	GND	/	/	COM	/	/
7	/	/	/	/	/	/
8	WAKEUP	GND	/	/	GND	GND

5.3 Installation Instructions

5.3.1 Attention Layout（considering the length of sensors）

AOHAI AH-4~10KTH-G1 only uses meter as its sensor, before installing your system you should know something as below:

1.The cable of meter is suggested not longer than 15m. Because of this, you should consider the cable length between the inverter and combiner box.

2.The meter must be installed in the L line.

3.The installation layout of energy storage system at home shows as following:

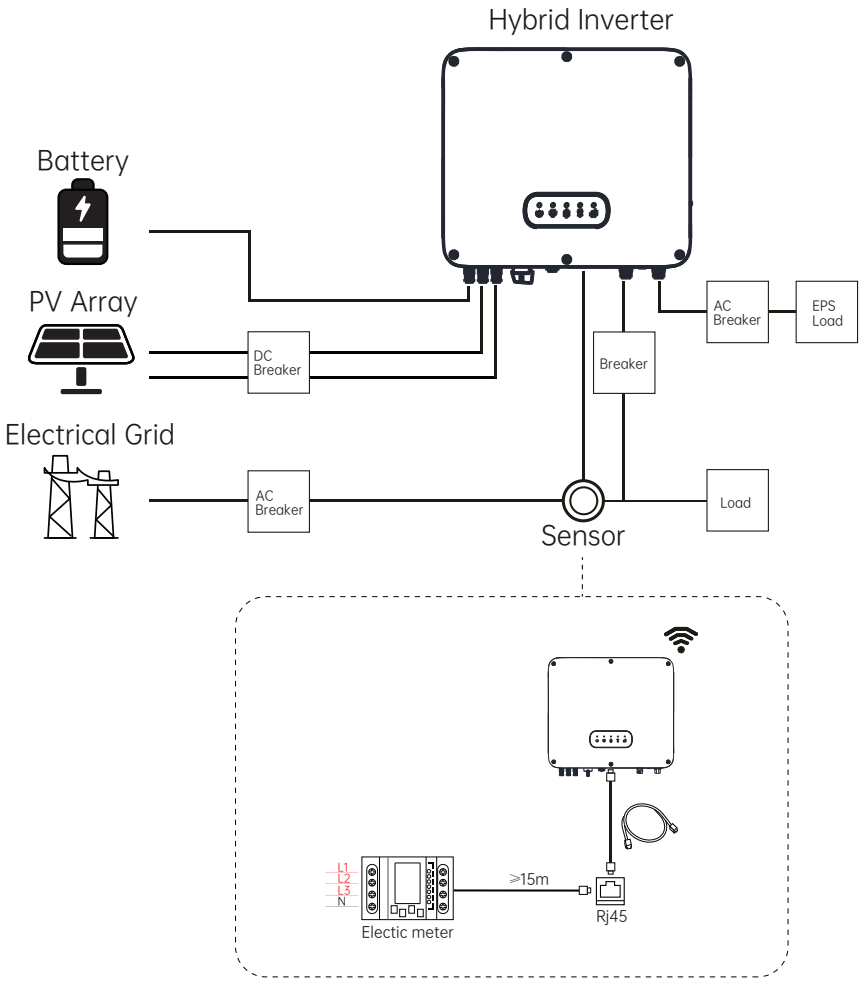


Figure 5.6

5.3.2 Installation Of The Inverter

1.First estimate the size of the inverter on the wall;

2.Determine the location of the drill hole through the cardboard (installation guide), put the cardboard on the wall and make sure the top edge of the cardboard is horizontal.

3.Mark four points at the wall via the hole of the paper board, then remove the cardboard.

4.Drill four Φ8 holes at the mark point, the depth is not less than 55mm.

5.Knock four explosion bolt into Φ8 holes (As the chart 5.8b below).

6.Hang the energy storage machine on the four setscrews (As the chart 5.8c below).

7.Lock the nut of setscrew (As the chart 5.8d below).

8.The whole installation has finished.

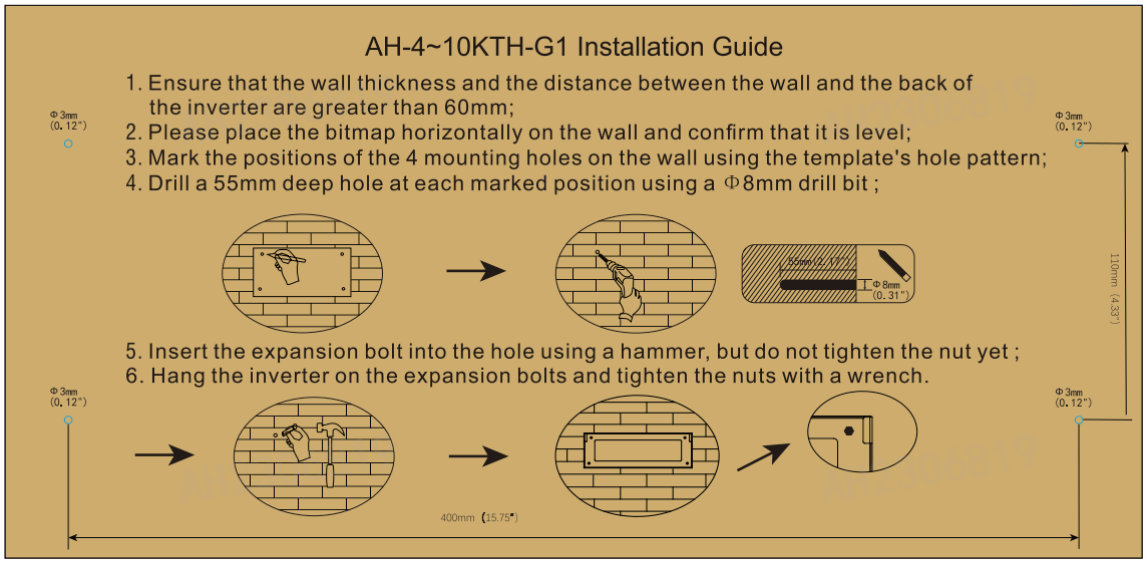


Figure 5.7

5.4 The Inverter System Connection Mode

5.4.1 Connection Of PV Terminal

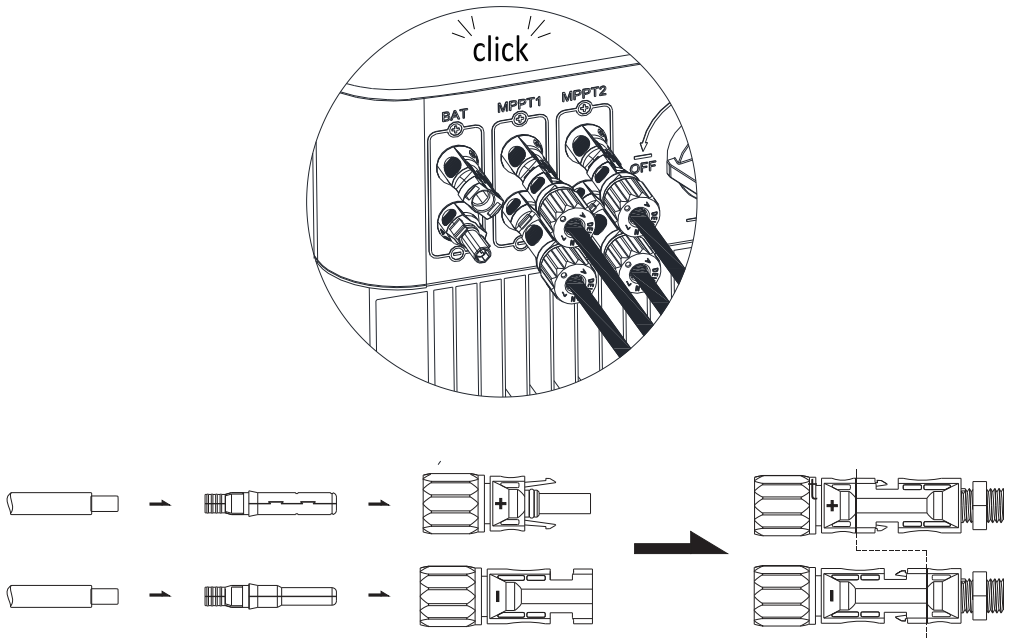


Figure 5.8

Similar to the traditional inverter connecting, the input of PV panel energy can be realized by using MC4 terminal, the detail steps are as follows:

Step 1:

Turn off PV switch.

Step 2:

Insert PV panel positive and negative cables into MC4 terminal, then connect positive pole(+) of connection cable to positive pole(+) of PV input connector, connect negative pole(-) of connection cable to negative pole(-) of PV input connector.

Please pay attention to PV input voltage and current within permission Limit:

- Max PV votage :1000V (consider the lowest temperature)
- Max PV input current: 16A
- Max PV input power per string: 7500W

REMARK	• We suggest you use the cable⩾4mm²/12 AWG to connect. • Please do not connect to DC source.

5.4.2 Attention Layout (length of sensors consider)

The inverter has a grid output terminal and off grid out terminal, look down on the inverter from the front, the terminal on the left (on grid) is grid outlet for connecting grid, the terminal on the right is an uninterrupted power outlet for connecting critical load.

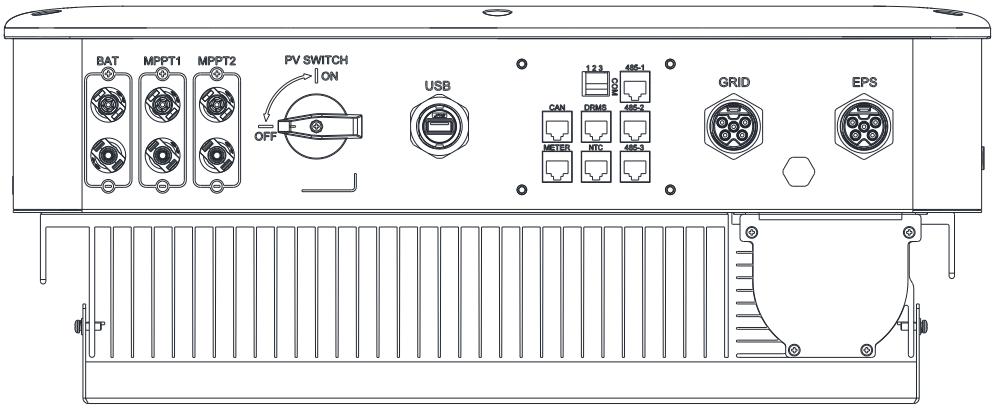


Figure 5.9

Wire suggest length:

Conductor cross section	Max cable length					
	AH-4KTH-G1	AH-5KTH-G1	AH-6KTH-G1	AH-7KTH-G1	AH-8KTH-G1	AH-10KTH-G1
5mm²-6mm²	88m	70m	59m	50m	44m	35m
3mm²-4mm²	55m	44m	37m	31m	27m	22m

AC output terminal connection steps as follow:

Step 1:

Uninstall the AC terminal as below chart.

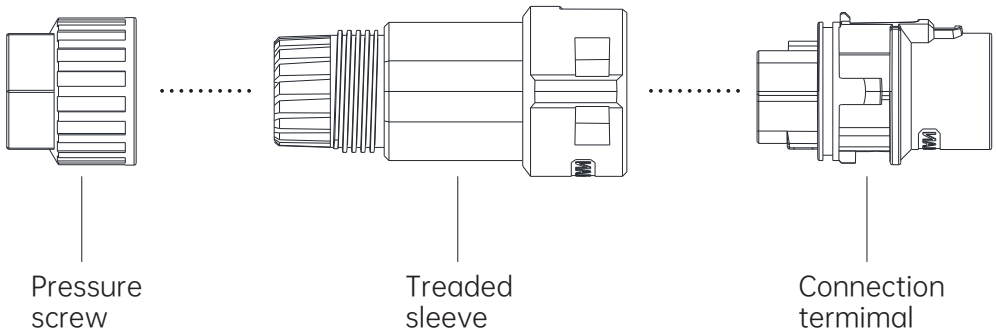


Figure 5.10

Step 2:

Insert PV panel positive and negative cables into MC4 terminal, then connect positive pole(+) of connection cable to positive pole(+) of PV input connector.

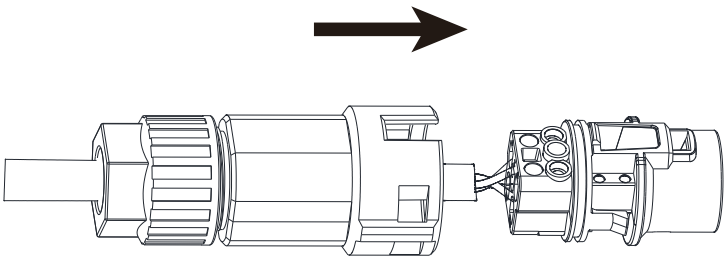


Figure 5.11

Step 3:

Push threaded sleeve on to connection terminal until both are locked tightly.

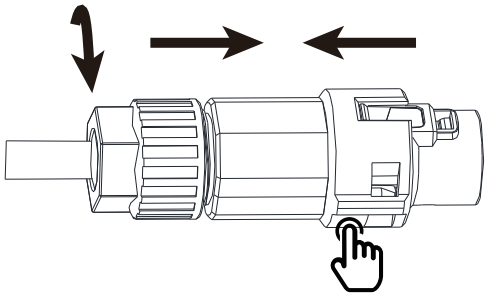


Figure 5.12

Step 4:

Plug the socket into AC output terminal, clockwise rotation to tighten thesocket, counterclockwise rotation to loosen the socket.

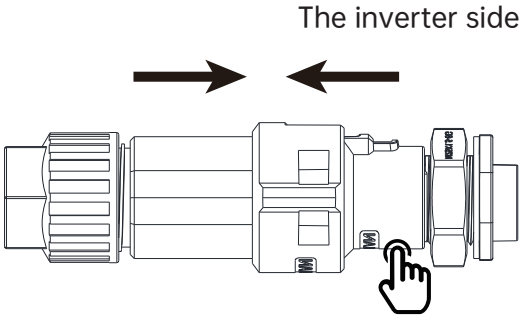


Figure 5.13

The following diagram shows the AC output terminal of the Australian machine connection steps, EPS output terminal connection steps are consistent with the above steps.

EPS output terminal connection steps are follow:

Step 1:

Uninstall the AC terminal as below chart.

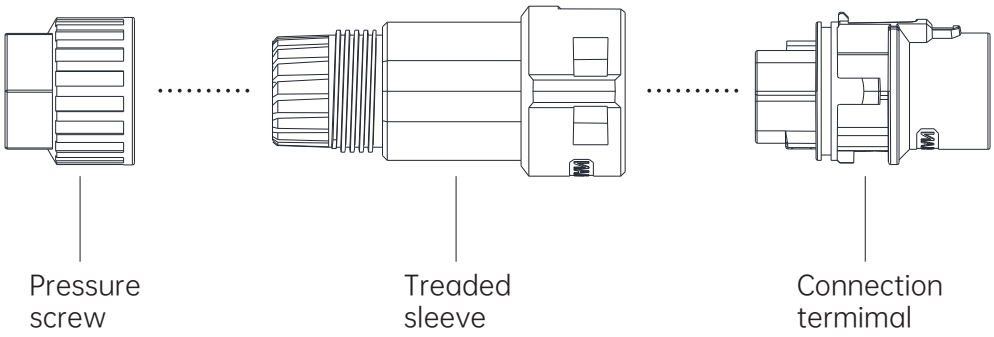


Figure 5.14

Step 2:

Thread cables through pressure screw, seal ring, threaded sleeve in sequence,insert cables into connection terminal according to polarities indicates on it and tighten the screws.

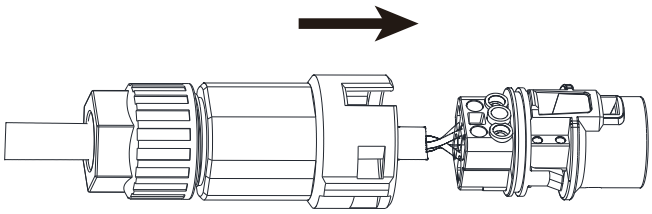


Figure 5.15

Step 3:

Push threaded sleeve on to connection terminal until both are locked tightly.

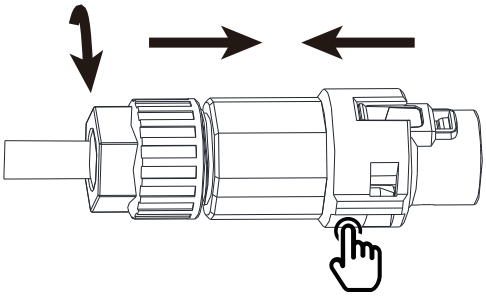


Figure 5.16

Step 4:

Plug the socket into EPS output terminal， clockwise rotation to tighten the socket, counterclockwise rotation to loosen the socket.

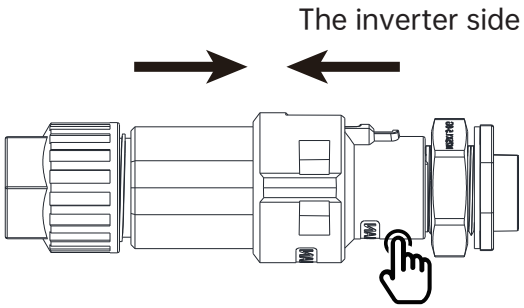


Figure 5.17

Step 5:

Push the connector into the port.

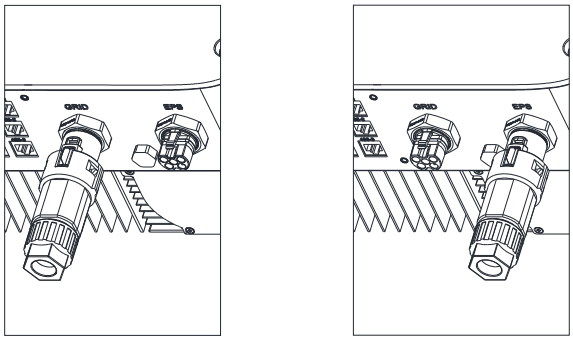


Figure 5.18

Similar to the traditional inverter connecting, the input of battery can be realized by When customer needs to use meter to monitor the energy flow, the meter terminal using MC4 terminal, the detail steps are as follows:

Step 1:

Turn off battery switch.

Step 2:

Insert battery panel positive and negative cables into MC4 terminal， then connect positive pole(+) of connection cable to positive pole(+) of battery input connector, connect negative pole(-) of connection cable to negative pole(-) of battery input connector.

Please pay attention to battery input voltage and current within permission Limit:

- Max battery voltage: 550V
- Max battery input current: 25A
- Max battery input power : 10000W

REMARK	• We suggest you use the cable⩾4mm²/10 AWG to connect.

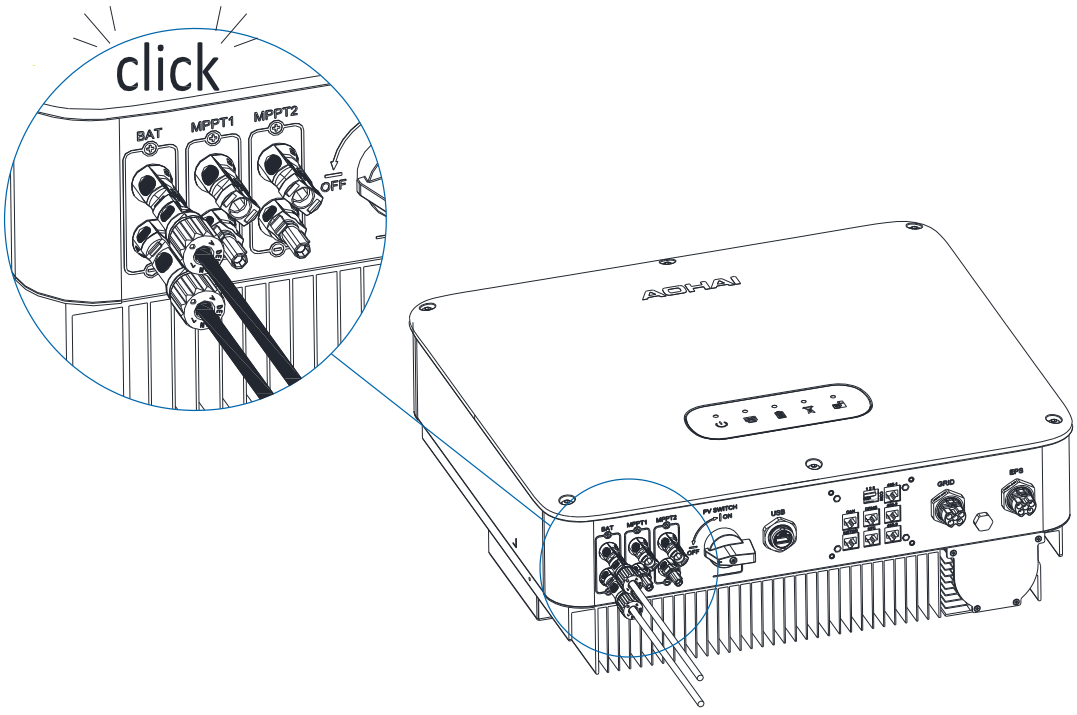


Figure 5.19

NOTE

- We suggest the distance between battery and the inverter no longer than 5m, and The power line area must be larger than 10AWG.

5.4.3 Connection Of Meter Terminal

When customer needs to use meter to monitor the energy flow, the meter terminal using MC4 terminal, the detail steps are as follows: connection steps are as follows:

Step 1: Reference 5.2, make LAN cables with RJ45 terminal.

Step 2: Thread the swivel nut over the LAN cable.

Step 3: Press the cable support sleeve out of the cable gland.

Step 4: Remove the filler plug from the cable support sleeve.

Step 5: Route the LAN cable through an opening in the cable support sleeve.

Step 6: Thread the LAN cable through the cable gland.

Step 7: Insert the RJ45 plug of the network cable into the "METER" pin connector on the inverter until it snaps into place.

Step 8: If no other cables need to be installed, lock the waterproof cover to the inverter with screws.

Step 9: Screw the swivel nut onto the waterproof cover.

NOTE

- Meter must be provided by AOHAI. If not, maybe meter can't communicate with the inverter.
- For more detailed descriptions,please turn to meter user manual.

Figure 5.20

The recommended wiring diagram is as follows:

Diagram A

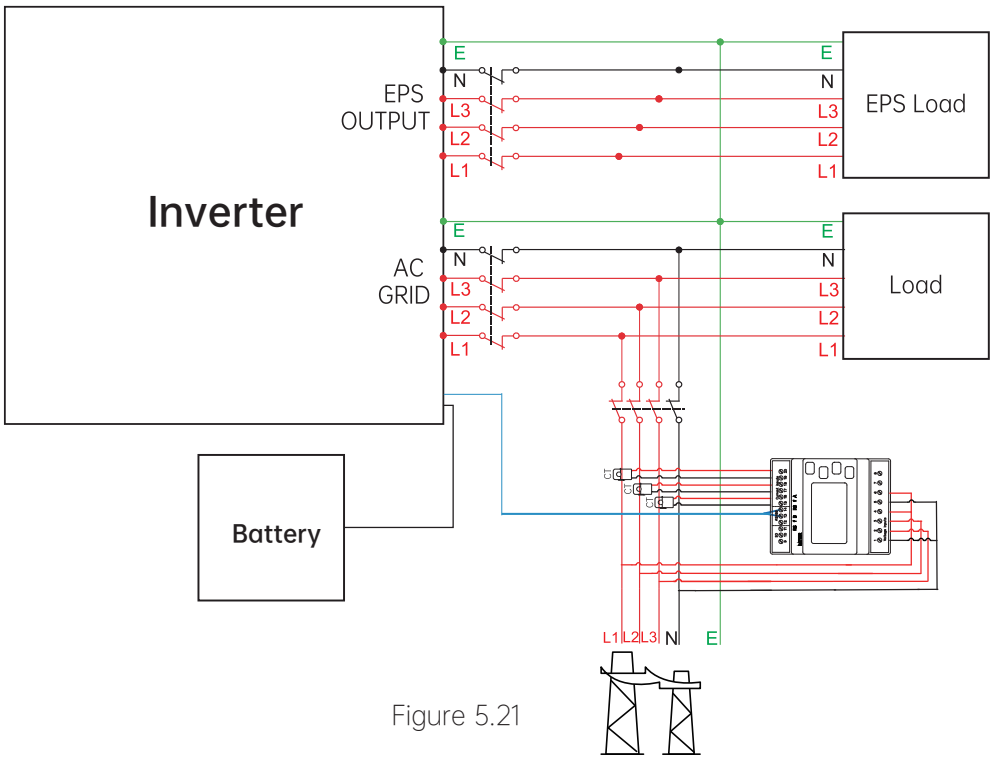


Figure 5.21

NOTE

- This diagram is an example for gird system without special requirement on electrical wiring connection.The neutral line is necessary.

Diagram B

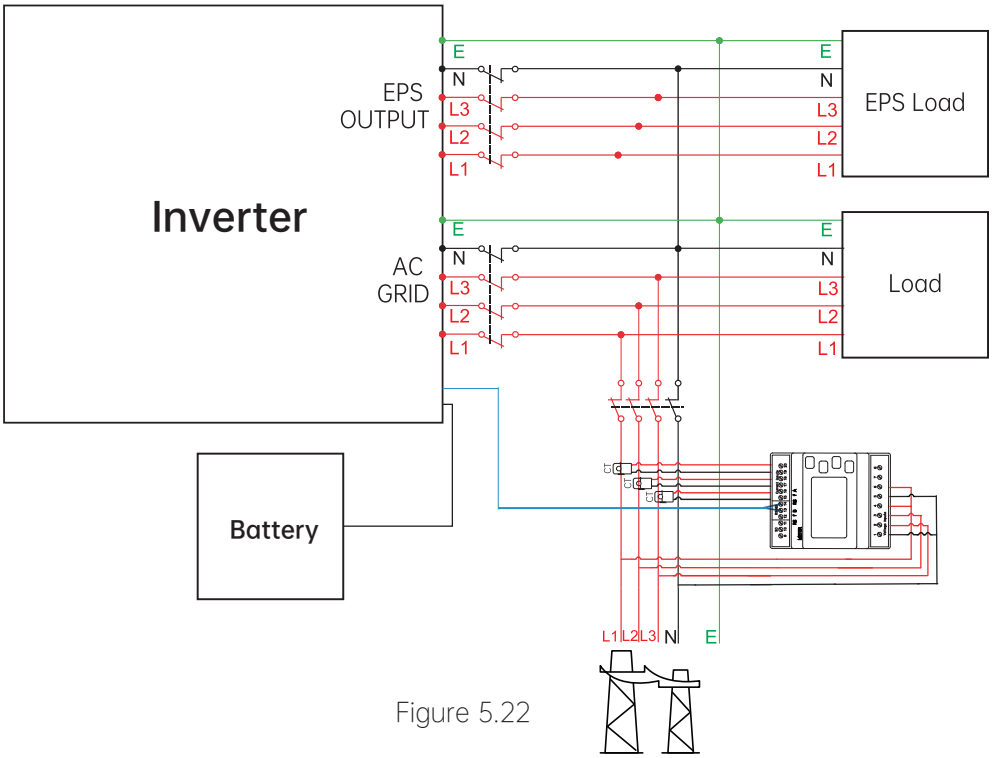


Figure 5.22

NOTE	● This diagram is an example for Australian and New Zealand gird system where neutral line can't be switched.The neutral line is necessary.

Diagram C

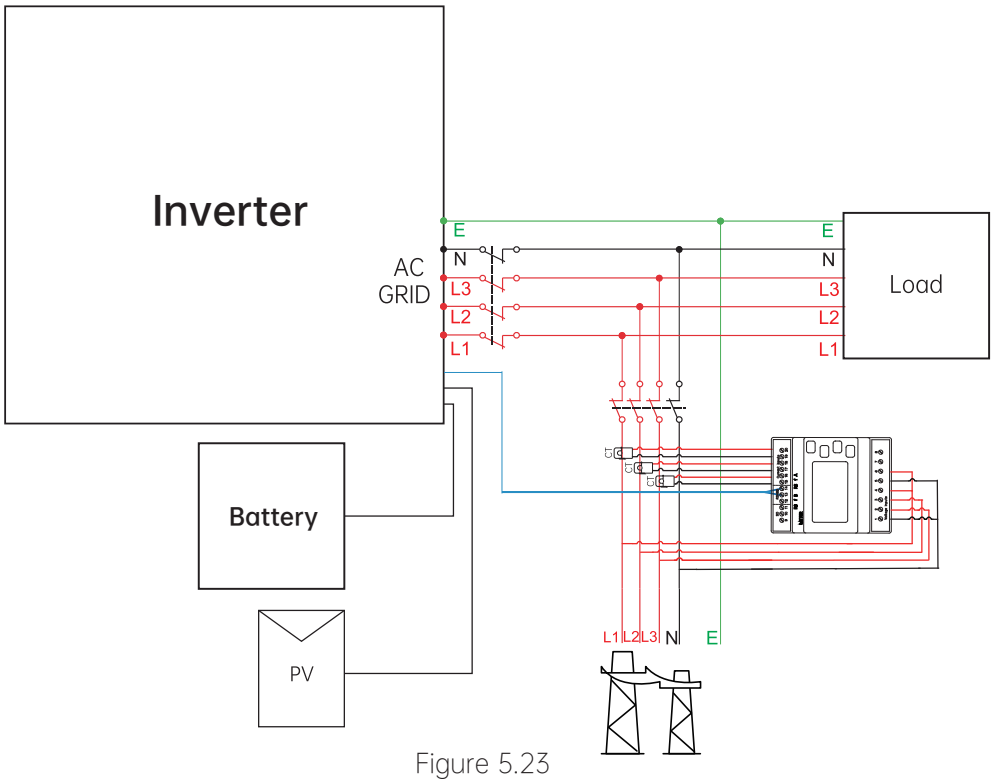
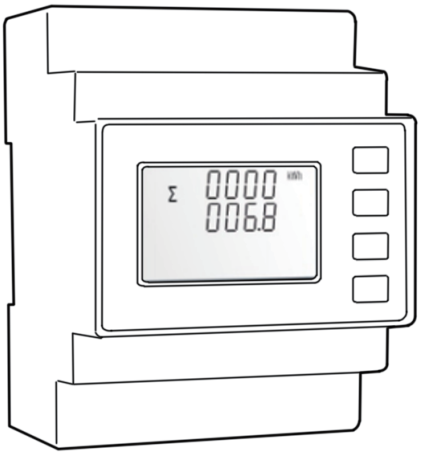


Figure 5.23

NOTE	● This diagram is an example for customer who only wants to use the on grid storage system.The neutral line is necessary.
NOTICE	● If you want to use on gird only, please refer to chart 5.22 Connect with AC grid and float EPS OUTPUT. ● If you have no battery now, you can also float BAT terminal, and this hybrid inverter will only work like a PV inverter. ● If you want to use both on gird power and backup power, please refer to chart 5.20 and 5.21.Connect with AC grid and EPS OUTPUT like the chart shown. ● On grid terminal and off grid terminal can't directly connect together. ● Off Grid terminal can't connect to grid. ● The first start of system needs Grid power.
	● EPS output does not support half-wave load type devices, such as hair dryers.

Three phase CT meter-Eastron:



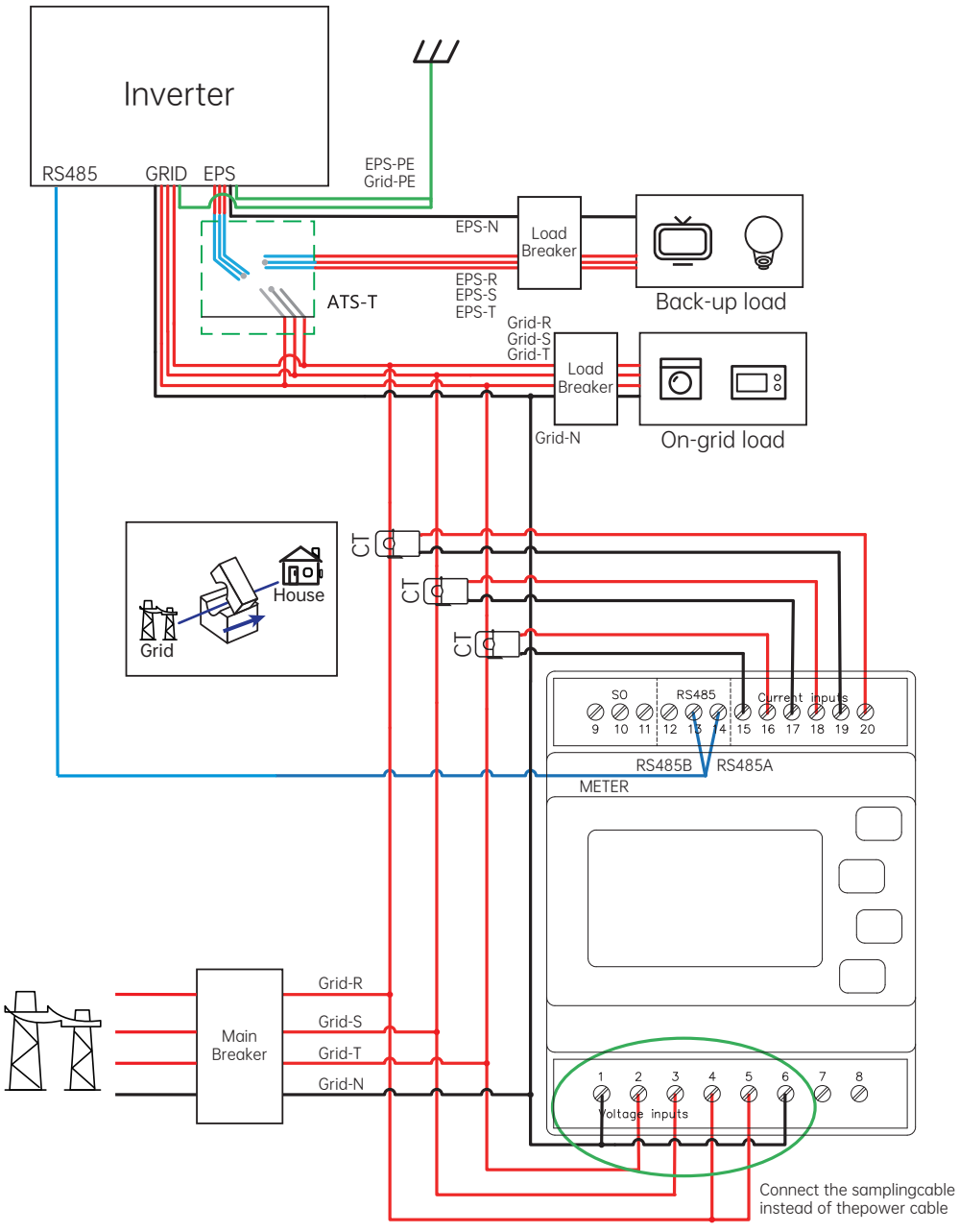


Figure 5.24

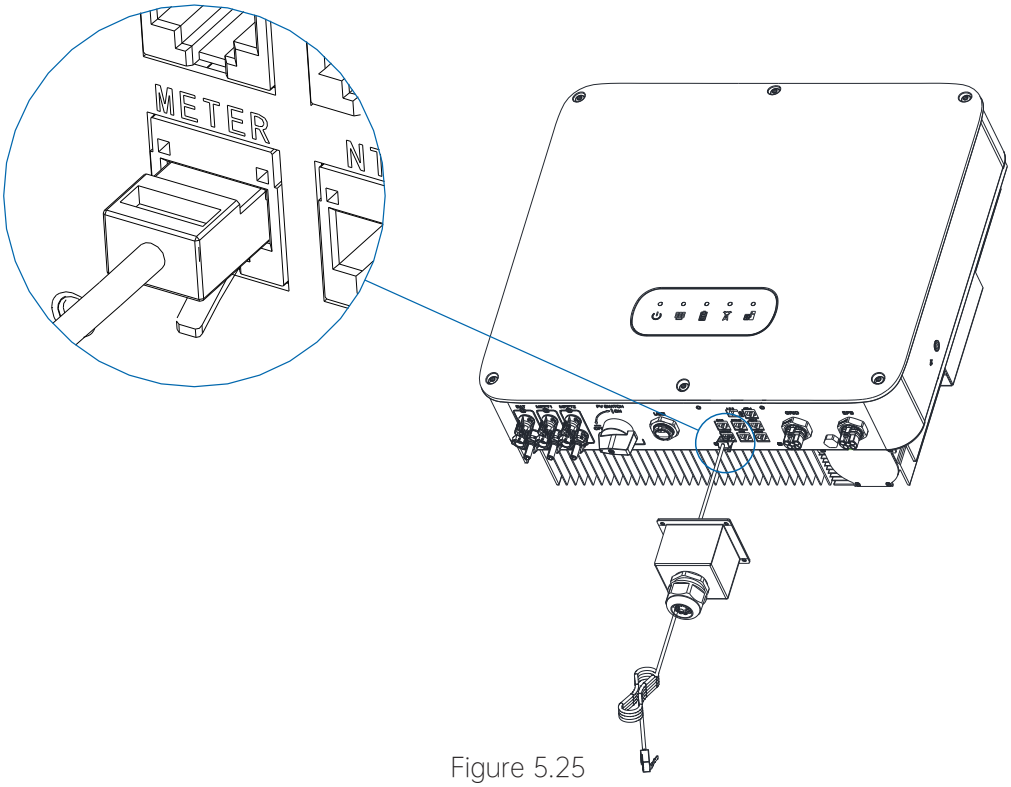


Figure 5.25

Remark:

Meter wire (15m in length) specification: RJ45, standard LAN line (one end with 8P modular plug, the other connected with transformer). But if the length is not enough,customer can add cable, so the length can be increased to 25m max, the operation is as following chart:

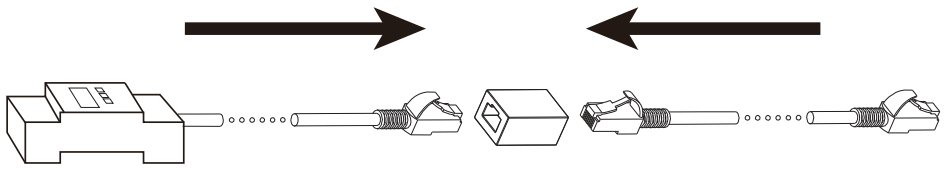


Figure 5.26

5.4.4 Connection Of Communication Terminal For Lithium Battery (CAN)

When using CAN communication with lithium batteries（for example PYLONTECH X1），connect lithium battery terminal (RJ45) steps as follows:

Step 1: Unscrew the swivel nut from the cable gland.

Step 2: Thread the swivel nut over the "CAN" cable.

Step 3: Press the cable support sleeve out of the cable gland.

Step 4: Remove the filler plug from the cable support sleeve.

Step 5: Route the "CAN" cable through an opening in the cable support sleeve.

Step 6: Thread the "CAN" cable through the cable gland.

Step 7: Insert the RJ45 plug of the network cable into the "CAN" pin connector on the inverter until it snaps into place.

Step 8: If no other cables need to be installed, lock the waterproof cover to the inverter with screws.

Step 9: Screw the swivel nut onto the waterproof cover.

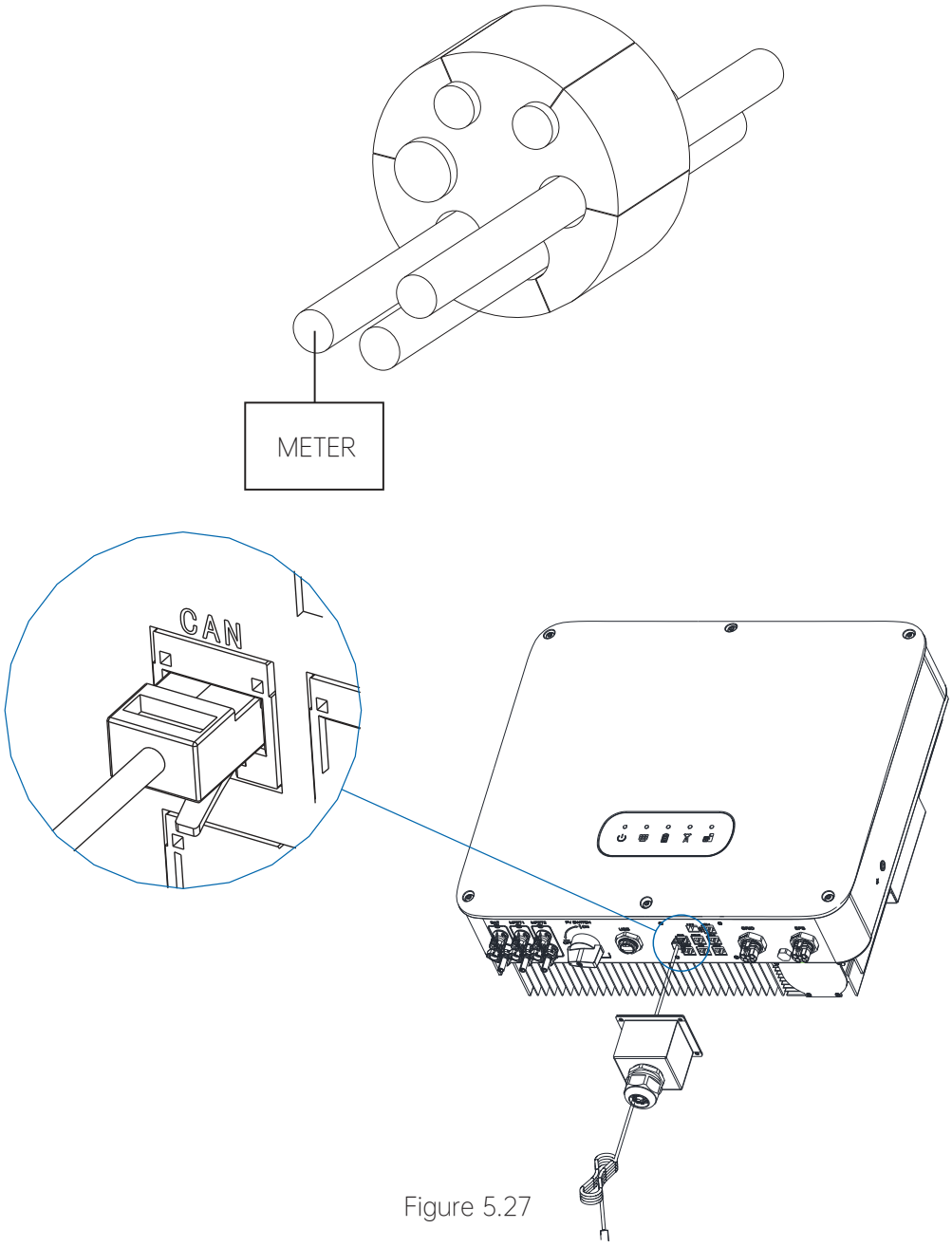


Figure 5.27

NOTE	• If you are using a lead-acid battery, you do not need to install this communication cable.

5.4.5 Connection Of RS 485 Terminal

RS 485 reserved communication interface, can be used for meter communication, please connect the terminal (RJ45) as follows:

Step 1: Unscrew the swivel nut from the cable gland.

Step 2: Thread the swivel nut over the "RS485" cable.

Step 3: Press the cable support sleeve out of the cable gland.

Step 4: Remove the filler plug from the cable support sleeve.

Step 5: Route the "RS485" cable through an opening in the cable support sleeve.

Step 6: Thread the "RS485" cable through the cable gland.

Step 7: Insert the RJ45 plug of the network cable into the or "485-2" pin connector on the inverter until it snaps into place.

Step 8: If no other cables need to be installed, lock the waterproof cover to the inverter with screws.

Step 9: Screw the swivel nut onto the waterproof cover.

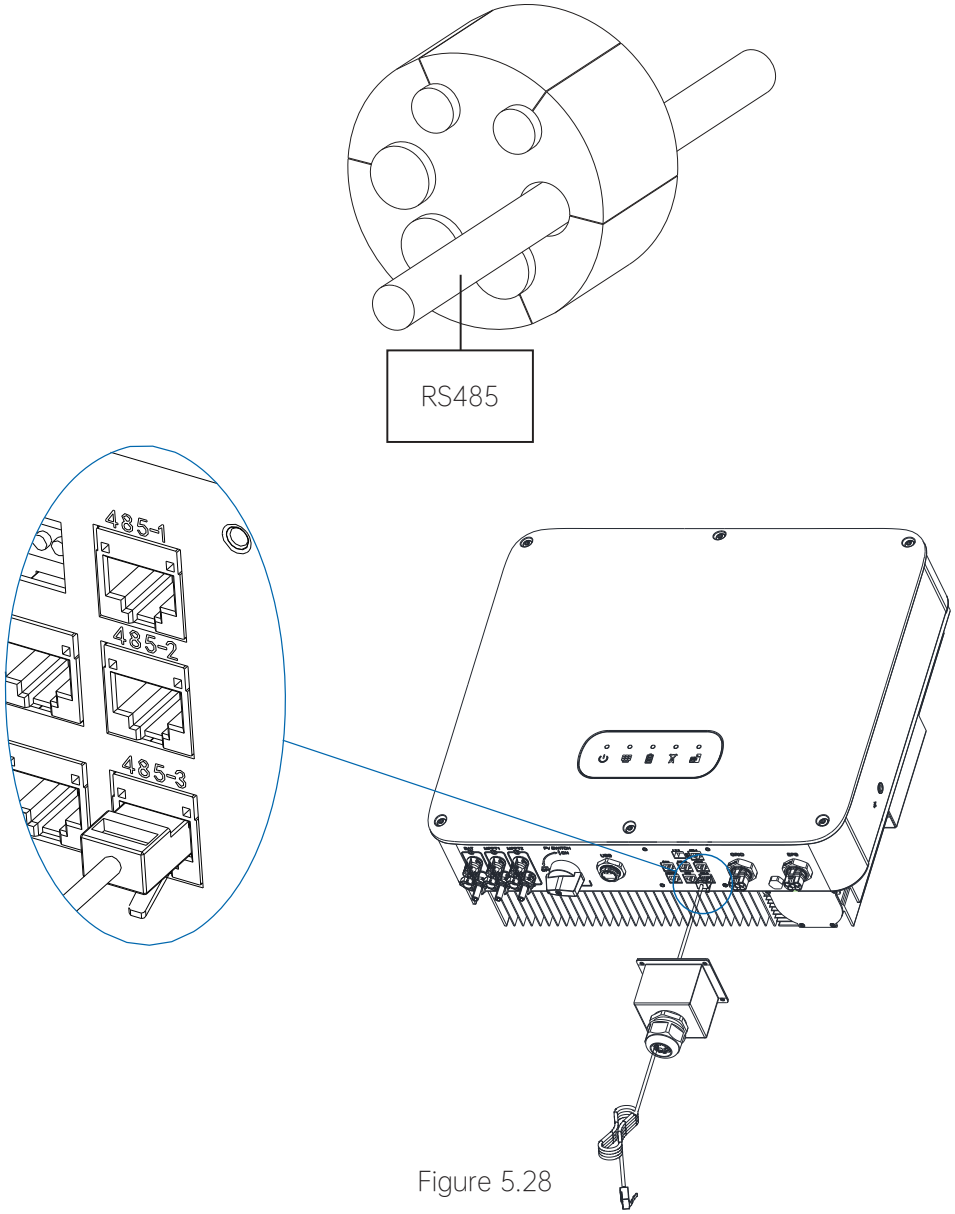


Figure 5.28

5.4.6 Connection Of DRMS Terminal(Australia only)

RS 485 reserved communication interface, can be used for meter communication, please connect the terminal (RJ45) as follows:

Step 1: Unscrew the swivel nut from the cable gland.

Step 2: Thread the swivel nut over the "RS485" cable.

Step 3: Press the cable support sleeve out of the cable gland.

Step 4: Remove the filler plug from the cable support sleeve.

Step 5: Route the "RS485" cable through an opening in the cable support sleeve.

Step 6: Thread the "RS485" cable through the cable gland.

Step 7: Insert the RJ45 plug of the network cable into the or "485-2" pin connector on the inverter until it snaps into place.

Step 8: If no other cables need to be installed, lock the waterproof cover to the inverter with screws.

Step 9: Screw the swivel nut onto the waterproof cover.

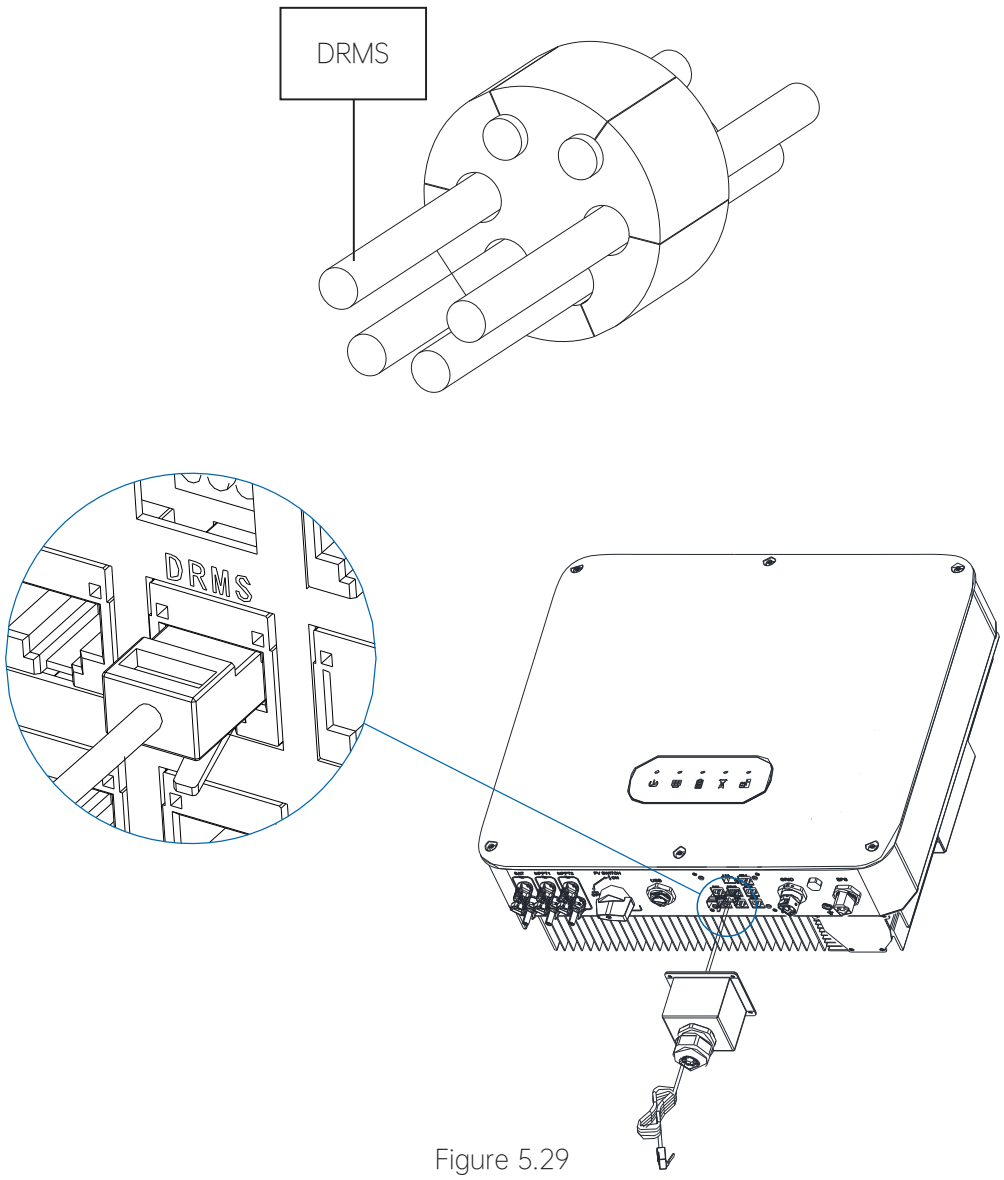


Figure 5.29

RJ45 terminal pin assignment:

PN	Assignment for inverter scalable of both charging and discharging
1	DRM5
2	DRM6
3	DRM7
4	DRM8
5	RefGen
6	COM/DRM0
7	-
8	-

Method of asserting demand response modes:

MODE	RJ45 socket asserted by shorting pins		Requirement
DRM0	5	6	Operate the disconnection device
DRM5	1	5	Do not generate power
DRM6	2	5	Do not generate at more than 50% of rated power
DRM7	3	5	Do not generate at more than 75% of rated power and sink reactive power if capable
DRM8	4	5	Increase power generation (subject to constraints from other active DRMs)

NOTE

- If the cable such as "NTC" (lead-acid battery temperature sensor) cable is not used,please do not remove the filler plug from the cable support sleeve.

5.4.7 Connection Of Dry Contact

The dry contact is used to communicate with external devices (such as remote start hot water heater). The wiring steps are as follows:

Step 1: Unscrew the swivel nut from the cable gland.

Step 2: Thread the swivel nut over the cable.

Step 3: Press the cable support sleeve out of the cable gland.

Step 4: Remove the filler plug from the cable support sleeve.

Step 5: Route the network cable through an opening in the cable support sleeve.

Step 6: Thread the network cable through the cable gland.

Step 7: Thread cables into connection terminal of the inverter, then press the terminal by relevant tools and make sure cables are firmly.

Step 8: If no other cables need to be installed, lock the waterproof cover to the inverter with screws.

Step 9: Screw the swivel nut onto the waterproof cover.

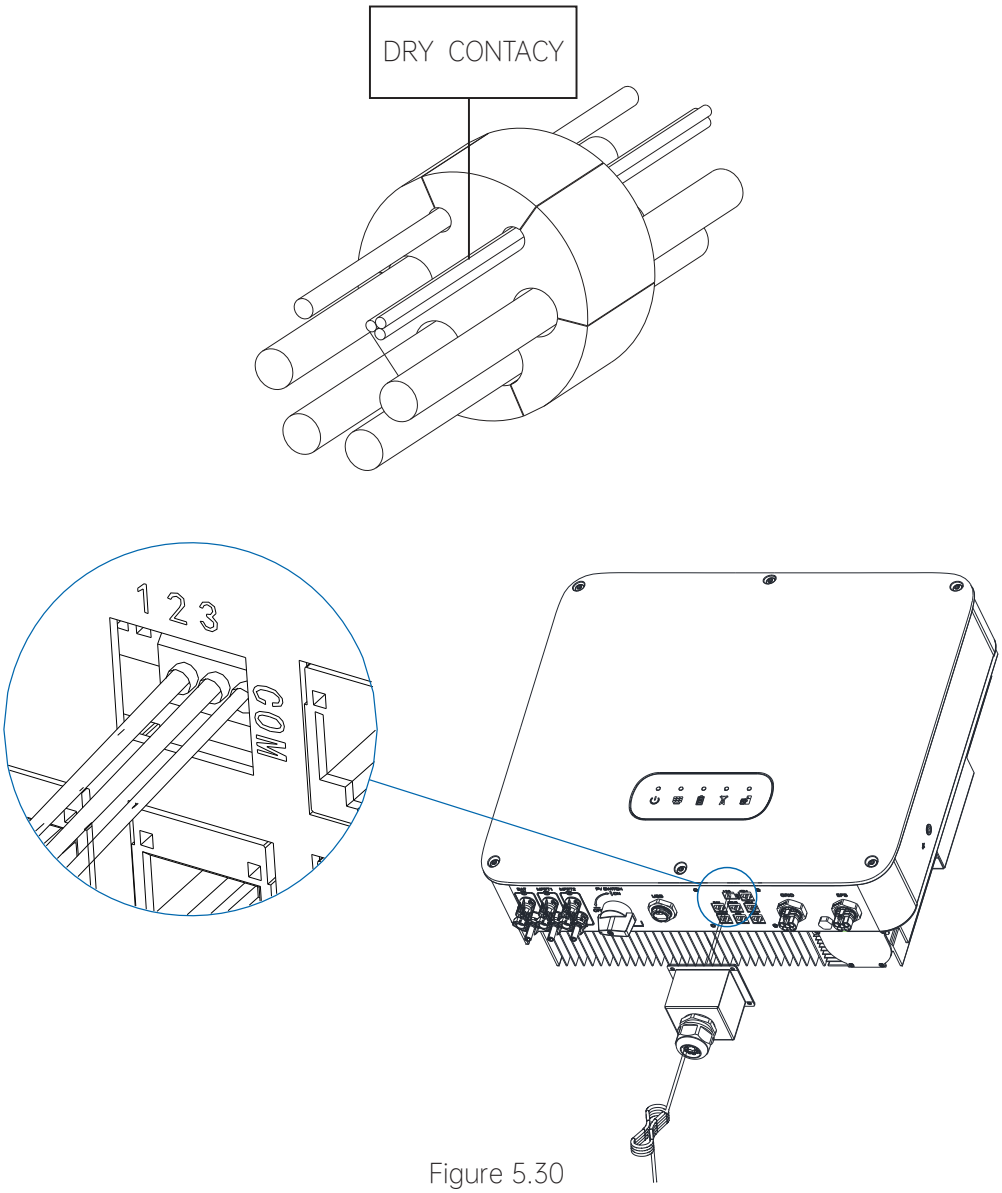


Figure 5.30

5.4.8 Grounding Connection

The inverter must be grounded by cable, the grounding point is shown as follows, and the minimum grounding cable wire diameter is 10.0mm.

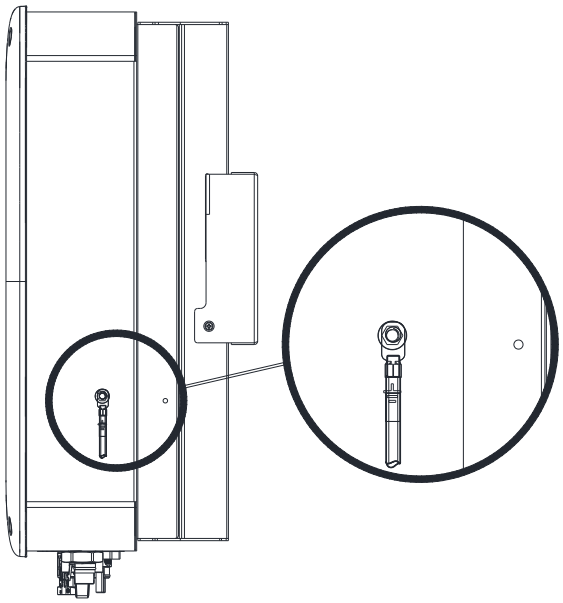


Figure 5.31

PV Array Grounding:

Grounding conductor of PV panel brackets must be firmly connected to earth at PV array side and inverter side and SP side. The sectional area of grounding conductor should be equal to the sectional area of DC grounding conductor. The minimum wire diameter is 10.0mm.

DC Grounding:

Select the DC Grounding mode according to the local standard and use the PV grounding terminal box and DC Grounding wires of the same specification.

Grounding Device:

If the positive pole or the negative pole of PV array need to be grounded in the PV system,the inverter output should be insulated by Isolation Transformer. Isolation transformer must conform to IEC62109-1,-2 standard.

Connection as below:

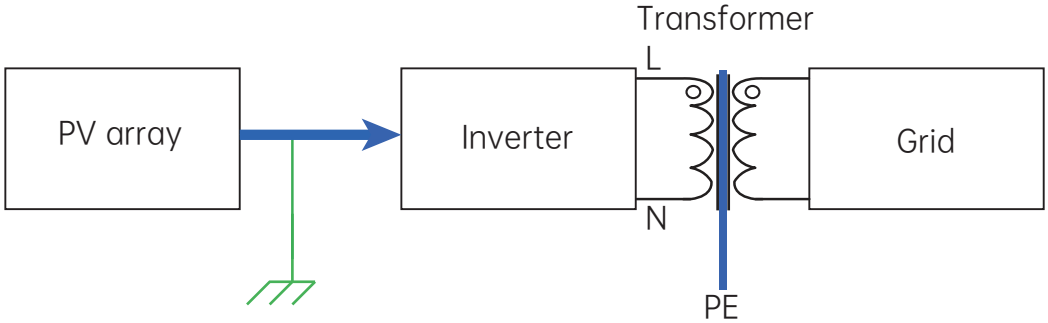


Figure 5.32

6.Commissioning

6.1 Commissioning Of The Inverter

Electrify the inverter after all installation of Part5 be finished, here are the steps:

- Connect PV.
- Connect AC.
- Connect battery.
- Turn on AC first.
- Then turn on battery.
- Last turn on PV.

If PV Grid and battery are available, system would work on the "normal" mode. When the inverter on the normal mode, LED is green, if the inverter not enter normal mode successful,especially the LED is red, you need to check below:

- Make sure all the connection is correct.
- All the external switches are on.
- Inverter built -in switch is on.
- Make sure the lithium battery is on.
- Refer to Part 9.1 for correction.

6.2 Operation Modes

6.2.1 Normal Mode

Normal mode is working state which includes online mode and backup mode.

- Online mode

  User can set an appropriate priority mode according to request when the inverter working on the online mode.if you use website settings, you can set up to three periods of the priority mode.

  Load first:load first is the default mode, when it's working in this mode, PV energy would offer to load and battery prior; when PV is Insufficient, battery would discharge;when PV is sufficient for load, the excess energy would feed to battery. If there is no battery or battery is full, the excess energy would feed to Grid(except anti -reflux).

  Battery first:when the inverter is working in this mode, battery would be charged first, it's suitable working on the period when the electric charge is low. User needs to set the mode ON and OFF time, and the end time of battery SOC. Users can set power rate which less than the battery maximum output power. If the customer doesn't enable the AC CHG (AC grid charging functions). Inverter will charge battery by PV power as large as it can. If the customer enables the AC CHG (AC grid charging functions). Inverter will charge battery by PV power and AC power from grid as large as it can.

Grid first:when the inverter working in Grid-first mode, the PV energy would feed to Grid first.

User can choose the period when electric charge is high. User needs to set the mode ON and OFF time, and the end time of battery SOC. user can set power rate which less than the battery maximum output power.

- **Backup Mode**

  If Grid lost, system would turn to backup mode (user can disable it) and AC output from EPS LOAD port, all the energy from PV and battery, if the PV also lost, then only battery discharge. To be noticed, the inverter maximum output power is 10000W in this mode, the load which connect with EPS LOAD should less than 10000W.

NOTICE	● If user needs to set more, pleases log in HaiPower. ● If user needs Grid charge to battery, user needs to input password on the SC surface and set theAC CHG to enable.

6.2.2 Fault Mode

The inverter's intelligent control system could monitor and adjust system's status continuously, when the inverter monitor anything unexpected happen, such as system fault or machine fault , in fault mode, the LED light will be lighten.

NOTICE	● The detail's fault information please refer to 9.1. ● Some fault information is in order to remind users that might have some faults occurred in inverter side.

6.2.3 Programming Mode

Programming mode indicates the inverter is updating, don't cut out power when it's updating until the process is finish, The inverter would log out automatically when the updating finishs and turn to other mode.

6.2.4 Checking Mode

Before the inverter work in normal mode, it will go to self-check mode. If all are ok, system will go to normal mode, otherwise, it will go to fault mode.

6.2.5 Standby Mode

If the system doesn't have faults while the condition is not qualified, the inverter would stay at standby mode.

6.2.6 Shutdown Mode

If customer needs the inverter stop working, customer should disconnect all the energy source, then the inverter will turn into shutdown mode automatically.

The following is the shutdown procedure:

- Shutdown the PV side
- Turn off battery switch.
- Shut down AC power of the inverter. Then you can see both LED of the inverter are off.

NOTICE	• After all the actions are done, you still have to wait for more than 5 minutes.

6.3 Country Setting

AOHAI can provide various regulations of the machine, after customers receive the machine, according to their country/region, by Mobile APP to set the corresponding regulations.Please select the correct option when installing AOHAI Inverter.Following is the Regulations introduction.

Number	Mode	Region Name	Regulations Name
1	S01	Germany	VDE0126
2	S02	China	CQC_2018
3	S03	(NULL)	CEI0_16
4	S04	Italy	CEI0_21
5	S05	Chile	CHILE
6	S06	Greece	GREECE_CONTINENT
7	S07	Germany	N4105
8	S08	Britain	G98
9	S09	Britain	G99
10	S0A	Northern Ireland	NI_G98
11	S0B	Northern Ireland	NI_G99
12	S0C	Ireland	IRELAND
13	S0D	britain	G100
14	S0E	Norway	NORWAY
15	S0F	Czech Republic	CZECH
16	S10	Poland	POLAND
17	S11	Hungary	HUNGARY

Number	Mode	Region Name	Regulations Name
18	S12	Belgium	BELGIUM
19	S13	Spain	SPAIN
20	S14	Sweden	SWEDEN
21	S15	Denmark	DEMARK_DK1
22	S16	Denmark	DEMARK_DK2
23	S17	Denmark	DEMARK_TR331_DK1
24	S18	Netherlands	EN50438T
25	S19	France	FRANCE
26	S1A	North America	IEEE1547_1
27	S1B	North America	US_RULE21
28	S1C	North America	US_RULE14_HECO
29	S1D	(NULL)	EN50549
30	S1F	South Africa	NRS097
31	S1G	Lithuania	LIETUANIA
32	S20	Brazil	BRAZIL
33	S21	Latvia	LATVIJA
34	S22	(NULL)	N4110_BDEW
35	S23	Taiwan	TAIWAN_TPC
36	S24	Taiwan	TAIWAN_VPC
37	S25	Pakistan	PAKISTAN
38	S26	India	INDIA
39	S27	Thailand_MEA	MEA
40	S28	Thailand_PEA	PEA
41	S29	Vietnam	VIETNAM_EVN
42	S2A	Greek Island	GREECE_ISLAND
43	S2B	New Zealand	NEWZEALAND
44	S2C	France VDE0126	FRANCE_ISLAND
45	S2D	Guyana, France	FRANCE_GUIANA

6.4 APP Operation And Eauipment Distribution Network

The AH-4~10KTH-G1 series inverter can be monitored and set through the HaiPower APP, on which you can download through the following QR code.

HaiPower

IOS

Figure 6.1

HaiPower

Android

Figure 6.2

Scan the QR code below to download the user manual of HaiPower APP

Figure 6.3

6.5 Communication

6.5.1 Use Of USB-A Port

USB-A port is mainly for firmware update. Through USB connection, we can quickly update the software of machine. You can see USB-A as below:

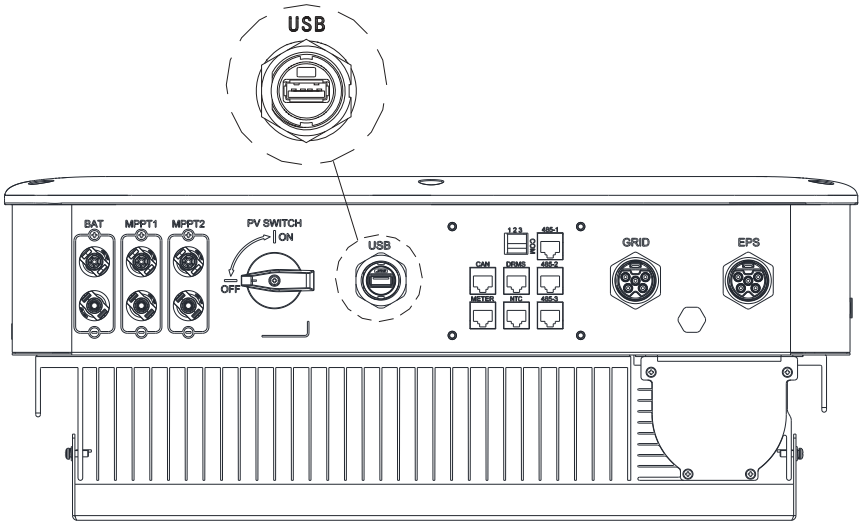


Figure 6.4

6.5.2 Use Of 485-1/485-2 Port

485-1/485-2 port is the extended 485 interface on the inverter, which needs to be used in conjunction with the RS485 to communicate with external devices.

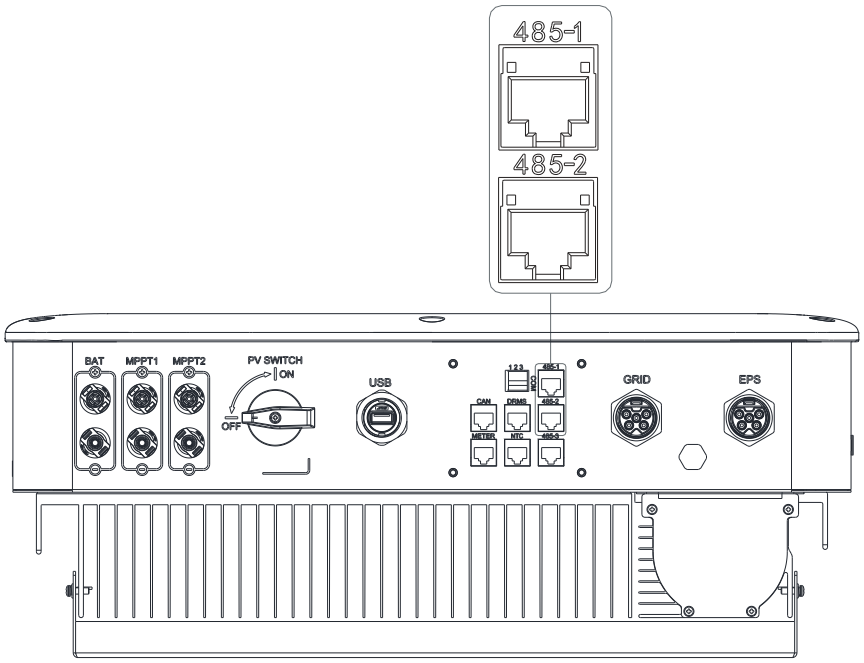


Figure 6.5

When set to Meter2 mode, the wiring diagram is as follows:

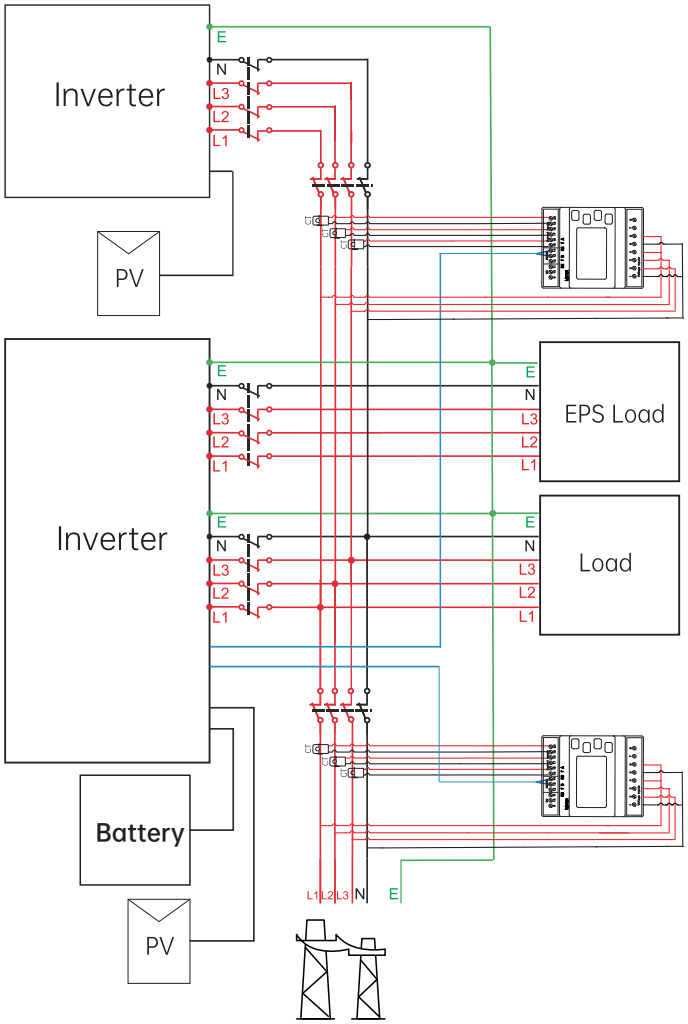


Figure 6.6

As the host, the inverter will receive information from two meters at the same time: the first meter needs to be connected to the grid-side bus, and the communication line is connected to the Meter port; the second meter needs to be connected to the output of the inverter terminal, the communication line is connected to 485-1/485-2 port.

When set to VPP mode, the wiring diagram is as follows:

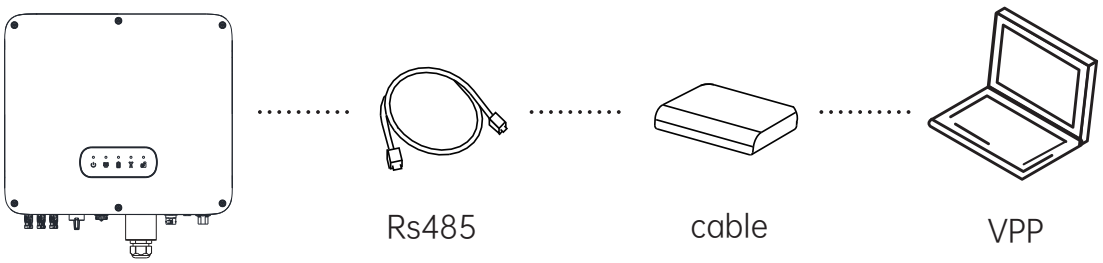


Figure 6.7

The external VPP collector is connected to 485-1/485-2 port through a network cable, at 6.5.3 The inverter's monitoring this time will respond to the relevant instructions issued by VPP.

6.5.3 Use Of 485-3 Port

485-3 port is mainly used for monitoring connection with computer, users can monitor,set parameters and update the software of the machine through connection with machine and PC, using the NewEnergy software developed by AOHAI.About NewEnergy software, when you needed, please download from official website of AOHAI.

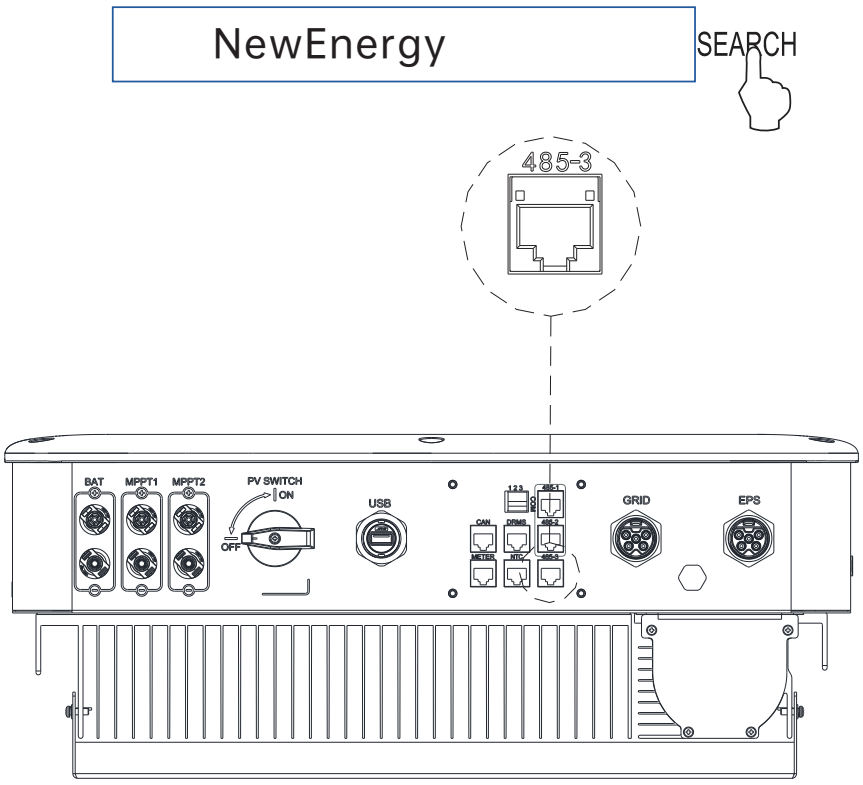


Figure 5.20

The wiring diagram is as follows:

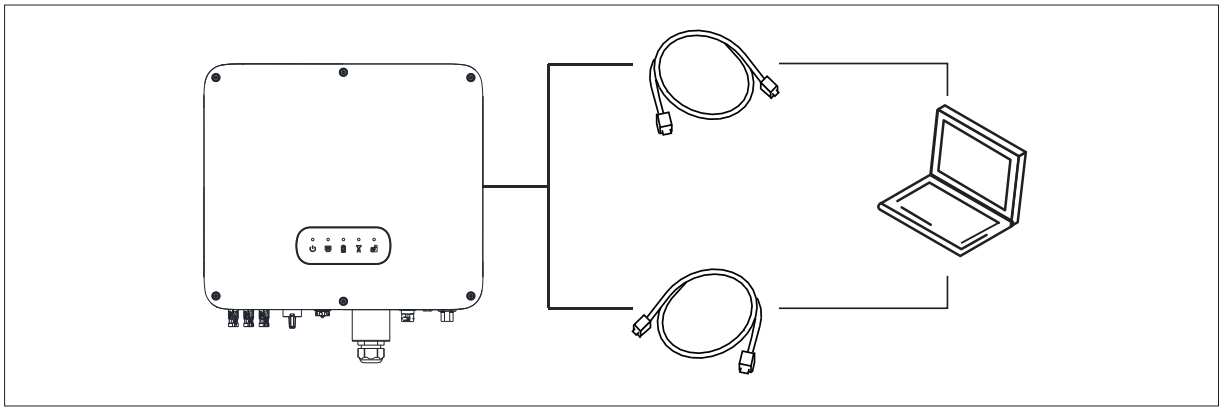
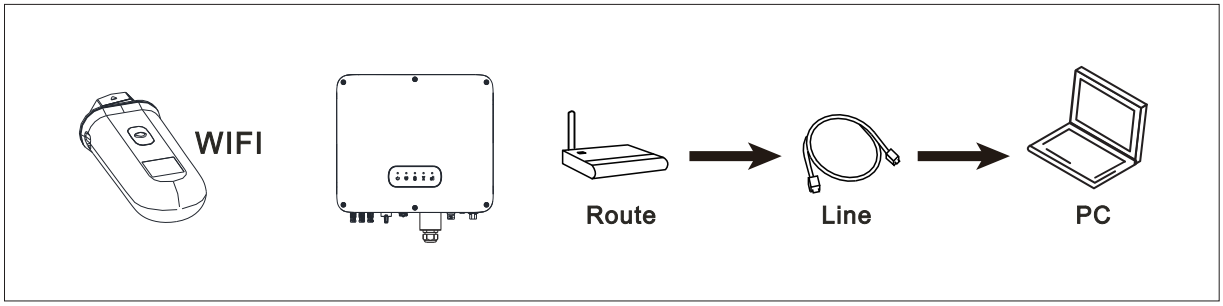


Figure 6.8

6.5.4 The Inverter's Monitoring

The inverter provide RS interface. Users can through the following communication solution to monitor the inverter.

NOTE	● This monitoring devices can only be used with AOHAI's Haipower monitor platform. Wi-Fi are connect with inverter via USB interface and use computer terminal / or mobile phone for data monitoring.



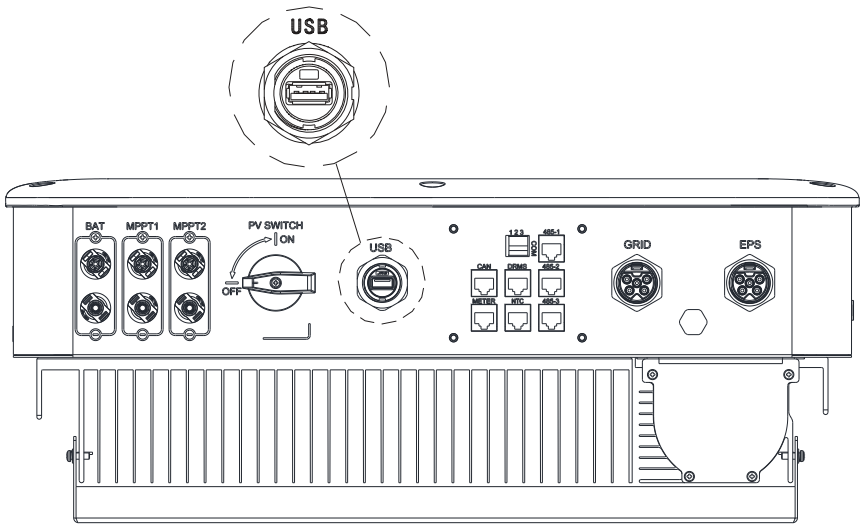


Figure 6.9

7. Attention Of The Installation Environment, Maintenance And Cleaning

Heat dissipation performance is very important when the inverter work under the environment of high temperature, better heat dissipation can reduce the possibility of the inverter stops working. The inverter without fan so belongs to natural cooling, hot air from the top of the radiator, tie-in battery, use environment for Ip66, please pay attention to the temperature of the installation environment, to ensure that the battery's safety and the normal work of the machine.

 CAUTION	● Do not dispose of batteries in a fire. The batteries may explode. ● Do not open or damage batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. ● A battery can present a risk of electrical shock and high short-circuit current.

The following precautions should be observed when working on batteries:

- Remove watches, rings or other metal objects.
- Use tools with insulated handles.
- Connect to Battery.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine if battery is inadvertently grounded. If inadvertently grounded, remove source from ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock can be reduced if such grounds are removed during installation and maintenance(applicable to equipment and remote battery supplies nothaving a grounded supply circuit).

If the inverter doesn't work for overheating or too cold, solve it according to the following methods:

- Confirm whether the radiator air duct installation is reasonable, choose the appropriate position before installation.
- If lead-acid batteries are connected, confirming the NTC battery is in a good installation.
- Confirm whether the battery temperature is too high, too high temperature of battery can also lead to the inverter fail to work, at this point, to ventilation or cooling battery will start with small load in low temperature output, after temperature back to the battery, please.
- If temperature is low, also can appear the battery low temperature protection, the to normal system can work normally, please be patient at this time.
- If the temperature is too low, it is possible that battery will be low temperature.

- Servicing of batteries should be performed or supervised by personnel protection, at this time, please pay attention to the working temperature range listed in the specifications of the book.
- When replacing batteries, replace with the same type and number of batteries or battery packs.

General instructions regarding removal and installation of batteries:

 REMARK	• All of above action should be operated by professional person, if you want to do these works, you must make sure the whole system are off.

8.Start-up And Shut Down The Inverter System

8.1 Start-up The Inverter System

Users can start-up the inverter through following steps:

- Connect to PV.
- Connect to Grid.
- Connect to Battery.
- Turn the switch on in turn of Grid, battery and PV.
- Start-up the inverter system.
- When the LED lamps turns green, it indicates the successful start-up of the inverter.

8.2 Disconnect The Inverter System

- Turn off all the circuit breaker and switch.
- Disconnect PV.
- Disconnect the inverter.
- Disconnect the battery.
- Disconnect the inverter system.
- Pull up AC PLUG connection.
- Waiting until LED lamps have gone out, the inverter is shut down completely.

9. EU Declaration Of Conformity

With the scope of EU directives:

- 2014/35/EU Low Voltage Directive (LVD)
- 2014/30/EU Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU RoHS Directive and its amendment (EU)2015/863

DongGuan AOHAI Technology Co. Ltd confirms that the AOHAI inverters and accessories described in this document are in compliance with the above mentioned EU directives. The entire EU Declaration of Conformity can be found at www.digitalpoweraohai.com.

10. Fault Removal

Our products are carried out with strict tests before they take out, if the operation difficulties in the process of installation, please log on to www.digitalpoweraohai.com website,view the Q&A program. When the inverter fault happens, please inform our company, and to provide the inverter related information, we will have a professional after-sales service personnel to answer you.

What you need to provide the information about the inverter including:

- Serial number.
- Model.
- Information about the LED lamps. .
- Brief description of problems.
- The battery voltage.
- The PV input voltage and power per string.
- Did the problem happen in the past?
- The grid voltage and frequency.
- Can you retell the failure problem? If you can, what kind of a situation.
- When did this fault happen? First installation?

About the battery:

- Output voltage of the battery.
- The manufacturer name and model of battery.
- Capacity of battery.
- The time you buy Battery and frequency you use it.

10.1 System Fault Information List And Troubleshooting Suggestions

Warning Message		
Error message	Description	Suggestion
Warning100	The inverter failed to communicate with meter	1. Check if the connection between theelectricity meter and the inverter isnormal. 2.Check if the distance between theelectricity meter and the inverter is within the specified range. 3.Restart the inverter and meter. andreconnect them. 4.If the warning message persistsplease contact AOHAI support.
Warning101	Meter Reversed	1. Check if the Meter is reversely connected. 2. If the error message persists, please contact AOHAI support.
Warning102	CT Reversed	1. Check if the CTis reversely connected. 2. If the error message persistsplease contact AOHAI support.
Warning103	No AC Connection	1. Check if the grid is down. 2. If the error message persists,please contact AOHAI support.
Warning104	AC V Outrange	1. Check the grid voltage andrestart the inverter. 2. If the error message persistsplease contact AOHAI suppor.
Warning105	AC F Outrange	1. Check the grid voltage andrestart the inverter. 2. If the error message persistsplease contact AOHAI suppor.
Warning302	Battery SOC Low	The battery level is too low, it isrecommended to charge the battery
Warning305	Battery voltage is belowthe lower threshold	1. Check the battery voltage. 2. If the error message persistsplease contact AOHAI suppor.
Warning502	EEPROM abnormal	1. Restart the inverter. 2. If the error message persistsplease contact AOHAI support

Error message		
Error message	**Description**	**Error message**
Error 100	Grid voltage is beyondthe permissible range	1. Check the grid voltage and restartthe inverter. 2. If the error message persists,please contact AOHAI support
Error 101	Grid frequency exceeds the allowable range	1. Check the grid frequency andrestart the inverter. 2. If the error message persists,please contact AOHAI support,
Error 102	No utility grid connected	1. After shutdown, check the gridwiring. 2. If the error message persists.please contact AOHAI support.
Error 103	The DC component of the outputcurrent is too high	1. Restart the inverter 2. If the error message persists,please contact AOHAI support
Error 103	The DC component of the outputcurrent is too high	1.Check whether the N line onthe inverter side with PV negative grounding is short-circuited with the ground cableand whether the output side isisolated with a transformer. 2.Ifthe error message persists.please contact AOHAI support
Error 104	Neutral-to-Ground voltageabnormal	1.Check whether the N line onthe inverter side with PV negative grounding is short-circuited with the ground cableand whether the output side isisolated with a transformer. 2.Ifthe error message persists.please contact AOHAI support.
Error 200	Off grid output voltage too low	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 201	Off grid output voltage too high	1. After shutdown, check the gridwiring. 2. If the error message persists.please contact AOHAI support.
Error 202	Short circuit of off grid output	1. After shutdown, check the gridwiring. 2. If the error message persists.please contact AOHAI support.
Error 203	EPS Over Load	1. After shutdown, check the gridwiring. 2. If the error message persists.please contact AOHAI support.
Error 204	DCV Abnormal	1. After shutdown, check the gridwiring. 2. If the error message persists.please contact AOHAI support.
Error 300	Battery terminals reversed	1.Check if the battery terminalsare reversely connected. 2.If the error message persists,please contact AOHAI support.

Error message	Description	Error message
Error 301	Battery disconnected	1. Check the wiring of the battenyterminals. 2.If the error message persists please contact AOHAI suppor.
Error 305	Battery voltage exceeds theupper threshold	1. Check the battery voltage. If it iswithin the permissible range,please restart the inverter. 2. If the error message persists please contact AOHAI support.
Error 307	BMS COM Waring	1. Check if the battery is turned on. 2. Check if the battery is correctland securely connected to theinverter.
Error 400	DC input voltage exceeds theupper threshold	1.Disconnect the DC switchimmediately and check thevoltage. 2.If the DC input voltage is withinthe permissible range and theerror message persists, pleasecontact AOHAI support.
Error 401	PV panels have low insulationresis-tance	1. Check if the PV strings arepropery grounded. 2.If the error message persists,please contact AOHAI support.
Error 402	An excessively high leakagecurrent has been detected	1. Restart the inverter. 2.If the error message persists,please contact AOHAI support.
Error 403	PV Circuit short	1. After shutdown, check if the PVstring is reversely connected tothe inverter. 2. Restart the inverter. 3. If the error message persists.please contact AOHAI support.
Error 404	PV Reversed	1. Check if the PV is reverselyconnected. 2. If the error message persists.please contact OHAI support.
Error 501	Bus voltage sampling abnormal	1.Restart the inverter. 2. If the error message persists,please contact AOHAI support.
Error 502	Internal communication failure	1. Check the communication lineafter shutdown. 2.If the error message persists please contact AOHAI support.
Error 503	Auto-test failed	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 504	Model abnormal	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 505	Temperature sensor disconnected	1. Check if the temperature sensomodule is properly connected. 2.If the error message persists please contact AOHAI suppor.

Error message	Description	Error message
Error 506	Over temperature	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 507	Relay fault	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 508	Over Current	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 509	Backflow Time Out	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.
Error 510	System Software Version Error	1. Restart the inverter. 2. If the error message persists.please contact AOHAI support.

11.Product Specification

11.1 The Inverter Energy Storage Aachine Product Specification

Technical Data	AH-4KTH-G1	AH-5KTH-G1	AH-6KTH-G1	AH-7KTH-G1	AH-8KTH-G1	AH-10KTH-G1
Solar Input Data						
Max. PV Input Power(W)	6000	7500	9000	10500	12000	15000
Max. Input Voltage(V)	1000					
Start-up Voltage(V)	120					
Nominal Input Voltage(V)	600					
MPPT Operating Voltage Range(V)	120-1000					
Max. Input Current per MPPT(A)	16/16					
Max. Short Circuit Current per MPPT(A)	20/20					
Number of MPPT	2					
Number of Strings per MPPT	1/1					
AC Input Data						
Nominal Input Voltage(V)	220/380, 230/400, 3L/N/PE					
Max. AC Current(A)	6.1	7.6	9.1	10.6	12.2	15.2
Max. Apparent Power(VA)	4000	5000	6000	7000	8000	10000
AC Frequency Range(Hz)	50/45~55, 60/55~65					
Battery Data						
Battery Type	Li-Ion/Lead-acid					
Nominal Battery Voltage(V)	415					
Battery Voltage Range(V)	100~550					
Max. Charge/Discharge Current(A)	25					
Max. Charge/Discharge Power(W)	4000	5000	6000	7000	8000	10000
Number of Battery Input	1					
AC Output Data(On-Grid)						
Nominal Output Power(W)	4000	5000	6000	7000	8000	10000
Max. Apparent Output Power(VA)	4000	5000	6000	7000	8000	10000
Nominal Output Voltage(V)	220/380, 230/400, 3L/N/PE					
Nominal Grid Frequency/Range(Hz)	50/45~55, 60/55~65					
Max. Output Current(A)	6.1	7.6	9.1	10.6	12.2	15.2
Power Factor	~1(Adjustable from 0.8 leading to 0.8 lagging)					

Technical Data	AH-4KTH-G1	AH-5KTH-G1	AH-6KTH-G1	AH-7KTH-G1	AH-8KTH-G1	AH-10KTH-G1
THDi(nominal power)	< 3%					
AC Output Data(Back-UP)						
Nominal Output Power(W)	4000	5000	6000	7000	8000	10000
Max. Apparent Power(VA)	4000	5000	6000	7000	8000	10000
Nominal AC Voltage(V)	220/380, 230/400, 3L/N/PE					
Nominal Grid Frequency(Hz)	50/60					
Max. Output Current(A)	6.1	7.6	9.1	10.6	12.2	15.2
THDv (@linear load)	< 3%					
Efficiency						
Max. Efficiency	97.60%					
European Efficiency	97.20%					
MPPT Efficiency	99.90%					
Protection						
PV Reverse Polarity Protection	YES					
Battery Reverse Protection	YES					
Anti-Islanding Protection	YES					
Output Short Protection	YES					
Ground Fault Monitoring	YES					
Insulation Resistance Monitoring	YES					
DC Switch	YES					
Residual Current Monitoring	YES					
General Data						
Dimension (W*H*D) (mm)	545*480*195					
Weight(kg)	31.9					
Relative Humidity	0%~100%					
Operating Temperature Range(℃)	-25~+60 (Derating above +45)					
Noise Emission(dB)	⩽35					
Altitude(m)	3000 (Derating above 2000)					
Cooling Method	Natural					
Ingress Protection	IP66					
Communication	RS485/USB，CAN/WiFi/GPRS(Optional)					
Display	LED&APP					
PV Connector	MC4/H4(Optional)					

Technical Data	AH-4KTH-G1	AH-5KTH-G1	AH-6KTH-G1	AH-7KTH-G1	AH-8KTH-G1	AH-10KTH-G1
Battery Connector	Connector					
AC Connector	Connector					

11.2 DC Input Terminal Parameter

Mc4 specification:

	2.5mm²/14AWG	4mm²/12 AWG	6mm²/10 AWG	10mm²/8AWG
Rated current	10A	15A	23.5A	33A
Nominal system voltage	1000V DC(UL) 1000V DC(TUV)			
Contact resistance	0.25mΩ (model)			
Protection grade	IP68			

Socket contact materials	Copper, tin
Insulation materials	Thermoplastics UL94 V-0
Ambient temperature range	-40℃ to +90℃
Wire stripping length	7.0mm(9/32)
Cable casing diameter	4.5 to 7.8mm(3/16: to 5/16")

11.3 Torque

Upper cover screws	1.3Nm(10.8 1bf.in)
Shell	0.7Nm(6.2 1bf.in)
Dc connector	1.8Nm(16.0 1bf.in)
M6 screwdriver	2Nm(18 1bf.in)
Grounding screw	2Nm(18 1bf.in)

11.4 Appendix

The following chart is the energy storage machine optional appendix list, if there is a need please contact the AOHAI Technology Co., Ltd or dealer orders.(P/N is only for reference,and it may be changed)

Name	Description	AOHAI P/N
Wi-Fi	Used for data record	

12. Decommissioning

12.1 Dismantling The Energy Storage

- Disconnect the inverter such as mentioned in section 7.
- Disconnect the upper cable of the inverter.

  **CAUTION**	• Watch out the inverter's shell heat and prevent to scald. • Wait 20 minutes until the inverter cooling and then to disassembly!

12.2 Packing The Inverter

Usually placed the inverter in the packing box with tape sealing, If the inverter cannot reoccupy, You can choose a cheap carton for packaging. Carton requirements must meet the size of the inverter and can support energy storage machine overall weight.

12.3 Storing The Inverter

Store the inverter in a dry place where ambient temperatures are always between -25°C and +60°C.

12.4 Disposing Of The Inverter

Do not dispose of the inverter together with household waste. Please accordance with the disposal regulations for electronic waste which apply at the installation site at that time. Ensure that the old unit and, where applicable, any accessories are disposed of in a proper manner.

13. Contact

If you have technical problems about our products, contact the AOHAI Service line or dealer.

We need the following information in order to provide you with the necessary assistance:

- The inverter Serial number.
- The inverter module information.
- The inverter communication mode.
- The inverter fault information code.
- The inverter Display content.
- The manufacturer and model of the battery.
- Battery capacity and connection mode.

Shenzhen Aohai Digital Power Co., Ltd

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