Uno Hybrid K-Series

3.0kW

User Manual

GERMAN-based company

TOMMATECH GmbH

GERMAN-based company

EN

Contents

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1 Notes on this Manual

1.1 Scope of Validity

This manual is an integral part of Uno-Hybrid K-Series, It describes the assembly, installation, commissioning, maintenance and failure of the product. Please read it carefully before operating.

Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K

Note: "Uno-Hybrid K-Series" refers to the energy storage inverter that supports photovoltaic grid-connected.
    "**5.0**"means 5.0kW.

Uno-Hybrid 5.0K/ Uno-Hybrid 7.5K complies with Thailand's PEA/MEA grid-connected regulations.
Keep this manual available at any time.

1.2 Target Group

This manual is for qualifed electricians.The tasks described in this manual only can be performed by qualifed electricians.

1.3 Symbols Used

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

⚠	**Danger!** "Danger" refers to a dangerous situation that, if not avoided, will result in a high level of risk such as serious injury or even death.
⚠	**Warning!** "Warning" indicates a hazardous situation which, if not avoided, could result in serious injury or death.
⚠	**Caution!** "Caution" indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
☞	**Notice!** "Notice" provides tips that are valuable for the optimal operation of our product.

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1.3.1 Important Safety Instructions

> **Danger!**
>
> **Danger to life due to high voltages in the inverter!**
> The personnel responsible for the installation, electrical connection, debugging, maintenance and fault handling operation of this product need to be trained, master the correct operation method, have the corresponding electrician qualification and safety operation knowledge.

> **Caution!**
>
> When the inverter is working, it is strictly forbidden to touch the shell. The temperature of the shell canis high and there is a risk of scalding.

> **Caution!**
>
> **Radiation may be harmful to health!**
> Do not stay for a long time and keep at least 20 cm away from the inverter.

> **Notice!**
>
> **Ground PV system.**
> Finish PV modules and photovoltaic system grounding in accordance with local requirements to achieve optimal protection of systems and personnel.

> **Warning!**
>
> Ensure that the input DC voltage is below the inverter limit. Excessive DC voltage and current may cause permanent damage or other losses to the inverter, which is not covered by the warranty.

> **Warning!**
>
> Authorized service personnel must disconnect the AC and DC power supply of the inverter before performing any maintenance, cleaning or operation of any circuit connected to the inverter.

> **Warning!**
> The inverter can not be operated when it is running.

> **Warning!**
> Risk of electric shock!

Strictly follow relevant safety specifications for product installation and testing. During installation, operation or maintenance, please read carefully and follow the instructions and precautions on the inverter or user manual. If the operation is incorrect, it may cause personal and property losses. Please keep the user manual properly after use.

This inverter can only use the accessories sold and recommended by TommaTech, otherwise it may cause fire, electric shock or casualties. Without the authorization of our company, you may not open the inverter cover or replace the inverter parts, otherwise the warranty promise of the inverter will be invalid.

The use and operation of the inverter must be carried out in accordance with the instructions in this manual, otherwise this protection will fail and the warranty of the inverter will also fail. During working, the inverter surface temperature may exceed 60℃, please make sure the inverter cools down before touching, and make sure children can not touch.

When exposed to sunlight, photovoltaic arrays generate dangerous high DC voltages. Please follow our instructions, otherwise it will be life-threatening.

All DC and AC power sources must be disconnected from the inverter for at least 5 minutes before any wiring or electrical operation is performed on the inverter to ensure complete isolation of the inverter and avoid electric shock.

A photovoltaic module used on the inverter must have a IEC61730A rating, and the total open circuit voltage of the photovoltaic string / array is lower than the maximum rated DC input voltage of the inverter. Any damage caused by photovoltaic over voltage is not covered by warranty.

Installation position should be away from wet environment and corrosive substances.

After the inverter and power grid cut off the PV power supply**,**there will be a certain amount of residual current in a short time, be cautious or it may lead to serious personal injury and even high risk of death.Use a multimeter (impedance at least 1 MΩ) to measure the voltage between the UDC + and the UDC- to ensure that the inverter port is discharged below the safe voltage before starting operation (35 VDC).

➢ **Surge protection devices (SPDs) for PV installation**

⚠	Warning**!** Over-voltage protection with surge arresters should be provided when the PV power system is installed. The grid connected inverter is fitted with SPDs in both PV input side and MAINS side.

Direct or indirect lightning strikes can cause failures. Surge is the main cause of lightning damage to most devices. Surge voltage may occur at photovoltaic input or AC output, especially in remote mountain areas where long distance cable is supplied.

Please consult professionals before installing SPDs.

The external lightning protection device can reduce the influence of direct lightning strike, and the lightning protection device can release surge current to the earth.

If the building installed with external light protection device is far away from the inverter location, in order to protect the inverter from electrical and mechanical damage, the inverter should also install an external lightning protection equipment.

In order to protect DC system, two-stage surge protection equipment is needed between DC cable of inverter and photovoltaic equipment module.

In order to protect the AC system, the level 2 surge protection equipment should be installed at the AC output, located between the inverter and the grid. Installation requirements must comply with IEC61643-21 standard.

All DC cables shall be installed in a distance as short as possible, and the positive and negative cables of the same input need to be bundled together to avoid causing loops in the system. Minimum distance installation and binding requirements also apply to auxiliary grounding and shielding grounding conductors.

➢ **Anti-Islanding Effect**

The islanding effect means that when the power grid is cut off, the grid-connected power generation system fails to detect the power outage and still supplies power to the power grid. This is very dangerous for the maintenance personnel and the power grid on the transmission line.

Uno-Hybrid K-Series inverters use active frequency offset method to prevent islanding effect.

➢ **PE Connection and Leakage Current**

• All inverter's incorporate a certified internal Residual Current Monitoring (RCM) in order to protect against possible electrocution and fire hazard in case of a malfunction in the PV array, cables or inverter.
There are 2 trip thresholds for the RCM as required for certification (IEC 62109-2:2011).
The default value for electrocution protection is 30mA, and for slow rising current is 300mA.

• The inverter, with built-in RCM, will exclude possibility of DC residual current to 6mA,thus in the system an external RCD (type A) can be used (≥ 30mA).

⚠	**Warning!**
	High leakage Current!
	Earth connection essential before connecting supply.

• A faulty ground connection can result in equipment failure, personal and death injuries, and electromagnetic interference.
• Ensure correct according to grounding to IEC62109 and conductor diameter according to STANDARD specification.
• Do not connect the grounding end of the equipment in series to prevent multi-point grounding.
• Electrical appliances must be installed in accordance with the wiring rules of each country.

For United Kingdom
• The installation that connects the equipment to the supply terminals shall comply with the requirements of BS 7671.
• Electrical installation of PV system shall comply with requirements of BS 7671 and IEC 60364-7-712.
• All protective devices cannot be changed.
• User shall ensure that equipment is so installed, designed and operated to maintain at all times compliance with the requirements of ESQCR22(1)(a).

➢ **Battery Safety Instructions**

TommaTech Uno-Hybrid K-Series inverter should pair with high voltage battery, for the specific parameters such as battey type, nominal voltage and nominal capacity etc., please refer to section 3.3.

Please refer to the matching battery specification or details.

1.3.2 Explanation of Symbols

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

● Symbols on the Inverter

Symbol Explanation	Explanation
	Operating Display
	Battery status
	An error has occurred, please inform your installer immediately

● Symbols on the Type Label

Symbols	Explanation
CE	CE mark. The inverter complies with the requirements of the applicable CE guidelines.
UKCA	UKCA mark. The inverter complies with the requirements of the applicable UKCA guidelines.
UKNI	UKNI mark. The inverter complies with the requirements of the applicable UKNI guidelines.
TÜVRheinland CERTIFIED	TUV certified.
RCM	RCM remark.

	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Danger of high voltages. Danger to life due to high voltages in the inverter!
	Danger. Risk of electric shock!
	Observe enclosed documentation.
	The inverter can not be disposed together with the household waste. Disposal information can be found in the enclosed documentation.
	Do not operate this inverter until it is isolated from battery, mains and on-site PV generation suppliers.
5min	Danger to life due to high voltage. There is residual voltage existing in the inverter after powering off, which needs 5 min to discharge. Wait 5 min before you open the upper lid or the DC lid.

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1.3.3 EC Directives

This chapter describes the requirements of the European low voltage regulations, including safety instructions and system licensing conditions, the user must comply with these regulations when installing, operating, and maintaining the inverter , otherwise it will cause personal injury or death, and the inverter will cause damage.

Please read the manual carefully when operating the inverter .If you do not understand "danger", "warning", "caution" and the description in the manual, please contact the manufacturer or service agent before installing and operating the inverter.

Grid-connected inverter comply with low voltage directive (LVD) 2014/35/EU and Electromagnetic compatibility directive (EMC) 2014/30/EU.Detection of components is based on:
EN 62109-1:2010;
EN 62109-2:2011;
IEC 62109-1(ed.1);
IEC62109-2(ed.1);
EN 61000-6-3:2007+A:2011;
EN 61000-6-1:2007;
EN 61000-6-2:2005;

For installation in photovoltaic module system, it is necessary to make sure that the whole system complies with the requirements of EC(2014/35/EU, 2014/30/EU, etc.) before starting the module (i.e. to start the operation). The assembly shall be installed in accordance with the statutory wiring rules. Install and configure the system in accordance with safety rules, including the use of specified wiring methods. The installation of the system can only be done by professional assemblers who are familiar with safety requirements and EMC. The assembler shall ensure that the system complies with the relevant national laws.

The individual subassembly of the system shall be interconnected by means of the wiring methods outlined in national/international such as the national electric code (NFPA) No. 70 or VDE regulation 0107.

2 Introduction

2.1 Basic Features

Uno-Hybrid K-Series is a high-quality inverter that can convert solar energy into alternating current and store energy into batteries. The inverter can be used to optimize self-consumption, stored in batteries for future use or fed into the public grid. The way it works depends on user preferences. It can provide emergency power during power outages.

2.2 System Diagram

Uno-Hybrid K-Series are designed to has four EPS(Off-grid) wiring schemes, customers can choose EPS(Off-grid) compatible parts Load and EPS(Off-grid) compatible with all load use.
There are different ways of wiring in different countries, one is to connect N line with PE line, the other is to separate the line from the PE line wiring, see below;

Diagram A: Neutral line and PE line are separated from each other, and the common load is connected to the EPS(Off-grid) port; (For most countries)
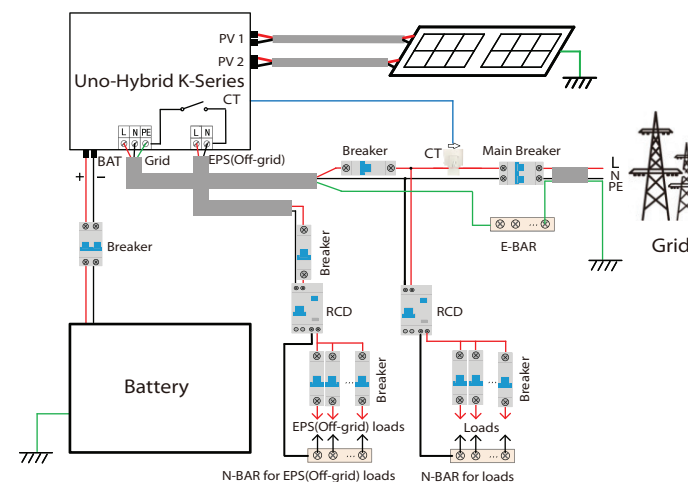
Diagram B: Neutral line and PE line are combined together, and the common load is connected to the EPS(Off-grid) port; (Apply to Australia)
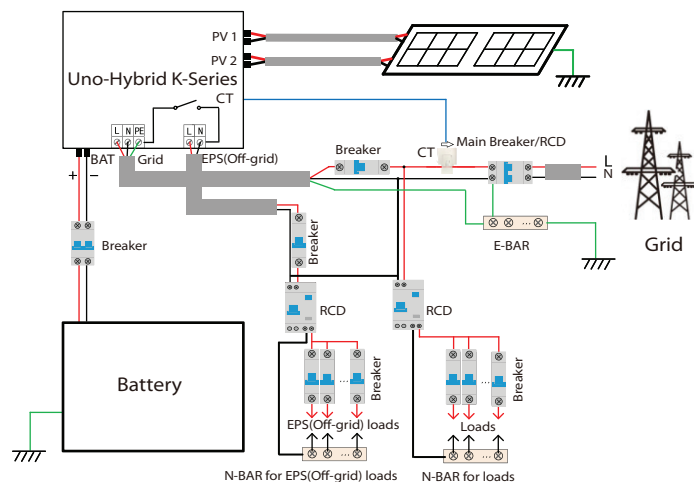
Notice!
• When power cuts suddenly, the inverter connects the N line of EPS(Off-grid) load with the ground through relay, providing a fxed zero potential for EPS(Off-grid) load and ensuring the safety of electricity use by users.

• Please control the inverter load and make sure it is "output value" in "within " EPS(Off-grid) mode, otherwise the inverter will stop and alarm overload fault".

• Please confirm with the grid operator whether there are special regulations for grid connection.

2.3 Work Modes

Uno-Hybrid K-Series, can be based on different needs, there are a variety of models.

Self Use

The self-use mode is suitable for areas with low feed-in subsidies and high electricity prices.

① When the power of PV is sufficient
Active Charge or Discharge time period: PV will power the loads firstly, and surplus power will charge to the battery.
If the battery is fully charged, then sell the surplus power to the grid; (The inverter will limit the output if Feed-in limit or zero feed-in is needed)
(PV > Load, PV →Load→Battery → Grid)

② When the power of PV is insufficient
Active Charge time period: PV will power the loads firstly , the remaining power will be taken from the grid, the battery will not discharge at this time.
(PV < Load, PV + Grid → Load)
Active Discharge time period: PV+BAT will power the loads together. If the power is still not enough, the remaining power will be taken from the grid.
(PV < Load, PV + Battery + Grid → Load)

③ Without PV power
Active Charging time period: The grid supplies the loads and also can charge the battery;
(PV=0, Grid → Load + Battery)
Active Discharge time period: The battery will power the home loads firstly. If the battery power is not enough ,the remaining power will be taken from the grid. The inverter will enter into the standby state.
(PV=0, Battery+Grid → Load)
Battery min SOC can be set:10%-100%
Charge battery to min SOC can be set:10%-100%

Feed-in priority

The Feed-in priority mode is suitable for areas with high feed-in subsidies, but has feed-in power limitation.
①When the power of PV is sufficient
Active Charge time period: First, PV supply power to the load, then charge the battery to the set capacity, and then sell the power to the grid. If the local grid company limits the grid-connected power of the inverter, the excess energy continues to charge the battery.
(PV＞Load, PV → Load → Battery→ Grid → Battery)
Active Discharge time period :PV will power the loads firstly, and surplus power will feed-in to the grid.
(PV＞Load, PV → Load → Grid)
②When the power of PV is insufficient
Active Charge time period:PV will power the loads firstly, the remaining power will be taken from the grid. The battery will not discharge.
(PV＜Load, PV + Grid → Load)
Discharge time period:PV+BAT will power the loads together. If the power is still not enough, the remaining power will be taken from the grid.
(PV＜Load, PV + Battery + Grid → Load)
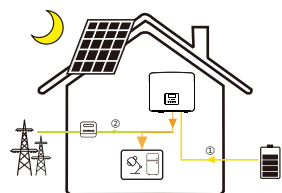
③Without PV power
Active Charge time period: The grid will power the home loads and also charge the battery;
(PV=0, Grid → Load +Battery)
Active Discharge time period: The battery will power the home loads firstly. If the battery power is not enough, the remaining power will be taken from the grid. The inverter will enter into the standby state.
(PV=0, Battery+Grid → Load)
Battery min SOC can be set:10%-100%
Charge battery to min SOC can be set:10%-100%

Backup mode

The back-up mode is suitable for areas with frequent power outages.
Same working logic with "Self-use" mode. This mode will maintain the battery capacity at a relatively high level, to ensure that the emergency loads can be used when the grid is off. Customers no need to worry about the battery capacity.
Battery min SOC can be set: 30%-100%.
Charge battery to min SOC can be set: 30%-100%.
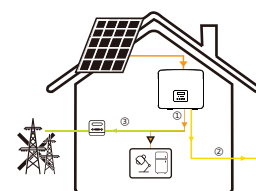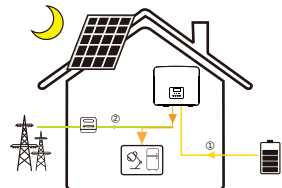
EPS(Off-grid)

In case of power failure, the system will power EPS loads through PV and battery.

(Battery must be installed, and EPS loads shall not exceed battery's max. output power.)
①When the power of PV is sufficient
PV will power the loads firstly, and surplus power will charge to the battery.
(PV > Load, PV → Load → Battery)
②When the power of PV is insufficient
The remaining power will be taken from the battery.
(PV < Load, PV → Load)
③ Without PV power
The battery will power the emergency loads until the battery reached the min SOC, then the inverter will enter an idle mode.
(PV=0, Battery → Load)
EPS(off-grid) SOC-min condition is adjustable within the range of 10%-25%;

Notice: in the case of grid connection, all working modes work normally when the battery SOC >5%. When the battery charge rate is below 5%, the PV or Grid will first charge the battery SOC11%, and then return to the working mode selected by the user.

2.4 Dimension

482mm

417mm

181mm
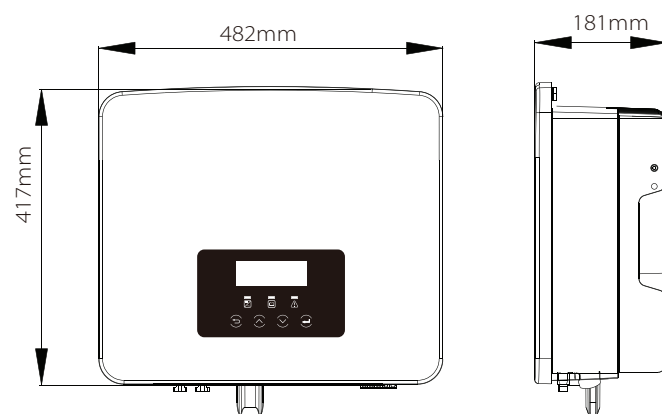
2.5 Terminals of Inverter
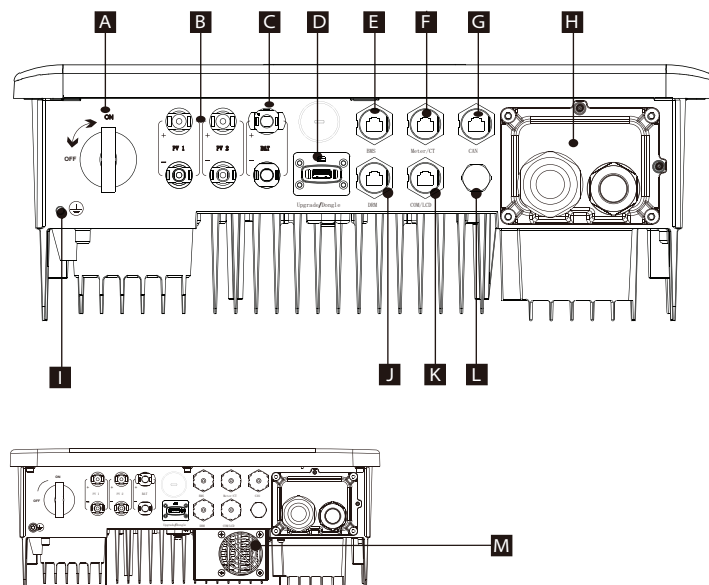
Object	Description
A	DC switch
B	PV connection port
C	Battery connection port
D	USB port for upgrading/ External monitoring connection port
E	Battery communication port
F	Meter/CT Port
G	CAN is a reserved port
H	Grid/EPS (Off-grid) Output port
I	Ground connection port
J	DRM Port(only for Australia)
K	Communications/ LCD is a reserved port
L	Waterproof valve
M	Fans (only for Uno-Hybrid 7.5K)

Warning!
Qualified electrician required for the installation.

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3 Technical Data

3.1 DC Input

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Max. recommended PV power [W]	4500	5500	7500	9000	10000
Max. DC voltage [V]	600	600	600	600	600
Nominal DC operating voltage [V]	360	360	360	360	360
MPPT voltage range [V]	70-550				
MPPT full power voltage range [V]	100-480	120-480	165-480	195-480	245-480
Max. input current [A]	16/16	16/16	16/16	16/16	16/16
Max. short circuit current [A]	20/20	20/20	20/20	20/20	20/20
Start output voltage [V]	90	90	90	90	90
No. of MPP trackers	2	2	2	2	2
Strings per MPP tracker	1	1	1	1	1

3.2 AC Output/ Input

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
AC Output					
Nominal AC power [VA]	3000	3680	5000 (Germany 4600,AU 4999)	6000	7500 (PEA 6900)
Max. apparent AC power [VA]	3300	3680	5500 (Germany 4600, AU 4999)	6600	7500 (PEA 7300)
Rated AC voltage [V]	220/ 230/ 240 (180 to 270)				
Rated grid frequency [Hz]	50/60				
Max. AC current [A]	14.4	16	23.9 (Germany 20, AU 21.7)	28.6	32.6 (PEA 33)
Displacement power factor	0.8 leading...0.8 lagging				
Total harmonic distortion (THDi)	< 2%				
AC Input					
Max. apparent power [VA]	6300	7360	9200	9200	9200
Rated AC power [W]	3000	3680	5000	6000	7500
Rated grid voltage (range) [V]	220/230/240 (180 to 270)				
Rated grid frequency [Hz]	50/60				
Max. AC current [A]	27.4	32	40	40	40
Displacement power factor	0.8 leading...0.8 lagging				

3.3 Battery

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Battery type	Lithium batteries				
Battery Full Voltage [V]	80-480				
Maximum charge/discharge flow [A]	30A				
Communication interface	CAN/RS485				
Reverse connection protection	Yes				

3.4 Efficiency, Safety and Protection

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
MPPT efficiency	99.9%	99.9%	99.9%	99.9%	99.9%
European efficiency	97.0%	97.0%	97.0%	97.0%	97.0%
Maximum efficiency	97.6%	97.6%	97.6%	97.6%	97.6%
Max. battery charge efficiency (PV to BAT) (@ full load)	97.0%	97.0%	97.0%	97.0%	97.0%
Max. battery discharge efficiency (BAT to AC) (@ full load)	97.0%	97.0%	97.0%	97.0%	97.0%
Security & Protection					
DC SPD Protection	Integrated				
AC SPD Protection	Integrated				
Over/under voltage protection	YES				
Grid protection	YES				
DC injection monitoring	YES				
Back feed current monitoring	YES				
Residual current detection	YES				
Anti-islanding protection	YES				
Over load protection	YES				
Over heat protection	YES				
Array insulation resistance detection	YES				

3.5 EPS(Off-grid) Output

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
EPS (Off-grid) rated power [VA]	3000	3680	5000	6000	7500
EPS (Off-grid) rated voltage [V]	230VAC				
Frequency [Hz]	50/60				
EPS (Off-grid) rated current [A]	13	16	21.7	26.1	32.6
EPS (Off-grid) Peak Power [VA]	120%rated,1h	120%rated,1h	120%rated,1h	120%rated,10min	100%rated
Switching time (typical value) [ms]	internal switch<10, external switch＜100				
Total harmonic distortion (THDv)	<2%				

3.6 Generic Data

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Dimensions (W/H/D) [mm]	482*417*181				
Dimensions of Packing (W/H/D)[mm]	590*530*315				
Net weight [kg]	24	24	24	24	25
Gross weight * [kg]	28	28	28	28	29
Heat dissipation treatment	Natural Cooling				Smart Cooling
Noise emission (typical) [dB]	<30				<45
Storage temperature range [℃]	-40~+65				
Operating temperature range [℃]	-35~+60 (derating at 45)				
Humidity [%]	0%~100%				
Altitude [m]	<3000				
Protection level	IP65				
Security level	I				
Cold standby consumption	<3W				
Over voltage category	III(MAINS), II(PV, Battery)				
Pollution Degree	III				
Installation mode	Wall mounted				
Inverter Topology	non-isolated				
Communication interface	Meter/ CT, external control Rs485, Mobile series (optional), DRM, USB				
Standard warranty	Standard 10 years				

* The specific gross weight is subject to the actual situation of the whole machine, which may be a little different due

   to the influence of the external environment.

4 Installation

4.1 Check for Transport Damage

Ensure that the inverter is in good condition via transportation. If there is any visible damage such as cracks, please contact the dealer immediately.

4.2 Packing List

Open the package and check the materials and accessories according to the following list.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R
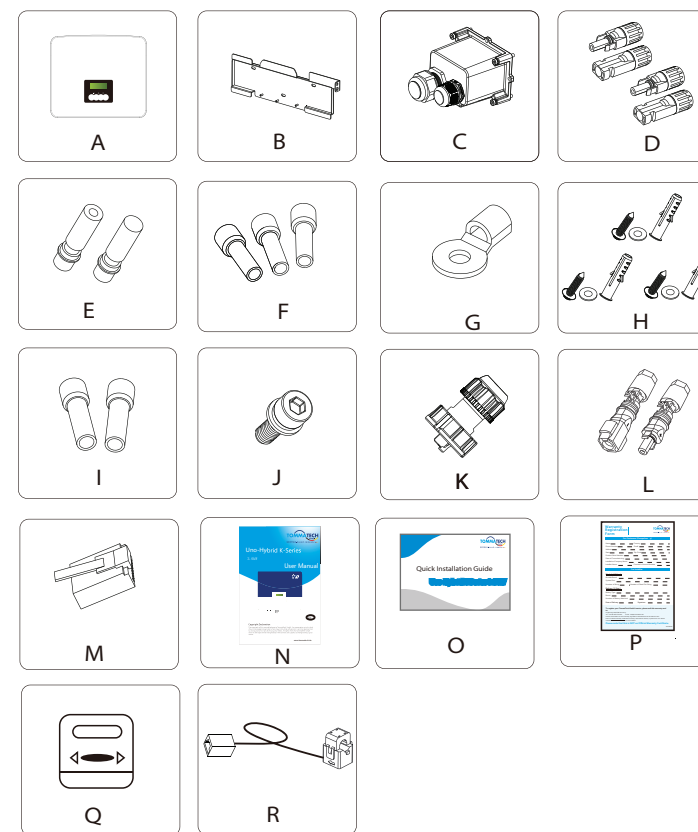
Number	Quantity	Description
A	1	Uno-Hybrid K-Series inverter
B	1	Bracket
C	1	Waterproof shield
D	4	PV terminal (positive*2 , negative*2)
E	4	PV pin angle (positive*2, negative*2)
F	3	8AWG European terminals
G▲	1	OT terminal (inverter grounding)
H	3	(Expansion bolt, Gasket, Self-tapping bolt)*3
I	2	10AWG European terminals
J	1	M5 inner hexagon bolt
K★	4/3	Waterproof connector with RJ45 (COM/CAN/DRM/CT)
L▲	2	Battery connection terminals (positive*1, negative*1)
M▲	1	RJ 45 terminals
N	1	Manual
O	1	Quick Installation Guide
P	1	Warranty Registration Form
Q	1	Meter (optional)
R	1	CT

Note:
● "K" marked with "★" indicates that, the D-series inverter is equipped with 4 pieces for Australia and 3 pieces for other countries, and the M-series inverter is equipped with 3 pieces for Australia and 2 pieces for other countries.
● "G", "L" and "M" marked with "▲" indicate that they are included in the D-series inverter, but not the M-series inverter.

4.3 Installation Precautions

The protection level of Uno-Hybrid K-Series inverters is IP 65, so that the inverter can be installed outdoors.
Check the installation environment and pay attention to the following conditions when installing:
 • Do not expose to strong light.
 • Do not touch flammable building materials.
 • Do not approach flammable and explosive gases or liquids (e.g. where chemicals are stored).
 • Do not touch cold air directly.
 • Do not approach TV antenna or cable.
 • Do not place in areas above 3000 meters above sea level.
 • Do not install in precipitation or high humidity, which may cause corrosion or damage Internal devices.
 • Keep the system out of reach of children.
 If the inverter is installed in a narrow area, be sure to reserve appropriate space for heat dissipation.
 The ambient temperature of the installation site is -35℃~60℃.
 The maximum angle range of wall tilt ±5°.
 Avoid direct sunlight, rain and snow weather.

No direct sunlight	No Rain Exposure	No snow Lay up

Stay away from combustibles	Direct Sunlight	Rain Exposure	Snow Lay up	Stay away from antenna cables
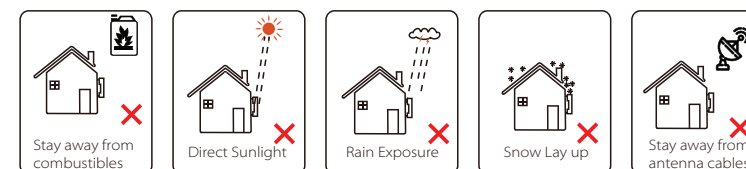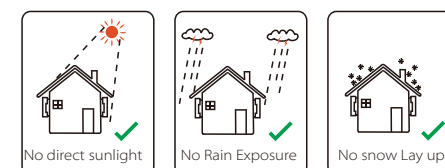
4.4 Tool preparation

Tool equipment				
Type	Name	Image	Name	Image
Machine Installation Tools	Hammer drill	Bit Φ10	Multimeter	DC Voltage Range ≥1100 V DC
	Torque screwdriver	Crosshead M5	Socket wrench set (Hexagon)	
	OT terminals press clamp	0.5mm²~6mm²	Diagonal pliers	
	Utility knife		Multifunction terminal crimping tool (RJ45)	
	Diagonal poliers		Marker	
	Rubber hammer		Tape measure	
	Crimping Tool		Hexagon keys	
	European terminal crimping tool		Spirit level	
Individual Protection Tools	Dustproof Cover		Protective glasses	

Tool equipment				
Type	Name	Image	Name	Image
Individual Protection Tool	Safety gloves		Safety shoes	

Type	Name	Image	Requirement
Equipment Preparation	Breaker		Grid port and EPS(Off-grid) port wiring section (4.5.2)
Cable Preparation	PV end wire		Dedicated PV wire, line number #12 AWG withstand voltage 1000V, temperature resistance 105℃ fire resistance grade VW-1
	EPS(Off-grid) end wire		Double Core Cables
	Grid end wire		Triple Core Cables
	Communi-cation lines		Twisted pair with shield
	Battery Cable		Conventional wire
	PE Cable		Conventional wire

4.5 Installation Site Conditions

4.5.1 Installation Carrier Requirements
Do not install the inverter near flammable materials.

Please install the inverter on a solid object that can withstand the weight requirements of the inverter and energy storage system.

Please be careful not to install the inverter in the plasterboard wall or similar to the residential places with poor sound insulation ,so as not to work with noise and interfere with the residents life in the morning.

4.5.2 Installation Requirements

Install the inverter at a maximum back tilt of 5 degrees, the inverter can not be tilted forward, inverted, excessive back tilted or side tilted.
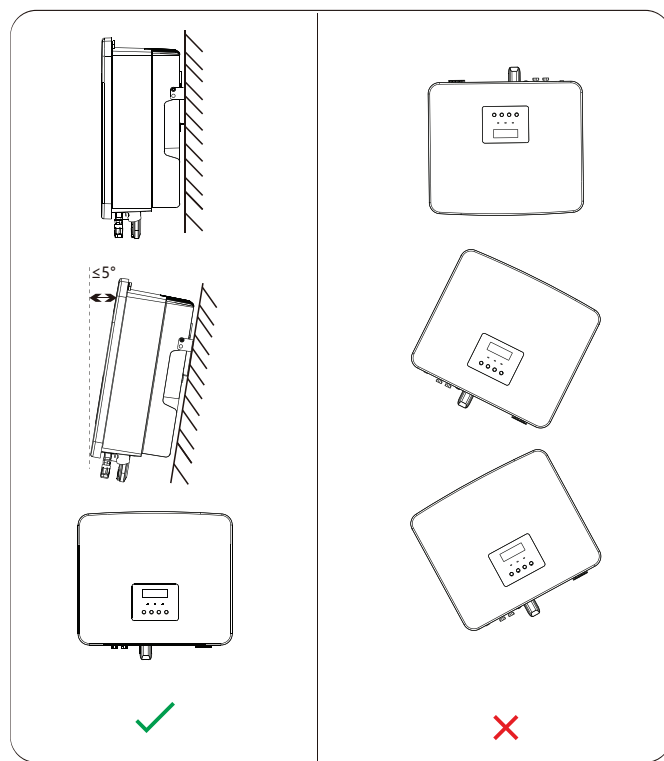
4.5.3 Installation Space Requirements

Reserve enough space when installing inverter (at least 300mm) for heat dissipation.
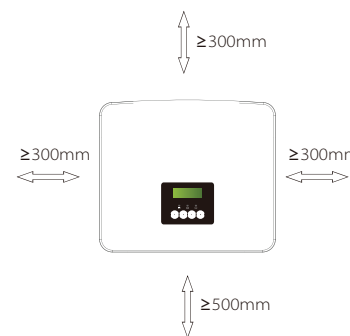
Reserved space dimensions of installation

Position	Min Distance
Left	300mm
Right	300mm
Up	300mm
Down	500mm

For multi-inverter installation scenarios, the inline installation method is recommended; when the space is insufficient, the recommended method of installation in the form of "products"; it is not recommended to install multiple inverters in stacks. If you choose stack installation, please refer to the installation separation distance below.
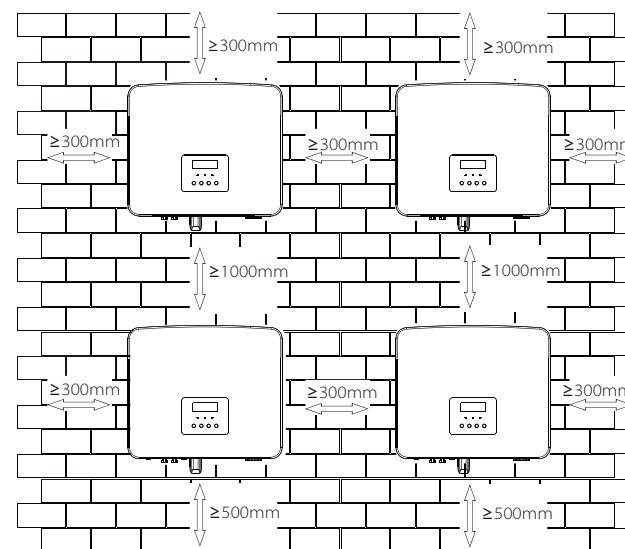
4.6 Mounting

➤ **Preparation**

Please prepare the following tools before installation.

Installation tools: screwdriver, wrench, Φ10 drill, rubber hammer, socket wrench set, Hexagon keys and spirit level.

➤ **Step 1: Fix the wall bracket to the wall**

First find the expansion screw and the wall bracket in the accessory bag, as shown below:

Expansion bolts, Gasket, Tapping screws
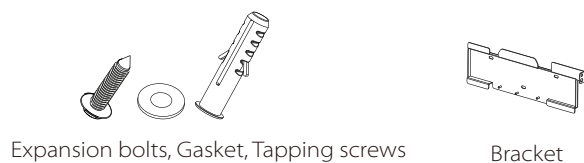
Bracket

a) Draw drilling holes as per the bracket's hole locations by a marker, and ensure that the two top holes lie on the same straight line by spirit level.

b) Drill holes at marked spots at depth of 80 mm.

a)

80.00 mm

Φ10 Drill
(Depth: 80 mm)
b)
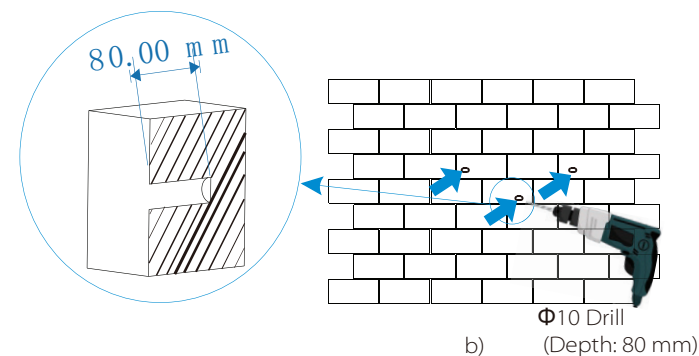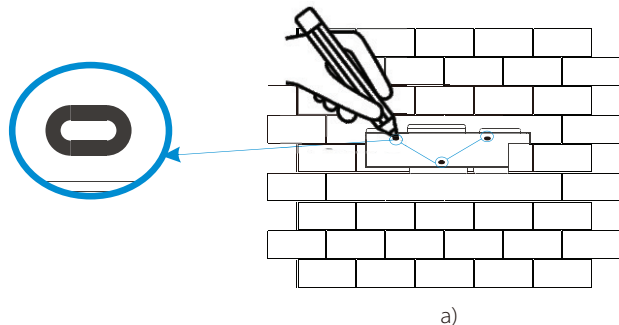
➤ **Step 2: Hang the inverter on the bracket**

c) Insert expansion bolt into the hole, use rubber hammer to knock the expansion screw bolt into the wall;
d) The bracket is aligned with the screw uses the outer hexagonal wrench to screw the tapping screw until the expansion bolt "bang" is heard.

Expansion bolts

Rubber hammer
c)

Self-tapping screws

Gasket

Outer hexagon wrench
(Torque :9±0.2 N· m)
d)

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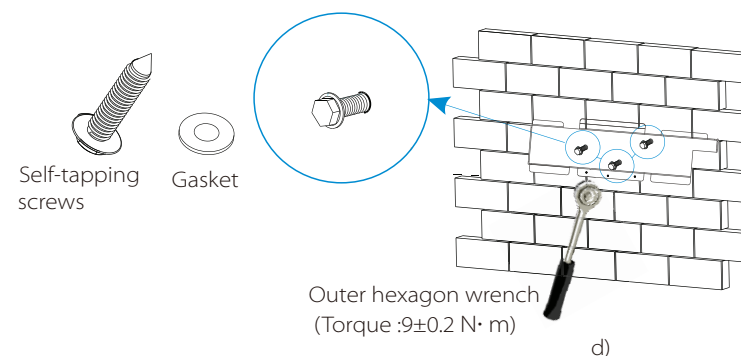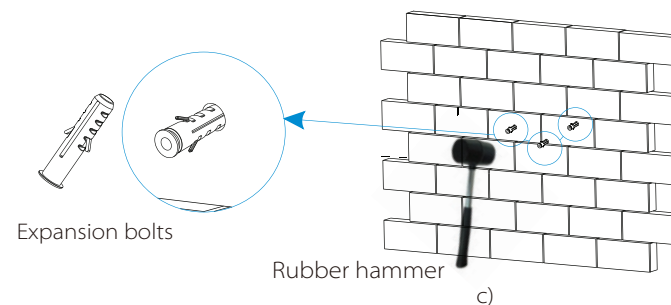
Step 3: Tighten the inverter and bracket

e) Hang the buckle on the inverter to the corresponding position of the backplane;
f) Use the inner hexagonal wrench to tighten the inner hexagonal screw on the right side of the inverter.
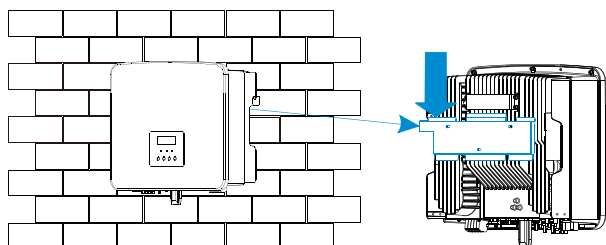
e)
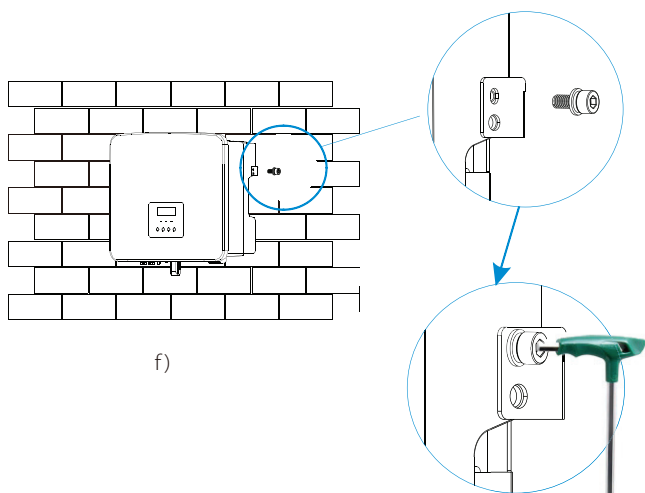
f)

Inner hexagonal wrench
(Torque :1.2±0.1 N· m)

5 Electrical Connections

5.1 PV Connection

Uno-Hybrid K-Series inverter have two PV inputs. Please select photovoltaic modules with good performance and quality assurance. The open circuit voltage of the module array should be less than the maximum PV input voltage specified by the inverter, and the working voltage should be within the MPPT voltage range.

Table 1: Maximum input voltage limit

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Max. DC input voltage	600V				

> **Warning!**
> The voltage of photovoltaic modules is very high, and is dangerous voltage. When wiring, please follow the safe electricity regulations.

> **Notice!**
> Do not ground the positive or negative pole of the photovoltaic module!

> **Notice!**
> The following PV module requirements need to be applied to each input range:
> 1. Same model
> 2. Same quantity
> 3. The same queue
> 4. The same angle

> **Notice!**
> Uno-Hybrid K-Series inverters do not support the following PV module connection modes.
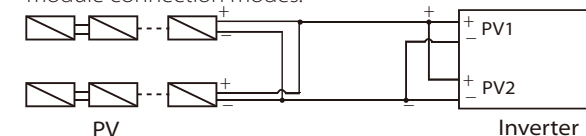
PV   Inverter

Uno-Hybrid K-Series inverters support the following PV module connection modes.

PV   Inverter
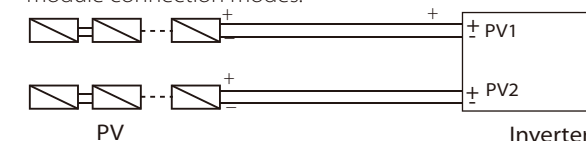
➢ **Connection step**

Step 1. Turn off the DC switch, connect the PV module, prepare a 12AWG PV cable, and find the PV (+) terminal and PV (-) terminal in the package.

PV cable   PV pin   Negative terminal
                                                Positive terminal
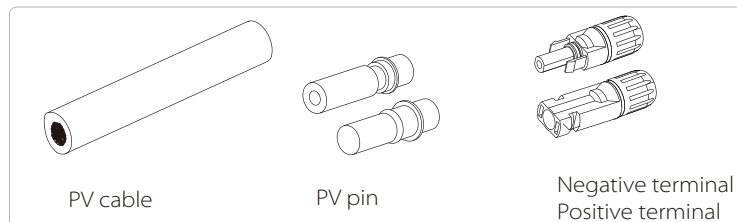
Step 2. Use a wire stripper to strip the 7mm insulation layer of the wire end.

Wire stripper   7.0mm
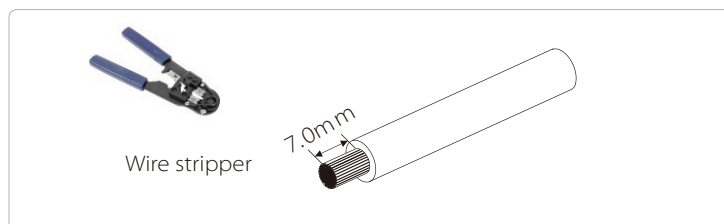
Step 3. Tighten the cable with the insulation layer stripped and insert it into the metal terminal (see Figure 1), make sure all wires are inserted Into the metal terminal (see Figure 2).

Positive PV pin

Negative PV pin

Figure 1

Positive metal terminal

Negative metal terminal

Figure 2
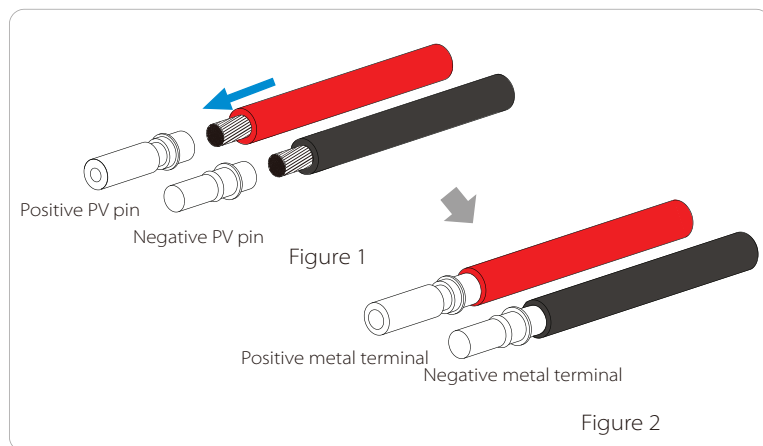
Step 4. Tighten the PV pin needle and the wiring harness to make the connection tight without looseness.

Crimping Tool
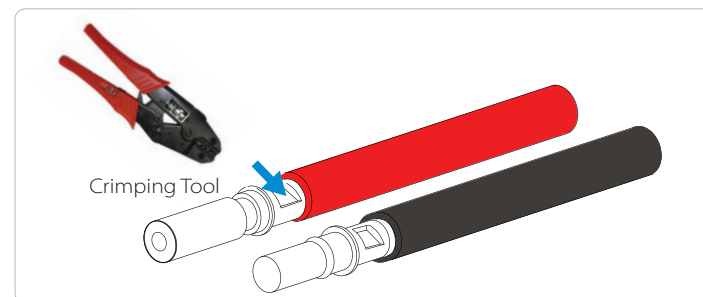
Step 5. The PV joint is divided into 2 parts - the plug and the fastening head. Insert the cable through the fastening head and the opposite plug.
Notice that the red and black lines correspond to different of plugs. Finally, force the cable pair into the plug, will a "click" sound, which indicates that the connection is completely.

Positive terminal   click!

Negative terminal   click!
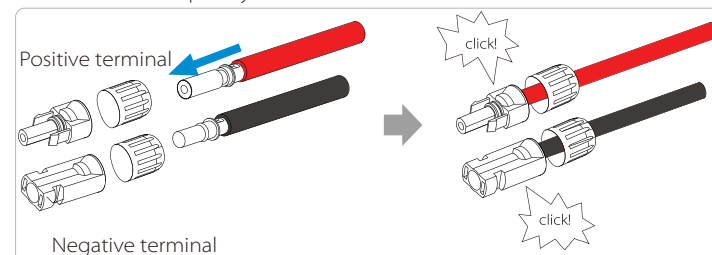
Step 6. Tighten the fastening head and into insert the corresponding positive and negative (PV-/PV+) ports of the inverter.

Positive   click!   PV+

                                               PV-

Negative   click!
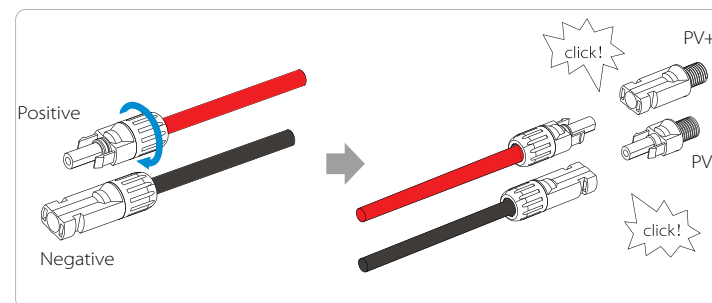
The following is the location of the inverter positive and negative (PV-/PV+) ports.

PV1+
PV2+
PV1-
PV2-
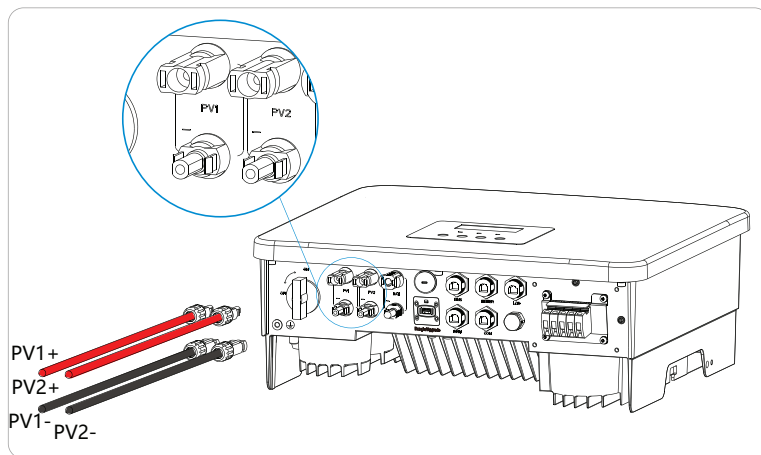
Schematic diagram of the inverter PV connected.
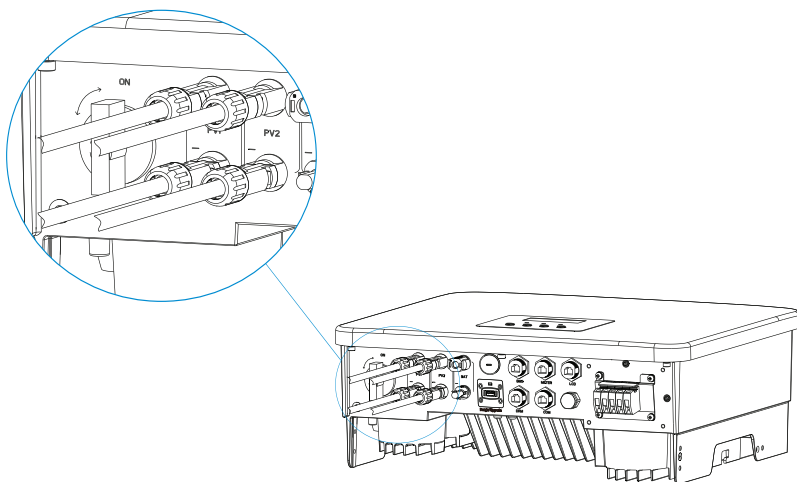
5.2 Grid Port and EPS(Off-grid) Output Connection

Uno-Hybrid K-Series inverter is a single-phase inverter, which is suitable for rated voltage 220/230/240V, frequency 50/60Hz. For more technical requirements, please consult the requirements of the local public grid.

➢ Grid port connection

Grid Cable and Micro-breaker recommended

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Cable (copper)	4-6mm²	6-8mm²	8-10mm²	8-10mm²	8-10mm²
Micro-Breaker	32A	40A	50A	50A	50A

EPS(Off-grid) Cable and Micro-breaker recommended

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Cable (copper)	3-4mm²	3-4mm²	4-6mm²	4-6mm²	6-8mm²
Micro-Breaker	25A	25A	32A	32A	40A

The circuit breaker should be installed between the inverter and the mains, and the load should not be directly connected to the inverter.
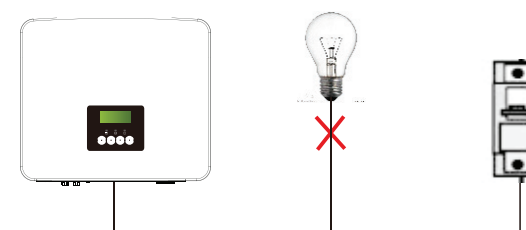
Figure: Wrong connection of load and inverter

5.3 EPS(Off-grid) Block Diagram

Uno-Hybrid K-Series inverter has an EPS(Off-grid) function. When the grid is connected, the inverter outputs go through the Grid port, and when the grid is disconnected, the inverter outputs go through the EPS(Off-grid) port.
The EPS(Off-grid) function can be connected to part of the load, and it can also be used to connect to all loads. Please refer to the following diagram for the wiring .
To be compatible with all loads, you will need an addition a accessory. If you need a solution, please contact our sales.

➢ EPS(Off-grid) wiring diagram

For to different local wiring rules, please refer to the diagram below
Please select the appropriate wiring method according to local wiring rules.

Diagram A: Neutral line and PE line are separated from each other, and the common load is connected to the EPS(Off-grid) port; (For most countries)
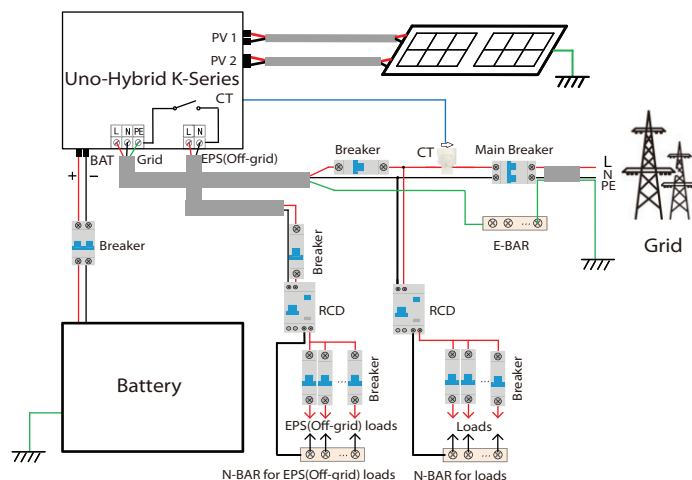
Diagram B: Neutral line and PE line are combined together, and the common load is connected to the EPS(Off-grid) port; (Apply to Australia)
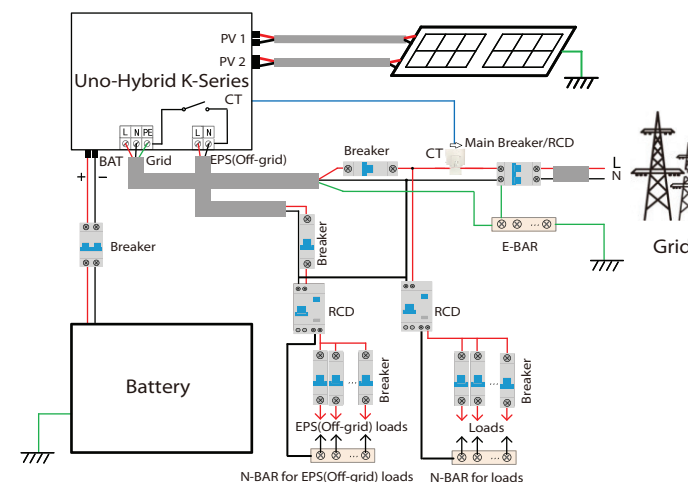
➢ **EPS(Off-grid) load requirements**

> **Warning!**
> Ensure that the EPS(Off-grid) load rated power is within the EPS(Off-grid) rated output power range, otherwise, the inverter will report an "overload" warning.
>
> When "overload" occurs, adjust the load power to make sure it is within the EPS(Off-grid) rated output power range, and the inverter will automatically return to normal.
>
> For non-linear loads, ensure that the inrush current power is within the EPS(Off-grid) rated output power range.
> When the configuration current is less than the maximum DC input current, the capacity and voltage of lithium battery and lead acid battery will decrease linearly.

The following table shows some common loads for your reference.

Notice: Please check with the manufacturer for high-power inductive loads.

Content	Power		Common equipment	Instance		
	Start	Rated		Equipment	Start	Rated
Resistive load	X 1	X 1	Incandescent lamp	Incandescent lamp 100W	100VA (W)	100VA (W)
Inductive load	X 3~5	X 2	Fan Fridge	Fridge 150W	450 - 750VA (W)	300VA (W)

➢ **Grid and EPS(Off-grid) connection steps**

● Connection requirements

Notice: Check the grid voltage and compare the voltage range (see technical data).
Disconnect the circuit board from all power sources to prevent electric shock.

Step 1. Prepare a Grid cable (three-core wire) and an EPS(Off-grid) cable (two-core wire), and then find the European terminal and waterproof cover in the accessory bag.

Grid(Triple Core Cable) 8AWG*3

EPS(Off-grid)(Double Core Cable)10AWG*2

10AWG Euro Terminal*2

Euro Terminal 8AWG *3
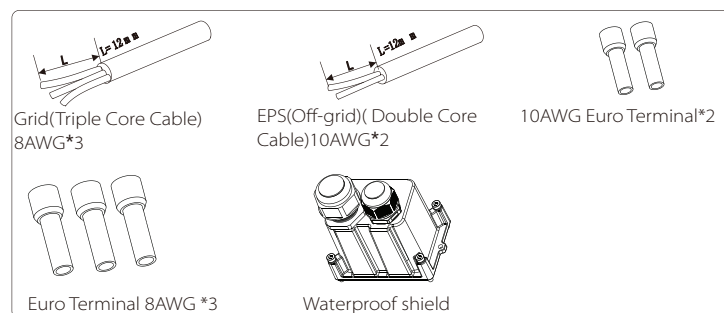
Waterproof shield

Step 2: The Grid and EPS(Off-grid) cables go through the corresponding Grid and EPS(Off-grid) ports of the waterproof shield.

Grid

EPS(Off-grid)
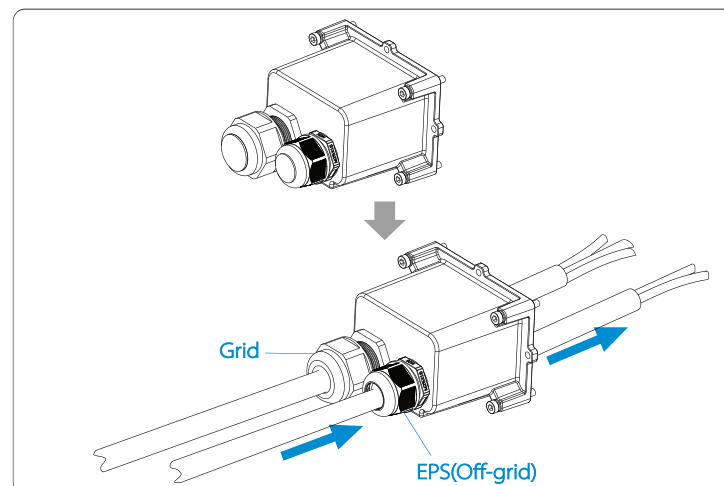
Step 3. Remove the 12mm insulation layer at the end of the wire. Insert the European-style terminals respectively, and make sure that the stripped ends are inserted into the European-style terminal ,and finally use crimping pliers to press tightly.

Diagonal plier

L=12mm

Crimping Tool

Grid

EPS(Off-grid)
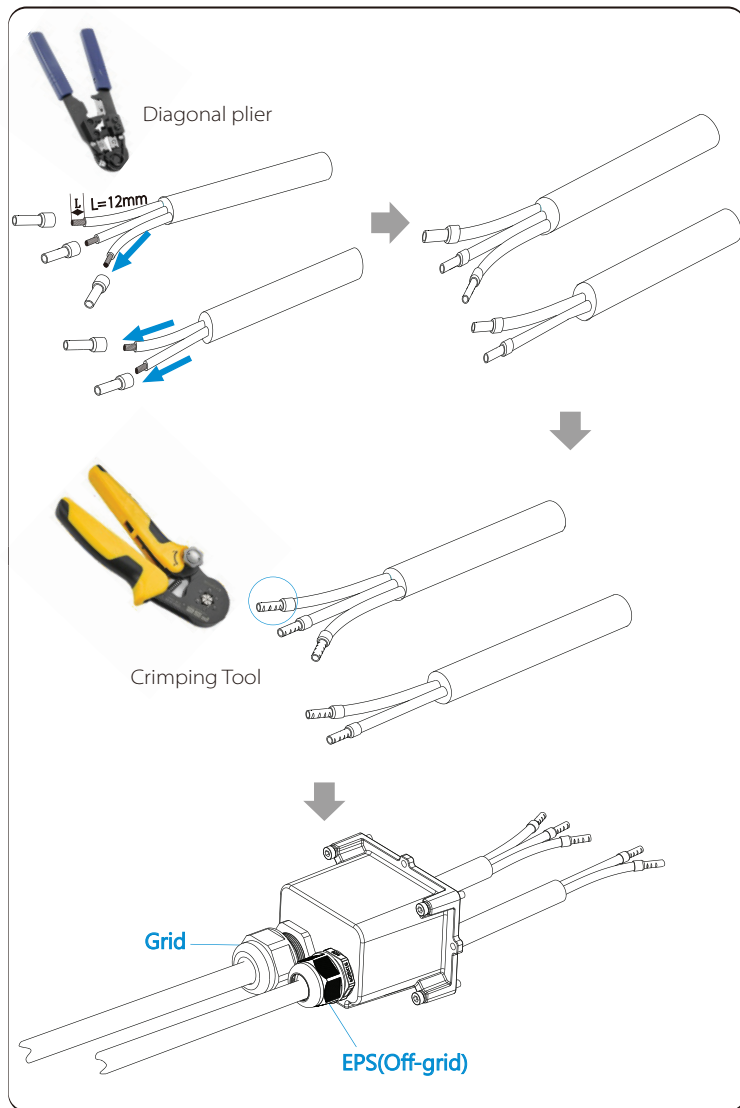
Step 4. Find the location of the AC interface on the inverter, insert the crimped terminals into the UW10 terminals L, N, and P according to the wire sequence, and use a flat-blade screwdriver to tighten the screws. (Torque: 0.2±0.1N ·m)

GRID   EPS(Off-grid)

L N PE L N

Torque screwdriver
(Torque: 1.5±0.1N ·m)
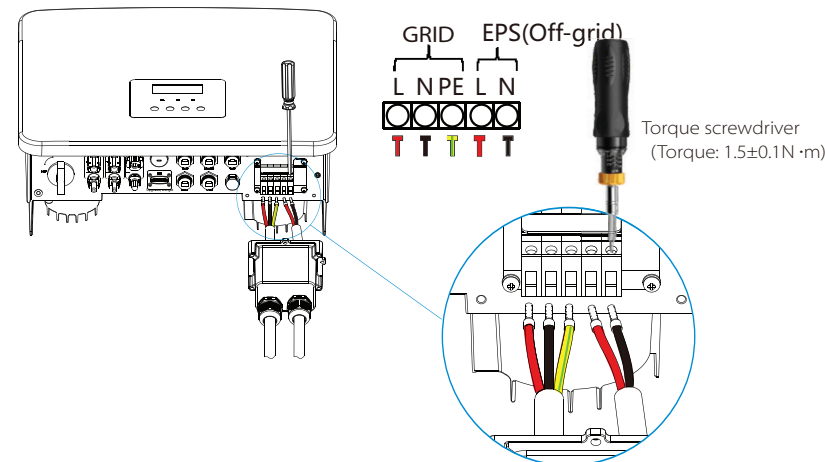
Step 5. Install the AC waterproof shield and tighten the screws on the four sides of the waterproof shield with an Allen wrench.

Hexagon keys
(Torque: 0.8±0.1N ·m)
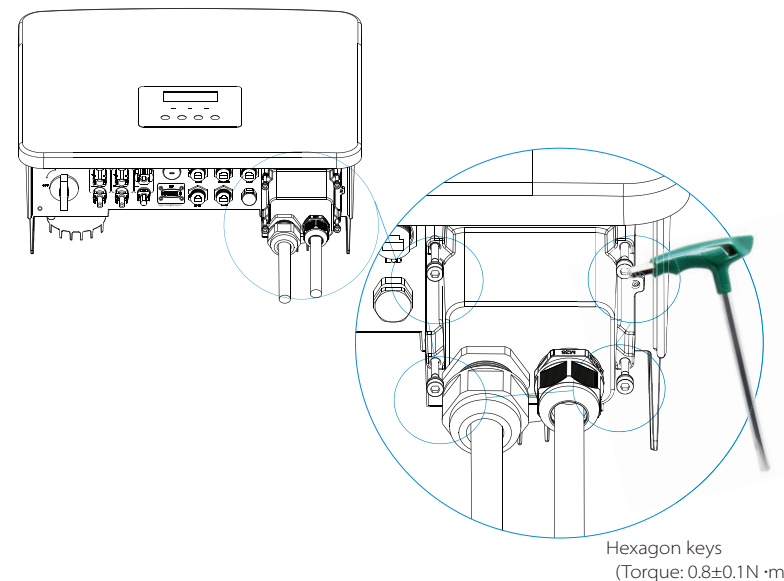
Step 6. Tighten the waterproof fastening head.
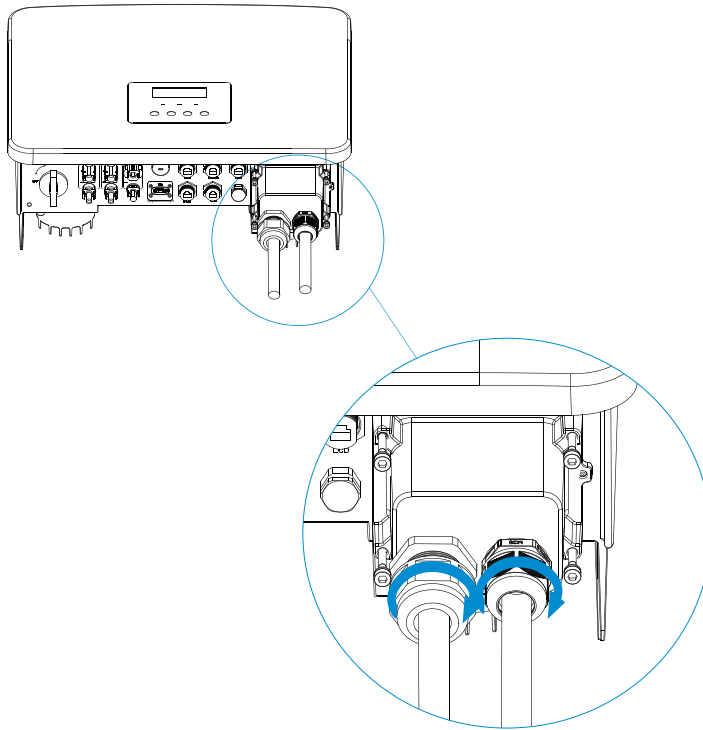
5.4 Battery Connection

➢ **Connection requirements**

Uno-Hybrid K-Series inverter charge and discharge system can be equipped with high voltage lithium battery and lead acid battery. Please note that the maximum voltage of the battery should not exceed 480 V, battery communication should be compatible with the Uno-Hybrid K-Series inverter.

➢ **Battery Breaker**

Before connecting the battery, a non-polar DC MCB must be installed to ensure safety.
Before maintenance, the inverter need to be safely disconnected.

Model	Uno-Hybrid 3.0K	Uno-Hybrid 3.7K	Uno-Hybrid 5.0K	Uno-Hybrid 6.0K	Uno-Hybrid 7.5K
Voltage	Nominal voltage of DC breaker should be larger than maximum voltage of battery.				
Current[A]	32A				

➢ **Battery connection diagram**

High voltage lithium battery
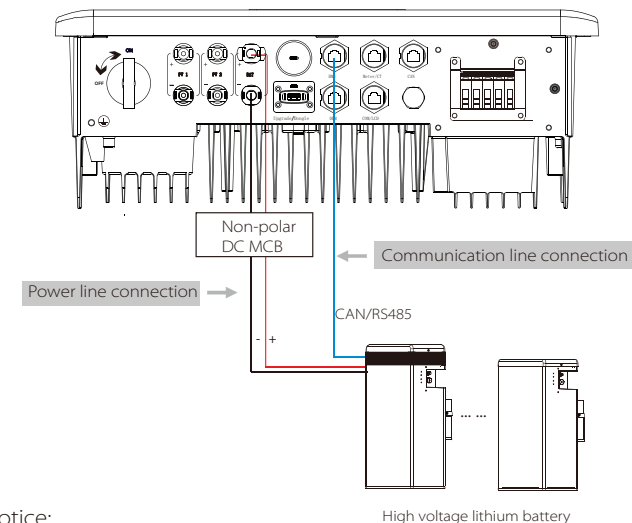
Notice:
When using TommaTech batteries, it is recommended that the number of battery control (General Pack (Master)) is 1 and the number of battery modules (Booster Pack (Slave)) is 0-2; the number of battery control (General Pack 3.0) is 1 and the number of battery modules (TT-3.0kWh) is 1-4 pcs.

➢ **Battery connection steps**

Step 1. Prepare 8 AWG battery power line, find the DC plug (+), DC plug (-) in the accessory bag.

8 AWG

Power line   BAT plug (+)   BAT plug (-)
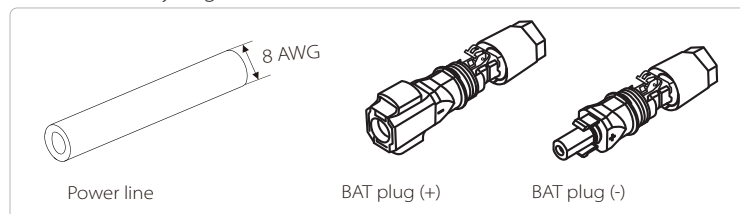
Step 2. Strip the insulation layer (length: 15mm) at one end of the power line.

15.0mm

Diagonal pliers
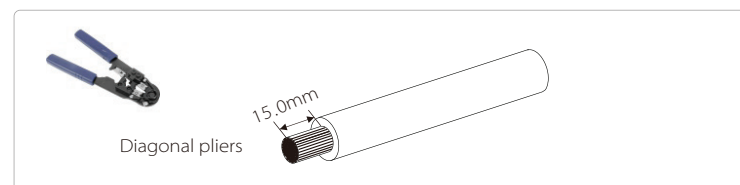
Step 3. Insert the striped cables into the DC plug (-) and DC Plug (+) respectively.

-          +

DC plug (-)   DC plug (+)

Spring

Cavity

The cable must pass through here
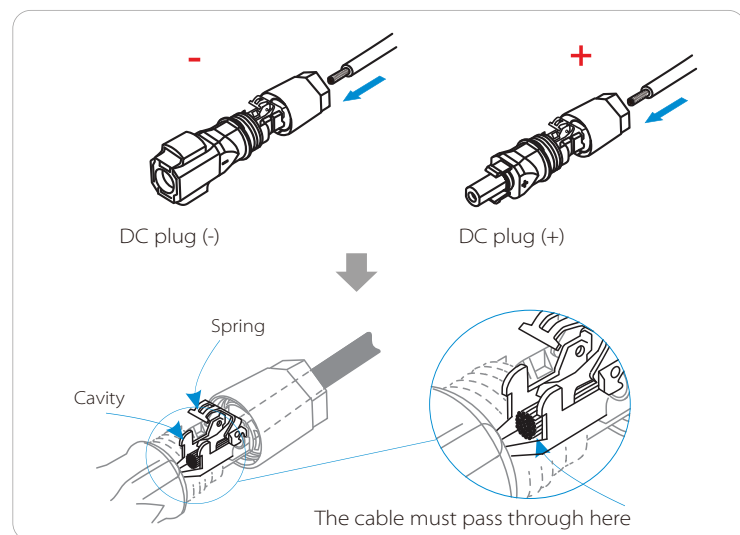
Step 4. Press down on the spring by hand, you can hear a click sound , then push the ends together, and tighten the screw joints.

Spring   Spring

Crack
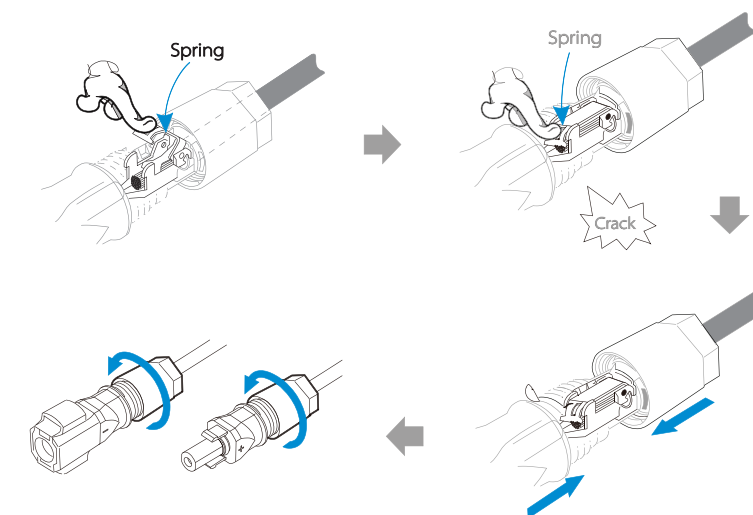
Step 5. Insert the battery power lines into the corresponding BAT port (+), (-) of the inverter.

BAT
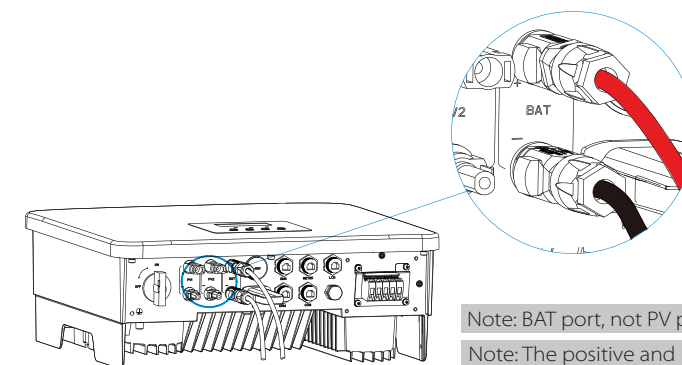
Note: BAT port, not PV port!

Note: The positive and negative wires of the battery are not allowed to be reversed!

➢ **Communication connection**

BMS port definition

The communication interface between the inverter and the battery uses the waterproof connector with RJ45.

1) White with orange stripes
2) Orange
3) White with green stripes
4) Blue
5) White with blue stripes
6) Green
7) White with brown stripes
8) Brown
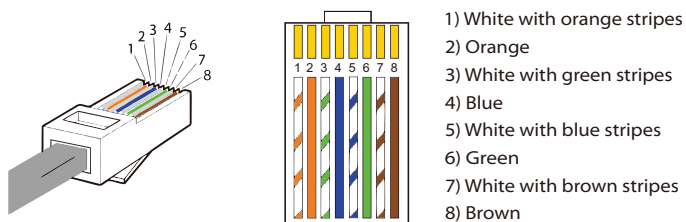
PIN	1	2	3	4	5	6	7	8
Definition	BAT_TEMP	GND	GND	BMS_CANH	BMS_CANL	X	BMS_485A	BMS_485B

Notice!
After the BMS communication between the battery and the inverter is finished, the battery will work normally.
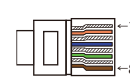
5.5 Communication Connection

5.5.1 Introduction to DRM communication

Uno-Hybrid K-Series can support external control signal response, such as complying with AS4777 regulatory requirements.

➢ **DRM requirements(AS4777 regulatory requirements)**

Mode	Requirement
DRM0	Operation disconnect device
DRM1	Do not consume power
DRM2	Do not consume more than 50% of rated power
DRM3	Do not consume more than 75% of rated power AND Source reactive power if capable
DRM4	Increase power consumption (subject to constraints from other active DRMs)
DRM5	Do not generate power
DRM6	Do not generate more than 50% of rated power
DRM7	Do not generate more than 75% of rated power AND Sink reactive power if capable
DRM8	Increase power generation (subject to constraints from other active DRMs)

1	2	3	4	5	6	7	8
DRM1/5	DRM2/6	DRM3/7	DRM4/8	+3.3V	DRM0	GND	GND

Notice!
For AS4777 DRM function, currently only PIN6 (DRM0) and PIN1 (DRM1/5) are functional, other PIN functions are under development.

5.5.2 Introduction to meter/CT Communication

Uno-Hybrid K-Series inverter should work with an electric meter or current sensor (CT for short) to monitor household electricity usage.
The electricity meter or CT can transmit the relevant electricity data to the inverter or platform, which is convenient for users to read at anytime.

Users can choose to use electric meters or CTs according to demand.

Please Notice that the meter/CT brand required by TommaTech must be used.

Notice!
The meter or CT must be connected to the inverter, otherwise the inverter will shut down and alarm TommaTech "meter failure"alarm.
Smart meters must be authorized by TommaTech, third party or other companies, Unauthorized meter may be incompatible with the inverter.

TommaTech will not be responsible for the impact caused by the use of other appliances.

➢ **Electric meter connection diagram**

Grid
in········►out
Load
L
N
Household Meter
Meter1
(Single-phase meter)
in◄········out

If the user has other power generation equipment (such as inverter) at home and wants to monitor both, Uno-Hybrid K-Series inverter provides Meter2 communication function to monitor the power generation equipment. For more information, please contact TommaTech.

Meter2
Other power generation equipment

➢ **CT Connection**

The current sensor measures the current on the live wire between the inverter and the public grid.

● **CT connection diagram**

Grid
Loads
L
CT 1
N
Household Meter

Note: The arrow on the CT must point at the public grid.

Meter/CT port is at the bottom of the inverter.

CT 2

Public grid electricity
L Line
CT
Meter/CT

Other power generation equipment

If the user has other power generation equipment (such as inverter) at home and wants to monitor both,Uno-Hybrid K-Series inverter provides CT2 communication function to monitor the power generation equipment. For more information, please contact TommaTech.

● **LCD settings**
To select CT, you need to enter Use setting, then enter CT/Meter Setting.

CT/Meter Setting
> Select
CT

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mail@tommatech.de
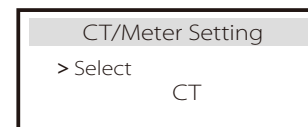
- • Notice for CT connection:

Notice!
- Do not place the CT on the N wire or ground wire.
- Do not put CT on the N line and L line at the same time.
- Do not place the CT on the side where the arrow points to the inverter.
- Do not place the CT on non-insulated wires.
- The cable length between CT and inverter should not exceed 100 meters.
- After CT is connected, prevent the CT clip from falling off. It is recommended to wrap the CT clip around in circles with insulating tape.
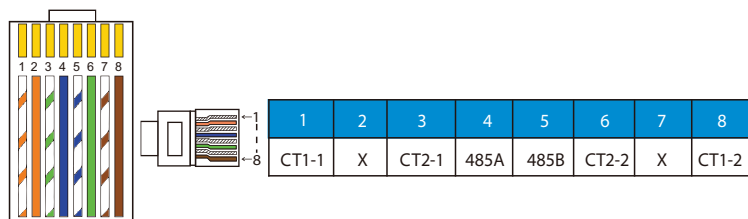
1	2	3	4	5	6	7	8
CT1-1	X	CT2-1	485A	485B	CT2-2	X	CT1-2

Notice!
Only one of the Meter and CT connections can be selected.
Meter cable goes to pin terminal 4 and 5; CT cable goes to pin terminal 1 and 8; reserve CT cable goes to pin terminal 3 and 6.
If you need this feature, please contact us TommaTech for assistance.

➢ BMS communication cable

The BMS pin is defined as follows:

1	2	3	4	5	6	7	8
BAT_TEMP	GND	GND	BMS_CANH	BMS_CANL	X	BMS_485A	BMS_485B
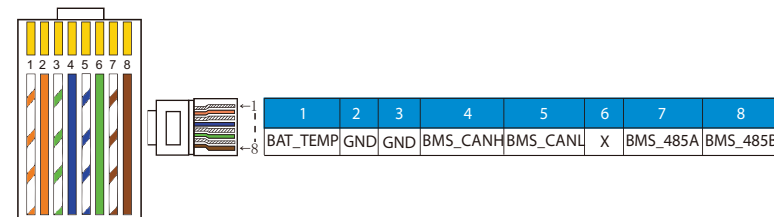
Notice!
The BMS port on the inverter is the communication port for connecting the battery. The communication port on the lithium battery must be consistent with the definition of pins 4, 5, 7, and 8 above;

➢ DRM communication cable

The DRM pin is defined as follows:

1	2	3	4	5	6	7	8
DRM1/5	DRM2/6	DRM3/7	DRM4/8	+3.3V	DRM0	GND	GND
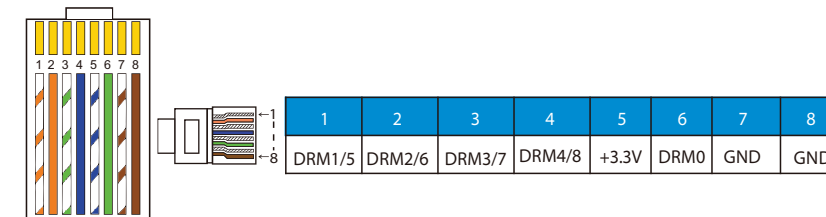
Notice!
At present, there are only PIN6 (DRM0) and PIN1 (DRM1 /5), and other PIN functions are under development.

5.5.3 Parallel Connection

Uno-Hybrid K-Series inverters provide parallel function, and up to 2 inverters can be connected in a system.
In this system, one inverter is set as the "master inverter", and the other inverter is switched to the "slave inverter" state, and the inverters are connected to communicate through the CAN line. The converter "controls the "slave inverter".

➢ **System Diagram**

System diagram applied to electric meters:
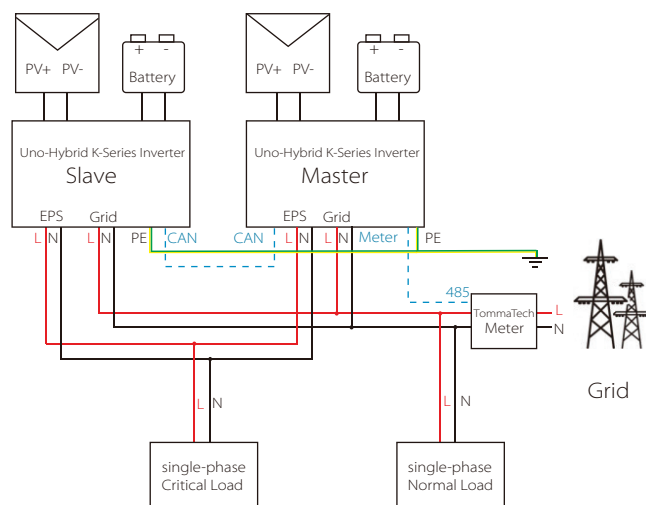
System diagram applied to temperature sensor CT:
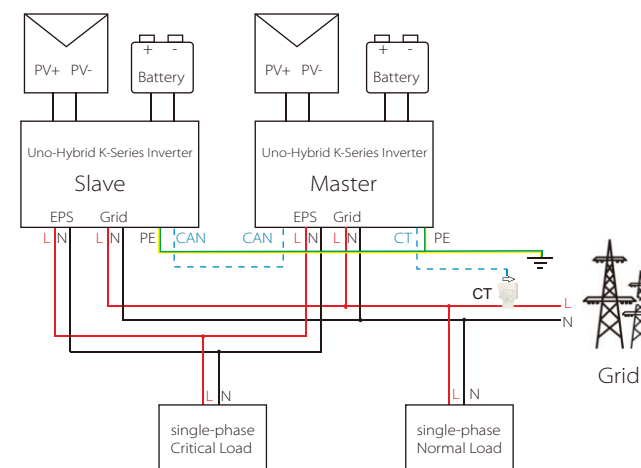
➢ **Work Modes in parallel system**

There are three work modes in parallel system, and your acknowledge of different inverter's work modes will help you understand parallel system better, therefore please read it carefully before operating.

Free mode	Only when none of the inverters is set to "Master", both inverters are in free mode in the system.
Master mode	When one inverter is set as "Master", this inverter enters master mode. Master mode can be changed to free mode.
Slave mode	Once one inverter is set as "Master", another inverter will enter slave mode automatically. slave mode cannot be changed from other modes by LCD setting.

> **Wiring Operation and LCD Setting**

☞ Note: Before operation, please make sure that the inverter meets the following three conditions,
1. The software version of all inverters is the same;
2. The power range of all inverter models is the same;
3. The type and quantity of batteries connected to all inverters are the same;
Otherwise, this function cannot be used.

Step1: Connect all inverters' communication together by connecting CAT7 network cables between CAN ports.
- Insert one side of CAT7 cable into the frst inverter's CAN port and the other side into the next inverter's CAN port.
‒ Insert one side of CAT5 cable Meter, and the other side into the Meter port the master inverter.

> **CAN PIN Definition**

1	2	3	4	5	6	7	8
485A	485B	VCC	CANH	CANL	GND	SYN1	SYN2
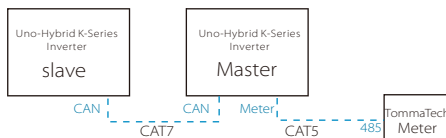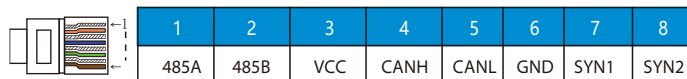
Step 2: Turn on the power of the entire system, fnd the inverter connected to the meter, enter the setting page of the inverter LCD screen, click on the parallel settings, and select "master control" .

Adavance
EPS Setting
Parallel Setting
Main Breaker Limit

Parallel Setting
> Setting
Master
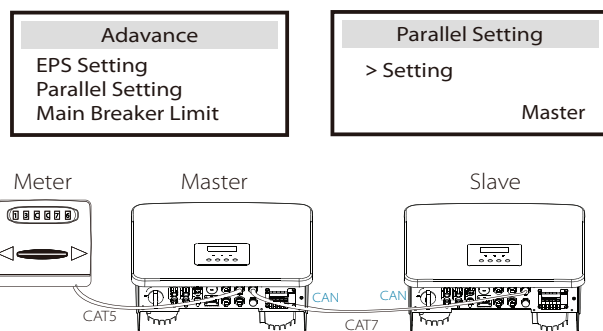
> **How to Remove parallel system**

If one inverter wants to exit from this parallel system, please do the steps as below:

- step1: Disconnect all the network cables on the CAN port.
- step2: Enter setting page and click parallel setting, and choose "Free".

☞ **Note!**
- If a slave inverter is set to "Free" mode but not disconnect the network cable, this inverter will return to "slave" mode automatically.
- If a slave inverter is disconnected with other inverter but not be set to "Free" mode, this inverter will stop working and maintain "waiting" status.

> **LCD display**

Main display:
Once inverter enters parallel system, the "today yield" will be replaced by " Inverter Class", and parallel relevant fault has a higher priority than other faults and will be showed frstly on main display.

Power	5688W
Today	20.5KWh
Battery	67%
Normal	

Power	5688W
Parallel	Master
Battery	67%
Normal	

Power	5688W
Parallel	Slave1
Battery	67%
Normal	
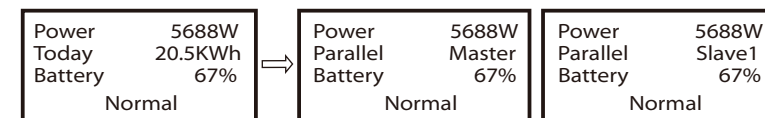
Status display:
User can obtain all the status data from master inverter. System power and individual slave inverter power can be obtain in status display of master inverter.

Menu
Status
>Parallel Status
History

Parallel Status
>All   2
Slave1
Slave2

Parallel Status
>Grid
Solar
Load

Means the total number of online inverters
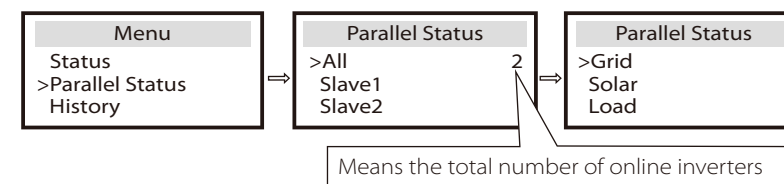
➢ **Parallel Control Function**

Master inverter has an absolute lead in the parallel system to control slave inverter's energy management and dispatch control. Once master inverter has some error and stop working, slave inverter will be stop simultaneously. But master inverter is independent of slave inverter to work and will not be affected by slave inverter's fault.

Overall system will be running according to master inverter's setting parameters, and most setting parameters of slave inverter will be kept but not be cancelled.
Once slave inverter exit from system and be running as an independent unit, its all setting will be re-excuted.

The rest of this section covers several important parallel control functions, and the next page table shows which LCD options are controlled by master inverter and which can work independently.

O ffmode setting:
O ffmode can only be set by master inverter
(long press ESC button on LCD).

Safety setting:
System safety protection is cancelled by master inverter's safety. slave inverter protection mechanism will only be triggered by master inverter's instructions.

Self-use setting:
If system is running as self-use mode, please note the Feedin Power Limit set of master inverter is for the overall system and the corresponding set of slave inverter is invalid.

Power Factor setting:
All sets about power factor are all for the overall system and the corresponding sets of slave inverter are invalid.

Remote control setting:
The remote demand instructions received by master inverter will be interpreted as the demand instructions to overall system.

5.5.4 COM Communication

COM communication interface is mainly provided for customization the second step of development use.The inverter supports the control of external equipment or external equipment control through communication. For example, the inverter adjusts the working mode of the heat pump and so on.

➢ **Application occasion**

COM is a standard communication interface, through which the monitoring data of the inverter can be directly obtained. Also, external communication devices can be connected to carry out the secondary development of the inverter. For specific technical docking, please contact TommaTech.

External communication equipment controls the inverter

RS485   Data Read
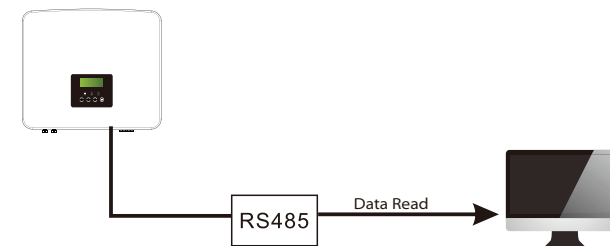
Inverter communication control external equipment
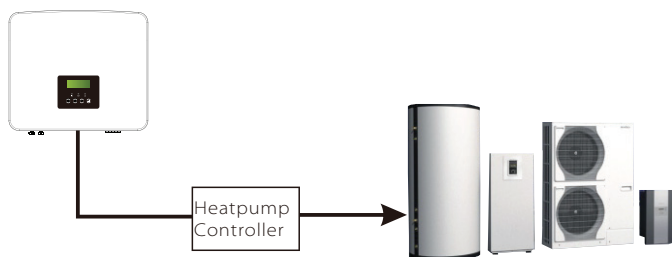
> ➤ COM PIN Definition

1	2	3	4	5	6	7	8
Drycontact_A(in)	Drycontact_B(in)	+13V	485A	485B	GND	Drycontact_A(out)	Drycontact_B(out)

Notice!
Customers can communicate or control the inverter and external devices through the COM interface. Professional users can use pins 4 and 5 to realize data acquisition and external control functions. The communication protocol is Modbus RTU. For details, please contact TommaTech. If the user wants to use the inverter dry contact to control external equipment (such as a heat pump), it can be used with TommaTech's Heatpump Controller. For details, please refer to the Quick Installation Manual of the Heatpump Controller.

5.5.5 Communication Connection Steps

Step 1. Prepare a communication cable, and then find the communication adapter in the accessory bag.

Communication cable   Waterproof connector with RJ 45   RJ 45 terminal
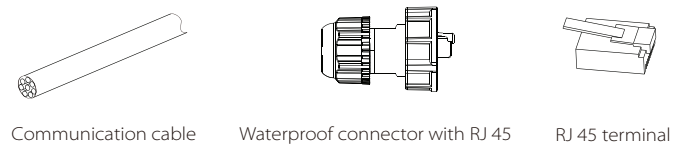
Step 2. Insert the communication cable through the communication adapter, and peel off the outer insulation layer of 15 mm.

Diagonal pliers

15.00mm
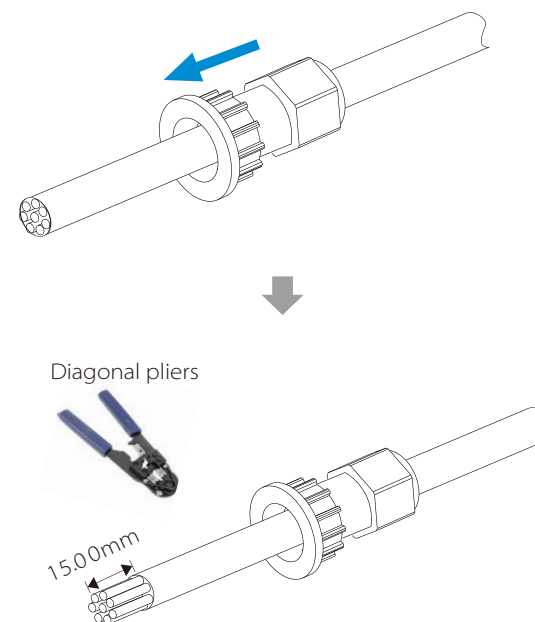
Step 3. Insert the prepared communication cables into the RJ45 terminals in sequence, and then use network cable crimping pliers to press them tightly.
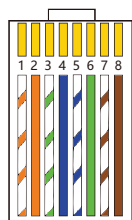
1) White with orange stripes
2) Orange
3) White with green stripes
4) Blue
5) White with blue stripes
6) Green
7) White with brown stripes
8) Brown

Multifunction terminal crimping tool (RJ45)
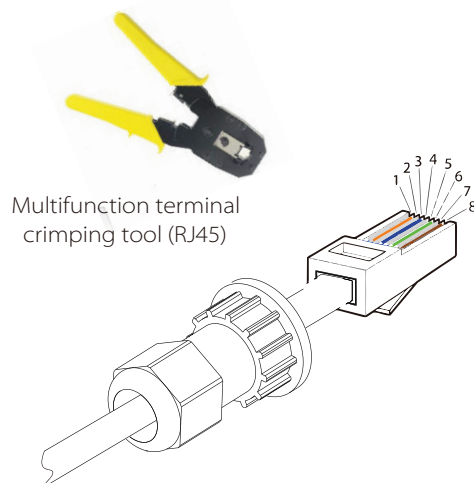
➢ **METER/CT communication cable**

METER/CT pin is defined as follow:
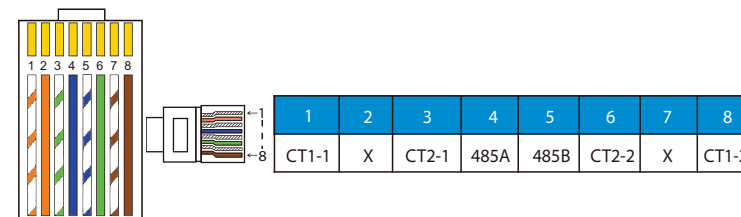
1	2	3	4	5	6	7	8
CT1-1	X	CT2-1	485A	485B	CT2-2	X	CT1-2

Notice!
Only one of the Meter and CT connections can be selected.
Meter cable goes to pin terminal 4 and 5; CT cable goes to pin terminal 1 and 8; CT2 cable goes to pin terminal 3 and 6.

1) Users can customize the length of the CT communication cable. The accessory package provides 1*RJ45 and 1*waterproof connector with RJ45 terminals.
When the CT cable is completed, connect the A terminal to the "CT/METER" port of the inverter and tighten the waterproof screw, and connect the B terminal to the RJ45 coupler.

A

B
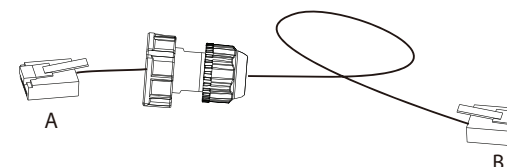
2) One side of the finished cable, Waterproof connector with RJ45 is inserted into the inverter, and one side of the RJ45 terminal is inserted into the CT connection.
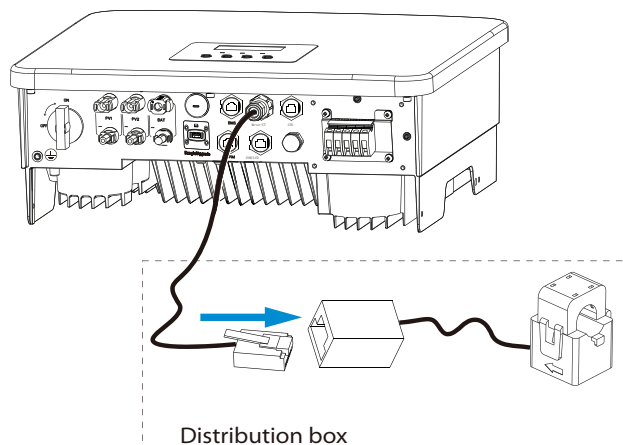
Distribution box

> **Notice!**
> When installing, pay attention to water resistance. All the connected parts of CT must be put into the distribution cabinet.

Step 4. Tighten the completed Meter/CT/BMS communication line and tighten the waterproof plug.
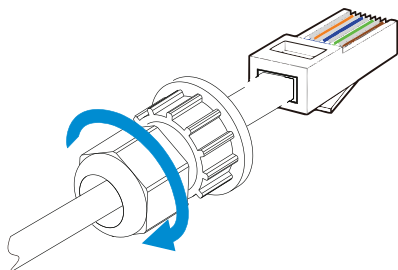
Step 5: Finally, find the corresponding COM, METER, CT, DRM, LCD poets on the inverter and insert the communication cable into the corresponding ports.

BMS

Meter/CT

BMS

Meter/CT

DRM

COM/LCD
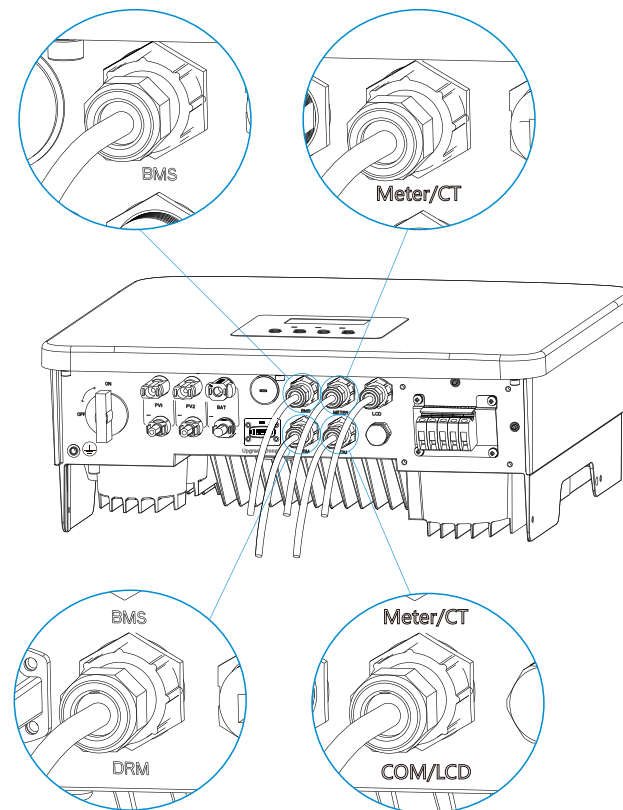
5.6 Grounding Connection (Mandatory)

The user must make two ground connections :one shell grounding, and one equipotentialgrounding.This prevents electric shock.

Notice: If the PV end of the inverter is not connected with earth , the inverter will turn on a red light Inspect and report ISO Fault .This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring.

➢ **Ground connection steps**

Step 1. Prepare a one-core cable (12AWG), and then find the ground terminal in the accessories.

12AWG

One-core cable (12 AWG)   OT terminal   Hexagon socket screws

Step 2. Strip the grounding cable insulation(length"L2), insert the striped cable into the ring terminal, and then clamp it.

Diagonal pliers

L1

L2=L1+3mm
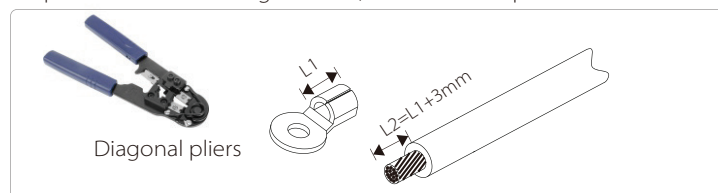
Step 3. Insert the stripped cable into OT terminal and tighten the terminal with a terminal crimping tool.

Leaking cable

Crimping Tool
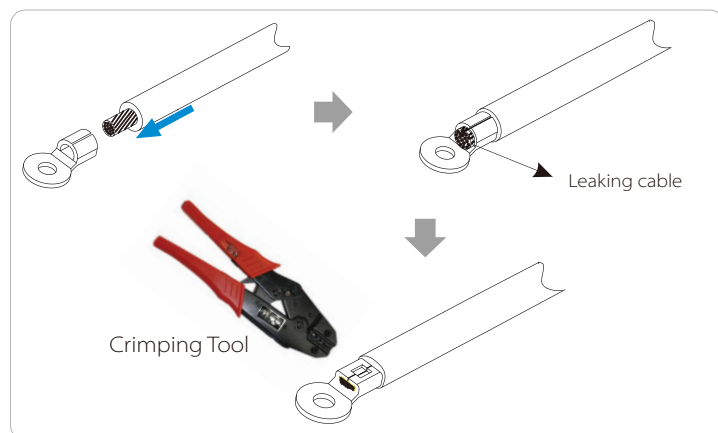
Step 4. Find the ground connection port on the inverter, and screw the ground wire on the inverter with an M5 Hexagon keys.

Hexagon keys
Torque: 1.5±0.2N·m

66

67
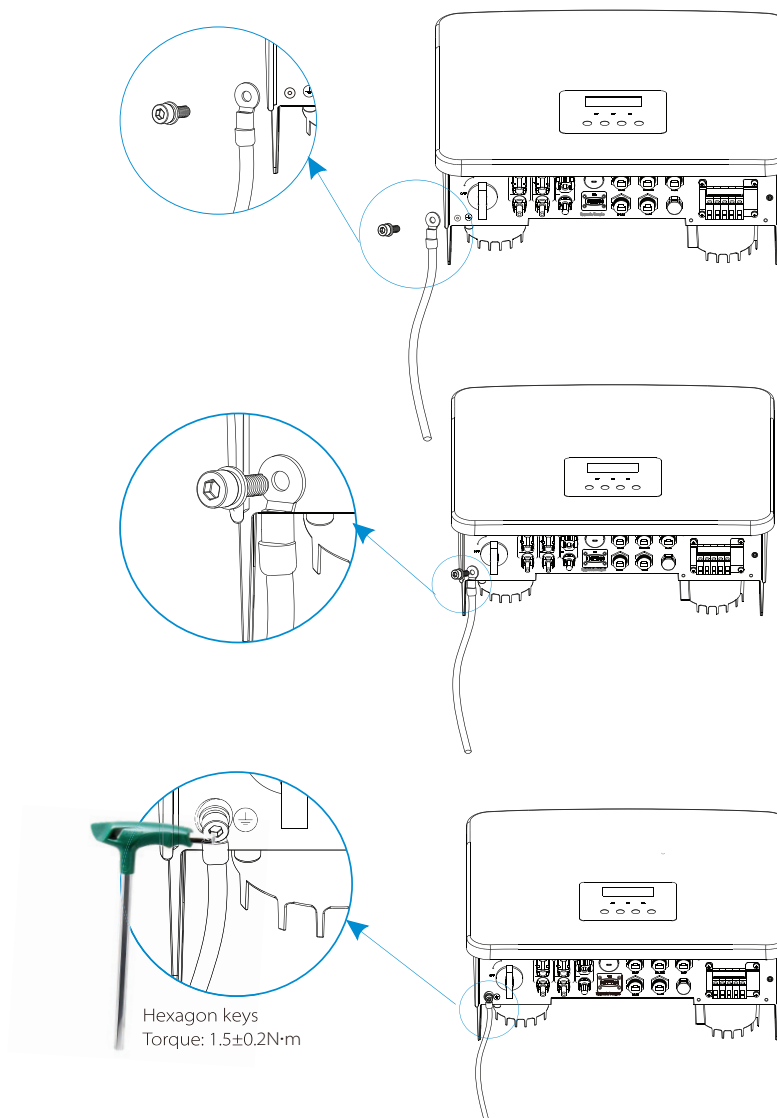
5.7 Monitoring Connection (Accessories)

The inverter provides a DONGLE port, which can transmit data of the inverter to the monitoring website via and Mobile LAN. (If necessary, purchase products from TommaTech)

➢ **WiFi connection diagram**

TommaTech Cloud

Router
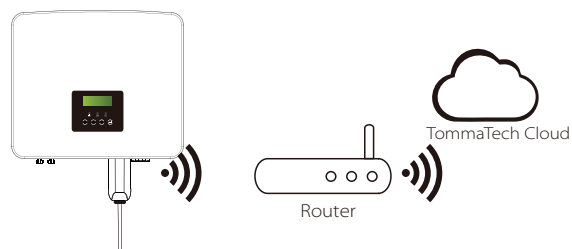
➢ **Wireless monitoring accessories connection steps**

Step 1. First find the DONGLE port of the inverter.

Dongle/Upgrade
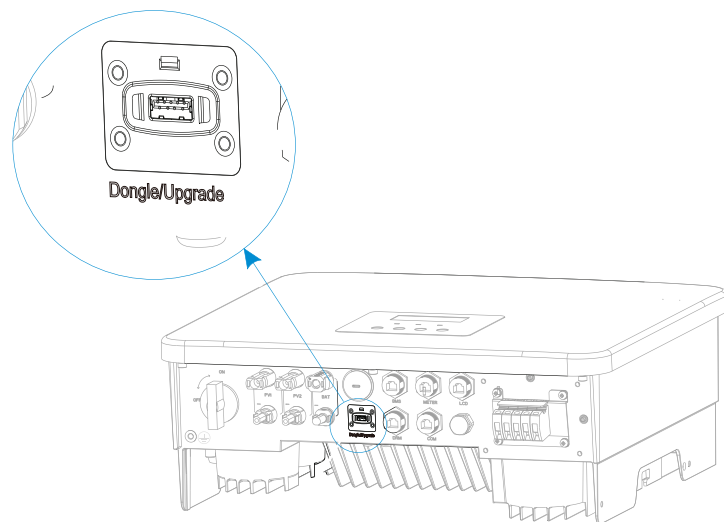
Step 2. Plug Mobile Wi-Fi into the DONGLE port.
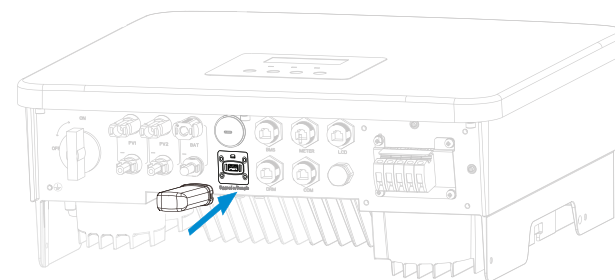
Mobile Wi-Fi
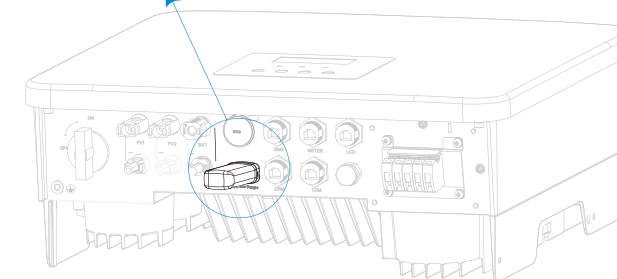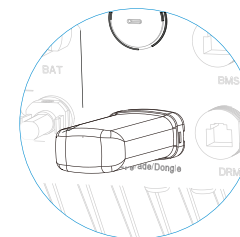
Please check the Mobile Wi-Fi user manual/Mobile LAN user manual /4G user manual.

5.8 Check All Below Steps Before Starting Inverter

➢ After the inverter is checked, then conduct the following steps

❶ Make sure that the inverter is fixed on the wall.

❷ Ensure that all ground wires are grounded.

❸ Confirm that all DC lines and AC lines are connected.

❹ Make sure the CT is connected.

❺ Make sure the battery is well connected.

❻ Turn on the Load switch and EPS(Off-grid) switch.

❼ Turn on the battery switch.

Long press the "Enter "key for 5 seconds to exit the Off mode.
(The mode is factory defaulted as Off Mode)
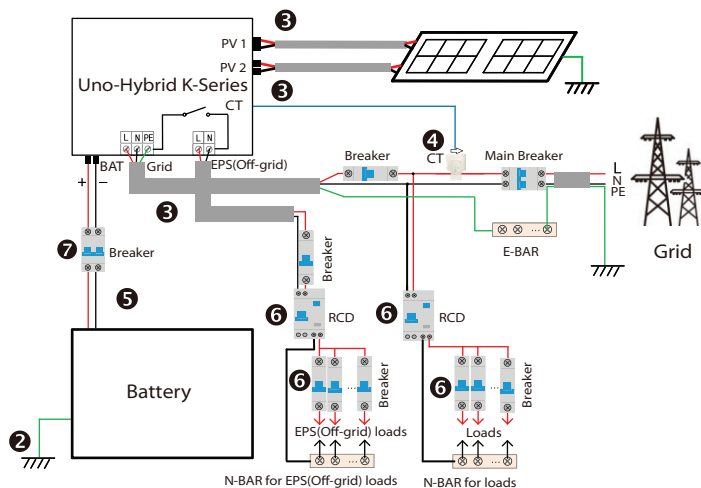
5.9 Inverter Operation

➢ Before operation, check the inverter according to the following steps

a) Check that the inverter is well fxed on the wall.
b) Ensure that all ground wires are well tightened.
c) Ensure that all DC and AC circuit breakers are disconnected.
d) Ensure that all ground wires are well tightened.
e) The AC output terminal is correctly connected to the mains.
f) Ensure that all photovoltaic panels and inverter are properly connected. Unused DC connectors should be blocked with caps.

➢ Start the inverter

• Steps to start the inverter
  - Turn on the AC switch between the Uno-Hybrid K-Series and the power grid.
  - (Optional) Remove the locking screw from the DC switch.
  - Turn on the DC switch between the PV string and the Uno-Hybrid K-Series if there is any.
  - Turn on the DC switch at the bottom of the Uno-Hybrid K-Series .
• When the photovoltaic panel generates enough power, the inverter will start automatically.
• Check the status of the LED and LCD screen, the LED is green, and the LCD screen displays the main interface.
• If the LED is not green, please check the following:
  -All connections are correct.
  -All external disconnect switches are closed.

The following are 3 different states of inverter operation, which means that the inverter starts successfully.
Waiting: When the DC output voltage of the photovoltaic panel is higher than 70V (lowest starting voltage) and lower than 90V (lowest working voltage), the inverter waits for checking.
Checking: The inverter will automatically detect the DC input. When the DC input voltage of the photovoltaic panel is higher than 90V and the photovoltaic panel has enough energy to start the inverter, the inverter will enter the checking state.
Normal: When the inverter is working normally, the green light is always on. At the same time, the power is fed back to the grid, and the LCD displays the output power.

If it is the first time to boot, please ollow the prompts to enter the setting interface.

> ⚠ **Warning!**
> The input terminal of the inverter can be opened only when all the installation work of the inverter has been completed. All electrical connections must be performed by professionals in accordance with local regulations.

> ☞ **Notice!**
> If it is the first time to operate the inverter, the system will automatically display setup guide. Please follow the setup guide to complete the basic inverter settings.

6 Firmware Upgrading

➢ **Upgrade Notices**

Please read the following precautions before upgrading.

⚠	**Warning!** -In order to upgrade the firmware smoothly, if the DSP and ARM firmware need to be upgraded, please note that ARM firmware must be upgraded first, then DSP firmware! -Please make sure that the category format is correct, do not modify the firmware file name, Otherwise, the inverter may not work!

⚠	**Warning!** -For Uno-Hybrid K-Series, ensure that the PV input voltage is greater than 100V (upgrade on sunny days). please ensure that the battery SOC is greater than 20% or the battery input voltage is greater than 90V. Otherwise, it may cause serious failure during the upgrade process!

⚠	**Caution!** -If the ARM firmware upgrade fails or stops, please do not unplug the U disk power off the inverter and restart it., Then repeat the upgrade steps.

⚠	**Caution!** -If the DSP firmware upgrade fails or stops, please check whether the power is off. If it is normal, plug in the U disk again and repeat the upgrade.

➢ **Upgrade preparation**

1) Please check the inverter version and prepare a U disk (USB 2.0/3.0) and personal computer before upgrading.

⚠	**Caution!** -Please make sure that the size of the U disk is smaller than 32G, and the format is fat16 or fat 32.

2) Please contact our service support through www.tommatech.de to obtain the firmware, and store the firmware in the U disk according to the following path.

Update:
For ARM file:update \ARM\618.00361.00_HYB_1P_ARM_V1.01_0710.usb";
For DSP file:update\DSP\618.00360.00_HYB_1P_DSP_V1.01_0710.usb";

➢ **Upgrade steps**

Step 1. Please save the "Upgrade" firmware in your U disk first, and press the "Enter" button on the inverter screen for 5 seconds to enter the OFF mode.

Long press for 5 seconds

Step 2. Find the "Update" port of the inverter, unplug the monitoring module (Mobile Wi-Fi/ Mobile LAN) by hand, and insert the USB flash drive.

U Disk
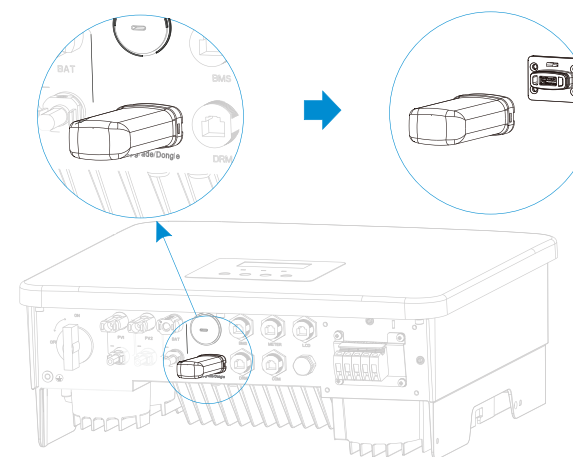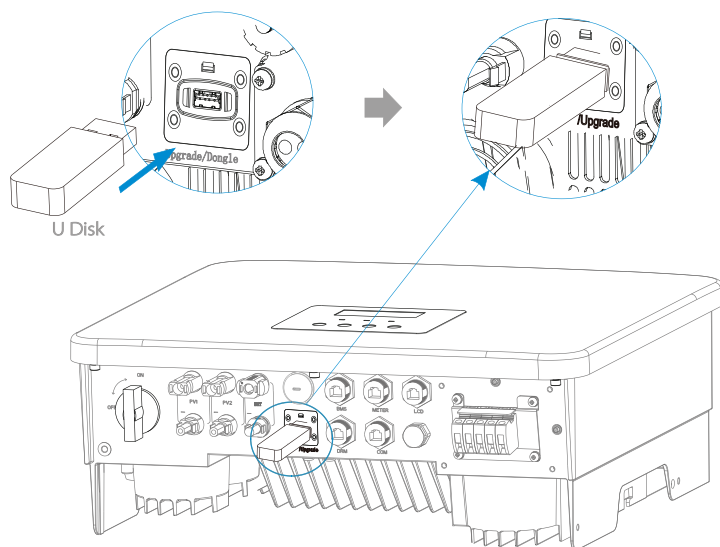
Step 3. LCD operation, enter the upgrade interface "update", as shown below(a): Please press the up and down keys to select ARM, then press down to set "OK", press the enter key to enter the software version interface;

```
==  Upgrade Selection  ==
   >ARM
    DSP
```
(a)

```
===    Upgrade(ARM)    ===
    Cancel
   >OK
```
(b)

Step 4. Please confirm the new firmware version again and select the firmware to upgrade. The upgrade takes about 20 seconds.
(d) When it is completed, the LCD screen returns to the "Update" page.

```
=== Update(ARM)    ===
 >618.00361.00_HYB_
 1P_ARM_V1.01_
 0710.usb
```
(c)

```
==== Update(ARM)    ====
  Upgrading---------25%
```
(d)

```
====    Update    ====
   >ARM
    DSP
```
(e)

Step 5. For DSP: Please wait for 10 seconds. When "Update" page shown as as below, press down to select "DSP" and then press Enter. Please confirm the firmware version again and press Enter to upgrade. The upgrade takes about 2 minutes.

```
==== :    Update    ==== :
   ARM
  >DSP
```
(f)

```
===   Update(DSP)   ===
  >618.00360.00_HYB_
  1P_DSP_V1.01_07
  10.hex
```
(g)

```
===    Update(DSP)   ===
  connect
```
(h)

```
===     Update(DSP)   ===
  DSP Erasing---------
```
(i)

```
===    Update(DSP)   ===
  Upgrading---------25%
```
(j)

Step 6. After the upgrade is completed, the LCD screen displays "Upgrade Successful".

```
===  Upgrade(DSP)   ===
  Upgrade Successful
```
(k)

Step 7. Plug off the U disk, press "Esc" to return to the main interface, and long press the enter key to exit the mode.

⚠ **Caution!**
-Please strictly follow each step from step 1-6, don't miss it.
-Please confirm the ARM/DSP firmware version on the USB flash drive.

Tip: If the display screen is stuck on "Uno-Hybrid K-Series" after the upgrade, please turn off the photovoltaic power supply and restart, and the inverter will restart and return to normal. If not, please contact our www.tommatech.de for help.

7 Setting

7.1 Control Panel

A

C

B

D
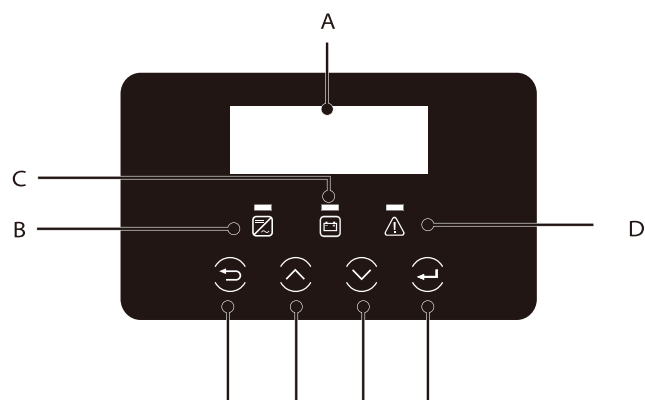
Object	Name	Description
A	LCD Screen	Display inverter information on the LCD display.
B	LED Indicator light	Blue light: The inverter is in normal state or EPS(Off-grid) mode. Blue flashing:The inverter is in the waiting, checking state or the system switch is off. Off: The inverter is in a fault state.
C		Green: The battery communication is normal but the battery MCB is disconnected, and the battery communication is normal and working normally. Green flashing:The battery communication is normal and in an idle state. Off: The battery does not communicate with the inverter.
D		Red light on: The inverter is in a fault state. Off: The inverter has no error.
E	Key Function	ESC button: Return from the current interface or function.
F		Up button: Move the cursor to the upper part or increase the value.
G		Down button: Move the cursor down or decrease the value.
H		Enter button: Confirm selection.

7.2 Menu Structure

❶ System ON/OFF

❷ Work Mode
- Self Use
- Feed-in priority
- Backup mode
- Manual
  - Forced discharge
  - Forced charge
  - Stopcharge&discharge

❸ System Status
- PV1
- PV2
- Battery
- On-grid
- EPS
- Meter/CT

Menu main

❹ History Data
- On-grid
- EPS
- Meter/CT-1
- Meter/CT-2
- Error Logs

❺ settings

❻ About
- Inverter
- Battery
- Internal Code

User settings
- Date&Time
- Language
- EPS Mute
- Self Use Mode
- Feed-in Priority
- Backup mode
- Chrg & Dischrg Period
- Dry Contact
- User Password

☆Advanced settings
- Safety Code
- Grid Parameters
- Charger
- PV Connection
- Export Control
- Meter/CT Settings
- Self Test
- Shadow Fix
- Modbus
- External ATS
- Power Factor
- Pu Function
- FVRT Function
- Power Limit
- AS4777 Setting
- DRM Function
- Main Breaker Limit
- Battery Heating
- EPS Setting
- Parallel Setting
- Reset
- ShutDown
- MicroGrid

Manufactory settings
- Advance Password
- DIO Function
- COM Port Select

Notice:" ☆"This part of the content cannot be set by the end user.
Please contact the installer or TommaTech if necessary.

76

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7.3 LCD Operation

The main interface is the default interface, the inverter will automatically return to this interface when the system started up successfully or not operated for a period of time.

The information of the interface is as below. "Power" means the instant output power; "Today" means the power generated within the day. "Battery" means the left capacity of battery energy.

```
Power          0W
Today          0.0KWh
Battery        80%
        Normal
```

➢ **Menu interface**

The menu interface is another interface for users to change settings or obtain information.
-When the LCD displays the main interface, click "OK" to enter this interface.
-The user can select up and down the menu, and press the "OK" key to confrm.

```
        Menu
> System ON/OFF
  Work Mode
  System Status
```

```
                    ┌── System ON/OFF
                    │
                    ├── Work Mode
                    │
                    ├── System Status
      Menu main ────┤
                    ├── History Data
                    │
                    ├── Settings
                    │
                    └── About
```
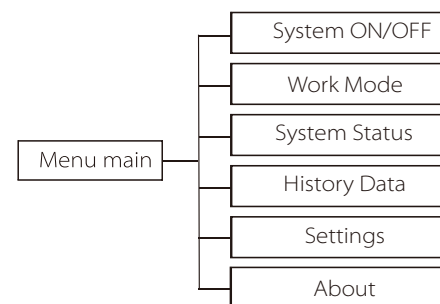
➢ **System ON/OFF**

"ON" indicates that the inverter is in working state, which is generally the default state.

"OFF" means that the inverter stops running and only the LCD screen is turned on.

```
        System
  Switch

          >OFF<
```

> Mode Selection
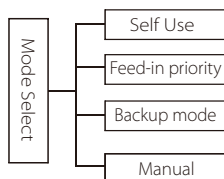
Mode selection, there are 4 working modes to choose from.

Name	Description
Self Use	The self-use mode is suitable for areas with low feed-in subsidies and high electricity prices. ① When the power of PV is sufficient Active Charging or Discharge time period: PV will power the loads frstly, and surplus power will charge to the battery. If the battery is fully charged, then sell the surplus power to the grid; (The inverter will limit the output if Feed-in limit or zero feed-in is needed) (PV > Load, PV →Load→Battery → Grid) ② When the power of PV is insufficient Active Charging time period: PV will power the loads frstly ,the remaining power will be taken from the grid , the battery will not discharge at this time. (PV < Load, PV + Grid → Load) Active Discharge time period: PV+BAT will power the loads together. If the power is still not enough, the remaining power will be taken from the grid. (PV < Load, PV + Battery + Grid → Load) ③ Without PV power Active Charging time period: The grid supplies the loads and also can charge the battery; (PV=0, Grid → Load + Battery) Active Discharge time period: The battery will power the home loads frstly .If the battery power is not enough ,the remaining power will be taken from the grid. The inverter will enter into the standby state. (PV=0, Battery+Grid → Load) Battery min SOC can be set:10%-100% Charge battery to min SOC can be set:10%-100%.
Feed-in priority	The Feed-in priority mode is suitable for areas with high feed-in subsidies, but has feed-in power limitation. ①When the power of PV is sufficient Active Charging time period: First, PV supply power to the load, then charge the battery to the set capacity, and then sell the power to the grid. If the local grid company limits the grid-connected power of the inverter, the excess energy continues to charge the battery (PV＞Load, PV → Load → Battery→ Grid → Battery) Active Discharge time period: PV will power the loads frstly, and surplus power will feed-in to the grid. (PV＜Load, PV → Load → Grid)

Feed-in priority	②When the power of PV is insufficient Active Charging time period: PV will power the loads frstly, the remaining power will be taken from the grid. The battery will not discharge. (PV＜Load, PV + Grid → Load) Discharge time period: PV+BAT will power the loads together. If the power is still not enough, the remaining power will be taken from the grid. (PV＜Load, PV + Battery + Grid → Load) ③Without PV power Active Charging time period: The grid will power the home loads and also charge the battery; (PV=0, Grid → Load +Battery) Active Discharge time period: The battery will power the home loads frstly. If the battery power is not enough, the remaining power will be taken from the grid. The inverter will enter into the standby state. (PV=0, Battery+Grid → Load) Battery min SOC can be set:10%-100%. Charge battery to min SOC can be set:10%-100%.
Backup mode	The back-up mode is suitable for areas with frequent power outages. Same working logic with "Self-use" mode. This mode will maintain the battery capacity at a relatively high level. (Users' setting) to ensure that the emergency loads can be used when the grid is off. Customers no need to worry about the battery capacity. Battery min SOC can be set: 30%-100%. Charge battery to min SOC can be set: 30%-100%.
EPS (Off-grid)	The EPS(Off-grid) mode is used when the power grid is off. System will provides emergency power through PV and batteries to supply power to the household loads. (Battery is necessary) ①When the power of PV is sufficent PV will power the loads frstly, and surplus power will charge to the battery.(PV > Load, PV → Load → Battery) ②When the power of PV is insufficient The remaining power will be taken from the battery. (PV < Load, PV+Battery → Load) ③Without PV power The battery will power the emergency loads until the battery reached the min SOC, then the inverter will enter into the idle mode. (PV=0, Battery → Load) EPS(off-grid) SOC-min condition is adjustable within the range of 1 0%-25%;

Notice: in the case of grid connection, all working modes work normally when the battery SOC >5%. When the battery charge rate is below 5%, the PV or Grid will first charge the battery SOC11%, and then return to the working mode selected by the user.

• Manual mode (manual mode), there are three options to choose from: forced charging, forced discharge, stop charging and discharging (grid-connected 0 power).

Work Select
>Manual
Forced Charge

Work Select
>Manual
Forced Discharge

Work Select
>Manual
Stop Chrg&Dischrg

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www.tommatech.de
mail@tommatech.de
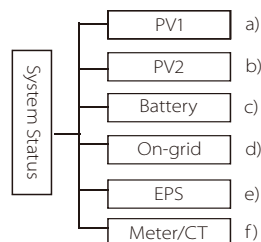
➢ **System Status**

System status contains six content: PV1/PV2/Battery/On-grid (energy feed into or buy from the grid)and EPS and so on.
Press up and down to select, press "Enter" to confrm the selection, and press "ESC" to return to the menu.

a/b) PV1, PV2
Here you can see the voltage, current and power of the PV 1 and PV 2 photovoltaic panels respectively;

PV1	
>U	0.0V
I	0.0A

PV2	
>U	0.0V
I	0.0A

c) Battery
This status shows the battery condition of the system. Including battery voltage and battery current, Battery power, battery capacity, battery temperature, BMS connection status. The meaning of the sign of battery current and power: "+" means charging; "-" means discharging.

Battery	
U	400.0V
I	-1.0A
P	-400W

d)On-grid
Here you can see the voltage, current, frequency, and power of the grid.

On-grid	
U	0.0V
I	0.0A
P	0.0W

e) EPS
Here you can see the voltage, current, frequency and power of the inverter when it is disconnected from the grid.

EPS	
U	0.0V
I	0.0A
P	0VA

f)Meter/CT
Here you can see the data showing the meter or the CT.

Meter/CT	
>Meter/CT-1	
Meter/CT-2	

Meter/CT	
>Meter/CT-1	
	4000w

Meter/CT	
>Meter/CT-2	
	4000w

➢ **History Yield**
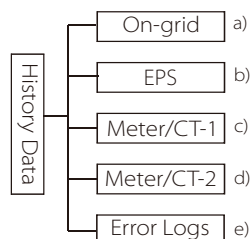
The history data contains five pieces of information: on-grid power of the inverter, EPS power generation, power of the meter/CT and error logs.

Press up and down to select, press Enter to confirm selection, and press ESC to return to the menu.

a)On-grid
Here is a record of the power capacity of the inverter connected to the grid today and the total.

On-grid	On-grid
Input Total	Input Today
0.0 kWh	0.0 kWh

On-grid	On-grid
Output Total	Output Today
0.0 kWh	0.0 kWh

b)EPS
Here you can see the EPS output of the inverter today and the total output.

EPS	EPS
Total:	Today：
0.0 kWh	0.0 kWh

c)Meter /CT-1Here you can see the inverter electricity sold, total electricity sold, electricity bought from the grid and total electricity bought on that day.

Meter CT-1
>FeedInToday:
00.0KWh

d)Meter /CT-2
Here you can see the total power output of the inverter for the day.

Meter CT-2
>Output Today:
00.0KWh

e) Error Logs
Here you can see the most recent six error messages.

Error logs
>No error

➢ **User Settings**

```
                    ┌─────────────────────┐
                    │     Date&Time       │ a)
                    ├─────────────────────┤
                    │     Language        │ b)
                    ├─────────────────────┤
  ┌──────────┐      │     EPS Mute        │ c)
  │   User   │      ├─────────────────────┤
  │ settings │──────│   Self-use Mode     │ d)
  └──────────┘      ├─────────────────────┤
                    │ Feed-in Priority Mode │ e)
                    ├─────────────────────┤
                    │    Backup Mode      │ f)
                    ├─────────────────────┤
                    │ Chrg & Dischrg Period │ g)
                    ├─────────────────────┤
                    │    Dry  Contact     │ h)
                    ├─────────────────────┤
                    │   User Password     │ l)
                    └─────────────────────┘
```
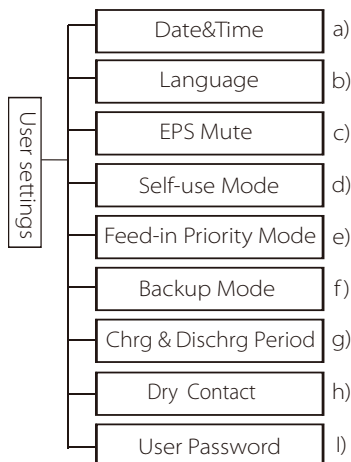
Here you can set the inverter time, language, working mode, charging and discharging time period and user password.

```
┌──────────────────────────────┐
│        User Setting          │
├──────────────────────────────┤
│  Date Time                   │
│  Language                    │
│  EPS Mode                    │
└──────────────────────────────┘
```

a) Date time
This interface is for users to set the system date and time.

```
┌──────────────────────────────┐
│         Date time            │
├──────────────────────────────┤
│      >2019 - 11 - 15         │
│          10 : 19             │
└──────────────────────────────┘
```

b) Language
This inverter provides multiple languages for customers to choose.

```
┌──────────────────────────────┐
│         Language             │
├──────────────────────────────┤
│  > Select:                   │
│         English              │
└──────────────────────────────┘
```

c)EPS Mute
Here you can choose whether the buzzer is turned on when the inverter is running in EPS mode. Select Yes, the buzzer mutes, select NO, EPS mode, the buzzer will sound once every 4s when the battery is fully charged, the closer the battery is to the empty state, the higher the buzzer will sound, to remind users to avoid battery loss.

```
┌──────────────────────────────┐
│          EPS Mute            │
├──────────────────────────────┤
│  > Mute:                     │
│               Yes            │
└──────────────────────────────┘
```

d) Self-use mode
In this mode, you can set the power reserve percentage of the minimum battery state, set whether the power can be taken from the mains side to charge the battery, and set the amount of power to charge the battery.
For example: set the reserved minimum SOC of the battery capacity to "10%", which means that when the battery has been discharged to 10% of the battery capacity, the battery is not allowed to continue to discharge; When Charge from grid is set to "Enable", the utility power is allowed to charge the battery; when set to "Disable", the utility power is not allowed to charge the battery;
Charge battery to is set to 90%, indicating that the mains is allowed to charge the battery at 90%.

```
┌──────────────────────────┐   ┌──────────────────────────┐
│      Self-use Mode       │   │      Self-use Mode       │
├──────────────────────────┤   ├──────────────────────────┤
│  > Min SOC:              │   │  > Charge from grid      │
│                   10%    │   │              Disable     │
└──────────────────────────┘   └──────────────────────────┘

┌──────────────────────────┐
│      Self-use Mode       │
├──────────────────────────┤
│  > Charge battery to     │
│              90%         │
└──────────────────────────┘
```

e)Feed-in Priority mode

In this mode, you can set the power reserve percentage of the minimum battery state, set whether the power can be taken from the mains side to charge the battery, and set the amount of power to charge the battery.

For example: set the reserved minimum SOC of the battery capacity to "10%", which means that when the battery has been discharged to 10% of the battery capacity, the battery is not allowed to continue to discharge;

Charge battery to is set to 90%, indicating that the mains is allowed to charge the battery at 90%.

```
┌─────────────────────────┐   ┌─────────────────────────┐
│   Feed-in Priority mode │   │   Feed-in Priorty mode  │
│ > Min SOC：              │   │ > Charge battery to     │
│                    10%  │   │                    90%  │
└─────────────────────────┘   └─────────────────────────┘
```

f) Backup mode

In this mode, you can set the power reserve percentage of the minimum battery state, set whether the power can be taken from the mains side to charge the battery, and set the amount of power to charge the battery.

For example: set the reserved minimum SOC of the battery capacity to "30%", which means that when the battery has been discharged to 10% of the battery capacity, the battery is not allowed to continue to discharge;

Charge battery to is set to 90%, indicating that the mains is allowed to charge the battery at 90%.

```
┌─────────────────────────┐   ┌─────────────────────────┐
│      Backup mode        │   │      Backup mode        │
│ > Min SOC：              │   │ > Charge battery to     │
│                    10%  │   │                    90%  │
└─────────────────────────┘   └─────────────────────────┘
```

g) Charge and discharge time

Here you can set the charge and discharge time period.

If two charging and discharging periods are needed, turn on the charging and discharging period 2 and set the period.

```
┌─────────────────────────┐   ┌─────────────────────────┐
│   Chrg&Dischrg Period   │   │     Charge Period       │
│  >    Charge Period     │   │  >    Charge Period     │
│      Start Time         │   │        End Time         │
│        00:00            │   │         00:00           │
└─────────────────────────┘   └─────────────────────────┘

┌─────────────────────────┐
│   Chrg&Dischrg Period2   │
│ > Function Control       │
│                          │
│        Enable            │
└─────────────────────────┘

┌─────────────────────────┐   ┌─────────────────────────┐
│    Char&Disc Period 2   │   │    Char&Disc Period 2   │
│ > Allowed Char Period    │   │ > Allowed Disc Period    │
│      Start Time          │   │        End Time          │
│        00:00             │   │         00:00            │
└─────────────────────────┘   └─────────────────────────┘
```

h) Dry Contact

When the user uses the inverter communication control external device function, you can enter here to set the parameters of the external response control. For the setting method, please refer to the user manual of the compatible external device.

If the user uses the inverter dry contacts to control external devices (such as heat pumps) through the Heatpump Controller, please refer to the Heatpump Controller quick installation manual to set the parameters here.

```
┌─────────────────────────────┐
│      Load Management        │
│                             │
│  >   Mode Select            │
│                             │
│                    Disable  │
└─────────────────────────────┘
```

h) User Password

The default password for the end user is "0000", where you can reset the new password and press the up/down key to increase or decrease the value. Press "Enter" to confirm the value and jump to the next digit .When all passwords have been entered and confirmed, press "OK" to set the password successfully.

```
┌─────────────────────────────┐
│       User Password         │
│                             │
│  >                          │
│                             │
│     0     0     0     0     │
└─────────────────────────────┘
```

➢ Advance settings

Advanced settings		
Safety Code	a)
Grid Parameters	b)
Charger	c)
PV Connection	d)
Export Control	e)
Meter/CT Settings	f)
Self Test	g)
Shadow Fix	h)
Modbus	i)
External ATS	j)
Power Factor	k)
Pu Function	l)
FVRT Function	m)
Power Limit	n)
AS4777 Setting	o)
DRM Function	p)
Main Breaker Limit	q)
Battery Heating	r)
EPS Setting	s)
Parallel Setting	t)
Reset	u)
ShutDown	v)
MicroGrid	w)
Advance Password	x)

All advanced settings can be set here, such as battery, grid, EPS(Off-grid), etc.. "Advanced" setting is generally customization and resetting for battery and grid . Each part has lower level parts.

Please contact your installer or factory and enter the installer password.

```
┌─────────────────────────────┐
│          Advanced           │
│                             │
│       Safety Code           │
│     > Grid Parameters       │
└─────────────────────────────┘
```

a) Safety Code

User can set safety standard according to different countries and grid tied. There are now 1 standards to choose from. (The here may be changes in the future, please refer to the screen display)

Item	Standard	Country
1	ARN 4105	German

Grid Parameters

OverVoltage_L1
UnderVoltage_L1
OverFreq_L1
UnderFreq_L1
Vac 10min Avg
OverVoltage_L2
UnderVoltage_L2
OverFreq_L2
UnderFreq_L2
OverFreq_L2
UnderFreq_L2
Tovp_L1
Tuvp_L1
Tofp_L1

Grid Parameters

Tovp_L2
Tuvp_L2
Tofp_L2
Tufp_Fast
Reconnection Time
Checking Time
W(Gra)
OFPL_StartPoint
OFPL_SetRate
OFPL_DelayTime
UFPL_StartPoint
UFPL_SetRate
UFPL_DelayTime

b) Grid Parameters

Here you can set the protection value of grid voltage and frequency. The default value is the specified value under the current safety regulations, and the user cannot change it .

The display content will be displayed according to the requirements of local laws and regulations, which are constantly increasing. Please refer to the contents displayed on the inverter screen.

Grid
>OverVoltage_L1
0.0V

Grid
>UnderVoltage_L1
0.0V

Grid
>OverFreq_L1
0.0Hz

Grid
>UnderFreq_L1
0.0Hz

Grid
>Vac 10min Avg
0.0V

Grid
>OverVoltage_L2
0.0V

c) Charger

Here the user can set the parameters of charger on this page, the inverter is compatible with both lithium battery. Users can set the charge & discharge parameters.
For the detailed parameters, please refer to below table.

Charger
Charge Max
Current   25A

Charger
Discharge Max
Current   25A

d) PV Connection

PV connection is divided into Comm Mode and Multi Mode. Comm Mode refers to connect a string of pvs to the two MPPT's in an inverter. Multi Mode refers to the inverter's two MPPT are independent of each other.

PV Connection
PV Mode!
> COMM <

PV Connection
PV Mode!
MULTI

e) Export Control

This feature allows the inverter to control the amount of electricity output to the grid.
The factory value is the default and can be changed by the user. The user value set by setup must be less than the maximum. If the user does not want to supply power to the grid, set it to 0.

Export Control
User value:
0W

f) Meter/CT Settings

The user needs to select the CT or electricity meter to connect the inverter here. Select the address of the meter. CT does not need to select the address. In the Meter/CT Settings box, there are two options (Negative and Positive) available for users. If the Meter is reversely connected, please click the Negative tab.

```
    CT/Meter Setting          CT/Meter Setting

    > Select                  > Meter 1Addr:
              Meter                       xxxxxxxx
```

g) Self Test (only for CEI 0-21)
The self test function allows users to test the following items. "Full test", "Ovp(59.S2) test"27. "Uvp (s1) test", "Uvp (27. s2) test", "Ofp (81> .S1) test", "Ufp (81 <.S1) test", "Ufp (81> .S2) test", "Ufp (81 <.S2) test", "Ovp10 (59. s1) test".
In the self-test interface, the user can select "all tests" or a single test item for testing.
Before testing, make sure that the inverter is connected to the grid.
All tests take about 6 minutes. And it will display "Success" and then "Delivery".
For a single test item, it takes about a few seconds or minutes.
Click "Test Report" to view the test results of all items.

```
              Self Test
           ALL Test
           Test report
           Uvp(27.S1) test
```

```
   >Ofp2(81>.S2)result          >Ovp2(59.S2)result
   Ft: 51.50Hz  Tt:1000ms       Vt: 264.5V  Tt: 300ms
   Fs:  0.00Hz  To:  998ms      Vs:    0.0V  To: 200ms
   F0:  0.00Hz     pass         V0:    0.0V        pass
```

```
   >Ofp2(27.S2)result           >Uvp2(27.S1)result
   Vt:  92.0V  Tt: 200ms        Vt: 195.5V  Tt: 400ms
   Vs:   0.0V  To: 196ms        Vs:    0.0V  To: 200ms
   V0:   0.2V     pass          V0:    0.0V        pass
```

```
   >Ofp2(81>S1)result           >Ufp2(81<.S1)result
   Ft:  50.50Hz  Tt: 100ms      Ft:  49.50Hz  Tt: 100ms
   Fs:   0.00Hz  To:  96ms      Fs:   0.00Hz  To:  98ms
   F0:   0.2Hz        pass      F0:   0.02Hz       pass
```

```
   >Ufp2(81<.S2)result          >Ovp10(59.S1)result
   Ft:  47.50Hz  Tt: 400ms      Vt: 253.0V  Tt: 600ms
   Fs:   0.00Hz  To: 3999ms     Vs:    0.0V  To: 598ms
   F0:   0.02Hz       pass      V0:    0.0V        pass
```

h) Shadow Fix
If the user's PV module is blocked by a fixed object, you can turn on the shadow tracking setting low, middle, and high here. If there is no object blocked, please choose to turn off this function.

```
              Shadow Fix

           > Func Select

                     >OFF<
```

i) Modbus
Here you select the baud rate of the external communication protocol, the default location of 19200 and 485 addresses.

```
    Modbus RTU/485            Modbus RTU/485
    Baud Rate:               RS485 Addr:
        115200

                                      1
```

j) External ATS
If you want Matebox installed, you need to turn this feature on here.

```
             External ATS

          > Select

                    Enable
```

k) Power Factor (applicable to specific countries, please refer to local grid requirements.)

There are 5 modes for selecting: Off , Under-Excited, Over-Excited, Curve, Q(u). (May be changed or added without notice)
User press up and down key to select, press enter key to confirm.

```
     Power Factor              Power Factor
    Mode Select               Mode Select

    >        Off        <      >    Over-Excited    <
```

```
     Power Factor              Power Factor
    Mode Select               Mode Select

    >   Under-Excited   <      >       Curve        <
```

```
┌─────────────────────────────────┐
│         Power Factor            │
│  Mode Select                    │
│                                 │
│   >          Q(u)          <    │
└─────────────────────────────────┘
```

Mode	Comment
Off	–
Over-Excited	PF value
Under-Excited	PF value
Curve	Upper limit
	Lower limit
	Power Upper
	Power Lower
	PFLockInPoint (CEI 0-21 only)
	PFLockOutPoint (CEI 0-21 only)
	3Tau
Q(u)	VoltRATIO 1 (AS4777.2 only)
	VoltRATIO 4 (AS4777.2 only)
	QURESPONSEV2 (AS4777.2 only)
	QURESPONSEV3 (AS4777.2 only)
	QURESPONSEV4 (AS4777.2 only)
	K Value (CEI 0-21 only)
Fixed Q Power	Q Power

● Reactive power control, reactive power standard curve cos φ = f(P)

For VDE ARN 4105, the curve cos = f(P) should refer to curve B. The set default value is shown in curve B.

For e8001, the curve cos = f(P) should be curve A. The set default value is shown in curve A.

For CEI 0-21, the default value of PFLockInPoint is 1.05. When Vac> 1.05Vn, Pac> 0.2 Pn, curve cos cp = f(P) corresponds to curve B.

curve A

curve B

curve C

● Reactive power control, reactive power standard curve Q= f(V)

V2s=1.10Vn
V1s=1.08Vn=QuVlowRate

V2i=0.90Vn
V2i=0.92Vn=QuVlowRate
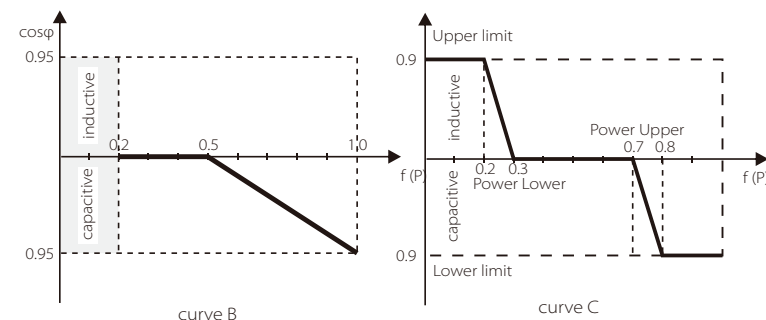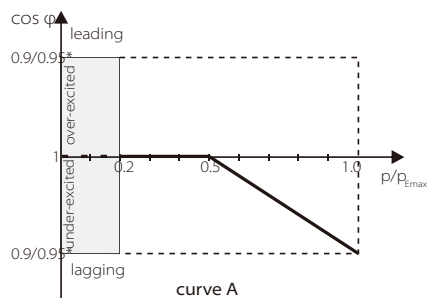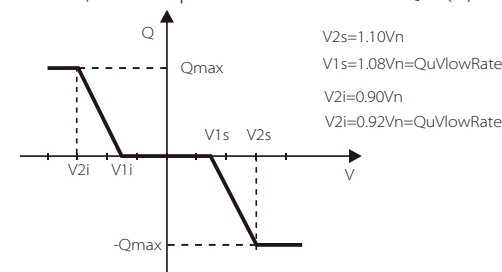
l) PU Function (applicable to specific countries, please refer to local grid requirements)

The PU function is a volt-watt response mode required by certain national standards such as AS4777.2. This function can control the active power of the inverter according to the grid voltage.
Selecting "Enable" means that this function is turned on and is the default value.
Select "Disable" to deactivate the function.

```
┌─────────────────────┐   ┌─────────────────────┐
│     PU Function     │   │     PU Function     │
│  >PuFunction        │   │  Response V2        │
│                     │   │                     │
│       Enable        │   │       220.0V        │
└─────────────────────┘   └─────────────────────┘

┌─────────────────────┐   ┌─────────────────────┐
│     PU Function     │   │     PU Function     │
│  Response V3        │   │  Response V4        │
│                     │   │                     │
│       250.0V        │   │       265.0V        │
└─────────────────────┘   └─────────────────────┘
```

m) FVRT Function(apply to 50549)
Here you can set the high and low enable or disable.

FVRT Function
Function Control
Disable   Enable

n) Power limit
Power limit function, the maximum power of the AC port can be set by percentage.

Power Limit
>Proportion
1.00

o) AS4777 Setting
It is the same as the function of Export Control, but it's only applicable to Australia and New Zealand.

AS4777 Setting	Export Control	Export Control
>Export Control General Control	>Soft Limit Enable	>Soft Limit Value 00000W

p) DRM function (applied to NZS4777.2)
The DRM function is a demand response method required by the NZS4777.2 standard and is only applicable to NZS4777.2.
The default value is "enable". Select "Disable" to disable this function.

DRM Function
>Function   Control
Enable

q) Main Breaker Limit
For power limit of smart meter or CT, the current must be set in line with the utility's contract requirements. In case of failure to set, it may cause a circuit breaker fault of main switchboard, adversely affecting the charging or discharging of battery.
Click Main Breaker Limit to enter the setting interface, and then choose the corresponding amperage according to the utility's requirements.

Main Breaker Limit
>Current
40A

r) Battery Heating
If the user needs the battery heating function, you can set it to turn on here, and set the time period that needs to be heated, and the two time periods can be set. (Only for batteries with heating function)

Battery Heating	Battery Heating	Battery Heating
>Func Select: Enable Disable	>Heating Period 1 Start Time 00:00	>Heating Period 1 End Time 00:00

Battery Heating	Battery Heating
>Heating Period 2 Start Time 00:00	>Heating Period 2 End Time 00:00

s) EPS Setting
User can set the frequency selection in the EPS mode here, and set the minimum capacity reserved for battery discharge.

EPS Setting	EPS Setting	EPS Setting
> Frequency 50Hz	>Frequency 60Hz	> Min SoC 10%

t) Parallel Setting (a function for parallel operation)
If a parallel operation is required, the user may set it with Parallel Setting.

Parallel Setting	Parallel Setting
> Status Free setting > Master <	> Status Free setting Free

u) Reset
Users can reset the reset error log, meter power, inverter power, and restore factory settings here.

Reset Error Log	Reset Meter/CT_1	Reset Meter/CT_2
>Reset Yes	>Reset Yes	>Reset Yes

Reset INV Energy	Factory Reset
>Reset Yes	>Reset Yes

v) ShutDown
ShutDown is an Enable Switch. If the user wanna use ShutDown, the Enable mode can be set.

```
            ShutDown
  ShutDown
            > Enable <
```
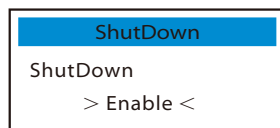
w) MicroGrid

If the user wanna use MicroGrid, the Enable mode can be set.

```
            MicroGrid
  >MicroGrid
            Enable
```
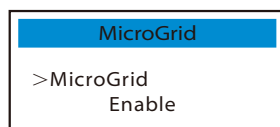
x) Advance Password

Here you can reset the advanced password. "Set OK!" is displayed on success, and "Setup Failed!" Will also displayed on failure.

```
  Advance Password        Advance Password

  Set OK!                 Setup failed
```

➢ **Manufactory Setting**

```
                ┌─ DIO Function      a)
  Manufactory
  settings
                └─ COM Port Select   b)
```
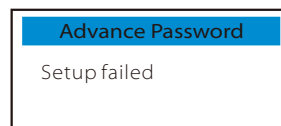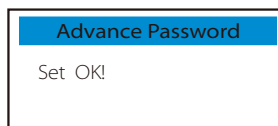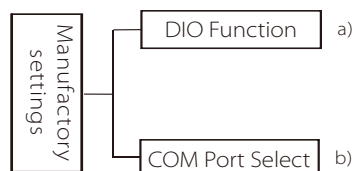
a) DIO Function

The reserved functions will be displayed after being added later.

```
            DIO Function
  >function
            Enable
```
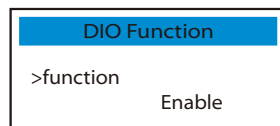
b) COM Port Select

Here external communication protocol or external indoor screen of the inverter can be set. When it is used for external communication protocol, it can choose RS485 or MOBUS. When it is used for external indoor screen, it can choose YES or NO.

```
  RS485/MOBUS             External LCD

  > RS485                 > Yes
    MOBUS                   No
```

➢ About

```
                    ┌─ Inverter SN
                    ├─ Register SN★
          Inverter ─┼─ DSP
                    ├─ ARM
                    ├─ On-grid Run Time
                    └─ EPS Run Time

                    ┌─ "BatBrand": BAK
                    ├─ Bat_M SN
                    ├─ Bat_PS1 SN
                    ├─ Bat_PS2 SN
  About ──  Battery ─┼─ Bat_PS3 SN
                    ├─ Bat_PS4 SN
                    ├─ BatteryM Version
                    └─ BatteryS Version

  Internal Code ─┬─ Inverter code
                 └─ BMS Code
```
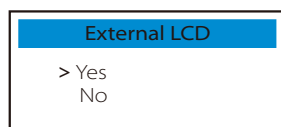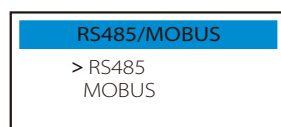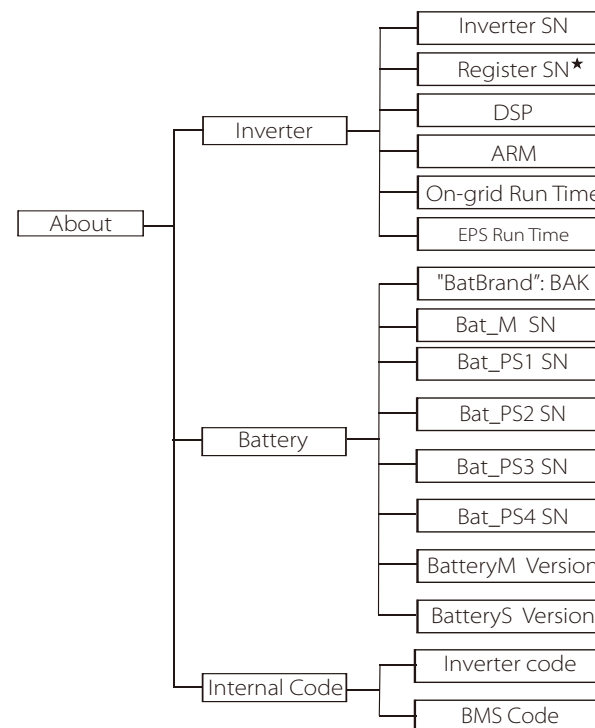
★ Register1 SN: Represents the serial number of external monitoring equipment, such as Mobile Wi-Fi, Mobile LAN.

a) About

Here you can see some basic information of the inverter and battery.
such as the inverter and battery SN number, software version number,
and system run time.

About
>Inverter
Battery

Inverter

Inverter
>Inverter SN
01234560123456

Inverter
>Register SN
SWNZJ23ZUR

Inverter
>DSP
2.07

Inverter
>ARM
1.03

Inverter
>EPS Runtime
20.0H

Inverter
>On-grid runtime
45.9H

Battery

Battery
>BatBrand:BAK

Battery
>Bat_M SN
6S012345012345

Battery
>Bat_PS1 SN
6S012345012345

Battery
>Bat_PS2 SN
6S012345012345

Battery
>Bat_PS3 SN
6S012345012345

Battery
>Bat_PS4 SN
6S012345012345

Battery
>BatteryM Version
2.01

Battery
>BatteryM Version
2.01

Internal Code

Internal Code
>Inverter code
01 00 01 xx

Internal Code
>BMS code

Internal Code
>BAT-M
2.01

Internal Code
>BAT-S1
1.01 50

Internal Code
>BAT-S2
1.01 50

•••

Internal Code
>BAT-S8
1.01 50

8 Troubleshooting

8.1 Troubleshooting

This section contains information and procedures for resolving possible problems with Uno-Hybrid K-Series, and provides you with troubleshooting tips to identify and solve most problems that may occur in Uno-Hybrid K-Series. This section will help you narrow down the source of any problems you may encounter. Please read the troubleshooting steps below.

Check the warning or fault information on the system control panel or the fault code on the inverter information panel. If a message is displayed, log it before doing anything further.

Try the solutions indicated in the table below.

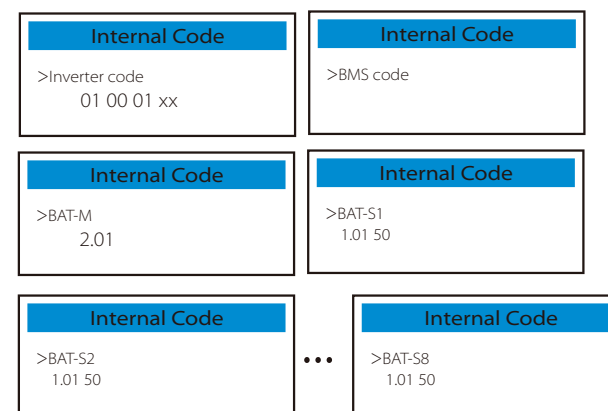| Number	Faults	Diagnosis and solution
IE 001	TZ Protect Fault	Overcurrent fault. Wait for a while to check if you're back to normal. Disconnect PV+ PV- and batteries, reconnect. Or ask for help from the installer if itcan not return to normal.
IE 002	Grid Lost Fult	•Check battery input voltage if it's within normal range •Or ask the installer for help.
IE 003	Grid Volt Fault	Power grid voltage overrun Wait a moment, if the utility returns to normal, the system will reconnect. • Please check if the grid voltage is within normal range. • Or ask the installer for help.
IE 004	Grid Freq Fault	Electricity frequency beyond range If the utility returns to normal, the system reconnects. Or ask the installer for help.
IE 005	PV Volt Fault	PV voltage out of range • Check the output voltage of the PV panel • Or ask the installer for help.
IE 006	Bus Volt Fault	Press the "ESC" key to restart the inverter. •Check that the PV input open circuit voltage is in the normal range. Or ask the installer for help.
IE 007	Bat Volt Fault	Battery voltage fault •Check battery input voltage if it's within normal range •Or ask the installer for help.
IE 008	AC10M Volt Fault	The grid voltage was out of range in the last 10 minutes. The system will return to normal if the grid returns to normal. Or ask the installer for help.

Number	Faults	Diagnosis and solution
IE 009	DCI OCP Fault	DCI overcurrent protection fault. Wait for a while to check if it's back to normal. Or ask the installer for help.
IE 010	DCV OVP Fault	DCV EPS(Off-grid) overvoltage protection failure. Wait for a while to check if it's back to normal. Or ask the installer for help.
IE 011	SW OCP Fault	Software Detection of Overcurrent Fault. • Wait for a while to check if it's back to normal. • Shut down photovoltaic, battery and grid connections • Or ask the installer for help.
IE 012	RC OCP Fault	Overcurrent protection fault. Check the impedance of DC input and AC output. Wait for a while to check if it's back to normal. Or ask the installer for help.
IE 013	Isolation Fault	Insulation Fault Please check the wire insulation for damage. Wait for a while to check if it's back to normal. Or ask the installer for help.
IE 014	Temp Over Fault	Temperature beyond limit Check if ambient temperature exceeds the limit. Or ask the installer for help.
IE 015	Bat Con Dir Fault	EPS(Off-grid)mode current is too strong. •Ensure that the load power is within the EPS(Off-grid)power range. •Check for any non-linear load connections on the EPS(Off-grid). •Move this load to check for recovery. •Or ask for help from the installer if itcan not return to normal.
IE 016	EPS(Off-grid) Overload Fault	EPS(Off-grid) over load fault. Shutdown the high-power device and press the "ESC" key to restart the inverter. •Or ask for help from the installer if it can not return to normal.
IE 017	OverLoad Fault	On-grid mode overload •Shutdownthehigh-power device and press the" ESC" key to restart the inverter. Or ask for help from the installer if it can not return to normal.
IE 018	BatPowerLow	• Close the high-power device and press the "ESC" key to restart the inverter. • Please charge the battery to a level higher than the protection capacity or protection voltage
IE 019	BMS Lost	Battery communication loss Check that the communication lines between the battery and the inverter are properly connected. Or ask for help from the installer if it can not return to normal.
IE 020	Fan Fault	Fan Fault Check for any foreign matter that may have caused the fan not to function properly. Or ask for help from the installer if it can not return to normal.
IE 021	Low Temp	Low temperature fault. Check if the ambient temperature is too low. Or ask for help from the installer if it can not return to normal.

Number	Faults	Diagnosis and solution
IE 022	ARM Unmatched	ARM software version mismatch Fault • update the software and press the ESC" key to restart the inverter. Or ask for help from the installer if itcan not return to normal .
IE 023	Other Device Fault	Other device Fault • update the software and press the ESC" key to restart the inverter. Or ask for help from the installer if itcan not return to normal .
IE 025	InterComms Error	Mgr InterCom Fault • Shut down photovoltaic, battery and grid, reconnect. Or ask for help from the installer if itcan not return to normal .

IE 025	InterComms Error	• Internal communication errors
		   Shut down photovoltaic, battery and grid connections.
		   Or ask for help from the installer if itcan not return to normal.

IE 026	Inv EEPROM Fault	Inverter EEPROM Fault. • Shut down photovoltaic, battery and grid, reconnect. • Or ask for help from the installer if it can not return to normal.

IE 027	RCD Fault	Fault of Residual Current Device
		   Check the impedance of DC input and AC output.
		   Disconnect PV + PV - and batteries, reconnect.
		   Or ask for help from the installer if itcan not return to normal.

IE 028	Grid Relay Fault	Electrical relay failure
		   Disconnect PV+ PV- grid and batteries and reconnect.
		   Or ask for help from the installer if itcan not return to normal.

IE 029	EPS(Off-grid) Relay Fault	EPS(Off-grid)relay failure
		   Disconnect PV+ ,PV-, grid and batteries and reconnect.
		   Or ask for help from the installer if itcan not return to normal.

IE 030	PV ConnDirFault	PVdirectionfault
		   Check if the PV input lines are connected in the opposite direction.
		   Or ask for help from the installer if itcannotreturntonormal.

IE 031	ChargerRelayFault	Charge relay fault
		   Press the ESC"key to restart the inverter.
		   Or ask for help from the installer if itcannotreturntonormal.

IE 032	EarthRaleyFault	EPS(Off-grid) earth relay fault
		   Press the ESC"key to restart the inverter.
		   Or ask for help from the installer if itcannotreturntonormal.

IE 101	PowerTypeFault	Power type fault
		   Upgrade the software and press the ESC"key to restart the inverter
		   Or ask for help from the installer if itcannotreturntonormal.

IE 102	Port OC Warning	EPS(Off-grid) port over current fault
		   Check that the EPS(Off-grid) load does not exceed the system requirements, and press the ESC" key to restart the inverter.
		   Or ask for help from the installer if itcannotreturntonormal.

Number	Faults	Diagnosis and solution

IE 103	Mgr EEPROM Fault	Manager EEEPROM Fault.
		   Shut down photovoltaic, battery and grid, reconnect.
		   Or seek help from the installer if it can not return to normal.

IE 104	DSPunmatched	DSP version error. • Check that the DSP1 version matches • Or seek help from the installer if it can not return to normal.

IE 105	NTC Sample Invalid	NTC invalid
		   Make sure the NTC is properly connected and the NTC is in good condition.
		   Please confirm that the installation environment is normal
		   Or ask for help from the installer, if itcannotreturnto normal.

IE 106	Bat Temp Low	Batterytemplow
		   Check the battery installation environment to ensure good heat dissipation.
		   Or ask for help from the installer, if itcannot returnto normal.

IE 107	Bat Temp High	Batterytemphigh
		   Check the battery installation environment to ensure good heat dissipation.
		   Or ask for help from the installer, if itcannotreturnto normal.

IE 109	Meter Fault	Meter error
		   Please check that the instrument is working properly.
		   Or seek help from the installer if it can not return to normal.

IE 110	BypassRaleyFault	Bypass relay fault
		   Press the ESC" key to restart the inverter.
		   Or ask for help from the installer if itcannotreturntonormal.

BE 001	BMS_External_Err	Battery Error - External Communication Fault Please contact the battery supplier.
BE 002	BMS_Internal_Err	Battery Error - Internal Communication Fault Please contact the battery supplier.
BE 003	BMS_OverVoltage	Over voltage in battery system Please contact the battery supplier.
BE 004	BMS_LowerVoltage	Low voltage in battery system Please contact the battery supplier.
BE 005	BMS_ChargeOCP	Battery fault - over charge fault • Please contact the battery supplier.
BE 006	BMS_DischargeOCP	Battery fault-discharge over current fault • Please contact the battery supplier.
BE 007	BMS_TemHigh	Over temperature in battery system Please contact the battery supplier.
BE 008	BMS_TempSensor Fault	Battery temperature sensor malfunction Please contact the battery supplier.

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Number	Faults	Diagnosis and solution
BE 009	BMS_CellImblance	Battery Unbalanced Failure • Please contact the battery supplier.
BE 010	BMS_Hardware Protect	Battery hardware protection failure Please contact the battery supplier.
BE 011	BMS_Circuit_Fault	Battery circuit failure •Restart the battery . Please contact the battery supplier.
BE 012	BMS_ISO_Fault	Battery insulation failure •Check that the battery is properly grounded and restart the battery. Please contact the battery supplier.
BE 013	BMS_VolSen_Fault	Battery voltage sensor fault Please contact the battery supplier.
BE 014	BMS_TemppSen_Fault	Temperature sensor failure •Restart the battery . Please contact the battery supplier.
BE 015	BMS_CurSensor Fault	Battery current sensor fault • Please contact the battery supplier.
BE 016	BMS_Relay Fault	Battery relay failure Please contact the battery supplier.
BE 017	BMS_Type_Unmatch	Battery type failure •Upgrade the battery BMS software. Please contact the battery supplier.
BE 018	BMS_Ver_ Unmatch	Battery version mismatch failure •Upgrade the battery BMS software. Please contact the battery supplier.
BE 019	BMS_MFR_ Unmatch	Batterymanufacturer did not match the fault •Upgrade the battery BMS software. Please contact the battery supplier.
BE 020	BMS_SW_ Unmatch	Battery hardware and software mismatch failure •Upgrade the battery BMS software. Please contact the battery supplier.
BE 021	BMS_M&S_ Unmatch	Battery master slave control mismatches •Upgrade the battery BMS software. Please contact the battery supplier.
BE 022	BMS_CR_ NORespond	Battery charging request does not respond to a fault •Upgrade the battery BMS software. Please contact the battery supplier.
BE 023	BMS_SW_ Protect	Battery slave software protection failure •Upgrade the battery BMS software. Please contact the battery supplier.
BE 024	BMS_536_Fault	Battery fault-discharge over current fault • Please contact the battery supplier.
BE 025	BMS_SelfcheckErr	Over temperature in battery system Please contact the battery supplier.

Number	Faults	Diagnosis and solution
BE 026	BMS_TempdiffErr	Battery temperature sensor malfunction Please contact the battery supplier.
BE 027	BMS_BreakFault	Battery Unbalanced Failure • Please contact the battery supplier.
BE 028	BMS_Flash_Fault	Battery hardware protection failure Please contact the battery supplier.
BE 029	BMS_Precharge_Fault	Battery precharge failure Please contact the battery supplier.
BE 030	BMS_AirSwitch_Fault	Battery air switch failure •Check that the battery breaker is off. • Please contact the battery supplier.

• If the information panel of your inverter does not show the fault light, check the following list to ensure the current installation status, correct operation.

------Is the inverter located in a clean, dry and well-ventilated place?
------Is the DC input circuit breaker open?
------Is the specification and length of the cable adequate?
------Are the input and output connections and wiring in good condition?
------Is the configuration set correct for your particular installation?

Please contact TommaTech customer service for further assistance. Please be prepared to describe the details of your system installation and provide the inverter serial number.

8.2 Routine Maintenance

Inverter do not require any maintenance or correction in most cases, but if the inverter often loses power due to overheating, this can be attributed to the following reason:

·heat sink behind the inverter is covered with dirt.
If necessary, clean the cooling heat sink with a soft dry cloth or brush.
Only trained and authorized professionals familiar with safety requirements can perform maintenance and maintenance work.

➤ Safety inspections

Safety checks should be conducted at least every 12 months, please contact the manufacturer to arrange for appropriate training, expertise, and practical experience in performing these tests.
(Please note that this action is not covered by warranty).
These data should be recorded in the device log. If the equipment is not running properly or any test fails, the equipment must be repaired for details of safety inspections, refer to section 2 of this manual for safety instructions and european commission instructions.

➤ Regular maintenance

Only qualifed people can do the following work.

In the process of using frequency converter, the manager should check and maintain the machine regularly. The specific operation is as follows.

1. Check whether the heat sink is covered with dirt, clean the inverter and absorb dust if necessary. This work should be performed from time to time.

2. Check whether the frequency converter indicator is normal, check whether the frequency converter button is normal, check whether the frequency converter display is normal.
This inspection should be conducted at least every 6 months.

3. Check the input and output lines for damage or aging. This inspection should be conducted at least every 6 months.

4. Cleaning and safety inspection of PV modules shouldbe carriedoutatleastonceevery6months.

9 Decommissioning

9.1 Disassemble of Inverter

· Remove DC input line and AC output line of inverter.
· Wait for at least 5 minutes to power off.
· Remove all cable connections from the inverter.
· Remove inverter from finger support the bracket.
· Remove the bracket if necessary.

9.2 Packing

Load the inverter into the original package if possible.

· If the original package can not be found, you can also use the following requirements of the carton packaging:
  Bearing capacity of more than 30kg.
  Easy to carry.
  Can completely seal the cover.

9.3 Storage and Transportation

Store the inverter in a dry, temperature -40℃~ 65℃ environment.
Pay attention to less than four inverter on each stack board during storage and transportation.

9.4 Waste Disposal

If it is necessary to scrap the inverter or other related parts, be sure to send the waste inverter and packaging materials to the designated location for recycling by the relevant department.

10 Disclaimer

The Uno-Hybrid K-Series hybrid inverters are transported, used and operated under limited condition, such as environmental, electrical etc. TommaTech shall not be liable to provide the service, technical support or compensation under conditions listed below, including but not limited to:

- Inverter is damaged or broken by force majeure (such as earthquake, flooding, thunderstorm, lighting, fire hazard, volcanic
- eruption etc).
- Inverter's warranty is expired and doesn't buy extended warranty.
- Can't provide the inverter's SN, warranty card or invoice.
- Inverter is damaged by man-made cause. Inverter is used or
- operated against any items in local policy.
  Inverter's installation, configuration, commissioning doesn't follow
- the requirements mentioned in this manual.
  Inverter is installed, refitted or operated in improper ways
- mentioned in this manual without authority from TommaTech.
  Inverter is installed, operated under improper environment or electrical condition mentioned in this manual without authority
- from TommaTech.
  Inverter is changed, updated or disassembled on hardware or
- software without authority from TommaTech.
- Obtain the communication protocol from other illegal channels.
- Build monitoring, control system without authority from TommaTech.
  Connect to other brands batteries without authority from TommaTech.

TommaTech will keep right to explain all the contents in this user manual.