# CONFIGURATION GUIDE

## Three-Phase Meter

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# Preface

## Table of adapted inverters

| NO. | Product Type | Model |
|---|---|---|
| 1 | Three-phase inverters (PV) | SOFAR 3-12KTL*-G3 |
| 2 | | SOFAR 15-24KTL*-G3 |
| 3 | | SOFAR 25-50KTL*-G3 |
| 4 | | SOFAR 60-80KTL*-G3 |
| 5 | | SOFAR 100-136KTL |
| 6 | Three-phase inverters (Energy Storage) | HYD 5-20KTL-3PH |
| 7 | | ME 5-20KTL-3PH |

## Scope of application

This product manual describes the installation, electrical connection, debugging, maintenance and troubleshooting of Three-Phase Meter.

## Versions of the manual

| Versions | Modify records | Time |
|---|---|---|
| V1.0 | First Edition Release | 2023.04.20 |
| | | |

# 1. Symbol interpretation

Read the safety precautions in this manual carefully. If ignored, serious injury or death may result.

## DANGER

**Non-observance will result in death or serious injury.**

• Follow the warnings in order to prevent death or serious injury!

## WARNING

**Non-observance may result in death or serious injury.**

• Follow the warnings in order to prevent serious injury!

## CAUTION

**Non-observance may result in minor injury.**

• Follow the warnings in order to prevent injury!

## ATTENTION

**Non-observance may result in property damage!**

• Follow the warnings in order to prevent damage to or destruction of the product.

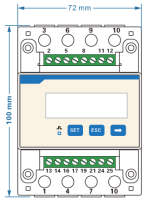
## NOTE

• Provides tips essential to the optimal operation of the product.

# 2. Introduction

This scheme is a 1-to-1 communication mode, and one set of electricity meter cannot correspond to multiple grid-connected inverters.

| Type | Model | Appearance | Reference Voltage | Frequency | Nominal Current | Adapted CT |
|---|---|---|---|---|---|---|
| Three-Phase Meter | DTSU666 |  | 3x230V/400V | 50Hz/60Hz | 1.5(6)A | HY94C5-200, 200A, 2KV, -30~75℃, Φ24 |
| | | | | | 5(80A) | No need for external CT |

# 3. Meter installation

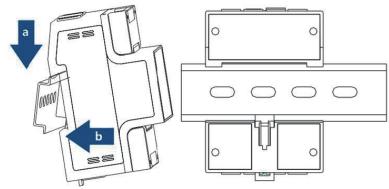
**DANGER**

·Please ensure installation with power off
·Please select the correct power connection
·Please connect in strict accordance with the wiring diagram

**ATTENTION**

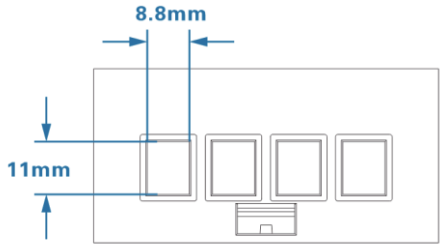
·Please install in a suitable meter size distribution cabinet

## 3.1 The meter is installed on the DIN35 standard guide rail.

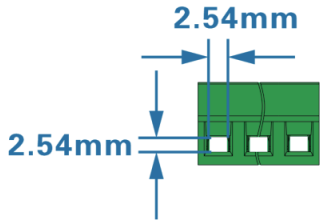


## 3.2 AC current Conductor Cross-sectional Area Range ≤16 mm2

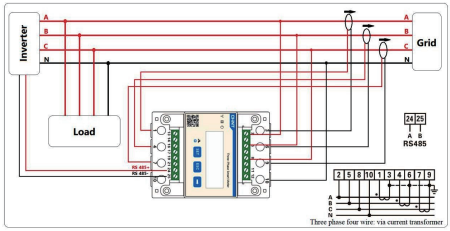



## 3.3 RS485 cable



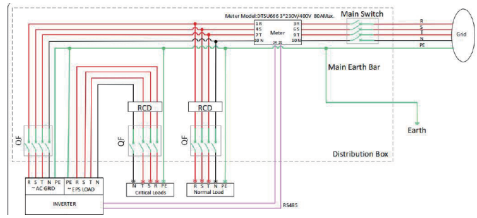

The meter communication is in RS485 communication mode, and the port rate can be set to 1200,2400,4800, and 9600 (default). The device communication address defaults to 01(please see instrument factory number or crystal display screen). For communication lines, shielded twisted pair wire shall be used, with copper net diameter not less than 0.5mm². When wiring, the communication line should be far away from strong cables or other strong electric fields, with a maximum transmission distance of 1200 meters.

## 3.4 Wiring diagram




Meter+CT




Only Meter

CT is installed between the load and the grid, CT with arrow with the arrow in the figure (arrow points to the grid). CT without an arrow, the direction of the arrow represents the direction of P1 (inverter) to P2 (power grid).

① Meter port 1: connected with A phase CT red line, and meter port 3 is connected with A phase CT black line.
② Meter port 2: connected to the phase A power grid power grid sampling.
③ Meter port 4: connected to B phase CT red line, and meter port 6 connects to B phase CT black line.
④ Meter port 5: connected to the B-phase power grid power grid sampling.
⑤ Meter port 7: connected to C phase CT red line, and meter port 9 is connected to C phase CT black line.
⑥ Meter port 8: connected to the phase C power grid power grid sampling.
⑦ Meter port 10: connected to the N-phase power grid power grid sampling.
⑧ Meter port 24: connected to inverter communication port RS485A (+), and meter port 25 is connected to inverter communication port RS485B (-).

# 4. Setting Feed-in limitation of the inverters

SOFAR Grid-tied Inverters have two button operation menus respectively.

## 4.1 Introduction of the button function (two buttons on the screen)

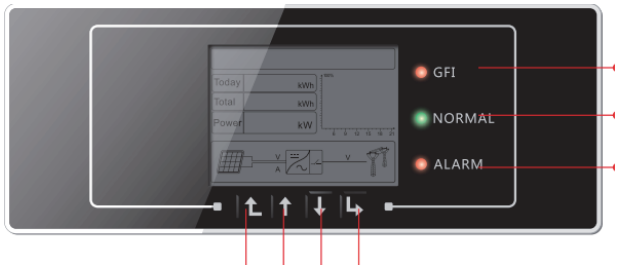
| Parameter setting (long press ↓ to enter the menu) | ---Long press ↓ to enter |
|---|---|
| Some settings require a password (the default password is 0001)<br><br>(The menu number varies slightly according to different models.) | 1. Set the system time |
| | 2. Clear up the power generation capacity |
| | 3. Clear the event record |
| | 4. Import the safety gauge parameters |
| | 5. Switch on machine control |
| | 6. Set up the total power generation capacity |
| | 7. Set up the correspondence address |
| | 8. Set the input mode |
| | 9. Set language |
| | 10. Set Feed-in limitation |
| | 11. Logical interface |
| | 12. Curve scan |
| | 13. PCC Select |
| | 14. Reflux Mode |

1. If you only need to monitor the power, you don't need the Feed-in limitation function:
10. Set Feed-in limitation ->Disable
2. If you need to connect the meter to realize the Feed-in limitation function:
10. Set Feed-in limitation →Reflux Enable→***KW
13. PCC select→ PCC Meter.
14. Reflux Mode→ CTR Total Power (The vector sum of three-phase current addition shall not exceed the Feed-in limitation power)
→ CTR Phase Power(Single phase minimum load + Feed-in limitation power /3)
→ CTR Selling Power(The current of output current (towards the power grid) shall not exceed the Feed-in limitation power)

When the three-phase load is balanced, the three modes have the same effect.

## 4.2 Introduction (four buttons on screen)




| Advanced setting (back to the menu) | ---Press the OK key to enter |
|---|---|
| Some settings require a password (the default password is 0715)<br><br>(The menu number varies slightly according to different models.) | 1. Set the system time |
| | 2. Clear up the power generation capacity |
| | 3. Clear the event record |
| | 4. Set up safety regulations for countries |
| | 5. Switch on machine control |
| | 6. Country setting |
| | 7. Settings, total power generation |
| | 8. Settings, correspondence address |
| | 9. Set up, input mode |
| | 10. Set up the language |
| | 11. Set the startup parameters |
| | 12. Set the safety gauge voltage |
| | 13. Set the safety regulation frequency |
| | 14. Set up the insulation impedance |
| | 15. Set the reactive power |
| | 16. Set up the active power and load reduction |
| | 17. Set Feed-in limitation |
| | 18.MPPT scan |
| | 19. Start-up time setting |
| | 20. Set Meter |
| | 21. Logical interface |
| | 22. Set the power ratio |

1. If you only need to monitor the power, you don't need the Feed-in limitation function:
20. Set Feed-in Limitation→Disable
2. If you need to connect the meter to realize the Feed-in limitation function:
17. Set Feed-in limitation→Enable
20. Feed-in Power->***KW

# 5. Check the installation results

## 5.1 Direction of current

For the transformer access type, turn off the load, the power on the meter shows the forward power (Imp), open the load to turn off the inverter, the reverse power (Exp) on the meter represents the correct position and direction of the transformer; the power factor is close to 1 represents the transformer and the voltage line phase, otherwise check the phase correspondence.

For the direct access type, turn off the load, the power on the meter shows the forward power (Imp), open the load and turn off the inverter, and the reverse power (Exp) displayed on the meter means that the meter wiring direction is correct.

## 5.2 RS485 Communications

Open the meter enabling function on the inverter. When RS485 has abnormal communication, the inverter will report an abnormal communication fault. When encountering this fault, please check the RS485 wiring, and try to change the positive and negative to solve it.

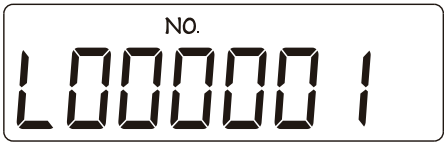
# 6. Display function

The positive pulse indicator flashes when the meter is in a normal operating state (on duty). If the indicator light is not flashing or not on for a long time, check that the meter is wired correctly.

## Three-Phase Meter

Each set of data is displayed for 5 seconds, and the display interface is shown below.

| No. | Content | Description |
|---|---|---|
| 01 |  | Combined Active Energy =10000.00kWh |
| 02 |  | Import Active Energy =10000.00kWh |
| 03 |  | Export Active Energy =2345.67kWh |
| 04 |  | Protocol: DT/L645-2007 address =000000000001 |
| 05 |  | |

| | | |
|---|---|---|
| 06 |  | Communication Modbus n1 states no valid bit and 1 stop bit 9600 stats Baud rate 9600bps 001 states Meter address |
| 07 |  | |
| 08 |  | A Phase Voltage =220.0V |
| 09 |  | B Phase Voltage =220.1V |
| 10 |  | C Phase Voltage =220.20V |
| 11 |  | A Phase Current =5.000A |

| No. | Content | Description |
|---|---|---|
| 12 |  | B Phase Current =5.001A |
| 13 |  | C Phase Current =5.002A |
| 14 |  | Combine Phase Active Power=3.291kW |
| 15 |  | A Phase Active Power =1.090kW |
| 16 |  | B Phase Active Power =1.101kW |
| 17 |  | C Phase Active Power =1.100kW |

| | | |
|---|---|---|
| 18 |  | Combined Phase<br>Power Factor PFt=0.500 |
| 19 |  | A Phase Power Factor<br>Pfa =1.000 |
| 20 |  | B Phase Power Factor<br>PFb =0.500 |
| 21 |  | C Phase Power Factor<br>PFc =-0.500 |

## ATTENTION

·Protocol: DL/T645-2007 display 4 and 5， Protocol: Modbus-RTU display 6 and 7.

·The above interface is used to show the meaning of the display content. Due to the different functions of the instrument, the display symbols will increase or decrease.

·When RS485 communicating, the telephone sign will flashes.

## 6.1 Programming operation

Key description: "SET" key means "OK", or "Cursor shift" (when entering the number), "ESC" key means "exit", "key" "means" add ", because only the key can only" add ", not" subtract ", when you add the number to the maximum value, the number will start from 0. Enter a password (default: 701).

The meter can match different proportions of transformers. Before use, the current ratio should be set according to the transformer ratio (such as 100A: 5A transformer, 20 current ratio). For this equipment, our company has adjusted the current ratio before shipment. Set up to refer to the following figure.

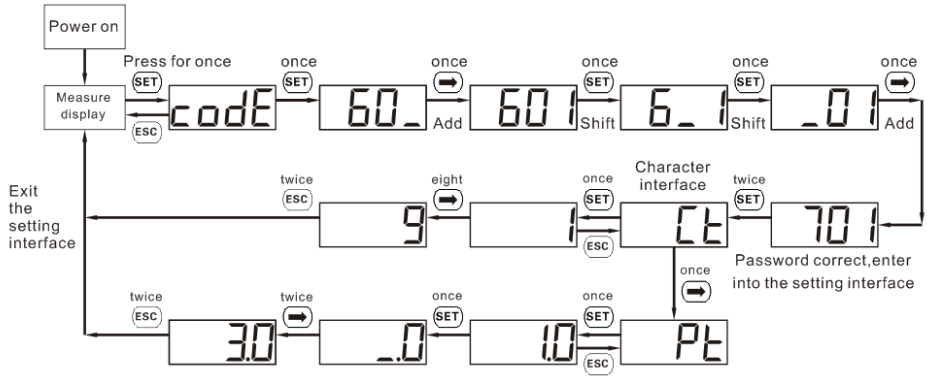



Figure: Setting examples for current and potential transformer ratio

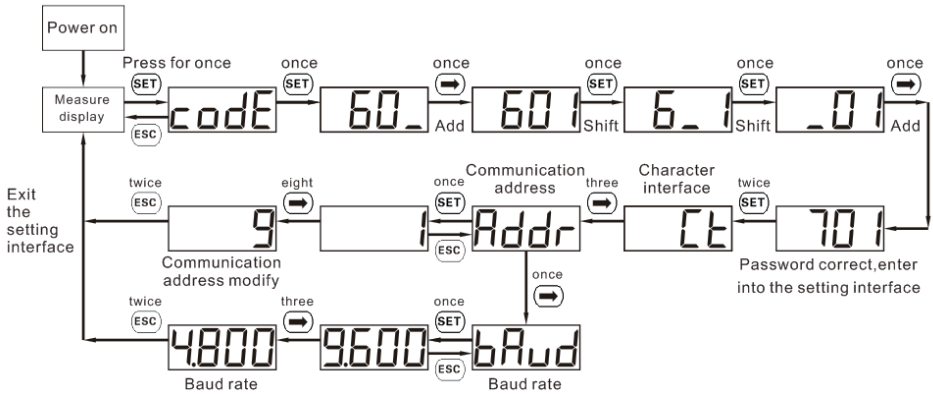



Figure: Setting examples for communication address and Baud Rate

# 7. Communication

Communication protocol: complied with the requirement of Modbus communication protocol. The following table is the common Modbus protocol address table.

**NOTE**

Modbus-RTU protocol read command is 03H, write command is 10H.

## 7.1 Modbus protocol address table

| Parameter address | Parameter code | Instructions of parameters | Data type | Data length Word | R/W property |
|---|---|---|---|---|---|
| **Keyboard parameters (specific parameters see the instructions of programming parameters, the actual value with (*) parameter= communication parameter value × 0.1)** | | | | | |
| 0000H | REV. | Version No. | 16bit with signal | 1 | R/W |
| 0001H | UCode | Programming code codE (1～9999) | 16bit with signal | 1 | R/W |
| 0002H | ClrE | Power reset CLr.E (1: energy clear) | 16bit with signal | 1 | R/W |
| 0003H | net | Network selection (0: three phase four wire,1: three phase three wire) | 16bit with signal | 1 | R/W |
| 0006H | IrAt | Current transformer rate IrAt (1～9999) | 16bit with signal | 1 | R/W |
| 0007H | UrAt | Voltage transformer rate UrAt (*) (1～9999 represents voltage ratio 0.1～999.9) | 16bit with signal | 1 | R/W |
| 000AH | Disp | Rotating display time(s)) | 16bit with signal | 1 | R/W |

| Parameter address | Parameter code | Instructions of parameters | Data type | Data length Word | R/W property |
|---|---|---|---|---|---|
| 000BH | B.LCD | Backlight time control(s) | 16bit with signal | 1 | R/W |
| 000CH | Endian | Single-precision floating point size end mode (0: ABCD;1: CDAB;2: BADC;3: DCBA;) | 16bit with signal | 1 | R/W |
| 002CH | Protocol | Protocol switching (1: DL/T645-2007;2: n.2;5: n.1;6: E.1;7:o.1) | 16bit with signal | 1 | R/W |
| 002DH | bAud | Communication baud rate bAud (0: 1200;1: 2400;2: 4800; 3:9600; 4:19200) | 16bit with signal | 1 | R/W |
| 002EH | Addr | Communication address Addr (1～247) | 16bit with signal | 1 | R/W |
| **Electricity data on the secondary side** | | | | | |
| 2000H | Uab | Three phase line voltage data, Unit V(×0.1V) | Single-precision floating point | 2 | R |
| 2002H | Ubc | | | | |
| 2004H | Uca | | | | |
| 2006H | Ua | Three phase voltage data, Unit V V(×0.1V) (Invalid for three phase) | Single-precision floating point | 2 | R |
| 2008H | Ub | | Single-precision floating point | 2 | R |
| 200AH | Uc | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 200CH | Ia | Three phase current data, Unit A(×0.001A) | Single-precision floating point | 2 | R |
| 200EH | Ib | | Single-precision floating point | 2 | R |
| 2010H | Ic | | Single-precision floating point | 2 | R |
| 2012H | Pt | Combined active power, Unit W(×0.1W) | Single-precision floating point | 2 | R |
| 2014H | Pa | A phase active power, Unit W(×0.1W) | Single-precision floating point | 2 | R |
| 2016H | Pb | B phase active power, Unit W(×0.1W) (Invalid for three phase three phase) | Single-precision floating point | 2 | R |
| 2018H | Pc | C phase active power, Unit W(×0.1W) | Single-precision floating point | 2 | R |
| 201AH | Qt | Combined reactive power, Unit var(×0.1var) | Single-precision floating point | 2 | R |
| 201CH | Qa | A phase reactive power, Unit var(×0.1var) | Single-precision floating point | 2 | R |
| 201EH | Qb | B phase reactive power, Unit var(×0.1var) (Invalid for three phase three phase) | Single-precision floating point | 2 | R |
| 2020H | Qc | C phase reactive power, Unit var(×0.1var) | Single-precision floating point | 2 | R |
| 202AH | PFt | Combined power factor (positive number: Inductive, negative number: capacitive) (×0.001) | Single-precision floating point | 2 | R |

| Parameter address | Parameter code | Instructions of parameters | Data type | Data length Word | R/W property |
|---|---|---|---|---|---|
| 202CH | PFa | A phase power factor (positive number: Inductive, negative number: capacitive) (Invalid for three phase three phase) (×0.001) | Single-precision floating point | 2 | R |
| 202EH | PFb | B phase power factor (positive number: inductive, negative number: capacitive) (Invalid for three phase three phase) (×0.001) | Single-precision floating point | 2 | R |
| 2030H | PFc | C phase power factor (positive number: inductive, negative number: capacitive) (Invalid for three phase three phase) (×0.001) | Single-precision floating point | 2 | R |
| 2044H | Freq | Frequency, Unit Hz(×0.01Hz) | Single-precision floating point | 2 | R |
| **Power secondary side data** | | | | | |
| 101EH | ImpEp | (current) positive total active energy | Single-precision floating point | 2 | R |
| 1028H | ExpEp | (current) negative total active energy | Single-precision floating point | 2 | R |
| 1032H | Q1Eq | (current) Total reactive energy of the first quadrant | Single-precision floating point | 2 | R |
| 103CH | Q2Eq | (current) Total reactive energy of the second quadrant | Single-precision floating point | 2 | R |

| | | | | | |
|---|---|---|---|---|---|
| 1046H | Q3Eq | （current）Total reactive energy of the third quadrant | Single-precision floating point | 2 | R |
| 1050H | Q4Eq | （current）Total reactive energy of the fourth quadrant | Single-precision floating point | 2 | R |

## NOTE

When the ratio of the voltage transformer is 1, the data of read voltage transformer ratio register UrAt is 10. When the ratio of voltage transformer is 1, ignore the above table (UrAt×0.1).

·Single-precision floating point adopts standard IEEE754 format, total 32 bit(4 word). The single-precision floating point mode is assumed to be ABCD (high type in the front, low byte behind).

·The table only give the regular correspondence address. If you need the primary data address and other addresses, you can call for the detailed communication protocol.

### 7.2 Read data copy

Assume the voltage ratio is 1.0, the current ratio is 20, single-precision floating point mode (0: ABCD), the example of read dada is as follows:

**Read A phase voltage Ua(2006H):**

Read command frame: 01 03 20 06 00 02 2F CA (hexadecimal, 01 is the table address, 03 is read command, 2006 is A phase voltage address, 0002 is single-precision floating point data length, 2PCA is CRC16 check code).

Return frame: 01 03 04 45 09 70 00 1A FD (01 is table address，03 is read command，04 is read register return data number, 45097000 is data(single-precision floating point))1APD is CRC16 check code)Ua measurement=0x45097000(single-precision floating point)×voltage ratio×0.1=2199(decimalist) × (10×0.1) × 0.1=219.9V.

**Read A phase current Ia(200CH)**:

Read command frame：01 03 20 0C 00 02 0F C8 (hexadecimal，01 is table address，03 is read command，200C is A phase current address,0002 is single-precision floating point data length, 0FC8 is CRC16 check code).

Return frame：01 03 04 45 9C 38 00 3C D1 (01 is table address，03 is read command，04 is read register return data number, 459C3800 is floating data，3CD1 is CRC16 check code)Ia measurement=0x459C3800(single precision floating point)×current ratio×0.001=4999(decimalist)×20×0.001=99.98A.

**Read current positive active total energy ImpEp (101EH)**:

Read command frame：01 03 10 1E 00 02 A0 CD (hexadecimal，01 is table address，03 is read command，101E is current positive total active energy address, 0002 is single-precision floating point data length，A0CD is CRC16 check code).

Return frame：01 03 04 3F F1 EB 85 28 87(01 is table address，03 is read command，04 is read register return data number，3FF1EB85 is floating data，2887 is CRC16 check code) ImpEp measurement=0x3FF1EB85(single-precision floating point) × current ratio × voltage ratio=1.89(decimalist)×20×(10×0.1)= 37.8kWH.

**Read current ratio Irat(0006H)**:

Write command frame：01 10 00 06 00 01 02 00 0A 26 31 (hexadecimal，01 is table address，10 is read command，0006 is current ratio address, 0001 is write register return data number，02 is write register data length, 000A is current ratio data (16-bit signed integer type)，2631 is CRC16 check code).

Return frame：01 10 00 06 00 01 E1 C8 (01 is table address，10 is read command，0006 is current ratio address，0001 is register number, E1C8 is CRC16 check code).

**Write Big/Little Endian setting (000CH)**:

Some PLC data type float follows the mode " high byte low address, low type high address" (single-precision floating point mode 3:DCBA). The following example shows how to change the single-precision floating point mode to 3: DCBA.

Write command frame:01 10 00 0C 00 01 02 00 03 E6 9D (hexadecimal，01 is table address，10 is read command，000C is current ratio address, 0001 is write register umber, 02 is write register data-length, 0003 is Big/Little Endian setting data (16 bit singed integer type)，E6 9D is CRC16 check code ).

Return frame：01 10 00 0C 00 01 C1 CA (01 is table address，10 is read command，000C is current ratio address, 0001 is register number, C1 CA is CRC16 check code).

# 8. Troubleshooting

| Problems | Reason | Troubleshooting |
|---|---|---|
| No display | 1. The meter wiring is incorrect.<br>2. The voltage supplied to the meter is abnormal. | 1. If the wiring is incorrect, please follow the correct wiring instruction (see wiring diagram).<br>2. If the power supply voltage is abnormal, please supply power according to the voltage range specification on Manuel.<br>3. If it is not the above problem, please contact the local supplier. |
| Current display 0 | CT current sampling is abnormal. | Check whether the CT wiring is correct and stable. |
| Significant difference between meter and real value | 1. Wrong connection, voltage and current are connected to wrong Pin.<br>2. CT positive and negative pole are connect correctly; Noted: please obverse the power of Pa, Pb, Pc, if have negative value that means abnormal (expect some special device). | 1. If connection is wrong, please refers to the correct connection according to wiring diagram.<br>2. If not above issue, please contact local supplier. |
| RS485 Communication Abnormal | 1. The RS485 communication cable is open, shorted, or connected reversely.<br>2. The address, baud rate, and data bit check digit of the instrument does not match the host.<br>3. The end of RS485 communication cable has not been matched with resistance (when the distance over than100 meters) | 1. If there is a problem with the communication cable, please replace the communication cable.<br>2. Set the address, baud rate and data bit check digit of the meter is same as host, then set the operation to be “parameter settings”.<br>3. If the communication distance is over than 150 meters, and the communication parameter settings are the same as the host computer, but cannot be communicated, then please lower the baud rate or add a resistance of 120Ω at the start terminal and ending terminal. |

# 9. Interface description

There are two interfaces respectively.

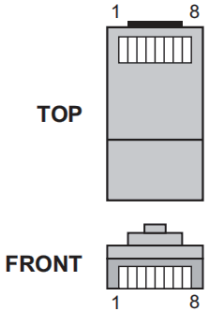
## 9.1 Type 1 (two screen buttons)

| NO | Definition | Function | Remarks |
|---|---|---|---|
| 1 | RS485A | RS485 Differential signal + | Wired monitoring or Inverter cascade monitoring |
| 2 | RS485A | RS485 Differential signal + | |
| 3 | RS485B | RS485 Differential signal- | |
| 4 | RS485B | RS485 Differential signal- | |
| 5 | Electricity Meter, RS485A | Meter RS485 Differential signal + | Cable connection meter |
| 6 | Electricity Meter, RS485B | Power Meter RS485 Differential signal- | Cable connection meter |
| 7 | GND.S | RS485 signal ground | / |
| 8 | DRM0 | Remote shutdown signal | DRMS joggle |
| 9 | DRM1/5 | / | |
| 10 | DRM2/6 | / | |
| 11 | DRM3/7 | / | |
| 12 | DRM4/8 | / | |
| 13 | GND.S | Communication to | / |
| 14-16 | empty PIN | N/A | N/A |

## 9.2 Type 2 (four screen buttons)

Network cable crystal head- -multi-function communication interface.




| NO | Colour | Function |
|---|---|---|
| 1 | White orange | RS485B- |
| 2 | Orange | RS485A+ |
| 3 | White green | RS485A+ |
| 4 | Blue | RS485A+ |
| 5 | White blue | RS485B- |
| 6 | Green | RS485B- |
| 7 | White brown | NC |
| 8 | Brown | NC |