# CT112&CT112A Series

## Solar Pump Inverter User Manual

# Content

Thank you for your using our solar pump inverter.

● Please read this manual thoroughly to ensure proper usage, keep this manual at an easily accessible place so that you can refer anytime as necessary.

# Safety Precautions

Please read this operation manual carefully before installation, operation, maintenance or inspection.

In this manual, the safety precautions were sorted to "WARNING" or "CAUTION".

| | | |
|---|---|---|
| ⚠ | WARNING | Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. |
| ⚠ | CAUTION | Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury and physical damage. This sign is also used for alert of any un-safety operation. |

In some cases, the contents of "CAUTION" could cause serious accident. Please follow these important precautions in any situation.

★**NOTE** is the necessary step to ensure the proper operation.

Warning Marks were shown on the front keypad of inverters.
Please follow these indications when using the inverter.

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**1. WARNING**

● **May cause injury or electric shock.**
● **Please follow the instructions in the manual before installation or operation.**
● **Disconnect all power line before opening front cover of unit. Wait at least 5 minute until DC Bus capacitors discharge.**
● **Use proper grounding techniques.**
● **Never connect AC power to output UVW terminals**

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**Before installation**

| |
|---|
|  Danger |
| ➢ Do not operate the inverter if there are any signs of water in the inverter when unpacking. |
| ➢ Do not operate the inverter if there is any damage or components loss to the inverter when unpacking. Otherwise, physical injury or damage to the devices may occur. |
| ➢ Do not touch the control terminals, PCB board or components inside the inverter with hands or body. |
|  Warning |
| ➢ Do not operate the inverter if the packing list is not consistent with the devices. |
| ➢ Do not operate the inverter if the information on the name plate is not consistent with your order. |

**2. Installation**

| |
|---|
|  Danger |
| ➢ Only qualified electricians are allowed to perform the installation, otherwise electric shock may occur. |
| ➢ Please install the inverter on fire-retardant materials and keep the inverter away from combustible materials, otherwise a fire may occur. |
| ➢ Please assemble and tighten the mounting screws of the inverter according to the regulations, otherwise the inverter may fall off. |
| ➢ Do not install the inverter in explosive atmospheres, otherwise an explosion may occur. |
|  Warning |

➤ Handle the inverter with care to prevent it falling off and thus leading to injury to your feet or the device.

➤ Keep the inverter away from the places with large vibrations, water drops and direct sunlight.

➤ When installing the inverter in the cabinet, especially two or more inverters are installed in a cabinet, please pay attention to the installation space and ventilation.

➤ Avoid screws, cables and other conductive matters falling into the inverter during installation.

## 3. Wiring


Danger

➤ Only qualified electricians are allowed to perform the wiring, otherwise electric shock or device damage may occur.

➤ Carry out wiring strictly in accordance with this manual, otherwise there is a risk of electric shock or device damage.

➤ Ensure any input power supply is disconnected before wiring, otherwise electric shock may occur.

➤ Please select all cables, circuit breakers and contactors meeting the national standards as required by the manual.

➤ The inverter must be grounded reliably, otherwise electric shock may occur.

➤ Carry out wiring strictly in accordance with the silk printing instructions and avoid connecting the input and output wires reversely, otherwise the damage to the devices may occur.


Warning

➤ Keep the terminal signal cables of the inverter away from the power cables as far as possible, or distribute the two categories of cables vertically-crossed if the distance is not far enough, otherwise it may cause signal interference.

➤ Ensure that all the screws are tightened when wiring, otherwise damage to the inverter may occur.

» The encoders and sensors should be applied with the shielded cables and the shielded layer should be grounded reliably.

## 4. Operation


Danger

➢ Confirm that the wiring is completed and correct and then cover the plate before power on.

➢ Do not open the plate after power on, otherwise electric shock may occur.

➢ Operate the inverter appropriately, otherwise damage to the inverter may occur.

➢ Non-professionals are not allowed to test the signals when the inverter is running. Otherwise, physical injury or damage to the devices may occur.

➢ Any arbitrary change in parameters of the inverter is prohibited, otherwise damage to the inverter may occur.


Warning

➢ Do not touch the fans and brake resistors, otherwise it may cause mechanical injury or burn.

➢ Do not start up or stop the inverter by power on or off, otherwise damage to the inverter may occur.

➢ Ensure that the circuit breakers or contactors at the output sides of the inverter are not in output state before switching, otherwise damage to the inverter may occur.

## 5. Others


Warning

➢    This inverter is not suitable for the occasions when the specifications exceed those specified in this manual. If you have special requirements, please contact our technical department.

➢    The inverter is equipped with surge suppressors inside, which can protect it from the lightning. It is necessary to mount external surge suppressors at the power input side of the inverter in high lightning incidence areas.

➢    When the conductors between the inverter and the motor exceed 100m, it is recommended to mount the output reactors to avoid overcurrent caused by excessive distributed capacitance.

➢    Do not mount the compensation capacitors and the surge absorbers at the output sides of the inverter. Otherwise, it may cause damage to the inverter due to overheating.

➢    Mounting the input or output reactors, special filters and magnetic rings at the input or output sides of the inverter can effectively reduce the noise and thus avoid interference to other devices.

➢    Non-professionals are not allowed to perform withstand voltage tests on the inverter, , otherwise damage to the inverter may occur.

➢    Deal with the devices as industrial effluent after scrapping. Burning is strictly prohibited, otherwise an explosion may occur.

➢    The cooling effect of the inverter is reduced and the electrolytic capacitor electrolyte is also volatile in high altitude areas, which will shorten the life of the inverter. Check the altitude of the actual usage site is below 1000m. If exceeds, reduce rated output current by 1% for every additional 100m.

# Chapter 1 System Introduction

## 1.1 Brief Introduction

A complete solar Pump system consist of solar array, pump and solar Pump inverter. The inverter can convert DC power from solar PV array to AC power to run pump motors.

Solar array, an aggregation of many solar modules connected in series and parallel, absorbs sunlight radiation and converts it into electrical energy, providing dynamical water for the whole system.

Inverter controls the system operation and adjust the output frequency in real-time according to the variation of sunlight intensity to realize the maximum power point tracking (MPPT).

Pump, drive by 3-phase or single phase AC motor, can draw water from the deep wells or rivers and lakes to pour into the storage tank or reservoir, or directly connect to the irrigation system, fountain system, etc.
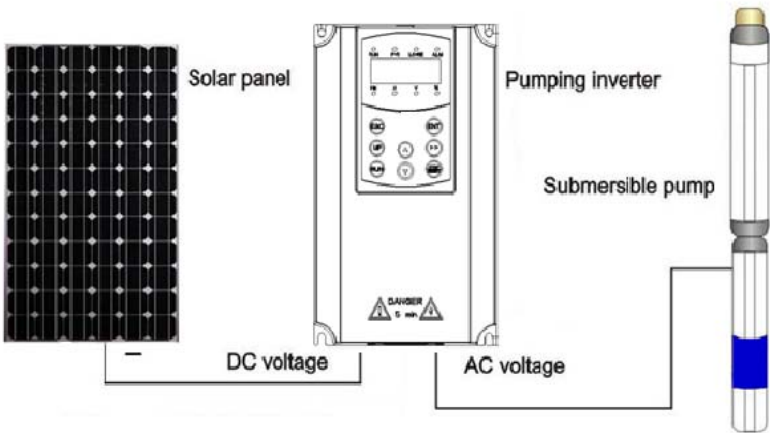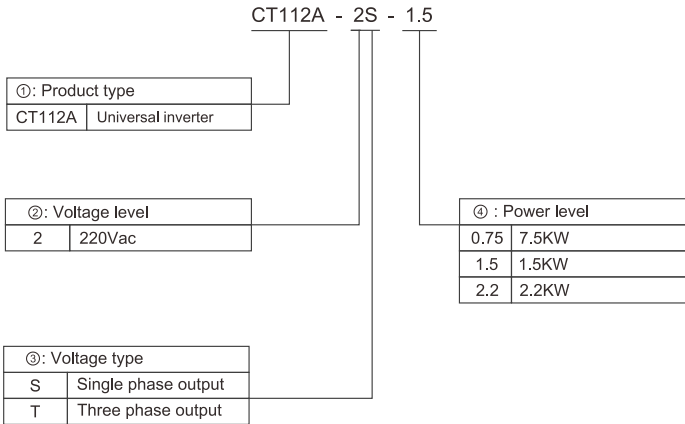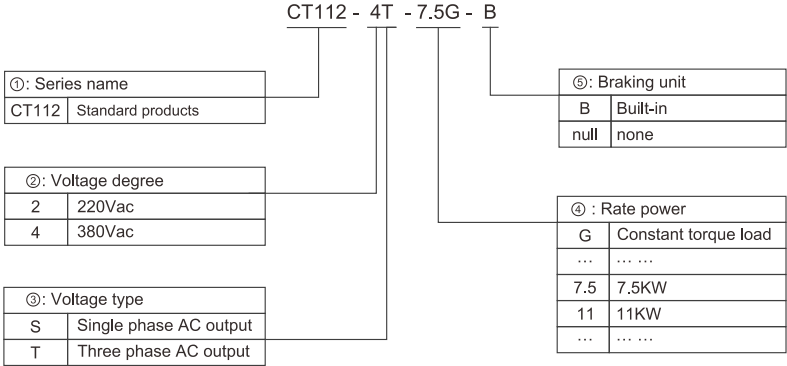


Figure 1 Structure of solar Pump system

# Chapter 2 Solar Pump Inverter

## 2.1 Model Description

Model numbers on name plate consist of numbers, symbols, and letters, to express its respective series, suitable power type, power level and other information.

CT112 - 4T - 7.5G - B

①: Series name

| CT112 | Standard products |
|-------|-------------------|

②: Voltage degree

| 2 | 220Vac |
|---|--------|
| 4 | 380Vac |

③: Voltage type

| S | Single phase AC output |
|---|------------------------|
| T | Three phase AC output  |

⑤: Braking unit

| B    | Built-in |
|------|----------|
| null | none     |

④ : Rate power

| G   | Constant torque load |
|-----|----------------------|
| …   | … …                  |
| 7.5 | 7.5KW                |
| 11  | 11KW                 |
| …   | … …                  |

CT112A - 2S - 1.5

①: Product type

| CT112A | Universal inverter |
|--------|--------------------|

②: Voltage level

| 2 | 220Vac |
|---|--------|

③: Voltage type

| S | Single phase output |
|---|---------------------|
| T | Three phase output  |

④ : Power level

| 0.75 | 7.5KW |
|------|-------|
| 1.5  | 1.5KW |
| 2.2  | 2.2KW |

## 2.2 Name plate

**MODEL:** CT112-4T-7.5G  CE

**POWER:** 7.5KW

**INPUT:** DC 300V~780V

**OUTPUT:** AC 3PH 0V~380V 0Hz~50Hz 18.5A

**S/N:**

**MODEL:** CT112A-2T-2.2  CE

**POWER:** 2.2KW

**DC Input:** Vmax.PV:        450V
MPPT Range : 100V~400V
Vmp Range :   100V~400V

**AC Input:** 1PH 220V~240V 47Hz~63Hz  24A

**AC Output:** 0V-220V 1Hz~400Hz 14A(1PH)/10A(3PH)

**S/N:**

## 2.3 Parameters

### 2.3.1 CT112 series parameters

| CT112 Solar Pump Inverter | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | Rated Power (KW) | DC Input VOC Voltage(V) | Recommend VOC Voltage (V) | Recommend MPPT Voltage (V) | Max. DC Input Current (A) | Rated Output Current(A) | Rated output Voltage(V) | Output Frequency (Hz) |
| CT112-2S-0.7G | 0.75 | 300~450 | 388~450 | 320~370 | 8.5 | 5.5 | 1PH 220 | 0-50/60 |
| CT112-2S-1.5G | 1.5 | 300~450 | 388~450 | 320~370 | 14 | 10 | 1PH 220 | 0-50/60 |
| CT112-2S-2.2G | 2.2 | 300~450 | 388~450 | 320~370 | 23 | 13.8 | 1PH 220 | 0-50/60 |
| CT112-2S-4.0G | 4 | 300~450 | 388~450 | 320~370 | 35 | 20 | 1 PH 220 | 0-50/60 |
| CT112-2T-0.7G | 0.75 | 200~450 | 388~450 | 320~370 | 8.5 | 4.5 | 3PH220 | 0-50/60 |
| CT112-2T-1.5G | 1.5 | 200~450 | 388~450 | 320~370 | 14 | 7.0 | 3PH220 | 0-50/60 |
| CT112-2T-2.2G | 2.2 | 200~450 | 388~450 | 320~370 | 23 | 10 | 3PH220 | 0-50/60 |
| CT112-2T-4.0G | 4 | 200~450 | 388~450 | 320~370 | 35 | 16 | 3PH220 | 0-50/60 |
| CT112-2T-5.5G | 5.5 | 200~450 | 388~450 | 320~370 | 50 | 20 | 3PH220 | 0-50/60 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CT112-4T-0.7G | 0.75 | 300~780 | 670~780 | 540~ 630 | 8.5 | 2.5 | 3PH380 | 0-50/60 |
| CT112-4T-1.5G | 1.5 | 300~780 | 670~780 | 540~630 | 8.5 | 3.7 | 3PH380 | 0-50/60 |
| CT112-4T-2.2G | 2.2 | 300~780 | 670~780 | 540~630 | 14 | 5.3 | 3PH380 | 0-50/60 |
| CT112-4T-4.0G | 4.0 | 300~780 | 670~780 | 540~630 | 23 | 9.5 | 3PH380 | 0-50/60 |
| CT112-4T-5.5G | 5.5 | 300~780 | 670~780 | 540~ 630 | 23 | 14.0 | 3PH380 | 0-50/60 |
| CT112-4T-7.5G | 7.5 | 300~780 | 670~780 | 540~630 | 35 | 18.5 | 3PH380 | 0-50/60 |
| CT112-4T-11G | 11 | 300~780 | 670~780 | 540~630 | 35 | 25.0 | 3PH380 | 0-50/60 |
| CT112-4T-15G | 15 | 300~780 | 670~780 | 540~630 | 50 | 32.0 | 3PH380 | 0-50/60 |
| CT112-4T-18.5G | 18.5 | 300~780 | 670~780 | 540~ 630 | 50 | 38.0 | 3PH380 | 0-50/60 |
| CT112-4T-22G | 22 | 300~780 | 670~780 | 540~630 | 75 | 45.0 | 3PH380 | 0-50/60 |
| CT112-4T-30G | 30 | 300~780 | 670~780 | 540~630 | 75 | 60.0 | 3PH380 | 0-50/60 |
| CT112-4T-37G | 37 | 300~780 | 670~780 | 540~630 | 100 | 75.0 | 3PH380 | 0-50/60 |
| CT112-4T-45G | 45 | 300~780 | 670~780 | 540~ 630 | 100 | 92.0 | 3PH380 | 0-50/60 |
| CT112-4T-55G | 55 | 300~780 | 670~780 | 540~630 | 150 | 115.0 | 3PH380 | 0-50/60 |
| CT112-4T-75G | 75 | 300~780 | 670~780 | 540~630 | 225 | 150.0 | 3PH380 | 0-50/60 |
| CT112-4T-90G | 90 | 300~780 | 670~780 | 540~630 | 300 | 180.0 | 3PH380 | 0-50/60 |
| CT112-4T-110G | 110 | 300~780 | 670~780 | 540~ 630 | 375 | 215.0 | 3PH380 | 0-50/60 |
| CT112-4T-132G | 132 | 300~780 | 670~780 | 540~ 630 | 450 | 260.0 | 3PH380 | 0-50/60 |

| | | | |
|---|---|---|---|
| CT112-2S-0.4G ~4.0G | Input specification | Maximum Input PV Voltage (PV Open-Circuit Voltage) | 450VDC |
| | | Recommended MPPT Voltage Range | 320~370VDC(Vmp) |
| | | Recommended Input Operation Voltage | 388~450VDC (VOC) |
| | Input specification (Grid or backup generator input) | Input voltage | 1PH 220V(-15%～30%) |
| | Output specification | Rated output voltage | 1PH 220V |
| | | Output frequency | 0～600.00Hz（default: 0～60.00Hz） |
| | Fault protection | Built-in Protection | Protection of light load, over-current, over-voltage, output phase-lose, under-load, under-voltage, short circuit, overheating, water pump run dry etc. |
| CT112-2T-0.7G ~5.5G | Input specification (PV Input) | Maximum Input PV Voltage (PV Open-circuit Voltage) | 450VDC |
| | | Recommended MPPT Voltage Range | 320~370VDC(Vmp) |
| | | Recommended Input Operation Voltage | 388~450VDC (VOC) |
| | Input specification (Grid or backup generator input) | Input voltage | 1PH 220V(-15%～30%) |

| | | | |
|---|---|---|---|
| | Output specification | Rated output voltage | 3PH 220V |
| | | Output frequency | 0~600.00Hz（default: 0~60.00Hz） |
| | Fault protection | Built-in Protection | Protection of light load, over-current, over-voltage, output phase-lose, under-load, under-voltage, short circuit, overheating, water pump run dry etc. |
| CT112-4T-0.7G ~132G | Input specification(PV Input) | Maximum Input DC Voltage (PV Open-circuit Voltage) | 780VDC |
| | | Recommended MPPT Voltage Range | 540~630VDC(Vmp) |
| | | Recommended Input Operation Voltage | 670~780VDC (VOC) |
| | Input specification(Grid or backup generator input) | Input Voltage Range | Three phase 380VAC(-15%~30%) |
| | Output specification | Rated output voltage | 3PH 380VAC |
| | | Output frequency | 0~600.00Hz（Default 0~60.00Hz） |
| | Fault protection | Built-in Protection | Protection of light load, over-current, over-voltage, output phase-lose, under-load, under-voltage, short circuit, overheating, water pump run dry etc. |
| Keypad display | LED display | Highlight LED digital tube displays the inverter information | |
| | LCD display | LCD displays inverter information | |
| Others | Application Site | No direct sunshine, no dust, corrosive gas, combustible gas, oil mist, steam, dripping or salinity etc. | |
| | Altitude | 0~2000m, Derated use above 1000m,per100m, the rated output current decrease 1%. | |
| | Environment Temperature | -10℃~50℃ (Environment Temperature be 40℃~50℃, please keep derated use.) | |
| | Humidity | 5~95%,non-condensation | |
| | Vibration | less than 5.9 m/s$^2$（0.6g） | |
| | Storage Temperature | -20℃~+70℃ | |
| | Efficiency | Rated Power Run≥93% | |
| | Installation | Wall or rail mounting | |
| | Cooling | Forced Air Cooling | |

### 2.3.2 CT112A series parameters

| CT112A Solar Pump Inverter | | | |
|---|---|---|---|
| CT112A-2S/2T-XXX | 0.7 | 1.5 | 2.2 |
| Rated output power(kW） | 0.7 | 1.5 | 2.2 |
| Max. DC input current（A） | 9 | 12 | 12 |
| Rated AC input current—AC type（A） | 9.3 | 15.7 | 24 |
| Rated output current（A） | 4.5 | 10 | 14 |

Note: Output current is defined as rated value at single 220V output voltage, and output current at three phase output is counted additionally according to the power.

| Mode | CT112A-2S-0.7 CT112A-2T-0.7 | CT112A-2S-1.5 CT112A-2T-1.5 | CT112A-2S-2.2 CT112A-2T-2.2 |
|---|---|---|---|
| **DC INPUT** | | | |
| Max. DC voltage(V) | 450 | | |
| Starting voltage(V) | 80 | 100 | |
| Min. Operation voltage(V) | 60 | 80 | |
| Recommended MPPT voltage(V) | 80~400 | 100~400 | |
| Input channel | One channel:MC4 | | |
| Max. DC input current(A) | 9 | 12 | |
| **Bypass AC input (model supports mains input)** | | | |
| Input voltage(Vac) | 220/230/240(1PH)（-15%~+10%） | | |
| Input frequency （Hz） | 47~63 | | |
| AC input terminal | 1P2L | | |
| **AC output** | | | |
| Rated （W） | 750 | 1500 | 2200 |
| Rated current（A） | 5.1（1PH） 4.2（3PH） | 10.2（1PH） 7.5（3PH） | 14（1PH） 10（3PH） |
| Output voltage(Vac) | 0~input voltage | | |
| Output wiring mode | 1P2L/2P3L/3P3L | | |
| Output frequency（Hz） | 1~400 | | |
| **Control performance** | | | |
| Control mode | MPPT | | |
| Motor type | Asynchronous motor | | |
| **Other parameters** | | | |
| Dimension（L*W*H）（mm) | 314*280*128 | | |
| Protection level | IP54 | | |
| Cooling mode | Natural cooling | | |
| HMI | External LED keypad | | |
| **Communication terminal** | | | |
| External communication | RS485/3 digital inputs | | |
| **Operation environment** | | | |
| Ambient temperature | -25℃~60℃（derate when the temperature is above 45℃） | | |
| Operation altitude | 3000 m（derate when the altitude is above 2000m） | | |
| Warranty | 18 months | | |

## 2.4 External Dimensions
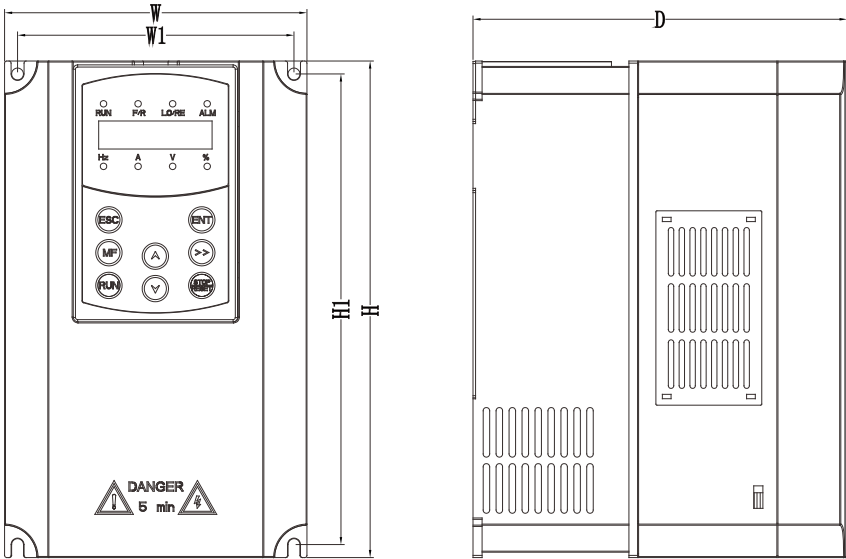## 2.4.1 CT112 series solar pump inverter
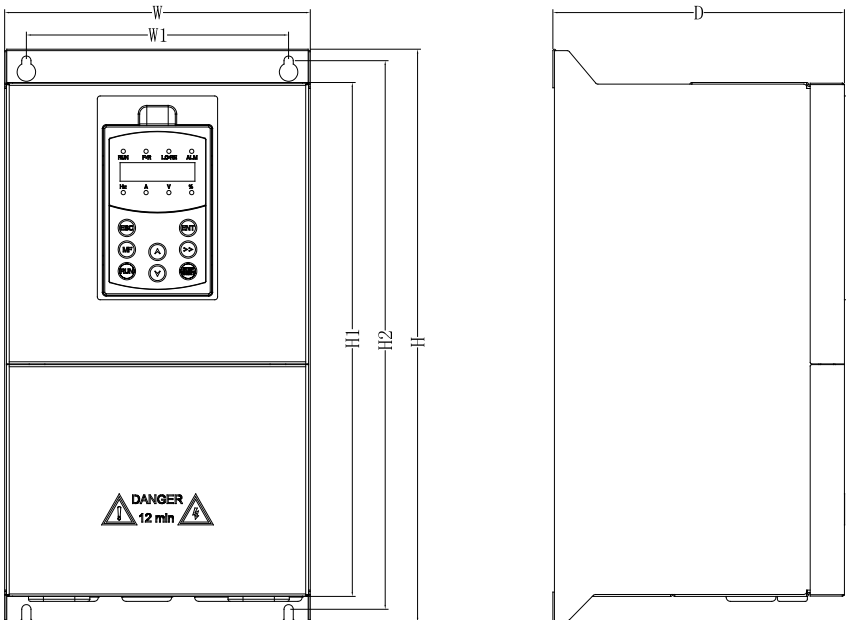


Figure 2 Dimensions (CT112:11KW and below)



Figure 3 Dimensions(CT112:15KW~132KW)

Table 1 Dimensions of CT112 series inverter

| Power(kw) | Size（mm） | | | | | | Installation | Weight | Shape of |
|---|---|---|---|---|---|---|---|---|---|
| | W | H | D | W1 | H1 | H2 | Hole(mm) | (kg) | Inverter |
| CT112-2S-0.4G | 126 | 186 | 155 | 115 | 175 | --- | 5 | 1.6 | C0 |
| CT112-2S-0.7G | | | | | | | | | |
| CT112-2S-1.5G | | | | | | | | | |
| CT112-2S-2.2G | | | | | | | | | |
| CT112-2S-4.0G | 140 | 230 | 172 | 128 | 218 | --- | 5.5 | 3.5 | C1 |
| CT112-2T-0.7G | 126 | 186 | 155 | 115 | 175 | --- | 5 | 1.6 | C0 |
| CT112-2T-1.5G | | | | | | | | | |
| CT112-2T-2.2G | | | | | | | | | |
| CT112-2T-4.0G | 140 | 230 | 172 | 128 | 218 | --- | 5.5 | 3.5 | C1 |
| CT112-2T-5.5G | 165 | 285 | 200 | 153 | 273 | --- | 5.5 | 5.5 | C2 |
| CT112-4T-0.7G | 126 | 186 | 155 | 115 | 175 | --- | 5 | 1.6 | C0 |
| CT112-4T-1.5G | | | | | | | | | |
| CT112-4T-2.2G | | | | | | | | | |
| CT112-4T-4.0G | 140 | 230 | 172 | 128 | 218 | --- | 5.5 | 3.5 | C1 |
| CT112-4T-5.5G | | | | | | | | | |
| CT112-4T-7.5G | 165 | 285 | 200 | 153 | 273 | --- | 5.5 | 5.2 | C2 |
| CT112-4T-11G | | | | | | | | | |
| CT112-4T-15G | 214 | 402 | 205 | 184 | 360 | 385 | 7 | 11.5 | C3 |
| CT112-4T-18.5G | | | | | | | | | |
| CT112-4T-22G | | | | | | | | | |
| CT112-4T-30G | 250 | 442 | 230 | 220 | 405 | 425 | 7 | 19 | C4 |
| CT112-4T-37G | | | | | | | | | |
| CT112-4T-45G | 299 | 602 | 276 | 240 | 540 | 580 | 9 | 30 | C5 |
| CT112-4T-55G | | | | | | | | | |
| CT112-4T-75G | 329 | 660 | 332 | 250 | 601 | 640 | 9 | 56 | C6 |
| CT112-4T-90G | | | | | | | | | |
| CT112-4T-110G | | | | | | | | | |
| CT112-4T-132G | | | | | | | | | |

### 2.4.2 CT112A solar pump inverter
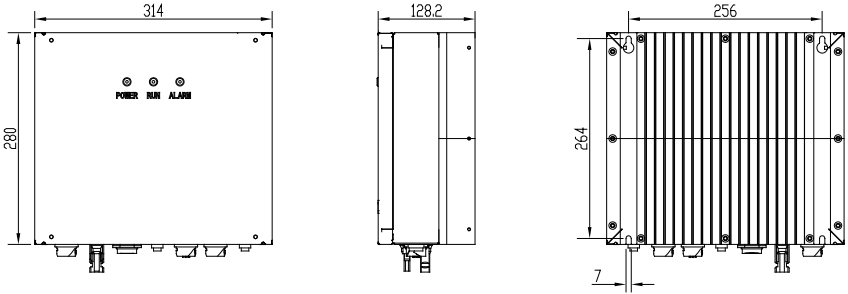


Figure 4 CT112A series dimension diagram

Table 2 Dimensions of CT112A series inverter

| Mode | Height H1 (mm) | Width W1 (mm) | Depth D (mm) | Height H2 (mm) | Width W2 (mm) | Installation hole |
|---|---|---|---|---|---|---|
| CT112A-2S/2T-0.7 | 280 | 314 | 128.2 | 264 | 256 | M6 |
| CT112A-2S/2T-1.5 | | | | | | |
| CT112A-2S/2T-2.2 | | | | | | |

# Chapter 3 System Collection Diagram

## 3.1 CT112 Series Main Circuit Terminals

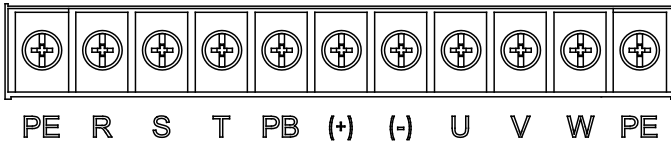### 3.1.1 Schematic Diagram for Connection of Main Circuit Terminals
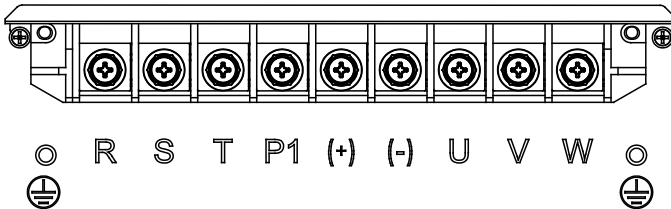①Connection diagram of main circuit for the inverter of 220v

| (+) | PB | (−) | L | N | / | U | V | W | PE |

②Connection diagram of main circuit for the inverter of 380v　0.7~22KW

| (+) | PB | (-) | R | S | T | U | V | W | PE |
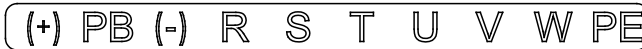
③Connection diagram of main circuit for the inverter of 380v 30~37KW

| PE | R | S | T | PB | (+) | (-) | U | V | W | PE |

④Connection diagram of main circuit for the inverter of 380v 45~55kw

| ○ ⏚ | R | S | T | P1 | (+) | (-) | U | V | W | ○ ⏚ |

⑤Connection diagram of main circuit for the inverter of 380v 75~132kw

R　S　T　(-)　(+)　P1

PE　U　V　W　PE
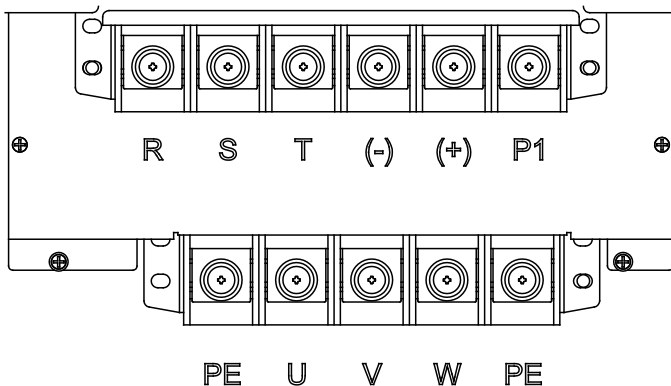
### 3.1.2 Instructions of Main Circuit Terminals of Inverter:

| Terminal | Description |
|---|---|
| R、S、T | Terminals of 3 phase AC input |
| (+)、(-) | Terminals of 2 phase DC input |
| (+)、PB | Spare terminals of external braking resistor |
| P1、(+) | Spare terminals of external DC reactor |
| (-) | Terminal of negative DC bus |
| U、V、W | Terminals of 3 phase AC output |
| ⏚ | Terminal of ground |


Danger

● the voltage class of CT112 series inverter 3phase power has 2 class: 220V, 380V, before connecting power, please make sure the power class on inverter nameplate is the same with the accessing power. Otherwise do not connect.
● DC bus (+) (-)terminal: take note that when power outrage there is residual voltage on DC bus P+ P- terminal, need to wait for a while until CHARGE LED off. Otherwise it is danger of electric shock.
●When selecting external brake unit, note the polarity of P= (+) and (-) cannot be reversely connected, otherwise it can result in damage or even fire.
Do not directly connect brake resistor to DC bus, it may result damage or fire.


Warning

1)Input power L,N or R, S T: the cable connection at input side of the inverter has no phase sequence requirement.
2)Brake unit cable length should not exceed 10m, twisted pair or double cable parallel wiring should be used.
3)Brake resistor connecting terminal (+) (-): confirm whether the device has built-in brake unit, its brake resistor connecting terminal is effect. The brake resistor selection table 2-4 recommending value and the wiring distance should less than 5M.
Other it can damage inverter.

4)External DC electric reactor connecting terminal P1 (+): for external DC reactor to 45Kw and above power inverter, get rid off the connector between P1 (+) terminal during installation, reactor is installed between the 2 terminal.

5)Inverter output side U V W: the output side cannot connect capacitor or surge absorber, otherwise it will affect inverter in self-protection frequently or damage.

6)In case the motor cable is too long, it may generate electrical resonance easily due to the impact of distributed capacitance, thus damaging the motor insulation or generating higher leakage current to invoke over current protection of the inverter. When the length of motor cables longer than 100 meters, it needs to install a AC output reactor.

7)Earth terminal PE:

This terminal shall be earthed reliably, with resistance of earth cable of less than 10Ω.Otherwise, it may cause fault or damage the inverter.

Do not share the earth terminal with zero line R,S,T terminal, otherwise it will result equipment abnormal running or damage.

### 3.1.3 Control Circuit Terminal

| Terminal | Description |
|---|---|
| DI1～DI5 | ON-OFF signal input, optical coupling with PW and COM. Input voltage range: 9~30V Input impedance: 3.3kΩ |
| PW | External power supply. +24V terminal is connected to PW terminal as default setting. If user need external power supply, disconnect +24V terminal with PW terminal and connect PW terminal with external power supply. |
| +24V | Provide output power supply of +24V. Maximum output current: 150mA |
| AIN | Analog input, 0~10V/ 0~20mA Input impedance: 10kΩ |
| GND | Common ground terminal of analog signal and +10V. GND must isolated from COM. |
| COM | Common ground terminal for digital signal and +24V (or external power supply). |
| +10V | Supply +10V for inverter. |
| PE | Ground Terminal. |
| T1A、T1B、T1C | RO1 relay output: RO1A—common; RO1B—NC; RO1C—NO. Contact capacity: AC 250V/3A, DC 30V/1A. |
| T2A、T2C | RO2 relay output: RO2A—common; RO2C—NO. Contact capacity: AC 250V/3A, DC 30V/1A. |

## 3.2 CT112A Main Circuit Terminals

## 3.2.1 Terminals description of CT112A
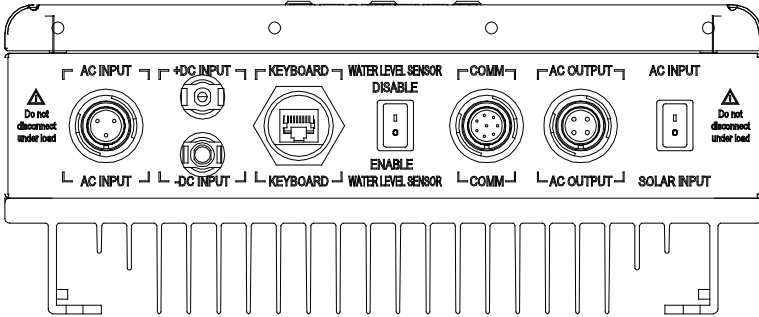


| No | Terminal name | Pin definition | |
|---|---|---|---|
| 1 | AC input terminal | 1. L | |
| | | 2. N | |
| | | 3. PE | |
| 2 | PV input terminal: negative | -DC INPUT | |
| 3 | PV input terminal: positive | +DC INPUT | |
| 4 | External keypad terminal | RJ45 | |
| 5 | Water level indication switch | 1. DI3 | Short circuit: water shortage. Direct short-circuit running without water level sensor |
| | | 2.COM | |
| 6 | Functional terminal | 1. 485+ | |
| | | 2. 485- | |
| | | 3. DI2 | Short circuit: full water |
| | | 4. DI3 | Short circuit: water shortage |
| | | 5. COM | |
| | | 6. AIN | Pressure sensor |
| | | 7. +24V | |
| | | 8. PE | |
| 7 | AC output terminal | 1. U | |
| | | 2. V | |
| | | 3. W | |
| | | 4. PE | |
| 8 | Solar/mains switch | 1. DI4 | Solar restrict switch, F05.04=42, DI4 setting |
| | | 2. COM | |

## 3.2.2 Power terminal description

3.2.2.1 Terminal 1 is AC input terminal, which is involved in the model supports mains input.

Live wire of the grid links with L, neutral wire links with N, earth wire links with PE.

(Attention: make sure PE is connected reliably for safety)

3.2.2.2 Terminal 7 is AC output terminal to connect water pump motor. When three phase motor is used, please connect the U, V, W three phase of the motor to U, V, W of solar Pump inverter, motor frame connects PE pin of terminal 7.

3.2.2.3 If single phase motor is used, there are two wiring methods according to different control modes.

(1) Single phase control method: connect the phase wire of single phase motor to U, W of the inverter terminal 7, motor frame connects PE pin of terminal 7. This method doesn't need to disassemble the motor starting capacitor, convenient wiring but bad starting performance makes that it's only applicable for some single-phase motors.

(2) Two phase control method: this method needs to disassemble starting capacitor and running capacitor (if existed) of the motor. Internal wiring of normal single-phase motor is as below, L1 is running winding, L2 is starting winding, C1 is running capacitor, C2 is starting capacitor. When the speed of motor is beyond 75% of rated speed, starting capacitor breaks off through centrifugal switch.
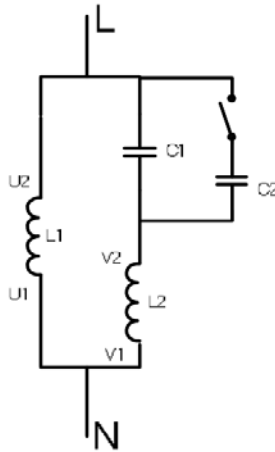


Disassemble the starting capacitor and running capacitor, internal wiring of single phase motor winding is as below:
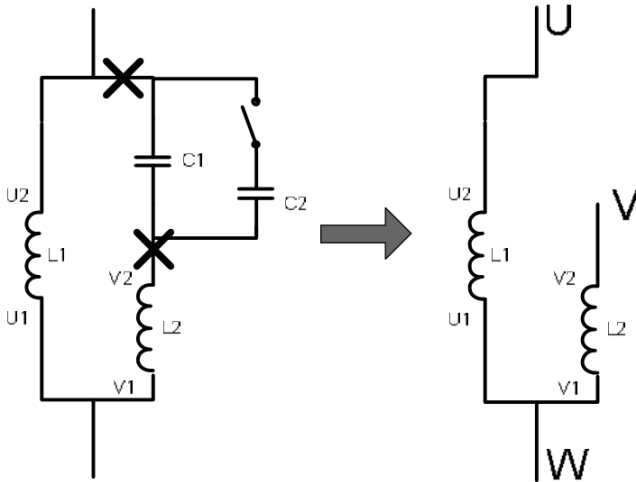
U1 and V1 are common ends of winding to connect with W phase output of solar Pump inverter, connect U2 end of running winding to U phase output and connect V2 of starting winding to V phase output.

After adjustment of positive way, change the running direction by F00.13 as same with positive/negative way control of three phase motor.

### 3.2.3 Communication terminal description

| Terminal name | Description | |
|---|---|---|
| PE | Grounding terminal | |
| COM | +24V common terminal | |
| DI2 | Switch input2 | 1. Internal impedance:3.3kΩ |
| DI3 | Switch input 3 | 2. Acceptable 12~30V voltage input<br>3. Single-way input terminal, only supports NPN wiring. |
| DI4 | Switch input 4 | 4. Maximum input frequency:1kHz<br>5.Programmable digital input terminal, user can set terminal functions by function codes.<br>6. DI1 short circuit with COM by default internally, no leading outwards. |
| 485+ | 485 communication interface,485 differential signal interface, standard | |
| 485- | 485 communication port connects in twisted pair cable or shielded cable. | |

## 3.3 Collection Diagram for Different Motor



Figure 4 Diagram of single phase inverter connection method (PV Input)
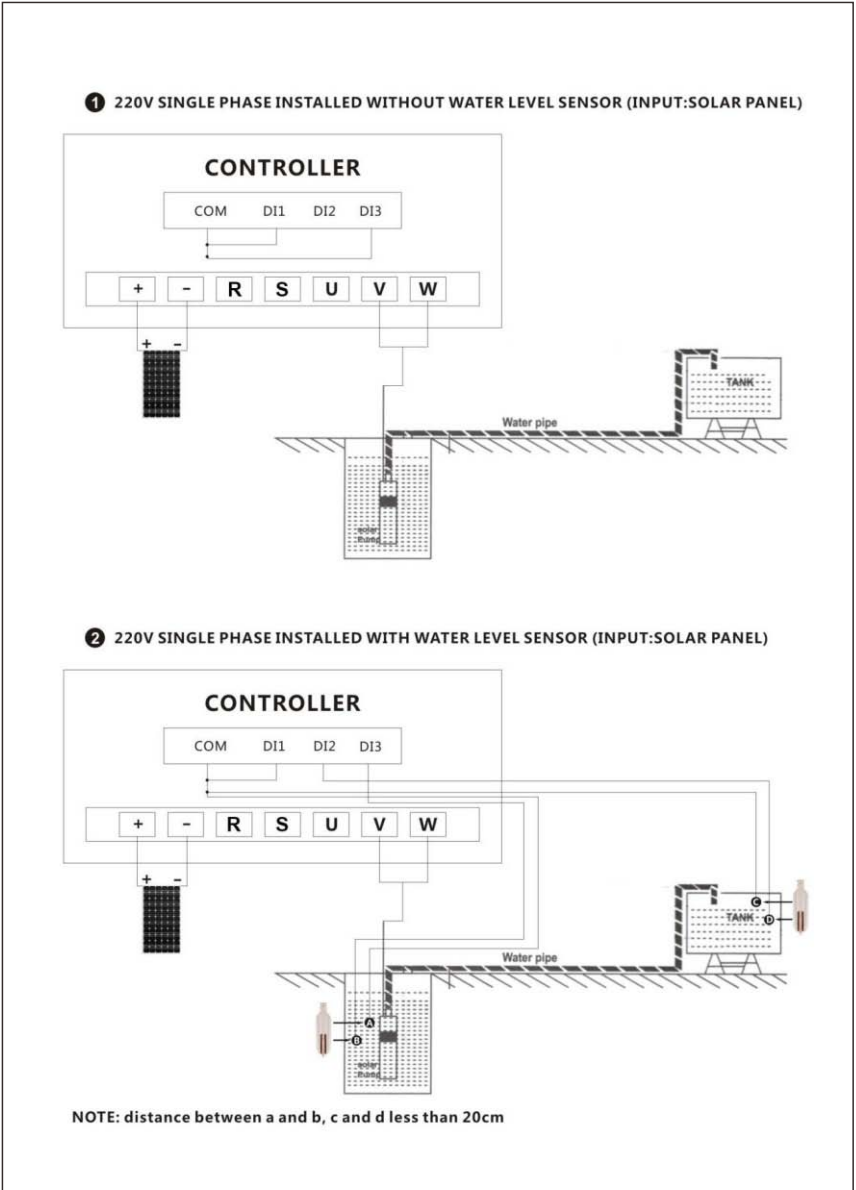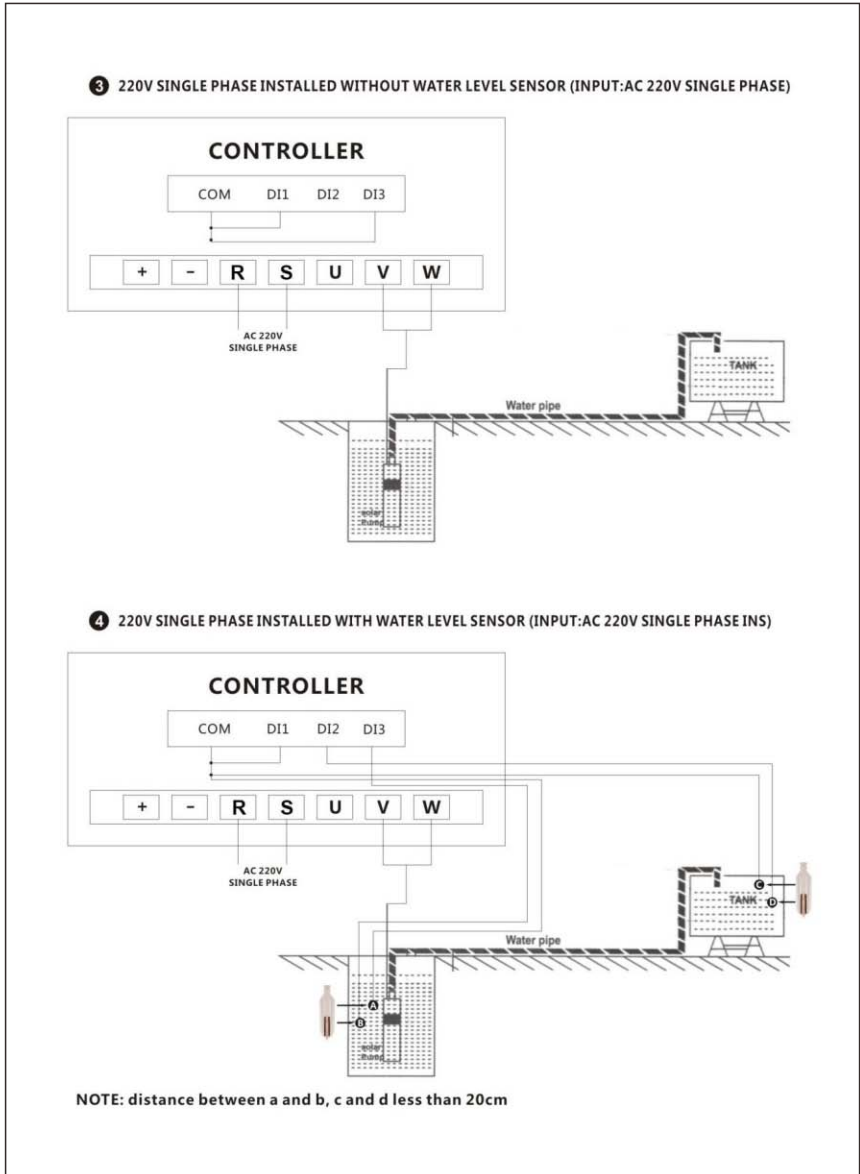
Figure 5 Diagram of single phase inverter connection method (AC Input)
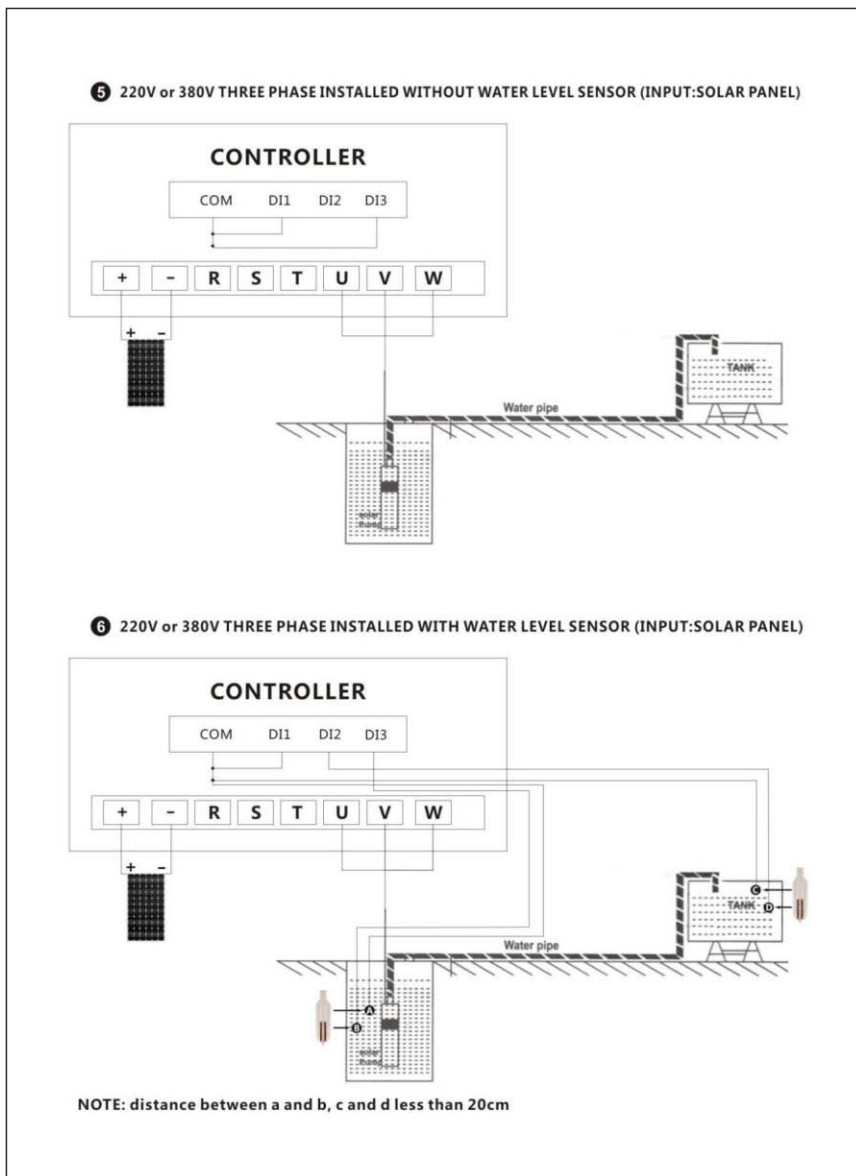
Figure 6 Diagram of 3phsae inverter connection method (PV Input)
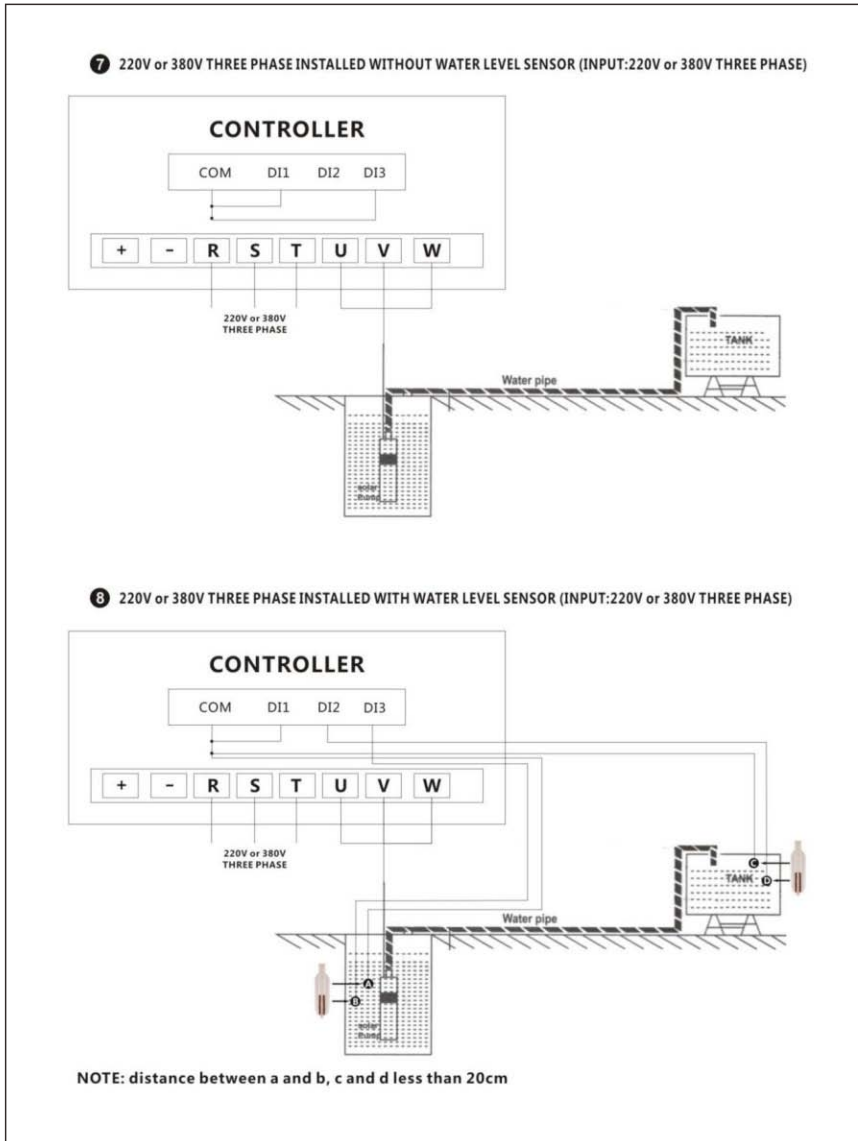
Figure 7 Diagram of 3phase inverter connection method (AC Input)

Note : If no need water level sensor of tank , please don't connect 'DI2' , 'COM' . If you want to operate inverter by hand , no run/stop automatically , please don't connect 'DI1' , 'COM'.

### 3.4 Keypad operation procedure

### 3.4.1 Keypad induction

The keypad consists of three parts for unit/status LEDs display, parameters display and

key operation as shown below.

### 3.4.2 Operation panel button and potentiometer function

| Button | Name | Description |
|--------|------|-------------|
| (ESC) | Programming Key | Entry or escape of first-level menu. |
| (ENT) | Enter Key | Progressively enter menu and confirm parameters. |
| (∧) | UP Increment Key | Progressively increase data or function codes. |
| (∨) | DOWN Decrement Key | Progressive decrease data or function codes. |
| (>>) | Shift Key | In parameter setting mode, press this button to select the bit to be modified. In other modes, cyclically displays parameters by right shift |
| (RUN) | Run Key | Start to run the inverter in keypad control mode. |
| (STOP RESET) | STOP/RESET Key | In running status, restricted by F05.05, can be used to stop the inverter. When fault alarm, can be used to reset the inverter without any restriction. |
| (MF) | Shortcut Key | Determined by Function Code F05.04<br>0: Jog operation<br>1: Switch between forward and reverse<br>2: Clear the UP/DOWN settings.<br>3: Quick debugging mode1 (by menu)<br>4: Quick debugging mode2 (bylatest order)<br>5: Quick debugging mode3 (by non-factory setting parameters) |

### 3.4.3 Indicator of Light Description

### 3.4.3.1 Unit Indicator Light Description

| Light | Unit indicator | Description |
|---|---|---|
| Status Light | RUN | Light on ：Run<br>Light off：Stop<br>Flash：Sleeping mode |
| | F/R | Light on：Reverse<br>Light off：Forward |
| | LO/RE | Light on：Communication control;<br>Light off：Keypad control<br>Flash：Terminal control |
| | ALM | Light on ：Fault alarm;<br>Light off：No fault alarm<br>Flash：Overload warning |
| Units Light | Hz | Frequency unit |
| | A | Current unit |
| | V | Voltage unit |
| | RPM | Rotating speed unit |
| | % | Percentage |

### 3.4.3.2 Keypad Display Description

| Displayed word | Meaning | Displayed word | Meaning | Displayed word | Meaning | Displayed word | Meaning |
|---|---|---|---|---|---|---|---|
| | 0 | | 1 | | 2 | | 3 |
| | 4 | | 5 | | 6 | | 7 |
| | 8 | | 9 | | A | | b |
| | C | | d | | E | | F |
| | H | | I | | L | | N |
| | o | | P | | S | | T |
| | U | | V | | . | | |

# Chapter 4 Function Parameters

## 4.1 The Basic Function Parameters

The symbols in the function code table are described as follows:

"○" means the value of this parameter can be modified in stop and running status of drive;

"☆″ means the value of this parameter cannot be modified when drive is running;

"●" means this parameter is a measured value that cannot be modified;

Default: The value when restored to factory default. Neither measured parameter value nor recorded value will be restored.

Setting Range: the scope of setting and display of parameters.

| Code | Name | Description | Factory Default | Attribute |
|------|------|-------------|-----------------|-----------|
| **F00 Group: Basic function** | | | | |
| F00.01 | Command Source Selection of Run/Start | 0：Operation Panel（LED off）<br>1：Terminal Panel（L/R on）<br>2：Computer Communications（L/R flash） | 1 | ○ |
| F00.03 | Maximum frequency | F00.04～600.00Hz | 50.00Hz | ☆ |
| F00.04 | Upper frequency limit | F00.05～F00.03 | 50.00Hz | ☆ |
| F00.05 | Lower frequency limit | 0.00 Hz～F00.04 | 0.00Hz | ☆ |
| F00.06 | Frequency setting | 0: keypad digital setting<br>1: analog AI1 setting | 0 | ○ |
| F00.11 | Acceleration Time 0 | 0.0s~3600.0s | Model Set | ○ |
| F00.12 | Deceleration Time 0 | 0.0s~3600.0s | Model Set | ○ |
| F00.13 | Run direction | 0: positive<br>1: reverse<br>2: prohibit reverse | 0 | ☆ |
| F00.14 | Carrier frequency set | 1.0~15.0kHz | Model Set | ○ |
| F00.17 | Inverter type | 0：G type<br>1：P type | 0 | ☆ |
| F00.18 | Restore parameters | 0：No action<br>1：Restore factory setting<br>2：Clear fault records | 0 | ☆ |
| **F01 Group: Start and stop control** | | | | |
| F01.01 | Starting frequency | 0.00~50.00Hz | 0.50Hz (CT112-4T)<br>20.00Hz (CT112-2S)<br>0.00Hz (CT112A) | ☆ |
| F01.02 | Hold time of starting frequency | 0.0~50.0s | 0.0s | ☆ |

| Code | Name | Description | Factory Default | Attri bute |
|------|------|-------------|-----------------|------------|
| F01.08 | Stop mode selection | 0：Deceleration stop<br>1：Freewheel stop | 0<br>(CT112)<br>1<br>(CT112A) | ○ |
| F01.13 | Dead time of FWD/REV | 0.0~3600.0s | 0.0s | ○ |
| F01.14 | Switch mode of FWD/REV | 0：switch after zero frequency<br>1：switch after starting frequency<br>2：delay and switch after stop speed | 0 | ○ |
| F01.15 | Stop speed | 0.00~100.00Hz | 10.00HZ<br>(CT112)<br>0.50 Hz<br>(CT112A) | ○ |
| F01.18 | Terminal Control When Power-On | 0：Terminal Command Enabled<br>1：Terminal Command Disabled | 1 | ○ |
| F01.19 | Actuation when running frequency is less than lower limit frequency | 0: run at lower limit frequency<br>1: stop<br>2: stand-by | 0 | ☆ |
| F01.20 | Delay time of dormancy wake up | 0.0~3600.0s | 0.0s | ☆ |
| F01.21 | Restart when Power-off | 0：Forbid to Restart<br>1：Allow to restart | 1 | ○ |
| F01.22 | Waiting time for restart after power-off | 0.0~3600.0s | 60.0s | ○ |
| F01.23 | Delay time of start | 0.0~60.0s | 60.0s | ○ |
| F01.24 | Wait Time of Restart When Power-off | 0.0~100.0s | 0.0s | ○ |
| **F02 Group Motor parameter** | | | | |
| F02.00 | Motor1 type | 0：Asynchronous motor | 0 | ● |
| F02.01 | Motor 1 Rated Power | 0.1kW~3000.0kW | Model Set | ☆ |
| F02.02 | Motor 1 Rated Frequency | 0.00Hz~F00.03 | 50.00Hz | ☆ |
| F02.03 | Motor 1 Rated Rotational Speed | 1RPM~36000RPM | Model Set | ☆ |
| F02.04 | Motor 1 Rated Voltage | 0V~1200V | Model Set | ☆ |
| F02.05 | Motor 1 Rated Current | 0.8A~6000.0A | Model Set | ☆ |
| F02.06 | Stator resistance of asynchronous motor | 0.001~65.535Ω | Model Set | ○ |
| F02.07 | Rotor resistance of asynchronous motor | 0.001~65.535Ω | Model Set | ○ |
| F02.08 | Inductance of asynchronous motor | 0.1~6553.5mH | Model Set | ○ |
| F02.09 | Mutual inductance of asynchronous motor | 0.1~6553.5mH | Model Set | ○ |
| F02.10 | Non-load current of asynchronous motor | 0.1~6553.5A | Model Set | ○ |

| Code | Name | Description | Factory Default | Attribute |
|------|------|-------------|-----------------|-----------|
| F02.26 | Motor overload protection | 0: no protection<br>1: ordinary motor(with low speed compensation)<br>2: variable frequency motor(without low speed compensation) | 2 | ☆ |
| F02.27 | Motor overload protection factor | 20.0~120.0% | 100.0% | ○ |
| **F03 Group: Reserved** | | | | |
| **F04 Group: V/F control** | | | | |
| F04.00 | V/F curve | 0: straight line V/F curve<br>1: multi-dots V/F curve<br>2: $1.3^{th}$ power low torque V/F curve<br>3: $1.7^{th}$ power low torque V/F curve<br>4: $2.0^{nd}$ power low torque V/F curve<br>5: V/F separated curve | 4 | ☆ |
| F04.01 | Motor 1 Torque Boost | 0.0%   (automatic)0.1%~10.0% | 1.0% | ○ |
| F04.02 | Motor 1 Torque Boost to Stop | 0.0%~50.0% | 20.0% | ○ |
| F04.03 | V/F frequency 1 | 0.00Hz～F04.05 | 0.00Hz | ○ |
| F04.04 | V/F voltage 1 | 0.0%～110.0% (motor rated voltage) | 00.0% | ○ |
| F04.05 | V/F frequency 2 | F04.03～F04.07 | 00.00Hz | ○ |
| F04.06 | V/F voltage 2 | 0.0%～110.0% (motor rated voltage) | 00.0% | ○ |
| F04.07 | V/F frequency 3 | F04.05～F02.02 (motor rated frequency) | 00.00Hz | ○ |
| F04.08 | V/F voltage 3 | 0.0%～110.0% (motor rated voltage) | 00.0% | ○ |
| F04.09 | Slip compensation gain | 0.0～200.0% | 100.0% | ○ |
| F04.10 | Low frequency surge suppression factor | 00～100 | 10 | ○ |
| F04.11 | High frequency surge suppression factor | 00～100 | 10 | ○ |
| F04.12 | Frequency threshold of surge suppression | 0.00Hz～F00.03 (Max. frequency) | 30.00 Hz | ○ |
| F04.27 | Voltage setting | 0: Keypad setting<br>1: AI1 voltage setting<br>2~10:Reserved | 0 | ○ |
| F04.28 | Keypad setting voltage | 0.0%～100.0% | 100.0% | ○ |
| F04.29 | Voltage ACC time | 0.0s～3600.0s | 5.0s | ○ |
| F04.30 | Voltage DEC time | 0.0s～3600.0s | 5.0s | ○ |
| F04.31 | Max. V/F separated voltage | F04.32～100.0% | 100.0% | ☆ |
| F04.32 | Min. V/F separated voltage | 0.0%～F04.31 | 0.0% | ☆ |

| Code | Name | Description | Factory Default | Attribute |
|------|------|-------------|-----------------|-----------|
| F04.33 | Weak magnetic coefficient of constant power zone | 1.00~1.30 | 1.00 | ○ |
| **F05 Group: Input terminal** | | | | |
| F05.01 | Terminal DI1 Function Selection | 0: disabled<br>1: forward run | 1 | ☆ |
| F05.02 | Terminal DI2 Function Selection | 2: reverse running<br>3: three-wire running | 43 | ☆ |
| F05.03 | Terminal DI3 Function Selection | 4: forward jogging<br>5: reverse jogging | 44 | ☆ |
| F05.04 | Terminal DI4 Function Selection | 6: freewheel stop<br>7: fault reset | 42 | ☆ |
| F05.05 | Terminal DI5 Function Selection | 8: emergency stop<br>9: external fault input<br>21: ACC/DEC time selection 1<br>22: ACC/DEC time selection 2<br>30: ACC/DEC disabled<br>36: switch command to keypad<br>36: switch command to terminal<br>36: switch command to communication<br>40: power consumption clear<br>41: power consumption stay<br>42: PV Inverter Forbid<br>43: Full-Water<br>44: Dry -Water | 0 | ☆ |
| F05.10 | Terminal DI1~DI5 Positive/Negative Logic | 0x00~0x1F | 0x004 | ☆ |
| F05.11 | DI Terminal Filtering Time | 0.000~1.000s | 0.010s | ○ |
| F05.12 | Virtual terminal setting | 0:virtual terminal invalid<br>1:MODBUS communication virtual terminal valid | 0 | ☆ |
| F05.13 | Terminal control running mode | 0: two-wire control mode 1<br>1: two-wire control mode 2<br>2: three-wire control mode 1<br>3: three-wire control mode 2 | 0 | ☆ |
| F05.14 | Delay time of DI1 on | 0.000~50.000s | 0.000s | ○ |
| F05.15 | Delay time of DI1 off | 0.000~50.000s | 0.000s | ○ |
| F05.16 | Delay time of DI2 on | 0.000~50.000s | 0.000s | ○ |
| F05.17 | Delay time of DI2 off | 0.000~50.000s | 0.000s | ○ |
| F05.18 | Delay time of DI3 on | 0.000~50.000s | 0.000s | ○ |
| F05.19 | Delay time of DI3 off | 0.000~50.000s | 0.000s | ○ |
| F05.20 | Delay time of DI4 on | 0.000~50.000s | 0.000s | ○ |
| F05.21 | Delay time of DI4 off | 0.000~50.000s | 0.000s | ○ |
| F05.22 | Delay time of DI5 on | 0.000~50.000s | 0.000s | ○ |
| F05.23 | Delay time of DI5 off | 0.000~50.000s | 0.000s | ○ |

| Code | Name | Description | Factory Default | Attribute |
|------|------|-------------|-----------------|-----------|
| F05.32 | AI1 lower limit | 0.00V~F05.34 | 0.00V | ○ |
| F05.33 | Corresponding setting of AI1 lower limit | -100.0%~100.0% | 0.0% | ○ |
| F05.34 | AI1 upper limit | F05.32~10.00V | 10.00V | ○ |
| F05.35 | Corresponding setting of AI1 upper limit | -100.0%~100.0% | 100.0% | ○ |
| F05.36 | AI1 input filter time | 0.000s~10.000s | 0.100s | ○ |
| F05.37 | AI0 lower limit | 0.00V~F05.39 | 0.00V | ○ |
| F05.38 | Corresponding setting of AI0 lower limit | -100.0%~100.0% | 0.0% | ○ |
| F05.39 | AI0 upper limit | F05.37~10.00V | 10.00V | ○ |
| F05.40 | Corresponding setting of AI0 upper limit | -100.0%~100.0% | 100.0% | ○ |
| F05.41 | AI0 input filter time | 0.000s~10.000s | 0.100s | ○ |
| **F06 Group: Output terminal** | | | | |
| F06.03 | Relay T1 Output Function | 0：Disabled<br>1: running | 1 | ○ |
| F06.04 | RelayT2 Output Function | 2: forward running<br>3: reverse running<br>4: jogging<br>5: inverter fault<br>6: frequency level detection FDT1<br>7: frequency level detection FDT2<br>8: frequency arrival<br>9: zero speed running<br>10: upper limit frequency arrival<br>11: lower limit frequency arrival<br>12: running ready<br>14: overload early warning<br>15: under-load early warning<br>20:external fault valid<br>22: running time arrival<br>23: MODBUS communication virtual terminal output | 5 | ○ |
| F06.05 | Output Terminal Positive/Negative Logic | 0x0~0x1F | 0x0 | ○ |
| F06.10 | Relay T1 Output delay time | 0.000~50.000 | 0.000s | ○ |
| F06.11 | Relay T1 Disconnect delay time | 0.000~50.000 | 0.000s | ○ |
| F06.12 | Relay T2 Output Delay Time | 0.000~50.000 | 0.000s | ○ |
| F.6.13 | Relay T2 disconnect Delay Time | 0.000~50.000 | 0.000s | ○ |

| Code | Name | Description | Factory Default | Attri bute |
|------|------|-------------|-----------------|------------|
| **F07 Group: HMI interface** | | | | |
| F07.00 | User Password | 0~65535 | 0 | ○ |
| F07.02 | MF key function selection | 0:invalid<br>1: jogging running<br>2:left-shift key to switch display state<br>3: FWD/REV switch<br>4: clear UP/DOWN setting<br>5: freewheel stop<br>6: switch command methods in order<br>7: non-factory parameter debugging | 1 | ☆ |
| F07.03 | MF key switch command method order | 0: keypad →terminal→communication<br>1: keypad←→terminal<br>2: keypad←→communication<br>3: terminal←→communication | 0 | ○ |
| F07.04 | STOP/RESET key stop function | 0: only valid for keypad control<br>1: valid for keypad and terminal control at the same time<br>2: valid for keypad and communication control at the same time<br>3: valid for all control modes | 0 | ○ |
| F07.05 | Running Status Display Selection | 0x0000~0xFFFF<br>BIT0：Output frequency<br>BIT1：Reference frequency<br>BIT2：DC bus voltage<br>BIT3：Output voltage<br>BIT4：Output current<br>BIT5：Rotation speed<br>BIT6：Output power<br>BIT10: input terminal status<br>BIT11: output terminal status | 0x05F | ○ |
| F07.06 | Running Status Display Selection 2 | 0x0000~0xFFFF<br>BIT0: Analog AI1(V light on)<br>BIT1: Analog AI2(V light on)<br>BIT2: Analog AI3(V light on)<br>BIT3~BIT15: Reserved | 0x0000 | ○ |
| F07.07 | Stop Status Display Selection | 0x0000~0xFFFF<br>BIT0：Reference frequency<br>BIT1：DC bus voltage<br>BIT2：Input terminal status<br>BIT3：Output terminal status<br>BIT7: Analog AI1(V light on)<br>BIT8: Analog AI2(V light on)<br>BIT9: Analog AI3(V light on) | 0x00FF | ○ |
| F07.08 | Frequency display coefficient | 0.01~10.00<br>Display frequency=running frequency* F07.08 | 1.00 | ○ |

| Code | Name | Description | Factory Default | Attri bute |
|------|------|-------------|-----------------|------------|
| F07.09 | Rotating speed display coefficient | 0.1~999.9%<br>Mechanical speed=120*display frequency×F07.09/Number of motor pole pairs | 100.0% | ○ |
| F07.10 | Linear speed display coefficient | 0.1~999.9%<br>Linear speed=Mechanical speed×F07.10 | 1.0% | ○ |
| F07.11 | Rectification bridge temperature | 0~100.0℃ | | ● |
| F07.12 | Converting module temperature | 0~100.0℃ | | ● |
| F07.13 | Software version | 1.00~655.35 | | ● |
| F07.14 | Accumulative running time | 0~65535h | | ● |
| F07.18 | Inverter Rate Power | 0.4~3000.0kW | | ● |
| F07.19 | Inverter Rate Voltage | 50~1200V | | ● |
| F07.20 | Inverter Rate Current | 0.1~6000.0A | | ● |
| F07.27 | Now Fault Type | 0: Not fault | | ● |
| F07.28 | Latest Fault Type | 1: Over-current when acceleration （OC1） | | ● |
| F07.29 | The Second Fault Type | 2: Over-current when deceleration （OC2） | | ● |
| F07.30 | The Third Fault Type | 3: Over-current when constant speed running（OC3） | | ● |
| F07.31 | The Fourth Fault Type | | | ● |
| F07.32 | The Fifth Fault Type | 4: Over-voltage when acceleration （OV1）<br>5: Over-voltage when deceleration （OV2）<br>6: Over-voltage when constant speed running（OV3）<br>7: DC bus Under-voltage（UV）<br>8: IGBT Ph-U fault（OUT1）<br>9: IGBT Ph-V fault（OUT2）<br>10: IGBT Ph-W fault（OUT3）<br>11: Motor overload（OL1）<br>12: Inverter overload（OL2）<br>13: overload alarm（OL3）<br>14: IGBT overheat（OH1）<br>15: Rectify overheat（OH2）<br>16: Input phase failure（SFI）<br>17: Output phase failure（SFO）<br>18: Brake unit fault（bCE）<br>19: Ground short-circuit fault (ETH)<br>20: Under load fault (LL)<br>21: Communication fault（E.485）<br>22: External fault（EF）<br>23: EEPROM fault（EEE）<br>24: Trial time reached（END） | | ● |

| Code | Name | Description | Factory Default | Attribute |
|------|------|-------------|-----------------|-----------|
| | | 25：Current detection fault (ItE)<br>32：Short to ground fault 1(ETH1)<br>33：Short to ground fault 2(ETH2)<br>36：Low-load fault(LL) Warning:<br>A-LS：Lack sunlight<br>A-tF：water full<br>A-LL：lack water source<br>A-LL1：water source drain | | |
| **F08 Group: Auxiliary function** | | | | |
| F08.00 | ACC time 2 | 0.0～3600.0s | Depend on mode | ○ |
| F08.01 | DEC time 2 | 0.0～3600.0s | Depend on mode | ○ |
| F08.02 | ACC time 3 | 0.0～3600.0s | Depend on mode | ○ |
| F08.03 | DEC time 3 | 0.0～3600.0s | Depend on mode | ○ |
| F08.04 | ACC time 4 | 0.0～3600.0s | Depend on mode | ○ |
| F08.05 | DEC time 4 | 0.0～3600.0s | Depend on mode | ○ |
| F08.06 | Jogging frequency | 0.00～F00.03 (Max. frequency) | 5.00Hz | ○ |
| F08.07 | Jogging running ACC time | 0.0～3600.0s | Depend on mode | ○ |
| F08.08 | Jogging running DEC time | 0.0～3600.0s | Depend on mode | ○ |
| F08.28 | Fault Auto Reset Times | 0~10 | 5 | ○ |
| F08.29 | Reset Interval | 0.1~3600.0s | 2.0s | ○ |
| F08.32 | FDT1 level detection value | 0.00～F00.03 (Max. frequency) | 50.00Hz | ○ |
| F08.33 | FDT1 lag detection | -100.0～100.0% (FDT1 level) | 5.0% | ○ |
| F08.34 | FDT2 level detection value | 0.00～F00.03 (Max. frequency) | 50.00Hz | ○ |
| F08.35 | FDT2 lag detection | -100.0～100.0% (FDT2 level) | 5.0% | ○ |
| F08.36 | Frequency arrival detective value | 0.00～F00.03 (Max. frequency) | 0.00Hz | ○ |
| F08.37 | Energy consumption brake enable | 0: brake disable<br>1: brake enable | 0 | ○ |
| F08.38 | Braking threshold voltage | 200.0~2000.0V (220V voltage:380.0V)<br>200.0~2000.0V(380V voltage:700.0V)<br>200.0~2000.0V(660V voltage:1120.0V) | Depend on voltage | ○ |
| F08.39 | Running mode of cooling fan | 0: normal running mode<br>1: keep running after power on | 0 | ○ |

| Code | Name | Description | Factory Default | Attribute |
|------|------|-------------|-----------------|-----------|
| **F09 Group: Reserved** | | | | |
| **F10 Group: Reserved** | | | | |
| **F11 Group: Protective parameter** | | | | |
| F11.00 | Phase loss protection | 0x00~0x11<br>LED ones place:<br>0: input phase loss protection disabled<br>1:input phase loss protection enabled<br>LED tens place:<br>0: output phase loss protection disabled<br>1:output phase loss protection enabled | 10 (CT112-4T)<br>00 (CT112A)<br>(CT112-2S) | ○ |
| F11.01 | Frequency decreasing point at sudden power loss | 00.0~100.0% (standard bus voltage) | 80.0% | ○ |
| F11.02 | Frequency decreasing ratio at sudden power loss | 0.00Hz~F00.03 (Max. frequency) | 15.00Hz/s | ○ |
| F11.03 | Overvoltage stall selection | 0: disabled<br>1: enabled | 0 | ○ |
| F11.04 | Overvoltage stall protection voltage | 380V: 120~150%(standard bus voltage) | 140% | ○ |
| | | 220V: 120~150%(standard bus voltage) | 120% | |
| F11.05 | Overcurrent stall actuation selection | 0x00~0x11<br>Ones place:actuation selection<br>0: Current limit actuation selection<br>1:actuation always valid<br>Tens place:hardware current limit over-load alarm selection<br>0:hardware current limit over load alarm valid<br>1:hardware current limit over load alarm invalid | 01 | ☆ |
| F11.06 | Overcurrent stall protection current | 50.0%~200.0% | 160.0% | ☆ |
| F11.07 | Overcurrent stall frequency decreasing ratio | 0.00~50.00Hz/s | 10.00Hz/s | ☆ |
| F11.08 | Over(under)load warning actuation selection | 0x000~0x131<br>Ones place:<br>0: motor over(under)load early alarm,relative to motor rated current<br>1: inverter over/under load early alarm,relative to inverter rated current | 0x000 | ○ |

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| Code | Name | Description | Factory Default | Attri bute |
|---|---|---|---|---|
| | | Tens place:<br>0: inverter keeps running after over/under load alarm<br>1: inverter keeps running after under-load alarm and stops after over-load alarm<br>2: inverter keeps running after over-load alarm and stops after under-load alarm<br>3: inverter stops after over/under load alarm<br>Hundreds place:<br>0: detecting all the way<br>1:detecting during constant running | | |
| F11.13 | Fault output terminal actuation selection | 0x00~0x11<br>Ones place:<br>0: action when under-voltage fault appears<br>1: no action when under-voltage fault appears<br>Tens place:<br>0:action during automatic resetting<br>1:no action during when automatic resetting | 0x00 | ○ |
| F11.16 | Automatic frequency reduction selection of Voltage fallen-down | 0: invalid<br>1:valid | 1 | ○ |
| **F14 Group: Communication** | | | | |
| F14.00 | Local address | 0 is the broadcast address, 1~247 are slave addresses | 1 | ○ |
| F14.01 | Baud rate | 0: 1200bps<br>1: 2400bps<br>2: 4800bps<br>3: 9600bps<br>4: 19200bps<br>5: 38400bps<br>6: 57600bps | 4 | ○ |
| F14.02 | Data check | 0: no check (N, 8,1) for RTU<br>1: even check (E, 8,1) for RTU<br>2: odd check (O, 8,1) for RTU<br>3: no check (N, 8,2) for RTU<br>4: even check (E, 8,2) for RTU<br>5: odd check (O, 8,2) for RTU | 1 | ○ |
| F14.03 | Response delay | 0~200ms | 5 | ○ |
| F14.04 | Communication timeout detection time | 0.0 (invalid), 0.1~100.0s | 0.0S | ○ |

| Code | Name | Description | Factory Default | Attri bute |
|------|------|-------------|-----------------|------------|
| F14.05 | Communication timeout error handling | 0: alarm and coast to stop<br>1: no alarm and continue running<br>2: no alarm and stop according to stop mode (communication mode is valid)<br>3: no alarm and stop according to stop mode (all control modes are valid) | 0 | ○ |
| F14.06 | Communication processing actuation selection | LED ones<br>0: write with response<br>1: write without response<br>LED tens<br>0: set value unsaved after power off<br>1: set value saved after power off | 0x00 | ○ |
| F15 Group Solar inverter special function | | | | |
| F15.00 | PV Inverter Selection | 0：Disabled<br>1：Enabled<br>2：Boost enabled (CT112A special) | 1 (CT112)<br>2 (CT112A) | ○ |
| F15.01 | Vmpp Voltage Selection | 0：Constant Voltage<br>1：Max. Power Point Tacking(MPPT)<br>2： Bus voltage *0.85 | 1 | ○ |
| F15.02 | Vmpp Voltage Keypad Set | 0.0~6553.5Vdc | 555.0V or 200.0V Depend on mode | ○ |
| F15.03 | PID Off Set Limits | 0.0~100.0%(100.0% refer P11.18) | 0.0% | ☆ |
| F15.04 | PID Max. Output Frequency | 0~100.0% | 100.0% | ○ |
| F15.05 | PID Min. Output Frequency | 0.0%~100.0% | 0.0% | ○ |
| F15.06 | KP1 | 0.00~100.00 | 1.0 (CT112)<br>10.0 (CT112A) | ○ |
| F15.07 | KI1 | 0.00~100.00 | 1.0 (CT112)<br>10.0 (CT112A) | ○ |
| F15.08 | KP2 | 0.00~100.00 | 15.00 (CT112)<br>10.00 (CT112A) | ○ |
| F15.09 | KI2 | 0.00~100.00 | 15.00 (CT112)<br>10.00 (CT112A) | ○ |

| Code | Name | Description | Factory Default | Attri bute |
|------|------|-------------|-----------------|------------|
| F15.10 | PI Amplitude | 0.0~6553.5Vdc | 25.0V /30.0V /60.0V Depend on mode | ○ |
| F15.11 | Dry Pump Function | 0: Disabled<br>1: Enabled | 1 | ○ |
| F15.12 | Dry-Water Threshold | 0.0~100.0% | 0.0% | ○ |
| F15.13 | Delay Time of Dry-Water | 0~3600.0s | 60.0s | ○ |
| F15.14 | Wake-up Delay Time of Dry-Water | 0~3600.0s | 600.0s | ○ |
| F15.15 | POWER SELECT | 0: motor<br>1: UI | 0 | ○ |
| F15.16 | Over-heat reduced frequency | 0.00~10.00Hz/℃ | 3.00Hz/℃ | ○ |
| F15.17 | Delay Time of Full-Water | 0.0~3600.0s | 60.0s | ○ |
| F15.18 | Reset Delay of Full-Water | 0.0~3600.0s | 120.0s | ○ |
| F15.19 | Frequency of Weak Light | 0~50.00Hz | 5.00Hz (CT112) 15.00Hz (CT112A) | ○ |
| F15.20 | Delay Time of Weak Light | 0.0~3600.0s | 600.0s | ○ |
| F15.21 | Reset Delay of Weak Light | 0.0~3600.0s | 300.0s | ○ |
| F15.22 | Reference Voltage of Given Display | 0.0~2000.0V | 0V | ● |
| F15.23 | Min. Voltage of MPPT | 0.0~6553.5Vdc | 50.0V | ○ |
| F15.24 | Max. Voltage of MPPT | 0.0~6553.5Vdc | 780.0V | ○ |
| F15.25 | KP3 (CT112A special) | 0.00~100.00 | 40.00 | ○ |
| F15.26 | KI3 (CT112A special) | 0.00~100.00 | 5.00 | ○ |
| F15.27 | Boost Voltage set (CT112A special) | 0.0~6553.5Vdc | 330.0V | ○ |
| F15.28 | KP4 (CT112A special) | 0.00~100.00 | 20.00 | ○ |
| F15.29 | KI4 (CT112A special) | 0.00~100.00 | 5.00 | ○ |
| **F17 Group: Status view function** | | | | |
| F17.00 | Set frequency | 0.00Hz~F00.03 | 0.00Hz | ● |
| F17.01 | Output frequency | 0.00Hz~F00.03 | 0.00Hz | ● |
| F17.02 | Slope given frequency | 0.00Hz~F00.03 | 0.00Hz | ● |

| Code | Name | Description | Factory Default | Attri bute |
|------|------|-------------|-----------------|-------|
| F17.03 | Output voltage | 0~1200V | 0V | ● |
| F17.04 | Output current | 0.0~5000.0A | 0.0A | ● |
| F17.05 | Motor rotary speed | 0~65535RFM | 0 RFM | ● |
| F17.08 | Motor power | -300.0~300.0% | 0.0% | ● |
| F17.10 | Solar buttery voltage | 0.0~2000.0V | 0v | ● |
| F17.11 | DC bus voltage | 0.0~2000.0V | 0V | ● |
| F17.12 | Digital input terminal status | 0000~00FF | 0 | ● |
| F17.13 | Digital output terminal status | 0000~000F | 0 | ● |
| F17.14 | Digital adjustment | 0.00Hz~F00.03 | 0.00V | ● |
| F17.15 | Given torque | -300.0%~300.0% | 0.0% | ● |
| F17.16 | Solar battery current | 0.0~2000.0A | 0A | ● |
| F17.19 | AI1 input voltage | 0.00~10.00V | 0.00V | ● |
| F17.20 | AI2 input voltage | 0.00~10.00V | 0.00V | ● |
| F17.21 | AI3 input voltage | -10.00~10.00V | 0.00V | ● |
| F17.22 | HDI input Frequency | 0.00Hz~50.00kHz | 0.00kHz | ● |

# Chapter 5 Troubles Shooting

## 5.1 Main Circuit Terminals

| Fault Code | P.OFF | Fault Type | Power Off |
|---|---|---|---|
| **Reason** | External power supply close | **Solution** | Check the three-phase power is off or not |
| **Fault Code** | E.Out1<br>E.Out2<br>E.Out3 | **Fault Type** | IGBT    Ph-U fault<br>IGBT    Ph-V fault<br>IGBT    Ph-W fault |
| **Reason** | Acc/Dec time is too short<br>IGBT module fault<br>Malfunction caused by interference<br>Ground is not properly | **Solution** | Increase Acc/Dec time<br>Ask for support<br>Inspect external equipment and eliminate interference<br> |
| **Fault Code** | E.oC1 | **Fault Type** | Over-current when acceleration |
| **Reason** | Acc time is too short<br>Input voltage is too low<br>Capacity of inverter is too small | **Solution** | Increase Acc time<br>Check the power supply<br>Select bigger capacity inverter |
| **Fault Code** | E.oC2 | **Fault Type** | Over-current when deceleration |
| **Reason** | Dec time is too short<br>Load is too heavy<br>Capacity of inverter is too small | **Solution** | Increase Dec time<br>Install proper external braking unit<br>Select bigger capacity inverter |
| **Fault Code** | E.oC3 | **Fault Type** | Over-current when constant speed running |
| **Reason** | Sudden change of load or abnormal<br>Input voltage is too low<br>Capacity of inverter is too small | **Solution** | Check the load or reduce sudden change of load<br>Check the power supply<br>Select bigger capacity inverter |
| **Fault Code** | E.oU1 | **Fault Type** | Over-voltage when acceleration |
| **Reason** | Input voltage abnormal<br>After instant power off, restart the rotating motor | **Solution** | Check the power supply<br>Void restart after power off |
| **Fault Code** | E.oU2 | **Fault Type** | Over-voltage when deceleration |
| **Reason** | Dec time is too short<br>Load is too heavy<br>Input voltage abnormal | **Solution** | Increase Dec time<br>Increase braking resistance /unit<br>Check the power supply |
| **Fault Code** | E.oU3 | **Fault Type** | Over-voltage when constant speed running |
| **Reason** | Input voltage abnormal<br>Load is too heavy | **Solution** | Install input DC reactor<br>Install proper external braking unit |
| **Fault Code** | E.LU | **Fault Type** | DC bus Under-voltage |
| **Reason** | Input voltage is too low | **Solution** | Inspect the input power supply |

| Fault Code | E.oL1 | Fault Type | Motor overload |
|---|---|---|---|
| **Reason** | Input voltage is too low | **Solution** | Inspect the input power supply |
| | Improper motor's overload protection threshold | | Set proper motor rated current |
| | Motor block or sudden change of load | | Check the load and adjust torque boost |
| | Motor drive heavy load at low speed for a long time | | Select variable frequency motor |
| **Fault Code** | E.oL2 | **Fault Type** | Inverter overload |
| **Reason** | Acc time is too short | **Solution** | Decrease acceleration |
| | Restart the rotating motor | | Avoid restart after power off |
| | Input voltage is too low | | Check the power supply |
| | Load is too heavy | | Select bigger capacity inverter |
| **Fault Code** | E.SPI | **Fault Type** | Input phase failure |
| **Reason** | Phase loss of R,S,T input | **Solution** | 1.Check power supply 2.Check the wiring installation |
| **Fault Code** | E.SPo | **Fault Type** | Output phase failure |
| **Reason** | Phase loss of U,V,W output (or a serious unbalance in 3phase input) | **Solution** | Check the wiring installation of output |
| | Connection loose | | Check the motor and wiring |
| **Fault Code** | E.oH1 | **Fault Type** | Rectify overheat |
| | E.oH2 | | IGBT overheat |
| **Reason** | Instant over current of inverter | **Solution** | Refer to over current solution |
| | Short-circuit or ground fault occurred at inverter output | | Check the wiring and install again |
| | Obstruction of ventilation channel or Cooling fans of inverter stops or damaged | | Clear the ventilation Channel or Replace cooling fan |
| | Ambient temperature is too high | | Reduce Ambient temperature |
| | Control board wire or plug-ins loss | | Check the wiring and Installation |
| | Auxiliary power damaged or under voltage of driver voltage | | Ask for support |
| | Power module bridge short | | Ask for support |
| | Control board abnormal | | Ask for support |
| **Fault Code** | E.EF | **Fault Type** | External fault |
| **Reason** | SI External fault input terminal take effect | **Solution** | Inspect input of external equipment |
| **Fault Code** | E.CE | **Fault Type** | Communication fault |
| **Reason** | Improper baud rate setting | **Solution** | Set proper baud rate |
| | Receive wrong data | | Press STOP/RESET to reset. Ask for support |
| | Communication is nterrupted for long time | | Check wiring of communication interface |

| Fault Code | E.ItE | Fault Type | Current detection fault |
|---|---|---|---|
| **Reason** | Wires or connectors of control boards are loose | **Solution** | Check the signal linker and insert it again |
| | Auxiliary power damaged | | Ask for support |
| | Hall sensor is damaged | | Ask for support |
| | Amplifying circuit is abnormal | | Ask for support |
| **Fault Code** | E.tE | **Fault Type** | Motor auto tuning fault |
| **Reason** | Capacity of motor is not meet that of inverter | **Solution** | Change the model of inverter |
| | Improper setting of motor rated parameters | | Set rated parameters according to motor nameplate |
| | The motor parameter auto-tuning are warped with the standard parameter | | Run the motor without load and do auto-tuning again |
| | Overtime of auto-tuning | | Check motor's wiring and parameters |
| **Fault Code** | E.EEP | **Fault Type** | EPROM fault |
| **Reason** | R/W fault of control parameters | **Solution** | Press STOP/RESET to Reset. Ask for support |
| | EEPROM damaged | | Ask for support |
| **Fault Code** | E.PIDE | **Fault Type** | Ask for support |
| **Reason** | PID feedback disconnect | **Solution** | Inspect PID feedback signal wire |
| | PID feedback source disappears | | Inspect PID feedback source |
| **Fault Code** | E.bCE | **Fault Type** | Brake unit fault |
| **Reason** | Braking circuit failure or brake tube damaged | **Solution** | Inspect braking unit, replace braking tube |
| | Too low resistance of externally connected braking resistor | | Increased braking resistance |
| **Fault Code** | E.ENd | **Fault Type** | Setting time has finished |
| **Reason** | The actual running time is beyond the setting time | **Solution** | Ask for support |
| **Fault Code** | E.oL3 | **Fault Type** | Electronic overload |
| **Reason** | Load is too heavy | **Solution** | Check the load |
| | Electronic warning point is too low | | Check electronic warning point |
| **Fault Code** | E.EAH1 | **Fault Type** | Output is short-circuited to ground |
| **Reason** | One phase Output of inverter is short-circuited to ground | **Solution** | Check the motor wiring |
| | Current detect circuit is broken | | Ask for support |
| **Fault Code** | E.EAH2 | **Fault Type** | Output is short-circuited to ground |
| **Reason** | One phase Output of inverter is short-circuited to ground | **Solution** | Check the motor wiring |
| | Current detect circuit is broken | | Ask for support |

| Fault Code | A-LS | Fault Type | Weak light |
|---|---|---|---|
| Reason | Light is too weak to keep running state | Solution | Wait for stronger sunshine |
| Fault Code | A-tF | Fault Type | Full water |
| Reason | Water is adequate | Solution | Wait for clearing alert |
| Fault Code | A-LL | Fault Type | Water shortage |
| Reason | Water sources are lacking of water | Solution | Wait for clearing alert |
| Fault Code | A-LL1 | Fault Type | Water shortage |
| Reason | Water sources are lacking of water | Solution | Wait for clearing alert |

## 5.2 Common faults and solutions

The drive may have following faults or malfunctions during operation, please refer to the following solutions.

**No display after power on:**

Inspect whether the voltage of power supply is same as the inverter rated voltage or not with multi-meter. If the power supply has problem, inspect and solve it. Inspect whether the 3 phase rectify bridge is in good condition or not. If the rectification bridge is burst out, ask for support.

Check the CHARGE light. If the light is off, the fault is mainly in the rectify bridge or the buffer resistor. If the light is on, the fault may be lies in the switching power supply. Please ask for support. Power supply air switch trips off when power on:

Inspect whether the input power supply is grounded or short circuit. Please solve the problem. Inspect whether the rectify bridge has been burnt or not. If it is damaged, ask for support.

**Motor doesn't move after inverter running:**

Inspect if there is balanced three-phase output among U, V, W. If yes, then motor could be damaged, or mechanically locked. Please solve it.

If the output is unbalanced or lost, the inverter drive board or the output module may be damaged, ask for support.

If there is not output voltage, the drive board or the output module may be damaged. Ask for support.

Inverter displays normally when power on, but breaker switch at the input side trips when running: Please check whether inverter or motor has short circuit or wrongly connecting earth.

If the breaker is occasionally switch off and the distance is too long between motor and inverter, please consider to add AC output choke.

# Chapter 6 Warranty

## 6.1 Warranty

The warranty of this inverter is18 months, or we provide 2% spare parts for free. When any fault or damage occurs on the product, with in the warranty period, our company will provide free maintenance. After the warranty time, we can provide lifetime paid warranty service.

## 6.2 Supplementary

In order to enjoy better after-sales service , please pay attention to the following ：

| Provide below information when inquiry, we will make good configuration for you. | | |
|---|---|---|
| 1 | Pump | Power, Voltage, Phase |
| 2 | Solar Panel | Each panel power, voc voltage, vmp voltage |
| Provide below photo sand information after installation. | | |
| 1 | Pump | Photos show pump, pump specification, pump and inverter connection |
| 2 | Inverter | Photos show inverter installation environment inverter connection and switch, LCD screen parameter setting. |
| 3 | Solar Panel | Photos show solar panel and inverter connection, solar panel specification, solar panel array and quantity. |

 **Prompt: Warranty only covers the body of the inverter**

## 6.3 Warranty agreement

1   The warranty of this inverter is 18 months, or 2% spare parts for free. When any fault or damage occurs on the product, with in the warranty period, our company will provide free maintenance. After the warranty time, we can provide lifetime paid warranty service.

2   The warranty time starts from the date when the product is leaving the factory, and the machine frame code is the only proof to determine the warranty period.

3   Certain maintenance charge should be considered during warranty period if the fault is caused by the following reason:

·Fault caused by operating against the manual or surpass the standard specification

·Fault caused by self fix and modification without permission.

·Fault caused by poor preservation

·Fault by using the inverter in malfunction

·Machine damage caused by fire, salt corrosion, gas corrosion, earthquake, storm, lightning, abnormal voltage or other force majeure.

4   Please be sure to retain this card and show it to the maintenance service.

# Chapter 7 Communication protocol

The CT112&CT112A series inverters provide RS485 communication interface. You can realize centralized control via PC/PLC (set the run commands and function parameters of the inverter, read the work state and fault information of the inverter) to meet the specific requirements.

1. Content

The serial communication protocol defines the content and format of the transmission information for serial communication, including master polling (or broadcast) format, master encoding method including the required function codes, transmission data and error check. The slave response also uses the same structure including actuation confirmation, return data and error check. If an error occurs when the slave receives information or the slave cannot complete the actuation required by the master, it will feedback a response of fault information to the master.

2. Application mode

The inverter has access to "single- master multi-slaves" PC/PLC control network with RS485 bus.

Support Modbus protocol and RTU format; broadcast address is 0 and slave address can be set to 1~247.

3. Bus structure

(1) interface mode

RS485 (CT112 terminals: 485 + and 485-) hardware interface

(2) transmission mode

Asynchronous serial, half duplex transmission. At the same time, only one can send data and the other can receive data for the master and the slave. Data in the serial asynchronous communication process, in the form of a message, can be sent one by one frame.

(3) topology structure

Single-master multi-slaves network, the slave address in the network must be unique.

4. Description of the protocol

CT112&CT112A series inverter communication protocol is an asynchronous serial master-slave Modbus communication protocol and only one device (master) in the network can establish a protocol (called "query/command"). Other devices (slaves) can only provide data to respond to the master's "query/command" or make the corresponding actuation according to the master's "query/command". The master refers to a personal computer (PC), an industrial control device or a programmable logic controller (PLC), etc. The slave is inverter. The master can communicate with a single slave as well as send a broadcast message to all slaves. For the master's single "query/command", the slave has to return a message (called a response), for the master's broadcast message, the slaves do not need to respond to the master.

5. Communication data format

The Modbus protocol communication data format of CT112 series inverters is as follows:

In RTU mode, the minimum interval time should be at least 3.5 bytes for message transmission, which is the easiest way to achieve a variety of character time at the baud rate. The first transmitted field is the device address. The transmitted characters can be hexadecimal 0...9 and A...F. The network device constantly detects the network bus, even during the interval time. When the first field (address field) is received, the corresponding device decodes next transmitting character. After the last transmitting character, the interval time of at least 3.5 bytes marks the end of the message. A new message can start after this pause.

The whole message frame is a continuous transmitting flow. If there is an interval time of more than 1.5 bytes before the frame is completed, the receiving device will renew the uncompleted message and assume that the next byte is the address field of a new message. As such, if the new message follows the previous message within the interval time of 3.5 bytes, the receiving device will deal with it as the same with the previous message. If these two phenomena all happen during the transmission, the CRC will generate a fault message to respond to the sending devices.

RTU frame format

| START | Interval time of 3.5 bytes |
|---|---|
| ADR | Communication address: 1~247 |
| CMD | 03: read slave parameters; 06: write slave parameters |
| DATA (N-1) | Function parameter address, function parameter number, function parameter value etc. |
| DATA (N-2) | |
| ...... | |
| DATA (0) | |
| CRC CHK low bit | Detection value: CRC |
| CRC CHK high bit | |
| END | Interval time of 3.5 bytes |

CMD (command instruction) and DATA

Command code: 03H, read N words (at most 16 words can be read)

For example: the baud rate 19200bps, even check (E, 8,1) for RTU, read continuous two

data from the inverter F06.19 with the slave address of 01.

Master command message

| ADR | 01H |
|---|---|
| CMD | 03H |
| High bit of start address | 06H (Function code group) |
| Low bit of start address | 13H (Function code bit) |
| High bit of register number | 00H |
| Low bit of register number | 02H |
| Low bit of CRC CHK | 35H |
| High bit of CRC CHK | 46H |

Slave response message

| ADR | 01H |
|---|---|
| CMD | 03H |
| The number of bytes | 04H |
| High bit of F06.19 data | 00H |
| Low bit of F06.19 data | 00H |
| High bit of F06.20 data | 03H |
| Low bit of F06.20 data | E8H |
| Low bit of CRC CHK | FAH |
| High bit of CRC CHK | 8DH |

Command code: 06H, write a word

For example: the baud rate 19200bps, even check (E, 8,1) for RTU, write 40.00Hz

(communication without decimal point) (0FA0H) to F00.09H address of the inverter

whose slave address is 02H, and change the keypad set frequency to 40.00Hz.

Master command message

| ADR | 02H |
|---|---|
| CMD | 06H |
| High bit of F00.09 address | 00H (Function code group) |
| Low bit of F00.09 address | 09H (Function code bit) |
| High bit of F00.09 data | 0FH |
| Low bit of F00.09 data | A0H |
| Low bit of CRC CHK | 5CH |
| High bit of CRC CHK | 73H |

Slave response message

| ADR | 02H |
|---|---|
| CMD | 06H |
| High bit of F00.09 address | 00H (Function code group) |
| Low bit of F00.09 address | 09H (Function code bit) |
| High bit of F00.09 data | 0FH |
| Low bit of F00.09 data | A0H |
| Low bit of CRC CHK | 5CH |
| High bit of CRC CHK | 73H |

Check mode-CRC (Cyclical Redundancy Check) check

The checkout uses RTU frame format. The frame includes the frame error detection field

which is based on the CRC calculation method. The CRC field is two bytes including 16

figure binary values. It is added into the frame after calculated by transmitting device.

The receiving device recalculates the CRC of the received frame and compares them

with the value in the received CRC field. If the two CRC values are different, there is an

error in the communication.

Using the RTU frame format, the message includes an error detection field based on the

CRC method. The CRC field detects the contents of the entire message. The CRC field

is two bytes and contains a 16-bit binary value. It is added to the message by the

transmission device. The receiving device recalculates the CRC of the received

message and compares it with the value in the received CRC field. If the two CRC

values are not equal, the transmission has an error.

During CRC, 0*FFFF will be stored. And then, deal with the continuous 6-above bytes in

the frame and the value in the register. Only the 8Bit data in every character is effective to CRC, while the start bit, the end and the odd and even check bit is ineffective.

The calculation of CRC applies the international standard CRC checkout principles. When you are editing CRC calculation, you can refer to the relative standard CRC calculation to write the required CRC calculation program.

Here provided a simple function of CRC calculation for the reference (programmed with C language)

```
unsigned int crc_cal_value(unsigned char*data_value,unsigned char data_length)
{
int i;
unsigned int crc_value=0xffff;
while(data_length--)
{
crc_value^=*data_value++;
for(i=0;i<8;i++)
{
if(crc_value&0x0001)
crc_value=(crc_value>>1)^0xa001;
else
crc_value=crc_value>>1;
}
}
return(crc_value);
}
```

Fault message response

The slave uses functional code fields and fault addresses to indicate it is a normal response or some error occurs (named as objection response). For normal responses,

the slave shows corresponding function codes, digital address or sub-function codes as the response. For objection responses, the slave returns a code which equals the normal code, but the first byte is logic 1.

For example: when the master sends a message to the slave, requiring it to read a group of address data of the inverter function codes, there will be following function codes:

0 0 0 0 0 0 1 1 (hexadecimal 03H)

For normal responses, the slave responds the same function codes, while for objection responses, it will return:

1 0 0 0 0 0 1 1 (hexadecimal 83H)

Besides the function codes modification for the objection fault, the slave will respond a byte of abnormal code which defines the error reason.

When the master receives the response for the objection, in a typical processing, it will send the message again or modify the corresponding order.

Error code and meaning

| Modbus abnormal code | | |
|---|---|---|
| Code | Name | Meaning |
| 01H | Illegal command | The command from master cannot be executed. This command is only for new version and this version cannot realize. Slave is in fault state and cannot execute it. |
| 02H | Illegal data address | Some of the operation addresses are invalid or not allowed to access. Especially the combination of the register and the transmitting bytes are invalid. |
| 03H | Illegal value | When there are invalid data in the message framed received by slave. Note: This error code does not indicate the data value to write exceed the range, but indicate the message frame is an illegal frame. |
| 06H | The slave is busy | Inverter is busy (EPPROM is in storage) |
| 10H | Password error | The password written to the password check address is not the same as the password set by P7.00. |
| 11H | Check error | In the frame message sent by the upper monitor, the length of the digital frame is incorrect or the counting of CRC check bit in RTU is different from the lower monitor. |

| Modbus abnormal code | | |
|---|---|---|
| Code | Name | Meaning |
| 12H | Invalid parameter change | It only happens in write command. The written data exceeds the parameter range. The parameter should not be modified now. The terminal has already been used. |
| 13H | The system is locked | When the upper computer is reading or writing and the user password is set without password unlocking, it will report that the system is locked. |

Address definition of communication parameters

It is used to control the inverter operation, inverter status and related parameter settings.

Read and write function parameters (some function codes cannot be changed, only for manufacturers to use):

The rules of parameter address of the function codes:

High byte: group number before the radix point of the function code (00～15) Group 0 to Group 15

Low byte: the number after the radix point (00～FF)

For example, the parameter address of F13.17 is 0D11H.

Note: Some parameters cannot be changed when the inverter is in the running state and some parameters cannot be changed in any state. The setting range, unit and relative instructions should be paid attention to when modifying the function code parameters. Besides, EEPROM is stored frequently, which may shorten the usage time of EEPROM. Some functions are not necessary to be stored on the communication mode. The needs can be met on by changing the value in RAM. Changing the high bit of the function code from 0 to 1 can also realize the function. The corresponding function code address is as follows:

High byte: 00～0F

Low byte: 00～FF

For example, F03.12 is not stored in EEPROM, the address is 830CH; the address can only write RAM and cannot read, read for the invalid address.

## 485 communication address

| Function instruction | Address definition | Data meaning instruction | R/W characteristics |
|---|---|---|---|
| Communication control command | 2000H | 0001H: forward running<br>0002H: reverse running<br>0003H: forward jogging<br>0004H: reverse jogging<br>0005H: stop<br>0006H: freewheel stop<br>0007H: fault reset<br>0008H: jogging stop | W/R |
| Inverter status | 2100H | 0001H: forward running<br>0002H: reverse running<br>0003H: stop<br>0004H: fault<br>0005H: -E.Lv- status | R |
| The address of the running /stopping parameter | 3000H | Running frequency (0~Fmax, unit 0.01Hz) | R |
| | 3001H | Set frequency (0~Fmax, unit 0.01Hz) | R |
| | 3002H | Bus voltage | R |
| | 3003H | Output voltage | R |
| | 3004H | Output current | R |
| | 3005H | Running speed | R |
| | 3006H | Output power | R |
| | 3007H | Reserved | R |
| | 3008H | Reserved | R |
| | 3009H | Reserved | R |
| | 300AH | Input terminal status (000 to 0FF, unit 01H) | R |
| | 300BH | Output terminal status (00 to 0F, unit 01H) | R |
| | 300CH | Analog AI1(0.00~10.00V, unit 0.01V) | R |
| | 300DH | Reserved | R |
| | 300EH | Reserved | R |
| | 300FH | Reserved | R |
| | 3010H | Reserved | R |
| | 3011H | Reserved | R |
| | 3012H | Reserved | R |
| | 3013H | Reserved | R |
| | 3014H | External count number | R |
| | 3015H | Torque set value | R |
| | 3016H | Reserved | R |

# User's Information

User Company:

Contact person:

Address:

Telephone:

Dealer company:

Post code:

Model:Serial number:

Purchase date:Handling person:

---

## Qualification  Certificate

Type of product _____

Checked   by    _____

Test   date     _____

This product has been strictly
quality-chenked and granted for delicery