# Operation Manual

## UMI-EU-B1 Series Inverter


**http://www.unitronics.com**

**Ver. 1.6. 28.05.2020**

Document ID: DOC60000-A2

# Contents

# 1 Safety precautions

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the inverter. If ignored, physical injury or death may occur, or damage may occur to the devices.

If any physical injury or death or damage to the devices occurs due to neglect of the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

## 1.1 Safety definition

| | |
|---|---|
| Danger: | Serious physical injury or even death may occur if related requirements are not followed |
| Warning: | Physical injury or damage to the devices may occur if related requirements are not followed |
| Note: | Physical hurt may occur if related requirements are not followed |
| Qualified electricians: | People working on the device should take part in professional electrical and safety training, receive the certification and be familiar with all steps and requirements of installing, commissioning, operating and maintaining the device to avoid any emergency. |

## 1.2 Warning symbols

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Following warning symbols are used in this manual:

| Symbols | Name | Instruction | Abbreviation |
|---|---|---|---|
|  Danger | Danger | Serious physical injury or even death may occur if related requirements are not followed |  |
|  Warning | Warning | Physical injury or damage to the devices may occur if related requirements are not followed |  |
|  Do not | Electrostatic discharge | Damage to the PCBA board may occur if related requirements are not followed |  |
|  Hot sides | Hot sides | Sides of the device may become hot. Do not touch. |  |
| Note | Note | Physical hurt may occur if related requirements are not followed | Note |

## 1.3 Safety guidelines

✧ Only qualified electricians are allowed to operate on the inverter.

✧ Do not carry out any wiring and inspection or changing components when the power supply is applied. Ensure all input power supplies are disconnected before wiring and checking and always wait for at least the time designated on the inverter or until the DC bus voltage is less than 36V. The table below describes the waiting time:

| Inverter module | | Minimum waiting time |
|---|---|---|
| 1PH 230V | 0.4kW-2.2kW | 5 minutes |
| 3PH 230V | 0.4kW-7.5kW | 5 minutes |
| 3PH 400V | 0.75kW-110kW | 5 minutes |

✧ Do not refit the inverter unauthorized; otherwise, fire, electric shock or other injury may occur.

✧ The base of the radiator may become hot during running. Do not touch to avoid hurt.

✧ The electrical parts and components inside the inverter are electrostatic. Take measurements to avoid electrostatic discharge during related operation.

### 1.3.1 Delivery and installation

✧ Please install the inverter on fire-retardant material and keep the inverter away from combustible materials.

✧ Connect the braking optional parts (braking resistors, braking units or feedback units) according to the wiring diagram.

✧ Do not operate on the inverter if there is any damage or components loss to the inverter.

✧ Do not touch the inverter with wet items or body; otherwise, electric shock may occur.

**Note:**

✧ Select appropriate moving and installing tools to ensure a safe and normal running of the inverter and avoid physical injury or death. For physical safety, the erector should take some mechanical protective measurements, such as wearing exposure shoes and working uniforms.

✧ Ensure to avoid physical shock or vibration during delivery and installation.

✧ Do not carry the inverter by its cover. The cover may fall off.

✧ Install away from children and other public places.

✧ The inverter cannot meet the requirements of low voltage protection in IEC61800-5-1 if the altitude of installation site is above 2000m.

✧ The leakage current of the inverter may be above 3.5mA during operation. Ground with proper techniques and ensure the grounding resistance is less than 10Ω. The

conductivity of PE grounding conductor is the same as that of the phase conductor (with the same cross sectional area).

✧ R, S and T are the input terminals of the power supply, while U, V and W are the motor terminals. Please connect the input power cables and motor cables with proper techniques; otherwise, the damage to the inverter may occur.

### 1.3.2 Commissioning and running

✧ Disconnect all power supplies applied to the inverter before the terminal wiring and wait for at least the designated time after disconnecting the power supply.
✧ High voltage is present inside the inverter during running. Do not carry out any operation except for the keypad setting.
✧ The inverter may start up by itself when P01.21=1. Do not get close to the inverter and motor.
✧ The inverter cannot be used as “Emergency-stop device”.
✧ The inverter cannot be used to brake the motor suddenly. A mechanical braking device should be provided.

**Note:**

✧ Do not switch on or off the input power supply of the inverter frequently.
✧ For inverters that have been stored for a long time, check and fix the capacitance and try to run it again before utilization (see Maintenance and Hardware Fault Diagnose).
✧ Cover the front board before running; otherwise, electric shock may occur.

### 1.3.3 Maintenance and replacement of components

✧ Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of the inverter.
✧ Disconnect all power supplies to the inverter before the terminal wiring. Wait for at least the time designated on the inverter after disconnection.
✧ Take measures to avoid screws, cables and other conductive matters to fall into the inverter during maintenance and component replacement.

**Note:**

✧ Please select proper torque to tighten screws.
✧ Keep the inverter, parts and components away from combustible materials during maintenance and component replacement.
✧ Do not carry out any isolation and pressure test on the inverter and do not measure the control circuit of the inverter by megameter.

### 1.3.4 What to do after scrapping

✧ There are heavy metals in the inverter. Deal with it as industrial effluent.

# 2 Product overview

## 2.1 Quick start-up

### 2.1.1 Unpacking inspection

Check as follows after receiving products:

| |
|---|
| 1. Check whether the packing box is damaged or dampened. If yes, contact local dealers or UNITRONICS offices. |
| 2. Check the model identifier on the exterior surface of the packing box is consistent with the purchased model. If no, contact local dealers or UNITRONICS offices. |
| 3. Check whether the interior surface of packing box is abnormal, for example, in wet condition, or whether the enclosure of the inverter is damaged or cracked. If yes, contact local dealers or UNITRONICS offices. |
| 4. Check whether the name plate of the inverter is consistent with the model identifier on the exterior surface of the packing box. If no, contact local dealers or UNITRONICS offices. |
| 5. Check whether the accessories (including user's manual and control keypad) inside the packing box are complete. If no, contact local dealers or UNITRONICS offices. |

### 2.1.2 Application confirmation

Check the machine before beginning to use the inverter:

| |
|---|
| 1. Check the load type to verify that there is no overload of the inverter during work and check that whether the drive needs to modify the power degree. |
| 2. Check that the actual current of the motor is less than the rated current of the inverter. |
| 3. Check that the control accuracy of the load is the same of the inverter. |
| 4. Check that the incoming supply voltage is correspondent to the rated voltage of the inverter. |

### 2.1.3 Environment

Check as follows before the actual installation and usage:

| |
|---|
| 1. Check that the ambient temperature of the inverter is below 40°C. If exceeds, derate 1% for every additional 1°C. Additionally, the inverter cannot be used if the ambient temperature is above 50°C.<br>**Note:** for the cabinet inverter, the ambient temperature means the air temperature inside the cabinet. |
| 2. Check that the ambient temperature of the inverter in actual usage is above -10°C. If no, add heating facilities.<br>**Note:** for the cabinet inverter, the ambient temperature means the air temperature inside the cabinet. |
| 3. Check that the altitude of the actual usage site is below 1000m. If exceeds, derate1% for every additional 100m. |

| |
|---|
| 4. Check that the humidity of the actual usage site is below 90% and condensation is not allowed. If no, add additional protection inverters. |
| 5. Check that the actual usage site is away from direct sunlight and foreign objects cannot enter the inverter. If no, add additional protective measures. |
| 6. Check that there is no conductive dust or flammable gas in the actual usage site. If no, add additional protection to inverters. |

**2.1.4 Installation confirmation**

Check as follows after the installation:

| |
|---|
| 1. Check that the load range of the input and output cables meet the need of actual load. |
| 2. Check that the accessories of the inverter are correctly and properly installed. The installation cables should meet the needs of every component (including reactors, input filters, output reactors, output filters, DC reactors, braking units and braking resistors). |
| 3. Check that the inverter is installed on non-flammable materials and the calorific accessories (reactors and brake resistors) are away from flammable materials. |
| 4. Check that all control cables and power cables are routed separately and the wire layout complies with EMC requirement. |
| 5. Check that all grounding systems are properly grounded according to the requirements of the inverter. |
| 6. Check that the free space during installation is sufficient according to the instructions in user's manual. |
| 7. Check that the installation conforms to the instructions in user's manual. The drive must be installed in an upright position. |
| 8. Check that the external connection terminals are tightly fastened and the torque is appropriate. |
| 9. Check that there are no screws, cables and other conductive items left in the inverter. If no, get them out. |

**2.1.5 Basic commissioning**

Complete the basic commissioning as follows before actual utilization:

| |
|---|
| 1. Autotune. If possible, de-coupled from the motor load to start dynamic autotune. Or if no, static autotune is available. |
| 2. Adjust the ACC/DEC time according to the actual running of the load. |
| 3. Commission the device via jogging and check that the rotation direction is as required. If no, change the rotation direction by changing the wiring of motor. |
| 4. Set all control parameters and then operate. |

## 2.2 Product specification

| Function | | Specification |
|---|---|---|
| Power input | Input voltage (V) | AC 1PH 220V (-15%)–240V (+10%), rated voltage: 230V<br>AC 3PH 220V (-15%)–240V (+10%), rated voltage: 230V<br>AC 3PH 380V (-15%)–440V (+10%), rated voltage: 400V |
| | Input current (A) | Refer to the rated value |
| | Input frequency (Hz) | 50Hz or 60Hz; Allowed range: 47–63Hz |
| Power output | Output voltage (V) | 0–input voltage |
| | Output current (A) | Refer to the rated value |
| | Output power (kW) | Refer to the rated value |
| | Output frequency (Hz) | 0–400Hz |
| Technical control feature | Control mode | SVPWM, SVC |
| | Motor | Asynchronous motor |
| | Adjustable-speed ratio | Asynchronous motor 1:100 (SVC) |
| | Speed control accuracy | ±0.2% (SVC) |
| | Speed fluctuation | ± 0.3% ( SVC) |
| | Torque response | <20ms (SVC) |
| | Torque control accuracy | 10% |
| | Starting torque | 0. 5Hz/150% (SVC) |
| | Overload capability | 150% of rated current: 1 minute<br>180% of rated current: 10 seconds<br>200% of rated current: 1 second |
| Running control feature | Frequency setting method | Digital setting, analog setting, pulse frequency setting, multi-step speed running setting, simple PLC setting, PID setting, MODBUS communication setting |

| Function | | Specification |
|---|---|---|
| | | Shift between the set combination and set channel. |
| | Auto-adjustment of the voltage | Keep a stable voltage automatically when the grid voltage transients |
| | Fault protection | Provide comprehensive fault protection functions: overcurrent, overvoltage, undervoltage, overheating, phase loss and overload, etc. |
| | Start after speed tracking | Smoothing starting for running motor |
| Peripheral interface | Analog input | 1 (AI2) 0–10V/0–20mA and 1 (AI3) -10–10V |
| | Analog output | 2 (AO1, AO2) 0–10V/0–20mA.<br>* AO2 output only available on UMI-EU-B1 >2.2kW |
| | Digital input | 4 common inputs, the Max frequency: 1kHz;<br>1 high speed input, the Max frequency: 50kHz |
| | Digital output | 1 Y1 terminal output |
| | Relay output | 2 programmable relay outputs<br>RO1A NO, RO1B NC, RO1C common terminal<br>RO2A NO, RO2B NC, RO2C common terminal<br>Contact capacity: 3A/AC250V<br>*Relay 2 output only available on UMI- B1 EU> 2.2kW |
| Others | Temperature of the running environment | -10 to 50°C, derate 1% for every additional 1°C when the temperature is above 40°C |
| | DC reactor | Standard embedded DC reactor for the inverters (≥18.5kW) |
| | Installation mode | Wall and rail installation of the inverters (single phase 230V/three phase 400V, ≤2.2KW and three phase 230V, ≤0.75KW)<br>Wall and flange installation of the inverters (three phase 400V, ≥4KW and three phase 230V, ≥1.5KW) |
| | Braking unit | Standard for the inverters≤37kW and optional for the inverters of 45–110kW |

| Function | | Specification |
|---|---|---|
| | EMI filter | 3PH 400V 4kW and above/3PH 230V 1.5kW and above can comply with IEC61800-3 class C3, others can meet requirements of IEC61800-3 class C3 by installing external filter (optional). This series of products can comply with IEC61800-3 class C2 by installing external filter (optional). |
| | Ambient environment | -10 to 50°C, derate 1% for every additional 1°C |
| | Elevation | Below 1000m. If the elevation is above 1000m, derate 1% for every additional 100m. |
| | Protection level | IP20<br>Note: The inverter with plastic casing should be installed in metal distribution cabinet which conforms to IP20 and the top of which conforms to IP3X. |
| | Pollution level | Level 2 |
| | Safety regulation | Comply with CE requirements |
| | Cooling | Air-cooling |

## 2.3 Name plate

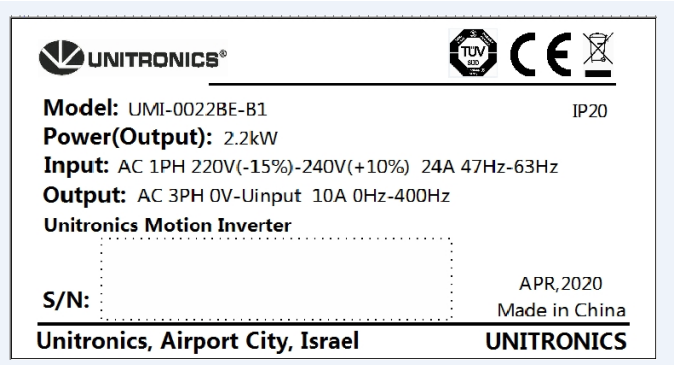



Figure 2-1 Name plate

**Note:** This is the example for the standard products. And the CE/TUV/IP20 will be marked according to the actual.

## 2.4 Type designation key

The type designation contains information on the inverter. The user can find the type designation on the type designation label attached to the inverter or the simple name plate.

**UMI–0550EE–B–B1**

① ② ③④ ⑤ ⑥

Figure 2-2 Product type

| Key | No. | Description | Content |
|---|---|---|---|
| Product line | | Abbreviation for product line | UMI for Unitronics Inverters |
| Rated power | | Power Range | Examples:<br>0004:400W<br>0550:55kW |
| Voltage degree | | Voltage degree | B: 1PH 220V (-15%)–240V (+10%)<br>C: 3PH 220V (-15%)–240V (+10%)<br>E: 3PH 380V (-15%)–440V (+10%) |
| Certification | ④ | Certification | E: EU Built-in safe torque off function |
| Optional Braking unit | ⑤ | Optional Braking unit | B: Built-in braking unit.<br>Optional for models ⩾45kW |

| Key | No. | Description | Content |
|---|---|---|---|
| | | | <Blank> No Built-in braking unit. |
| Product series | ⑥ | Product series | B1: for B1 Series Inverter Family |

## 2.5 Rated specifications

| Model | Voltage degree | Rated output power (kW) | Rated input current (A) | Rated output current (A) | STO function |
|---|---|---|---|---|---|
| UMI-0004BE-B1 | Single phase 230V | 0.4 | 6.5 | 2.5 | Class SIL2 PLd CAT.3 |
| UMI-0007BE-B1 | | 0.75 | 9.3 | 4.2 | |
| UMI-0015BE-B1 | | 1.5 | 15.7 | 7.5 | |
| UMI-0022BE-B1 | | 2.2 | 24 | 10 | |
| UMI-0004CE-B1 | Three phase 230V | 0.4 | 3.7 | 2.5 | |
| UMI-0007CE-B1 | | 0.75 | 5 | 4.2 | |
| UMI-0015CE-B1 | | 1.5 | 7.7 | 7.5 | Class SIL3 PLe CAT.3 |
| UMI-0022CE-B1 | | 2.2 | 11 | 10 | |
| UMI-0040CE-B1 | | 4 | 17 | 16 | |
| UMI-0055CE-B1 | | 5.5 | 21 | 20 | |
| UMI-0075CE-B1 | | 7.5 | 31 | 30 | |
| UMI-0007EE-B1 | Three phase 400V | 0.75 | 3.4 | 2.5 | Class SIL2 PLd CAT.3 |
| UMI-0015EE-B1 | | 1.5 | 5.0 | 4.2 | |
| UMI-0022EE-B1 | | 2.2 | 5.8 | 5.5 | |
| UMI-0040EE-B1 | | 4 | 13.5 | 9.5 | Class SIL3 PLe CAT.3 |
| UMI-0055EE-B1 | | 5.5 | 19.5 | 14 | |
| UMI-0075EE-B1 | | 7.5 | 25 | 18.5 | |
| UMI-0110EE-B1 | | 11 | 32 | 25 | |
| UMI-0150EE-B1 | | 15 | 40 | 32 | |
| UMI-0185EE-B1 | | 18.5 | 47 | 38 | |
| UMI-0220EE-B1 | | 22 | 51 | 45 | |
| UMI-0300EE-B1 | | 30 | 70 | 60 | |
| UMI-0370EE-B1 | | 37 | 80 | 75 | |
| UMI-0450EE-B1<br>UMI-0450EE-B-B1 | | 45 | 98 | 92 | |
| UMI-0550EE-B1<br>UMI-0550EE-B-B1 | | 55 | 128 | 115 | |
| UMI-0750EE-B1<br>UMI-0750EE-B-B1 | | 75 | 139 | 150 | |
| UMI-0900EE-B1<br>UMI-0900EE-B-B1 | | 90 | 168 | 180 | |

| Model | Voltage degree | Rated output power (kW) | Rated input current (A) | Rated output current (A) | STO function |
|---|---|---|---|---|---|
| UMI-1100EE-B1<br>UMI-1100EE-B-B1 | | 110 | 201 | 215 | |

## 2.6 Structure diagram

Figure 2-3 is the layout figure of the inverter (Three phase 400V, ≤2.2kW) (take the inverter of 0.75kW as the example).

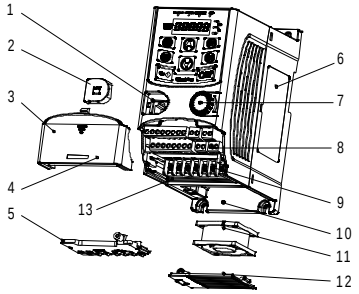



Figure 2-3 Product structure (Three phase 400V, ≤2.2kW)

| Serial No. | Name | Illustration |
|---|---|---|
| 1 | External keypad port | Connect the external keypad |
| 2 | Port cover | Protect the external keypad port |
| 3 | Cover | Protect the internal parts and components |
| 4 | Hole for the sliding cover | Fix the sliding cover |
| 5 | Trunking board | Protect the inner components and fix the cables of the main circuit |
| 6 | Name plate | See ***Product Overview*** for detailed information |
| 7 | Potentiometer knob | Refer to the ***Keypad Operation Procedure*** |
| 8 | Control terminals | See ***Electric Installation*** for detailed information |
| 9 | Main circuit terminals | See ***Electric Installation*** for detailed information |
| 10 | Screw hole | Fix the fan cover and fan |
| 11 | Cooling fan | See ***Maintenance and Hardware Fault Diagnose*** for detailed information |
| 12 | Fan cover | Protect the fan |
| 13 | Bar code | The same as the bar code on the name plate<br>**Note:** The bar code is on the middle shell which is under the cover |
| **Note:** In above figure, the screws at 4 and 10 are provided with packaging and specific installation depends on the requirements of customers. | | |

Figure 2-4 is the layout figure of the inverter (3PH 400V, ≥4kW) (take the inverter of 4kW as the example).

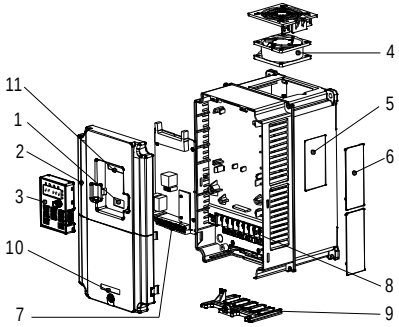



Figure 2-4 Product structure (Three phase 400V, ≥4kW)

| Serial No. | Name | Illustration |
|---|---|---|
| 1 | External keypad port | Connect the external keypad |
| 2 | Cover | Protect the internal parts and components |
| 3 | Keypad | Refer to the ***Keypad Operation Procedure*** |
| 4 | Cooling fan | See ***Maintenance and Hardware Fault Diagnose*** for detailed information |
| 5 | Name plate | See ***Product Overview*** for detailed information |
| 6 | Cover for the heat emission hole | Optional, enhancement of the protective degree. It is necessary to derate the inverter because the internal temperature is increasing |
| 7 | Control terminals | See ***Electric Installation*** for detailed information |
| 8 | Main circuit terminals | See ***Electric Installation*** for detailed information |
| 9 | The cable entry of the main circuit | Fix the cables |
| 10 | Simple name plate | Refer to ***Type Designation Key*** |
| 11 | Bar code | The same as the bar code on the name plate<br>**Note:** The bar code is on the middle shell which is under the cover |

# 3 Installation guide

The chapter describes the mechanical installation and electric installation.

- ✧ Only qualified electricians are allowed to carry out what described in this chapter. Please operate as the instructions in ***Safety Precautions***. Ignoring these may cause physical injury or death or damage to the devices.
- ✧ Ensure the power supply of the inverter is disconnected during the operation. Wait for at least the time designated after the disconnection if the power supply is applied.
- ✧ The installation and design of the inverter should be complied with the requirement of the local laws and regulations in the installation site. If the installation infringes the requirement, our company will exempt from any responsibility. Additionally, if users do not comply with the suggestion, some damage beyond the assured maintenance range may occur.

## 3.1 Mechanical installation

### 3.1.1 Installation environment

The installation environment is the safeguard for a full performance and long-term stable functions of the inverter. Check the installation environment as follows:

| Environment | Conditions |
|---|---|
| Installation site | Indoor |
| Environment temperature | -10°C–+50°C, and the temperature changing rate is less than 0.5°C/minute.<br>If the ambient temperature of the inverter is above 40°C, derate 1% for every additional 1°C.<br>It is not recommended to use the inverter if the ambient temperature is above 50°C.<br>In order to improve the reliability of the device, do not use the inverter if the ambient temperature changes frequently.<br>Please provide cooling fan or air conditioner to control the internal ambient temperature below the required one if the inverter is used in a close space such as in the control cabinet.<br>When the temperature is too low, if the inverter needs to restart to run after a long stop, it is necessary to provide an external heating device to increase the internal temperature; otherwise, damage to the devices may occur. |
| Humidity | RH≤90%<br>No condensation is allowed. |
| Storage temperature | -40°C–+70°C, and the temperature changing rate is less than 1°C/minute. |

| Environment | Conditions |
|---|---|
| Running environment condition | The installation site of the inverter should:<br>keep away from the electromagnetic radiation source;<br>keep away from contaminative air, such as corrosive gas, oil mist and flammable gas;<br>ensure foreign objects, such as metal power, dust, oil, water cannot enter into the inverter (do not install the inverter on the flammable materials such as wood);<br>keep away from direct sunlight, oil mist, steam and vibration environment. |
| Altitude | Below 1000m<br>If the altitude is above 1000m, please derate 1% for every additional 100m. |
| Vibration | ≤ 5.8m/s$^2$ (0.6g) |
| Installation direction | The inverter should be installed on an upright position to ensure sufficient cooling effect. |

**Note:**

- UMI-EU-B1 series inverters should be installed in a clean and ventilated environment according to enclosure classification.
- Cooling air must be clean, free from corrosive materials and electrically conductive dust.

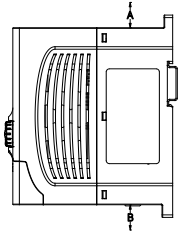
### 3.1.2 Installation direction

The inverter may be installed on the wall or in a cabinet.

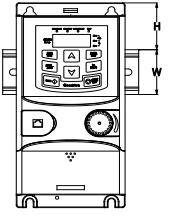
The inverter needs be installed in the vertical position. Check the installation site according to the requirements below. Refer to chapter ***Dimension Drawings*** in the appendix for frame details.

### 3.1.3 Installation manner

1. Wall and rail mounting for the inverters (single phase 230V/three phase 400V, ≤2.2KW and three phase 230V, ≤0.75KW)




(a) Wall mounting




(b) Rail mounting

Figure 3-1 Installation

**Note:** The minimum space of A and B is 100mm if H is 36.6mm and W is 35.0mm.

2. Wall and flange mounting for the inverters (three phase 400V, ≥4KW and three phase 230V, ≥1.5KW)

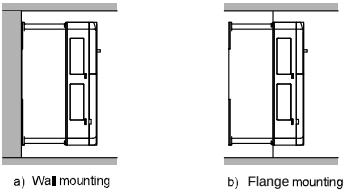



Figure 3-2 Installation

(1) Locate the position of the installation hole.

(2) Fix the screw or nut on the located position.

(3) Put the inverter against the wall.

(4) Tighten up the screws.

## 3.2 Standard wiring

### 3.2.1 Connection diagram of main circuit

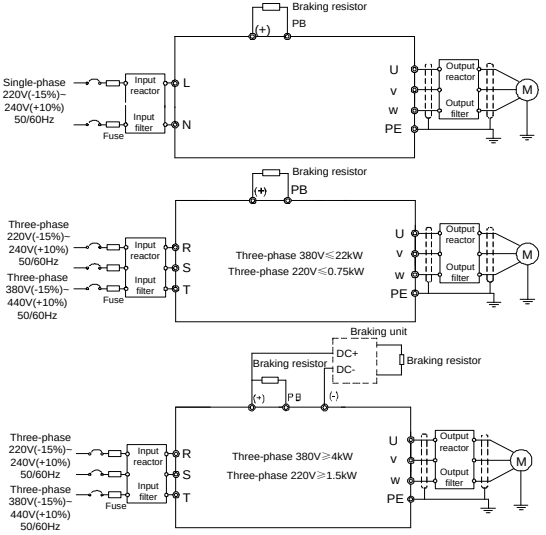



Figure 3-3 Connection diagram of main circuit

**Note:**

- The fuse, braking resistor, input reactor, input filter, output reactor, output filter are optional parts. Please refer to ***Peripheral Optional Parts*** for detailed information.
- Remove the yellow warning labels of PB, (+) and (-) on the terminals before connecting the braking resistor; otherwise, poor connection may be occur.

### 3.2.2 Terminals figure of main circuit

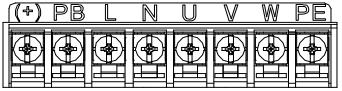



Figure 3-4 1PH terminals of main circuit (single phase)

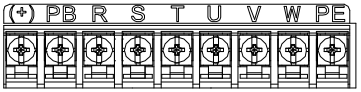



Figure 3-5 3PH terminals of main circuit (230V, ≤0.75kW, and 400V, ≤2.2kW)

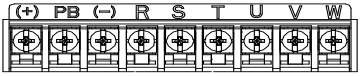



Figure 3-6 3PH terminals of main circuit (230V, ≤1.5kW, and 400V, 4-22kW)

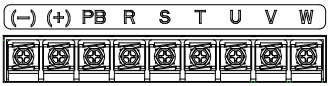



Figure 3-7 3PH terminals of main circuit (30-37kW)

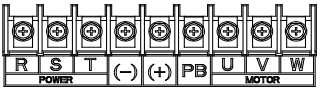



Figure 3-8 3PH terminals of main circuit (45-110kW)

| Terminal | Function |
|---|---|
| L, N | Single phase AC input terminals which are generally connected with the power supply. |
| R, S, T | Three phase AC input terminals which are generally connected with the power supply. |
| PB, (+) | External dynamic braking resistor terminal |
| (+), (-) | Input terminal of the DBU or DC bus |
| U, V, W | Three phase AC input terminals which are generally connected to motor. |
| PE | Protective grounding terminal |

**Note:**

- Do not use asymmetrically motor cables. If there is a symmetrically grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the inverter and motor ends.
- Route the motor cable, input power cable and control cables separately.

### 3.2.3 Wiring of terminals in main circuit

1. Connect the ground line of input power cable to the ground terminal of inverter (PE)

directly, and connect 3PH input cable to R, S and T and fasten up.

2. Connect the ground line of motor cable to the ground terminal of the inverter, and connect the 3PH motor cable to U, V, W and fasten up.
3. Connect the brake resistor which carries cables to the designated position.
4. Fasten up all the cables on the outside of the inverter if allowed.

### 3.2.4 Wiring diagram of control circuit

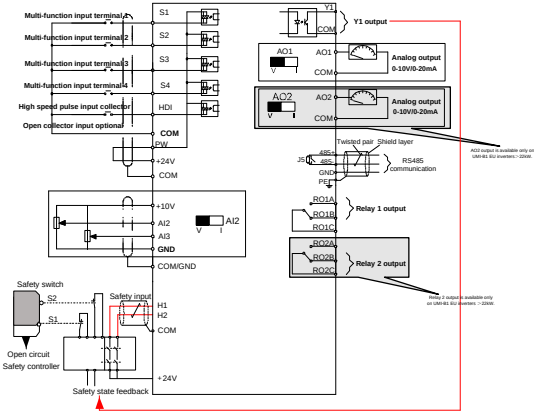



Figure 3-9 Wiring of control circuit

### 3.2.5 Terminals of control circuit

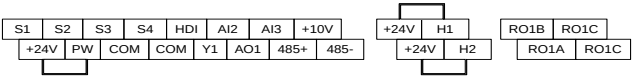



Figure 3-10 Connection terminal diagram for inverters ≤2.2kW

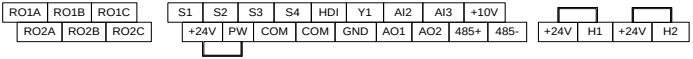



Figure 3-11 Connection terminal diagram for inverters ≥ 4kW

| Type | Terminal name | Function description | Technical specifications |
|---|---|---|---|

| Type | Terminal name | Function description | Technical specifications |
|---|---|---|---|
| Communication | 485+ | 485 communication | RS485 communication interface.<br>In order to ensure stable communication channel:<br>• Use shielded twisted pair cable.<br>• Connect the HOST RS485 signal ground to one of the VFD CMD/GND terminals.<br>• Connect one of the CMD/GND terminals to PE terminal.<br>• Earth the cable shield to the PE terminal. |
| | 485- | | |
| Digital input/output | S1 | Digital input | 1. Internal impedance: 3.3kΩ<br>2. 12–30V voltage input is available<br>3. The terminal is the dual-direction input terminal<br>4. Max input frequency: 1kHz |
| | S2 | | |
| | S3 | | |
| | S4 | | |
| | HDI | High frequency input channel | Except for S1–S4, this terminal can be used as high frequency input channel.<br>Max input frequency: 50kHz<br>Duty cycle: 30%–70% |
| | PW | Digital power supply | To provide the external digital power supply<br>Voltage range: 12–30V |
| | Y1 | Digital output | 1. Contact capacity: 50mA/30V;<br>2. Output frequency range: 0–1kHz;<br>3. Default is STO state output indicator. |
| STO function input | 24V-H1 | STO input 1 | 1. Safe torque stop (STO) redundant input, externally connected to NC contact, STO acts when the contact is open, and the drive stops output;<br>2. The safe input signal cable should be shield cable within 25m.<br>3. When employing STO function, please disassemble the short circuit plate on the terminals shown in fig 3.10 and fig 3.11. |
| | 24V-H2 | STO input 2 | |

| Type | Terminal name | Function description | Technical specifications |
|---|---|---|---|
| 24V power supply | +24V | 24V power supply | External 24V±10% power supply and the maximum output current is 200mA.<br>Generally used as the operation power supply of digital input and output or external sensor power supply |
| | COM | | |
| Analog input/output | +10V | External 10V reference power supply | 10V reference power supply<br>Max. output current: 50mA<br>As the adjusting power supply of the external potentiometer<br>Potentiometer resistance: 5kΩ above |
| | AI2 | Analog input | 1. Input range: AI2 voltage and current can be chosen: 0–10V/0–20mA; AI3: -10V–+10V.<br>2. Input impedance: voltage input: 20kΩ; current input: 500Ω.<br>3. Voltage or current input can be set by dip switch.<br>4. Resolution: the minimum AI2/AI3 is 10mV/20mV when 10V corresponds to 50Hz. |
| | AI3 | | |
| | GND | Analog reference ground | Analog reference ground |
| | AO1 | Analog output | 1. Output range: 0–10V voltage or 0–20mA current;<br>2. Voltage or current output is set by jumpers or toggle switch;<br>3. Error ±1%, 25°C;<br>4. There is only one AO1 for inverters ≤ 2.2kW. |
| | AO2 | | |
| Relay output | RO1A | Relay 1 NO contact | 1. Contact capacity: 3A/AC250V, 1A/DC30V;<br>2. Please note that it should not be used as high frequency switch output;<br>3. There is only one relay output for inverters ≤2.2kW. |
| | RO1B | Relay 1 NC contact | |
| | RO1C | Relay 1 common contact | |
| | RO2A | Relay 2 NO contact | |
| | RO2B | Relay 2 NC contact | |
| | RO2C | Relay 2 common contact | |

### 3.2.6 Input/output signal connection figure

Please use U-shaped contact tag to set NPN mode or PNP mode and the internal or external power supply. The default setting is NPN internal mode.

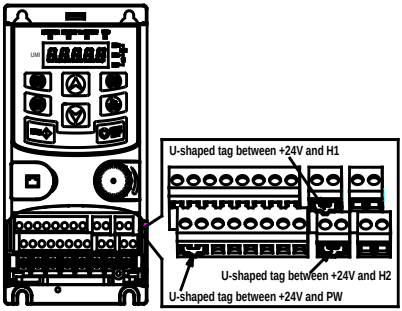



Figure 3-12 U-shaped contact tag

If the signal is from NPN transistor, please set the U-shaped contact tag between +24V and PW as below according to the used power supply.

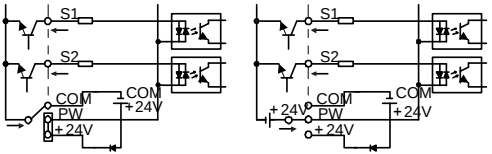



Figure 3-13 NPN modes

If the signal is from PNP transistor, please set the U-shaped contact tag as below according to the used power supply.

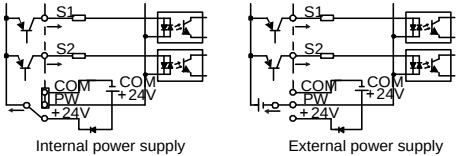


Figure 3-14 PNP modes

## 3.3 Overview of STO function

Reference standards:

1. EN 61326-3-1:2017
2. EN/IEC 61508-1:2010
3. EN/IEC 61508-2:2010
4. EN 61800-3:2004/A1:2012
5. EN 61800-5-1:2007/A1:2017
6. EN 61800-5-2:2017
7. EN 62061:2005/A2:2015
8. EN ISO 13849-1:2015
9. IEC 61800-5-1:2007
10. IEC 61800-5-1:2007/AMD1:2016
11. IEC 61800-5-2:2016
12. IEC 62061:2005
13. IEC 62061:2005/AMD1:2012
14. IEC 62061:2005/AMD2:2015
15. ISO 13849-1:2015

The STO function can be used where main power of the drive is on to prevent unexpected start. The function cuts off the drive signal to disable the drive output, thus preventing motor from unexpected start (see the following figure). After enabling STO function, short-time operations (like non-electrical cleaning-up in lathe industry) and/or maintenance on non-electrical parts can be conducted.

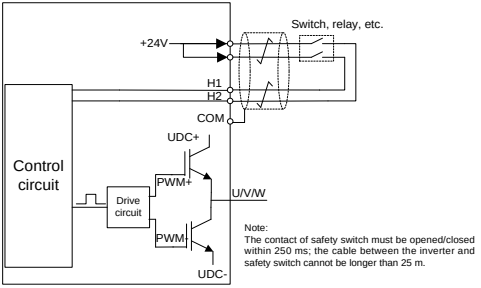



Figure 3-15 STO function circuits

### 3.3.1 Logic table for STO function

Input states and corresponding faults of STO function:

| STO input state | Corresponding STO fault |
|---|---|
| H1, H2 opens simultaneously | Trigger STO function, the drive can't operate normally |
| H1, H2 closes simultaneously | Don't trigger STO function, the drive can operate normally |
| Either H1 or H2 opens or closes | Trigger STL1/STL2/STL3 fault, fault code:<br>38: Safety circuit of channel 1 is abnormal (STL1)<br>39: Safety circuit of channel 2 is abnormal (STL2)<br>40: Internal circuit is abnormal (STL3) |

### 3.3.2 Description of STO channel delay

STO channel trigger and indication delay time:

| STO mode | STO trigger and indication delay [1), 2)] |
|---|---|
| STO fault: STL1 | Trigger delay＜10ms, indication delay＜280ms |
| STO fault: STL2 | Trigger delay＜10ms, indication delay＜280ms |
| STO fault: STL3 | Trigger delay＜10ms, indication delay＜280ms |
| STO fault: STO | Trigger delay＜10ms, indication delay＜100ms |

1) STO trigger delay = the delay between triggering STO and cutting off drive output

2) STO indication delay= the delay between triggering STO and indicating STO output state

### 3.3.3 Self-inspection on STO installation

Before installing STO, please perform self-inspection according to below table to ensure the effectiveness of STO.

**Actions**

- ☐ Ensure that the drive can be run and stopped freely during commissioning.
- ☐ Stop the drive (if running), cut off input power and isolate the drive from the power cable via the switch
- ☐ Check STO circuit connection against circuit diagram.
- ☐ Check that the shield of STO input cable is connected to +24V reference GND COM
- ☐ Power on
- ☐ Test the operation of STO when the motor is stopped:
  - Give a stop command to the drive (if running) and wait until the motor shaft is at standstill.
  - Activate STO function and give a start command to the drive, ensure the motor stays at standstill
  - Inactivate STO circuit
- ☐ Restart the drive and check if the motor runs normally

- ☐ Test the operation of STO function when the motor is running:
  - Start the drive and ensure the motor runs normally.
  - Activate STO circuit。
  - The drive reports STO fault (refer to fault and countermeasure in page X), ensure that motor coast to stop and stops rotation.
  - Inactivate STO circuit
- ☐ Restart the drive and check if the motor runs normally

## 3.4 Layout protection

### 3.4.1 Protecting the inverter and input power cable in short-circuit situations

Protect the inverter and input power cable in short circuit situations and against thermal overload.

Arrange the protection according to the following guide.

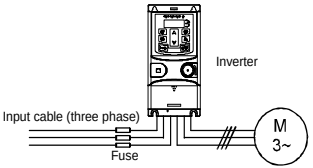



Figure 3-16 Fuse configuration

**Note:** Select the fuse as the manual indicated. The fuse will protect the input power cable from damage in short-circuit situations. It will protect the surrounding devices when the internal of the inverter is short circuited.

### 3.4.2 Protecting the motor and motor cables

The inverter protects the motor and motor cable in a short-circuit situation when the motor cable is dimensioned according to the rated current of the inverter. No additional protection devices are needed.

| | |
|---|---|
| ⚠ | ✧ **If the inverter is connected to multiple motors, a separate thermal overload switch or a circuit breaker must be used for protecting each cable and motor. These devices may require a separate fuse to cut off the short-circuit current.** |

### 3.4.3 Implementing a bypass connection

It is necessary to set power frequency and variable frequency conversion circuits for the assurance of continuous normal work of the inverter if faults occur in some significant situations.

In some special situations, for example, if it is only used in soft start, the inverter can be

converted into power frequency running after starting and some corresponding bypass should be added.

✧ **Never connect the supply power to the inverter output terminals U, V and W. Power line voltage applied to the output can result in permanent damage to the inverter.**

If frequent shifting is required, employ mechanically connected switches or contactors to ensure that the motor terminals are not connected to the AC power line and inverter output terminals simultaneously.

# 4 Keypad operation procedure

## 4.1 Keypad introduction

The keypad is used to control UMI-EU-B1 series inverters, read the state data and adjust parameters.

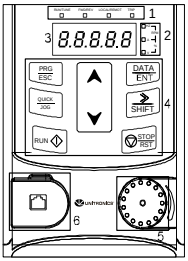



Figure 4-1 Film keypad

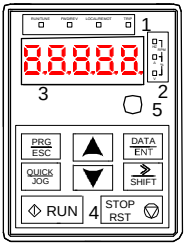
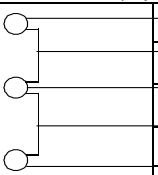



Figure 4-2 External keypad

**Note:**

1. The film keypad is standard for the inverters of 1PH 230V/3PH 400V (≤2.2kW) and the inverters of 3PH (≤0.75kW). The external keypad is standard for the inverters of 3PH 400V (≥4kW) and 3PH 230V (≥1.5kW).
2. The external keypads are optional (including the external keypads with and without the function of parameter copying).

| No. | Name | Description | |
|---|---|---|---|
| 1 | State LED | RUN/TUNE | LED off means that the inverter is in the stopping state; LED blinking means the inverter is in the parameter autotune state; LED on means the |

<table>
<tr><th>No.</th><th>Name</th><th colspan="3">Description</th></tr>
<tr><td rowspan="4"></td><td rowspan="4"></td><td></td><td colspan="2">inverter is in the running state.</td></tr>
<tr><td>FWD/REV</td><td colspan="2">FED/REV LED<br>LED off means the inverter is in the forward rotation state; LED on means the inverter is in the reverse rotation state</td></tr>
<tr><td>LOCAL/REMOT</td><td colspan="2">LED for keypad operation, terminals operation and remote communication control<br>LED off means that the inverter is in the keypad operation state; LED blinking means the inverter is in the terminals operation state; LED on means the inverter is in the remote communication control state.</td></tr>
<tr><td>TRIP</td><td colspan="2">LED for faults<br>LED on when the inverter is in the fault state; LED off in normal state; LED blinking means the inverter is in the pre-alarm state.</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Unit LED</td><td colspan="3">Mean the unit displayed currently</td></tr>
<tr><td rowspan="5">  </td><td>Hz</td><td>Frequency unit</td></tr>
<tr><td>RPM</td><td>Rotating speed unit</td></tr>
<tr><td>A</td><td>Current unit</td></tr>
<tr><td>%</td><td>Percentage</td></tr>
<tr><td>V</td><td>Voltage unit</td></tr>
<tr><td>3</td><td>Code displaying zone</td><td colspan="3">5-figure LED display displays various monitoring data and alarm code such as set frequency and output frequency.
<table>
<tr><th>Displayed character</th><th>Corresponding character</th><th>Displayed character</th><th>Corresponding character</th><th>Displayed character</th><th>Corresponding character</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>3</td><td>3</td><td>4</td><td>4</td><td>5</td><td>5</td></tr>
<tr><td>6</td><td>6</td><td>7</td><td>7</td><td>8</td><td>8</td></tr>
<tr><td>9</td><td>9</td><td>A</td><td>A</td><td>b</td><td>b</td></tr>
<tr><td>C</td><td>C</td><td>d</td><td>d</td><td>E</td><td>E</td></tr>
<tr><td>F</td><td>F</td><td>H</td><td>H</td><td>I</td><td>I</td></tr>
<tr><td>L</td><td>L</td><td>n</td><td>N</td><td>n</td><td>n</td></tr>
<tr><td>o</td><td>O</td><td>P</td><td>P</td><td>r</td><td>r</td></tr>
<tr><td>S</td><td>S</td><td>t</td><td>t</td><td>U</td><td>U</td></tr>
<tr><td>v</td><td>v</td><td>.</td><td>.</td><td>-</td><td>-</td></tr>
</table></td></tr>
</table>

| No. | Name | Description | | |
|---|---|---|---|---|
| 4 | Buttons | PRG ESC | Programming key | Enter or escape from the first level menu and remove the parameter quickly |
| | | DATA ENT | Entry key | Enter the menu step-by-step<br>Confirm parameters |
| | | ▲ | UP key | Increase data or function code progressively |
| | | ▼ | DOWN key | Decrease data or function code progressively |
| | | SHIFT | Right-shift key | Move right to select the displaying parameter circularly in stopping and running mode.<br>Select the parameter modifying digit during the parameter modification |
| | | RUN | Run key | This key is used to operate on the inverter in key operation mode |
| | | STOP RST | Stop/ Reset key | This key is used to stop in running state and it is limited by function code P07.04<br>This key is used to reset all control modes in the fault alarm state |
| | | QUICK JOG | Quick key | The function of this key is confirmed by function code P07.02. |
| 5 | Analog potential meter | AI1, When the external common keypad (without the function of parameter copy ) is valid, the difference between the local keypad AI1 and the external keypad AI1 is:<br>When the external keypad AI1 is set to the Min. value, the local keypad AI1 will be valid and P17.19 will be the voltage of the local keypad AI1; otherwise, the external keypad AI1 will be valid and P17.19 will be the voltage of the external keypad AI1.<br>**Note**: If the external keypad AI1 is frequency reference source, adjust the local potentiometer AI1 to 0V/0mA before starting the inverter. | | |
| 6 | Keypad port | External keypad port. When the external keypad with the function of parameter copying is valid, the local keypad LED is off; When the external keypad without the function of parameter copying is valid, the local and external keypad LEDs are on.<br>**Note:** Only the external keypad which has the function of parameters copy owns the function of parameters copy, other keypads do not have. (only for the inverters≤2.2kW) | | |

## 4.2 Keypad displaying

The keypad displaying state of UMI-EU-B1 series inverters is divided into stopping state parameter, running state parameter, function code parameter editing state and fault alarm state and so on.

### 4.2.1 Displayed state of stopping parameter

When the inverter is in the stopping state, the keypad will display stopping parameters which is shown in Figure 4-2.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by P07.07. See the instructions of P07.07 for the detailed definition of each bit.

In the stopping state, there are 14 stopping parameters can be selected to be displayed or not. They are: set frequency, bus voltage, input terminals state, output terminals state, PID given, PID feedback, torque set value, AI1, AI2, AI3, HDI, PLC and the current stage of multi-step speeds, pulse counting value, length value. P07.07 can select the parameter to be displayed or not by bit and 》/SHIFT can shift the parameters form left to right, QUICK/JOG (P07.02=2) can shift the parameters form right to left.

### 4.2.2 Displayed state of running parameters

After the inverter receives valid running commands, the inverter will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction which is shown in Figure 4-2.

In the running state, there are 24 parameters can be selected to be displayed or not. They are: running frequency, set frequency, bus voltage, output voltage, output torque, PID given, PID feedback, input terminals state, output terminals state, torque set value, length value, PLC and the current stage of multi-step speeds, pulse counting value, AI1, AI2, AI3, HDI, percentage of motor overload, percentage of inverter overload, ramp given value, linear speed, AC input current. P07.05 and P07.06 can select the parameter to be displayed or not by bit and 》/SHIFT can shift the parameters form left to right, QUICK/JOG (P07.02=2) can shift the parameters from right to left.

### 4.2.3 Displayed state of fault

If the inverter detects the fault signal, it will enter into the fault pre-alarm displaying state. The keypad will display the fault code by flicking. The TRIP LED on the keypad is on, and the fault reset can be operated by the STOP/RST on the keypad, control terminals or communication commands.

### 4.2.4 Displayed state of function codes editing

In the state of stopping, running or fault, press PRG/ESC to enter into the editing state (if there is a password, see P07.00 ).The editing state is displayed on two classes of

menu, and the order is: function code group/function code number→function code parameter, press DATA/ENT into the displayed state of function parameter. On this state, press DATA/ENT to save the parameters or press PRG/ESC to escape.

Figure 4-3 Displayed state

## 4.3 Keypad operation

Operate the inverter via operation panel. See the detailed structure description of function codes in the brief diagram of function codes.

### 4.3.1 How to modify the function codes of the inverter

The inverter has three levels menu, which are:

1. Group number of function code (first-level menu)

2. Tab of function code (second-level menu)

3. Set value of function code (third-level menu)

Remarks: Press both the PRG/ESC and the DATA/ENT can return to the second-level menu from the third-level menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-level menu without saving the parameters, and keep staying at the current function code.

Under the third-level menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

1) This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;

2) This function code is not modifiable in running state, but modifiable in stop state.

Example: Set function code P00.01 from 0 to 1.

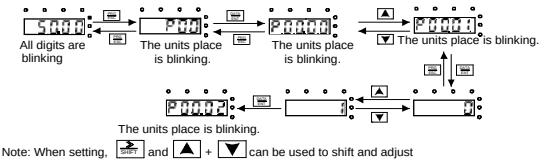



Figure 4-4 Sketch map of modifying parameters

### 4.3.2 How to set the password of the inverter

UMI-EU-B1 series inverters provide password protection function to users. Set P7.00 to gain the password and the password protection becomes valid instantly after quitting from the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

Set P7.00 to 0 to cancel password protection function.

The password protection becomes effective instantly after retreating from the function code editing state. Press PRG/ESC again to the function code editing state, "0.0.0.0.0" will be displayed. Unless using the correct password, the operators cannot enter it.

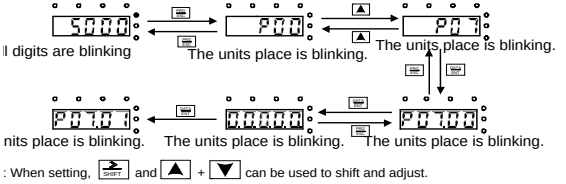



Figure 4-5 Sketch map of password setting

### 4.3.3 How to watch the inverter state through function codes

UMI-EU-B1 series inverters provide group P17 as the state inspection group. Users can enter into P17 directly to watch the state.

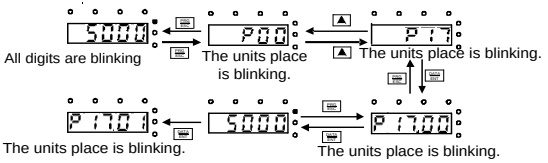



Figure 4-6 Sketch map of state watching

# 5 Function parameters

The function parameters of UMI-EU-B1 series inverters have been divided into 30 groups (P00–P29) according to the function, of which P18–P28 are reserved. Each function group contains certain function codes applying 3-level menus. For example, “P08.08” means the eighth function code in the P8 group function, P29 group is factory reserved, and users are forbidden to access these parameters.

For the convenience of function codes setting, the function group number corresponds to the first level menu, the function code corresponds to the second level menu and the function code corresponds to the third level menu.

**1.** Below is the instruction of the function lists:

**The first column** “Function code”: codes of function parameter group and parameters；

**The second column** “Name”: full name of function parameters；

**The third column** “Detailed illustration of parameters”: Detailed illustration of the function parameters

**The fourth column** “Default value”: the original factory set value of the function parameter；

**The fifth column** “Modify”: the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below is the instruction:

“○”: means the set value of the parameter can be modified on stop and running state；

“◎”: means the set value of the parameter cannot be modified on the running state；

“●”: means the value of the parameter is the real detection value which cannot be modified.

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| **P00 Group Basic function group** | | | | |
| P00.00 | Speed control mode | 0: SVC 0<br>.No need to install encoders. Suitable in applications which need low frequency, big torque for high accuracy of rotating speed and torque control. Relative to mode 1, it is more suitable for the applications which need small power.<br>1: SVC 1<br>1 is suitable in high performance cases with the advantage of high accuracy of rotating speed and torque. It does not need to install | 1 | ◎ |

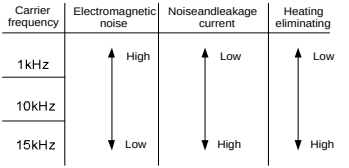
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | pulse encoder.<br>2: SVPWM control<br>2 is suitable in applications which do not need high control accuracy, such as the load of fan and pump. One inverter can drive multiple motors.<br>Note: Motor parameter autotuning is required when vector mode is applied. | | |
| P00.01 | Run command channel | Select the run command channel of the inverter.<br>The control command of the inverter includes: start, stop, forward/reverse rotating, jogging and fault reset.<br>0: Keypad running command channel ("LOCAL/REMOT" light off)<br>Carry out the command control by RUN, STOP/RST on the keypad.<br>Set the multi-function key QUICK/JOG to FWD/REVC shifting function (P07.02=3) to change the running direction; press **RUN** and **STOP/RST** simultaneously in running state to make the inverter coast to stop.<br>1: Terminal running command channel ("LOCAL/REMOT" flickering)<br>Carry out the running command control by the forward rotation, reverse rotation and forward jogging and reverse jogging of the multi-function terminals<br>2:Communication running command channel ("LOCAL/REMOT" on);<br>The running command is controlled by the upper monitor via communication | 0 | ○ |
| P00.03 | Max output frequency | This parameter is used to set the maximum output frequency of the inverter. Users need to pay attention to this parameter because it is the foundation of the frequency setting and the speed of acceleration and deceleration.<br>Setting range: P00.04–400.00Hz | 50.00Hz | ◎ |
| P00.04 | Upper limit of | The upper limit of the running frequency is | 50.00Hz | ◎ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | running frequency | the upper limit of the output frequency of the inverter which is lower than or equal to the maximum frequency.<br>Setting range: P00.05–P00.03 (max output frequency) | | |
| P00.05 | Lower limit of running frequency | The lower limit of the running frequency is that of the output frequency of the inverter. The inverter runs at the lower limit frequency if the set frequency is lower than the lower limit.<br>**Note:** Max output frequency ≥ Upper limit frequency ≥ Lower limit frequency<br>Setting range: 0.00Hz–P00.04 (Upper limit of the running frequency) | 0.00Hz | ◎ |
| P00.06 | A frequency command selection | **Note:** A frequency and B frequency cannot set as the same frequency given method. The frequency source can be set by P00.09.<br>0: Keypad data setting<br>Modify the value of function code P00.10 (set the frequency by keypad) to modify the frequency by the keypad.<br>1: Analog AI1 setting (corresponding keypad potentiometer)<br>2: Analog AI2 setting (corresponding terminal AI2)<br>3: Analog AI3 setting (corresponding terminal AI3)<br>Set the frequency by analog input terminals. UMI-EU-B1 series inverters provide 3 channels analog input terminals as the standard configuration, of which AI1 is adjusting through analog potentiometer, while AI2 is the voltage/current option (0–10V/0–20mA) which can be shifted by jumpers; while AI3 is voltage input (-10V–+10V).<br>**Note:** when analog AI2 select 0–20mA input, the corresponding voltage of 20mA is 10V. 100.0% of the analog input setting corresponds to the maximum frequency (function code P00.03) in forward direction | 0 | ○ |
| P00.07 | B frequency command selection | | 2 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | and -100.0% corresponds to the maximum frequency in reverse direction (function code P00.03)<br>4: High-speed pulse HDI setting<br>The frequency is set by high-speed pulse terminals. UMI-EU-B1 series inverters provide 1 high speed pulse input as the standard configuration. The pulse frequency range is 0.00–50.00kHz.<br>100.0% of the high speed pulse input setting corresponds to the maximum frequency in forward direction (function code P00.03) and -100.0% corresponds to the maximum frequency in reverse direction (function code P00.03).<br>**Note:** The pulse setting can only be input by multi-function terminals HDI. Set P05.00 (HDI input selection) to high speed pulse input, and set P05.49 (HDI high speed pulse input function selection) to frequency setting input.<br>5: Simple PLC program setting<br>The inverter runs at simple PLC program mode when P00.06=5 or P00.07=5. Set P10 (simple PLC and multi-step speed control) to select the running frequency running direction, ACC/DEC time and the keeping time of corresponding stage. See the function description of P10 for detailed information.<br>6: Multi-step speed running setting<br>The inverter runs at multi-step speed mode when P00.06=6 or P00.07=6. Set P05 to select the current running step, and set P10 to select the current running frequency.<br>The multi-step speed has the priority when P00.06 or P00.07 does not equal to 6, but the setting stage can only be the 1–15 stage. The setting stage is 1–15 if P00.06 or P00.07 equals to 6.<br>7: PID control setting<br>The running mode of the inverter is process PID control when P00.06=7 or P00.07=7. It is | | |

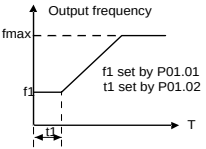
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | necessary to set P09. The running frequency of the inverter is the value after PID effect. See P09 for the detailed information of the preset source, preset value and feedback source of PID.<br>8: MODBUS communication setting<br>The frequency is set by MODBUS communication. See P14 for detailed information.<br>9–11: Reserved | | |
| P00.08 | B frequency command reference selection | 0: Maximum output frequency, 100% of B frequency setting corresponds to the maximum output frequency<br>1: A frequency command, 100% of B frequency setting corresponds to the maximum output frequency. Select this setting if it needs to adjust on the base of A frequency command. | 0 | ○ |
| P00.09 | Combination of the setting source | 0: A, the current frequency setting is A frequency command<br>1: B, the current frequency setting is B frequency command<br>2: A+B, the current frequency setting is A frequency command + B frequency command<br>3: A-B, the current frequency setting is A frequency command - B frequency command<br>4: Max (A, B): The bigger one between A frequency command and B frequency is the set frequency.<br>5: Min (A, B): The lower one between A frequency command and B frequency is the set frequency.<br>**Note:** The combination manner can be shifted by P05 (terminal function) | 0 | ○ |
| P00.10 | Keypad set frequency | When A and B frequency commands are selected as “keypad setting”, this parameter will be the initial value of inverter reference frequency<br>Setting range: 0.00 Hz–P00.03 (the Max | 50.00Hz | ○ |

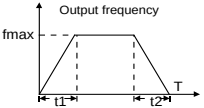
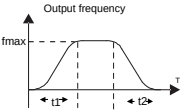
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | frequency) | | |
| P00.11 | ACC time 1 | ACC time means the time needed if the inverter speeds up from 0Hz to the max one (P00.03). | Depend on model | ○ |
| P00.12 | DEC time 1 | DEC time means the time needed if the inverter speeds down from the max output frequency to 0Hz (P00.03).<br>UMI-EU-B1 series inverters have four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the inverter is the first group.<br>Setting range of P00.11 and P00.12: 0.0–3600.0s | Depend on model | ○ |
| P00.13 | Running direction selection | 0: Runs at the default direction, the inverter runs in the forward direction. FWD/REV indicator is off.<br>1: Runs at the opposite direction, the inverter runs in the reverse direction. FWD/REV indicator is on.<br>Modify the function code to shift the rotation direction of the motor. This effect equals to the shifting the rotation direction by adjusting either two of the motor lines (U, V and W). The motor rotation direction can be changed by QUICK/JOG on the keypad. Refer to parameter P07.02.<br>**Note:** When the function parameter comes back to the default value, the motor's running direction will come back to the factory default state, too. In some cases it should be used with caution after commissioning if the change of rotation direction is disabled.<br>2: Forbid to run in reverse direction: It can be used in some special cases if the reverse running is disabled. | 0 | ○ |

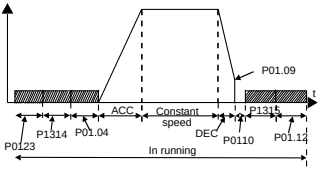
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P00.14</td><td>Carrier frequency setting</td><td>


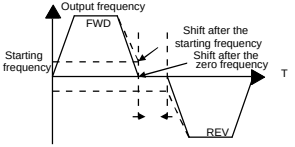
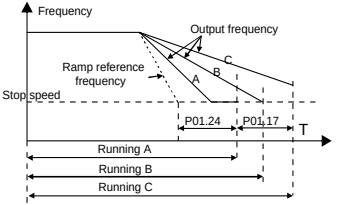
The relationship table of the motor type and carrier frequency:
<table>
<tr><th>Motor type</th><th>Factory setting of carrier frequency</th></tr>
<tr><td>0.4–11kW</td><td>8kHz</td></tr>
<tr><td>15–110kW</td><td>4kHz</td></tr>
</table>
The advantage of high carrier frequency: ideal current waveform, little current harmonic wave and motor noise.<br>
The disadvantage of high carrier frequency: increasing the switch loss, increasing inverter temperature and the impact to the output capacity. The inverter needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase.<br>
Applying low carrier frequency is contrary to the above, too low carrier frequency will cause unstable running, torque decreasing and surge.<br>
The manufacturer has set a reasonable carrier frequency when the inverter is in factory. In general, users do not need to change the parameter.<br>
When the frequency used exceeds the default carrier frequency, the inverter needs to derate 10% for each additional 1k carrier frequency.<br>
Setting range: 1.0–15.0kHz</td><td>Depend on model</td><td>○</td></tr>
<tr><td>P00.15</td><td>Motor parameter</td><td>0: No operation<br>1: Rotating autotuning</td><td>0</td><td>◎</td></tr>
</table>

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | autotuning | Comprehensive motor parameter autotune<br>It is recommended to use rotating autotuning when high control accuracy is needed.<br>2: Static autotuning 1 (autotune totally); It is suitable in the cases when the motor cannot de-couple from the load. The autotuning for the motor parameter will impact the control accuracy.<br>3: Static autotuning 2 (autotune part parameters); when the current motor is motor 1, autotune P02.06, P02.07, P02.08 | | |
| P00.16 | AVR function selection | 0: Invalid<br>1: Valid during the whole procedure<br>The auto-adjusting function of the inverter can cancel the impact on the output voltage of the inverter because of the bus voltage fluctuation. | 1 | ○ |
| P00.18 | Function restore parameter | 0: No operation<br>1: Restore the default value<br>2: Clear fault records<br>3: Lock all function codes<br>**Note:** The function code will restore to 0 after finishing the operation of the selected function code.<br>Restoring to the default value will cancel the user password, please use this function with caution. | 0 | ◎ |
| **P01 Group Start-up and stop control** | | | | |
| P01.00 | Start mode | 0: Start-up directly: start from the starting frequency P01.01<br>1: Start-up after DC braking: start the motor from the starting frequency after DC braking (set the parameter P01.03 and P01.04). It is suitable in the cases where reverse rotation may occur to the low inertia load during starting.<br>2: Start after speed tracking 1<br>3: Start after speed tracking 2 | 0 | ◎ |

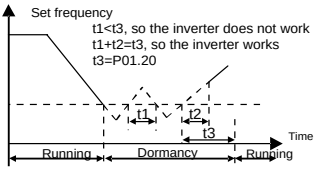
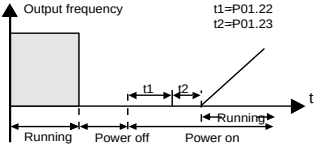
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | The direction and speed will be tracked automatically for the smoothing starting of rotating motors. It suits the application with reverse rotation when big load starting.<br>**Note:** This function is only available for the inverters≥4kW | | |
| P01.01 | Starting frequency of direct start-up | Starting frequency of direct start-up means the original frequency during the inverter starting. See P01.02 for detailed information.<br>Setting range: 0.00–50.00Hz | 0.50Hz | ◎ |
| P01.02 | Retention time of the starting frequency | Set a proper starting frequency to increase the torque of the inverter during starting. During the retention time of the starting frequency, the output frequency of the inverter is the starting frequency. And then, the inverter will run from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the inverter will stop running and keep in the stand-by state. The starting frequency is not limited in the lower limit frequency.<br>  <br><br>Setting range: 0.0–50.0s | 0.0s | ◎ |
| P01.03 | Braking current before starting | The inverter will carry out DC braking at the braking current set before starting and it will speed up after the DC braking time. If the DC braking time is set to 0, the DC braking is invalid.<br>The stronger the braking current, the bigger the braking power. The DC braking current before starting means the percentage of the rated current of the inverter. | 0.0% | ◎ |
| P01.04 | Braking time before starting | | 0.00s | ◎ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | Setting range of P01.03: 0.0–100.0%<br>Setting range of P01.04: 0.00–50.00s | | |
| P01.05 | ACC/DEC selection | The changing mode of the frequency during start-up and running.<br>0: Linear type<br>The output frequency increases or decreases linearly.<br>  <br><br>1: S curve, the output frequency will increase or decrease according to the S curve<br>S curve is generally used on the applications of gradual starting and stopping, such as elevators.<br>  <br> | 0 | ◎ |
| P01.06 | ACC time of the starting step of S curve | 0.0–50.0s | 0.1s | ◎ |
| P01.07 | DEC time of the ending step of S curve | | 0.1s | ◎ |
| P01.08 | Stop selection | 0: Decelerate to stop: after the stop command becomes valid, the inverter decelerates to reduce the output frequency during the set time. When the frequency decreases to 0Hz, the inverter stops.<br>1: Coast to stop: after the stop command becomes valid, the inverter ceases the output immediately. And the load coasts to stop at the mechanical inertia. | 0 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P01.09 | Starting frequency of DC braking while stop | Starting frequency of DC braking: start the DC braking when running frequency reaches starting frequency determined by P1.09.<br>Waiting time before DC braking: Inverters blocks the output before starting the DC braking. After this waiting time, the DC braking will be started so as to prevent over-current fault caused by DC braking at high speed.<br>DC braking current: the value of P01.11 is the percentage of rated current of inverter. The bigger the DC braking current is, the greater the braking torque is.<br>DC braking time: the retention time of DC braking. If the time is 0, the DC braking is invalid. The inverter will stop at the set deceleration time.<br>  <br>Setting range of P01.09: 0.00Hz–P00.03 (the Max frequency)<br>Setting range of P01.10: 0.00–50.00s<br>Setting range of P01.11: 0.0–100.0%<br>Setting range of P01.12: 0.00–50.00s | 0.00Hz | ○ |
| P01.10 | Stop brake waiting time | | 0.00s | ○ |
| P01.11 | Stop DC braking current | | 0.0% | ○ |
| P01.12 | Stop DC braking time | | 0.00s | ○ |
| P01.13 | Deadzone time of FWR/REV rotation | During the procedure of switching FWD/REV rotation, set the threshold by P01.14, which is as the table below: | 0.0s | ○ |

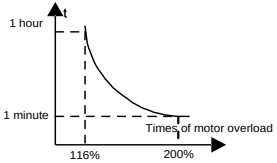
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | |  <br>Setting range: 0.0–3600.0s | | |
| P01.14 | Switching between FWD/REV rotation | Set the threshold point of the inverter:<br>0: Switch after zero frequency<br>1: Switch after the starting frequency<br>2: Switch after the speed reach P01.15 and delay for P01.24 | 0 | ◎ |
| P01.15 | Stopping speed | 0.00–100.00Hz | 0.50Hz | ◎ |
| P01.16 | Detection of stopping speed | 0: Detect at the setting speed<br>1: Detect at the feedback speed (only valid for vector control) | 1 | ◎ |
| P01.17 | Detection time of the feedback speed | When P01.16=1, the actual output frequency of the inverter is less than or equal to P01.15 and is detected during the time set by P01.17, the inverter will stop; otherwise, the inverter stops in the time set by P01.24.<br>  <br>Setting range: 0.00–100.00s ( valid only when P01.16=1) | 0.50s | ◎ |
| P01.18 | Power-on terminal running protection selection | When the running command channel is the terminal control, the system will detect the state of the running terminal during powering on.<br>0: The terminal running command is invalid | 0 | ○ |

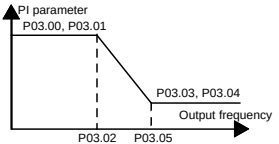
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | when powering on. Even the running command is detected to be valid during powering on, the inverter won't run and the system keeps in the protection state until the running command is canceled and enabled again.<br>1: The terminal running command is valid when powering on. If the running command is detected to be valid during powering on, the system will start the inverter automatically after the initialization.<br>**Note:** This function should be selected with cautions, or serious result may follow. | | |
| P01.19 | Action when running frequency is lower than the lower limit (valid when frequency lower limit is larger than 0) | This function code determines the running state of the inverter when the set frequency is lower than the lower-limit one.<br>0: Run at the lower-limit frequency<br>1: Stop<br>2: Hibernation<br>The inverter will coast to stop when the set frequency is lower than the lower-limit one. If the set frequency is above the lower limit one again and it lasts for the time set by P01.20, the inverter will come back to the running state automatically. | 0 | ◎ |
| P01.20 | Wake up from sleep delay time | This function code determines the hibernation delay time. When the running frequency of the inverter is lower than the lower limit one, the inverter will stop to stand by.<br>When the set frequency is above the lower limit one again and it lasts for the time set by P01.20, the inverter will run automatically. | 0.0s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | |  <br>Setting range: 0.0–3600.0s (valid when P01.19=2) | | |
| P01.21 | Restart after power off | This function can enable the inverter start or not after the power off and then power on.<br>0: Disabled<br>1: Enabled, if the starting need is met, the inverter will run automatically after waiting for the time defined by P01.22. | 0 | ○ |
| P01.22 | The waiting time of restart after power off | The function determines the waiting time before the automatic running of the inverter when powering off and then powering on.<br>  <br>Setting range: 0.0–3600.0s (valid when P01.21=1) | 1.0s | ○ |
| P01.23 | Start delay time | The function determines the brake release after the running command is given, and the inverter is in a stand-by state and wait for the delay time set by P01.23<br>Setting range: 0.0–60.0s | 0.0s | ○ |
| P01.24 | Delay of stopping speed | Setting range: 0.0–100.0s | 0.0s | ○ |
| P01.25 | 0Hz output | Select the 0Hz output of the inverter.<br>0: No voltage output<br>1: With voltage output<br>2: Output at stop DC brake current | 0 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| **P02 Group Motor 1** | | | | |
| P02.01 | Rated power of asynchronous motor | 0.1–3000.0kW | Depend on model | ◎ |
| P02.02 | Rated frequency of asynchronous motor | 0.01Hz–P00.03 | 50.00Hz | ◎ |
| P02.03 | Rated speed of asynchronous motor | 1–36000rpm | Depend on model | ◎ |
| P02.04 | Rated voltage of asynchronous motor | 0–1200V | Depend on model | ◎ |
| P02.05 | Rated current of asynchronous motor | 0.8–6000.0A | Depend on model | ◎ |
| P02.06 | Stator resistor of asynchronous motor | 0.001–65.535Ω | Depend on model | ○ |
| P02.07 | Rotor resistor of asynchronous motor | 0.001–65.535Ω | Depend on model | ○ |
| P02.08 | Leakage inductance of asynchronous motor | 0.1–6553.5mH | Depend on model | ○ |
| P02.09 | Mutual inductance of asynchronous motor | 0.1–6553.5mH | Depend on model | ○ |
| P02.10 | Non-load current of asynchronous | 0.1–6553.5A | Depend on model | ○ |

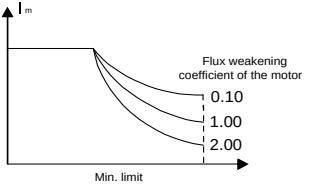
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | motor | | | |
| P02.11 | Magnetic saturation coefficient 1 for the iron core of AM1 | 0.0–100.0% | 80.0% | ◎ |
| P02.12 | Magnetic saturation coefficient 2 for the iron core of AM1 | 0.0–100.0% | 68.0% | ◎ |
| P02.13 | Magnetic saturation coefficient 3 for the iron core of AM1 | 0.0–100.0% | 57.0% | ◎ |
| P02.14 | Magnetic saturation coefficient 4 for the iron core of AM1 | 0.0–100.0% | 40.0% | ◎ |
| P02.26 | Motor overload protection selection | 0: No protection<br>1: Common motor (with low speed compensation). Because the heat-releasing effect of the common motors will be weakened, the corresponding electric heat protection will be adjusted properly. The low speed compensation characteristic mentioned here means reducing the threshold of the overload protection of the motor whose running frequency is below 30Hz.<br>2: Frequency conversion motor (without low speed compensation). Because the heat-releasing of the specific motors won't be impacted by the rotation speed, it is not necessary to adjust the protection value during low-speed running. | 2 | ◎ |

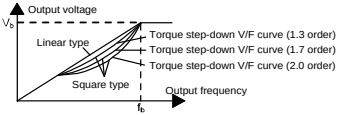
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P02.27 | Motor overload protection coefficient | Times of motor overload M = Iout/(In*K)<br>In is the rated current of the motor, Iout is the output current of the inverter and K is the motor protection coefficient.<br>So, the bigger the value of K is, the smaller the value of M is. When M =116%, the fault will be reported after 1 hour, when M =200%, the fault will be reported after 1 minute, when M>=400%, the fault will be reported instantly.<br>  <br>Setting range: 20.0%–120.0% | 100.0% | ○ |
| P02.28 | Correction coefficient of motor 1 power | Correct the power displaying of motor 1. Only impact the displaying value other than the control performance of the inverter.<br>Setting range: 0.00–3.00 | 1.00 | ○ |
| **P03 Group Vector control** | | | | |
| P03.00 | Speed loop proportional gain 1 | The parameters P03.00–P03.05 only apply to vector control mode. Below the switching frequency 1 (P03.02), the speed loop PI parameters are: P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed loop PI parameters are: P03.03 and P03.04. PI parameters are gained according to the linear change of two groups of parameters. It is shown as below: | 20.0 | ○ |
| P03.01 | Speed loop integral time 1 | | 0.200s | ○ |
| P03.02 | Switching low point frequency | | 5.00Hz | ○ |
| P03.03 | Speed loop proportional gain 2 | | 20.0 | ○ |
| P03.04 | Speed loop integral time 2 | | 0.200s | ○ |
| P03.05 | Switching high point frequency | | 10.00 Hz | ○ |

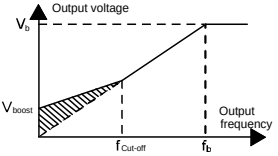
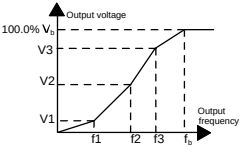
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | |  <br>PI has a close relationship with the inertia of the system. Adjust on the base of PI according to different loads to meet various demands.<br>Setting range of P03.00 and P03.03: 0–200.0<br>Setting range of P03.01 and P03.04: 0.000–10.000s<br>Setting range of P03.02: 0.00Hz–P00.05<br>Setting range of P03.05: P03.02–P00.03 | | |
| P03.06 | Speed loop output filter | 0–8 (corresponds to $0–2^8$/10ms) | 0 | ○ |
| P03.07 | Compensation coefficient of vector control electromotion slip | Slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy of the system. Adjusting the parameter properly can control the speed steady-state error.<br>Setting range: 50%–200% | 100% | ○ |
| P03.08 | Compensation coefficient of vector control brake slip | | 100% | ○ |
| P03.09 | Current loop proportional coefficient P | **Note**:<br>These two parameters adjust the PI adjustment parameter of the current loop which affects the dynamic response speed and control accuracy directly. Generally, users do not need to change the default value;<br>Only apply to the vector control mode without PG 0 (P00.00=0).<br>Setting range: 0–65535 | 1000 | ○ |
| P03.10 | Current loop integral coefficient I | | 1000 | ○ |
| P03.11 | Torque setting mode selection | This parameter is used to enable the torque control mode, and set the torque setting | 0 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | means.<br>0: Torque control is invalid<br>1: Set via keypad（P3.12）<br>2: Set via AI1（100% relative to three times of motor current）<br>3: Set via AI2（100% relative to three times of motor（same as above）<br>4: Set via AI3（100% relative to three times of motor（same as above）<br>5: Set via pulse frequency HDI（same as above）<br>6: Multi-step torque setting (same as above)<br>7: Set via MODBUS communication<br>8–10: Reserved<br>**Note**: Setting mode 2–7, 100% corresponds to 3 times of the motor rated current | | |
| P03.12 | Keypad setting torque | Setting range: -300.0%–300.0% (motor rated current) | 50.0% | ○ |
| P03.13 | Torque given filter time | 0.000–10.000s | 0.100s | ○ |
| P03.14 | Setting source of forward rotation upper-limit frequency in torque control | 0: Keypad setting upper-limit frequency (P03.16 sets P03.14, P03.17 sets P03.15)<br>1: Set via AI1（100% corresponds to max frequency）<br>2: Set via AI2（same as above）<br>3: Set via AI3（same as above） | 0 | ○ |
| P03.15 | Setting source of reverse rotation upper-limit frequency in torque control | 4: Set via pulse frequency HDI (same as above)<br>5: Multi-step setting upper limit frequency (same as above)<br>6: Set via MODBUS communication (same as above)<br>7–9: Reserved<br>Note: setting method 1–9, 100% corresponds to the maximum frequency | 0 | ○ |
| P03.16 | Torque control forward rotation upper-limit frequency | This function is used to set the upper limit of the frequency. P03.16 sets the value of P03.14; P03.17 sets the value of P03.15.<br>Setting range: 0.00 Hz–P00.03 (the Max | 50.00 Hz | ○ |

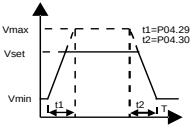
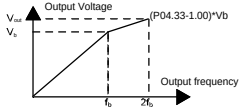
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | keypad limit value | output frequency) | | |
| P03.17 | Torque control reverse rotation upper-limit frequency keypad limit value | | 50.00 Hz | ○ |
| P03.18 | Upper-limit setting of electromotion torque | This function code is used to select the electromotion and braking torque upper-limit setting source selection.<br>0: Keypad setting upper-limit frequency (P03.20 sets P03.18 and P03.21 sets P03.19)<br>1：Set via AI1 (100% relative to three times of motor current)<br>2：Set via AI2 (same as above)<br>3：Set via AI3 (same as above)<br>4：Set via HDI (same as above)<br>5：Set via MODBUS communication (same as above)<br>6–8: Reserved<br>**Note:** Setting mode 1–8, 100% corresponds to three times of the motor current. | 0 | ○ |
| P03.19 | Upper-limit setting of braking torque | | 0 | ○ |
| P03.20 | Electromotion torque upper-limit set via keypad | The function code is used to set the limit of the torque.<br>Setting range: 0.0–300.0% (motor rated current) | 180.0% | ○ |
| P03.21 | Braking torque upper-limit set via keypad | | 180.0% | ○ |
| P03.22 | Weakening coefficient in constant power zone | The usage of motor in weakening control. Function code P03.22 and P03.23 are effective at constant power. The motor will enter into the weakening state when the motor runs at rated speed. Change the weakening curve by modifying the weakening control coefficient. The bigger the weakening | 0.3 | ○ |
| P03.23 | The lowest weakening point in | | 20% | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | constant power zone | control coefficient is, the steeper the weak curve is.<br>  <br>Setting range of P03.22: 0.1–2.0<br>Setting range of P03.23: 10%–100% | | |
| P03.24 | Max voltage limit | P03.24 set the max voltage of the inverter, which is dependent on the site situation.<br>The setting range: 0.0–120.0% | 100.0% | ◎ |
| P03.25 | Pre-exciting time | Pre-activate the motor when the inverter starts up. Build up a magnetic field inside the motor to improve the torque performance during the starting process.<br>The setting time: 0.000–10.000s | 0.300s | ○ |
| P03.26 | Flux-weakening proportional gain | 0–8000 | 1200 | ○ |
| P03.27 | Speed display selection of vector control | 0: Display as per the actual value<br>1: Display as per the setting value | 0 | ○ |
| P03.28 | Static friction compensation coefficient | 0.0–100.0% | 0.0% | ○ |
| P03.29 | Dynamic friction compensation coefficient | 0.0–100.0% | 0.0% | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| **P04 Group** | **SVPWM control** | | | |
| P04.00 | V/F curve setting | These function codes define the V/F curve of UMI-EU-B1 motor 1 to meet the need of different loads.<br>0: Straight V/F curve; applying to the constant torque load<br>1: Multi-points V/F curve<br>2: 1.3th power low torque V/F curve<br>3: 1.7th power low torque V/F curve<br>4: 2.0th power low torque V/F curve<br>Curves 2–4 apply to the torque loads such as fans and water pumps. Users can adjust according to the features of the loads to get the best performance.<br>5: Customized V/F (V/F separation); in this mode, V can be separated from f and f can be adjusted through the frequency given channel set by P00.06 or the voltage given channel set by P04.27 to change the feature of the curve.<br>**Note:** $V_b$ in the below picture is the motor rated voltage and $f_b$ is the motor rated frequency.<br>  | 0 | ◎ |
| P04.01 | Torque boost | Torque boost to the output voltage for the features of low frequency torque. P04.01 is for the Max output voltage $V_b$.<br>P04.02 defines the percentage of closing frequency of manual torque to $f_b$.<br>Torque boost should be selected according to the load. The bigger the load is, the bigger the torque is. Too big torque boost is inappropriate because the motor will run with over magnetic, and the current of the inverter | 0.0% | ○ |
| P04.02 | Torque boost end | | 20.0% | ○ |

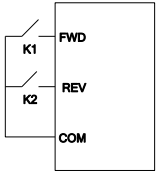
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | will increase to add the temperature of the inverter and decrease the efficiency.<br>When the torque boost is set to 0.0%, the inverter is automatic torque boost.<br>Torque boost threshold: below this frequency point, the torque boost is valid, but over this frequency point, the torque boost is invalid.<br>  <br>Setting range of P04.01: 0.0%: (automatic) 0.1%–10.0%<br>Setting range of P04.02: 0.0%–50.0% | | |
| P04.03 | V/F frequency point 1 |  <br>When P04.00 =1, the user can set V//F curve through P04.03–P04.08.<br>V/F is generally set according to the load of the motor.<br>**Note:** V1＜V2＜V3, f1＜f2＜f3. Too high low frequency voltage will heat the motor excessively or damage. Overcurrent stall or overcurrent protection may occur.<br>Setting range of P04.03: 0.00Hz–P04.05<br>Setting range of P04.04, P04.06 and P04.08 : 0.0%–110.0% (rated motor voltage)<br>Setting range of P04.05: P04.03–P04.07<br>Setting range of P04.07: P04.05–P02.02 (rated motor voltage frequency) | 0.00Hz | ○ |
| P04.04 | V/F voltage point 1 | | 0.0% | ○ |
| P04.05 | V/F frequency point 2 | | 0.00Hz | ○ |
| P04.06 | V/F voltage point 2 | | 0.0% | ○ |
| P04.07 | V/F frequency point 3 | | 0.00Hz | ○ |
| P04.08 | V/F voltage point 3 | | 0.0% | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P04.09 | V/F slip compensation gain | This function code is used to compensate the change of the rotation speed caused by load during compensation SVPWM control to improve the rigidity of the motor. It can be set to the rated slip frequency of the motor which is counted as below:<br>$\Delta f=f_b-n*p/60$<br>Of which, $f_b$ is the rated frequency of the motor, its function code is P02.02; n is the rated rotating speed of the motor and its function code is P02.03; p is the pole pair of the motor. 100.0% corresponds to the rated slip frequency$\Delta f$.<br>Setting range: 0.0–200.0% | 100.0% | ○ |
| P04.10 | Low frequency vibration control factor | In the SVPWM control mode, current fluctuation may occur to the motor on some frequency, especially the motor with big power. The motor cannot run stably or overcurrent may occur. These phenomena can be canceled by adjusting this parameter.<br>Setting range of P04.10: 0–100<br>Setting range of P04.11: 0–100<br>Setting range of P04.12: 0.00Hz–P00.03 (the Max frequency) | 10 | ○ |
| P04.11 | High frequency vibration control factor | | 10 | ○ |
| P04.12 | Vibration control threshold | | 30.00 Hz | ○ |
| P04.26 | Energy-saving operation selection | 0: No operation<br>1: Automatic energy-saving operation<br>Motor on the light load conditions, automatically adjusts the output voltage to save energy | 0 | ◎ |
| P04.27 | Voltage Setting channel | Select the output setting channel at V/F curve separation.<br>0: Set via keypad: the output voltage is determined by P04.28.<br>1：Set via AI1<br>2：Set via AI2<br>3：Set via AI3<br>4：Set via HDI<br>5：Set via multi-step（the set value is determined by the multi-step speed in P10 | 0 | ○ |

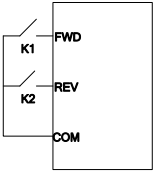
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | group）<br>6：Set via PID<br>7：Set via MODBUS communication<br>8–10: Reserved<br>**Note:** 100% corresponds to the rated voltage of the motor. | | |
| P04.28 | Voltage value set via keypad | The function code is the voltage digital set value when the voltage setting channel is selected as “keypad selection”<br>The setting range: 0.0%–100.0% | 100.0% | ○ |
| P04.29 | Voltage increase time | Voltage increasing time is the time when the inverter accelerates from the output minimum voltage to the output maximum voltage.<br>Voltage decreasing time is the time when the inverter decelerates from the output maximum voltage to the output minimum voltage.<br>The setting range: 0.0–3600.0s | 5.0s | ○ |
| P04.30 | Voltage decrease time | | 5.0s | ○ |
| P04.31 | Output maximum voltage | Set the upper and low limit of the output voltage.<br>Setting range of P04.31: P04.32–100.0% (the rated voltage of the motor)<br>Setting range of P04.32: 0.0%– P04.31 (the rated voltage of the motor) | 100.0% | ◎ |
| P04.32 | Output minimum voltage |  | 0.0% | ◎ |
| P04.33 | Weakening coefficient in constant power zone | Adjust the output voltage of the inverter in SVPWM mode when weakening.<br>**Note:** Invalid in the constant torque mode.<br>  | 1.00 | ○ |

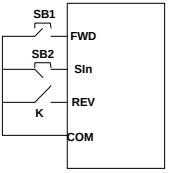
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | Setting range of P04.33: 1.00–1.30 | | |
| P04.34 | Analog calibration function selection | 0: Invalid<br>1: Valid | 1 | ◎ |
| **P05 Group Input terminals** | | | | |
| P05.00 | HDI input selection | 0: HDI is high pulse input. See P05.49–P05.54<br>1: HDI is switch input | 0 | ◎ |
| P05.01 | S1 terminals function selection | **Note**: S1–S4, HDI are the upper terminals on the control board and P05.12 can be used to set the function of S5–S8<br>0: No function<br>1: Forward rotation operation<br>2: Reverse rotation operation<br>3: Tri-linear running control<br>4: Forward jogging<br>5: Reverse jogging<br>6: Coast to stop<br>7: Fault reset<br>8: Operation pause<br>9: External fault input<br>10: Increasing frequency setting (UP)<br>11: Decreasing frequency setting (DOWN)<br>12: Cancel the frequency change setting<br>13: Shift between A setting and B setting<br>14: Shift between combination setting and A setting<br>15: Shift between combination setting and B setting<br>16: Multi-step speed terminal 1<br>17: Multi-step speed terminal 2<br>18: Multi-step speed terminal 3<br>19: Multi-step speed terminal 4<br>20: Multi-step speed pause | 1 | ◎ |
| P05.02 | S2 terminals function selection | | 4 | ◎ |
| P05.03 | S3 terminals function selection | | 7 | ◎ |
| P05.04 | S4 terminals function selection | | 0 | ◎ |
| P05.05 | S5 terminals function selection | | 0 | ◎ |
| P05.06 | S6 terminals function selection | | 0 | ◎ |
| P05.07 | S7 terminals function selection | | 0 | ◎ |
| P05.08 | S8 terminals function selection | | 0 | ◎ |

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P05.09</td><td>HDI terminals function selection</td><td>21: ACC/DEC time 1<br>22: ACC/DEC time 2<br>23: Simple PLC stop reset<br>24: Simple PLC pause<br>25: PID control pause<br>26: Wobbling frequency pause (stop at present frequency)<br>27: Wobbling frequency reset (return to center frequency)<br>28: Counter reset<br>29: Torque control prohibition<br>30: ACC/DEC prohibition<br>31: Counter trigger<br>32: Reserved<br>33: Cancel the frequency change setting temporarily<br>34: DC brake<br>35: Reserved<br>36: Shift the command to keypad<br>37: Shift the command to terminals<br>38: Shift the command to communication<br>39: Pre-magnetized command<br>40: Clear the power consumption<br>41: Keep the power consumption<br>42–60: Reserved<br>61: PID pole switching<br>62–63: Reserved</td><td>0</td><td>◎</td></tr>
<tr><td>P05.10</td><td>Polarity selection of the input terminals</td><td>The function code is used to set the polarity of the input terminals.<br>Set the bit to 0, the input terminal is anode.<br>Set the bit to 1, the input terminal is cathode.<br><table><tr><td>BIT8</td><td>BIT7</td><td>BIT6</td><td>BIT5</td><td>BIT4</td></tr><tr><td>HDI</td><td>S8</td><td>S7</td><td>S6</td><td>S5</td></tr><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td><td></td></tr><tr><td>S4</td><td>S3</td><td>S2</td><td>S1</td><td></td></tr></table>The setting range: 0x000–0x1FF</td><td>0x000</td><td>○</td></tr>
</table>

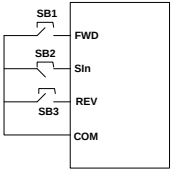
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P05.11</td><td>Switch filter time</td><td>Set the sample filter time of S1–S4 and HDI terminals. If the interference is strong, increase the parameter to avoid wrong operation.<br>0.000–1.000s</td><td>0.010s</td><td>○</td></tr>
<tr><td>P05.12</td><td>Virtual terminals setting</td><td>0x000–0x1FF (0: Disabled, 1: Enabled )<br>BIT0: S1 virtual terminal<br>BIT1: S2 virtual terminal<br>BIT2: S3 virtual terminal<br>BIT3: S4 virtual terminal<br>BIT4: S5 virtual terminal<br>BIT5: S6 virtual terminal<br>BIT6: S7 virtual terminal<br>BIT7: S8 virtual terminal<br>BIT8: HDI virtual terminal</td><td>0x000</td><td>◎</td></tr>
<tr><td>P05.13</td><td>Terminals control running mode</td><td>Set the operation mode of the terminals control<br>0: 2-wire control;1: comply the enable with the direction. This mode is widely used. It determines the rotation direction by the defined FWD and REV terminals command.<br> 

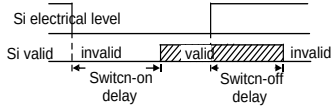
<table>
<tr><td>FWD</td><td>REV</td><td>Running command</td></tr>
<tr><td>OFF</td><td>OFF</td><td>Stopping</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Reverse running</td></tr>
<tr><td>ON</td><td>ON</td><td>Hold on</td></tr>
</table>
1: 2-wire control 2; Separate the enable from the direction. FWD defined by this mode is the enabling ones. The direction depends on the state of the defined REV.</td><td>0</td><td>◎</td></tr>
</table>

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>


<table>
<tr><td>FWD</td><td>REV</td><td>Running command</td></tr>
<tr><td>OFF</td><td>OFF</td><td>Stopping</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Stopping</td></tr>
<tr><td>ON</td><td>ON</td><td>Reverse running</td></tr>
</table>
2: 3-wire control 1; Sin is the enabling terminal on this mode, and the running command is caused by FWD and the direction is controlled by REV. Sin is natural closed.


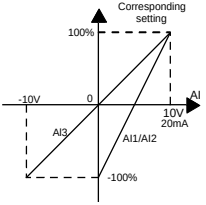
The direction control is as below during operation:
<table>
<tr><th>SIn</th><th>REV</th><th>Previous direction</th><th>Current direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>Forward</td><td>Reverse</td></tr>
<tr><td>Reverse</td><td>Forward</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">ON→OFF</td><td>Reverse</td><td>Forward</td></tr>
<tr><td>Forward</td><td>Reverse</td></tr>
<tr><td rowspan="2">ON→ OFF</td><td>ON</td><td colspan="2" rowspan="2">Decelerate to stop</td></tr>
<tr><td>OFF</td></tr>
</table>
3: 3-wire control 2; Sin is the enabling terminal on this mode, and the running command is caused by SB1 or SB3 and both of them control the running direction. NC SB2 generates the stop command.
</td><td></td><td></td></tr>
</table>

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>


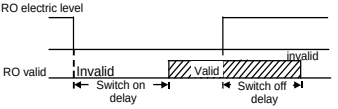
<table>
<tr><th>SIn</th><th>FWD</th><th>REV</th><th>Direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>ON</td><td>Forward</td></tr>
<tr><td>OFF</td><td>Reverse</td></tr>
<tr><td rowspan="2">ON</td><td>ON</td><td rowspan="2">OFF→ON</td><td>Forward</td></tr>
<tr><td>OFF</td><td>Reverse</td></tr>
<tr><td>ON→ OFF</td><td></td><td></td><td>Decelerate to stop</td></tr>
</table>
Note: for the 2-wire running mode, when FWD/REV terminal is valid, the inverter stop because of the stopping command from other sources, even the control terminal FWD/REV keeps valid; the inverter won't work when the stopping command is canceled. Only when FWD/REV is re-launched, the inverter can start again. For example, the valid STOP/RST stop when PLC signal cycles stop, fixed-length stop and terminal control (see P07.04).
</td><td></td><td></td></tr>
<tr><td>P05.14</td><td>S1 terminal switching on delay time</td><td rowspan="4">The function code defines the corresponding delay time of electrical level of the programmable terminals from switching on to switching off.<br> 

<br>Setting range: 0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.15</td><td>S1 terminal switching off delay time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.16</td><td>S2 terminal switching on delay time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.17</td><td>S2 terminal switching off</td><td>0.000s</td><td>○</td></tr>
</table>

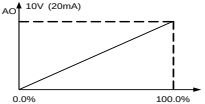
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | delay time | | | |
| P05.18 | S3 terminal switching on delay time | | 0.000s | ○ |
| P05.19 | S3 terminal switching off delay time | | 0.000s | ○ |
| P05.20 | S4 terminal switching on delay time | | 0.000s | ○ |
| P05.21 | S4 terminal switching off delay time | | 0.000s | ○ |
| P05.30 | HDI terminal switching on delay time | | 0.000s | ○ |
| P05.31 | HDI terminal switching off delay time | | 0.000s | ○ |
| P05.32 | Lower limit of AI1 | AI1 is set by the analog potentiometer, AI2 is set by control terminal AI2 and AI3 is set by control terminal AI3. The function code defines the relationship between the analog input voltage and its corresponding set value. If the analog input voltage beyond the set minimum or maximum input value, the inverter will count at the minimum or maximum one. When the analog input is the current input, the corresponding voltage of 0–20mA is 0–10V. In different cases, the corresponding rated value of 100.0% is different. See the application for detailed information. | 0.00V | ○ |
| P05.33 | Corresponding setting of the lower limit of AI1 | | 0.0% | ○ |
| P05.34 | Upper limit of AI1 | | 10.00V | ○ |
| P05.35 | Corresponding setting of the upper limit of AI1 | | 100.0% | ○ |
| P05.36 | AI1 input filter time | | 0.100s | ○ |
| P05.37 | Lower limit of | | 0.00V | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | AI2 | The figure below illustrates different applications:   | | |
| P05.38 | Corresponding setting of the lower limit of AI2 | | 0.0% | ○ |
| P05.39 | Upper limit of AI2 | | 10.00V | ○ |
| P05.40 | Corresponding setting of the upper limit of AI2 | | 100.0% | ○ |
| P05.41 | AI2 input filter time | Input filter time: this parameter is used to adjust the sensitivity of the analog input. Increasing the value properly can enhance the anti-interference of the analog, but weaken the sensitivity of the analog input<br>**Note:** AI1 supports 0–10V input and AI2 supports 0–10V or 0–20mA input, when AI2 selects 0–20mA input, the corresponding voltage of 20mA is 10V. AI3 can support the output of -10V–+10V.<br>Setting range of P05.32: 0.00V–P05.34<br>Setting range of P05.33: -100.0%–100.0%<br>Setting range of P05.34: P05.32–10.00V<br>Setting range of P05.35: -100.0%–100.0%<br>Setting range of P05.36: 0.000s–10.000s<br>Setting range of P05.37: 0.00V–P05.39<br>Setting range of P05.38: -100.0%–100.0%<br>Setting range of P05.39: P05.37–10.00V<br>Setting range of P05.40: -100.0%–100.0%<br>Setting range of P05.41: 0.000s–10.000s<br>Setting range of P05.42: -10.00V–P05.44<br>Setting range of P05.43: -100.0%–100.0%<br>Setting range of P05.44: P05.42–P05.46<br>Setting range of P05.45: -100.0%–100.0%<br>Setting range of P05.46: P05.44–10.00V<br>Setting range of P05.48: 0.000s–10.000s | 0.100s | ○ |
| P05.42 | Lower limit of AI3 | | -10.00V | ○ |
| P05.43 | Corresponding setting of the lower limit of AI3 | | -100.0 % | ○ |
| P05.44 | Middle value of AI3 | | 0.00V | ○ |
| P05.45 | Corresponding middle setting of AI3 | | 0.0% | ○ |
| P05.46 | Upper limit of AI3 | | 10.00V | ○ |
| P05.47 | Corresponding setting of the upper limit of AI3 | | 100.0% | ○ |
| P05.48 | AI3 input filter time | | 0.100s | ○ |
| P05.50 | Lower limit | 0.000kHz–P05.52 | 0.000 kHz | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | frequency of HDI | | | |
| P05.51 | Corresponding setting of HDI low frequency setting | -100.0%–100.0% | 0.0% | ○ |
| P05.52 | Upper limit frequency of HDI | P05.50–50.000kHz | 50.000 kHz | ○ |
| P05.53 | Corresponding setting of upper limit frequency of HDI | -100.0%–100.0% | 100.0% | ○ |
| P05.54 | HDI frequency input filter time | 0.000s–10.000s | 0.100s | ○ |
| **P06 Group Output terminals** | | | | |
| P06.01 | Y1 output selection | 0: Invalid<br>1: In operation<br>2: Forward rotation operation<br>3: Reverse rotation operation<br>4: Jogging operation<br>5: The inverter fault<br>6: Frequency level test FDT1<br>7: Frequency level test FDT2<br>8: Frequency reached<br>9: Zero speed running<br>10: Upper limit frequency reached<br>11: Lower limit frequency reached<br>12: Ready for operation<br>13: Pre-magnetizing<br>14: Overload pre-alarm<br>15: Underload pre-alarm<br>16: Completion of simple PLC stage<br>17: Completion of simple PLC cycle<br>18: Setting count value arrival<br>19: Defined count value arrival<br>20: External fault valid<br>21: Reserved | 27 | |
| P06.03 | Relay RO1 output selection | | 1 | ○ |
| P06.04 | Relay RO2 output selection | | 5 | ○ |

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>22: Running time arrival<br>23: MODBUS communication virtual terminals output<br>24–25: Reserved<br>26: Establishment of DC bus voltage<br>27: STO action<br>28–30: Reserved</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Polarity selection of output terminals</td><td>The function code is used to set the pole of the output terminal.<br>When the current bit is set to 0, input terminal is positive.<br>When the current bit is set to 1, input terminal is negative.<br><table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO2</td><td>RO1</td><td>Reserved</td><td>Y1</td></tr></table>Setting range: 0–F</td><td>0</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y1 open delay time</td><td>The setting range: 0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y1C off delay time</td><td>The setting range: 0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.10</td><td>RO1 switching on delay time</td><td rowspan="3">The function code defines the corresponding delay time of the electrical level change during the programmable terminal switching on and off.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.11</td><td>RO1 switching off delay time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.12</td><td>RO2 switching on delay time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.13</td><td>RO2 switching off delay time</td><td> 

The setting range: 0.000–50.000s<br>Note: P06.08 and P06.08 are valid only when P06.00=1.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.14</td><td>AO1 output selection</td><td>0: Running frequency<br>1: Setting frequency<br>2: Ramps reference frequency<br>3: Running rotation speed<br>4: Output current (relative to 2 times of the rated current of the inverter)</td><td>0</td><td>○</td></tr>
<tr><td>P06.15</td><td>AO2 output selection</td><td></td><td>0</td><td>○</td></tr>
</table>

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | 5: Output current (relative to 2 times of the rated current of the motor)<br>6: Output voltage<br>7: Output power<br>8: Set torque value<br>9: Output torque<br>10: Analog AI1 input value<br>11: Analog AI2 input value<br>12: Analog AI3 input value<br>13: High speed pulse HDI input value<br>14: MODBUS communication set value 1<br>15: MODBUS communication set value 2<br>16–21: Reserved<br>22: Torque current (corresponds to 3 times of the rated current of the motor)<br>23: Ramp reference frequency (with sign)<br>24–30: Reserved | | |
| P06.17 | Lower limit of AO1 output | The above function codes define the relative relationship between the output value and analog output. When the output value exceeds the range of set maximum or minimum output, it will count according to the low-limit or upper-limit output.<br>When the analog output is current output, 1mA equals to 0.5V.<br>In different cases, the corresponding analog output of 100% of the output value is different. Please refer to each application for detailed information.<br>  <br><br>Setting range of P06.17: -100.0%– P06.19<br>Setting range of P06.18: 0.00V–10.00V<br>Setting range of P06.19: P06.17–100.0%<br>Setting range of P06.20: 0.00V–10.00V<br>Setting range of P06.21: 0.000s–10.000s | 0.0% | ○ |
| P06.18 | Corresponding AO1 output to the lower limit | | 0.00V | ○ |
| P06.19 | Upper limit of AO1 output | | 100.0% | ○ |
| P06.20 | The corresponding AO1 output to the upper limit | | 10.00V | ○ |
| P06.21 | AO1 output filter time | | 0.000s | ○ |
| P06.22 | Lower limit of AO2 output | | 0.0% | ○ |
| P06.23 | Corresponding AO2 output to the lower limit | | 0.00V | ○ |
| P06.24 | Upper limit of AO2 output | | 100.0% | ○ |
| P06.25 | Corresponding | | 10.00V | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | AO2 output to the upper limit | Setting range of P06.22:- 100.0%– P06.24<br>Setting range of P06.23: 0.00V–10.00V | | |
| P06.26 | AO2 output filter time | Setting range of P06.24: P06.22–100.0%<br>Setting range of P06.25: 0.00V–10.00V<br>Setting range of P06.26: 0.000s–10.000s | 0.000s | ○ |
| **P07 Group Human-Machine Interface** | | | | |
| P07.00 | User's password | 0–65535<br>The password protection will be valid when setting any non-zero number.<br>00000: Clear the previous user's password, and make the password protection invalid.<br>After the user's password becomes valid, if the password is incorrect, users cannot enter the parameter menu. Only correct password can make the user check or modify the parameters. Please remember all users' passwords.<br>Retreat editing state of the function codes and the password protection will become valid in 1 minute. If the password is available, press PRG/ESC to enter into the editing state of the function codes, and then "0.0.0.0.0" will be displayed. Unless input right password, the operator cannot enter into it.<br>**Note:** Restoring to the default value can clear the password, please use it with caution. | 0 | ○ |
| P07.01 | Parameter copy | 0: No operation<br>1: Upload the local function parameter to the keypad<br>2: Download the keypad function parameter to local address (including the motor parameters)<br>3: Download the keypad function parameter to local address (excluding the motor parameter of P02 and P12 group) | 0 | ◎ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | 4: Download the keypad function parameters to local address (only for the motor parameter of P02 and P12 group)<br>**Note**: After finish 1–4, the parameter will restore to 0 and the uploading and downloading does not include P29. | | |
| P07.02 | Key function selection | 0x00–0x27<br>Ones: QUICK/JOG key function<br>0: Null<br>1: Jogging<br>2: Switch display state via shift key<br>3: Switch between FWD/REV rotation<br>4: Clear UP/DOWN setting<br>5: Coast to stop<br>6: Switch running command ref. mode in order<br>7: Quick commission mode (based on non-default parameter)<br>tens:<br>0: keys unlocked<br>1: Lock all keys<br>2: Lock part of the keys (lock PRG/ESC key only) | 0x01 | ◎ |
| P07.03 | QUICK/JOG the shifting sequence of running command | When P07.02=6, set the shifting sequence of running command channels.<br>0: Keypad control→terminals control →communication control<br>1: Keypad control←→terminals control<br>2: Keypad control←→communication control<br>3: Terminals control←→communication control | 0 | ○ |
| P07.04 | STOP/RST stop function | Select the stop function by STOP/RST. STOP/RST is effective in any state for the keypad reset.<br>0: Only valid for the keypad control<br>1: Both valid for keypad and terminals control<br>2: Both valid for keypad and communication | 0 | ○ |

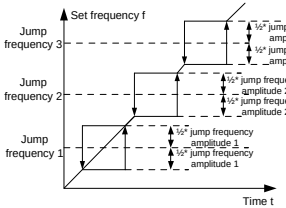
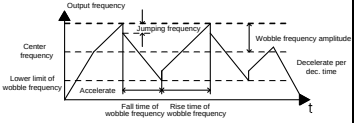
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | control<br>3: Valid for all control modes | | |
| P07.05 | Displayed parameters 1 of running state | 0x0000–0xFFFF<br>BIT0: running frequency (Hz on)<br>BIT1: set frequency (Hz flickering)<br>BIT2: bus voltage (Hz on)<br>BIT3: output voltage (V on)<br>BIT4: output current (A on)<br>BIT5: running rotation speed (rpm on)<br>BIT6: output power (% on)<br>BIT7: output torque (% on)<br>BIT8: PID reference (% flickering)<br>BIT9: PID feedback value (% on)<br>BIT10: input terminals state<br>BIT11: output terminals state<br>BIT12: torque set value (% on)<br>BIT13: pulse counter value<br>BIT14: reserved<br>BIT15: PLC and the current step of multi-step speed | 0x03FF | ○ |
| P07.06 | Displayed parameters 2 of running state | 0x0000–0xFFFF<br>BIT0: analog AI1 value (V on)<br>BIT1: analog AI2 value (V on)<br>BIT2: analog AI3 value (V on)<br>BIT3: high speed pulse HDI frequency<br>BIT4: motor overload percentage (% on)<br>BIT5: the inverter overload percentage (% on)<br>BIT6: ramp frequency given value (Hz on)<br>BIT7: linear speed<br>BIT8: AC inlet current (A on)<br>BIT9–15: reserved | 0x0000 | |
| P07.07 | The parameter selection of the stop state | 0x0000–0xFFFF<br>BIT0: set frequency (Hz on, frequency flickering slowly)<br>BIT1: bus voltage (V on)<br>BIT2: input terminals state | 0x00FF | ○ |

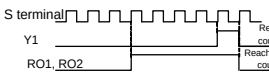
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | BIT3: output terminals state<br>BIT4: PID reference (% flickering)<br>BIT5: PID feedback value (% flickering)<br>BIT6: torque reference (% flickering)<br>BIT7: analog AI1 value (V on)<br>BIT8: analog AI2 value (V on)<br>BIT9: analog AI3 value (V on)<br>BIT10: high speed pulse HDI frequency<br>BIT11: PLC and the current step of multi-step speed<br>BIT12: pulse counters<br>BIT13–BIT15: reserved | | |
| P07.08 | Frequency display coefficient | 0.01–10.00<br>Displayed frequency=running frequency* P07.08 | 1.00 | ○ |
| P07.09 | Speed display coefficient | 0.1–999.9%<br>Mechanical rotation speed =120*displayed running frequency×P07.09/motor pole pairs | 100.0% | ○ |
| P07.10 | Linear speed displayed coefficient | 0.1–999.9%<br>Linear speed= Mechanical rotation speed×P07.10 | 1.0% | ○ |
| P07.11 | Rectifier bridge module temperature | -20.0–120.0°C | | ● |
| P07.12 | Converter module temperature | -20.0–120.0°C | | ● |
| P07.13 | Software version | 1.00–655.35 | | ● |
| P07.14 | Local accumulative running time | 0–65535h | | ● |
| P07.15 | High bit of power consumption | Display the power used by the inverter.<br>The power consumption of the inverter =P07.15*1000+P07.16<br>Setting range of P07.15: 0–65535 kWh (*1000)<br>Setting range of P07.16: 0.0–999.9 kWh | | ● |
| P07.16 | Low bit of power consumption | | | ● |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P07.17 | Reserved | Reserved | | ● |
| P07.18 | Rated power of the inverter | 0.4–3000.0kW | | ● |
| P07.19 | Rated voltage of the inverter | 50–1200V | | ● |
| P07.20 | Rated current of the inverter | 0.1–6000.0A | | ● |
| P07.21 | Factory bar code 1 | 0x0000–0xFFFF | | ● |
| P07.22 | Factory bar code 2 | 0x0000–0xFFFF | | ● |
| P07.23 | Factory bar code 3 | 0x0000–0xFFFF | | ● |
| P07.24 | Factory bar code 4 | 0x0000–0xFFFF | | ● |
| P07.25 | Factory bar code 5 | 0x0000–0xFFFF | | ● |
| P07.26 | Factory bar code 6 | 0x0000–0xFFFF | | ● |
| P07.27 | Type of present fault | 0: No fault<br>1: OUt1<br>2: OUt2<br>3: OUt3<br>4: OC1<br>5: OC2<br>6: OC3<br>7: OV1<br>8: OV2<br>9: OV3<br>10: UV<br>11: Motor overload (OL1)<br>12: Inverter overload (OL2)<br>13: Input side phase loss (SPI)<br>14: Output side phase loss (SPO)<br>15: Overheat of rectifier module (OH1)<br>16: Overheat fault of inverter module (OH2)<br>17: External fault (EF)<br>18: 485 communication fault (CE) | | ● |
| P07.28 | Type of the last fault | | | ● |
| P07.29 | Type of the last but one fault | | | ● |
| P07.30 | Type of the last but two fault | | | ● |
| P07.31 | Type of the last but three fault | | | ● |
| P07.32 | Type of the last but four fault | | | ● |

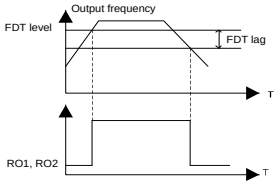
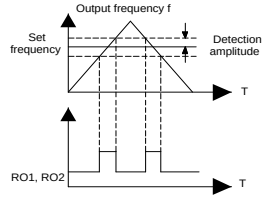
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | 19: Current detection fault (ItE)<br>20: Motor autotune fault (tE)<br>21: EEPROM operation fault (EEP)<br>22: PID feedback offline fault (PIDE)<br>23: Brake unit fault (bCE)<br>24: Running time reached (END)<br>25: Electronic overload (OL3)<br>26: Panel communication error (PCE)<br>27: Parameter upload error (UPE)<br>28: Parameter download error (DNE)<br>29–31: Reserved<br>32: To-earth short circuit fault 1 (ETH1)<br>33: To-earth short circuit fault 2 (ETH2)<br>34: Speed deviation fault (dEu)<br>35: Maladjustment (STo)<br>36: Underload fault (LL)<br>37: Safe torque off (STO)<br>38: Channel 1 is abnormal (STL1)<br>39: Channel 2 is abnormal (STL2)<br>40: Channel 1 and channel 2 become abnormal simultaneously (STL3)<br>41: Safety code FLASH CRC check fault (CrCE) | | |
| P07.33 | Reference frequency of present fault | | 0.00Hz | ● |
| P07.34 | Ramps reference frequency of present fault | | 0.00Hz | |
| P07.35 | Output voltage of present fault | | 0V | |
| P07.36 | Output current of present fault | | 0.0A | |
| P07.37 | Bus voltage of present fault | | 0.0V | |
| P07.38 | Max temperature of present fault | | 0.0°C | |
| P07.39 | Input terminals state of present fault | | 0 | ● |
| P07.40 | Output terminals state of present fault | | 0 | ● |
| P07.41 | Running frequency of the last fault | | 0.00Hz | ● |
| P07.42 | Ramps reference frequency of the last fault | | 0.00Hz | ● |
| P07.43 | Output voltage of the last fault | | 0V | ● |
| P07.44 | Output current of the last fault | | 0.0A | ● |
| P07.45 | Bus voltage of the last fault | | 0.0V | ● |
| P07.46 | Max temperature of the last fault | | 0.0°C | ● |
| P07.47 | Input terminals state of the last fault | | 0 | ● |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P07.48 | Output terminals state of the last fault | | 0 | ● |
| P07.49 | Reference frequency of the last but one fault | | 0.00Hz | ● |
| P07.50 | Ramp reference frequency of last but one fault | | 0.00Hz | ● |
| P07.51 | Output voltage of the last but one fault | | 0V | ● |
| P07.52 | Output current of the last but one fault | | 0.0A | ● |
| P07.53 | Bus voltage of the last but one fault | | 0.0V | ● |
| P07.54 | Max temperature of the last but one fault | | 0.0°C | ● |
| P07.55 | Input terminals state of the last but one fault | | 0 | ● |
| P07.56 | Output terminals state of the last but one fault | | 0 | ● |
| **P08 Group Enhanced functions** | | | | |
| P08.00 | ACC time 2 | Refer to P00.11 and P00.12 for detailed definition.<br>UMI-EU-B1 series define four groups of ACC/DEC time which can be selected by P5 group. The first group of ACC/DEC time is the factory default one.<br>Setting range: 0.0–3600.0s | Depend on model | ○ |
| P08.01 | DEC time 2 | | | ○ |
| P08.02 | ACC time 3 | | | |
| P08.03 | DEC time 3 | | | ○ |
| P08.04 | ACC time 4 | | | ○ |
| P08.05 | DEC time 4 | | | ○ |
| P08.06 | Jog running frequency | This parameter is used to define the reference frequency during jogging.<br>Setting range: 0.00Hz–P00.03 (the max frequency) | 5.00Hz | ○ |
| P08.07 | Jogging running ACC time | The jogging ACC time means the time needed if the inverter runs from 0Hz to the max frequency.<br>The jogging DEC time means the time needed if the inverter goes from the max frequency (P00.03) to 0Hz.<br>Setting range: 0.0–3600.0s | Depend on model | ○ |
| P08.08 | Jogging running DEC time | | | ○ |
| P08.09 | Jumping frequency 1 | When the set frequency is in the range of jumping frequency, the inverter will run at the edge of the jumping frequency.<br>The inverter can avoid the mechanical resonance point by setting the jumping frequency. The inverter can set three jumping frequency. But this function will be invalid if all jumping points are 0. | 0.00Hz | ○ |
| P08.10 | jumping frequency range 1 | | 0.00Hz | ○ |
| P08.11 | Jumping frequency 2 | | 0.00Hz | ○ |
| P08.12 | Jumping frequency range 2 | | 0.00Hz | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P08.13 | Jumping frequency 3 |  Setting range: 0.00–P00.03 (the max frequency) | 0.00Hz | ○ |
| P08.14 | Jumping frequency range 3 | | 0.00Hz | ○ |
| P08.15 | Traverse range | This function applies to the industries where traverse and convolution function are required such as textile and chemical fiber. The traverse function means that the output frequency of the inverter is fluctuated with the set frequency as its center. The route of the running frequency is illustrated as below, of which the traverse is set by P08.15 and when P08.15 is set as 0, the traverse is 0 with no function. | 0.0% | ○ |
| P08.16 | Sudden jumping frequency range | | 0.0% | ○ |
| P08.17 | Traverse boost time | | 5.0s | ○ |
| P08.18 | Traverse declining time |  Traverse range: The traverse running is limited by upper and low frequency.<br>The traverse range relative to the center frequency: traverse range AW＝center frequency×traverse range P08.15.<br>Sudden jumping frequency＝traverse range AW×sudden jumping frequency range P08.16. When run at the traverse frequency, the value which is relative to the sudden jumping frequency.<br>The raising time of the traverse frequency: The time from the lowest point to the highest | 5.0s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | one.<br>The declining time of the traverse frequency: The time from the highest point to the lowest one.<br>Setting range of P08.15: 0.0–100.0% (relative to the set frequency)<br>Setting range of P08.16: 0.0–50.0% (relative to the traverse range)<br>Setting range of P08.17: 0.1–3600.0s<br>Setting range of P08.18: 0.1–3600.0s | | |
| P08.19 | Linear speed/ frequency decimals | Ones: decimals of linear speed display<br>0: no decimals<br>1: one decimal<br>2.: two decimals<br>3: three decimals<br>Tens: decimals of frequency display<br>0: two decimals<br>1: one decimal | 0x00 | ○ |
| P08.25 | Setting counting value | The counter works by the input pulse signals of the HDI terminals. | 0 | ○ |
| P08.26 | Given counting value | When the counter achieves a fixed number, the multi-function output terminals will output the signal of “fixed counting number arrival” and the counter go on working; when the counter achieves a setting number, the multi-function output terminals will output the signal of “setting counting number arrival”, the counter will clear all numbers and stop to recount before the next pulse.<br>The setting counting value P08.26 should be no more than the setting counting value P08.25.<br>The function is illustrated as below:<br>  <br>Setting range of P08.25: P08.26–65535<br>Setting range of P08.26: 0–P08.25 | 0 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P08.27 | Setting running time | Pre-set running time of the inverter. When the accumulative running time achieves the set time, the multi-function digital output terminals will output the signal of “running time arrival”.<br>Setting range: 0–65535min | 0m | ○ |
| P08.28 | Time of fault reset | The time of the fault reset: set the fault reset time by selecting this function. If the reset time exceeds this set value, the inverter will stop for the fault and wait to be repaired.<br>The interval time of the fault reset: The interval between the time when the fault occurs and the time when the reset action occurs.<br>Setting range of P08.28: 0–10<br>Setting range of P08.29: 0.1–100.0s | 0 | ○ |
| P08.29 | Interval time of automatic fault reset | | 1.0s | ○ |
| P08.30 | Frequency decreasing ratio in drop control | The output frequency of the inverter changes as the load. And it is mainly used to balance the power when several inverters drive one load.<br>Setting range: -50.00Hz–50.00Hz | 0.00Hz | ○ |
| P08.32 | FDT1 electrical level detection value | When the output frequency exceeds the corresponding frequency of FDT electrical level, the multi-function digital output terminals will output the signal of “frequency level detect FDT” until the output frequency decreases to a value lower than (FDT electrical level—FDT retention detection value) the corresponding frequency, the signal is invalid. Below is the waveform diagram: | 50.00Hz | ○ |
| P08.33 | FDT1 retention detection value | | 5.0% | ○ |
| P08.34 | FDT2 electrical level detection value | | 50.00Hz | ○ |
| P08.35 | FDT2 retention detection value | | 5.0% | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | |  <br>Setting range of P08.32: 0.00Hz–P00.03 (the max frequency)<br>Setting range of P08.33 and P08.35: 0.0–100.0%<br>Setting range of P08.34: 0.00Hz–P00.03 (the max frequency) | | |
| P08.36 | Frequency arrival detection range | When the output frequency is among the below or above range of the set frequency, the multi-function digital output terminal will output the signal of “frequency arrival”, see the diagram below for detailed information:<br>  <br>The setting range: 0.00Hz–P00.03 (the Max frequency) | 0.00Hz | ○ |
| P08.37 | Energy consumption brake enable | This parameter is used to control the internal braking unit.<br>0: Disabled<br>1: Enabled<br>**Note:** Only applied to internal braking unit. | 0 | ○ |
| P08.38 | Energy consumption | After setting the original bus voltage to brake the energy, adjust the voltage appropriately | 220V voltage: 380.0V | ○ |

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td>brake threshold voltage</td><td>to brake the load. The factory changes with the voltage level.<br>The setting range: 200.0–2000.0V<br>In order to prevent customers set the value is too large, it is recommended setting range:<br><table><tr><td>Voltage</td><td>220V</td><td>380V</td></tr><tr><td>Range</td><td>375–400V</td><td>685–750V</td></tr></table></td><td>380V voltage: 700.0V</td><td></td></tr>
<tr><td>P08.39</td><td>Cooling fan running mode</td><td>0: Rated running mode<br>1: The fan keeps on running after power on</td><td>0</td><td>○</td></tr>
<tr><td>P08.40</td><td>PWM selection</td><td>0x000–0x0021<br>LED ones: PWM mode selection<br>0: PWM mode 1, three-phase modulation and two-phase modulation<br>1: PWM mode 2, three-phase modulation<br>LED tens: low-speed carrier frequency limit mode<br>0: Low-speed carrier frequency limit mode 1, the carrier frequency will limit to 1k or 2k if it exceeds 2k at low speed<br>1: Low-speed carrier frequency limit mode 2, the carrier frequency will limit to 4k if it exceeds 4k at low speed<br>2: No limit</td><td>0x01</td><td>◎</td></tr>
<tr><td rowspan="2">P08.41</td><td rowspan="2">Over-modulation selection</td><td>LED ones<br>0: Invalid<br>1: Valid</td><td>0x00</td><td rowspan="2">◎</td></tr>
<tr><td>LED tens (for factory commissioning)<br>0: Light over-modulation; in zone 1<br>1: Heavy over-modulation; in zone 2<br>The default value of the inverters of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW) is 00;<br>The default value of the inverters of 3PH 380V (≥4kW) and 3PH 220V (≥1.5kW) is 01.</td><td>0x01</td></tr>
<tr><td>P08.42</td><td>Keypad digital control setting</td><td>0x0000–0x1223<br>LED ones: frequency enable selection<br>0: Both ∧/∨ keys and analog potentiometer adjustments are valid<br>1: Only ∧/∨ keys adjustment is valid</td><td>0x0000</td><td>○</td></tr>
</table>

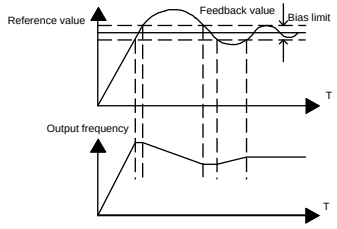
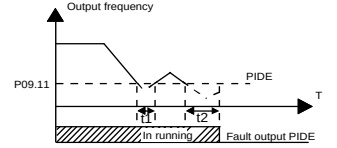
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | 2: Only analog potentiometer adjustments is valid<br>3: Neither ∧/∨ keys nor digital potentiometer adjustments are valid<br>LED tens: frequency control selection<br>0: Valid only when P00.06=0 or P00.07=0<br>1: Valid for all frequency setting modes<br>2: Invalid for multi-step speed when multi-step speed has the priority<br>LED hundreds: action selection during stopping<br>0: Setting is valid<br>1: Valid during running, cleared after stopping<br>2: Valid during running, cleared after receiving the stop command<br>LED thousands: ∧/∨ keys and analog potentiometer integral function<br>0: The Integral function is valid<br>1: The Integral function is invalid | | |
| P08.43 | Integral speed ratio of keypad potentiometer | 0.01–10.00s | 0.10s | ○ |
| P08.44 | UP/DOWN terminals control setting | 0x00–0x221<br>LED ones: frequency control selection<br>0: UP/DOWN terminals setting valid<br>1: UP/DOWN terminals setting invalid<br>LED tens: frequency control selection<br>0: Valid only when P00.06=0 or P00.07=0<br>1: All frequency modes are valid<br>2: When the multi-step speed are priority, it is invalid to multi-step speed<br>LED hundreds: action selection when stop<br>0: Setting is valid<br>1: Valid in running, clear after stop<br>2: Valid in running, clear after receiving the stop commands | 0x000 | ○ |
| P08.45 | UP terminals frequency increment | 0.01–50.00s | 0.50 s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | integral speed ratio | | | |
| P08.46 | DOWN terminals frequency decrement integral speed ratio | 0.01–50.00s | 0.50 s | ○ |
| P08.47 | Action selection at power loss | 0x000–0x111<br>LED ones: Action selection when power off.<br>0: Save when power off<br>1: Clear when power off<br>LED tens: Action selection when MODBUS set frequency off<br>0: Save when power off<br>1: Clear when power off<br>LED hundreds: The action selection when other frequency set frequency off<br>0: Save when power off<br>1: Clear when power off | 0x000 | ○ |
| P08.48 | High bit of original power consumption value | This parameter is used to set the original value of the power consumption.<br>The original value of the power consumption =P08.48*1000+ P08.49<br>Setting range of P08.48: 0–59999 kWh (k)<br>Setting range of P08.49: 0.0–999.9 kWh | 0 kWh | ○ |
| P08.49 | Low bit of original power consumption value | | 0.0 kWh | ○ |
| P08.50 | Flux brake coefficient | This function code is used to enable magnetic flux.<br>0: Invalid.<br>100–150: the bigger the coefficient, the bigger the braking strength.<br>This inverter can slow down the motor by increasing the magnetic flux. The energy generated by the motor during braking can be transformed into heat energy by increasing the magnetic flux.<br>The inverter monitors the state of the motor | 0 | ○ |

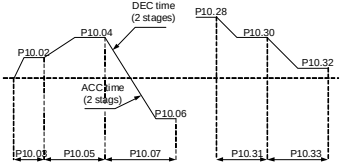
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | continuously even during tSe magnetic flux period. So the magnetic flux can be used in the motor stop, as well as to change the rotation speed of the motor. Its other advantages are:<br>Brake immediately after the stop command. It does not need to wait the magnetic flux weaken.<br>The cooling is better. The current of the stator other than the rotor increases during magnetic flux braking, while the cooling of the stator is more effective than the rotor. | | |
| P08.51 | Current adjustment coefficient on the input side | This function code is used to adjust the displayed current of the AC input side.<br>Setting range: 0.00–1.00 | 0.56 | ○ |
| **P09 Group PID control** | | | | |
| P09.00 | PID reference source | When the frequency command selection (P00.06, P00. 07) is 7 or the voltage setting channel selection (P04.27) is 6, the running mode of the inverter is procedure PID controlled.<br>The parameter determines the target given channel during the PID procures.<br>0: Keypad digital given (P09.01)<br>1: Analog channel AI1 given<br>2: Analog channel AI2 given<br>3: Analog channel AI3 set<br>4: High speed pulse HDI set<br>5: Multi-step speed set<br>6: MODBUS communication set<br>7–9: Reserved<br>The setting target of procedure PID is a relative one, 100% of the setting equals to 100% of the response of the controlled system.<br>The system is calculated according to the relative value (0–100.0%). | 0 | ○ |

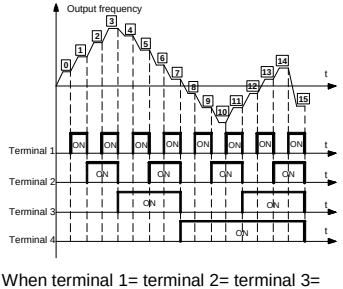
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | **Note:** Multi-step speed given, it is realized by setting P10 group parameters. | | |
| P09.01 | Keypad PID preset | When P09.00=0, set the parameter whose basic value is the feedback value of the system.<br>The setting range: -100.0%–100.0% | 0.0% | ○ |
| P09.02 | PID feedback source | Select the PID channel by the parameter.<br>0: Analog channel AI1 feedback<br>1: Analog channel AI2 feedback<br>2: Analog channel AI3 feedback<br>3: High speed HDI feedback<br>4: MODBUS communication feedback<br>5–7: Reserved<br>**Note:** The reference channel and the feedback channel cannot coincide; otherwise, PID cannot control effectively. | 0 | ○ |
| P09.03 | PID output feature | 0: PID output is positive: when the feedback signal exceeds the PID reference value, the output frequency of the inverter will decrease to balance the PID. For example, the strain PID control during wrap-up<br>1: PID output is negative: When the feedback signal is stronger than the PID reference value, the output frequency of the inverter will increase to balance the PID. For example, the strain PID control during wrap down | 0 | ○ |
| P09.04 | Proportional gain (Kp) | The function is applied to the proportional gain P of PID input.<br>P determines the strength of the whole PID adjuster. The parameter of 100 means that when the offset of PID feedback and given value is 100%, the adjusting range of PID adjustor is the max frequency (ignoring integral function and differential function).<br>The setting range: 0.00–100.00 | 1.00 | ○ |
| P09.05 | Integral time (Ti) | This parameter determines the speed of PID adjustor to carry out integral adjustment on the deviation of PID feedback and reference. When the deviation of PID feedback and | 0.10s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | reference is 100%, the integral adjustor works continuously after the time (ignoring the proportional effect and differential effect) to achieve the max frequency (P00.03) or the max voltage (P04.31). Shorter the integral time, stronger is the adjustment<br>Setting range: 0.00–10.00s | | |
| P09.06 | Differential time (Td) | This parameter determines the strength of the change ratio when PID adjustor carries out integral adjustment on the deviation of PID feedback and reference.<br>If the PID feedback changes 100% during the time, the adjustment of integral adjustor (ignoring the proportional effect and differential effect) is the max frequency (P00.03) or the Max Voltage (P04.31). Longer the integral time, stronger is the adjusting.<br>Setting range: 0.00–10.00s | 0.00s | ○ |
| P09.07 | Sampling cycle (T) | This parameter means the sampling cycle of the feedback. The modulator calculates in each sampling cycle. The longer the sapling cycle is, the slower the response is.<br>Setting range: 0.001–10.000s | 0.100s | ○ |
| P09.08 | PID control deviation limit | The output of PID system is relative to the maximum deviation of the close loop reference. As shown in the diagram below, PID adjustor stops to work during the deviation limit. Set the function properly to adjust the accuracy and stability of the system. | 0.0% | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | |  <br>Setting range: 0.0–100.0% | | |
| P09.09 | Upper limit of PID output | These parameters are used to set the upper and lower limit of the PID adjustor output.<br>100.0 % corresponds to Max Frequency or the max voltage of ( P04.31)<br>Setting range of P09.09: P09.10–100.0%<br>Setting range of P09.10: -100.0%–P09.09 | 100.0% | ○ |
| P09.10 | Lower limit of PID output | | 0.0% | ○ |
| P09.11 | Feedback offline detection value | Set the PID feedback offline detection value, when the detection value is smaller than or equal to the feedback offline detection value, and the lasting time exceeds the set value in P09.12, the inverter will report “PID feedback offline fault” and the keypad will display PIDE. | 0.0% | ○ |
| P09.12 | Feedback offline detection time |  <br>Setting range of P09.11: 0.0–100.0%<br>Setting range of P09.12: 0.0–3600.0s | 1.0s | ○ |
| P09.13 | PID adjustment selection | 0x00–0x11<br>LED ones:<br>0: Keep on integral adjustment when the frequency achieves the upper/lower limit; the integration shows the change between the reference and the feedback unless it reaches the internal integral limit. When the trend between the reference and the feedback | 0x0001 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | changes, it needs more time to offset the impact of continuous working and the integration will change with the trend.<br>1: Stop integral adjustment when the frequency reaches the upper/lower limit. If the integration keeps stable, and the trend between the reference and the feedback changes, the integration will change with the trend quickly.<br>LED tens:<br>0: The same with the main reference direction; if the output of PID adjustment is different from the current running direction, the internal will output 0 forcedly.<br>1: Opposite to the main reference direction<br>LED hundreds:<br>0: Limit as per the maximum frequency<br>1: Limit as per A frequency<br>LED thousands:<br>0: A+B frequency, main reference A frequency source buffering ACC/DEC is invalid;<br>1: main reference A frequency source buffering ACC/DEC is valid and the ACC/DEC is determined by P08.04 | | |
| P09.14 | Proportional gain at low frequency (Kp) | 0.00–100.00 | 1.00 | ○ |
| P09.15 | PID command ACC/DEC time | 0.0–1000.0s | 0.0s | ○ |
| P09.16 | PID output filter time | 0.000–10.000s | 0.000s | ○ |
| **P10 Group Simple PLC and multi-step speed control** | | | | |
| P10.00 | Simple PLC means | 0: Stop after running once. The inverter has to be commanded again after finishing a cycle.<br>1: Run at the final value after running once. After finish a signal, the inverter will keep the running frequency and direction of the last | 0 | ○ |

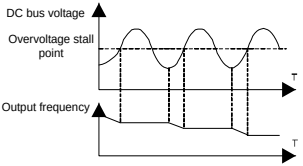
| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | run.<br>2: Cycle running. The inverter will keep on running until receiving a stop command and then, the system will stop. | | |
| P10.01 | Simple PLC memory selection | 0: Power loss without memory<br>1: Power loss memory；PLC record the running stage and frequency when power loss. | 0 | ○ |
| P10.02 | Multi-step speed 0 | 100.0% of the frequency setting corresponds to the max frequency P00.03.<br>When selecting simple PLC running, set P10.02–P10.33 to define the running frequency and direction of all stages.<br>**Note:** The symbol of multi-step determines the running direction of simple PLC. The negative value means reverse rotation.<br>  <br><br>multi-step speeds are in the range of $-f_{max}$–$f_{max}$ and it can be set continuously.<br>UMI-EU-B1 series inverters can set 16 stages speed, selected by the combination of multi-step terminals 1–4, corresponding to the speed 0 to speed 15. | 0.0% | ○ |
| P10.03 | Running time of step 0 | | 0.0s | ○ |
| P10.04 | Multi-step speed 1 | | 0.0% | ○ |
| P10.05 | Running time of step 1 | | 0.0s | ○ |
| P10.06 | Multi-step speed 2 | | 0.0% | ○ |
| P10.07 | Running time of step 2 | | 0.0s | ○ |
| P10.08 | Multi-step speed 3 | | 0.0% | ○ |
| P10.09 | Running time of step 3 | | 0.0s | ○ |
| P10.10 | Multi-step speed 4 | | 0.0% | ○ |
| P10.11 | Running time of step 4 | | 0.0s | ○ |
| P10.12 | Multi-step speed 5 | | 0.0% | ○ |
| P10.13 | Running time of step 5 | | 0.0s | ○ |
| P10.14 | Multi-step speed 6 | | 0.0% | ○ |
| P10.15 | Running time of step 6 | | 0.0s | ○ |
| P10.16 | Multi-step speed 7 | | 0.0% | ○ |

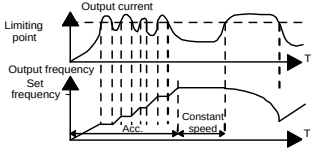
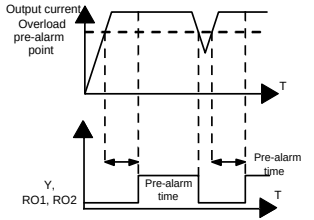
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P10.17</td><td>Running time of step 7</td><td rowspan="16"> 

When terminal 1= terminal 2= terminal 3= terminal 4=OFF, the frequency input manner is selected via code P00.06 or P00.07. When all terminal 1= terminal 2= terminal 3= terminal 4 terminals aren't off, it runs at multi-step which takes precedence of keypad, analog value, high-speed pulse, PLC, communication frequency input. Select at most 16 stages speed via the combination code of terminal 1, terminal 2, terminal 3, and terminal 4.<br>The start-up and stopping of multi-step running is determined by function code P00.06, the relationship between terminal 1, terminal 2, terminal 3, terminal 4 terminals and multi-step speed is as following:
<table>
<tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>step</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Terminal 4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
</table></td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.18</td><td>Multi-step speed 8</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.19</td><td>Running time of step 8</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.20</td><td>Multi-step speed 9</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.21</td><td>Running time of step 9</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.22</td><td>Multi-step speed 10</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.23</td><td>Running time of step 10</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.24</td><td>Multi-step speed 11</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.25</td><td>Running time of step 11</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.26</td><td>Multi-step speed 12</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.27</td><td>Running time of step 12</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.28</td><td>Multi-step speed 13</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.29</td><td>Running time of step 13</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.30</td><td>Multi-step speed 14</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.31</td><td>Running time of step 14</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.32</td><td>Multi-step speed 15</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.33</td><td>Running time of step 15</td><td>0.0s</td><td>○</td></tr>
</table>

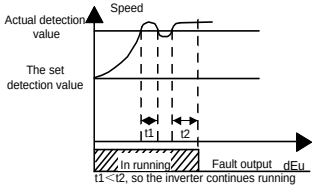
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>step</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr>
</table>
Setting range of P10.(2n, 1<n<17): -100.0–100.0%<br>Setting range of P10.(2n+1, 1<n<17): 0.0–6553.5s (min)</td><td></td><td></td></tr>
<tr><td>P10.34</td><td>Simple PLC 0–7 step ACC/DEC time selection</td><td>Below is the detailed instruction:
<table>
<tr><th>Function code</th><th colspan="2">Binary bit</th><th>Step</th><th>ACC/DEC 0</th><th>ACC/DEC 1</th><th>ACC/DEC 2</th><th>ACC/DEC 3</th></tr>
<tr><td rowspan="8">P10.34</td><td>BIT1</td><td>BIT0</td><td>0</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>1</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>2</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>3</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>4</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>5</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>6</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>7</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
</table></td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.35</td><td>Simple PLC 8–15 step ACC/DEC time selection</td><td>
<table>
<tr><td rowspan="8">P10.35</td><td>BIT1</td><td>BIT0</td><td>8</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>9</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>10</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>11</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>12</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>13</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>14</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>15</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
</table>
After the users select the corresponding ACC/DEC time, the combining 16 binary bit will change into decimal bit, and then set the corresponding function codes.<br>Setting range: -0x0000–0xFFFF</td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.36</td><td>PLC restart mode</td><td>0: Restart from the first stage; stop during running (cause by the stop command, fault or power loss), run from the first stage after restart.<br>1: Continue to run from the stop frequency; stop during running (cause by stop command and fault), the inverter will record the running</td><td>0</td><td>◎</td></tr>
</table>

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed instruction of parameters</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>time automatically, enter into the stage after restart and keep the remaining running at the setting frequency.</td><td></td><td></td></tr>
<tr><td>P10.37</td><td>Multi-step time unit selection</td><td>0: Seconds; the running time of all stages is counted by second<br>1: Minutes; the running time of all stages is counted by minute</td><td>0</td><td>◎</td></tr>
<tr><td colspan="5">P11 Group Protective parameters</td></tr>
<tr><td>P11.00</td><td>Phase loss protection</td><td>0x00–0x11<br>LED ones:<br>0: Input phase loss software protection disable<br>1: Input phase loss software protection enable<br>LED tens:<br>0: Output phase loss protection disable<br>1: Output phase loss protection enable<br>LED hundreds:<br>0: Input phase loss hardware protection disable<br>1: Input phase loss hardware protection enable</td><td>0x10</td><td>○</td></tr>
<tr><td>P11.01</td><td>Frequency-drop at sudden power loss</td><td>0: Enabled<br>1: Disabled</td><td>0</td><td>○</td></tr>
<tr><td>P11.02</td><td>Frequency-drop ratio at sudden power loss</td><td>Setting range: 0.00Hz/s–P00.03 (the Max frequency)<br>After the power loss of the grid, the bus voltage drops to the sudden frequency-decreasing point, the inverter begin to decrease the running frequency at P11.02, to make the inverter generate power again. The returning power can maintain the bus voltage to ensure a rated running of the inverter until the recovery of power.
<table>
<tr><td>Voltage degree</td><td>220V</td><td>380V</td><td>660V</td></tr>
<tr><td>Frequency-decreasing point at sudden</td><td>260V</td><td>460V</td><td>800V</td></tr>
</table></td><td>10.00 Hz/s</td><td>○</td></tr>
</table>

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | power loss<br>**Note:** 1. Adjust the parameter properly to avoid the stopping caused by inverter protection during the switching of the grid.<br>2. Prohibit the input phase loss protection to enable this function. | | |
| P11.03 | Overvoltage stall protection | 0: Disabled<br>1: Enabled<br>  | 1 | ○ |
| P11.04 | Overvoltage stall protective voltage | 120–150% (standard bus voltage) (380V) | 136% | ○ |
| | | 120–150% (standard bus voltage) (220V) | 120% | |
| P11.05 | Current limit action | The actual increasing ratio is less than the ratio of output frequency because of the big load during ACC running. It is necessary to take measures to avoid overcurrent fault and the inverter trips.<br>During the running of the inverter, this function will detect the output current and compare it with the limit level defined in P11.06. If it exceeds the level, the inverter will run at stable frequency in ACC running, or the inverter will derate to run during the constant running. If it exceeds the level continuously, the output frequency will keep on decreasing to the lower limit. If the output current is detected to be lower than the limit level, the inverter will accelerate to run. | 0x01 | ◎ |
| P11.06 | Automatic current limit level | | G: 160.0% | ◎ |
| P11.07 | Frequency-drop rate during current limit | | 10.00 Hz/s | ◎ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | |  <br>Setting range of P11.05:<br>0: current limit invalid<br>1: current limit valid<br>2: current limit is invalid during constant speed<br>Setting range of P11.05: 0x00–0x12<br>Setting range of P11.06: 50.0–200.0%<br>Setting range of P11.07: 0.00–50.00Hz/s | | |
| P11.08 | Over/under-load pre-alarm of motor/ inverter | The output current of the inverter or the motor is above P11.09 and the lasting time is beyond P11.10, overload pre-alarm will be output. | 0x0000 | ○ |
| P11.09 | Overload pre-alarm detection level |  | 150% | ○ |
| P11.10 | Overload pre-alarm detection time | Setting range of P11.08:<br>Enable and define the overload pre-alarm of the inverter or the motor.<br>Setting range: 0x0000–0x1131<br>LED ones:<br>0: Over/under-load pre-alarm of the motor, relative to the rated motor current.<br>1: Over/under-load pre-alarm of the inverter, relative to the rated inverter current<br>LED tens: | 1.0s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | 0: The inverter continues to work after over/under-load pre-alarm<br>1: The inverter continues to work after underload pre-alarm and stops running after overload fault<br>2: The inverter continues to work after overload pre-alarm and stops running after underload fault<br>3. The inverter stops when over/under-load occurred.<br>LED hundreds :<br>0: Detect all the time<br>1: Detect during constant running<br>Setting range of P11.09: P11.11–200%<br>Setting range of P11.10: 0.1–3600.0s<br>LED thousands:<br>Overload integral function selection<br>0: Overload integral is invalid;<br>1: Overload integral is valid | | |
| P11.11 | Underload pre-alarm detection level | If the inverter current or the output current is lower than P11.11, and its lasting time is beyond P11.12, the inverter will output underload pre-alarm.<br>Setting range of P11.11: 0–P11.09<br>Setting range of P11.12: 0.1–3600.0s | 50% | ○ |
| P11.12 | Underload pre-alarm detection time | | 1.0s | ○ |
| P11.13 | Output terminal action selection during fault | Select the action of fault output terminals on undervoltage and fault reset.<br>0x00–0x11<br>LED ones:<br>0: Action during undervoltage fault<br>1: No action during undervoltage fault<br>LED tens:<br>0: Action during the automatic reset period<br>1: No action during the automatic reset period | 0x00 | ○ |
| P11.14 | Speed deviation detection value | 0.0–50.0%<br>Set the speed deviation detection time. | 10.0% | ○ |
| P11.15 | Speed deviation | This parameter is used to set the speed deviation detection time. | 0.5s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | detection time |  <br>Setting range of P11.15: 0.0–10.0s | | |
| P11.16 | Extension function selection | 0x000–0x111<br>LED ones: Automatic frequency-drop at voltage drop<br>0: Automatic frequency-drop at voltage drop is invalid<br>1: Automatic frequency-drop at voltage drop is valid<br>LED tens: The second ACC/DEC time selection<br>0: The second ACC/DEC time detection selection is invalid<br>1: The second ACC/DEC time detection selection is valid;<br>when the operation is above P08.36, ACC/DEC time is switched to the second ACC/DEC time<br>LED hundreds: STO function selection<br>0: STO alarm locked<br>Alarm lock means when STO appears, reset is a must after state recovery.<br>1: STO alarm unlocked<br>STO alarm unlocked means when STO appears, STO alarm will disappeared automatically after state recovery.<br>Note: STL1–STL3 are fault lock and cannot be reset. | 0x000 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| **P13 Group Control parameters of SM** | | | | |
| P13.13 | Short circuit brake current | After the inverter starts, when P01.00=0, set P13.14 to non-zero value and begin short circuit braking.<br>After the inverter stops, when the operation frequency is less than P01.09, set P13.15 to non-zero value and begin stopping short-circuit braking and then DC braking.<br>Setting range of P13.13: 0.0–150.0% (inverters)<br>Setting range of P13.14: 0.00–50.00s | 0.0% | ○ |
| P13.14 | Hold time of short circuit brake at start | | 0.00s | ○ |
| P13.15 | Hold time of short circuit brake at stop | | 0.00s | ○ |
| **P14 Group Serial communication** | | | | |
| P14.00 | local communication address | The setting range: 1–247<br>When the master is writing the frame, the communication address of the slave is set to 0; the broadcast address is the communication address. All slaves on the MODBUS fieldbus can receive the frame, but the salve doesn't answer.<br>The communication address of the drive is unique in the communication net. This is the fundamental for the point to point communication between the upper monitor and the drive.<br>**Note:** The address of the slave cannot set to 0. | 1 | ○ |
| P14.01 | Communication baud rate setup | Set the digital transmission speed between the upper monitor and the inverter.<br>0: 1200BPS<br>1: 2400BPS<br>2: 4800BPS<br>3: 9600BPS<br>4: 19200BPS<br>5: 38400BPS<br>6: 57600BPS<br>**Note:** The baud rate between the upper monitor and the inverter must be the same. Otherwise, the communication is not applied. | 4 | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | The bigger the baud rate, the quicker the communication speed. | | |
| P14.02 | Data bit check setup | The data format between the upper monitor and the inverter must be the same. Otherwise, the communication is not applied.<br>0: No parity check (N, 8, 1) for RTU<br>1: Even parity check (E, 8, 1) for RTU<br>2: Odd parity check (O, 8, 1) for RTU<br>3: No check (N, 8, 2) for RTU<br>4: Even parity check (E, 8, 2) for RTU<br>5: Odd parity check (O, 8, 2) for RTU<br>6: No check (N, 7, 1) for ASCII<br>7: Even check (E, 7, 1) for ASCII<br>8: Odd check (O, 7, 1) for ASCII<br>9: No check (N, 7, 2) for ASCII<br>10: Even check (E, 7, 2) for ASCII<br>11: Odd check (O, 7, 2) for ASCII<br>12: No check (N, 8, 1) for ASCII<br>13: Even check (E, 8, 1) for ASCII<br>14: Odd check (O, 8, 1) for ASCII<br>15: No check (N, 8, 2) for ASCII<br>16: Even check (E, 8, 2) for ASCII<br>17: Odd check (O, 8, 2) for ASCII | 1 | ○ |
| P14.03 | Communication response delay | 0–200ms<br>It means the interval time between the interval time when the drive receive the data and sent it to the upper monitor. If the answer delay is shorter than the system processing time, then the answer delay time is the system processing time, if the answer delay is longer than the system processing time, then after the system deal with the data, waits until achieving the answer delay time to send the data to the upper monitor. | 5 | ○ |
| P14.04 | Communication overtime fault time | 0.0 (invalid), 0.1–60.0s<br>When the function code is set as 0.0, the communication overtime parameter is invalid. When the function code is set as non-zero, if the interval time between two | 0.0s | ○ |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| | | communications exceeds the communication overtime, the system will report “485 communication faults” (CE). | | |
| P14.05 | Transmission error processing | 0: Alarm and stop freely<br>1: No alarm and continue running<br>2: No alarm and stop as per the stop mode (only under communication control mode)<br>3: No alarm and stop as per the stop mode (under all control modes) | 0 | ○ |
| P14.06 | Communication processing action selection | 0x00–0x11<br>LED ones:<br>0: Write with response: the inverter will respond to all reading and writing commands of the upper monitor.<br>1: Write without response: the inverter only responds to the reading command other than the writing command of the drive. The communication efficiency can be increased by this method.<br>LED tens: (reserved)<br>0: Communication encrypting is invalid<br>1: Communication encrypting is valid | 0x00 | ○ |
| P14.07 | Reserved | | | ● |
| P14.08 | Reserved | | | ● |
| **P17 Group** | **Monitoring function** | | | |
| P17.00 | Setting frequency | Display current set frequency of the inverter<br>Range: 0.00Hz–P00.03 | | ● |
| P17.01 | Output frequency | Display current output frequency of the inverter<br>Range: 0.00Hz–P00.03 | | ● |
| P17.02 | Ramp reference frequency | Display current ramp reference frequency of the inverter<br>Range: 0.00Hz–P00.03 | | ● |
| P17.03 | Output voltage | Display current output voltage of the inverter<br>Range: 0–1200V | | ● |
| P17.04 | Output current | Display current output current of the inverter<br>Range: 0.0–5000.0A | | ● |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P17.05 | Motor speed | Display the rotation speed of the motor.<br>Range: 0–65535RPM | | ● |
| P17.06 | Torque current | Display current torque current of the inverter<br>Range: 0.0–5000.0A | | ● |
| P17.07 | Magnetized current | Display current magnetized current of the inverter<br>Range: 0.0–5000.0A | | ● |
| P17.08 | Motor power | Display current power of the motor.<br>Setting range: -300.0%–300.0%<br>(the rated current of the motor) | | ● |
| P17.09 | Output torque | Display the current output torque of the inverter.<br>Range: -250.0–250.0% | | ● |
| P17.10 | The motor frequency evaluation | Evaluate the motor rotor frequency on open loop vector<br>Range: 0.00– P00.03 | | ● |
| P17.11 | DC bus voltage | Display current DC bus voltage of the inverter<br>Range: 0.0–2000.0V | | ● |
| P17.12 | Switch input terminals state | Display current Switch input terminals state of the inverter<br>Range: 0000–00FF | | ● |
| P17.13 | Switch output terminals state | Display current Switch output terminals state of the inverter<br>Range: 0000–000F | | ● |
| P17.14 | Digital adjustment | Display the adjustment through the keypad of the inverter.<br>Range : 0.00Hz–P00.03 | | ● |
| P17.15 | Torque reference | Display the torque reference, the percentage to the current rated torque of the motor.<br>Setting range: -300.0%–300.0%<br>(the rated current of the motor) | | ● |
| P17.16 | Linear speed | Display the current linear speed of the inverter.<br>Range: 0–65535 | | ● |
| P17.17 | Reserved | | | ● |
| P17.18 | Counting value | Display the current counting number of the inverter.<br>Range: 0–65535 | | ● |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P17.19 | AI1 input voltage | Display analog AI1 input signal<br>Range: 0.00–10.00V | | ● |
| P17.20 | AI2 input voltage | Display analog AI2 input signal<br>Range: 0.00–10.00V | | ● |
| P17.21 | AI3 input voltage | Display analog AI2 input signal<br>Range: -10.00–10.00V | | ● |
| P17.22 | HDI input frequency | Display HDI input frequency<br>Range: 0.00–50.00kHz | | ● |
| P17.23 | PID reference value | Display PID reference value<br>Range: -100.0–100.0% | | ● |
| P17.24 | PID feedback value | Display PID feedback value<br>Range: -100.0–100.0% | | ● |
| P17.25 | Power factor of the motor | Display the current power factor of the motor.<br>Range: -1.00–1.00 | | ● |
| P17.26 | Current running time | Display the current running time of the inverter.<br>Range: 0–65535min | | ● |
| P17.27 | Simple PLC and present stage of the multi-step speed | Display simple PLC and the current stage of the multi-step speed<br>Range: 0–15 | | ● |
| P17.28 | ASR controller output | The percentage of the rated torque of the relative motor, display ASR controller output<br>Range: -300.0%–300.0% (rated motor current) | | ● |
| P17.29 | Reserved | | | ● |
| P17.30 | Reserved | | | ● |
| P17.31 | Reserved | | | ● |
| P17.32 | Magnetic flux linkage | Display the magnetic flux linkage of the motor.<br>Range: 0.0%–200.0% | | ● |
| P17.33 | Exciting current reference | Display the exciting current reference in the vector control mode.<br>Range: -3000.0–3000.0A | | ● |
| P17.34 | Torque current reference | Display the torque current reference in the vector control mode.<br>Range: -3000.0–3000.0A | | ● |

| Function code | Name | Detailed instruction of parameters | Default value | Modify |
|---|---|---|---|---|
| P17.35 | AC input current | Display the input current in AC side.<br>Range: 0.0–5000.0A | | ● |
| P17.36 | Output torque | Display the output torque. Positive value is in the electromotion state, and negative value is in the power generating state.<br>Range : -3000.0Nm–3000.0Nm | | ● |
| P17.37 | Motor overload counting | 0–100 (OL1 when 100) | | ● |
| P17.38 | PID output | Display PID output<br>-100.00–100.00% | | ● |
| P17.39 | Reserved | | | ● |

# 6 Fault tracking

## 6.1 Maintenance intervals

If installed in an appropriate environment, the inverter requires very little maintenance. The table lists the routine maintenance intervals recommended by UNITRONICS.

| Checking part | | Checking item | Checking method | Criterion |
|---|---|---|---|---|
| Ambient environment | | Check the ambient temperature, humidity and vibration and ensure there is no dust, gas, oil fog and water drop. | Visual examination and instrument test | Conforming to the manual |
| | | Ensure there are no tools or other foreign or dangerous objects | Visual examination | There are no tools or dangerous objects. |
| Voltage | | Ensure the main circuit and control circuit are normal. | Measurement by millimeter | Conforming to the manual |
| Keypad | | Ensure the display is clear enough | Visual examination | The characters are displayed normally. |
| | | Ensure the characters are displayed totally | Visual examination | Conforming to the manual |
| Main circuit | For public use | Ensure the screws are tightened securely | Tighten up | NA |
| | | Ensure there is no distortion, crackles, damage or color-changing caused by overheating and aging to the machine and insulator. | Visual examination | NA |
| | | Ensure there is no dust and dirtiness | Visual examination | NA<br>**Note:** if the color of copper blocks change, it does not mean that there is something wrong with the |

| Checking part | | Checking item | Checking method | Criterion |
|---|---|---|---|---|
| | | | | features. |
| | The lead of the conductors | Ensure that there is no distortion or color-changing of the conductors caused by overheating. | Visual examination | NA |
| | | Ensure that there are no crackles or color-changing of the protective layers. | Visual examination | NA |
| | Terminals seat | Ensure that there is no damage | Visual examination | NA |
| | Filter capacitors | Ensure that there is no weeping, color-changing, crackles and cassis expansion. | Visual examination | NA |
| | | Ensure the safety valve is in the right place. | Estimate the usage time according to the maintenance or measure the static capacity. | NA |
| | | If necessary, measure the static capacity. | Measure the capacity by instruments. | The static capacity is above or equal to the original value *0.85. |
| | Resistors | Ensure whether there is replacement and splitting caused by overheating. | Smelling and visual examination | NA |
| | | Ensure that there is no offline. | Visual examination or remove one ending to coagulate or measure with multimeters | The resistors are in ±10% of the standard value. |
| | Transformers and reactors | Ensure there is no abnormal vibration, noise and smelling, | Hearing, smelling and visual examination | NA |

| Checking part | | Checking item | Checking method | Criterion |
|---|---|---|---|---|
| | Electromagnetic contactor and relay | Ensure whether there is vibration noise in the workrooms. | Hearing | NA |
| | | Ensure the contactor is good enough. | Visual examination | NA |
| Control circuit | PCB and plugs | Ensure there are no loose screws and contactors. | Fasten up | NA |
| | | Ensure there is no smelling and color-changing. | Smelling and visual examination | NA |
| | | Ensure there are no crackles, damage distortion and rust. | Visual examination | NA |
| | | Ensure there is no weeping and distortion to the capacitors. | Visual examination or estimate the usage time according to the maintenance information | NA |
| Cooling system | Cooling fan | Estimate whether there is abnormal noise and vibration. | Hearing and Visual examination or rotate with hand | Stable rotation |
| | | Estimate there is no losses screw. | Tighten up | NA |
| | | Ensure there is no color-changing caused by overheating. | Visual examination or estimate the usage time according to the maintenance information | NA |
| | Ventilating duct | Ensure whether there is stuff or foreign objection in the cooling fan, air vent. | Visual examination | NA |

### 6.1.2 Cooling fan

The inverter's cooling fan has a minimum life span of 25,000 operating hours. The actual life span depends on the inverter usage and ambient temperature.

The operating hours can be found through P07.14 (accumulative hours of the inverter).

Fan failure can be predicted by the increasing noise from the fan bearings. If the inverter is operated in a critical part of a process, fan replacement is recommended once these symptoms appear. Replacement fans are available from UNITRONICS.

✧ **Read and follow the instructions in chapter *Safety Precautions*. Ignoring the instructions would cause physical injury or death, or damage to the equipment.**

1. Stop the inverter and disconnect it from the AC power source and wait for at least the time designated on the inverter.
2. Lever the fan holder off the drive frame with a screwdriver and lift the hinged fan holder slightly upward from its front edge.
3. Disconnect the fan cable. Remove the installation bracket.
4. Install the bracket to the reversed direction. Pay attention to the air direction of the inverter and the fan as the figure below:

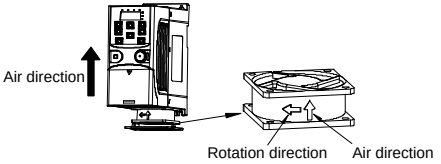



Figure 6-1 Fan installation of the inverters 1PH, 230V, ≤2.2kW

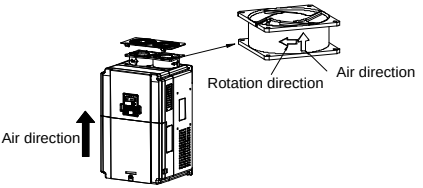



Figure 6-2 Fan installation of the inverters 3PH, 400V, ≥4kW

### 6.1.3 Capacitors

**Reforming the capacitors**

The DC bus capacitors must be reformed according to the operation instruction if the inverter has been stored for a long time. The storing time is counted form the producing date other than the delivery data which has been marked in the serial number of the inverter.

| Time | Operational principle |
|---|---|
| Storing time less than 1 year | Operation without charging |
| Storing time 1-2 years | Connect with the power for 1 hour before first ON command |
| Storing time 2-3 years | Use power surge to charge for the inverter<br>• Add 25% rated voltage for 30 minutes<br>• Add 50% rated voltage for 30 minutes<br>• Add 75% rated voltage for 30 minutes<br>• Add 100% rated voltage for 30 minutes |
| Storing time more than 3 years | Use power surge to charge for the inverter<br>• Add 25% rated voltage for 2 hours<br>• Add 50% rated voltage for 2 hours<br>• Add 75% rated voltage for 2 hours<br>• Add 100% rated voltage for 2 hours |

The method of using power surge to charge for the inverter:

The right selection of power surge depends on the supply power of the inverter. Single phase 230V AC/2A power surge applied to the inverter with single/three-phase 230V AC as its input voltage. The inverter with single/three-phase 230V AC as its input voltage can apply Single phase 230V AC/2A power surge (L+ to R and N to S or T). All DC bus capacitors charge at the same time because there is one rectifier.

High-voltage inverter needs enough voltage (for example, 400V) during charging. The small capacitor power (2A is enough) can be used because the capacitor nearly does not need current when charging.

**Change electrolytic capacitors**

✧ Read and follow the instructions in chapter *Safety Precautions*. Ignoring the instructions may cause physical injury or death, or damage to the equipment.

Change electrolytic capacitors if the working hours of electrolytic capacitors in the inverter are above 35000. Contact the local UNITRONICS offices for detailed operation.

### 6.1.4 Power cable

✧ Read and follow the instructions in chapter *Safety Precautions*. Ignoring the instructions may cause physical injury or death, or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for at least the time designated on the inverter.
2. Check the tightness of the power cable connections.
3. Restore power.

## 6.2 Fault solution

✧ Only qualified electricians are allowed to maintain the inverter. Read the safety instructions in chapter Safety precautions before working on the inverter.

### 6.2.1 Alarm and fault indications

Fault is indicated by LEDs. See ***Operation Procedure***. When TRIP light is on, an alarm or fault message on the panel display indicates abnormal inverter state. Using the information given in this chapter, most alarm and fault cause can be identified and corrected. If no, contact the UNITRONICS office.

### 6.2.2 How to reset

The inverter can be reset by pressing the keypad key STOP/RST, through digital input, or by switching the power light. When the fault has been removed, the motor can be restarted.

### 6.2.3 Fault instruction and solution

Do as the following after the inverter fault:

1. Check to ensure there is nothing wrong with the keypad. If no, contact the local UNITRONICS office.
2. If there is nothing wrong, please check P07 and ensure the corresponding recorded fault parameters to confirm the real state when the current fault occurs by all parameters.
3. See the following table for detailed solution and check the corresponding abnormal state.
4. Eliminate the fault and ask for relative help.
5. Check to eliminate the fault and carry out fault reset to run the inverter.

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| OUt1 | IGBT Ph-U fault | 1. Acc. is too fast | 1. Increase acc. time |
| OUt2 | IGBT Ph-V fault | 2. IGBT module damaged | 2. Replace the power unit |

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| OUt3 | IGBT Ph-W fault | 3. Misacts caused by interference<br>4. The connection of the drive wire is not good,<br>5. To-ground short circuit | 3. Check drive wires<br>4. Check whether there is strong interference caused by external equipment |
| OC1 | Over-current during acceleration | 1. Acc. is too fast.<br>2. Grid voltage is too low.<br>3. Inverter power is too small.<br>4. Load transients or is abnormal.<br>5. To-ground short circuit or output phase loss occur.<br>6. There is strong external interference.<br>7. The overvoltage stall protection is not open. | 1. Increase acc. time<br>2. Check input power<br>3. Select the inverter with a larger power<br>4. Check if the load is short circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth.<br>5. Check the output wiring.<br>6. Check if there is strong interference.<br>7. Check the setting of relative function codes. |
| OC2 | Over-current during deceleration | | |
| OC3 | Over-current when running at constant speed | | |
| OV1 | Over-voltage during acceleration | 1. The input voltage is abnormal.<br>2. There is large energy feedback.<br>3. No braking components.<br>4. Braking energy is not open | 1. Check the input power<br>2. Check if the load dec. time is too short or the inverter starts during the rotation of the motor or it is necessary to increase the energy consumption components.<br>3. Install the braking components.<br>4. Check the setting of relative function codes. |
| OV2 | Over-voltage during deceleration | | |
| OV3 | Over-voltage when running at constant speed | | |
| UV | DC bus under-voltage | The voltage of the power supply is too low. | Check the input power of the supply line. |
| OL1 | Motor overload | 1. The voltage of the power supply is too low.<br>2. The motor setting rated current is incorrect.<br>3. The motor stall or load transients is too strong. | 1. Check grid voltage<br>2. Reset the rated current of the motor<br>3. Check the load and adjust the torque lift |

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| OL2 | Inverter overload | 1. Acc is too fast<br>2. Restart the rotating motor<br>3. Grid voltage is too low.<br>4. The load is too heavy.<br>5. The rated power is much larger than the power actually needed | 1. Increase acc. time<br>2. Avoid restarting after stopping.<br>3. Check the grid voltage<br>4. Select an inverter with larger power.<br>5. Select a proper motor. |
| OL3 | Electrical overload | The inverter will report overload pre-alarm according to the set value. | Check the load and the overload pre-alarm point. |
| SPI | Input phase loss | Phase loss or fluctuation of input R, S, T | 1. Check input power<br>2. Check installation wiring |
| SPO | Output phase loss | U, V, W phase loss output (or serious asymmetrical three phase of the load) | 1. Check the output wiring<br>2. Check the motor and cable |
| OH1 | Rectify overheat | 1. Air duct is blocked or fan is damaged<br>2. Ambient temperature is too high.<br>3. The time of overload running is too long. | 1. Refer to the overcurrent solution<br>2. Redistribute dredge the wind channel or change the fan<br>3. Lower the ambient temperature<br>4. Check and reconnect<br>5. Change the power<br>6. Change the power unit<br>7. Change the main control panel |
| OH2 | IGBT overheat | | |
| EF | External fault | SI external fault input terminals acts | Check the external device input |
| CE | Communication error | 1. The baud rate setting is incorrect.<br>2. Fault occurs to the communication circuit.<br>3. The communication address is wrong.<br>4. There is strong interference to the communication. | 1. Set proper baud rate<br>2. Check the wiring of communication connection interface<br>3. Set proper communication address.<br>4. Chang or replace the wiring or improve the anti-interference capability. |

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| ItE | Current detection fault | 1. The connection of the control board is not good<br>2. Assistant power is bad<br>3. Hall components is broken<br>4. The magnifying circuit is abnormal. | 1. Check the connector and plug wire again<br>2. Change the Hall<br>3. Change the main control panel |
| tE | Autotuning fault | 1. The motor capacity does not match with inverter capacity<br>2. The rated parameter of the motor is set improperly.<br>3. The deviation between the parameters from autotune and the standard parameter is huge<br>4. Autotune overtime | 1. Change the inverter model<br>2. Set the rated parameter according to the motor name plate<br>3. Empty the motor load.<br>4. Check the motor connection and set the parameter.<br>5. Check if the upper limit frequency is above 2/3 of the rated frequency. |
| EEP | EEPROM fault | 1. Error occurred to R/W of the control parameter<br>2. EEPROM is damaged | 1. Press STOP/RST to reset<br>2. Change the main control panel |
| PIDE | PID feedback fault | 1. PID feedback offline<br>2. PID feedback source disappear | 1. Check the PID feedback signal wire<br>2. Check the PID feedback source |
| bCE | Braking unit fault | 1. Braking circuit fault or damage to the braking pipes<br>2. The external braking resistor is not sufficient | 1. Check the braking unit and , change new braking pipe<br>2. Increase the braking resistor |
| END | Time reach of factory setting | The actual running time of the inverter is larger than the internal setting running time. | Ask for the supplier and adjust the setting running time. |
| PCE | Keypad communication error | The keypad is not in good connection or offline;<br>The keypad cable is too long and there is strong interference;<br>Part of the communication circuits of the keypad or main board have fault. | Check the keypad cable and and ensure it is normal;<br>Check the environment and eliminate the interference source;<br>Change hardware and ask for maintenance service. |

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| UPE | Parameter upload error | The keypad is not in good connection or offline;<br>The keypad cable is too long and there is strong interference;<br>Part of the communication circuits of the keypad or main board have fault. | Check the environment and eliminate the interference source;<br>Replace the hardware and ask for maintenance service;<br>Change hardware and ask for maintenance service. |
| DNE | Parameter download error | The keypad is not in good connection or offline;<br>The keypad cable is too long and there is strong interference;<br>Data storage error in keypad | Check the environment and eliminate the interference source;<br>Replace the hardware and ask for maintenance service;<br>Backup data in the keypad again |
| ETH1 | Grounding shortcut fault 1 | 1.The output of the inverter is short circuited to the ground<br>2.There is fault in the current detection circuit<br>3.There is a great difference between the actual motor power setting and the inverter power | 1.Check if the connection of the motor is normal or not<br>2.Replace the hall<br>3.Replace the main control panel<br>4.Reset motor parameters and ensure those parameters are correct<br>5. Check whether motor power parameters in P2 group are consistent with the motor power actually used |
| ETH2 | Grounding shortcut fault 2 | | |
| LL | Electronic underload fault | The inverter will report the underload pre-alarm according to the set value. | Check the load and the underload pre-alarm point. |
| STO | Safe torque off | STO function operates normally | |
| STL1 | Channel H1 abnormal | Fault or internal hardware circuit fault occurred to H1 channel | Replace STO switch; if problem persists after replacement, contact the manufacturer. |
| STL2 | Channel H2 abnormal | Fault or internal hardware circuit fault occurred to H2 channel | |

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| STL3 | Internal circuit abnormal | Fault or internal hardware circuit fault occurred to H1 and H2 channels simultaneously | |
| CrCE | Safe code FLASH CRC check fault | Error occurred to STO safe code FLASH CRC check | Contact the manufacturer. |

**STO alarm**

1. When the hundreds of P11.16 is set to 0, the STO alarm is locked.

As shown in below Figure 6-3, When H1 and H2 are 'OFF' during operation (safety function is required), the drive enters safety mode and stops output. STO alarm will only be disappeared once reset action is valid. External running command need to be reset for the drive to execute running command again.

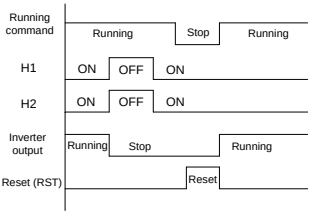



Figure 6-3

2. When the hundreds of P11.16 is set to 1, the STO alarm will be unlocked

As shown in below Figure 6-4, alarm unlock means when STO appears, the STO alarm will disappear automatically after state restoration, which requires no reset action. After reset of external running command, the drive will execute running command again.

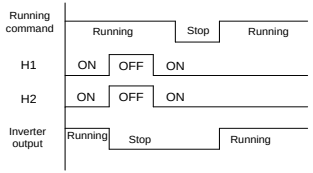



Figure 6-4

**STL1 fault**

As shown in below Figure 6-5, when the hardware circuit of safety circuit 1 is abnormal while that of H2 signal is normal, namely, when H1 is abnormal during operation (safety function is required), the drive enters safety mode and stops output no matter whatever the running command is. Despite of reset commands and external running command reset, the drive will not execute running command again, and it is STL1 alarm lock all the time.

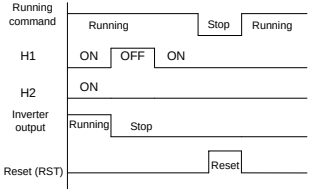



Figure 6-5

**STL 2 fault**

As shown in below Figure 6-6, when the hardware circuit of safety circuit 2 is abnormal while that of H1 signal is normal, namely, when H2 is abnormal during operation (safety function is required), the drive enters safety mode and stops output no matter whatever the running command is. Despite of reset commands and external running command reset, the drive will not execute running command again, and it is STL2 alarm lock all the time.

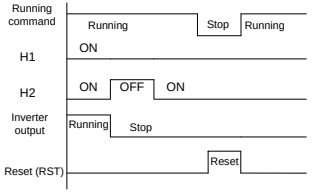



Figure 6-6

**6.2.4 Other states**

| Fault code | Fault type | Possible cause | Solutions |
|---|---|---|---|
| PoFF | System power off | System power off or low DC voltage | Check the grid |

# 7 Communication protocol

## 7.1 Brief instruction to Modbus protocol

Modbus protocol is a software protocol and common language which is applied in the electrical controller. With this protocol, the controller can communicate with other devices via network (the channel of signal transmission or the physical layer, such as RS485). And with this industrial standard, the controlling devices of different manufacturers can be connected to an industrial network for the convenient of being monitored.

There are two transmission modes for Modbus protocol: ASCII mode and RTU (Remote Terminal Units) mode. On one Modbus network, all devices should select same transmission mode and their basic parameters, such as baud rate, digital bit, check bit, and stopping bit should have no difference.

Modbus network is a controlling network with single-master and multiple slaves, which means that there is only one device performs as the master and the others are the slaves on one Modbus network. The master means the device which has active talking right to send message to Modbus network for the controlling and inquiring to other devices. The slave means the passive device which sends data message to the Modbus network only after receiving the controlling or inquiring message (command) form the master (response). After the master sends message, there is a period of time left for the controlled or inquired slaves to response, which ensure there is only one slave sends message to the master at a time for the avoidance of singles impact.

Generally, the user can set PC, PLC, IPC and HMI as the masters to realize central control. Setting certain device as the master is a promise other than setting by a bottom or a switch or the device has a special message format. For example, when the upper monitor is running, if the operator clicks sending command bottom, the upper monitor can send command message actively even it cannot receive the message from other devices. In this case, the upper monitor is the master. And if the designer makes the inverter send the data only after receiving the command, then the inverter is the slave.

The master can communicate with any single slave or with all slaves. For the single-visiting command, the slave should feedback a response message; for the broadcasting message from the master, the slave does not need to feedback the response message.

## 7.2 Application of the inverter

The Modbus protocol of the inverter is RTU mode and the physical layer is 2-wire RS485.

### 7.2.1 Two-wire RS485

The interface of 2-wire RS485 works on semiduplex and its data signal applies differential transmission which is called balance transmission, too. It uses twisted pairs, one of which is defined as A (+) and the other is defined as B (-). Generally, if the positive electrical level between sending drive A and B is among +2–+6V, it is logic“1”, if the electrical level is among -2V–-6V; it is logic“0”.

485+ on the terminal board corresponds to A and 485- to B.

Communication baud rate means the binary bit number in one second. The unit is bit/s (bps). The higher the baud rate is, the quicker the transmission speed is and the weaker the anti-interference is. If the twisted pairs of 0.56mm (24AWG) is applied as the communication cables, the Max Transmission distance is as below:

| Baud rate | Max transmission distance | Baud rate | Max transmission distance | Baud rate | Max transmission distance | Baud rate | Max transmission distance |
|---|---|---|---|---|---|---|---|
| 2400 BPS | 1800m | 4800 BPS | 1200m | 9600 BPS | 800m | 19200 BPS | 600m |

It is recommended to use shield cables and make the shield layer as the grounding wires during RS485 remote communication.

In the cases with less devices and shorter distance, it is recommended to use 120Ω terminal resistor as the performance will be weakened if the distance increase even though the network can perform well without load resistor.

#### 7.2.1.1 Single application

Figure 7-1 is the site Modbus connection figure of single inverter and PC. Generally, the computer does not have RS485 interface, the RS232 or USB interface of the computer should be converted into RS485 by converter. Connect the A terminal of RS485 to the 485+ terminal of the inverter and B to the 485- terminal. It is recommended to use the shield twisted pairs. When applying RS232-RS485 converter, if the RS232 interface of the computer is connected to the RS232 interface of the converter, the wire length should be as short as possible within the length of 15m. It is recommended to connect the RS232-RS485 converter to the computer directly. If using USB-RS485 converter, the wire should be as short as possible, too.

Select a right interface to the upper monitor of the computer (select the interface of RS232-RS485 converter, such as COM1) after the wiring and set the basic parameters such as communication baud rate and digital check bit to the same as the inverter.

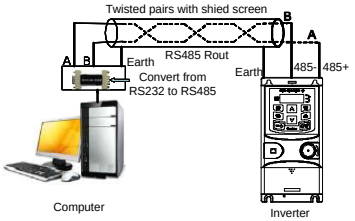



Figure 7-1 RS485 physical connection in single application

### 7.2.1.2 Multi-applications

In real multi-applications, the chrysanthemum connection is used.

Chrysanthemum chain connection is required in the RS485 industrial fieldbus standards. The two ends are connected to terminal resistors of 120Ω, as shown in Figure 7-2.

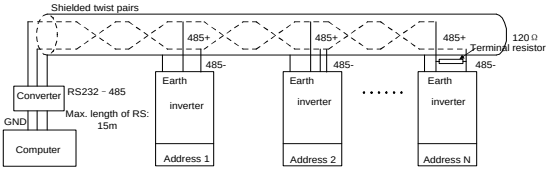



Figure 7-2 Chrysanthemum connection applications

It is recommended that you use shield cables when multiple devices are connected. The basic parameters of the devices, such as baud rate and digital check bit in RS485 should be the same and there should be no repeated address.

### 7.2.2 RTU mode

### 7.2.2.1 RTU communication frame format

If the controller is set to communicate by RTU mode in Modbus network every 8bit byte in the message includes two 4Bit hex characters. Compared with ACSII mode, this mode can send more data at the same baud rate.

**Code system**

· 1 start bit

· 7 or 8 digital bit, the minimum valid bit can be sent firstly. Every 8 bit frame includes two hex characters (0–9, A–F)

· 1 even/odd check bit. If there is no checkout, the even/odd check bit is inexistent.

· 1 end bit (with checkout), 2 Bit (no checkout)

**Error detection field**

· CRC

The data format is illustrated as below:

11-bit character frame (BIT1–BIT8 are the digital bits)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Start bit | BIT1 | BIT2 | BIT3 | BIT4 | BIT5 | BIT6 | BIT7 | BIT8 | Check bit | End bit |

10-bit character frame (BIT1–BIT7 are the digital bits)

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Start bit | BIT1 | BIT2 | BIT3 | BIT4 | BIT5 | BIT6 | BIT7 | Check bit | End bit |

In one character frame, the digital bit takes effect. The start bit, check bit and end bit is used to send the digital bit right to the other device. The digital bit, even/odd checkout and end bit should be set as the same in real application.

The Modbus minimum idle time between frames should be no less than 3.5 bytes. The network device is detecting, even during the interval time, the network bus. When the first field (the address field) is received, the corresponding device decodes next transmitting character. When the interval time is at least 3.5 byte, the message ends.

The whole message frame in RTU mode is a continuous transmitting flow. If there is an interval time (more than 1.5 bytes) before the completion of the frame, the receiving device will renew the uncompleted message and suppose the next byte as the address field of the new message. As such, if the new message follows the previous one 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.

The standard structure of RTU frame:

| | |
|---|---|
| START | T1-T2-T3-T4 (transmission time of 3.5 bytes) |
| ADDR | Communication address: 0–247 (decimal system) (0 is the broadcast address) |
| CMD | 03H: read slave parameters<br>06H: write slave parameters |
| DATA (N-1)<br>…<br>DATA (0) | The data of 2*N bytes are the main content of the communication as well as the core of data exchanging |
| CRC CHK low bit | Detection value: CRC (16BIT) |
| CRC CHK high bit | |
| END | T1-T2-T3-T4 (transmission time of 3.5 bytes) |

#### 7.2.2.2 RTU communication frame error checkout

Various factors (such as electromagnetic interference) may cause error in the data transmission. For example, if the sending message is a logic “1”,A-B potential difference on RS485 should be 6V, but in reality, it may be -6V because of electromagnetic interference, and then the other devices take the sent message as logic“0”. If there is no error checkout, the receiving devices will not find the message is wrong and they may give incorrect response which cause serious result. So the checkout is essential to the message.

The theme of checkout is that: the sender calculate the sending data according to a fixed formula, and then send the result with the message. When the receiver gets this message, they will calculate anther result according to the same method and compare it with the sending one. If two results are the same, the message is correct. If no, the message is incorrect.

The error checkout of the frame can be divided into two parts: the bit checkout of the byte and the whole data checkout of the frame (CRC check).

**Bit checkout of the byte**

The user can select different bit checkouts or non-checkout, which impacts the check bit setting of each byte.

The definition of even checkout: add an even check bit before the data transmission to illustrate the number of “1” in the data transmission is odd number or even number. When it is even, the check byte is “0”; otherwise, the check byte is”1”. This method is used to stabilize the parity of the data.

The definition of odd checkout: add an odd check bit before the data transmission to illustrate the number of “1” in the data transmission is odd number or even number. When it is odd, the check byte is “0”; otherwise, the check byte is”1”. This method is used to stabilize the parity of the data.

For example, when transmitting “11001110”, there are five “1” in the data. If the even checkout is applied, the even check bit is “1”; if the odd checkout is applied; the odd check bit is “0”. The even and odd check bit is calculated on the check bit position of the frame. And the receiving devices also carry out even and odd checkout. If the parity of the receiving data is different from the setting value, there is an error in the communication.

**CRC 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.

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 the user is editing CRC calculation, he 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):

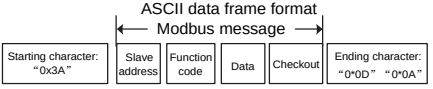
```
unsigned int crc_cal_value(unsigned char *data_value,unsigned char data_length)
{
int i;
unsigned int crc_value=0xffff;
while(data_length--)
{    crc_value^=*data_value++;
                for(i=0;i<8;i++)
                {
if(crc_value&0x0001)crc_value=(crc_value>>1)^0xa001;
                else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

In ladder logic, CKSM calculated the CRC value according to the frame with the table inquiry. The method is advanced with easy program and quick calculation speed. But the ROM space the program occupied is huge. So use it with caution according to the program required space.

### 7.2.3 ASCII mode

<table>
<tr><th>Name</th><th>Definition</th></tr>
<tr><td>Coding system</td><td>Communication protocol belongs to hexadecimal system. The meaning of message character in ASCII: “0”…“9”, “A”…”F”, each hex is represented by the ASCII message corresponds to the character.
<table>
<tr><td>Character</td><td>‘0’</td><td>‘1’</td><td>‘2’</td><td>‘3’</td><td>‘4’</td><td>‘5’</td><td>‘6’</td><td>‘7’</td></tr>
<tr><td>ASCII CODE</td><td>0x30</td><td>0x31</td><td>0x32</td><td>0x33</td><td>0x34</td><td>0x35</td><td>0x36</td><td>0x37</td></tr>
<tr><td>Character</td><td>‘8’</td><td>‘9’</td><td>‘A’</td><td>‘B’</td><td>‘C’</td><td>‘D’</td><td>‘E’</td><td>‘F’</td></tr>
<tr><td>ASCII CODE</td><td>0x38</td><td>0x39</td><td>0x41</td><td>0x42</td><td>0x43</td><td>0x44</td><td>0x45</td><td>0x46</td></tr>
</table></td></tr>
<tr><td>Data format</td><td>Starting bit, 7/8 data bit, check bit and stop bit. The data formats are listed as below:<br>11-bit character frame:
<table>
<tr><td>Starting bit</td><td>BIT1</td><td>BIT2</td><td>BIT3</td><td>BIT4</td><td>BIT5</td><td>BIT6</td><td>BIT7</td><td>BIT8</td><td>Check bit</td><td>Stop bit</td></tr>
</table>10-bit character frame:
<table>
<tr><td>Starting bit</td><td>BIT1</td><td>BIT2</td><td>BIT3</td><td>BIT4</td><td>BIT5</td><td>BIT6</td><td>BIT7</td><td>Check bit</td><td>Stop bit</td></tr>
</table></td></tr>
</table>

In ASCII mode, the frame header is “:” (“0*3A”), frame end is “CRLF” (“0*0D” “0*0A”) by default. In ASCII mode, all the data bytes, except for the frame header and frame end, are transmitted in ASCII code mode, in which four high bit groups will be sent out first and then, four low bit groups will be sent out. In ASCII mode, the data length is 8 bit. As for ‘A’–‘F’, its capital letters is adopted for ASCII code. The data now adopts LRC checkout which covers slave address to data information. The checksum equals to the complement of the character sum of all the participated checkout data.




Standard structure of ASCII frame:

<table>
<tr><td>START</td><td>‘:’ (0x3A)</td></tr>
<tr><td>Address Hi</td><td rowspan="2">Communication address:<br>8-bit address is formed by the combination of two ASCII codes</td></tr>
<tr><td>Address Lo</td></tr>
<tr><td>Function Hi</td><td rowspan="2">Function code:<br>8-bit address is formed by the combination of two ASCII codes</td></tr>
<tr><td>Function Lo</td></tr>
<tr><td>DATA (N-1)<br>…<br>DATA (0)</td><td>Data content:<br>nx8-bit data content is formed by combination of 2n (n≤16) ASCII codes</td></tr>
<tr><td>LRC CHK Hi</td><td rowspan="2">LRC check code:<br>8-bit check code is formed by the combination of two ASCII codes.</td></tr>
<tr><td>LRC CHK Lo</td></tr>
</table>

| | |
|---|---|
| END Hi | End character: |
| END Lo | END Hi=CR (0x0D), END Lo=LF (0x0A) |

**7.2.3.1 ASCII mode check (LRC Check)**

Check code (LRC Check) is the value combined of address and data content result. For instance, the check code of above 2.2.2 communication message is: 0x02+0x06+0x00+0x08+0x13+0x88=0xAB, then take the compliment of 2=0x55. Below is a simple LRC calculation function for user reference (programed with C language):

```
Static unsigned char
LRC(auchMsg,usDataLen)
unsigned char *auchMsg;
unsigned short usDataLen;
{
unsigned char uchLRC=0;
while(usDataLen--)
uchLRC+=*auchMsg++;
return((unsigned char)(–((char)uchLRC)));
}
```

## 7.3 Command code and communication data illustration

**7.3.1 RTU mode**

**7.3.1.1 Command code: 03H**

**03H (correspond to binary 0000 0011), read N words (Word) (the Max continuous reading is 16 words)**

Command code 03H means that if the master read data from the inverter, the reading number depends on the “data number” in the command code. The max continuous reading number is 16 and the parameter address should be continuous. The byte length of every data is 2 (one word). The following command format is illustrated by hex (a number with “H” means hex) and one hex occupies one byte.

The command code is used to read the working stage of the inverter.

For example, read continuous 2 data content from0004H from the inverter with the address of 01H (read the content of data address of 0004H and 0005H), the frame structure is as below:

RTU master command message (from the master to the inverter)

| | |
|---|---|
| START | T1-T2-T3-T4 |
| ADDR | 01H |
| CMD | 03H |
| High bit of the start address | 00H |
| Low bit of the start address | 04H |

| | |
|---|---|
| High bit of data number | 00H |
| Low bit of data number | 02H |
| CRC low bit | 85H |
| CRC high bit | CAH |
| END | T1-T2-T3-T4 |

T1-T2-T3-T4 between START and END is to provide at least the time of 3.5 bytes as the leisure time and distinguish two messages for the avoidance of taking two messages as one message.

**ADDR** = 01H means the command message is sent to the inverter with the address of 01H and ADDR occupies one byte

**CMD**=03H means the command message is sent to read data from the inverter and CMD occupies one byte

**"Start address"** means reading data from the address and it occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

**"Data number"** means the reading data number with the unit of word. If the "start address' is 0004H and the "data number" is 0002H, the data of 0004H and 0005H will be read.

**CRC** occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

**RTU** slave response message (from the inverter to the master)

| | |
|---|---|
| START | T1-T2-T3-T4 |
| ADDR | 01H |
| CMD | 03H |
| Byte number | 04H |
| Data high bit of address 0004H | 13H |
| Data low bit of address 0004H | 88H |
| Data high bit of address 0005H | 00H |
| Data low bit of address 0005H | 00H |
| CRC CHK low bit | 7EH |
| CRC CHK high bit | 9DH |
| END | T1-T2-T3-T4 |

The meaning of the response is that:

**ADDR** = 01H means the command message is sent to the inverter with the address of 01H and ADDR occupies one byte

**CMD**=03H means the message is received from the inverter to the master for the response of reading command and CMD occupies one byte

**"Byte number"** means all byte number from the byte (excluding the byte) to CRC byte (excluding the byte). 04 means there are 4 byte of data from the "byte number" to "CRC CHK low bit", which are "digital address 0004H high bit", "digital address 0004H low bit", "digital address 0005H high bit" and "digital address 0005H low bit".

There are 2 bytes stored in one data with the fact that the high bit is in the front and the low bit is in the behind of the message, the data of data address 0004H is 1388H, and the data of data address 0005H is 0000H.

CRC occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

**7.3.1.2 Command code: 06H**

06H (correspond to binary 0000 0110), write one word (Word)

The command means that the master write data to the inverter and one command can write one data other than multiple dates. The effect is to change the working mode of the inverter.

For example, write 5000 (1388H) to 0004H from the inverter with the address of 02H, the frame structure is as below:

RTU master command message (from the master to the inverter)

| START | T1-T2-T3-T4 |
|---|---|
| ADDR | 02H |
| CMD | 06H |
| High bit of writing data address | 00H |
| Low bit of writing data address | 04H |
| High bit of data content | 13H |
| Low bit of data content | 88H |
| CRC CHK low bit | C5H |
| CRC CHK high bit | 6EH |
| END | T1-T2-T3-T4 |

RTU slave response message (from the inverter to the master)

| START | T1-T2-T3-T4 |
|---|---|
| ADDR | 02H |
| CMD | 06H |
| High bit of writing data address | 00H |
| Low bit of writing data address | 04H |
| High bit of data content | 13H |
| Low bit of data content | 88H |
| CRC CHK low bit | C5H |
| CRC CHK high bit | 6EH |
| END | T1-T2-T3-T4 |

**Note:** section 10.2 and 10.3 mainly describe the command format, and the detailed application will be mentioned in 10.8 with examples.

**7.3.1.3 Command code 08H for diagnosis**

Meaning of sub-function codes

| Sub-function Code | Description |
|---|---|
| 0000 | Return to inquire information data |

For example: The inquiry information string is same as the response information string when the loop detection to address 01H of driver is carried out.

The RTU request command is:

| | |
|---|---|
| START | T1-T2-T3-T4 |
| ADDR | 01H |
| CMD | 08H |
| High bit of sub-function code | 00H |
| Low bit of sub-function code | 00H |
| High bit of data content | 12H |
| Low bit of data content | ABH |
| CRC CHK low bit | ADH |
| CRC CHK high bit | 14H |
| END | T1-T2-T3-T4 |

The RTU response command is:

| | |
|---|---|
| START | T1-T2-T3-T4 |
| ADDR | 01H |
| CMD | 08H |
| High bit of sub-function code | 00H |
| Low bit of sub-function code | 00H |
| High bit of data content | 12H |
| Low bit of data content | ABH |
| CRC CHK low bit | ADH |
| CRC CHK high bit | 14H |
| END | T1-T2-T3-T4 |

**7.3.1.4 Command code: 10H, continuous writing**

Command code 10H means that if the master writes data to the inverter, the data number depends on the “data number” in the command code. The max continuous reading number is 16.

For example, write 5000 (1388H) to 0004H of the inverter whose slave address is 02H and 50 (0032H) to 0005H, the frame structure is as below:

The RTU request command is:

| START | T1-T2-T3-T4 (transmission time of 3.5 bytes) |
|---|---|
| ADDR | 02H |
| CMD | 10H |
| High bit of write data | 00H |
| Low bit of write data | 04H |
| High bit of data number | 00H |
| Low bit of data number | 02H |
| Byte number | 04H |
| High bit of data 0004H | 13H |
| Low bit of data 0004H | 88H |
| High bit of data 0005H | 00H |
| Low bit of data 0005H | 32H |
| Low bit of CRC | C5H |
| High bit of CRC | 6EH |
| END | T1-T2-T3-T4 (transmission time of 3.5 bytes) |

The RTU response command is:

| START | T1-T2-T3-T4 (transmission time of 3.5 bytes) |
|---|---|
| ADDR | 02H |
| CMD | 10H |
| High bit of write data | 00H |
| Low bit of write data | 04H |
| High bit of data number | 00H |
| Low bit of data number | 02H |
| Low bit of CRC | C5H |
| High bit of CRC | 6EH |
| END | T1-T2-T3-T4 (transmission time of 3.5 bytes) |

**7.3.2 ASCII mode**

**7.3.2.1 Command code: 03H (0000 0011), read N words (Word) (N ≤ 16)**

For instance: As for the inverter whose slave address is 01H, the starting address of internal storage is 0004, read two words continuously, the structure of this frame is listed as below:

| ASCII master command message (the command sent from the master to the inverter | | ASCII slave response message (the message sent from the inverter to the master) | |
|---|---|---|---|
| START | ':' | START | ':' |
| ADDR | '0' | ADDR | '0' |
| | '1' | | '1' |
| CMD | '0' | CMD | '0' |
| | '3' | | '3' |
| High bit of starting address | '0' | Byte number | '0' |
| | '0' | | '4' |
| Low bit of starting address | '0' | High bit of data address 0004H | '1' |
| | '4' | | '3' |
| High bit of data number | '0' | Low bit of data address 0004H | '8' |
| | '0' | | '8' |
| Low bit of data number | '0' | High bit of data address 0005H | '0' |
| | '2' | | '0' |
| LRC CHK Hi | 'F' | Low bit of data address 0005H | '0' |
| LRC CHK Lo | '6' | | '0' |
| END Hi | CR | LRC CHK Hi | '5' |
| END Lo | LF | LRC CHK Lo | 'D' |
| | | END Hi | CR |
| | | END Lo | LF |

**7.3.2.2 Command code: 06H (0000 0110), write one word (Word)**

For instance: Write 5000 (1388H) to the 0004H address of the inverter whose slave address is 02H, then the structure of this frame is listed as below:

| ASCII master command message (the command sent by the master to the inverter) | | ASCII slave response message (the message sent by the inverter to the master) | |
|---|---|---|---|
| START | ':' | START | ':' |
| ADDR | '0' | ADDR | '0' |
| | '2' | | '2' |
| CMD | '0' | CMD | '0' |
| | '6' | | '6' |
| High bit of write data | '0' | High bit of write data | '0' |
| | '0' | | '0' |
| Low bit of write data | '0' | Low bit of write data | '0' |
| | '4' | | '4' |
| High bit of data | '1' | High bit of data | '1' |

| ASCII master command message (the command sent by the master to the inverter) | | ASCII slave response message (the message sent by the inverter to the master) | |
|---|---|---|---|
| content | '3' | content | '3' |
| Low bit of data content | '8' | Low bit of data content | '8' |
| | '8' | | '8' |
| LRC CHK Hi | '5' | LRC CHK Hi | '5' |
| LRC CHK Lo | '9' | LRC CHK Lo | '9' |
| END Hi | CR | END Hi | CR |
| END Lo | LF | END Lo | LF |

**7.3.2.3 Command code: 08H (0000 1000), diagnose function**

Meaning of sub function code:

| Sub function code | Instruction |
|---|---|
| 0000 | Return inquiry message data |

For instance: carry out circuit detection on drive address 01H, the content of inquiry message word string is the same with response message word string, its format is listed as below:

| ASCII master command message (the command sent by the master to the inverter) | | ASCII slave response message (the message sent by the inverter to the master) | |
|---|---|---|---|
| START | ':' | START | ':' |
| ADDR | '0' | ADDR | '0' |
| | '1' | | '1' |
| CMD | '0' | CMD | '0' |
| | '8' | | '8' |
| High bit of write data address | '0' | High bit of write data address | '0' |
| | '0' | | '0' |
| Low bit of write data address | '0' | Low bit of write data address | '0' |
| | '0' | | '0' |
| High bit of data content | '1' | High bit of data content | '1' |
| | '2' | | '2' |
| Low bit of data content | 'A' | Low bit of data content | 'A' |
| | 'B' | | 'B' |
| LRC CHK Hi | '3' | LRC CHK Hi | '3' |
| LRC CHK Lo | 'A' | LRC CHK Lo | 'A' |
| END Hi | CR | END Hi | CR |
| END Lo | LF | END Lo | LF |

#### 7.3.2.4 Command code: 10H, continuous writing function

Command code 10H means the master write data to the inverter, the number of data being written is determined by the command “data number”, the max number of continuous writing is 16 words.

For instance: Write 5000 (1388H) to 0004H of the inverter whose slave address is 02H, write 50 (0032H) to 0005H of the inverter whose slave address is 02H, then the structure of this frame is listed as below:

| ASCII master command message (the command sent by the master to inverter) | | ASCII slave response message (the message sent by the inverter to master) | |
|---|---|---|---|
| START | ‘:’ | START | ‘:’ |
| ADDR | ‘0’ | ADDR | ‘0’ |
| | ‘2’ | | ‘2’ |
| CMD | ‘1’ | CMD | ‘1’ |
| | ‘0’ | | ‘0’ |
| High bit of starting address | ‘0’ | High bit of starting address | ‘0’ |
| | ‘0’ | | ‘0’ |
| Low bit of starting address | ‘0’ | Low bit of starting address | ‘0’ |
| | ‘4’ | | ‘4’ |
| High bit of data number | ‘0’ | High bit of data number | ‘0’ |
| | ‘0’ | | ‘0’ |
| Low bit of data number | ‘0’ | Low bit of data number | ‘0’ |
| | ‘2’ | | ‘2’ |
| Byte number | ‘0’ | LRC CHK Hi | ‘E’ |
| | ‘4’ | LRC CHK Lo | ‘8’ |
| High bit of data 0004H content | ‘1’ | END Hi | CR |
| | ‘3’ | END Lo | LF |
| Low bit of data 0004H content | ‘8’ | | |
| | ‘8’ | | |
| High bit of data 0005H content | ‘0’ | | |
| | ‘0’ | | |
| Low bit of data 0005H content | ‘3’ | | |
| | ‘2’ | | |
| LRC CHK Hi | ‘1’ | | |
| LRC CHK Lo | ‘7’ | | |
| END Hi | CR | | |
| END Lo | LF | | |

## 7.4 The definition of data address

The address definition of the communication data in this part is to control the running of the inverter and get the state information and relative function parameters of the inverter.

### 7.4.1 The rules of parameter address of the function codes

The parameter address occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind. The range of high and low byte are: high byte—00–ffH; low byte—00–ffH. The high byte is the group number before the radix point of the function code and the low byte is the number after the radix point. But both the high byte and the low byte should be changed into hex. For example P05.05, the group number before the radix point of the function code is 05, then the high bit of the parameter is 05, the number after the radix point 05, then the low bit of the parameter is 05, then the function code address is 0505H and the parameter address of P10.01 is 0A01H.

| | | | | |
|---|---|---|---|---|
| P10.00 | Simple PLC means | 0: Stop after running once.<br>1: Run at the final value after running once.<br>2. Cycle running. | 0 | ○ |
| P10.01 | Simple PLC memory selection | 0: Power loss without memory<br>1: Power loss: PLC record the running stage and frequency when power loss. | 0 | ○ |

**Note:** P29 group is the factory parameter which cannot be read or changed. 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 stocked frequently, which may shorten the usage time of EEPROM. For users, some functions are not necessary to be stocked on the communication mode. The needs can be met on by changing the value in RAM. Changing the high bit of the function code form 0 to 1 can also realize the function. For example, the function code P00.07 is not stocked into EEPROM. Only by changing the value in RAM can set the address to 8007H. This address can only be used in writing RAM other than reading. If it is used to read, it is an invalid address.

### 7.4.2 The address instruction of other function in Modbus

The master can operate on the parameters of the inverter as well as control the inverter, such as running or stopping and monitoring the working state of the inverter.

Below is the parameter list of other functions

| Function instruction | Address definition | Data meaning instruction | R/W attribute |
|---|---|---|---|
| Communication control command | 2000H | 0001H: forward running | W/R |
| | | 0002H: reverse running | |
| | | 0003H: forward jogging | |
| | | 0004H: reverse jogging | |
| | | 0005H: stop | |
| | | 0006H: coast to stop (emergency stop) | |
| | | 0007H: fault reset | |
| | | 0008H: jogging stop | |
| The address of the communication n setting value | 2001H | Communication setting frequency (0–Fmax(unit: 0.01Hz)) | W/R |
| | 2002H | PID reference, range (0–1000, 1000 corresponds to100.0% ) | |
| | 2003H | PID feedback, range (0–1000, 1000 corresponds to100.0% ) | W/R |
| | 2004H | Torque setting value (-3000–3000, 1000 corresponds to the 100.0% of the rated current of the motor) | W/R |
| | 2005H | The upper limit frequency setting during forward rotation (0–Fmax (unit: 0.01Hz)) | W/R |
| | 2006H | The upper limit frequency setting during reverse rotation (0–Fmax (unit: 0.01Hz)) | W/R |
| | 2007H | The upper limit torque of electromotion torque (0–3000, 1000 corresponds to the 100.0% of the rated current of the motor) | W/R |
| | 2008H | The upper limit torque of braking torque (0–3000, 1000 corresponds to the 100.0% of the rated current of the motor) | W/R |
| | 2009H | Special control command word<br>Bit0–1: =00: motor 1 =01: motor 2<br>=10: motor 3 =11: motor 4<br>Bit2: =1 torque control prohibit<br>=0: torque control prohibit invalid<br>Bit3: =1 power consumption clear<br>=0: no power consumption clear<br>Bit4: =1 pre-exciting =0: pre-exciting prohibition<br>Bit5: =1 DC braking =0: DC braking prohibition | W/R |

| Function instruction | Address definition | Data meaning instruction | R/W attribute |
|---|---|---|---|
| | 200AH | Virtual input terminal command , range: 0x000–0x1FF | W/R |
| | 200BH | Virtual input terminal command , range: 0x00–0x0F | W/R |
| | 200CH | Voltage setting value (special for V/F separation) (0–1000, 1000 corresponds to the 100.0% of the rated voltage of the motor) | W/R |
| | 200DH | AO output setting 1 (-1000–1000, 1000 corresponds to 100.0%) | W/R |
| | 200EH | AO output setting 2 (-1000–1000, 1000 corresponds to 100.0%) | W/R |
| SW 1 of the inverter | 2100H | 0001H: forward running | R |
| | | 0002H: reverse running | |
| | | 0003H: stop | |
| | | 0004H: fault | |
| | | 0005H: POFF state | |
| | | 0006H: pre-exciting state | |
| SW 1 of the inverter | 2101H | Bit0: =0: bus voltage is not established =1: bus voltage is established<br>Bi1–2: =00: motor 1 =01: motor 2 =10: motor 3 =11: motor 4<br>Bit3: =0: asynchronous motor =1: synchronous motor<br>Bit4: =0: pre-alarm without overload =1:overload pre-alarm<br>Bit5– Bit6 :=00: keypad control =01: terminal control =10: communication control | R |
| Inverter fault code | 2102H | See the fault type instruction | R |
| Identifying code of the inverter | 2103H | UMI-----0x0106 | R |
| Operation frequency | 3000H | Range: 0.00Hz–P00.03 | R |
| Setting frequency | 3001H | Range: 0.00Hz–P00.03 | R |
| Bus voltage | 3002H | Range: 0–2000V | R |
| Output voltage | 3003H | Range: 0–1200V | R |

| Function instruction | Address definition | Data meaning instruction | R/W attribute |
|---|---|---|---|
| Output current | 3004H | Range: 0.0–3000.0A | R |
| Operation speed | 3005H | Range: 0–65535RPM | R |
| Output power | 3006H | Range: -300.0–300.0% | R |
| Output torque | 3007H | Range: -250.0–250.0% | R |
| Close loop setting | 3008H | Range: -100.0%–100.0% | R |
| Close loop feedback | 3009H | Range: -100.0%–100.0% | R |
| PID setting | 3008H | -100.0–100.0% (unit: 0.1%) | R |
| PID feedback | 3009H | -100.0–100.0% (unit: 0.1%) | R |
| Input IO | 300AH | 000–1FF | |
| Input IO | 300BH | 000–1FF | |
| AI 1 | 300CH | Range: 0.00–10.00V | R |
| AI 2 | 300DH | Range: 0.00–10.00V | R |
| AI 3 | 300EH | Range: 0.00–10.00V | R |
| AI 4 | 300FH | Range: -10.00–10.00V | R |
| Read high speed pulse 1 input | 3010H | Range: 0.00–50.00kHz | R |
| Read high speed pulse 2 input | 3011H | Reserved | R |
| Read current step of the multi-step speed | 3012H | Range: 0–15 | R |
| External length | 3013H | Range: 0–65535 | R |
| External counting value | 3014H | Range: 0–65535 | R |
| Torque setting | 3015H | -300.0–300.0% (Unit: 0.1% ) | R |
| Inverter code | 3016H | | R |
| Fault code | 5000H | | R |

R/W characteristics means the function is with read and write characteristics. For example, “communication control command” is writing chrematistics and control the inverter with writing command (06H). R characteristic can only read other than write and W characteristic can only write other than read.

**Note:** when operating on the inverter with the table above, it is necessary to enable some parameters. For example, the operation of running and stopping, it is necessary to set P00.01 to communication running command channel and set P00.02 to MODBUS communication channel. And when operate on “PID given”, it is necessary to set P09.00 to “MODBUS communication setting”.

The encoding rules for device codes (corresponds to identifying code 2103H of the inverter)

| Code high 8bit | Meaning | Code low 8 position | Meaning |
|---|---|---|---|
| 01 | UMI | 06 | UMI-EU-B1 Vector Inverter |

**Note:** the code is consisted of 16 bit which is high 8 bits and low 8 bits. High 8 bits mean the motor type series and low 8 bits mean the derived motor types of the series. For example, 0110H means UMI-EU-B1 vector inverters.

### 7.4.3 Fieldbus ratio values

The communication data is expressed by hex in actual application and there is no radix point in hex. For example, 50.12Hz cannot be expressed by hex so 50.12 can be magnified by 100 times into 5012, so hex 1394H can be used to express 50.12.
A non-integer can be timed by a multiple to get an integer and the integer can be called fieldbus ratio values.

The fieldbus ratio values are referred to the radix point of the setting range or default value in the function parameter list. If there are figures behind the radix point (n=1), then the fieldbus ratio value m is $10^n$. Take the table as the example:

| Function code | Name | Details | Setting range | Default value | Modify |
|---|---|---|---|---|---|
| P01.20 | Wake-up from sleep delay time | 0.0 – 3600.0s (valid when P01.19=2) | 0.0 – 3600.0 | 0.0s | ○ |
| P01.21 | Restart after power off | 0: Disable 1: Enable | 0 – 1 | 0 | ○ |

If there is one figure behind the radix point in the setting range or the default value, then the fieldbus ratio value is 10. if the data received by the upper monitor is 50, then the "hibernation restore delay time" is 5.0 (5.0=50÷10).

If Modbus communication is used to control the hibernation restore delay time as 5.0s. Firstly, 5.0 can be magnified by 10 times to integer 50 (32H) and then this data can be sent.

| 01 | 06 | 01 14 | 00 32 | 49 E7 |
|---|---|---|---|---|
| Inverter address | Write command | Parameters address | Data number | CRC check |

After the inverter receives the command, it will change 50 into 5 according to the fieldbus ratio value and then set the hibernation restore delay time as 5s.

Another example, after the upper monitor sends the command of reading the parameter of hibernation restore delay time, if the response message of the inverter is as following:

| 01 | 03 | 02 | 00 32 | 39 91 |
|---|---|---|---|---|
| Inverter address | Read command | 2-byte data | Parameters data | CRC check |

Because the parameter data is 0032H (50) and 50 divided by 10 is 5, then the hibernation restore delay time is 5s.

### 7.4.4 Fault message response

There may be fault in the communication control. For example, some parameter can only be read. If a writing message is sent, the inverter will return a fault response message.

The fault message is from the inverter to the master, its code and meaning is as below:

| Code | Name | Meaning |
|---|---|---|
| 01H | Illegal command | The command from master cannot be executed. The reason maybe:<br>1. This command is only for new version and this version cannot realize.<br>2. 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.<br>**Note:** This error code does not indicate the data value to write exceed the range, but indicate the message frame is an illegal frame. |
| 04H | Operation failed | The parameter setting in parameter writing is invalid. For example, the function input terminal cannot be set repeatedly. |
| 05H | Password error | The password written to the password check address is not same as the password set by P7.00. |
| 06H | Data frame 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. |
| 07H | Written not allowed. | It only happen in write command, the reason maybe:<br>1. The written data exceeds the parameter range.<br>2. The parameter should not be modified now.<br>3. The terminal has already been used. |
| 08H | The parameter cannot be modified during running | The modified parameter in the writing of the upper monitor cannot be modified during running. |
| 09H | Password protection | When the upper monitor is writing or reading and the user password is set without password unlocking, it will report that the system is locked. |

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 (Hex 03H)

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

1 0 0 0 0 0 1 1 (Hex 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.

For example, set the "running command channel" of the inverter (P00.01, parameter address is 0001H) with the address of 01H to 03, the command is as following:

| 01 | 06 | 00 01 | 00 03 | 98 0B |
|---|---|---|---|---|
| Inverter address | Read command | Parameters address | Parameters data | CRC check |

But the setting range of "running command channel" is 0–2, if it is set to 3, because the number is beyond the range, the inverter will return fault response message as below:

| 01 | 86 | 04 | 43 A3 |
|---|---|---|---|
| Inverter address | Abnormal response code | Fault code | CRC check |

Abnormal response code 86H means the abnormal response to writing command 06H; the fault code is 04H. In the table above, its name is operation failed and its meaning is that the parameter setting in parameter writing is invalid. For example, the function input terminal cannot be set repeatedly.

## 7.5 Example of writing and reading

Refer to section 7.3 for the command format.

### 7.5.1 Example of reading command 03H

Example 1: read the state word 1 of the inverter with the address of 01H (refer to table 1). From the table 1, the parameter address of the state word 1 of the inverter is 2100H.

**RTU mode:**

The command sent to the inverter:

| 01 | 03 | 21 00 | 00 01 | 8E 36 |
|---|---|---|---|---|
| Inverter address | Read command | Parameters address | Data number | CRC check |

If the response message is as below:

| 01 | 03 | 02 | 00 03 | F8 45 |
|---|---|---|---|---|
| Inverter address | Read command | Data address | Data content | CRC check |

**ASCII mode:**

The command sent to the inverter:

| : | 01 | 03 | 21 00 | 00 01 | DA | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Read command | Parameters address | Data number | LRC check | END |

If the response message is as below:

| : | 01 | 03 | 02 | 00 03 | F7 | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Read command | Byte number | Data content | LRC check | END |

The data content is 0003H. From the table 1, the inverter stops.

**7.5.2 Example of writing command 06H**

Example 1: make the inverter with the address of 03H to run forward. See table 1, the address of "communication control command" is 2000H and forward running is 0001. See the table below.

| Function instruction | Address definition | Data meaning instruction | R/W characteristics |
|---|---|---|---|
| Communication control command | 2000H | 0001H: forward running | W/R |
| | | 0002H: reverse running | |
| | | 0003H: forward jogging | |
| | | 0004H: reverse jogging | |
| | | 0005H: stop | |
| | | 0006H: coast to stop (emergency stop) | |
| | | 0007H: fault reset | |
| | | 0008H: jogging stop | |

**RTU mode:**

The command sent by the master:

| 03 | 06 | 20 00 | 00 01 | 42 28 |
|---|---|---|---|---|
| Inverter address | Write command | Parameters address | Forward running | CRC check |

If the operation is successful, the response may be as below (the same with the command sent by the master):

| 03 | 06 | 20 00 | 00 01 | 42 28 |
|---|---|---|---|---|
| Inverter address | Write command | Parameters address | Forward running | CRC check |

**ASCII mode:**

The command sent to the inverter:

| : | 01 | 06 | 20 00 | 00 01 | D6 | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Write command | Parameters address | Data number | LRC check | END |

If the response message is as below:

| : | 01 | 06 | 20 00 | 00 01 | D6 | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Write command | Parameters address | Data number | LRC check | END |

Example 2: set the max output frequency of the inverter with the address of 03H as100Hz.

| Function code | Name | Details | Setting range | Default value | Modify |
|---|---|---|---|---|---|
| P00.03 | Max output frequency | P00.04 – 600.00Hz (400.00Hz) | 10.00 – 600.00 | 50.00Hz | ◎ |

See the figures behind the radix point, the fieldbus ratio value of the max. output frequency (P00.03) is 100. 100Hz timed by 100 is 10000 and the corresponding hex is 2710H.

**RTU mode:**

The command sent by the master:

| 03 | 06 | 00 03 | 27 10 | 62 14 |
|---|---|---|---|---|
| Inverter address | Write command | Parameters address | Forward running | CRC check |

If the operation is successful, the response may be as below (the same with the command sent by the master):

| 03 | 06 | 00 03 | 27 10 | 62 14 |
|---|---|---|---|---|
| Inverter address | Write command | Parameters address | Forward running | CRC check |

**ASCII mode:**

The command sent to the inverter:

| : | 03 | 06 | 00 03 | 27 10 | BD | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Write command | Parameters address | Data number | LRC check | END |

If the response message is as below:

| : | 03 | 06 | 00 03 | 27 10 | BD | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Write command | Parameters address | Data number | LRC check | END |

**7.5.3 Example of continuous writing command10H**

Example 1: make the inverter whose address is 01H run forward at 10Hz. Refer to the instruction of 2000H and 0001. Set the address of "communication setting frequency" is 2001H and 10Hz corresponds to 03E8H. See the table below.

| Function instruction | Address definition | Data meaning instruction | R/W attribute |
|---|---|---|---|
| Communication control command | 2000H | 0001H: forward running | W/R |
| | | 0002H: reverse running | |
| | | 0003H: forward jogging | |
| | | 0004H: reverse jogging | |
| | | 0005H: stop | |
| | | 0006H: coast to stop (emergency stop) | |
| | | 0007H: fault reset | |
| | | 0008H: jogging stop | |
| The address of communication setting | 2001H | Communication setting frequency (0–Fmax (unit: 0.01Hz)) | W/R |
| | 2002H | PID given, range (0–1000, 1000 corresponds to100.0% ) | |

**RTU mode:**

The command sent to the inverter:

| 01 | 10 | 20 00 | 00 02 | 04 | 00 01 | 03 E8 | 3B 10 |
|---|---|---|---|---|---|---|---|
| Inverter address | Continuous writing command | Parameters address | Data number | Byte number | Forward running | 10Hz | CRC check |

If the response message is as below:

| 01 | 10 | 20 00 | 00 02 | 4A 08 |
|---|---|---|---|---|
| Inverter address | Continuous writing command | Parameters address | Data number | CRC check |

**ASCII mode:**

The command sent to the inverter:

| : | 01 | 10 | 20 00 | 00 02 | 04 | 00 01 | 03 E8 | BD | CR LF |
|---|---|---|---|---|---|---|---|---|---|
| START | Inverter address | Continuous writing command | Parameters address | Data number | Byte number | Forward running | 10Hz | LRC check | END |

If the response message is as below:

| : | 01 | 10 | 20 00 | 00 02 | CD | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Continuous writing command | Parameters address | Data number | LRC check | END |

Example 2: set the ACC time of 01H inverter as 10s and the DEC time as 20s

| | | | | |
|---|---|---|---|---|
| P00.11 | ACC time 1 | Setting range of P00.11 and P00.12: | Depend on model | ○ |
| P00.12 | DEC time 1 | 0.0–3600.0s | Depend on model | ○ |

The corresponding address of P00.11 is 000B, the ACC time of 10s corresponds to 0064H, and the DEC time of 20s corresponds to 00C8H.

**RTU mode:**

The command sent to the inverter:

| 01 | 10 | 00 0B | 00 02 | 04 | 00 64 | 00 C8 | F2 55 |
|---|---|---|---|---|---|---|---|
| Inverter address | Continuous writing command | Parameters address | Data number | Byte number | 10s | 20s | CRC check |

If the response message is as below:

| 01 | 10 | 00 0B | 00 02 | 30 0A |
|---|---|---|---|---|
| Inverter address | Continuous writing command | Parameters address | Data number | CRC check |

**ASCII mode:**

The command sent to the inverter:

| : | 01 | 10 | 00 0B | 00 02 | 04 | 00 64 | 00 C8 | B2 | CR LF |
|---|---|---|---|---|---|---|---|---|---|
| START | Inverter address | Continuous writing command | Parameters address | Data number | 10s | 20s | | LRC check | END |

If the response message is as below:

| : | 01 | 10 | 00 0B | 00 02 | E2 | CR LF |
|---|---|---|---|---|---|---|
| START | Inverter address | Continuous writing command | Parameters address | Data number | LRC check | END |

**Note:** the blank in the above command is for illustration. The blank cannot be added in the actual application unless the upper monitor can remove the blank by themselves.

## 7.6 Common communication fault

Common communication faults: no response to the communication or the inverter returns abnormal fault.

The possible reason for no response to the communication:

Selecting wrong serial interface, for example, if the converter is COM1, selecting COM2 during the communication

The baud rate, digital bit, end bit and check bit are not the same with the inverter + and - of RS485 are connected in reverse.

The 485 wire cap on the terminal board of the inverter is not plug in. the wire cap in behind the terminal arrangement.

# Appendix A Technical data

## A.1 Ratings

### A.1.1 Capacity

Inverter sizing is based on the rated motor current and power. To achieve the rated motor power given in the table, the rated current of the inverter must be higher than or equal to the rated motor current. Also the rated power of the inverter must be higher than or equal to the rated motor power. The power ratings are the same regardless of the supply voltage within one voltage range.

**Note:**

1. The maximum allowed motor shaft power is limited to 1.5*PN. If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload.

2. The ratings apply at ambient temperature of 40°C.

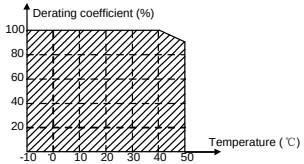
3. It is important to check that in common DC systems the power flowing through the common DC connection does not exceed PN.

### A.1.2 Derating

The load capacity decreases if the installation site ambient temperature exceeds 40°C, the altitude exceeds 1000 meters or the switching frequency is changed from 4 kHz to 8, 12 or 15 kHz.

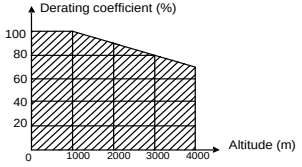
#### A.1.2.1 Temperature derating

In the temperature range of +40°C to +50°C, the rated output current is decreased by 1% for every additional 1°C. Refer to the below list for the actual derating.




#### A.1.2.2 Altitude derating

The device can output rated power if the installation site below 1000m. The output power decreases if the altitude exceeds 1000 meters. Below is the detailed decreasing range of the derating:




## A.2 CE

### A.2.1 CE marking

The CE mark is attached to the drive to verify that the drive follows the provisions of the European Low Voltage (2006/95/EC) and EMC Directives (2004/108/EC).

### A.2.2 Compliance with the European EMC Directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3:2004) covers requirements stated for drives. See section *EMC regulations*.

## A.3 EMC regulations

EMC product standard (EN 61800-3:2004) contains the EMC requirements to the inverter.

First environment: domestic environment (includes establishments connected to a low-voltage network which supplies buildings used for domestic purposes).

Second environment includes establishments connected to a network not directly supplying domestic premises.

Four categories of the inverter:

Inverter of category C1: inverter of rated voltage less than 1000 V and used in the first environment.

Inverter of category C2: inverter of rated voltage less than 1000 V other than pins, sockets and motion devices and intended to be installed and commissioned only by a professional electrician when used in the first environment.

**Note:** IEC/EN 61800-3 in EMC standard doesn't limit the power distribution of the inverter, but it defines the upstage, installation and commission. The professional electrician has necessary skills in installing and/or commissioning power drive systems, including their EMC aspects.

Inverter of category C3: inverter of rated voltage less than 1000 V and used in the second environment other than the first one

Inverter of category C4: inverter of rated voltage more than 1000 V or the nominal

current is above or equal to 400A and used in the complicated system in second environment.

### A.3.1 Category C2

The emission limits are complied with the following provisions:

1. The optional EMC filter is selected according to the options and installed as specified in the EMC filter manual.
2. The motor and control cables are selected as specified in this manual.
3. The drive is installed according to the instructions given in this manual.

✧ In a domestic environment, this product may cause radio inference, in which case supplementary mitigation measures may be required.

### A.3.2 Category C3

The immunity performance of the drive complies with the demands of IEC/EN 61800-3, second environment.

The emission limits are complied with the following provisions:

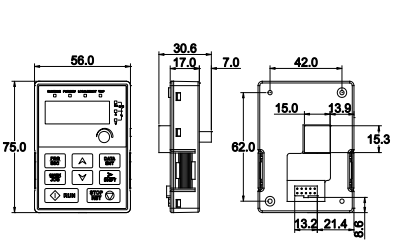
1. The optional EMC filter is selected according to the options and installed as specified in the EMC filter manual.
2. The motor and control cables are selected as specified in this manual.
3. The drive is installed according to the instructions given in this manual.

✧ A drive of category C3 is not intended to be used on a low-voltage public network which supplies domestic premises. Radio frequency interference is expected if the drive is used on such a network.

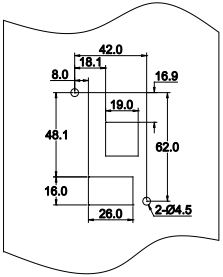
# Appendix B Dimension drawings

Dimension drawings of the UMI-EU-B1 are shown below. The dimensions are given in millimeters and inches.

## B.1 External keypad structure



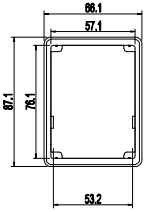

Overall drawing



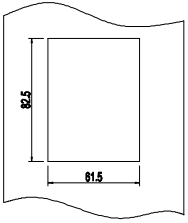

Hole drawing

Note: The external keypad is optional for the inverters (1PH 230V/3PH 400V ≤2.2kW and 3PH 230V ≤0.75kW); the standard keypad of inverters (3PH 400V ≥4kW and 3PH 230V ≥1.5kW) can be used as the external keypad.

The keypad can be installed on the bracket if it is external.

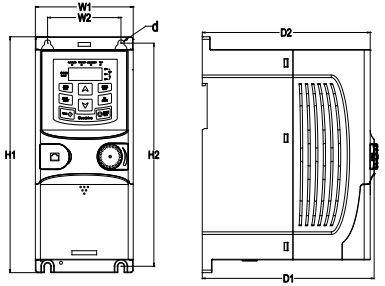



Installation bracket



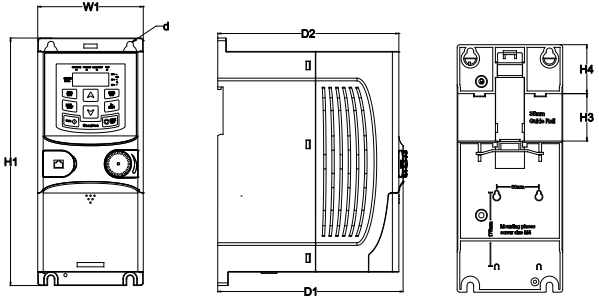

Installation dimension

## B.2 Inverter chart



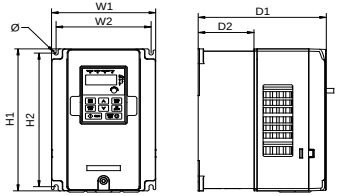

Wall mounting of 0.75–2.2kW inverters (dimension unit: mm)

| Model | W1 | W2 | H1 | H2 | D1 | D2 | Installation hole (d) |
|---|---|---|---|---|---|---|---|
| UMI-0004BE-B1 | 80.0 | 60.0 | 160.0 | 150.0 | 123.5 | 120.3 | 5 |
| UMI-0007BE-B1 | 80.0 | 60.0 | 160.0 | 150.0 | 123.5 | 120.3 | 5 |
| UMI-0015BE-B1 | 80.0 | 60.0 | 185.0 | 175.0 | 140.5 | 137.3 | 5 |
| UMI-0022BE-B1 | 80.0 | 60.0 | 185.0 | 175.0 | 140.5 | 137.3 | 5 |
| UMI-0007EE-B1 | 80.0 | 60.0 | 185.0 | 175.0 | 140.5 | 137.3 | 5 |
| UMI-0015EE-B1 | 80.0 | 60.0 | 185.0 | 175.0 | 140.5 | 137.3 | 5 |
| UMI-0022EE-B1 | 80.0 | 60.0 | 185.0 | 175.0 | 140.5 | 137.3 | 5 |

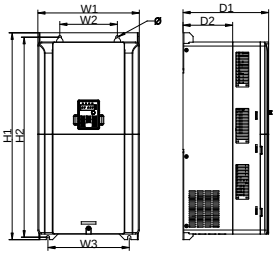



Rail mounting of inverters of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW) (dimension unit: mm)

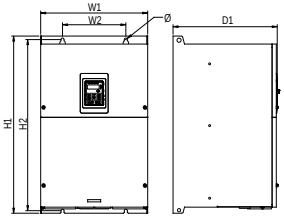
| Model | W1 | H1 | H3 | H4 | D1 | D2 | Installation hole (d) |
|---|---|---|---|---|---|---|---|
| UMI-0004BE-B1 | 80.0 | 160.0 | 35.4 | 36.6 | 123.5 | 120.3 | 5 |
| UMI-0007BE-B1 | 80.0 | 160.0 | 35.4 | 36.6 | 123.5 | 120.3 | 5 |
| UMI-0015BE-B1 | 80.0 | 185.0 | 35.4 | 36.6 | 140.5 | 137.3 | 5 |
| UMI-0022BE-B1 | 80.0 | 185.0 | 35.4 | 36.6 | 140.5 | 137.3 | 5 |
| UMI-0007EE-B1 | 80.0 | 185.0 | 35.4 | 36.6 | 140.5 | 137.3 | 5 |
| UMI-0015EE-B1 | 80.0 | 185.0 | 35.4 | 36.6 | 140.5 | 137.3 | 5 |
| UMI-0022EE-B1 | 80.0 | 185.0 | 35.4 | 36.6 | 140.5 | 137.3 | 5 |




Wall mounting of 3PH 400V 4–37kW and 3PH 230V 1.5–7.5 kW inverters

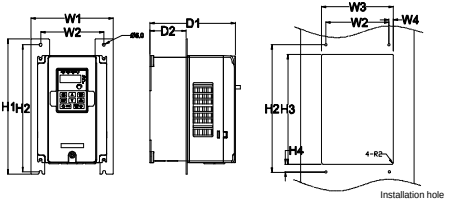



Wall mounting of 3PH 400V 45–75kW inverters

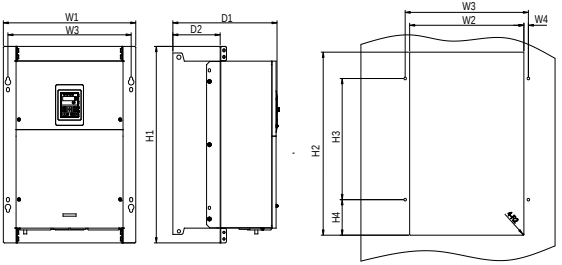



Wall mounting of 3PH 400V 90–110kW inverters (dimension unit: mm)

| Model | W1 | W2 | W3 | H1 | H2 | D1 | D2 | Installation hole |
|---|---|---|---|---|---|---|---|---|
| UMI-0040EE-B1 | 146.0 | 131.0 | — | 256.0 | 243.5 | 167.0 | 84.5 | 6 |
| UMI-0055EE-B1 | 146.0 | 131.0 | — | 256.0 | 243.5 | 167.0 | 84.5 | 6 |
| UMI-0075EE-B1 | 170.0 | 151.0 | — | 320.0 | 303.5 | 196.3 | 113.0 | 6 |
| UMI-0110EE-B1 | 170.0 | 151.0 | — | 320.0 | 303.5 | 196.3 | 113.0 | 6 |
| UMI-0150EE-B1 | 170.0 | 151.0 | — | 320.0 | 303.5 | 196.3 | 113.0 | 6 |
| UMI-0185EE-B1 | 200.0 | 185.0 | — | 340.6 | 328.6 | 184.3 | 104.5 | 6 |
| UMI-0220EE-B1 | 200.0 | 185.0 | — | 340.6 | 328.6 | 184.3 | 104.5 | 6 |
| UMI-0300EE-B1 | 250.0 | 230.0 | — | 400.0 | 380.0 | 202.0 | 123.5 | 6 |
| UMI-0370EE-B1 | 250.0 | 230.0 | — | 400.0 | 380.0 | 202.0 | 123.5 | 6 |
| UMI-0450EE-B1 | 282.0 | 160.0 | 226.0 | 560.0 | 542.0 | 238.0 | 138.0 | 9 |
| UMI-0550EE-B1 | 282.0 | 160.0 | 226.0 | 560.0 | 542.0 | 238.0 | 138.0 | 9 |
| UMI-0750EE-B1 | 282.0 | 160.0 | 226.0 | 560.0 | 542.0 | 238.0 | 138.0 | 9 |
| UMI-0900EE-B1 | 338.0 | 200.0 | — | 554.0 | 535.0 | 329.2 | — | 9.5 |
| UMI-1100EE-B1 | 338.0 | 200.0 | — | 554.0 | 535.0 | 329.2 | — | 9.5 |




Flange mounting of 3PH 400V 4–75kW and 3PH 230V 1.5–7.5kW inverters




Flange mounting of 3PH 400V 90–110kW inverters (dimension unit: mm)

| Model | W1 | W2 | W3 | W4 | H1 | H2 | H3 | H4 | D1 | D2 | Installation hole | Screw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UMI-0040EE-B1 | 170.2 | 131 | 150 | 9.5 | 292 | 276 | 260 | 6 | 167 | 84.5 | 6 | M5 |
| UMI-0055EE-B1 | 170.2 | 131 | 150 | 9.5 | 292 | 276 | 260 | 6 | 167 | 84.5 | 6 | M5 |
| UMI-0075EE-B1 | 191.2 | 151 | 174 | 11.5 | 370 | 351 | 324 | 12 | 196.3 | 113 | 6 | M5 |
| UMI-0110EE-B1 | 191.2 | 151 | 174 | 11.5 | 370 | 351 | 324 | 12 | 196.3 | 113 | 6 | M5 |
| UMI-0150EE-B1 | 191.2 | 151 | 174 | 11.5 | 370 | 351 | 324 | 12 | 196.3 | 113 | 6 | M5 |
| UMI-0185EE-B1 | 266 | 250 | 224 | 13 | 371 | 250 | 350.6 | 20.3 | 184.6 | 104 | 6 | M5 |
| UMI-0220EE-B1 | 266 | 250 | 224 | 13 | 371 | 250 | 350.6 | 20.3 | 184.6 | 104 | 6 | M5 |
| UMI-0300EE-B1 | 316 | 300 | 274 | 13 | 430 | 300 | 410 | 55 | 202 | 118.3 | 6 | M5 |
| UMI-0370EE-B1 | 316 | 300 | 274 | 13 | 430 | 300 | 410 | 55 | 202 | 118.3 | 6 | M5 |
| UMI-0450EE-B1 | 352 | 332 | 306 | 13 | 580 | 400 | 570 | 80 | 238 | 133.8 | 9 | M8 |
| UMI-0550EE-B1 | 352 | 332 | 306 | 13 | 580 | 400 | 570 | 80 | 238 | 133.8 | 9 | M8 |
| UMI-0750EE-B1 | 352 | 332 | 306 | 13 | 580 | 400 | 570 | 80 | 238 | 133.8 | 9 | M8 |
| UMI-0900EE-B1 | 418.5 | 361 | 389.5 | 14.2 | 600 | 559 | 370 | 108.5 | 329.5 | 149.5 | 9.5 | M8 |
| UMI-1100EE-B1 | 418.5 | 361 | 389.5 | 14.2 | 600 | 559 | 370 | 108.5 | 329.5 | 149.5 | 9.5 | M8 |

**Note:** The installation bracket is optional.

# Appendix C Further information

## C.1 Product and service inquiries

Address any inquiries about the product to your local UNITRONICS offices, quoting the type designation and serial number of the unit in question.

## C.2 Unitronics Contact Information

Unitronics Headquarter

3 Arava St. Airport City, P.O.B. 300

7019900, Israel

Phone: +972 3 977 88 88

Fax: +972 3 977 88 77

Info@unitronics.com

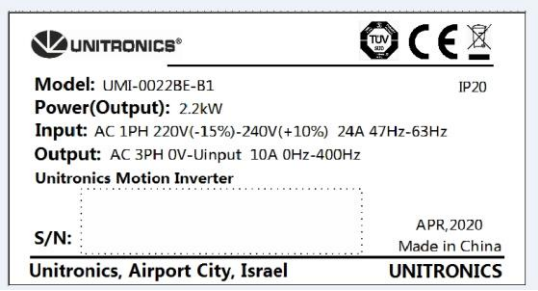
# Appendix D Safety Related Information

## D.1 Functional safety

| IEC/EN 61058 (type A system) | | | | | | | ISO 13849 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **SIL** | **PFH** | **HFT** | **SFF** | **λdu** | **λdd** | **PTI** | **PL** | **CCF** | **MTTFd** | **DC** | **Category** |
| 2 | $8.73*10^{-10}$ | 1 | 71.23% | $1.79*10^{-9}$ | 0 | 1 year | d | 57 | 343.76year | 60% | 3 |
| 3 | $8.53*10^{-10}$ | 1 | 99.38% | $0.64*10^{-10}$ | $3.3*10^{-9}$ | 3 months | e | 57 | 207.04year | 98.09% | 3 |

# Appendix E General Information

## E.1 Manufacturing date, struture description:




MMM, Month designate: Jan, Feb, Mar, Arp, May, Jun, Jul, Aug, Sep, Oct, Nov and Dec.
YYYY, Year designate: 4 digits

Example of manufacturing date:
APR, 2020 i.e. April 2020

Example of real photograph of the final name plate which will be affixed to the product: