# Preface

Thank you for buying AS600M series driver made by ShenZhen ALPHA Inverter Co.,Ltd.

This series of drivers adopt the closed-loop vector control technology that features precision speed control, high torque at low frequency and load capacity strongly. The revised weak magnetic algorithm makes the divers have qucik reponse on high speed area with the great load inertia, which can provide high-performance speed and position servo function for your equipments.Its powerful function and simple operation are easy to achieve the high precision turning,milling,spindle position control, rigidity tapping, thread cutting and so on.

This series of drivers have wide speed range, quick response，high torque at low frequency and position tracking. They apply to most motor drive applications, including the numerical control lathe, processing center, CNC milling machine, CNC boring machine, and other fields such as textile industry, plastic industry, carton packaging industry, woodworking machinery and so on.

If you have any problem that can’t be solved in operation, please contact the nearest local agents, or contact our company directly.

The instruction manual must be made avaible to the user. Prior to performing any work on the unit the user must familiarize himself with the unit. This especially applies to the knowledge and observance of the following safety and warning indications. The used pictograms have following significance.

| | |
|---|---|
|  | **Danger!** |
| | ◆ This equipment contains dangerous voltage. Operations not accordant with this manual might cause life risk and human injury. Only qualified personnel shall wire the drive. |
| | ◆ Please cut off the power before wiring and inspecting. It is not permissible to touch PCB or interior components before battery control lamp goes off or until 5 minutes after the power has been removed. It is necessary to use meters to confirm the charging capacitor has discharged off. Otherwise, a risk of electric shock may happen. |
| | ◆ Don't connect AC power source to the output terminals U, V, W of the driver. When using the driver, the earthing terminal of the driver must be grounded correctly and reliably according to IEC electrical safety regulation. |
|  | **Warning!** |
| | ◆ Unauthorized change of inner wiring and using accessories sold or recommended by unqualified manufacturer may cause fire, electric shock and injury. |
| | ◆ Since body static electricity may cause serious damage to MOS field-effect transistor and other sensitive elements. Please don't touch the interior devices, such as PCB, IGBT module etc. before any measure is taken to prevent static electricity. |
|  | **Caution!** |
| | ◆ Keep all marks and labels are clear to read. Replace the lost or worn mark at any moment. |
| | ◆ Please keep the user manual near the driver that can be reached easily and give this manual to the users who use the product. |

# Contents

# Chapter 1 Purchase Inspection

## 1.1 Unpacking Inspection

All drivers have passed the strict tests before delivery. After unpacking, please check if the product is damaged by careless transport, whether the product specification and model are complied with the order, and if it has a quality check passed mark. If there is any problem, please contact the supplier.

## 1.2 Naming Rule

The naming rule of the product is as following

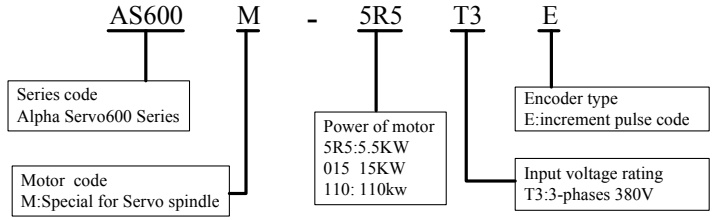



Figure 1-1 Model code

## 1.3 Nameplate of Driver

On the lower right side of driver, there is a nameplate, which marks the model and rated value of driver, as follows:

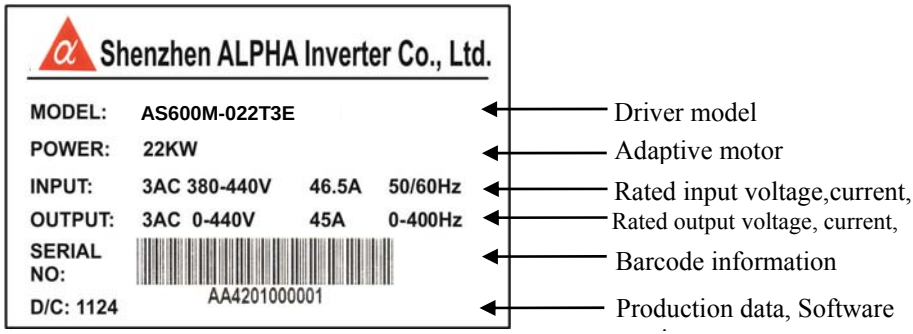



Figure 1-2 Nameplate of driver

## 1.4 Technical Specification

### 1.4.1 Input/Output Standard

| Model | Input Power | Power Capacity（kVA） | Input Current（A） | Output Current（A） | Motor Power（kW） |
|---|---|---|---|---|---|
| AS600M-004T3E | 3PH 380V 50/60Hz<br>Voltage Range：304～456V<br>Voltage unbalance rate：<3%<br>Frequency unbalance rate：<±5% | 6.0 | 10.7 | 9.0 | 4 |
| AS600M-5R5T3E | | 8.6 | 15.5 | 13.0 | 5.5 |
| AS600M-7R5T3E | | 11.2 | 20.5 | 17.0 | 7.5 |
| AS600M-011T3E | | 17.0 | 26.0 | 25.0 | 11 |
| AS600M-015T3E | | 21.0 | 35.0 | 32.0 | 15 |
| AS600M-018T3E | | 24.0 | 38.5 | 37.0 | 18.5 |
| AS600M-022T3E | | 30.0 | 46.5 | 45.0 | 22 |
| AS600M-030T3E | | 40.0 | 62.0 | 60.0 | 30 |

### 1.4.2 Technical Standard：

| Item | | Description |
|---|---|---|
| Output | maximum output voltage | three-phase voltage 380V～440V |
| | maximum output speed | 8000RPM |
| Input | Rated Voltage/frequency | three-phase voltage:380～440V 50/60Hz |
| | Admissible voltage fluctuation | +10%，-15% |
| | Admissible frequency fluctuation | ±5% |
| control characteristic | Control method | Sine wave PWM modulation, full closed-loop vector control |
| | speed regulation range | 1：5000 |
| | precision speed control | ±1% |
| | precision position control | ±1Pulse |
| | Set frequency resolution | Digital value:0.01HZ;Analog Value：unipolarity，maximum output frequency/4096; bipolarity，maximum output frequency /2048 |
| | ACC time /DEC time | 0～3600S to the maximum output frequency |
| | braking method | dynamic braking，Built-in Dynamic Braking Unit when the power of product is not more than 15KW. |
| Input/Output interface | Digital Input | 7 roads input optical coupling isolation；NPN and Optional Effective level |
| | Digital Output | 3 roads output optical coupling isolation，24V，50mA |
| | Analog Input | 2 roads：0~10V，0~20MA，-10V~+10V |
| | Analog Output | 1 road:0/2～10V 0/4～20MA Optional |
| | Relay Output | 1road a set of normally open and closed contacts；250VAC/30VDC 1A |

| Item | | Description |
|---|---|---|
| put/Output interface | Encoder Input Interface | 1 ： maximum received pulse 300KHZ；cables-driven manners；Standard RS422 communication interface； |
| | Pulse Input Inerface | 1 road：orientation +pulse/ orthogonal pulse /CW+CCW |
| | Encoder Output Interface | 1 road：frequency dividing output 1：1，cables-driven manners；Standard RS422 communication interface |
| | All line interface | 1 road：485 all line |
| Spindle funtion | Speed control | Range：0～8000RPM;Rotation Direction：positative and negative；Speed command code：unipolarity and bipolarity analog value、pulse frequency，all line |
| | Precision stop control | Precision:±1Pulse；8 position is available via terminals. |
| | rigidity tapping | Work with a variety of domestic and imported system，Tapping error rate 2% |
| | other | C axis control, thread cutting, electronic gear, reaming, zero speed lock |
| Protective funtion | overload protection | Drive and motor overload protection |
| | Overcurrent protection | Overcurrent protection is implemented by hardware |
| | Under-voltage/over-voltage protection | Start the protetive function when the voltage is over than 800V or less than 350V |
| | Output of short circuit protection | Output a alarm signal when the output to groud is a short circuit. |

# Chapter 2 Installation and Wiring

## 2.1 External Dimension and Installation Dimension (see Appendix 1)

## 2.2 Mounting Place Requirements and Management

**Attention**

**·Don't carry the driver by its cover. The cover cannot support the weight of the driver and the driver may drop.**

**·Please install the driver on a strong support, failing which the driver may fall off.**

**·Don't install the driver in places where water pipes may leak onto it.**

**·Don't allow screws, washers and other metal foreign matters to fall inside the driver, otherwise there is a danger of fire or damage.**

**·Don't operate the driver if parts are not complete, otherwise there is a danger of fire or human injury.**

**·Don't install the driver under direct sunshine; otherwise, it may be damaged.**

**·Don't short circuit PB, + and -, otherwise there is a danger of fire or the driver may be damaged.**

**·Cable lugs must be connected to main terminals firmly.**

**·Don't apply supply voltage (AC 220V) to control terminals except terminals TA, TB, TC.**

Please mount the driver as following instructions and maintain appropriate conditions

### 2.2.1 Installation Location

The installation location should meet the following conditions:

- Good indoor ventilation
- Ambient temperature: -10 °C ~ 40 °C. If the temperature is higher than 40 °C, forced ventilation or derating use is required.

- Humidity should be lower than 95%, no condensing and rain water drops.
- Do not mount the driver on the timber or other combustible matters.
- Avoid direct sunlight.
- It is strictly prohibited to install the drivers in places where have flammable, explosive, corrosive gases or liquids;
- Mount in the location free of dust, metal powder, corrosive gas or combustible gas.
- The installation foundation should be solid and free of vibration.
- No electromagnetic interference, away from source of interference.
- Derating use must be considered when the driver is installed at high altitude greater than 1000 m. This is because the cooling effect of driver is deteriorated because of the thin air. Derating 6% per 1000 m above 1000m altitude.

### 2.2.2 Ambient Temperature

In order to enhance operating reliability of the driver, be sure where the driver mounted has a good ventilation; when the driver is used in a closed case, cooling fans or an air-conditioning must be installed to keep the ambient temperature below 40℃

### 2.2.3 Preventive Measures

During installing, please set a shield to prevent metal debris falling into it, and remove the shield after installing.

Please remove the protection cover board when the ambient temperature is over 40° C or the internal temperature is too high due to other reasons. Otherwise the driver should be derated. After removing the protection cover, pay attention to avoid small parts falling into the driver.

## 2.3 Installation Direction and Space

Drivers of this series are all equipped fans for forced cooling. In order to be an effective cooling cycle, the driver must be mounted in the vertical direction, up, down, left and right away from adjacent articles or baffle (wall) maintain adequate space, as Figure 2-1

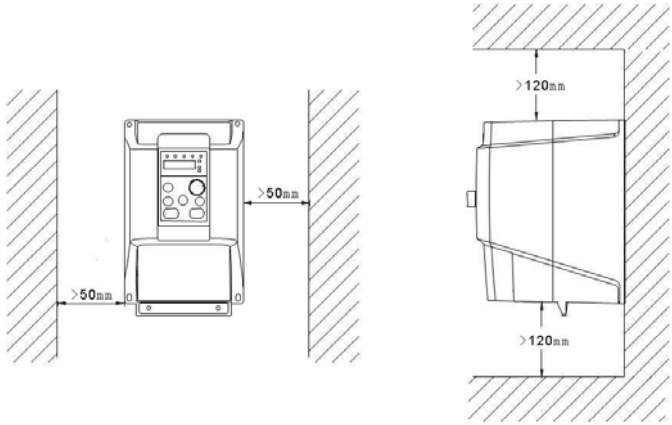



Figure 2-1 Installation Direction and Space

## 2.4 Main Circuit Wiring

### 2.4.1 The Main Circuit Terminals Arrangement and Wiring

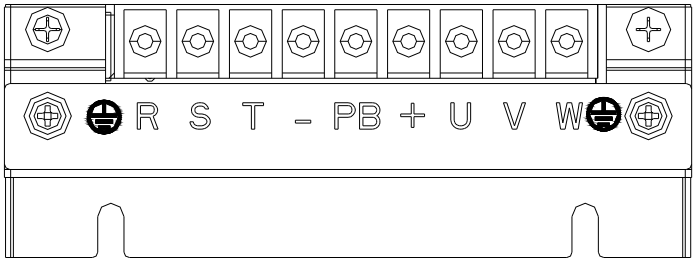



Figure 2-2 Wiring of terminals of main circuit of 3PH 380V 4kW

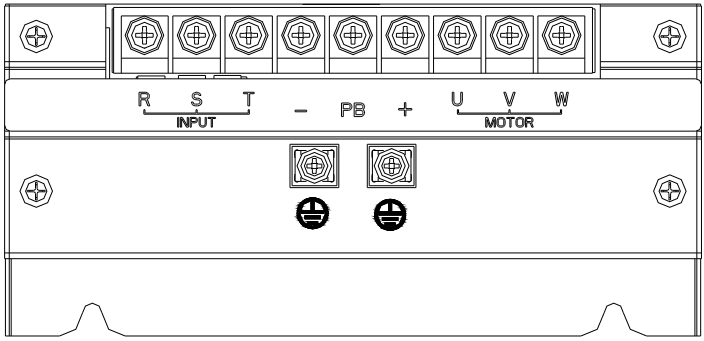



Figure 2-3 Wiring of terminals of main circuit of 380V 5.5~7.5kW

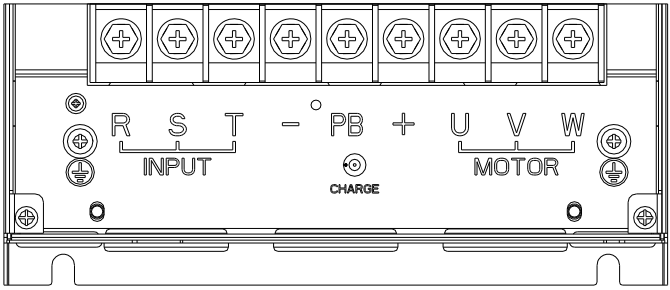



Figure 2-4 Wiring of terminals of main circuit of 380V 11~15kW

Table 2-1 Description of terminals of main circuit of 4~15KW

| Terminal symbol | Terminal name and function |
|---|---|
| R、S、T | Single-phase AC 220V input terminals or Three-phase AC 380V input terminals |
| +、PB | Terminals for an external braking resistor |
| - | DC negative bus output terminal |
| U、V、W | Three-phase AC output terminals |
| PE | Protective earth terminals for input power or earthing terminals for motor cable shield and braking resistor cable shield. |

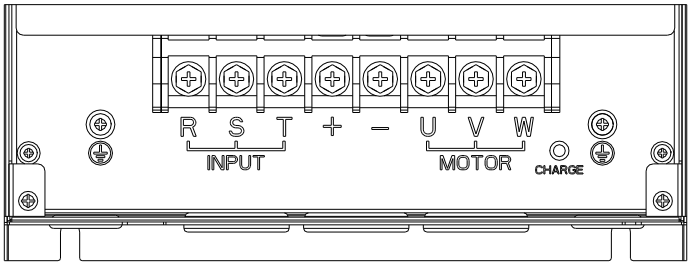



Figure 2-5 Wiring of terminals of main circuit of 380V 18.5~30kW

Table 2-2 Description of terminals of main circuit of 18.5~30KW

| Terminal symbol | Terminal name and function |
|---|---|
| R、S、T | Three-phase AC 380V input terminals |
| + | Terminals for an external braking resistor |
| - | DC negative bus output terminal |
| U、V、W | Three-phase AC output terminals |
| PE | Protective earth terminals for input power or earthing terminals for motor cable shield and braking resistor cable shield. |

### 2.4.2 Main Circuit Wiring Operation

Do not mistakenly connect the input power cable to the output terminal; otherwise the components in the driver will be damaged. Output terminals are prohibited to be grounded. The lines should not be collided with the enclosure, or short connected; otherwise the driver will be damaged.
Earth terminal PE must be grounded. 380V class grounding resistance should be 10Ω or less. The earth wire should never share with electric welder or power equipment. The earth wire should be of conductor diameter specified in the technical standard for electrical equipment, and should be as close to the ground point as possible. On occasions using more than two drivers at the same time, please do not form the earth wire into ring circuit. Proper grounding method and incorrect grounding method are shown in Fig. 2-6

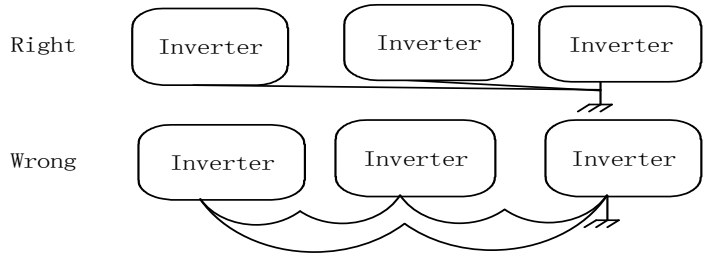


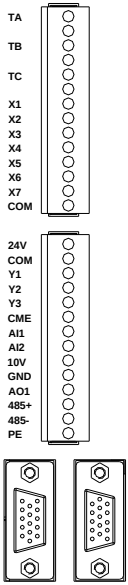

Figure 2-6 Earthing Connection Method

Notes: The neutral point of motor using Y connection can't be connected to earth.
Since the driver output PWM wave, if a capacitor for improving power factor or a lightning varistor is installed on the output side, which would cause tripping or damage to parts, be sure to remove it.
If a contactor or other on-off part is installed between the output and the motor, be sure the on-off operation is done when the driver has no output, otherwise the driver would be damaged.

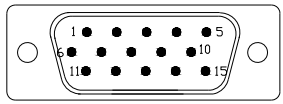
## 2.5 Control Circuit Connection

### 2.5.1 Function of Control Circuit Terminals

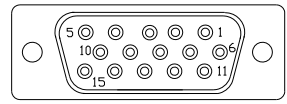
In order to reduce interference and attenuation of control signal, the length of control cables should be limited in 50m and away from power cables for more than 30cm. Avoid control wire and power wire being parallel. Try to use STP (Shielded Twisted Pair) to connect analog input and output signal.




Encoder Socket：




Pin Socket




Pass Socket

| | | | |
|---|---|---|---|
| 1 | P- | 9 | OZ+ |
| 2 | P+ | 10 | OB+ |
| 3 | 5V | 11 | |
| 4 | COM | 12 | |
| 5 | OA+ | 13 | OZ- |
| 6 | D- | 14 | OB- |
| 7 | D+ | 15 | OA- |
| 8 | | | |

| | | | |
|---|---|---|---|
| 1 | | 9 | B+ |
| 2 | | 10 | |
| 3 | A- | 11 | |
| 4 | B- | 12 | 5V |
| 5 | | 13 | COM |
| 6 | | 14 | Z- |
| 7 | | 15 | Z+ |
| 8 | A+ | | |

Plug the system encoder in the Pass Socket to connet the AS600M with the upper machine (CNC),and plug the motor encoder in the pin socket to connect the AS600M with the motor.

Figure 2-7 Terminal schematic

Table 2-3 Function of control circuit terminals

| Category | Terminal label | Name | Description of terminal function | Specification |
|---|---|---|---|---|
| Analog input/output | AI1 | Analog input 1 | Analog input | AI1：0~10V，0~20MA |
| | AI2 | Analog input 2 | | AI2：-10V~+10V |
| | 10V | +10V power | Analog input with the power | Maximum output current 30 mA |
| | GND | Common GND | Reference GND for AI1,AI2,10V,AO1 | Inner Isolated from COM |
| | AO1 | Analog output 1 | Provide analog voltage output | Output voltage range：0/2～10V 0/4～20MA |
| Communication | 485+ | RS485 communication interface | 485 differential signal positive terminal | Standard RS-485 communication interface, Please use twisted pair or shielded cable |
| | 485- | | 485 differential signal negative terminal | |

| Category | Terminal label | Name | Description of terminal function | Specification |
|---|---|---|---|---|
| Multi-function input terminal | X1 | Multi-function input terminal 1 | Enabled running/turning | NPN input，Setup the parameter to select the effiective leve .<br>COM is common GND. |
| | X2 | Multi-function input terminal 2 | reverse | |
| | X3 | Multi-function input terminal 3 | Enabled control | |
| | X4 | Multi-function input terminal 4 | Spindle orientation | |
| | X5 | Multi-function input terminal 5 | Rigid tapping/pulse position | |
| | X6 | Multi-function input terminal 6 | Programmed input | |
| | X7 | Multi-function input terminal 7 | Programmed input | High speed output 100K can be connected with Zero switch |
| Multi-function output terminal | Y1 | Open collector outputY1 | Speed reached | Optical coupling isolation open collector output operating voltage range：0V～26V<br>Maximum output current：50Ma |
| | Y2 | Open collector outputY2 | Ready | |
| | Y3 | Open collector output Y3 | Orientation Completed | |
| | CME | Common GND | Common GND for the multi-function output terminal | |
| Relay Output | TA、TB、TC | Relay Output | Fault output | TA-TB：closed；<br>TA-TC：open。<br>Contact capacity：30VDC/1A |
| Control power | 24V | +24V power | Provide ＋24V power | Maximum output current 200mA |
| | COM | Common GND for +24V power | Used with other terminals | Isolation from GND |
| Ground terminal | PE | shield earthing | Used to shield earthing of the terminal | Internally connected to the terminal PE of the main loop |
| Encoder input | +5V、COM | Encoder power and signal input | Encoder power | Standard RS422 ，<br>Maximum 300KHZ，<br>Compatible with 5 v OC interface. |
| | A+、A- | | Encoder A-phase input | |
| | B+、B- | | Encoder B-phase input | |

| Category | Terminal label | Name | Description of terminal function | Specification |
|---|---|---|---|---|
| Encoder input | Z+、Z- | Encoder power and signal input | Encoder Z-phase input | Standard RS422 ，Maximum 300KHZ，Compatible with 5 v OC interface. |
| Encoder output | OA+、OA- | Encoder signal output | Encoder A-phase output | 1:1 divider feedback to the system，Standard RS422 |
| | OB+、OB- | | Encoder B-phase output | |
| | OZ+、OZ- | | Encoder Z-phase output | |
| Pulse input | D+、D- | Pulse command input | CW/Directional signal /B-phase input | Standard RS422, the parameterchoose the pulse command input mode. |

### 2.5.2 Wiring of Control Circuit Terminals

● Wiring of Analog Input Terminals

AI1 terminals accept analog signal input, DIP switch SW1 select the input voltage (0 ~ 10V) or the input current (0 ~ 20mA). The wiring of terminals is shown in Fig. 2-8:

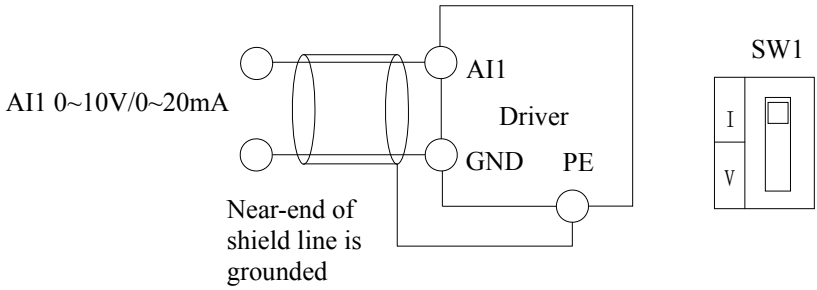



Fig. 2-8 Wiring diagram of analog input terminals

● Wiring of Analog Output Terminal

Analog output terminal AO1 is only support the voltage signal output, external connecting analog meter can indicate a variety of physical quantities. The wiring of terminals is shown in Fig. 2-9:

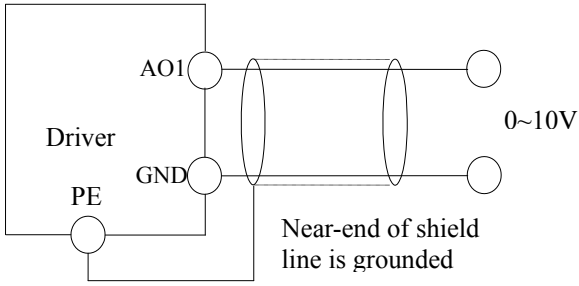



Fig. 2-9 Wiring diagram of analog output terminals

🕮 Tips

1) Dialing SW1 to “I” represents current; dialing to “V” represents voltage.
2) Analog input and output signals are easily disturbed by exterior environment, so shielded cables must be used for wiring and the length of the cables should be as short as possible.

● Wiring of Serial Communication Interface

The series of drivers provides users with RS485 serial communication interface, and can compose master-slave control system. The upper computer (a personal computer or PLC controller) can be used for real-time monitoring, implementation remote control , automatic control and others more complicated operations to drivers in network.

Fig. 2-10 Illustration of wiring between the upper computer and the driver interface:

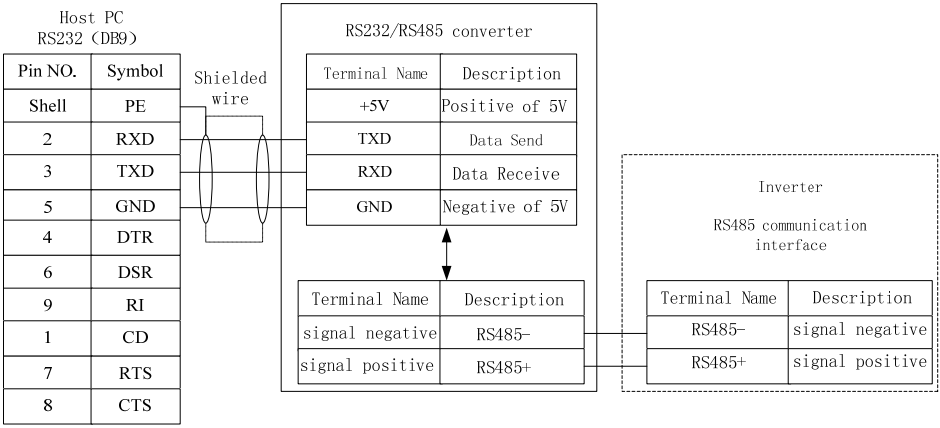



Fig. 2-10 Wiring diagram between the upper computer and the driver interface

When multiple drivers are connected in one RS485 system, the communication suffers more interference,
and a maximum of 31 drivers can be connected through RS485 serial bus. Wiring is

very important. Communication bus must be shielded twisted pair wiring. The following connection method is recommended:

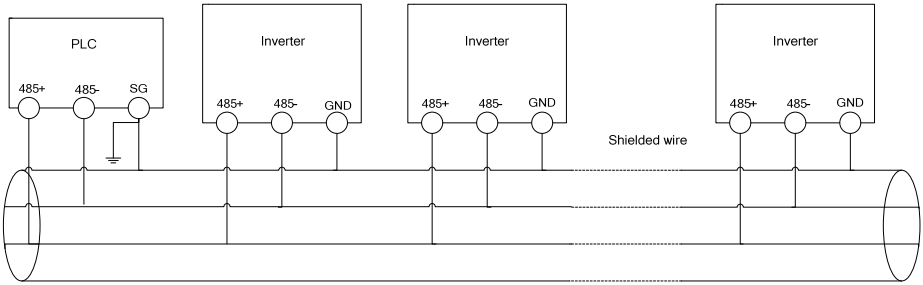



Fig. 2-11 Recommended wiring diagrams (drivers and motors are all well grounded) when PLC is in communication with multiple drivers

The host machine can be a personal computer or PLC controller, and the slave-based machine is this series of driver. When a PC is used as the host machine, a RS232/RS485 bus adapter should be added between the host machine and the bus; when a PLC controller is used as the host machine, connect the dotted terminals, namely RS485 terminal of slave-based machine and RS485 terminal of the host machine.

When multiple drivers compose RS485 bus communication, the matched resistance DIP switch SW2 on the control board of this series of drivers at the farthest two ends of the bus should be turned to ON position.

**●Multi-Function Input Terminal Wiring**

**Dry Contact Way** **Source (Drain Electrode) Mode**

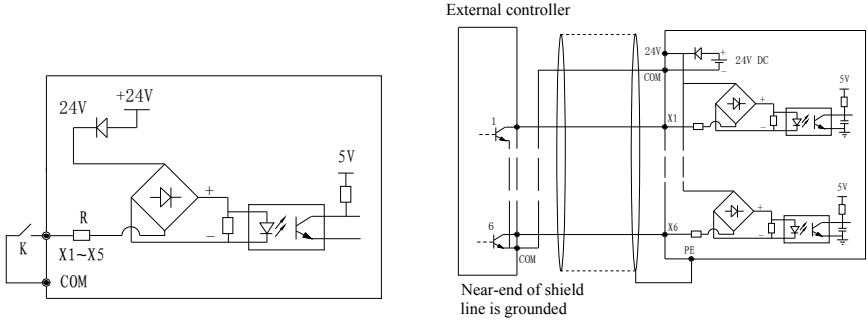



Fig. 2-12 Wiring diagram of multi-function input terminals

● Wire Multi-Function Output Terminals

1) Multi-function output terminals DO as discrete output can use the internal 24V

power supply of driver and the wiring method is shown in Figure 2-13.

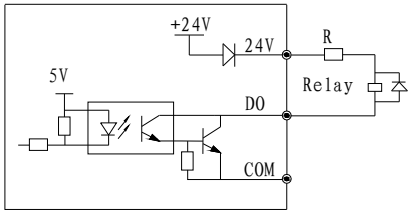



Fig. 2-13 On-off output connection mode 1 of multi-function output terminals

2) Multi-function output terminals DO as discrete output can also use the external, 9~30V, power supply and the wiring method is shown in Figure 2-14

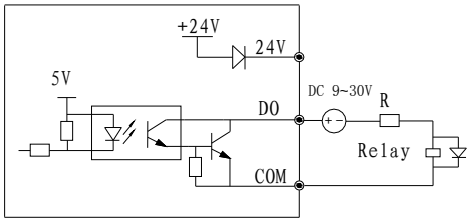



Fig. 2-14 On-off output connection mode 2 of multi-function output terminals

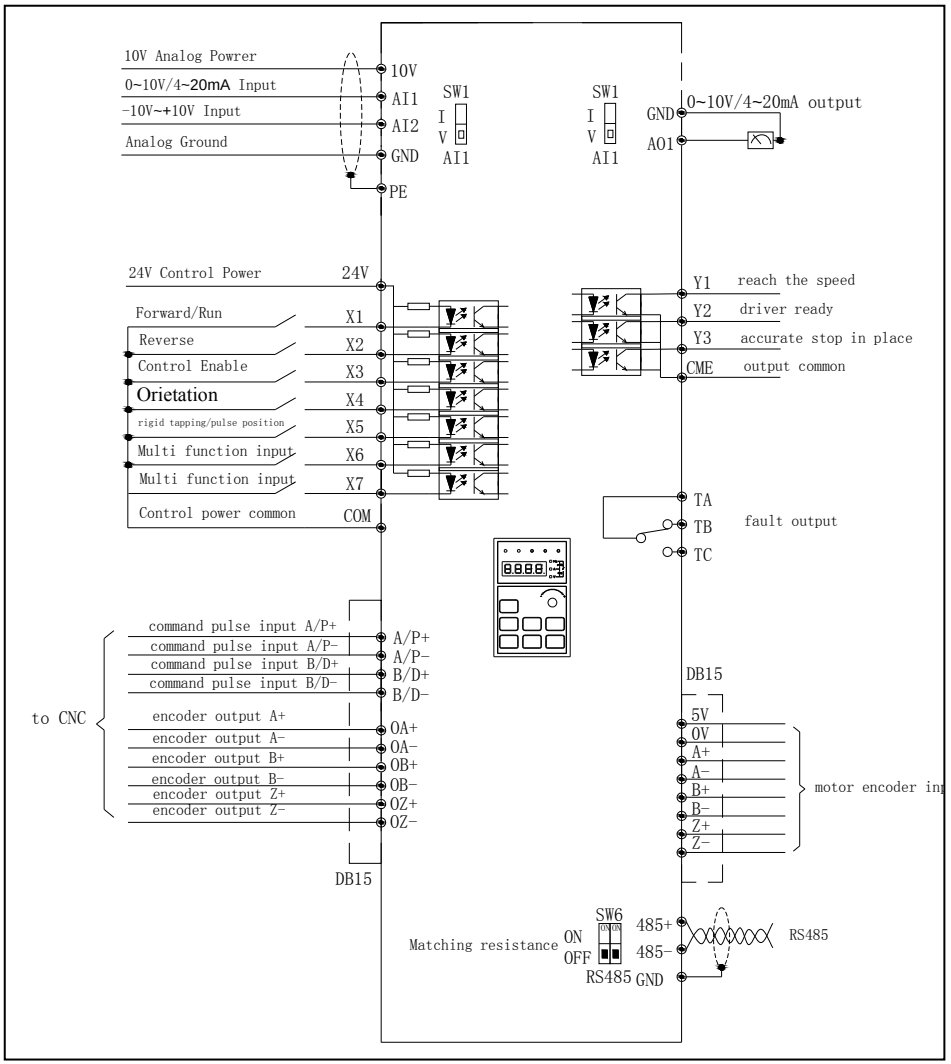
- Wiring of Relay Output Terminals TA, TB, TC

  To drive inductive loads (e.g. electromagnetic relays, contactors), it is suggested to add surge voltage absorption circuit, such as the RC absorption circuit, piezoresistor or flywheel diode (pay attention to the diode polarity when used for DC electromagnetic circuit), etc. Components of absorption circuit should be installed close to both ends of coil of relay or contactor.

🕮 Tips

1. Don't short circuit terminals 24V and COM, otherwise the control board may be damaged.
2. Please use multi-core shielded cable or multi-stranded cable (above 1 mm) to connect the control terminals.
3. When using a shielded cable, the shielded lay's end that is nearer to the driver should be connected to PE.
4. The control cables should be as far away (at least 30 cm) from the main circuit and high-voltage cables as possible (including power supply cables, motor cables, relay cables and cables of contactor). The cables should be vertical to each other to reduce the disturbance to minimum.

## 2.6 Wiring of Driver for Basic Operation




2-15 wiring diagram

# Chapter 3 Operation

| | |
|---|---|
| DANGER | 1 Only turn on the input power supply after close the front cover. Do not remove the cover while the driver is powered on. Otherwise there is risk of electric shock.<br>2 Keep away from the machinery. Otherwise there is risk of injury when the driver power supply recovers and runs suddenly. |
| CAUTION | 1 When braking resistor is used, the high voltage discharging at its two ends will increase its temperature. Do not touch the braking resistor to avoid danger of electric shock and burn.<br>2 Before running the driver, do check again the motor and machinery operating precautions to avoid risk.<br>3 Do not check signals during operation. It may damage the equipment.<br>4 All driver parameters have been preset at the factory. Do not change the settings unless it is required. |

## 3.1 Function and Operation of Keypad

The keypads of the different power rating drivers may have different exterior dimensions. However, all of them have the same array of buttons and LED display. Moreover, operation and function of them are all the same. Every keypad has a LED monitor of 4 digits with 7 segments, buttons, a digital encoder, and LED indicators. User can perform function setting, driver running, stop, and status monitoring with the keypad.

### 3.1.1 Keypad Layout

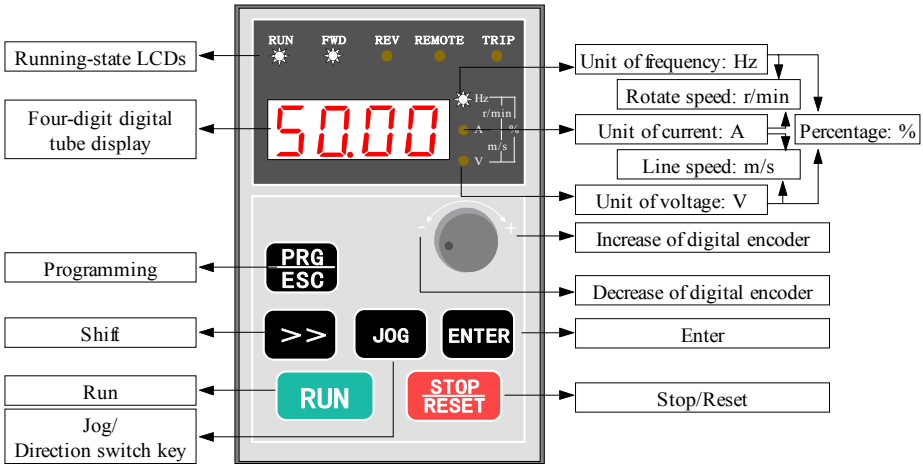



Fig. 3-1 Keypad layout and name of each part

Keypad upper part has five status indicators: RUN, FWD, REV, REMOTE and TRIP. The indicator RUN will be lit up if the driver is running; the indicator FWD will be lit up if it running forward and the indicator REV will be lit up if it runs reverse. The indicator REMOTE will be lit up if the driver is not controlled by keypad. The indictor TRIP will be lit up if fault occurs. To see the details, see table 3-2 description.

In monitoring status, the LED will display the status of monitored objects. At abnormal state it will display the fault code when the driver fails to run and show the warn code when the driver is warning. At normal state, it will display the object selected by parameter group PC. Refer to the detailed description of PC groups for the specific corresponding relation.

In programming mode, nixie tube displays three-level menus: function group, function codes and function parameter values. Under the function group display menu, it displays function group from "-P0-" to "-PF-"; under function code menu, it displays the corresponding function codes in the group. Under the parameters displayed in the function menu, the parameter values will be displayed.

### 3.1.2 Description of Button Function

On the driver keypad, there are eight buttons. In addition, the function of each button is defined as table 3-1.

Table 3-1 Keypad menu

| key | Name of key | Key functions |
|---|---|---|
| PRG ESC | Programming /Exit | Enter or exit programming mode. In monitoring mode, press PRG/ESC key to switch to programming mode. First, enter function group, and press ENTER key to enter function code and then function parameters progressively; press PRG/ESC, it will exit from function parameters to function code, then function group, next monitoring state, exit step by step like this; in case of an driver failure, it can switch failure display and function group. When giving an alarm, switch alarm state and function group. |
| ENTER | Enter | Enter the sub-menu, or store parameters during parameter setting. |
| Digital encoder | Up (clockwise)  | It can increase the function group number, function code number or function code value. In parameter setting mode, LED nixie tube blinking displays modified digit. If turn the knob clockwise, the function code value will increase; in display mode, if the keypad is set to be effective, digital frequency setting, speed PID setting or analog PID digital setting can be increased. |
|  | Down (counterclockwise)  | It can reduce the function code group number, function code number or function code value. In parameter setting mode, LED nixie tube blinking displays modified bit. If turn the knob CCW, the function code value will decrease; in display mode, if the keypad is set to be effective, digital frequency setting, speed PID setting or analog PID digital setting can be decreased. |
| > > | Shift | In edit mode, the modified digit of the set data can be selected;<br>In monitoring mode, displayed parameters can be switched. |
| JOG | P2.51=0 | Jog: In keypad mode, press this key to enter JOG running mode. |
| | P2.51=1 | Direction switch key: Press this button to change the direction of rotation. See P0.08 function description for details. |
| RUN | Run | In keypad control mode, it is to run the driver, and a running command will be given. |

| key | Name of key | Key functions |
|---|---|---|
| STOP RESET | Stop/Reset | In keypad control mode, the key is used to stop the driver. Clear the failure and return to normal state when there is a failure. |

### 3.1.3 Description of LED Digital Tube and Indicators

On the driver keypad there are four digits seven segments LEDs, 3 unit indicators, 5 status indicators. The LED can display the monitoring object, the function parameter values， the fault code, and the warning code. The three unit indicators have eight combinations, and each combination corresponds to one-unit. The combinations and their corresponding units are as Figure 3-2.

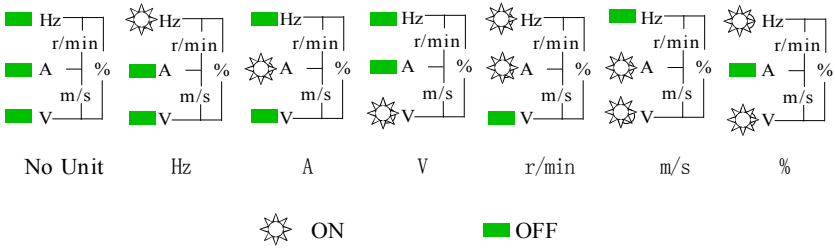



Figure 3-2 Combinations of unit indicator and their means

The five status indicators are just above the LED and the meaning of each indicator is shown in table 3-2

Table 3-2 Description of state indicators

| Indicator | Display state | The current state of the driver indicated |
|---|---|---|
| RUN Running-state indication | Off | Stop |
| | On | Running |
| | Flicker | Zero frequency operation |
| FWD Forward running direction indication | Off | Reverse rotation or not run |
| | Normally on | Stable forward rotation |
| | Quick flicker | Acceleration and deceleration of forward rotation |
| | Slow flicker | Going to stop, the direction is forward |
| REV Reverse running direction indication | Off | Forward rotation or not run |
| | Normally on | Stable reverse rotation |
| | Quick flicker | Acceleration and deceleration of reverse rotation |
| | Slow flicker | Going to stop, reverse direction |
| TRIP failure indicator | Off | Normal |
| | Flicker | Failure |
| REMOTE indicator | Off | Keypad control state |

| Indicator | Display state | The current state of the driver indicated |
|---|---|---|
| (Exclusive for control keypad) | On | Terminal control state |
| | Flicker | Serial communication state |

### 3.1.4 Operation Method of Keypad

Here are some examples of how to run the driver by the keypad:

Monitoring object switching:

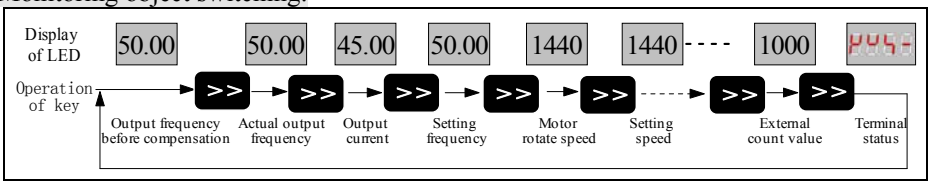



Fig. 3-3 Operation of parameters display at running/stop status

Frequency adjustment at common running: (Example: change the setting frequency from 50.00 Hz to 40.00 Hz)

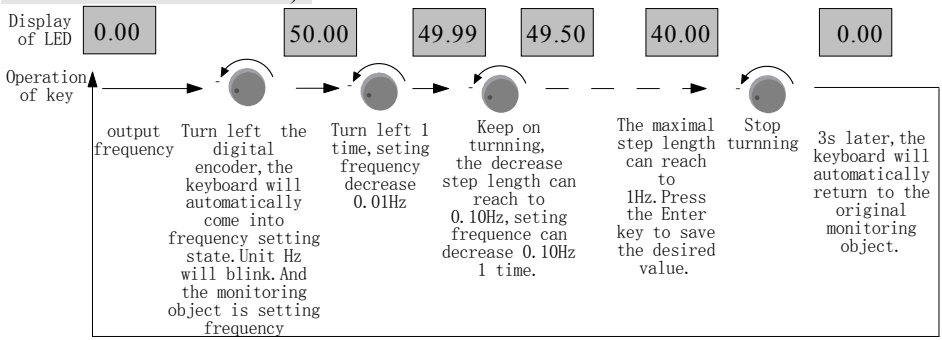



Figure 3-4 Flow chart of frequency setting

This method applies to given frequency parameter adjustment when the initial display state is any state.

When the monitor display is speed setting and analog PID digital setting, these parameters can be modified and displayed directly by turning the knob.

Setting of function code parameters: (example of changing Jog acceleration time, function code P2.01 from 6.0s to 3.2s)

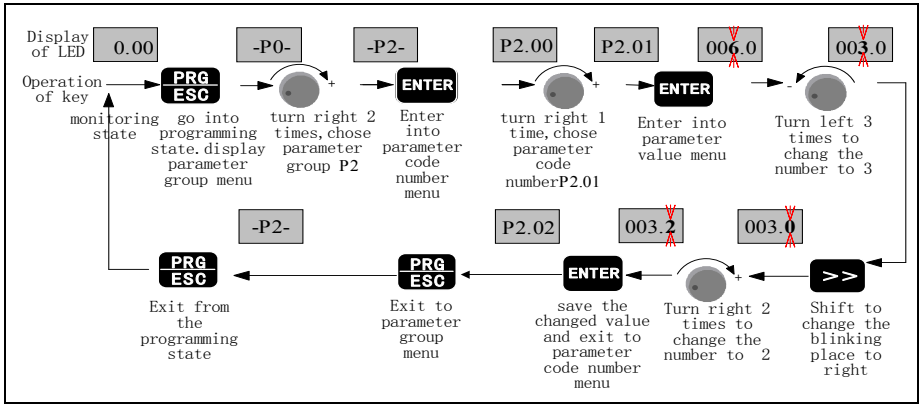


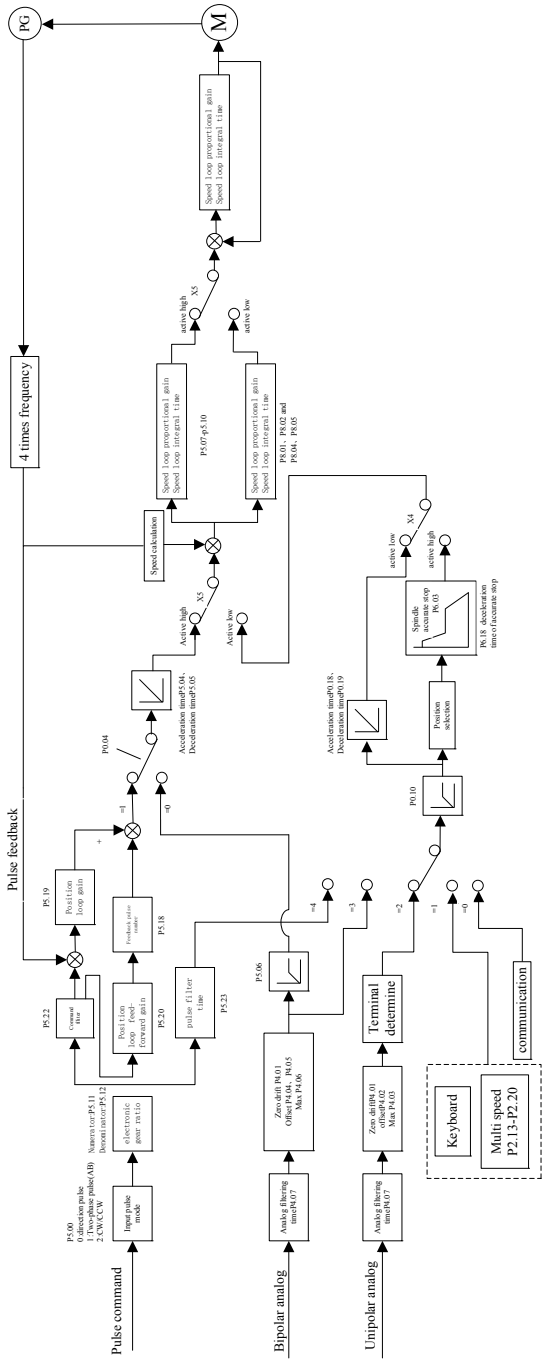

Figure 3-5 Flow chart of parameter setting

In three-level menu state, no flicker digit for a parameter indicates that the function code cannot be modified, and the possible reasons include:

- Modifying the value is forbidden because the parameter is actual measure value, or running record value or fixed value.
- The function parameter cannot be changed when the driver is at running state. However, it can be changed at stop state. So stop the driver and then change the parameter value.
- The driver parameters are protected. If function parameter value PF.01=1 or 2, the parameters are forbidden to be changed. This parameter protection function is to avoid operation mistake. To change the protection parameters, change value of function code PF.01 to zero, then all the parameters can be changed

## 3.2 Flow chart of switching driver running

The flow chart of switching driver running is shown in Fig 3-6. CNC system uses the pulse command and bipolarity analog AI2 or unipolarity analog AI1 to control AS600M run in speed control mode . And CNC system uses the pulse command and bipolarity analog AI2 to control AS600M run in position control mode. Position control and speed control mode can be switched through the terminal X5 rigid tapping/pulse position.




3-6 Drive running state switching flow graph

# Chapter 4 Parameter Index

Notes:

"○" means that the parameters can be changed during inverter running and stop state;
"×" means that the parameters cannot be changed during running;
"*" means that the parameters are actually measured value or fixed parameters which cannot be changed;
"-" means that the parameters can only be set by the manufacturer and cannot be changed by the users.

## P0: Basic Function

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P0.00 | Menu display mode | 0: Standard menu<br>1: Check mode menu | 0 | ○ | 0100 |
| P0.01 | Control mode | 0: V/F control<br>1: vector control (VC)<br>3: V/F separation control | 0 | × | 0101 |
| P0.02 | Frequency digital setting | 0.00Hz ~ maximum frequency | 0.00Hz | ○ | 0102 |
| P0.03 | Frequency setting source 1 | 0: NULL<br>1: Frequency digital setting, digital knob adjustment<br>2: Unipolar analog（AI1）<br>3: Bipolar Analog（AI2）<br>4: Pulse input<br>5: Communication setting | 1 | × | 0103 |
| P0.04 | Position command selection | 0: Analog Position Control(AI2)<br>1: Pulse position control | 1 | × | 0104 |
| P0.05~ P0.06 | Reserve | - | - | - | |
| P0.07 | Control command set channel | 0: Keypad control<br>1: Terminal control 1 (STOP key is inactive)<br>2: Terminal control 2 (STOP key is enabled)<br>3: Serial communication 1 (STOP key is inactive)<br>4: Serial communication 2 (STOP key is enabled)<br>5: Terminal control 3 (STOP and JOG keys are inactive) | 0 | ○ | 0107 |
| P0.08 | Keypad direction setting | 0: Forward rotation<br>1: Reverse rotation | 0 | ○ | 0108 |

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P0.09 | Basic frequency | 0.10~400.0Hz | 50.00Hz | × | 0109 |
| P0.10 | Maximum output frequency | MAX [50.00Hz, upper limit frequency, digital setting frequency, Multi-step frequency, jump frequency] ~ 400.0Hz | 50.00Hz | × | 010A |
| P0.11 | Motor type | 0: General Motors<br>1: A motor<br>2: B motor | 0 | × | 010B |
| P0.12~ P0.13 | Reserve | - | - | - | |
| P0.14 | Rated voltage of motor | 60~480V | Rated voltage | × | 010E |
| P0.15 | Reserve | - | - | - | |
| P0.16 | Maximum output voltage | 60~480V | Rated voltage | × | 0110 |
| P0.17 | Keypad knob adjusting rate | 0: Keypad knob integral regulation;<br>(1~250) * (0.01Hz \| 1rpm) | 0 | × | 0111 |
| P0.18 | Acceleration time 1 | 0.1~3600s | 6.0s | ○ | 0112 |
| P0.19 | Deceleration time 1 | 0.1~3600s | 6.0s | ○ | 0113 |

## P1: Start-stop control

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P1.00 | Start mode | 0: Start from the start-up frequency<br>1: First brake (excitation), and then start at the start-up frequency | 1 | ○ | 0200 |
| P1.01~ P1.03 | Reserve | - | - | - | |
| P1.04 | Start-up DC braking hold time | 0.0~30.0s | 0.3s | ○ | 0204 |
| P1.05~ P1.06 | Reserve | - | - | - | |
| P1.07 | Acceleration and deceleration mode | 0: Linear 1: S curve | 0 | ○ | 0207 |

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P1.08 | S curve start time | 10.0~50.0 % (acceleration and deceleration time ) P1.08+P1.09≤90% | 20.0% | ○ | 0208 |
| P1.09 | S curve ascending stage time | 10.0~80.0 % (acceleration and deceleration time) P1.08+P1.09≤90% | 60.0% | ○ | 0209 |
| P1.10 | Stop mode | 0: Deceleration stop<br>1: Free stop<br>2: Deceleration + DC braking | 0 | × | 020A |
| P1.11 | Stopping DC braking frequency | 0.00~MIN(50.00Hz, upper limit frequency ) | 0.10Hz | ○ | 020B |
| P1.12 | Reserve | - | - | - | |
| P1.13 | Reserve | - | - | - | |
| P1.14 | Digital setting of Stopping DC braking current | 0.0~100.0% motor rated current | 0.0% | ○ | 020E |
| P1.15 | Stopping DC braking time | 0.0~30.0s | 0.0s | ○ | 020F |
| P1.16 | Reserve | - | - | - | |
| P1.17 | Reserve | - | - | - | |
| P1.18 | Braking selection | 0: Do not use brake<br>1: Use energy consumption braking | 1 | × | 0212 |
| P1.19 | Energy consumption braking usage | 30.0%~100.0%<br>Note: It is active for 3015GB and below built-in models of this series; automatically add dynamic braking in deceleration | 100.0% | × | 0213 |

## P2: Auxiliary Run

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P2.00 | Jog frequency | 0.10Hz~upper limit frequency | 5.00Hz | ○ | 0300 |
| P2.01 | Jog acceleration time | 1.0~3600s | 20.0s | ○ | 0301 |
| P2.02 | Jog deceleration time | 1.0~3600s | 20.0s | ○ | 0302 |
| P2.03 | Reserve | - | - | - | |
| P2.04 | Reserve | - | - | - | |
| P2.05 | Frequency deviation setting | 0.00~2.50Hz | 0.10Hz | ○ | 0305 |
| P2.06 | Reserve | - | - | - | |

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P2.07 | Carrier frequency | Depend on model | Depend on model | × | 0307 |
| P2.08~ P2.12 | Reserve | - | - | - | |
| P2.13 | Multi-step frequency 1 | 0.00~maximum frequency | 5.00 Hz | ○ | 030D |
| P2.14 | Multi-step frequency 2 | | 8.00 Hz | | 030E |
| P2.15 | Multi-step frequency 3 | | 10.00 Hz | | 030F |
| P2.16 | Multi-step frequency 4 | | 15.00 Hz | | 0310 |
| P2.17 | Multi-step frequency 5 | | 18.00 Hz | | 0311 |
| P2.18 | Multi-step frequency 6 | | 20.00 Hz | | 0312 |
| P2.19 | Multi-step frequency 7 | | 25.00 Hz | | 0313 |
| P2.20 | Multi-step frequency 8 | | 28.00 Hz | | 0314 |
| P2.21~ P2.35 | Reserve | - | - | - | |
| P2.36 | Cooling Fan control mode | 0: Auto stop mode<br>1: Keep Running after power on | 0 | × | 0324 |
| P2.37 | Wiring direction of motor | 0: Positive sequence<br>1: Inverted sequence | 0 | × | 0325 |
| P2.38 | Anti-reverse selection | 0: Reverse rotation is enabled<br>1: Reverse rotation is disabled | 0 | × | 0326 |
| P2.39 | JOG key function selection | 0: JOG<br>1:FWD/REV | 0 | * | 0327 |
| P2.40 | Keypad keys UP / DN enable | 0:Disable<br>1:Enable | | * | 0328 |
| P2.41~ P2.43 | Reserve | - | - | - | |
| P2.44 | PG pulses per revolution | 1~9999 | 1000 | × | 032C |
| P2.45 | PG direction | 0:A phase advance during forward<br>1: B phase advance during forward | 0 | × | 032D |
| P2.46~ P2.49 | Reserve | - | - | - | |
| P2.50 | Motor and encoder reduction ratio | 1~4.000 | 1.000 | × | 0332 |

## P3: I / O Terminal Control

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P3.00 | Mode of terminal action | 0: Close is active<br>1: Open is active<br>(normally open / normally closed is not subject to this function) | 0 | × | 0400 |
| P3.01 | X1 terminal function | 0: NULL Not defined<br>1: FWD Forward running<br>2: REV Reverse running<br>3-5: Reserve<br>6: RST Reset<br>7-17: Reserve<br>18: S1 Multi-step speed 1<br>19: S2 Multi-step speed 2<br>20: S3 Multi-step speed 3<br>21: S4 Multi-step speed 4<br>22: S5 Multi-step speed 5<br>23: S6 Multi-step speed 6<br>24: S7 Multi-step speed 7<br>25-36: Reserve<br>37: EH0 external fault normally open<br>38: EH1 external fault normally closed<br>39-53: Reserve<br>54: Control Enable<br>55: spindle accurate stop<br>56: Rigid tapping / pulse position<br>57: Spindle swing(Reserve)<br>58:zero speed servo(Reserve)<br>59: Low-speed function(Reserve)<br>60: Orientation position 1<br>61: Orientation position 2<br>62: Orientation position 3<br>80: Pulse input(Reserve)<br>81: External zero(Reserve) | 1 | × | 0401 |
| P3.02 | X2 terminal function | | 2 | × | 0402 |
| P3.03 | X3 terminal function | | 37 | × | 0403 |
| P3.04 | X4 terminal function | | 0 | × | 0404 |
| P3.05 | X5 terminal function | | 0 | × | 0405 |
| P3.06 | X6 terminal function | | - | * | 0406 |
| P3.07 | X7 terminal function | | - | * | 0407 |
| P3.08~ P3.12 | Reserve | - | - | - | |
| P3.13 | X terminal filter time | 0.002s~1.000s | 0.010s | ○ | 040D |
| P3.14 | Reserve | - | - | - | |
| P3.15 | Unipolar operation command mode | 0:FWD/REV<br>1: Run + direction | 0 | × | 040F |

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P3.16~ P3.17 | Reserve | - | - | - | |
| P3.18 | Control Enable | 0: Terminals enable<br>1: Internal enabled | 1 | × | 0412 |
| P3.19 | Reserve | - | - | - | |
| P3.20 | Y1 terminal function | 0:NULL<br>1: Run<br>2: Ready<br>3: Reach the Speed<br>4: Orientation completed<br>5: Speed / position status output<br>7: 0 speed operation<br>19: Fault output | 3 | * | 0414 |
| P3.21 | Y2 terminal function | | 2 | * | 0415 |
| P3.22 | Y3 terminal function | | 4 | * | 0416 |
| P3.23 | Y4 (Reserve) | | - | * | 0417 |
| P3.24 | Relay 1 (TA/TB/TC) Output function selection | | 19 | × | 0418 |
| P3.25 | Reserve | - | - | - | |
| P3.26 | Frequency arriving detection width | 0.00~10.00Hz | 2.50Hz | | |

## P4: Analog and Pulse Input and Output Terminals

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P4.00 | AI1 nonlinear enable | 0:Disable 1: Enable | 0 | × | 0500 |
| P4.01 | Analog zero drift value | 0.000~1.000V Analog treated as 0 when the scope of the following (When the absolute value of the bipolar) | 0.00V | ○ | 0501 |
| P4.02 | AI1 Offset | -5.000~5.000V | 0 | ○ | 0502 |
| P4.03 | AI1 maximum analog input value | 0~10.00V | 10.00V | ○ | 0503 |
| P4.04 | AI2 Offset | -5.000~5.000V | 0 | ○ | 0504 |
| P4.05 | AI2 Analog input filter time constant | 0~10.000V | 10.0V | ○ | 0505 |
| P4.06 | Reserve | - | - | - | |
| P4.07 | Analog filtering time | 0~1000ms | 20ms | ○ | 0507 |
| P4.08 | Reserve | - | - | - | |
| P4.09 | AI1 nonlinear input value 1 | 0.000~10.000V | 0 | ○ | 0509 |

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P4.10 | AI1 nonlinear corresponding values 1 | 0~500.00HZ | 0 | ○ | 050A |
| P4.11 | AI1 nonlinear input value 2 | 0.000~10.000V | 0 | ○ | 050B |
| P4.12 | AI1 nonlinear corresponding values 2 | 0~500.00HZ | 0 | ○ | 050C |
| P4.13 | AI1 nonlinear input value 3 | 0.000~10.000V | 0 | ○ | 050D |
| P4.14 | AI1 nonlinear corresponding values 3 | 0~500.00HZ | 0 | ○ | 050E |
| P4.15 | AI1 nonlinear input value 4 | 0.000~10.000V | 0 | ○ | 050F |
| P4.16 | AI1 nonlinear corresponding values 4 | 0~500.00HZ | 0 | ○ | 0510 |
| P4.17 | AI1 nonlinear input value 5 | 0.000~10.000V | 0 | ○ | 0511 |
| P4.18 | AI1 nonlinear corresponding values 5 | 0~500.00HZ | 0 | ○ | 0512 |
| P4.19 | AI1 nonlinear input value 6 | 0.000~10.000V | 0 | ○ | 0513 |
| P4.20 | AI1 nonlinear corresponding values 6 | 0~500.00HZ | 0 | ○ | 0514 |
| P4.21 | AO1 function definition | 0: NULL<br>1: Output current (0 ~ 2 times of rated current of the inverter)<br>2: Output voltage (0 ~ maximum voltage)<br>5: Calibration signal (5V)<br>7: Output power (0 ~ 2 times of the rated power of the inverter)<br>12: Output frequency before compensation (0 ~ maximum frequency)<br>14: Running speed (0 ~ 2 times of the rated speed) | 0 | × | 0515 |
| P4.22~ P4.24 | Reserve | - | - | - | |

| Function code | Parameter | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P4.25 | AO1 output range selection | 0: 0~10V/0~20mA<br>1: 2~10V/4~20mA | 0 | ○ | 0519 |
| P4.26~ P4.27 | Reserve | - | - | - | |
| P4.28 | AO1 Gain | -10.00~10.00 | 1.00 | ○ | 051C |
| P4.29~ P4.30 | Reserve | - | - | - | |
| P4.31 | AO1 offset | -100.0%~100.0% | 0.0% | × | 051F |

## P5：Rigid Tapping and Position Control

| Function Code | Parameter name | Setting Range | Factory Setting | Modify Flag | Modbus address |
|---|---|---|---|---|---|
| P5.00 | mode of pulse command | 0：pulse + Direction signal<br>1：Two-phase pulse (Phase A + Phase B)<br>2：CW/CCW | 0 | × | 0600 |
| P5.01 | the opposite direction of position command | 0：not<br>1：Yes | 0 | × | 0601 |
| P5.02～ P5.03 | Reserve | - | - | * | - |
| P5.04 | Rigid tapping （position） acceleration time | The time from 0 acceleration to P5.06<br>0～50.00S | 0.50 | ○ | 0604 |
| P5.05 | Rigid tapping （position） deceleration time | The time from 0 deceleration to P5.06<br>0～50.00S | 0.50 | ○ | 0605 |
| P5.06 | The max frequency of Rigid tapping(position) | 0～400.00HZ | 30.00HZ | × | 0606 |
| P5.07 | Rigid tapping （position）Speed loop proportional gain 1 | 0～50.0 | 3.0 | ○ | 0607 |
| P5.08 | Rigid tapping （position）Speed loop integral time 1 | 0.000S～9.000 | 0.030 | ○ | 0608 |
| P5.09 | Rigid tapping （position）Speed loop proportional gain 2 | 0～50.0 | 5.0 | ○ | 0609 |

| Function Code | Parameter name | Setting Range | Factory Setting | Modify Flag | Modbus address |
|---|---|---|---|---|---|
| P5.10 | Rigid tapping （position）Speed loop integral time 2 | 0.000S～9.000 | 0.200 | ○ | 060A |
| P5.11 | Numerator of the electronic gear ratio | 1～9999 | 1 | × | 060B |
| P5.12 | Denominator of the electronic gear ratio | 1～9999 | 1 | × | 060C |
| P5.13 | The following error | Display value | - | - | 060D |
| P5.14 | Command frequency before the electronic gear （reserve） | Display value（KHZ） | - | - | 060E |
| P5.15 | Command frequency after the electronic gear（reserve） | Display value（KHZ） | - | - | 060F |
| P5.16 | Command pulse number before the electronic gear(reserve) | Display value | - | - | 0610 |
| P5.17 | Command pulse number after the electronic gear(reserve) | Display value | - | - | 0611 |
| P5.18 | Feedback pulse number | Display value | - | - | 0612 |
| P5.19 | Position loop gain | 0～255 | 1 | | 0613 |
| P5.20 | Position loop feed-forward gain | 0～2.55 | 0.8 | ○ | 0614 |
| P5.21 | The feed-forward filter time | 0.000～0.255S | 0.001 | ○ | 0615 |
| P5.22 | Command filter time | 000～255 the larger number,the stronger effect of the filter<br>Time constant=1024/（1024-P5.22） | 1 | ○ | 0616 |
| P5.23 | Pulse filter time | 0.001～0.255S | 0.020 | ○ | 0617 |

## P6：Spindle Orientation

| Function Code | Parameter name | Setting Range | Factory Setting | Modify Flag | Modbus address |
|---|---|---|---|---|---|
| P6.00 | Position feed-forward | Display value | - | * | 0700 |
| P6.01 | Pulse increment before the electronic gear | Display value | - | * | 0701 |
| P6.02 | Pulse increment after the electronic gear | Display value | - | * | 0702 |
| P6.03 | The pulse increment after filtering | Display value | - | * | 0704 |
| P6.04 | Display the current location | Display value | - | * | 0705 |
| P6.05～P6.06 | Reserve | - | - | * | 0706 |
| P6.07 | Position encoder selection (reserve) | 0：Motor encoder positioning<br>1：External encoder positioning | 0 | * | 0707 |
| P6.08 | Orientation signal mode(reserve) | 0：Active high<br>1：Active lOW | 0 | * | 0708 |
| P6.09 | Orientations direction selection | 0：Current direction；<br>1：Positive direction；<br>2：Negative direction; | 0 | × | 0709 |
| P6.10 | Orientation frequency | 0～50.00HZ | 5.00HZ | ○ | 070A |
| P6.11～P6.14 | Reserve | - | - | * | - |
| P6.15 | Orientation completed width | 0～9999 | 1 | × | 070F |
| P6.16 | Orientation completed time | 0.000～5.000s | 0.100S | × | 0710 |
| P6.17 | Orientation location selection terminal filter time | 0.000～5.000s | 0.050 | × | 0711 |
| P6.18 | Orientation deceleration time | 0.1～30.0s | 2.0s | ○ | 0712 |
| P6.19～P6.25 | reserve | - | - | * | - |
| P6.26 | Orientations position 1 | 0～a circle of pulse number -1 | 0 | ○ | 071A |
| P6.27 | Orientations position 2 | 0～a circle of pulse number -1 | 0 | ○ | 071B |

| Function Code | Parameter name | Setting Range | Factory Setting | Modify Flag | Modbus address |
|---|---|---|---|---|---|
| P6.28 | Orientations position 3 | 0～a circle of pulse number -1 | 0 | ○ | 071C |
| P6.29 | Orientations position 4 | 0～a circle of pulse number -1 | 0 | ○ | 071D |
| P6.30 | Orientations position 5 | 0～a circle of pulse number -1 | 0 | ○ | 071E |
| P6.31 | Orientations position 6 | 0～a circle of pulse number -1 | 0 | ○ | 071F |
| P6.32 | Orientations position 7 | 0～a circle of pulse number -1 | 0 | ○ | 0720 |
| P6.33 | Orientations position 8 | 0～a circle of pulse number -1 | 0 | ○ | 0721 |
| P6.34～ P6.39 | Reserve | - | - | * | - |
| P6.40 | Orientation response constant | 0.01～10.00 | 1.00 | ○ | 0728 |
| P6.41 | A circle of pulse number | 0～10000 | 4096 | × | 0729 |
| P6.42 | Enter zero servo lock range | 0～2000 | 160 | ○ | 072A |
| P6.43～ P6.44 | Reserve | - | - | * | - |
| P6.45 | Orientation crawling frequency | 0.01～3.00HZ | 0.10HZ | × | 072D |

## P7：Reserve

## P8：Speed control parameter

| Function Code | Parameter name | Setting Range | Factory Setting | Modify Flag | Modbus address |
|---|---|---|---|---|---|
| P8.00 | Pre-excitation current compensation amount | 0.0~500.0%<br>100.0% corresponds to the motor no-load current; the response time is set in P1.04 The upper limit is 80% of the rated current of the inverter or the smaller rated current of the motor | 100.0% | × | 0900 |
| P8.01 | Speed loop proportional gain 1 | 0.1~30.0 | 3.0 | ○ | 0901 |

| Function Code | Parameter name | Setting Range | Factory Setting | Modify Flag | Modbus address |
|---|---|---|---|---|---|
| P8.02 | Speed loop integral time 1 | 0.001~10.000s | 0.030s | ○ | 0902 |
| P8.03 | Speed loop switching frequency 1 | 0.00Hz ~ speed loop switching frequency 2 | 0.50Hz | ○ | 0903 |
| P8.04 | Speed loop proportional gain 2 | 0.1~30.0 | 5.0 | ○ | 0904 |
| P8.05 | Speed loop integral time 2 | 0.001~10.000s | 0.200s | ○ | 0905 |
| P8.06 | Speed loop switching frequency 2 | Speed loop switching frequency 1 ~ maximum frequency | 10.00 Hz | ○ | 0906 |
| P8.07 | Speed loop filter time | 0.000s~0.100s | 0.030s | ○ | 0907 |
| P8.08 | Current loop proportional gain | 0.1~9.9 | 1.0 | ○ | 0908 |
| P8.09 | Current loop integral time | 0.001~1.000s | 0.100s | ○ | 0909 |
| P8.10 | Reserve | | 0 | ○ | 090A |
| P8.11 | Speed feedback filter | 0～5 | 2 | ○ | 090B |
| P8.12 | Upper limit of driving torque | 0.0%～200.0% | 160% | ○ | 090C |
| P8.13 | Excitation current of proportional gain | 0.1～9.9 | 1.0 | ○ | 090D |
| P8.12 | Excitation current of integral time | 0.001～1.000s | 0.010s | ○ | 090E |
| P8.13～ P8.19 | Reserve | - | - | * | - |
| P8.20 | Zero servo start frequency (reserve) | 0.00~10.00Hz | 0.30Hz | ○ | 0914 |
| P8.21 | Zero servo gain (reserve) | 1.00~99.99 | 1.00 | × | 0915 |
| P8.22 | Zero servo tolerance (reserve) | 0~16383 | 10 | × | 0916 |

## P9: V / F Control Parameter

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P9.00 | V / F curve setting | 0: Constant torque characteristic curve 0<br>1: Lower torque characteristic curve 1 (2.0)<br>2: Lower torque characteristic curve 2 (1.5)<br>3: Lower torque characteristic curve 3 (1.2)<br>4: User sets V / F curve(determined by P9.01 ~ P9.06 function code) | 0 | × | 0A00 |
| P9.01 | V/F frequency F1 | 0.0~P9.03 | 10.00Hz | × | 0A01 |
| P9.02 | V/F voltage V1 | 0.0~100.0% | 20.0% | × | 0A02 |
| P9.03 | V/F frequency F2 | P9.01~P9.05 | 25.00Hz | × | 0A03 |
| P9.04 | V/F voltage V2 | 0.0~100.0% | 50.0% | × | 0A04 |
| P9.05 | V/F frequency F3 | P9.03~P0.09 | 40.00Hz | × | 0A05 |
| P9.06 | V/F voltage V3 | 0~100.0% | 80.0% | × | 0A06 |
| P9.07 | Torque lifting | 0.0: Automatic torque lifting<br>0.1-30.0%: Manual lifting | 0.0% | ○ | 0A07 |
| P9.08 | Manual torque lifting cutoff point | 0.00~50.00Hz | 16.67Hz | ○ | 0A08 |
| P9.09 | Slip frequency compensation | 0.0-250.0% (rated torque is 100%) | 0.0% | ○ | 0A09 |
| P9.10 | Slip compensation time constant | 0.01~2.55s | 0.20s | ○ | 0A0A |
| P9.11 | Energy efficient control selection | 0: Energy efficient control is disabled<br>1: Energy efficient control is enabled | 0 | × | 0A0B |
| P9.12 | Energy efficient gain coefficient | 0.00~655.3 | Depend on model | × | 0A0C |
| P9.13 | Energy efficient voltage lower limit (50Hz) | 0~120% | 50% | × | 0A0D |
| P9.14 | Energy efficient voltage lower limit (5Hz) | 0~25% | 12% | × | 0A0E |
| P9.15 | Average power time | (1~200) * (25ms) | 5 | × | 0A0F |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P9.16 | AVR function | 0: Failure to actuate<br>1: Run all the time<br>2: Not act only during deceleration | 2 | × | 0A10 |
| P9.17 | Overmodulation action | 0: Invalid<br>1: Valid | 0 | × | 0A11 |
| P9.18 | Droop control (load distribution) | 0.00~10.00Hz | 0.00Hz | ○ | 0A12 |
| P9.19 | Output voltage offset source | 0: Digital setting<br>1: Terminal AI1<br>2: Terminal AI2<br>3: Terminal AI3 (reserve for 3004GB and below models)<br>4: Pulse input<br>5: Communication setting<br><br>Maximum output voltage is 100%<br>Valid only in V / F separation mode | 0 | × | 0A13 |
| P9.20 | Output voltage offset | 0.0%~100.0% | 0.0% | ○ | 0A14 |
| P9.21 | Oscillation suppression coefficient | 0~100 | 0 | ○ | 0A15 |

## PA: Motor Parameters

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PA.00 | Motor selection | 0: Use motor 1<br>1: Use motor 2 | 0 | × | 0B00 |
| PA.01 | Number of poles of motor 1 | 2~56 | 4 | × | 0B01 |
| PA.02 | Rated power of motor 1 | 0.4~999.9kW | Depend on model | × | 0B02 |
| PA.03 | Rated speed of motor 1 | 0~24000r/min | | ○ | 0B03 |
| PA.04 | Rated current of motor 1 | 0.1~999.9A | | × | 0B04 |
| PA.05 | No-load current I0 of motor 1 | 0.1~999.9A | | × | 0B05 |
| PA.06 | Stator resistance R1 of motor 1 | 0.001~65.000Ω | | ○ | 0B06 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PA.07 | leakage inductance L1 of motor 1 | 0.1~2000.0mH | Depend on model | ○ | 0B07 |
| PA.08 | Rotor resistance R2 of motor 1 | 0.001~65.000Ω | | ○ | 0B08 |
| PA.09 | Mutual inductance resistance Lm of motor 1 | 0.1~2000.0mH | | ○ | 0B09 |
| PA.10 | Saturation coefficient 1 of motor 1 | 0.0%~100.0% | | ○ | 0B0A |
| PA.11 | Saturation coefficient 1 of motor 2 | 0.0%~100.0% | | ○ | 0B0B |
| PA.12 | Saturation coefficient 3 of motor 1 | 0.0%~100.0% | | ○ | 0B0C |
| PA.13 | Saturation coefficient 4 of motor 1 | 0.0%~100.0% | | ○ | 0C0D |
| PA.14 | Saturation coefficient 5 of motor 1 | 0.0%~100.0% | | ○ | 0B0E |
| PA.15~ PA.28 | reserve | - | | ○ | 0B1C |
| PA.29 | Motor parameter tuning | 0: No operation<br>1: Static parameter tuning<br>2: Rotating parameter tuning | 0 | × | 0B1D |
| PA.30 | Parameter tuning process information | - | | * | 0B1E |

## Pb: MODBUS Communication

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| Pb.00 | Baud rate selection | 0: 1200bps 1: 2400bps<br>2: 4800bps 3: 9600 bps<br>4: 19200bps 5: 38400bps | 3 | × | 0C00 |
| Pb.01 | Local address | 0~31 | 1 | × | 0C01 |
| Pb.02 | Even-odd check selection | 0: Even parity<br>1: Odd parity<br>2: No parity | 0 | × | 0C02 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| Pb.03 | Communication timeout detection time | 0.0~100.0s<br>0: No timeout detection<br>Other: Timeout detection time | 0.0s | ○ | 0C03 |
| Pb.04 | Response delay time | 0~500ms | 5ms | × | 0C04 |
| Pb.05 | Communication transmission frequency command unit | 0: 0.01Hz<br>1: 0.1Hz | 0 | × | 0C05 |
| Pb.06 | Communication data Eeprom save options | 0: Not save Eeprom directly<br>1: Save Eeprom directly | 0 | × | 0C06 |
| Pb.07 | CCF6 Troubleshooting | 0: Resume without reporting failure<br>1: Reported failure and shut down automatically | 0 | × | 0C07 |
| Pb.08 | Reserve | Reserve | 0 | - | 0C08 |

## PC: Display Control

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PC.00 | LCD Language Selection | 0: Chinese<br>1: English | 0 | ○ | 0D00 |
| PC.01 | Output frequency (Hz) (Before compensation) | 0: Not displayed 1: Displayed | 1 | ○ | 0D01 |
| PC.02 | Output frequency (Hz) (Actual) | 0: Not displayed 1: Displayed | 0 | ○ | 0D02 |
| PC.03 | Output current (A) | 0: Not displayed 1: Displayed | 1 | ○ | 0D03 |
| PC.04 | Set frequency (Hz flicker) | 0: Not displayed 1: Displayed | 1 | ○ | 0D04 |
| PC.05 | Reserve | - | - | * | 0D05 |
| PC.06~ PC.08 | Set speed (R / min blink) | 0: Not displayed 1: Displayed | 0 | ○ | 0D06 |
| PC.09 | Output power (kW) | 0: Not displayed 1: Displayed | 0 | ○ | 0D09 |
| PC.10 | Output torque (%) | 0: Not displayed 1: Displayed | 0 | ○ | 0D0A |
| PC.11 | Output voltage (V) | 0: Not displayed 1: Displayed | 1 | ○ | 0D0B |
| PC.12 | Bus voltage (V) | 0: Not displayed 1: Displayed | 0 | ○ | 0D0C |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PC.13 | AI1 (V) | 0: Not displayed 1: Displayed | 0 | ○ | 0D0D |
| PC.14 | AI2 (V) | 0: Not displayed 1: Displayed | 0 | ○ | 0D0E |
| PC.15 | Reserve | - | - | * | |
| PC.19 | Terminal state (No unit) | 0: Not displayed 1: Displayed | 0 | ○ | 0D13 |
| PC.20 | Actual length | 0: Not displayed 1: Displayed | 0 | ○ | 0D14 |
| PC.21 | Power on indication selection | 1~20 | 1 | ○ | 0D15 |
| PC.22 | Reserve | | | | 0D16 |
| PC.23 | Reserve | | | | 0D17 |

## Pd: Protection and Fault Parameters

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| Pd.00 | Motor overload protection mode selection | 0: Failure to actuate<br>1: Common motor (with low speed compensation)<br>2: Variable frequency motor (without low speed compensation)<br>3: Sensor protection (immediate protection once more than the threshold) | 1 | × | 0E00 |
| Pd.01 | Reserve | - | - | × | 0E01 |
| Pd.05 | Electronic thermal relay Electrical protection value | 20~110% | 100% | ○ | 0E05 |
| Pd.06 | Overload pre-alarm detection level | 20.0~200.0% | 160.0% | × | 0E06 |
| Pd.07 | Overload pre-alarm detection time | 0.0~60.0s | 60.0s | × | 0E07 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| Pd.08 | Current amplitude limit | 0: Invalid<br>1: Valid during acceleration and deceleration, and inactive during constant speed<br>2: Valid during both acceleration and deceleration and constant speed<br>3: Lower operating speed during overcurrent | 1 | ○ | 0E08 |
| Pd.09 | Current amplitude limit level | 80~180% | 160% | ○ | 0E09 |
| Pd.10 | Overvoltage stall selection | 0: Disable (Be chosen when installing braking resistor)<br>1: Allowed | 1 | × | 0E0A |
| Pd.11 | Overvoltage stall point | 3004GB and below: 110.0 ~ 150.0% of the bus voltage<br>35R5GB and above: 120.0 ~ 150.0% of the bus voltage | 220V models: 120%<br>380V models: 140% | × | 0E0B |
| Pd.12 | Input default phase detection reference | 1~100% | 100% | × | 0E0C |
| Pd.13 | Input default phase detection time | 2~255s | 10s | × | 0E0D |
| Pd.14 | Output default phase detection reference | 0~100% | 0% | × | 0E0E |
| Pd.15 | Output default phase detection time | 0.0~2.0s | 0.2s | × | 0E0F |
| Pd.16 | reserve | - | 0 | × | 0E10 |
| Pd.17 | reserve | - | 0 | × | 0E11 |
| Pd.18 | Number of automatic reset times | 0-10, 0 indicates no automatic reset<br>Only three failures have automatic reset function | 0 | × | 0E12 |
| Pd.19 | Reset interval time | 2.0~20.0s | 5.0s | × | 0E13 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| Pd.20 | Confirm the time before deceleration due to overcurrent | 0~200ms | 50ms | × | 0E14 |
| Pd.21 | Run protection while powering on | 0: Not protect<br>1: Protect | 0 | ○ | 0E15 |
| Pd.22 | Run protection after switching the run command set mode | 0: Continue to run<br>1: Stop, received a new run command<br>Re-run after the command | 0 | × | 0E16 |

## PE: Run History Record

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PE.00 | Type of latest fault | 0: NULL<br>1: Uu1 bus undervoltage<br>2: Uu2 control circuit undervoltage<br>3: Uu3 poor charging circuit<br>4: OC1 acceleration overcurrent<br>5: OC2 deceleration overcurrent<br>6: OC3 constant speed overcurrent<br>7: Ou1 acceleration overvoltage<br>8: Ou2 deceleration overvoltage<br>9: Ou3 constant speed overvoltage<br>10: GF Ground<br>11: OH1 radiator overheat<br>12: OL1 motor overload<br>13: OL2 inverter overload<br>14: SC load short circuit<br>15: EF0 external fault from an serial communication<br>16: EF1 external fault on terminals<br>17: SP1 input phase loss or unbalance<br>18: SPO output phase loss or unbalance | NULL | * | 0F00 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PE.00 | Type of latest fault | (contd)<br>19: CCF1 control loop fault<br>1. The transmission between the inverter and the keypad still cannot be established 5s after powering on<br>20: CCF2 control loop fault<br>2. After connecting the inverter and the keypad, the transmission failure last for more than 2 seconds<br>21: CCF3 EEPROM failure<br>22: CCF4 AD translation exception<br>23: CCF5 RAM failure<br>24: CCF6 CPU is disturbed<br>25: PCE Parameter name replication error<br>26: Reserve<br>27: HE Hall current detection fault<br>28: De Cut-to-length detection fault<br>29: Cue Feed off fault | NULL | * | 0F00 |
| PE.01 | Output frequency when the latest fault occurs | 0~upper limit frequency | 0.00Hz | * | 0F01 |
| PE.02 | Set frequency when the latest fault occurs | 0~upper limit frequency | 0.00Hz | * | 0F02 |
| PE.03 | Output current when the latest fault occurs | 0 ~ 2 times of the rated current | 0.0A | * | 0F03 |
| PE.04 | DC busbar voltage when the latest fault occurs | 0~1000V | 0V | * | 0F04 |
| PE.05 | Service condition when the latest fault occurs | 0: StP Stop<br>1: Acc Acceleration<br>2: dEc deceleration<br>3: con Constant speed | StP | * | 0F05 |
| PE.06 | Fault history (the latest) | The same with PE.00 | NULL | * | 0F06 |
| PE.07 | Fault history 2 | The same with PE.00 | NULL | * | 0F07 |
| PE.08 | Fault history 3 | The same with PE.00 | NULL | * | 0F08 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PE.09 | Accumulated running time | 0~65530h | 0h | * | 0F09 |
| PE.10 | Cumulative power-on time | 0~65530h | 0h | * | 0F0A |
| PE.11 | Total electricity consumption (MWh) | 0~9999MWh | 0MWh | * | 0F0B |
| PE.12 | Total electricity consumption (KWh) | 0~999KWh | 0KWh | * | 0F0C |

## PF: Parameter Protection and Product Identification Information

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PF.00 | User password | 0: No password<br>Other: Password protection | 0 | ○ | 1000 |
| PF.01 | Parameter write protection | 0: All parameters are allowed to be rewritten<br>1: The funciton codes cannot be rewritten except for P0.02 and this funciton code.<br>2: All the funcion codes cannot be rewritten except for this funcion code. | 0 | ○ | 1001 |
| PF.02 | Parameter Initialization | 0: No operation<br>1: Clear the fault history<br>2: Restore factory setting (Except record \ password \ motor parameters)<br>3: Restore factory setting (Except record \ password) | 0 | × | 1002 |
| PF.03 | Parameter copy | 0: No action<br>1: All parameters download<br>2: Parameters upload<br>3: Parameters download without motor's<br>Note: Only active for LCD keypad | 0 | × | 1003 |
| PF.04 | Reserve | - | 0 | × | 1004 |
| PF.05 | Product No. 1 | 0~9999 | | * | 1005 |
| PF.06 | Product No. 2 | 0~9999 | | * | 1006 |
| PF.07 | Product No. 3 | 0~9999 | | * | 1007 |
| PF.08 | Product No. 4 | 0~9999 | | * | 1008 |

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| PF.09 | Product serial number | 0~9999 | | * | 1009 |
| PF.10 | Software version number | 0.00~99.99 | | * | 100A |
| PF.11 | Non-standard version and serial number | 0.000~9.999 | | * | 100B |
| PF.12 | Software identification code | 0~9999 | | * | 100C |

# Chapter 5 Detailed Function Introductions

## 5.1 Basic Function

| P0.00 Menu display mode | Setting range: 0~1 [0] |
|---|---|

0: Standard menu 1: Check mode menu

Notes:

- When P0.00 is set to 1, the display enters the check menu mode. In this mode, you can view and modify each modified function code by the knob adjustment. The remaining unmodified function codes will not be displayed unless you change the setting to 0 again.

| P0.01 Control mode | Setting range: 0~3 [2] |
|---|---|

0: V/F control 1: vector control
2: Reserve 3: V/F separation control

Notes:

- V / F Control: VVVF ordinary open-loop control
- Closed-loop Vector Control: Speed sensor vector control mode is for high perfomance occasion.
- V/F Separation Control: This control mode can be used in some places where the frequency and the voltage are required to control independently.

| P0.02 Frequency digital setting | Setting range: 0.00Hz ~Maximum frequency [0.00Hz] |
|---|---|

Notes:

- When P0.03 = 1, the keypad can be used to set frequency digital.
- Tips:

The P0.02 ,which is changed by the digital knob on the keypad, can work immediately. If "ENTER" is pressed , the value will be stored into the inverter's internal EEPROM and will not be lost even power outage.

| P0.03 Frequency setting source 1 | Setting range: 0~5 [1] |
|---|---|

0: NULL
1: Frequency digital setting, digital knob adjustment
2: Unipolar analog（AI1）
3: Bipolar analog（AI2）
4: Pulse input
5: Communication setting

| P0.04 Position command selection | Setting range: 0~1 [1] |
|---|---|

0: Analog position Control(AI2) 1: Pulse position control

Notes:

- Set P0.03 to 1: During keypad digital setting, in monitoring status, the frequency setting can be modified through digital knob on the keypad; when the setting frequency is related to P0.02, in monitoring status, P0.02 can be adjusted through the knob on the keypad.
- When the unipolar analog (AI1) and bipolar analog (AI2) are used, the frequency of P0.01 correspond to 10V,but also can be adjusted by P4.When the bipolar AI2 is used, the polarity represents the direction and an enable signal is enough.
- Command pulse: Speed signal is up to the pulse frequency, P5.00 selects the pulse form.

| P0.07 Control command set channel | Setting range: 0~5 [0] |
|---|---|
| 0: Keypad control | 1: Terminal control 1 (STOP invalid) |
| 2: Terminal control 2 (STOP valid) | 3: Serial communication 1 (STOP invalid) |
| 4: Serial communication 2 (STOP valid) | 5: Terminal control 3 (STOP and JOG invalid) |

Notes:

- In the keypad control mode, the user uses RUN and STOP to start and stop the driver.
- In the terminal or serial communication control mode, STOP /JOGP on the keypad is optional
- to be effective .

| P0.09 Basic frequency | 0.10 ~ 400.0Hz |
|---|---|
| P0.10 Maximum output frequency | 0.10 ~ 400.0Hz |

Notes:

- Basic frequency $F_{BASE}$: the basic frequency of the motor.
- Maximum frequency $F_{MAX}$: the corresponding value of analog 10V( Can be adjusted by P4). The maximum output frequency is limited by this parameter, Generally speaking,the maximum speed corresponds to the maximum rotate speed. The relationship of speed and frequency is as below:

$f = n * P/60$ f: frequency n: Speed P: Motor pole pairs(Poles/2)

| P0.11 Motor type | Setting range: 0~1 [1] |
|---|---|
| 0: General Motors | 1: A motor |
| 2: B motor | |

Notes:

- Select the motor type. When selecting our company's A-type or B-type motor, after setting this parameter, the motor parameters and encoder lines will be set automatically. Self-learning motor parameters is no need.

| | |
|---|---|
| P0.18 Acceleration time1 | Setting range: 0.1~3600s [6.0s] |
| P0.19 Deceleration time1 | Setting range: 0.1~3600s [6.0s] |

Notes:

- Acceleration time: the time is for the driver rising from zero to the maximum frequency.
- Deceleration time: The time is for the driver decelerating from the maximum frequency to zero .

| | |
|---|---|
| P2.13 Multi-step frequency 1~ P2.19 Multi-step frequency 7 | Setting range: 0.00~Max frequency |

Notes:

- When Setting P0.03 to 1, X terminal set the multi-frequency setting, multi-frequency setting is of a high priority to the digital frequency setting, and the low number of multi-speed is high priority as following table:

| Multi-step frequency | S1 | S2 | S3 | S4 | S5 | S6 | S7 |
|---|---|---|---|---|---|---|---|
| P2.13 | 1 | × | × | × | × | × | × |
| P2.14 | 0 | 1 | × | × | × | × | × |
| P2.15 | 0 | 0 | 1 | × | × | × | × |
| P2.16 | 0 | 0 | 0 | 1 | × | × | × |
| P2.17 | 0 | 0 | 0 | 0 | 1 | × | × |
| P2.18 | 0 | 0 | 0 | 0 | 0 | 1 | × |
| P2.19 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Note: 1 represents the effective, 0 is invalid. × is an arbitrary value

| | |
|---|---|
| P2.37 Wiring direction of motor | When setting P2.37 to 1, the output phase sequence is inverted with the actual wiring to avoid changing the wiring. |
| P2.44 Built-in PG pulse number per revolution | For speed control encoder lines |
| P2.45 PG disconnection detection time (reserve) | For changing the direction of the encoder A/B phase |
| P2.50 Motor and encoder reduction ratio | The speed ratio of motor and encorder |

Notes:

- If the postive encoder is in contrast to the postive motor, the running will be abnormal. And the motor shakes and current is large, the user changes parameter P2.45 (0 to 1,1to 0)

- If the motor runs properly but the direction is reversed, the user changes the parameter P2.37 and P2.45.
- When the encoder is not mounted on the motor shaft, please set the correct P2.50 (motor and encoder reduction ratio)

## 5.2 I/O Terminal Ctrl

| | |
|---|---|
| P3.01 X1 terminal function | 1:FWD Forward Run / Run Enable |
| P3.02 X2 terminal function | 2:REV Reverse Run / Direction |
| P3.03 X3 terminal function | 54: Control Enable |
| P3.04 X4 terminal function | 55: Exact stop spindle |
| P3.05 X5 terminal function | 56: Rigid tapping / pulse position |
| P3.06 X6 terminal function | 37: EH0 external fault normally open |
| P3.07 X7 terminal function | 6: RST Reset |

Notes:

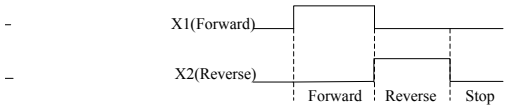
- Set the appropriate terminals to the other features when the above function is no need.
- Control sequence is as follows(P0.03 must be set to the terminal control) :

| Function | | Control Enable | X1 Forward | x2 Reverse | X4 Orientat-ion | X5 Rigid tapping / pulse position | Explanation |
|---|---|---|---|---|---|---|---|
| Forward run | Unipolar | 1 | 1 | 0 | 0 | 0 | |
| | bipolar | 1 | 1 | 0 | 0 | 0 | Analog is positive |
| Reverse run | Unipolar | 1 | 0 | 1 | 0 | 0 | |
| | bipolar | 1 | 1 | 0 | 0 | 0 | Analog is negative |
| Exact stop spindle | | 1 | × | × | 1 | × | Exact stop spindle highest priority |
| Rigid tapping (pulse position) | | 1 | × | × | 0 | 1 | |
| Free state | | 0 | × | × | × | × | Control enabled by X3 enabled, or internal enable, P3.18 = 1 (default is internal enabled) |

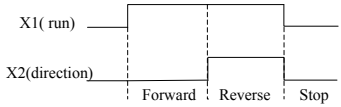
Notes: 1 represents the effective, 0 is invalid. × is an arbitrary value

When the speed is up to a unipolar analog or a digital timer ,the running command and direction is as follows:

P3.15 = 0 Forward / Reverse




P3.15 = 1 run + direction




When the speed is up to the bipolar analog to the timing, X1 runs signal, the polarity of the analog decides the running direction ,positive voltage means forward, negative voltage means reverse.

When the speed is up to the pulse, X1 runs signal, the pulse direction decides the running direction, positive pulse means forward, negative pulse means reverse.

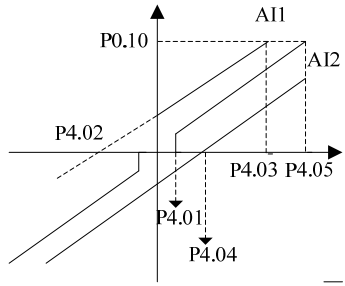
| | |
|---|---|
| P3.20 Y1 terminal function | 3: Speed reached Speed to reach a given speed range within P3.26 output valid |
| P3.21 Y2 terminal function | 2: Ready When the inverter has no fault, and ready output valid |
| P3.22 Y3 terminal function | 4: Exact stop place Exact stop position deviation in the range of P6.15 and P6.16 time after the effective output |
| P3.24 relay 1 (TA/TB/TC) | 19: Fault output |

Notes: Output terminals can also be set to the following functions
1 :Run the drive enable output is active
5 :Speed / position status output In the position control mode, the output is valid
7: 0 speed operation When the driver hasn't any speed output, the terminal output is valid

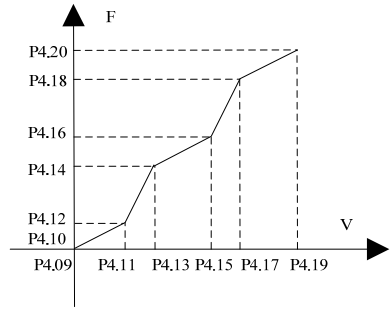
## 5.3 Analog (Group P4)

| | |
|---|---|
| P4.01 Analog zero drift value | When the analog at below this range, treated as zero(the absolute value of the bipolar) |
| P4.02 AI1 Offset | AI1 (unipolar analog) Offset |
| P4.03 AI1 maximum analog input value | Value corresponds to the maximum frequency (P0.10) analog |

| | |
|---|---|
| P4.04 AI2 Offset | AI2 (bipolar analog) offset value, adjustable analog symmetry |
| P4.05 AI2 Analog input filter time constant | Corresponding to the absolute value of the maximum frequency (P0.10) analog |




| | |
|---|---|
| P4.00 AI1 nonlinear enable | Nonlinear curve with AI1 is set to 1 |




## 5.4 Rigid Tapping and Pulse Control

### 5.4.1Analog quantity rigid tapping

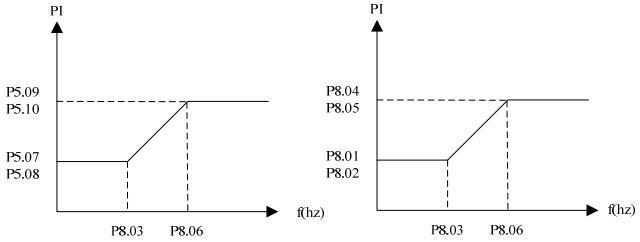
| | |
|---|---|
| P0.04 position command selection | 0：analog quantity position control（AI2） |
| P5.04 Rigid tapping（position） acceleration time | The acceration time of analog rigid tapping，the time from 0 acceleration to P5.06 |
| P5.05 Rigid tapping（position） deceleration time | The deceleration time of analog rigid tapping，the time from 0 deceleration to P5.06 |
| P5.06 The max frequency of Rigid tapping(position) | The max frequency when in analog rigid tapping mode，the corresponding frequency to AI2 10v |

Notes：

- The position loop is processed in CNC system when the frequency converter in analog quantity rigid tapping，the analog is the output of the position,which is

used to adjust the speed of spindle position loop .when X4 active high,the frequency converter run into analog quantity rigid tapping.In order to improve the resolution of the speed，usually P5.06 should not be too big，and the frequency should be linked to the max speed of rigid tapping on the system.

| | |
|---|---|
| P5.08 rigid tapping（position）Speed loop proportional gain 1 | Rigid tapping/pulse position terminal active high,the two set of parameters P5.07、P5.08andP5.08、P5.09active high；Rigid tapping/pulse position terminal active low,the two set of parameters P8.01、P8.02and P8.04、P8.05 active high；gain 1 and gain 2,integral time 1 and integral time 2 transition switch by P8.03 and P8.06.<br>The larger the gain，the better the rigid,but may cause oscillation. The smaller the gain，the better the rigid,but may cause oscillation. |
| P5.08 rigid tapping（position）Speed loop integral time 1 | |
| P5.09 rigid tapping（position）Speed loop proportional gain 2 | |
| P5.10 rigid tapping（position）Speed loop integral time 2 | |




rigid tapping/pulse position active high　　rigid tapping/pulse position active low

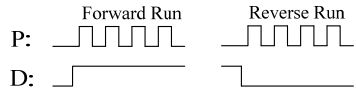
5.4.2Pulse position mode（C-Axis Function、indexing、Pulse rigid tapping）

| | |
|---|---|
| P0.04 position command selection | 1：pulse position control |
| P5.00 mode of pulse command | 0：pulse + Direction signal<br>1：Two-phase pulse (Phase A + Phase B)<br>2：CW/CCW |
| P5.01 the opposite direction of position command | 0：not<br>1：Yes |
| P5.11 Numerator of the electronic gear ratio | The actual number of pulses =the number of pulses that receives$\times \frac{P5.11}{P5.12}$ |
| P5.12 Denominator of the electronic gear ratio | |

| | |
|---|---|
| P5.19 Position loop gain | If the parameter is larger,so the rigidity will become better and follow error be smaller, but too large may cause oscillation. |
| P5.20 Position loop feed-forward gain | Increasing this parameter can be used to reduce the following error and accelerate response, but may cause overshoot |
| P5.21 The feed-forward filter time | Increasing this parameter will help reduce fluctuations that induced by feedforward, but has the potential to slow response |
| P5.22 Command filter time | Increasing this parameter the pulse command becomes smooth, but will slow response |

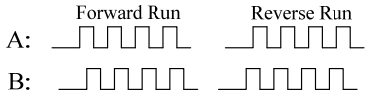
◆ mode of pulse command

0: pulse + Direction signal

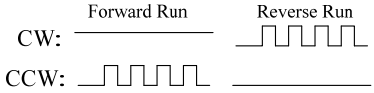



1: Two-phase pulse (Phase A + Phase B)

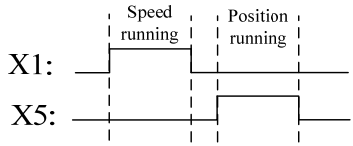
:




2: CCW pulse + CW pulse



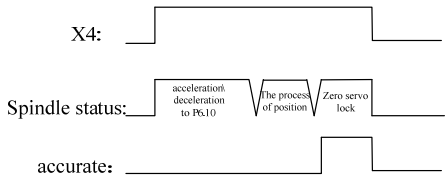

◆ Speed running mode and position running mode



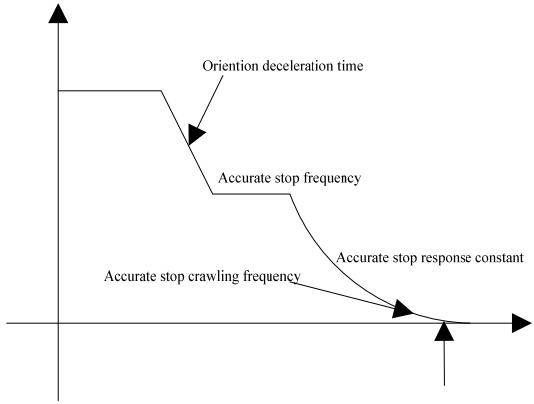
## 5.5 Spindle Orientation

| | |
|---|---|
| P6.09 Orientations direction selection | 0：current direction；<br>1：positive direction；<br>2：negative direction; |
| P6.10 Accrate stop frequency | reaching this frequency before accrate stop |
| P6.15 Orientation completed width | When the driver accurate stop and position deviation in complete range, after completion time it will send a singal of accurate stop |
| P6.16 Orientation completed time | |
| P6.17 Orientation location selection terminal filter time | This parameter indicates the time that location selection terminals to determine position when the accurate stop location is chose<br>From a plurality of locations |
| P6.18 Orientation deceleration time | This parameter indicates the deceleration time the driver used from<br>High-speed to accurate stop |
| P6.26 Orientation location 1<br>～<br>P6.33 Orientation location 8 | User can choose one position from 8 positions through the terminals |
| P6.40 Accrate stop response constant | Increasing this parameter can eliminate the overshoot caused by spindle inertia,but will slow down response |
| P6.41 a circle of pulses number | This value is 4 times frequency value.When the spindle and motor speed reduction ratio is 1:1,this value is 4 times the number of encoder line |
| P6.42 Enter zero servo lock range | The lowest frequency before accurate stop is limit at accurate stop<br>Crawling frequency,when the devitation and target position in the locking range within moment in zero lock range |
| P6.45 Accurate stop crawling frequency | |

◆ Orientation timing




◆ Orientation curve




◆ Determine the position of the spindle orientation

Spindle use encoder Z signal as the reference origin(0 pulse points)and display position to the form of pulse。For example,a ring of 4096(4 times frequency)：

$$\frac{1}{4096}\times 360^{o}=0.088^{o}$$

1、Lift the spindle orientation stop signal,so that the spindle is in free state。

2、Manual rotation so that the spindle stop at the target location(if the spindle encoder is used ,please forward rotation of the spindle in a circle above。

3、In the surveillance state press the “>>” key to switch to the current position display，and fill the value in the orientation of location parameter（P6.26-P6.33）。

4、Peform a spindle accurate stop,if there is a devitation,it can be calibrated through increasing or decreasing the number of pulses.

◆ Multi position accurate stop selection

After terminals set for 60-62 functions, user can get multi- position selection through the terminal combination. The choice of position signal must be effective before the accurate stop signal established。Terminal combination and Orientation location table as follows：

| | 60：accurate stop position 3 | 60：accurate stop position 2 | 60：accurate stop position 1 |
|---|---|---|---|
| Orientation location 1 | 0 | 0 | 0 |
| Orientation location 2 | 0 | 0 | 1 |
| Orientation location 3 | 0 | 1 | 0 |
| Orientation location 4 | 0 | 1 | 1 |
| Orientation location 5 | 1 | 0 | 0 |
| Orientation location 6 | 1 | 0 | 1 |
| Orientation location 7 | 1 | 1 | 0 |
| Orientation location 8 | 1 | 1 | 1 |

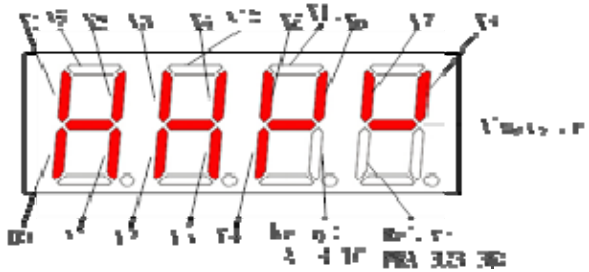
Note：“1”indicates terminal effective

## 5.6 monitoring status

| | |
|---|---|
| PC.01 Output frequency (Hz) (Before compensation) | When this parameter is set as 1 to show the parameter in the monitoring status ,press“>>”key to switch display |
| PC.02 Output frequency (Hz) (Actual) | |
| PC.03 Output current (A) | |
| PC.04 Setting frequency (Hz, Flicker) | |
| PC.05 Operating speed (r/min) | |
| PC.11 Output voltage (V) | |
| PC.12 Bus voltage (V) | |
| PC.13 AI1（V） | |
| PC.14 AI2（V） | |
| PC.19 Terminal status (no unit) | |

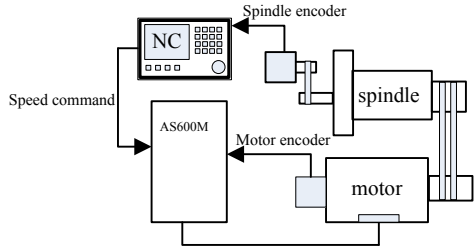
Notes:

◆ When PC.19 is set as 1, the terminal status will be displayed. If it is set as 0, the object will not be displayed.

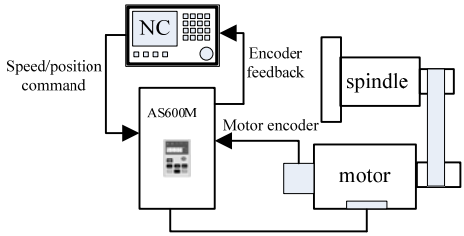


## 5.7 Recommended application

Case 1：
application：belt transmission,all CNC system
Features：the spindle speed control，low speed control and large torque，high speed maching，fast acceleration and deceleration.

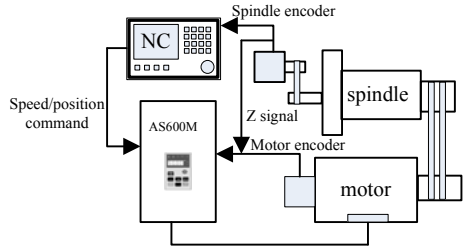



Case 2：
application：synchronous belt transmission，1：1transmission ratio，no spindle encoder.
Features：Spindle simulation/pulse speed control，accurate stop，pulse position control，realize the function of C-axis.




Case 3：
application：synchronous belt transmission or reducer transmission， transmission ratio of CNC is not 1：1.
Features：Spindle simulation/pulse speed control，accurate stop，pulse position control，

rigid tapping.If the system does not need the spindle encoder signal，user can use zero switch to replace the Z signal of the motor encoder.



# Chapter 6 Troubleshooting

## 6.1 Troubleshooting

When the driver has detected a fault, the keypad will display the fault code, and the driver will stop PWM output and come into fault protection state. In the fault indicator TRIP will flicker, the fault relay has output and the motor will coast to stop. At this time, you should find the reason of fault and apply corrective actions. If the listed troubleshooting cannot solve the problem, please contact our company directly. After debugging, you can press “STOP/RESET” or reset external terminals to restart the driver. Notes: the driver can’t startup even through debugging has been finished if operating signal isn’t removed. You should cut operating signal first and then close again or remove main circuit power supply once to make the fault reset. If the SC fault appeared, the reset is only permitted after 10 seconds. If you want to see the work condition (such as output frequency, reference frequency, output current, bus voltage., etc) or contents of the latest three faults, please press “PRG/ESC ” to enter program state and then turn the knob to see parameter value of function code PE.00~PE.08.

Table 6-1 Troubleshooting

| Fault Display | Name of Protection | Possible Cause to Fault | Countermeasure |
|---|---|---|---|
| Uu1 | Busbar under-voltage | ● The input voltage is abnormal | ● Check the voltage of power supply<br>● Check and test the electrical level setting |
| Uu2 | The control circuit is poor | ● The control circuit under-voltage | |
| Uu3 | The charging circuit is poor | ● The contactor doesn’t pull in. | ● Check the charging circuit |
| OC1 | Overcurrent during the acceleration | ● The acceleration time is too short<br>● The V/F curve is not appropriate<br>● The power voltage is low<br>● The driver power is too small<br>● The driver output load is short-circuited. | ● Increase the acceleration time<br>● Adjust the V/F curve setting and have the appropriate torque boost setting<br>● Check the input power supply<br>● Select the driver with the larger power<br>● Check the motor coil resistance and the motor insulation |

| Fault Display | Name of Protection | Possible Cause to Fault | Countermeasure |
|---|---|---|---|
| OC2 | Overcurrent during the deceleration | ● The deceleration time is too short<br>● The load inertia torque is large<br>● The driver power is too small<br>● The driver output load is short-circuited | ● Increase the deceleration time<br>● Add the appropriate brake components additionally<br>● Select the driver with the larger power<br>● Check the motor coil resistance and the motor insulation |
| OC3 | Overcurrent during the constant-speed operation | ● Abnormal load<br>● The acceleration or deceleration time is set to be too short<br>● The power voltage is low<br>● The driver power is too small<br>● The driver output load is short-circuited | ● Check the load<br>● Increase the acceleration or deceleration time appropriately<br>● Check the input power supply<br>● Select the frequency-driver with the larger power<br>● Check the motor coil resistance and the motor insulation |
| Ou1 | Overvoltage during the acceleration | ● The input voltage is abnormal<br>● The acceleration time is too short<br>● The stalling overvoltage point is too low | ● Check the input power supply; check & test the electrical level setting<br>● Increase the acceleration time appropriately<br>● Raise the stalling overvoltage point |
| Ou2 | Overvoltage during the deceleration | ● The input voltage is abnormal<br>● The deceleration time is too short<br>● The load inertia torque is large<br>● The stalling overvoltage point is too low | ● Check the input power supply; check & test the electrical level setting<br>● Increase the deceleration time appropriately<br>● Add the appropriate brake components additionally<br>● Raise the stalling overvoltage point |

| Fault Display | Name of Protection | Possible Cause to Fault | Countermeasure |
|---|---|---|---|
| Ou3 | Overvoltage during the constant-speed operation | ● The input voltage is abnormal<br>● The acceleration or deceleration time is too short<br>● The load inertia torque is large<br>● The stalling overvoltage point is too low | ● Check the input power supply; check & test the electrical level setting<br>● Increase the deceleration time appropriately<br>● Add the appropriate brake components additionally<br>● Raise the stalling overvoltage point |
| GF | Output earthing | ● The output earthing current exceeds the specified value | ● Check whether the motor insulation has become poor<br>● Check whether the connection line between the driver and the motor is damaged |
| OH1 | Heat radiator overheating | ● The environment temperature is too high<br>● The air duct is blocked<br>● The fan works abnormally/ is damaged | ● Reduce the environment temperature<br>● Clear the air duct<br>● Replace the fan |
| OL1 | Motor overloaded | ● The driver output exceeds the motor overload value<br>● The V/F curve is inappropriate<br>● The power grid voltage is too low<br>● The ordinary motor operates at the low speed and with the large load for a long time<br>● The motor stalls or the load becomes too large suddenly | ● Reduce the load<br>● Adjust the V/F curve and the torque boost<br>● Check the power grid voltage<br>● Select the special motor<br>● Check the load |

| Fault Display | Name of Protection | Possible Cause to Fault | Countermeasure |
|---|---|---|---|
| OL2 | Driver overloaded | ● The driver output exceeds its overload value<br>● The DC brake quantity is too large<br>● The V/F curve is not appropriate<br>● The power grid voltage is too low<br>● The load is too large<br>● The acceleration time is too short<br>● The current limit level is too low | ● Reduce the load and increase the acceleration time<br>● Reduce the DC brake current and increase the brake time<br>● Adjust the V/F curve and torque boost<br>● Check the power grid voltage<br>● Select the driver with the larger power<br>● Increase the acceleration time<br>● Raise the current limit level |
| SC | Load short-circuit/output earthing short-circuit | ● The driver output load is short-circuited<br>● The output side earthing is short-circuited | ● Check whether the connection cable between the driver and the motor is damaged<br>● Check the motor coil resistance<br>● Check the motor insulation |
| EF0 | External fault with the RS485 serial communication | ● The serial (MODBUS) transmission error<br>● Fault caused by the external control circuit | ● Set the correct timeout detection time or set the Pb.03 timeout detection time as 0.0s<br>● Check the external control circuit<br>● Check the input terminal conditions. If terminals are not used but the fault is still displayed, please seek the technical support for settlement. |
| EF1 | External fault with terminals X1~X5 | | |
| SP1 | Input phase loss or imbalance | ● Input R,S & T phase loss or imbalance | ● Check the input voltage<br>● Check the input connection line |
| SP0 | Output phase loss or imbalance | ● Output U,V,W phase loss or imbalance | ● Check the output connection line<br>● Check the motor and cable insulation |

| Fault Display | Name of Protection | Possible Cause to Fault | Countermeasure |
|---|---|---|---|
| CCF1 | Control circuit fault 0 | ● Transmission between the driver and the keypad cannot be established within 5s after power is supplied (when power is just supplied) | ● Re-connect the keypad<br>● Check the connection line<br>● Replace the keypad<br>● Replace the control board |
| CCF2 | Control circuit fault 1 | ● The -driver and the keypad communicate once after power is supplied, but the transmission fault afterwards last for at least 2s (in operation) | |
| CCF3 | EEPROM fault | ● EEPROM fault with the control board of driver | ● Replace the control board |
| CCF4 | AD conversion fault | ● AD conversion fault with the control board of driver | ● Replace the control board |
| CCF5 | RAM fault | ● RAM fault with the control board of driver | ● Replace the control board |
| CCF6 | CPU disturbance | ● Serious disturbance<br>● MCU reading & writing error with the control board<br>● The communication line is connected reversely or the DIP switch is at wrong position. | ● Reset via the button “STOP/RESET”<br>● Add the power filter at the power side additionally<br>● Seek the technical support |
| PCE | Parameter copying error | ● Error with the parameter copying between the keypad and EEPROM of the control board<br>● EEPROM of the control board is damaged | ● Repeat the copying operation<br>● Replace the control board<br>● Seek the technical support |
| HE | Current detection fault | ● Fault with the driver current detection circuit<br>● The Hall components are damaged | ● Replace the driver<br>● Seek the technical support |

Note:

① The products whose power is low including 3022G/3030P and below modes won't display these fault codes Uu2 and Uu3.

② The standard LED Keypad cannot copy the parameter ,while the apolegamic LCD keypad has this function.

## 6.2 Warning Display and Explanation

After warning action, warning code is displayed and flickering, but the driver is not in fault-protecting state. In other words, PWM output will not be closed off, fault relay will not act. In addition, the driver would automatically return to prevenient operation state after the warning cause is removed.

The following table lists different kinds of Warnings.

Table 6-2 Warning display and description

| Alarm Display | Display Content | Description |
|---|---|---|
| Uu | Under-voltage detection | Under-voltage is detected. The driver can still work in this case. |
| OLP2 | Driver overload pre-alarm | The driver working current is over the overload detection level and the duration is over the overload detection time. In this case, the driver can still work. |
| OH2 | Heat radiator temperature too high | The heat radiator temperature is larger than the OH2 detection benchmark. In this case, the driver can still work. |
| AE1 | Analog signal 1 is abnormal | The input analog signal in the analog input signal passage AI1 exceeds the allowed maximum range of -0.2~+10.2V. |
| SF1 | Function code setting is inappropriate | For example, for the I/O terminal, SS0-2 and TT0-1setting is not incomplete |
| SF2 | The running mode selection is inconsistent with the terminal setting | The operation manner setting is inconsistent with the setting of terminal X1~X10. |
| SF3 | The choice of Output terminal is wrong, which only occures in the 35 R5GB and above models | The driver has three open-collector outputs, their output terminals D0、Y1、Y2、Y3 are programmable and multifunctional terminals. The user can choose to output a part of Control and monitoring signals.The content of the function definition must be same, which is 26 or 27, to make the combination of D0,Y1,Y2 and Y3 effective When setting up an open-colletor output for the program runs instructions or fault indicator. |
| AtE | Parameter auto-tune is abnormal | The parameter auto-tune is abnormal. The driver will exit from the parameter tuning automatically. |

## 6.3 Motor's Faults and Corrective Measure

If the motor has one of the following faults, please find the reason and take corresponding corrective measure. Seek for technical support if the measure does not work

Table 6-3 Motor fault and corrective measure

| Fault | Check Content | Corrective Measures |
|---|---|---|
| The motor failsto run | Check whether the power is supplied to the power terminals R, S and T and whether the CHARGE LED indicator light is on. | ● Be connected to the power supply<br>● Disconnect the power supply and then be connected to it again.<br>● Check the power voltage<br>● Check whether the terminal screws have been tightened |
| The motor failsto run | Test whether the voltage of terminals U, V and W is correct with the rectifier voltmeter | ● Disconnect the power supply and then be connected to it again. |
| | Check whether the motor has been locked due to overload | ● Reduce the load and remove the lockout |
| | Check whether there is fault display on the keypad and whether the TRIP light is flickering | ● Search Table 6-1 according to the fault codes |
| | Check whether there is the operation command | ● Check whether the operating terminal connection lines are connected reliably |
| | Check whether the anti-reverse selection setting conflicts with the direction command | ● Set the reverse allowing or change the direction command |
| | Check whether the terminal operation signal is disconnected first and then connected after the fault occurs | ● The terminal operation signal is disconnected first and then connected |
| | Check whether the given frequency voltage is input | ● Check the given frequency voltage |
| | Check whether the operation manner is set correctly | ● Input the correct setting |
| The motorrotates reversely | Check whether the connection lines of terminals U, V and W are correct | ● Adjust the corresponding connection lines of terminals U, V and W<br>● Adjust the function code P2.45 |
| The motor rotates but cannot change the speed | Check whether the connection lines of frequency reference circuit are correct | ● Correct the connection lines |
| | Check whether the load is too large | ● Reduce the load or increase the acceleration or deceleration time |
| The motor rotating speed is too high or too low | Check whether the maximum output frequency setting value is correct | ● Check the maximum output frequency setting value |
| | Check whether the voltage drop between the motor terminals is too large with the rectifier voltmeter | ● Check the V/F characteristic value |

| Fault | Check Content | Corrective Measures |
|---|---|---|
| The motor rotating speed is unstable during operation | Check whether the load is too large | ● Reduce the load |
| | Check whether the load variation is too large | ● Reduce the load variation |
| | Check whether there is phase loss with the three-phase power | ● Check whether there is phase loss with the connection lines of the three-phase power<br>● For the single-phase power, connect the AC reactor to the power supply |
| | The frequency giving source is unstable | ● Check the frequency giving source |
| There is too much noise with the motor | The bearing is worn, lubrication is poor , and the rotor is eccentric | ● Repair the motor |
| | The carrier frequency is too low | ● Increase the carrier frequency |
| There is too large vibration with the motor | Mechanical resonance | ● Adjust the leaping frequency |
| | The machine legs are not even | ● Adjust the machine legs |
| | The three-phase outputs are imbalanced | ● Check the driver output |

# Chapter 7 Peripheral Equipment

## 7.1 Peripheral Equipment Connection Diagrams

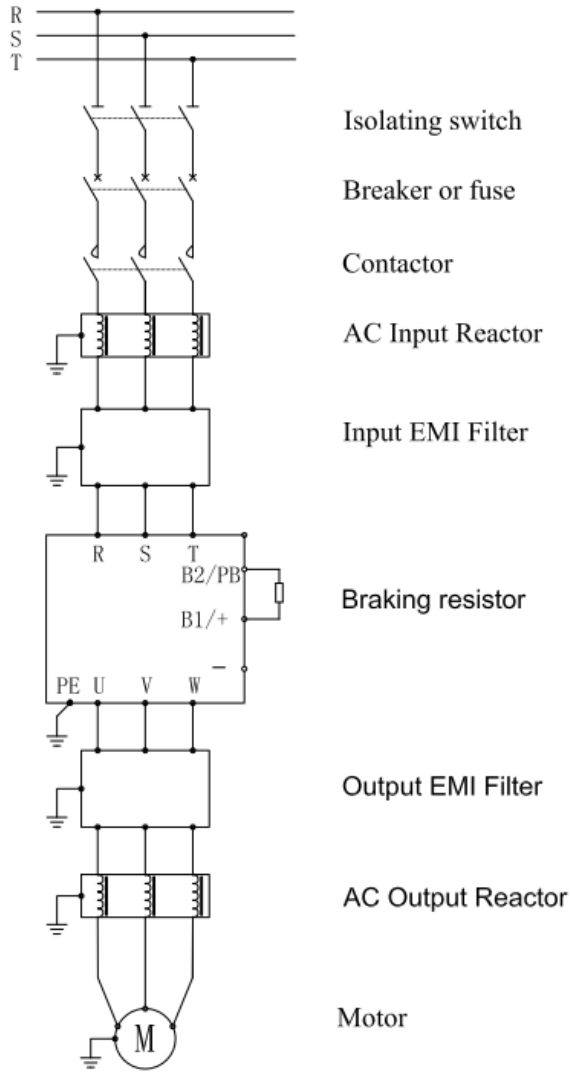



Figure 7-1 004T3E～015T3E Peripheral Equipment Connection Diagram

## 7.2 Function of Peripheral Equipment

Table 7-1 Function of Peripheral Equipment

| Peripheral Equipment & Optional parts | Description |
|---|---|
| **Breaker** | It is used to cut off the fault current of the driver rapidly and prevent the power fault caused by fault with the driver and its circuits. |
| **Contactor** | It is used to cut off the main power supply at the time of driver fault and prevent power failure & restarting after the fault |
| *** AC Reactor** | It is used to improve the input power factor, reduce the higher harmonic and inhibit the power surge |
| ***EMI Filter** | It is used reduce the radio disturbance caused by the driver. When the wiring distance between the motor and the driver is less than 20m, it is suggested to be connected to the power supply side; when the distance is over 20m, is suggested to be connected at the output side. |
| *** Braking Unit and Braking resistor** | They are selected and used when the braking torque cannot meet the requirements, and are applicable on occasions of high-inertia load & frequent braking or rapid stop. |

Remarks: *-marked items are optional parts.

### 7.2.1 AC Input Reactor

Using AC input reactor can restrain higher harmonic wave and improve power factor obviously. In the following situation, users are advised to use ac reactor.

- Power supply capacity: Driver capacity>10:1
- Silicon controlled load and switching controlled power factor compensator are on the same power supply line.
- Degree of three-phase voltage imbalance is more than 3%

### 7.2.2 Braking Unit and Braking resistor

Brake units are in-built in this series of drivers whose power rating is 15kW and below. When dynamic braking is required, the user just has to connect the braking resistor. There are not in-built brake units with the drivers of 18kW and above. When the dynamic braking is required, the additional braking unit should be connected. The braking unit consists of the control part, the driving part and the discharging resistance. The control part should be adjusted according to the overvoltage protection action values for this series of drivers. If the discharging resistance part is provided with the overheating protection, it is suggested that the controlling connection point be connected to the main control circuit.

Refer to the following table for common braking resistors specifications.

Table 7-2 Motor power and brake resistor selection

| Voltage (V) | Motor Power (kW) | Resistance Value (Ω) | Resistance Power (kW) |
|---|---|---|---|
| Three- phase 380V | 4 | 50 | 1 |
| | 5.5 | 50 | 1 |
| | 7.5 | 50 | 1 |
| | 11 | 40 | 1.5 |
| | 15 | 40 | 2 |
| | 18.5 | 30 | 4 |
| | 22 | 30 | 4 |
| | 30 | 20 | 6 |

At braking, the regenerated energy of motor is almost consumed on the braking resistor. The braking power can be calculated according to the following formula:

$$U * U / R = Pb$$

In the formula, R is the value of selected braking resistor, U is the braking voltage at stable braking of the system (it varies with different systems; for the 380VAC system, it is generally taken as 700V), and Pb is the braking power. Theoretically, the power of braking resistor is the same with the braking power, but generally 70% of it will be used. Power required by the braking resistor can be calculated according to the following formula:

$$0.7 * Pr = Pb * D$$

In the formula, Pr is power of the braking resistor, and D is the braking frequency (proportion of the regeneration process in the whole working process), which can be selected according to the following table:

Table 7-3 Reference for Braking Frequency

| Application Occasion | Elevator | Uncoiling & Coil Taking | Centrifuge | Accidental Braking Load | General Application |
|---|---|---|---|---|---|
| Braking Frequency | 20%~30% | 20~30% | 50%~60% | 5% | 10% |

### 7.2.3 Leakage Protector

There is direct earth safety capacitor or distributed capacitor inside the driver, the motor and with the input & output lead wires. At the same time this series of drivers is of low-noise type, and the higher carrier wave is used. Thus, the earth leakage current

of the driver is large, which is more obvious for the large capacity drivers. Sometimes, it may cause mistaken action of the leakage protection circuit.
In the above cases, not only the carrier frequency should be reduced appropriately, the lead wire should be shortened and the output reactor as well as the leakage protector should be installed. When the protector is installed, attention should be paid to the following points:
The leakage protector should be installed at the input side of driver and had better behind the breaker.
The leakage protector functioning current should be 10 times larger than the leakage current of this circuit under the fundamental frequency power supply and with the driver unused (total leakage current of circuits, EMI filter and motor, etc).

### 7.2.4 Capacitor Box

This optional device is applied specially on occasions where continuous operation is required as there is relative long momentary power off over 20ms. It can be purchased from our company. In the purchase order, please specify the actual load and the continuous operation time required after power off, so we can manufacture it appropriately.
As the capacitance box may influence some parameters in driver after it is assembled, the purchasing without our instruction is not recommended.

# Chapter 8 Maintenance

**Danger**

1. Please do not touch the terminals of driver, which are provided with the high voltage.
   There is the danger of electric shock.
2. Before power is supplied, please do install the terminal casing well. When the casing is dismantled, please do cut off the power supply.
   There is the danger of electric shock.
3. Maintenance and inspection cannot be started until the main circuit power supply is cut off and the CHARGE LED indicator light is confirmed to go out.
   There is the danger of residual voltage on the electrolytic capacitor.
4. Non-professionals are not allowed to do the job of maintenance and inspection.
   There is the danger of electric shock.

**Caution**

1. As the CMOS integrated circuit is installed on the keypad panel, the control circuit board and the driving circuit board, please pay special attention when they are used. If the circuit boards are touched with the finger directly, the integrated chips on them may be damaged by the electrostatic induction.
2. Please do not change the connection lines or dismantle the terminal lines when power is supplied.
   There is the danger of electric shock.
3. Please do not check the signal during operation. Otherwise, the equipment may be damaged.

## 8.1 Inspection and Maintenance

Driver is a typical product which combines the power electronics technology with the microelectronics technology. Therefore, it double features with industrial Equipment and microelectronics Equipment. The change of environment such as temperature, humidity, smog and internal components aging will cause kinds of faults to the driver. For long time reliable operation, daily inspection and regular maintenance (at least 3 or 6 months interval) is needed.

### 8.1.1 Daily Inspection

Before driver running, please check below:

- Whether there is abnormal sound or vibration with the motor;
- whether the driver and the motor heat up abnormally;
- whether the environment temperature is too high;
- whether the load ammeter indicates the same value as usual:
- whether the cooling fan of driver operates normally;
- Whether the braking resistor has the good earthing insulation.

The daily maintenance and inspection content is showed in Table 8-1.

Table 8-1 Content and Notice for Daily Maintenance & Inspection

| No. | Inspection Item | Inspection Part | Inspection Content | Judgment Standard |
|---|---|---|---|---|
| 1 | Display | LED Monitor | Whether the display is abnormal. | Determine according to the use state (e.g. when nothing is displayed after power is supplied, the braking resistor and the earthing insulation can be checked ) |
| 2 | Cooling System | Fan | Check whether it rotates flexibly, whether there is abnormal sound, and whether it is jammed by dust. | No abnormality |
| 3 | Driver Body | Inside the Machine Case | Temperature rising, abnormal sound, peculiar smell and accumulated dust | No abnormality |
| 4 | Working Environment | Surrounding Environment | Temperature, humidity, dust and harmful gas, etc | According to Clause 2.2 |
| 5 | Voltage | Input & Output Terminals | Input and output voltage | According to the technical specifications in Appendix 2 |
| 6 | Load | Motor | Temperature rising, abnormal sound and vibration | No abnormality |

### 8.1.2 Regular Maintenance

The power supply must be cut off before regular maintenance. Only after the monitor has no display and charge LED has gone off 5~10 minutes can the maintenance begin. Otherwise, you will risk electric shock because there are storage capacitors within the driver that will hold charge even after the input power is disconnected.

The regular maintenance contents and cautions are listed in Table 8-2.

Table 8-2 Content of Regular Maintenance & Inspection

| Inspection Item | Inspection Content | Countermeasure |
|---|---|---|
| Screws of main circuit terminals and control circuit terminals | whether the screws are loosened | Tighten them with the screwdrivers |
| Heat Radiator | whether there is dust | Purge it with the 4~6kg/cm$^2$ dry compressed air |
| PCB (Printed Circuit Board) | whether there is dust | Purge it with the 4~6kg/cm$^2$ dry compressed air |
| Cooling Fan | whether it rotates flexibly, whether there is abnormal sound or vibration, and whether there is accumulated dust or blocking object | Replace the cooling fan and clear the dust & foreign objects |
| Power device | whether there is dust | Purge it with the 4~6kg/cm$^2$ dry compressed air |
| Electrolytic Capacitor | Check whether there is color variation, peculiar smell, bubbles and liquid leaked, etc. | Replace the electrolytic capacitor |
| Braking resistor | whether the earthing insulation is good | Put the braking resistor at the dry and insulated place |

During the inspection, elements cannot be dismantled or shaken casually. Moreover, connectors cannot be pulled out casually. Otherwise, the driver may not be able to run normally or may enter the fault display state. Even, components faults may be caused or the main switch device IGBT module or other elements may be damaged.

When measurement is required, it should be noted that results with great difference may be got with different instruments. It is recommended that the moving-coil voltmeter be used to measure the input voltage, the bridge voltmeter be used to measure the output voltage, clamp-on ammeter be used to measure the input & output current, and the electric wattmeter be used to measure the power. If conditions are inadequate, the same meter can be used for measurement and record should be reserved to facilitate comparison.

If the waveform test is required, it is suggested the oscilloscope with the scanning frequency larger than 40MHz be used. When the instantaneous waveform is tested, the oscilloscope with the frequency over 100MHz should be used. Before the test, electric isolation should be done for the oscilloscope.

The recommended connection for the electrical measurement of the main circuit is as below Fig 8-1, the instruction is shown in Table 8-3.connection

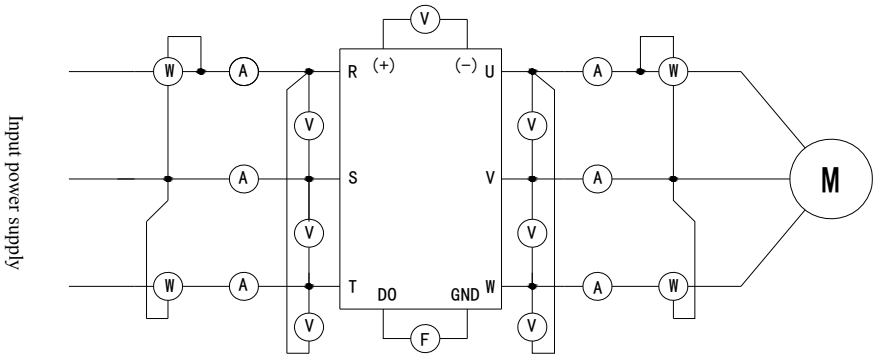
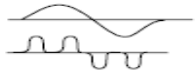
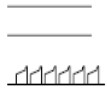
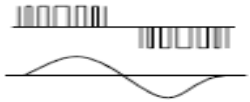



Figure 8-1 The recommended connection

Table 8-3 The insturction for the electrical measurement of the main circuit

| Item | | Input(Power) | | | DC Middle stage | Output（Motor） | | | D0 |
|---|---|---|---|---|---|---|---|---|---|
| Wave | Voltage |  | | |  |  | | | |
| | Current | | | | | | | | |
| Measuring instrument | | voltmeter | ammeter | Wattm-eter | DC voltmeter | Voltmeter | ammeter | wattmeter | voltmeter |
| Instrument type | | Moving coil | Electro-magne-tic | Dynamo -electric | Magnetoelec -tric | rectifier | electrom agnetic | Dynamoel-ectric | Agnetoele-ctric |
| Measured parameter | | Fundame-ntal wave effective value | total root mean square | total effective power | DC voltage | Fundament al wave effective value | total root mean square | total effective power | DC Voltage |

In the case of serious power supply asymmetry or three-phase current imbalance, it is suggested the three-wattmeter method be used to measure the power.

As the electric insulation test and the dielectric strength test have been done for the product before it leaves the factory, the users don't have to do such tests again. Moreover, such tests will reduce the insulation and voltage withstand performance of the product. If such tests are conducted inappropriately, product elements may even be damaged. If such tests have to be done really, it is suggested they be conducted by the skilled technicians.

If the main circuit voltage withstand test is to be done, the withstand voltage tester with

the time & leakage current settable and the similar capacity should be used. The test may reduce the life of product. If the main circuit insulation test is to be done, the main circuit terminals R, S, T, U, V, W, PB(P1), + and – etc should be short-circuited reliably and then the meg-ohmmeter with the near voltage grade (250V for 220V, 500V for 380V, and 1000V for 660V) should be used for measurement. The control circuit should be measured with the resistance shift of the universal meter instead of the meg-ohmmeter.

For the 380V main circuit, the ground insulation resistance should not be less than 5 MΩ; for the control circuit, the ground insulation resistance should not be less than 3 MΩ.

### 8.1.3 Regularly-replaced Elements

To ensure the long-term and reliable operation of driver, regular care and maintenance should be carried out for internal electronic elements of the driver. The life of these electronic elements varies with the environment and conditions where the drivers are used. Generally, if the driver is used continuously, the elements can be replaced according to the following table, which also depends on the using environment, load conditions and driver state, and other specific conditions.
As showed in Table 8-4, the maintenance term is just for user's reference when it is used.

Table 8-4 Replacement Time for Wearing Elements of Driver

| Name of Element | Standard Years for Replacement |
|---|---|
| Cooling Fan | 2~3 years |
| Electrolytic Capacitor | 4~5 years |
| Printed Circuit Board | 5~8 years |

## 8.2 Storage and Protection

If the driver is not used immediately after purchased and has to be stored temporarily or permanently, the following should be done:

- It should be put in the place within the specified temperature & humidity scope, without damp, dust and metal dust, and with good ventilation.
- If it is unused for over one year, the charging test should be conducted to restore the characteristics of electrolytic capacitor of the main circuit. During charging, the input voltage of the driver should be increased to the rating value slowly with the voltage regulator. The energizing time should be at least 1~2 hours.
- The above test should be conducted at least once a year.
  The voltage withstand test cannot be conducted casually, as it will reduce the life of driver and even damage the elements. For the insulation test, the 500V mega-ohmmeter whose insulation resistance is not less than 4 MΩ can be used.

# Chapter 9 Quality Guarantees

**The quality guarantees of this product follows the regulations below:**

The guarantee scope involves only the frequency inverter body. The guarantee period, starting from the date when it is delivered from the company, is 12 months after the product is purchased but is not beyond 24 months after the manufacture date on the nameplate.

For faults caused by the following reasons, the product will be repaired with charge even if it is still within the guarantee period:

- problems caused by incorrect operation or unauthorized repair or alteration;
- problems caused as the frequency inverter is used beyond the standard requirements;
- damage caused as it falls down or is carried violently after purchased;
- element aging or fault caused as it is used in the environment inconsistent with the requirements of the user manual ;
- damage caused by foreign objects (e.g. insects, etc) into the inverter;
- damage of inverter caused by the wrong wire connection;
- Faults caused by the earthquake, fire, storm & flood disaster, lightning strike, abnormal voltage or other natural disasters and reasons accompanying the disasters.

  For the product with faults, our company is entitled to entrust other agencies to do the job of guarantee maintenance.

  If the fault is surely included in the quality guarantees content of our company and the product is used domestically:
- guaranteed replacement, return and repair within one month after the product is delivered;
- guaranteed replacement and repair within three months after the product is delivered;
- guaranteed repair within 12 months after the product is delivered

  If the product is delivered overseas, guaranteed repair will be applied within 3 months after it is delivered. Relevant service expense will be calculated according to actual conditions. If there is an agreement, the expense will be settled according to the agreement in priority.

  All our sales departments and agencies over China can provide the after-sale service for the product.

**Additional Remarks:**

About liability exemption

- Our company shall not be liable for results caused or induced by violation of the user manual when the product is used;
- Our company shall not be liable for compensation for the loss or involving and ongoing damage caused to the user by the product faults.

**About User Instruction Manual:**
The user instruction manual is applicable to the series of products.
Our company has the lifelong liability for the product and provides all services related to use of this product.
Although the product is designed and manufactured with the strict quality control system, our company should be consulted first if it serves the following purposes that may endanger the human body or the life as a result of faults or operation mistakes.

- Used for the transport equipment;
- Medical device;
- Nuclear and power equipment;
- Aviation and aerospace device;
- Various safety devices;
- Other special purposes

**About hope for the User:**

We hope vast users can propose suggestions on our product design, performance, quality and service, which will be greatly appreciated.

# Appendix 1 External Dimension and Installation Dimension

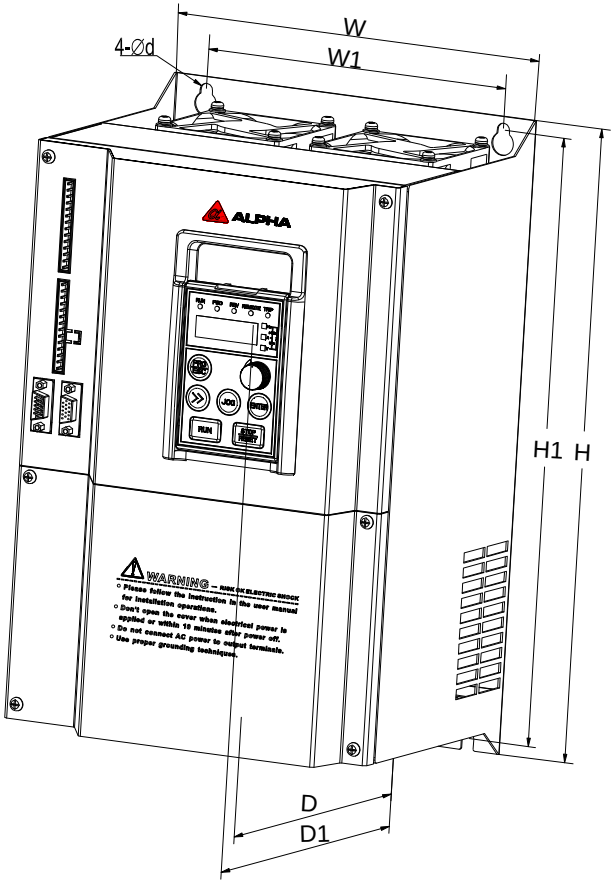



Figure A1-1 Schematic outline

Table A1-1 External Dimension (unit: mm)

| Specifications | H | H1 | W | W1 | D | D1 | d |
|---|---|---|---|---|---|---|---|
| 004T3E | 235 | 217.5 | 130 | 90 | 165.7 | 181.6 | 5 |
| 5R5T3E-7R5T3E | 298 | 284.5 | 180 | 135 | 178 | 193.6 | 5 |
| 011T3E-015T3E | 375 | 360 | 235 | 193 | 212 | 227 | 8 |
| 018T3E-030T3E | 460 | 440 | 285 | 230 | 266 | 281 | 8 |

# Appendix 2 Use of MODBUS Communication

These series drivers can use the programmable logic controller (PLC) and other upper devices to conduct the data exchange through MODBUS communication protocol.

- Constitution of MODBUS Communication

  The communication data bus consists a main controller (PLC) and 1~31 drivers. The signal is transmitted from the main controller and the driver responds to it.

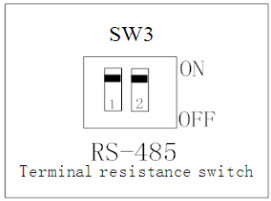
  The main controller conducts the signal transmission with maximum 31 drivers. All drivers should have their own address codes. The main controller transmits signals according to the specified codes. The drivers will function after receiving the commands from the main controller and feedback the response to the main controller.

- Communication Standard

| | |
|---|---|
| Interface | RS-485 |
| Communication Manner | Asynchronous and half-duplex |
| Communication Parameters | Speed: selected from 1200/2400/4800/9600/19200/38400bps<br>Parity Check Selection: even / odd/ none<br>Data length: 8 bits fixed,<br>Stop Bit: 1 bit fixed |
| Communication Protocol | MODBUS-RTU Mode |
| Number of Connectable Drivers | 31 |

Description of the communication connecting terminal

MODBUS communication uses 485+ and 485- terminals. Besides, the control board of the driver is equipped with terminal resistors: when multiple drivers in this series are connected using RS485 bus communication, from the perspective of PLC, the drivers regarded as the terminal should keep its SW3 at ON position. .




- Notice for Wring

(1) The communication cables should be separated from the main circuit cables, other power cables and electric cables.

(2) Shielded cables should be used as the communication cables. The shielding layer should be connected to the earthing terminal of driver, while the other end will not be connected. (To prevent malfunction caused by disturbance)

The sequence to have communication with PLC is as follows:

1. When the power supply is cut off, connect the communication cable between PLC and driver.
2. Supply the power.
3. Set the parameters required by communication on the keypad (P0.03~P0.07).
4. Cut off the power supply and wait until keypad display disappears completely.
5. Switch on the power supply again.
6. Conduct the communication with PLC.

- Setting of Communication Parameters

To communicate with PLC, communication-related parameters should be set. All the parameters cannot be changed during running except for Pb.01 and Pb.04 and can be changed during stop state. Pb.01 and Pb.04 can be changed during driver running.
"○" means that the parameters can be changed during inverter running and stop state;
"×" means that the parameters cannot be changed during running;

| Function code | Parameter name | Setting range | Factory setting | Modify flag | Modbus address |
|---|---|---|---|---|---|
| P0.03 | Speed command selection | 0: NULL<br>1: Frequency digital setting, digital knob adjustment<br>2: Unipolar analog（AI1）<br>3: Bipolar Analog（AI2）<br>4: Pulse input<br>5: Communication setting | 1 | × | 0002H |
| P0.07 | Control command set channel | 0: Keypad control<br>1: Terminal control 1 (STOP key is inactive)<br>2: Terminal control 2 (STOP key is enabled)<br>3: Serial communication 1 (STOP key is inactive)<br>4: Serial communication 2 (STOP key is enabled)<br>5: Terminal control 3 (STOP and JOG keys are inactive) | 0 | × | 0001H |

*Note 1: Only when the "Communication setting" passage is selected, can the command be written into the corresponding register. Otherwise, 02h will be reported.

*Note 2: If the Baud rate selection and the parity check selection are revised, new setting will not become effective until the driver is stopped first and then restarted.

Setting of these two items for the upper and lower computers should be the same. Otherwise, communication cannot be established or there will be errors with communication.

*Note 3: When the driver address is set as 0, the driver will not receive the communication command, including the broadcast command. When the driver address is larger than 0, the new address will become effective once it is revised.

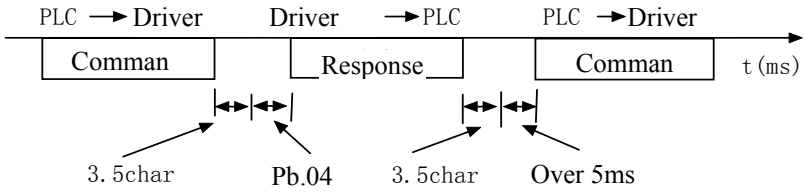
*Note 4: To match with other frequency communication command, please set the frequency communication command unit .For examples, when the frequency of 50HZ and PLC trasmission frequency of 01F4H is set, 1 is selected. The driver change to 50HZ after receiving the frequency comman; If the transmission frequency is 1388H ,0 is selected and the system deal with it as 50HZ.

- Transmission Period Limit
  In order to reduce the packet loss ratio caused by the communication disturbance and get the best communication effect, please limit the data transmission period in the host station to ensure both data transmission and receiving are normal.

| Pb.00 baud rate selection | Minimum transmission period limit (ms) （only even parity check） | Suggestion transmission period limit( ms) （all parity check） |
|---|---|---|
| 0：1200 | 220ms | 250ms |
| 1：2400 | 110ms | 150ms |
| 2：4800 | 65ms | 100ms |
| 3：9600 | 50ms | 90ms |
| 4：19200 | 35ms | 80ms |
| 5：38400 | 17ms | 50ms |

*Notes：With the even parity check manner selected, the user can obtain the quickest communication response.
The minimum transmission period limit includes the time from the transimisson to receiving the corret data.
If the transmission period limit is below the minimum transmission period limit, the main receiving data may be garbled.

- Command Formatting
  During communication, the main controller (PLC, etc) gives commands to drivers, and the drivers respond to them. As the command function content varies, the length of data will vary as well.
  The process constitutes the information transmission & receiving as showed in the following figure. The interval between two commands should maintain the time recorded below.




Driver address: driver address (0 ~ 31)

When it is set to 0, commands are transmitted together in the broadcast manner. Even if the broadcast command is received, the driver will not give response.

- Command Code

  There are four types of MODBUS command codes supported by the series of drivers, which are showed as follows:

| Command Code (16 bits ) | Function | Command Length (BYTE) | | Normal Response Length (BYTE) | | Abnormal Response Length (BYTE) | |
|---|---|---|---|---|---|---|---|
| | | Minimum | Maximum | Minimum | Maximum | Minimum | Maximum |
| 03H | Reading Record | 8 | 8 | 7 | 7 | 5 | 5 |
| 06H | Single Character Writing | 8 | 8 | 8 | 8 | 5 | 5 |
| 08H | Loopback Test | 8 | 8 | 8 | 8 | 5 | 5 |
| 10H | Writing Record | 11 | 11 | 8 | 8 | 5 | 5 |

CRC-16 method

The calculation method for CRC-16 used by MODBUS communication is as follows:

1) Generally, when CRC-16 is calculated, its initial value is 0, and the initial value of the communication terminal series is set as 1. (1 for 16 bits)
2) LSB according to the inverter address is MSB, and the final data MSB uses LSB to calculate CRC-16.
3) The response command of inverter also has to calculate CRC-16 to be compared with CRC-16 in the response command.

```
unsigned int CRC16(unsigned char*uptr，unsigned int ulenth)
{
unsigned int crc=0xffff ;
unsigned char uindex ;
if(ulenth>=9)
{
```

```
ulenth=9;
}
while(ulenth!=0)
{
        crc^=*uptr ;
        for(uindex=0;uindex<8;uindex++)
        {
            if((crc&0x0001)==0)
            {
                crc=crc>>1 ;
            }
            else
            {
                crc=crc>>1 ;
                crc^=0xa001 ;
            }
        }
        ulenth-=1 ;
        uptr++;
}
    return(((crc&0x00FF)<<8)|((crc&0xFF00)>>8));
}
```

- **Example of Command Application**

**[03H]**

Reading of Single-character Command: read the single-character record content from the specified code. The record content is divided into high 8 bits and low 8 bits and becomes part of the response content in order.

Example: read the state of driver 1

Command Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 03 |
| Start Address | High Bit | 00 |
| | Low Bit | 20 |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 01 |
| CRC | High Bit | 85 |
| | Low Bit | C0 |

Normal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 03 |
| Number of Data | | 02 |
| Content of Data | High Bit | 00 |
| | Low Bit | C1 |
| CRC | High Bit | 79 |
| | Low Bit | D4 |

Abnormal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 83 |
| Abnormality Code | | 03 |
| CRC | High Bit | 01 |
| | Low Bit | 31 |

Notes: The number of data doubles that of address.

**[06H]**

Single-character Writing Command: write a single character into the specified register, and save the specified data in the specified register. The data saved should be among the order of record codes. The command content should be arrayed in the sequence of high 8 bits and low 8 bits.

Example: start the operation of driver 1

Command Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 06 |
| Start Address | High Bit | 00 |
| | Low Bit | 01 |
| Content of Data | High Bit | 00 |
| | Low Bit | 01 |
| CRC | High Bit | 19 |
| | Low Bit | CA |

Normal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 06 |
| Start Address | High Bit | 00 |
| | Low Bit | 01 |
| Content of Data | High Bit | 00 |
| | Low Bit | 01 |
| CRC | High Bit | 19 |
| | Low Bit | CA |

Abnormal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 86 |
| Abnormality Code | | 00 |
| CRC | High Bit | 42 |
| | Low Bit | 60 |

**[08H]**

Loop Test Command: the command content is fed back originally in the form of response and is used for test of signal transmission and returning between the main controller and the driver. Arbitrary values can be used as the test code and data.

Example: loop feedback test

Command Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 08 |
| Test Code | High Bit | 00 |
| | Low Bit | 00 |
| Test Data | High Bit | 12 |
| | Low Bit | 34 |
| CRC | High Bit | ED |
| | Low Bit | 7C |

Normal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 08 |
| Test Code | High Bit | 00 |
| | Low Bit | 00 |
| Test Data | High Bit | 12 |
| | Low Bit | 34 |
| CRC | High Bit | ED |
| | Low Bit | 7C |

Abnormal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 88 |
| Abnormality Code | | 03 |
| CRC | High Bit | 06 |
| | Low Bit | 01 |

**[10H]**

Single-character Writing Command: write the content into the specified register, and write the specified data in the specified register. The data saved should be among the order of record codes. The command content should be arrayed in the sequence of high 8 bits and low 8 bits.

Example: set the frequency as 50.00Hz

Command Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 10 |
| Start Address | High Bit | 00 |
| | Low Bit | 02 |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 01 |
| Number of Data | | 02 |
| Content of Data | High Bit | 13 |
| | Low Bit | 88 |
| CRC | High Bit | AA |
| | Low Bit | E4 |

Normal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 10 |
| Start Address | High Bit | 00 |
| | Low Bit | 02 |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 01 |
| CRC | High Bit | A0 |
| | Low Bit | 90 |

Abnormal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 90 |
| Abnormality Code | | 03 |
| CRC | High Bit | 0C |
| | Low Bit | 01 |

Notes: The number of data doubles that of address.

**[10H]**

Data Saving Command: write the MODBUS register address corresponding to the function parameters into the special saving address of 0xFF, and save the parameter content into EEPROM. It is equivalent to ENTER of the keypad to save the data without being lost at power failure. The command content is arrayed in the order of high 8 bits and low 8 bits. 00FFH is specially used for data saving and is effective when Pb.06=0.

Example: set the frequency as 30.0Hz and save it in EEPROM.

Command Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 10 |
| Start Address | High Bit | 01 |
| | Low Bit | 02 |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 01 |
| Number of Data | | 02 |
| Content of Data | High Bit | 0B |
| | Low Bit | B8 |
| CRC | High Bit | B1 |
| | Low Bit | D2 |

Normal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 10 |
| Start Address | High Bit | 00 |
| | Low Bit | FF |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 01 |
| Number of Data | | 02 |
| Content of Data | High Bit | 01 |
| | Low Bit | 02 |
| CRC | High Bit | B3 |
| | Low Bit | CF |

Abnormal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 90 |
| Abnormality Code | | 23 |
| CRC | High Bit | 0D |
| | Low Bit | D9 |

**[10H]**

Two Commands Writing: it can operate the two registers of 0001 action command and 0002 frequency setting 1. It should be noted that the operation command giving manner setting (P0.07) should be “serial communication” and that the frequency setting source 1 (P0.03) should be “communication setting”.

Example: set the frequency as 50.0Hz.

Command Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 10 |
| Start Address | High Bit | 00 |
| | Low Bit | 01 |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 02 |
| Number of Data | | 04 |
| Content of Data | High Bit | 00 |
| | Low Bit | 01 |
| | High Bit | 13 |
| | Low Bit | 88 |
| CRC | High Bit | 6E |
| | Low Bit | F5 |

Normal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 10 |
| Start Address | High Bit | 00 |
| | Low Bit | 01 |
| Number of Addresses | High Bit | 00 |
| | Low Bit | 02 |
| CRC | High Bit | 10 |
| | Low Bit | 08 |

Notes: The number of data doubles that of address.

Abnormal Response Content

| | | |
|---|---|---|
| Driver Address | | 01 |
| Command Code | | 90 |
| Abnormality Code | | 03 |
| CRC | High Bit | 0C |
| | Low Bit | 01 |

- List of Data:

Command Data (writable)

| MODBUS Address | Name | bit | Content |
|---|---|---|---|
| 0000H | | ( Reserved) | |
| 0001H | Operation Signal | 0 | Operation Command 1: Operation 0: Stop |
| | | 1 | Reverse Command 1: Reverse 0: Forward |
| | | 2 | External Fault 1: External Fault (EFO) |
| | | 3 | Fault Resetting 1: Fault Resetting Command |
| | | 4 | Multi-functional Input Command 1 (P3.01 X1Terminal Function) |
| | | 5 | Multi-functional Input Command 2 (P3.02 X2Terminal Function) |
| | | 6 | Multi-functional Input Command 3 (P3.03 X3Terminal Function) |
| | | 7 | Multi-functional Input Command 4 (P3.04 X4Terminal Function) |
| | | 8 | Multi-functional Input Command 5 (P3.05 X5Terminal Function) |
| | | 9 | Multi-functional Input Command 6 (P3.05 X5Terminal Function) |
| | | A | Multi-functional Input Command 7 (P3.05 X5Terminal Function) |
| | | B~ F | Reserved (See below Note 1) |
| 0002H | Speed Command | | |
| 0003~001FH | Reserved | | |

Note 1: write “0” in the reserved BIT.

Note 2: when the communication frequency command is > the maximum frequency, the abnormality code 21H “Beyond the Upper & Lower Limit” will be reported and the operation frequency will be reserved unchanged.

Note 3: addresses of 000DH~0011H and 0013H~001FH are reserved in the general driver.

Note 4: when the above reserved register addresses are read, address error will be fed back.

Parameters Saving [Input Command] (Writable)

| Record | Name | Content | Setting Range | Initial Value |
|---|---|---|---|---|
| 00FFH | Input Command | MODBUS address in the function list | 0100H ~ 0FFFH | — |

Notes:

For the data writing command 06 and 10, only the data are written into RAM for operation and are effective for this operation. After the driver is powered off and restarted, the data written last time will not saved.

If the data written by communication has to be effective after the driver is powered off and restarted, the data should be written and saved in EEPROM. Function 10 can be used to write the parameters of MODBUS address to be saved into 0x00F.

By writing the MODBUS address corresponding to the parameters to be saved into 0x00FFH, the parameter data in RAM will be written and saved in EEPROM. As the maximum writing times of EEPROM is 100,000, the input command had better not be used frequently. The command is similar to ENTER in the keypad, by pressing which the set parameters will be written into EEPROM. The record code 00FFH is special for writing. When the record is read, record code errors may happen (abnormality code 02H).

- Monitoring Content (Read-only)

| MODBUS Address | Name | bit | Content |
|---|---|---|---|
| 0020H | State Signal | 0 | Operation 1: Operation 0: Stop |
| | | 1 | Reverse 1: Reverse 0: Forward |
| | | 2 | Fault Resetting 1: Fault Resetting 0: No Fault Resetting |
| | | 3 | Fault 1: Fault |
| | | 4 | Alarm 1: Alarm |
| | | 5 | Multi-functional Output Command 1 (1: DO ON 0: OFF) |
| | | 6 | Multi-functional Output Command 2 (1: DO ON 0: OFF) |
| | | 7 | Multi-functional Output Command 3 (1: DO ON 0: OFF) |
| | | 8 | Multi-functional Output Command 4 (1: TA ON 0: OFF) |
| | | 9 | Multi-functional Output Command 5 (1: DO ON 0: OFF) |
| | | A | Multi-functional Output Command 6 (1: TA ON 0: OFF) |
| | | B~F | (Reserved) |
| 0021H | Fault Content | 0 | Overcurrent (OC) |
| | | 1 | Accelerating Overvoltage (Ou1) |
| | | 2 | Driver Overload (OL2) |
| | | 3 | Driver Overheat (OH1) |
| | | 4 | Decelerating Overvoltage (Ou2) |
| | | 5 | Constant-speed Overvoltage (Ou3) |
| | | 6 | Hall Current Detection Fault (HE) |
| | | 7 | External Abnormality (EFO~EF1) |

| MODBUS Address | Name | bit | Content |
|---|---|---|---|
| 0021H | Fault Content | 8 | Hardware Abnormality (CCF3~CCF6) |
| | | 9 | Motor Overload (OL1) |
| | | A | Input/ Output Phase Loss or Imbalance (SP1~SP2) |
| | | B | Busbar Under-voltage (Uu1) |
| | | C | Control Circuit Under-voltage (Uu2) |
| | | D | Charging Circuit Under-voltage (Uu3) |
| | | E | Grounding GF or Load Short Circuit (SC) |
| | | F | (Reserved) |
| 0022H | Alarm Content | 0 | Busbar Under-voltage Alarm( Uu) |
| | | 1 | Driver Overload Pre-alarm (OLP2) |
| | | 2 | Analog Signal 1 Abnormality (AE1) |
| | | 3 | Reserved |
| | | 4 | Temperature too high (OH2) |
| | | 5 | The serial communication doesn't receive the normal control signal (CE) |
| | | 6 | The function code setting is inappropriate SF1 |
| | | 7 | The operation mode is inconsistent with the terminal setting SF2 |
| | | 8 | Output terminal setted up 26 can't up to 4 sets of SF3 ,and it setted up 27 can't up to 3 sets of SF3. |
| | | 9 | Motor Parameters Tuning Abnormality |
| | | A | Analog signal 3 Abnormality |
| | | B~F | (Reserved) |
| 0023H | Before the frequency command compensation | | |
| 0024H | After the frequency command compensation | | |
| 0025H | AI1 Analog Input (V), 0~10.00V corresponding to 0~1000 | | |
| 0026H | AI2 Analog Input (V), 0~10.00V corresponding to 0~1000 | | |
| 0027H | Output Current (A) | | |
| 0028H | Output Voltage (V) | | |
| 0029H | Set Frequency Hz | | |
| 002BH | Multi-functional Input Terminal State | 0 | Terminal X1 1: Close 0: Open |
| | | 1 | Terminal X2 1: Close 0: Open |
| | | 2 | Terminal X3 1: Close 0: Open |
| | | 3 | Terminal X4 1: Close 0: Open |
| | | 4 | Terminal X5 1: Close 0: Open |
| | | 5 | Terminal X6 1: Close 0: Open |
| | | 6 | Terminal X7 1: Close 0: Open |
| | | 7~F | (Reserved) |
| 002CH | | (Reserved) | |

| MODBUS Address | Name | bit | Content |
|---|---|---|---|
| 002DH | Multi-functional Output Terminal State | 0 | DO 1: “ON” 0: “OFF” |
| | | 1 | BRA-BRB-BRC Relay ( Reserved only 3040GB and below 1:”ON” 0:”OFF”) |
| | | 2 | TA-TB-TC Relay 1: “ON” 0: “OFF” |
| | | 3 | Y1 Relay ( Reserved only 3040GB and below 1:”ON” 0:”OFF”) |
| | | 4 | Y2 Relay ( Reserved only 3040GB and below 1:”ON” 0:”OFF”) |
| | | 5 | Y3 Relay ( Reserved only 3040GB and below 1:”ON” 0:”OFF”) |
| | | 6-F | Reserved |
| 002EH | AO1 Analog Output (V) 0~10.00V corresponding to 0~1000 | | |
| 0031H | DC Main Bus Voltage | | |
| 0032H | Output Torque | | |
| 0033H | Current Rotating Speed | | |
| 0034H | Set Rotating Speed | | |
| 0035H | Operating Linear Speed | | |
| 0036H | Set Linear Speed | | |
| 0037H | Output Power | | |
| 003CH | External Count Value | | |
| 003D~ 003FH | (Reserved) | | |
| 0040~ 004AH | Terminal State, 0040H~004AH corresponding to BIT0~BITA bit of 002BH in order | | |
| 004B~ 00FEH | (Reserved) | | |

- List of Modbus Register Addresses:

| Function Code Form Parameter Code(DEC) | Modbus Register Address(HEX) |
|---|---|
| (Saving Confirmed) | (00FFH) |
| (Command Data) | (0001H~001FH) |
| (Monitoring Content) | (0020H~004FH) |
| P0.00～P0.19 | 0100H～ 0113H* |
| P1.00～P1.23 | 0200H～ 0217H |
| P2.00～P2.50 | 0300H～ 0332H |
| P3.00～P3.36 | 0400H～ 0424H |
| P4.00～P4.35 | 0500H～ 0523H |
| P5.00～P5.36 | 0600H～ 0624H |
| P6.00～P6.18 | 0700H～ 0712H |
| P7.00～P7.28 | 0800H～ 081CH |
| P8.00～P8.28 | 0900H～ 091CH |
| P9.00～P9.21 | 0A00H～ 0A15H |
| PA00～PA.30 | 0B00H～ 0B1EH |

| Function Code Form Parameter Code(DEC) | Modbus Register Address(HEX) |
|---|---|
| Pb.00～Pb.08 | 0C00H～ 0C08H |
| PC.00～PC.23 | 0D00H～ 0D17H |
| Pd.00～Pd.34 | 0E00H～ 0E22H |
| PE.00～PE.12 | 0F00H～ 0F0CH |
| PF.00～PF.12 | 1000H～ 100CH |
| (For parameter extending) | (1100H~FFFFH) |

- Modbus Address Encoding Method:
  Refer to the function codes in the function code table. High 8 bit HI= function group number + 1; low 8 bit LO= function code. Other register addresses not listed are reserved.
- List of Abnormality Codes

| Abnormality Code | Content |
|---|---|
| 01H | Command code error<br>Command codes other than 03H, 08H and10H |
| 02H | Register address error<br>None of the register addresses is registered<br>Read the ENTER-confirmed special register[0X00FFH]<br>The communication function of the address is not initiated in the function code setting. (Note1) |
| 03H | Number error<br>Number of data read or written is not between 1 and 16<br>In the writing manner, the command data is not the bit number *2 |
| 21H | Data setting error<br>Upper and lower limit error during the control data & parameters input |
| 22H | Writing manner error<br>Write the non-revisable parameters or read-only parameters in operation (Note 2)<br>Parameters write-protected (Note 3)<br>Write data into the special read register<br>Write in the case of CCF3, i.e. EEPROM fault |
| 23H | Write in the case of under-voltage<br>Write parameters in the case of Uu |
| 24H | Write parameters from communication during the parameter processing<br>At the time of fault resetting, system power supply cutoff or data saving |
| 25H | CRC check fault (Note 4) |

Note 1: Set the P0.03 frequency setting as serial communication (when writing address 0002) or set P0.07 operation command control manner as serial communication (when writing address 0001).

Note 2: For parameters that can be set in operation, please refer to the function parameter list. If a parameter that cannot be revised in operation but can be revised at the time of stop, please stop the driver and then revise it.

Note 3: When parameters are write-protected and PF.01 is set to 1 or 2, please revise it as 0. Then all parameters can be revised.

Note 4: In case of CRC 16 check fault, response will be given even if the system receiving is over, and 25H fault will be reported to facilitate customer debugging.

Appendix 3 Driver Warranty Card

# Driver Warranty Card

| | |
|---|---|
| Name of User: | |
| Address of User: | |
| Contact Person: | Tel.: |
| P.C.: | Fax: |
| Type: | Serial No.: |
| Date of Purchase: | Date of Fault: |

Fault Details

| | |
|---|---|
| Motor: _____KW _____Pole | Application of Motor: _____ |
| Fault Occurrence Time: power supply, no-load, load __% Others: _____ | |
| Fault Phenomena: | |
| Fault Display: OC OL OU OH LU None Others: | |
| Control Terminal Used: | |
| Operation after Resetting: Yes No | Output Voltage: Yes No |
| Total Working Time: _____Hrs | Fault Frequency: _____Hz |

Installation Site Details

| | |
|---|---|
| Power Voltage: U-V:____ V, V-W:____ V, W-U:____V | |
| Transformer Capacity: KVA | Driver Earthing: Yes No |
| Distance from the Power Source:___m | Distance from the Motor:____m |
| Vibration: No, Medium, Strong | Dust: No, Medium, Much |
| Others: | |