# Contents

## Safety Precautions

Before carrying, installing, running or maintaining, please read the Operation Instruction carefully and follow all safety precautions thereof.

The safe operation related precautions in the Instruction are classified as either "warning" or "caution".

Warning Indicating the potential dangerous conditions which may cause casualties if not being avoided.

Caution Indicating the potential dangerous conditions which may cause minor or moderate personal injury and equipment damage, if not being avoided. This can also be used for warning against unsafe operation.

Under some circumstances, even the matters mentioned under Caution may also result in major accident. Therefore, please follow these important precautions in any case.

★ **Notice** the step to be taken for ensuring proper operation.

Warning label should be presented on the front cover of frequency converter.

Follow these instructions before using the frequency converter.

**Warning Label**

| **WARNING** |
|---|
| ● **May cause injury or electric shock.** |
| ● **Please follow the instructions in the manual before installation or operation.** |
| ● **Disconnect all power before opening front cover of unit. Wait at least 1 minute until DC Bus capacitors discharge.** |
| ● **Use proper grounding techniques.** |
| ● **Never connect AC power to output UVW terminals** |

| **Notice** |
|---|
| ● No withstand voltage test should be carried out on the components inside the frequency converter, because these semiconductor components may easily damaged by high voltage. |
| ● The output terminals **U, V or W** of frequency converter must never be connected to **AC** power supply. |
| ● IC of CMOS on the circuit board of frequency converter may easily influenced and damaged by static electricity, so please do not touch the main circuit board. |

# 1 Overview

## 1.1 Comprehensive Technical Characteristics of Frequency Converter

**●Input-output Characteristics**

◆ input voltage range: 380/220V±15%

◆ input frequency range: 47～63Hz

◆ output voltage range: 0～rated input voltage

◆ output frequency range: 0～600Hz

**●Peripheral Interface Characteristics**

◆ Programmable digital input: 7 inputs

◆ Programmable analog input: AI1: -10V～10V input, AI2: 0～10V or 0～20mA input

◆Programmable open collector output: 1 output (open collector output or high-speed pulse output)

◆ Relay output: 2 outputs

◆ Analog output: 2 outputs, optional 0/4～20mA or 0～10V

**●Technical Performance Characteristics**

◆ Control mode: Senserless vector control without PG, V/F control

◆ Overload capacity: 150% rated current for 60s; 180% rated current for 10s

◆ Starting torque: Senserless vector control without PG: 0.5Hz/150% (SVC)

◆ Speed ratio: Senserless vector control without PG: 1: 100

◆ Speed control accuracy: Senserless vector control without PG: ±0.5% maximum speed

◆ carrier frequency: 1k～15.0kHz

**●Functional Characteristics**

◆ Frequency setting methods: digital setting, analog setting, serial communication setting, multistage velocity setting, simple PLC setting, PID setting and the like, and the combination and mode switch of these settings can be realized.

◆ PID control function

◆ Simple PLC, multistage velocity control function: 16-stage velocity control

◆ Swing frequency control function

◆ The function of momentary power interruption but not shutdown

◆ QUICK/JOG key function: multi-functional shortcut key defined by the user freely

◆ Automatic voltage regulation function: being capable of keeping constant output voltage automatically in case of network voltage change

◆Providing various fault protecting functions: the functions of protection against over current, overvoltage, under voltage, over temperature, phase loss, overload and the like

### 1.2 Instructions on Nameplate of Frequency Converter

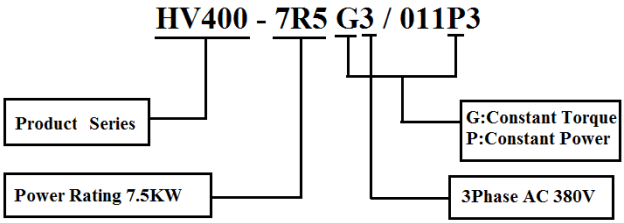


Fig. 1-1 Instructions on Nameplate of Frequency Converter

### 1.3 series models of frequency converter

| Frequency Converter Model | Input Voltage | Rated Output Power (kW) | Rated Input Current (A) | Rated Output Current (A) | Adaptive Motor |
|---|---|---|---|---|---|
| HV400-R75G1 | single-phase 220V ±15% | 0.75 | 8.2 | 4.0 | 0.75 |
| HV400-1R5G1 | | 1.5 | 14.2 | 7.0 | 1.5 |
| HV400-2R2G1 | | 2.2 | 23.0 | 10.0 | 2.2 |
| HV400-004G1 | | 4.0 | 38.0 | 17.0 | 4.0 |
| HV400-R75G3 | three-phase 220V ±15% | 0.75 | 5.0 | 4.5 | 0.75 |
| HV400-1R5G3 | | 1.5 | 7.7 | 7 | 1.5 |
| HV400-2R2G3 | | 2.2 | 11.0 | 10 | 2.2 |
| HV400-3R7G3 | | 3.7 | 17.0 | 16 | 3.7 |
| HV400-5R5G3 | | 5.5 | 21.0 | 20 | 5.5 |
| HV400-7R5G3 | | 7.5 | 31.0 | 30 | 7.5 |
| HV400-011G3 | | 11.0 | 43.0 | 42 | 11.0 |
| HV400-015G3 | | 15.0 | 56.0 | 55 | 15.0 |
| HV400-018G3 | | 18.5 | 71.0 | 70 | 18.5 |
| HV400-022G3 | | 22.0 | 81.0 | 80 | 22.0 |
| HV400-030G3 | | 30.0 | 112.0 | 110 | 30.0 |
| HV400-037G3 | | 37.0 | 132.0 | 130 | 37.0 |
| HV400-045G3 | | 45.0 | 163.0 | 160 | 45.0 |
| HV400-055G3 | | 55.0 | 200.0 | 200.0 | 55.0 |

| Frequency Converter Model | Input Voltage | Rated Output Power (kW) | Rated Input Current (A) | Rated Output Current (A) | Adaptive Motor |
|---|---|---|---|---|---|
| HV400-R75G3 | Three-phase 380V ±15% Note: G/P should not be integrated for the models higher than 350G (including) | 0.75/1.5 | 3.4/5.0 | 2.5/3.7 | 0.75/1.5 |
| HV400-1R5G3 | | 1.5/2.2 | 5.0/5.8 | 3.7/5 | 1.5/2.2 |
| HV400-2R2G3 | | 2.2/4.0 | 5.8/10 | 5/9 | 2.2/4.0 |
| HV400-004G3/5R5P3 | | 4.0/5.5 | 10/15 | 9/13 | 4.0/5.5 |
| HV400-5R5G3/7R5P3 | | 5.5/7.5 | 15/20 | 13/17 | 5.5/7.5 |
| HV400-7R5P3/011P3 | | 7.5/11.0 | 20/26 | 17/25 | 7.5/11.0 |
| HV400-011G3/0150P3 | | 11.0/15.0 | 26/35 | 25/32 | 11.0/15.0 |
| HV400-0150G3/0185P3 | | 15.0/18.5 | 35/38 | 32/37 | 15.0/18.5 |
| HV400-0185G3/0220P3 | | 18.5/22.0 | 38/46 | 37/45 | 18.5/22.0 |
| HV400-022G3/030P3 | | 22.0/30.0 | 46/62 | 45/60 | 22.0/30.0 |
| HV400-030G3/037P3 | | 30.0/37.0 | 62/76 | 60/75 | 30.0/37.0 |
| HV400-037G3/045P3 | | 37.0/45.0 | 76/90 | 75/90 | 37.0/45.0 |
| HV400-045G3/055P3 | | 45.0/55.0 | 90/105 | 90/110 | 45.0/55.0 |
| HV400-055G3/075P3 | | 55.0/75.0 | 105/140 | 110/150 | 55.0/75.0 |
| HV400-075G3/090P3 | | 75.0/90.0 | 140/160 | 150/176 | 75.0/90.0 |
| HV400-090G3/110P3 | | 90.0/110.0 | 160/210 | 176/210 | 90.0/110.0 |
| HV400-100G3/132P3 | | 110.0/132.0 | 210/240 | 210/250 | 110.0/132.0 |
| HV400-132G3/160P3 | | 132.0/160.0 | 240/290 | 250/300 | 132.0/160.0 |
| HV400-160G3/185P3 | | 160.0/185.0 | 290/330 | 300/340 | 160.0/185.0 |
| HV400-185G3/200P3 | | 185.0/200.0 | 330/370 | 340/380 | 185.0/200.0 |
| HV400-200G3/220P3 | | 200.0/220.0 | 370/410 | 380/415 | 200.0/220.0 |
| HV400-220G3/250P3 | | 220.0/250.0 | 410/460 | 415/470 | 220.0/250.0 |
| HV400-250G3/280P3 | | 250.0/280.0 | 460/500 | 470/520 | 250.0/280.0 |
| HV400-280G3/315P3 | | 280.0/315.0 | 500/580 | 520/600 | 280.0/315.0 |
| HV400-315G3/350P3 | | 315.0/350.0 | 580/620 | 600/640 | 315.0/350.0 |
| HV400-350G3 | | 350.0 | 620 | 640 | 350.0 |
| HV400-400G3 | | 400.0 | 670 | 690 | 400.0 |
| HV400-500G3 | | 500.0 | 835 | 860 | 500.0 |
| HV400-560G3 | | 560.0 | 920 | 950 | 560.0 |
| HV400-630G3 | | 630.0 | 1050 | 1100 | 630.0 |

### 1.4 instructions on Names of Components of Frequency Converter

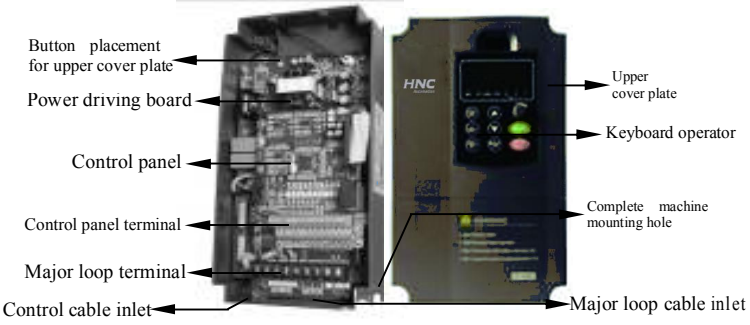


**Fig. 1-2 The Schematic Diagram of Names of Components of Frequency Converter**

### 1.5 Overall Dimension of Frequency Converter

#### 1.5.1 Overall Dimension

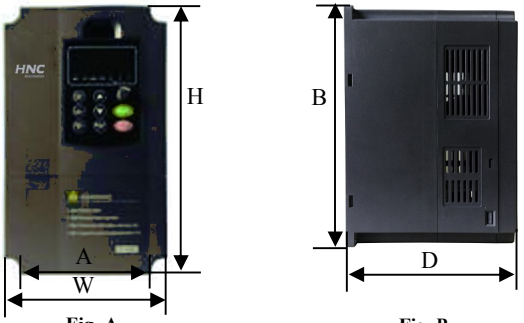


**Fig. A** **Fig. B**

**Fig. 1-3 The Schematic Diagram of Overall Dimension of Frequency Converter**

### 1.5.2Mechanical Parameter

| Frequency Converter Model | Installation Dimension | | Overall Dimension | | | Mounting Hole | Weight (kg) ≈ |
|---|---|---|---|---|---|---|---|
| | A (mm) | B (mm) | W (mm) | H (mm) | D (mm) | | |
| HV400-R4G3-S2 | 115 | 160 | 125 | 170 | 118 | Φ4 | 1.2 |
| HV400-R75G3-S2 | | | | | | | |
| HV400-1R5G3-S2 | 110 | 160 | 125 | 170 | 145 | Φ4 | 1.5 |
| HV400-2R2G3-S2 | | | | | | | |
| HV400-R75G3 | 110 | 160 | 125 | 170 | 145 | Φ4 | 1.5 |
| HV400-1R5G3 | | | | | | | |
| HV400-2R2G3 | | | | | | | |
| HV400-3R7G3/5R5P3 | 135 | 247 | 150 | 253 | 150 | Φ5 | 3 |
| HV400-5R5G3/7R5P3 | | | | | | | |
| HV400-7R5G/110P | | | | | | | |
| HV400-011G3/150P3 | 225 | 375 | 250 | 400 | 195 | Φ8 | 7.8 |
| HV400-015G3/018P3 | | | | | | | |
| HV400-018G3/022P3 | | | | | | | |
| HV400-022G3/030P3 | | | | | | | |
| HV400-030G3/037P3 | 295 | 495 | 320 | 515 | 255 | Φ8 | 22.5 |
| HV400-037G3/045P3 | | | | | | | |
| HV400-045G3/055P3 | | | | | | | |
| HV400-055G3/075P3 | 230 | 565 | 375 | 580 | 265 | Φ8 | 30 |
| HV400-075G3/090P3 | 320 | 735 | 460 | 755 | 335 | Φ8 | 60 |
| HV400-090G3/110P3 | | | | | | | |
| HV400-110G3/132P3 | | | | | | | |
| HV400-132G3/160P3 | – | – | 490 | 1490 | 395 | – | 120 |
| HV400-160G3/185P3 | | | | | | | |
| HV400-185G3/200P3 | | | | | | | |
| HV400-200G3/220P3 | – | – | 750 | 1670 | 400 | – | 200 |
| HV400-220G3/250P3 | | | | | | | |
| HV400-250G3/280P3 | | | | | | | |
| HV400-280G3/315P3 | | | | | | | |
| HV400-315G3/350P3 | | | | | | | |

### 1.5.3 The Overall Dimension of Operation Panel

HB402

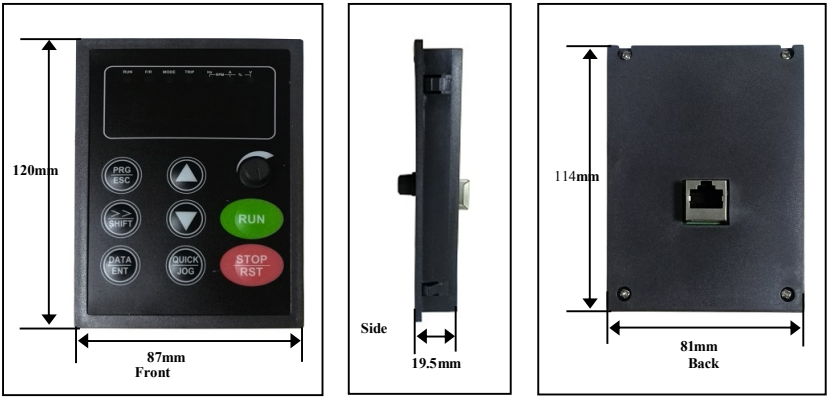


Fig. 1.5.3-1The Figure of Keyboard Operator Appearance and Installation Dimension

HB401

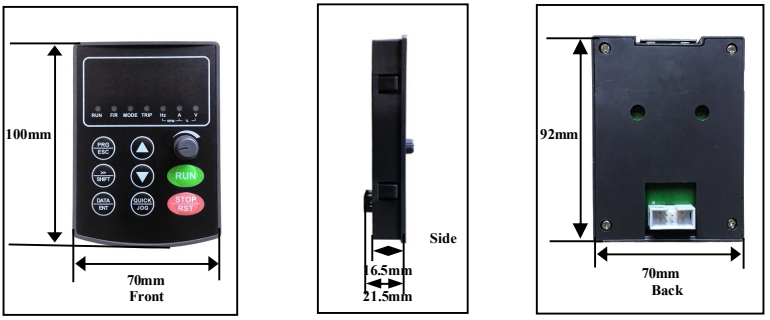


Fig. 1.5.3-2 The Figure of Keyboard Operator Appearance and Installation Dimension

## 2. Open-package Inspection

| Caution |
| --- |
| ●**Don't installing or running any damaged frequency converter or the one with fault part, otherwise it will be at the risk of injury.** |

Although our products have passed strict inspection before delivery, please make sure to check carefully after purchasing this product due to transportation or any unexpected case.

### 2.1 Inspection Items

Please confirm the following items when you get the product:

| Item to Confirm | Confirming Method |
| --- | --- |
| Whether the type and the model are consistent with what you ordered. | Please check the nameplate at the side of **HV400**. |
| Whether there is any damaged part. | Examining the overall appearance for checking whether there is any damage during transportation. |
| Whether some fastening parts become loosened, such as screw and the like. | Checking with screwdriver when necessary. |
| Instruction Book, Warranty Card and other accessories. | **HV400** Operation Instruction and corresponding accessories. |

Please contact with the supplier or the Sales Department of our company directly for any exception.

## 3. Disassembly and Assembly

### Warning

●The equipment must be designed, installed, debugged and run by the trained and qualified professionals; it must follow all provisions of "Warning" during the working, otherwise it may cause serious personal injury or significant property loss.

●Only permanent fastening connection shall be allowed for input power line, and the equipment must be grounded reliably.

●The following terminals may still carry dangerous voltage, even though the frequency converter is under the power off position.

-power supply terminals **R, S and T**

- terminals **U, V and W** connected with motor

●It must wait for more than 10 minutes and confirm that the POWER light goes out and the frequency converter discharges off, after switching off the power switch, and then the installation may be allowed to start.

●The minimum section area of grounding conductor should be **10mm²** at least, or the maximum value among the two items of the corresponding data in the Table below shall be selected as the section area of grounding conductor:

| Section Area **S** of Power Line Conductor **mm²** | Section Area of Grounding Conductor |
|---|---|
| **S≤16** | **S** |
| **16<S≤35** | **16** |
| **35<S** | **S/2** |

### Caution

●Holding the base while uplifting the cabinet body instead of uplifting by grasping the panel for moving the frequency converter, otherwise the main unit may fall and cause personal injury.

●The frequency converter should be installed on flame retardant materials, such as metal, away from heat and inflammable object, so as to avoid a fire.

●When two or more frequency converters are installed in one cabinet body, a cooling fan should be installed, and the air temperature should be controlled lower than **40**℃, otherwise the overheating may cause a fire or damage the device.

### 3.1 Environmental Conditions for Frequency Converter to Operate

#### 3.1.1 Temperature and Humidity

The operating ambient temperature shall be between **-10**℃ and **+40**℃, it must derate for using when the temperature is higher than **40**℃, and the temperature should not be more than **50**℃. It should derate by 4% per **1**℃ rise, when the ambient temperature is higher than **40**℃**.**

The relative air humidity should be less than or equal to 90%, there should be no condensation, the frequency converter should also be avoided placing in the direct sunlight, and the temperature could be represented in Fahrenheit.

#### 3.1.2 Altitude

When the frequency converter is installed at the altitude under **1000m**, it can run at its rated power. When the altitude is higher than **1000m**, the frequency converter power should be derated to the extent shown as follows:

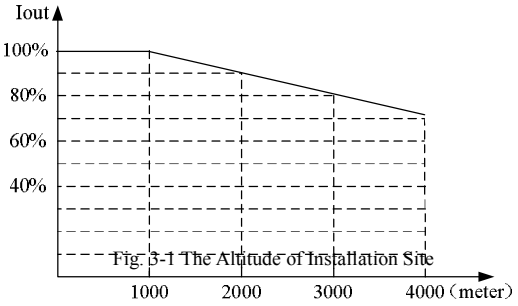


Fig. 3-1 The Altitude of Installation Site

#### 3.1.3 Other Environmental Requirements

Please install at the place which would impossibly be vibrated and shocked violently, and the maximum amplitude should be not more than **5.8m/S²** (**0.6g**).

Please install away from an electromagnetic radiant point.

Please install at the place where metal powder, dust, oil, water and the like could not immersed into the frequency converter.

Please do not install in the environment with direct sunlight, oil mist, steam or saline matter.

## 4. Wiring

### Warning

- ●It must be operated by the eligible approved professional electronic personnel for ensuring the safe operation of the frequency converter.
- ●It is forbidden to test the insulation of cable connected with the frequency converter by a high voltage insulation test equipment.
- ●Even though the frequency converter is not under running state, the power input wire, the DC circuit terminal and the electromotor terminal may still carry dangerous voltage, so it must wait for more than **10** minutes and confirm that the **POWER** light goes out and the frequency converter discharges off, after switching off the power switch, and then the installation may be allowed to start.
- ●The ground terminal of the frequency converter must be grounded reliably with the ground resistance less than **10Ω**, and otherwise it may cause the risks of electric shock and fire.
- ●The three-phase power supply should not be connected with the output terminals (**U, V and W**) of the frequency converter, and otherwise it may damage the frequency converter.
- ● Please confirm the correct connection of the power wire and the motor wire, with the power wire connected with terminals **R, S and T** and the motor wire connected with the terminals of **U, V and W**, before electrifying.
- ● It is forbidden to touch the frequency converter with wet hands, and otherwise it may cause the electric shock.

### Caution

- ●Please check whether the rated voltage of the frequency converter is consistent with the AC supply voltage.
- ● The power wire and the motor wire must be permanently connected in a fastened way.

## 4.1 Peripheral Equipment Connection Diagram

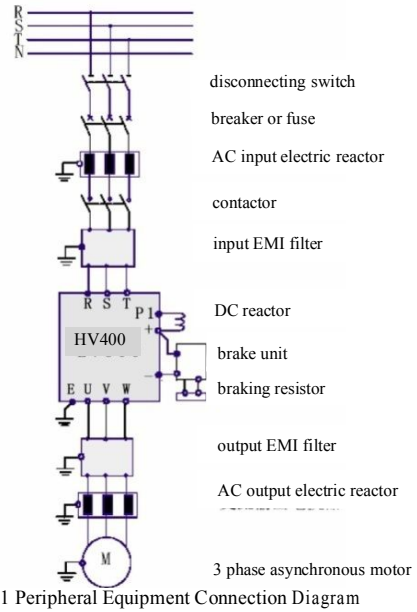


Fig. 4-1 Peripheral Equipment Connection Diagram

## 4.2 Wiring Terminal Diagram

4.2.1 Three-phase description of Major loop Terminal Block

The three-phase major loop terminal block distribution diagrams are shown in figures 4-2 (a-d), and the instruction on the functions of various terminals is shown as follows.

a) The Major Loop Terminal Block Distribution Diagram of 3 phase 0.75kW-7.5KW Frequency Converter (as shown in fig. 4-2b)


Fig.4-2a

b) The Major Loop Terminal Block Distribution Diagram of 3 phase 11kW-15kW Frequency Converter (as shown in fig. 4-2b)


Fig. 4-2b

c) The Major Loop Terminal Block Distribution Diagram of 3 phase 18.5kW-110kW Frequency Converter (as shown in fig. 4-2d)


Fig. 4-2c

d) The Major Loop Terminal Block Distribution Diagram of 3 phase 132kW-315kW Frequency Converter (as shown in fig. 4-2d)

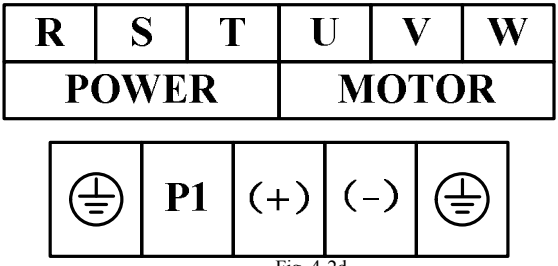


Fig. 4-2d

e) The Major Loop Terminal Block Distribution Diagram of 3 phase 132kW-315kW Frequency Converter (as shown in fig. 4-2e)

**Terminal Function Description**

| Terminal Symbol | Function Description |
|---|---|
| **P** and + | DC side voltage positive terminal |
| **-** | DC side voltage negative terminal |
| **PB** | DC Braking Resistor can be connected between P and PB |
| **P1** | DC reactor can be connected between P1 and + |
| **R, S, T** | To be connected with power grid three-phase AC power supply |
| **U, V, W** | To be connected with three-phase AC electromotor |
| ⏚ | ground terminal |

4.2.2 Single-phase major loop terminal block distribution diagram is shown in figure 4-2e, and the instruction on the functions of various terminals is shown as follows.

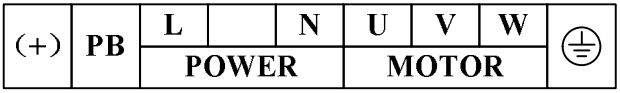


Fig. 4-2e

**Terminal Function Description**

| Terminal Symbol | Function Description |
|---|---|
| (+) | DC side voltage positive terminal |
| PB | DC Braking Resistor can be connected between P and B |
| L, N | To be connected with power grid single-phase AC power supply |
| U, V, W | To be connected with single/three-phase AC electromotor |
| ⏚ | ground terminal |

**4.2.3 Terminals of Control Loop:**

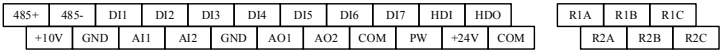


Fig. 4-3 Control Loop Wiring Terminal Diagram

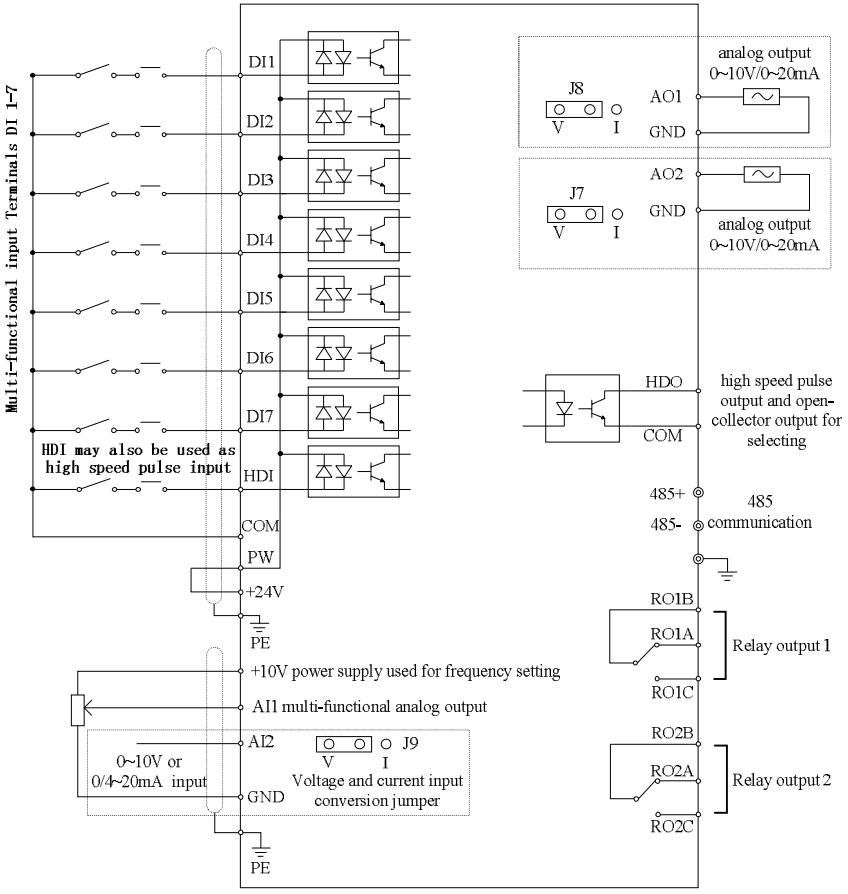


Fig. 4- 4 Standard Wiring Diagram

**4.3.1 Description of Control Panel Terminals**

| Terminal Name | Purpose and Description of Terminal |
|---|---|
| DI1～DI7 | on-off input terminal which forms optical coupling isolation input with +24V and COM<br>input voltage range: 9~30V<br>input impedance: 3.3kΩ |
| HDI | high-speed pulse input or on-off input which forms optical coupling isolation input with +24V and COM<br>pulse input frequency range: 0~50kHz<br>input voltage range: 9~30V,<br>input impedance: 1.1kΩ |
| +24V | +24V power supply provided for this equipment (current: 150mA) |
| COM | common terminal of +24V |
| AI1 | analog input, voltage range: -10V~+10V<br>input impedance: 20kΩ |
| AI2 | analog input, voltage (0~10V) /current (0~20mA), which can be selected via J9<br>input impedance: 20kΩ (voltage input) /250Ω (current input) |
| +10V | +10V power supply provided for this machine (current: 10mA) |
| GND | zero potential reference of +10V (Note: GND is isolated from COM) |
| HDO | high-speed pulse or open collector output terminal, the corresponding common terminal of which is COM<br>output frequency range: 0~50 kHz |
| AO1, AO2 | analog output terminal, wherein, AO1 can be selected voltage or current output by jumper J8;<br>AO2 can be selected voltage or current output by jumper J7<br>output range: voltage (0~10V) /current (0~20mA) |
| RO1A, RO1B, RO1C | RO1 relay output, RO1B common terminal, RO1A is normally closed, and RO1C is normally open<br>contact capacity: AC250V/3A, DC30V/1A |
| RO2A, RO2B, RO2C | RO2 relay output, RO2B common terminal, RO2A is normally closed, and RO2C is normally open<br>contact capacity: AC250V/3A, DC30V/1A |
| 485+, 485- | 485 communication ports, positive and negative terminals for 485 differential signal, please use twisted pair cable or shielded wire for standard 485 communication ports |

**4.3.2 Description of Control Panel Jumper**

| Terminal Name | Purpose and Description of Terminal |
|---|---|
| J4,J5,J6 | The jumpers special for manufacturer, which should not be changed by the user, and otherwise is may cause the malfunction of the frequency converter. |
| J7，J8 | Analog output (J8:AO1,J7:AO2) voltage (0-10V) /current (0-20mA) switching output. V: voltage, I: current |
| J9 | Analog input 2(AI2) voltage (0-10V) /current (0-20mA) switching. V: voltage, I:current |

## 4.4 Connection of Major Loop

### 4.4.1 Connection of Major Loop at the mains side

**4.4.1.1** Breaker

A breaker with the power suitable for the frequency converter should be accessed between the three-phase AC power supply and the power supply input terminals (**R, S and T**). The capacity of the breaker should be **1.5 to 2** times of the rated current of the frequency converter. Please refer to Capter 4.7 *the List of Specifications for Breaker, Cable and Contactor and reactor* for details.

**4.4.1.2** Electromagnetic Contactor

An electromagnetic contactor could be installed at the input side for controlling the on-off of the major loop power supply, so as to switch off the input power of the frequency converter effectively in case of the system failure and ensure the safety.

**4.4.1.3** Input AC reactor

In order to prevent the large current from flowing into the input power loop and damaging the components of rectification part at the moment of power grid spike pulse input, an AC reactor should be accessed at the input side, which will also improves the power factor at the input side. For protecting the frequency converter effectively, it suggest that the **380V**-grade frequency converter higher than **110KW** should be added with input reactor, and the **220V**-grade one higher than **45KW** should be also added with input reactor.

**4.4.1.4** Noise Filter at the Input Side

During the using of frequency converter, other surrounding electronic equipments may be interfered by the power wire, and this filter can reduce the interference towards the surrounding

equipments. The specific wiring method is shown below:

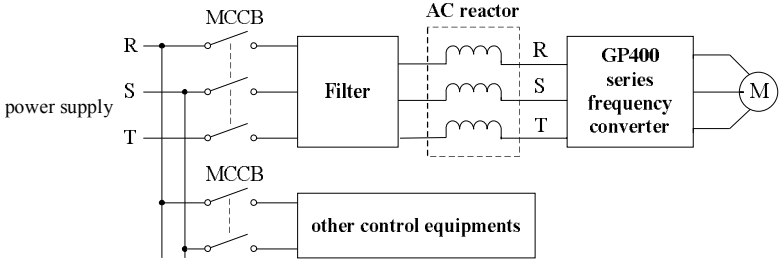


Fig. 4-5 The Diagram of the Connection of Major Loop at the Mains Side

**4.4.2 The Connection at the Major Loop Frequency Converter**

**4.4.2.1** DC reactor

DC reactor can improve the power factor and avoid damaging the rectifier bridge due to over large current input of frequency converter resulted from accessing the large capacity transformer, and it can also avoid damaging the rectifying circuit due to the harmonic wave resulted from power grid voltage leap or phase control load.

**4.4.2.2** Brake Unit and Braking Resistor

• **HV400** series (**380V**-grade) frequency converter of **15kW and lower than 15kW** should be provided with brake unit internally, and it must be connected with braking resistor at the terminals of **P and PB** for releasing the feedback energy at the moment of braking.

• The wiring for braking resistor should be at the length less than **5M**.

• The temperature of the braking resistor may rise because of releasing energy, so it should pay attention to safety protection and good ventilation when installing the braking resistor.

•When external brake unit is required, the **(+)** and **(-)** terminals of the brake unit should be corresponding with the **(+)** and **(-)** terminals of the frequency converter respectively, and the braking resistor should be connected at the terminals **P1** and **PB** of the brake unit.

• The wiring between the **(+)** and **(-)** terminals of the frequency converter and the **(+)** and **(-)** terminals of the brake unit should be at the length less than **5**M, and the wiring between the terminals **P1** and **PB** of the brake unit and the braking resistor should be at the length less than **10**m.

Note: the polarities of **(+)** and **(-)** should not be opposite; **(+)** and **(-)** terminals are not allowed to be connected with the braking resistor directly, and otherwise it may damage the frequency converter or cause the risk of a fire.

### 4.4.3 Connection of Major Loop at the Motor Side

**4.4.3.1** Output Reactor

When the distance between the frequency converter and the motor is more than **50**m, because the parasitic capacitance effect of long cable over the ground may cause the leakage current overlarge, and the frequency converter may carry out overcurrent protection frequently, it must add the output reactor for compensating, which also aims at avoiding the motor insulation damage.

**4.4.3.2** Noise Filter at Output Side

Adding the output noise filter can reduce the radio noise caused by the cable between frequency converter and the motor and the leakage current of conducting wire.

### 4.4.4 Connection of Common DC Bus

For the multi-motor drive applications such as paper manufacturing machine, chemical fiber and the like, the scheme of common DC bus is generally adopted. At one point, a motor is under the power-driven state, while the other motors are under the regenerative braking (power generation) state. Here, the renewable energy could equalize on the DC bus automatically for the motor under the power-driven state to use, which accordingly reduce the electric energy absorbed by the entire system from the power grid and achieve the goal of saving energy.

The following it the schematic diagram of two synchronously working motors (reeling motor and unreeling motor for example), wherein, one of them is always under the power-driven state, and the other one is always under the regenerative braking state. The DC buses of two frequency converters are in parallel connection, the renewable energy can be used by the power-driven motor, so as to achieve the aim of saving energy.

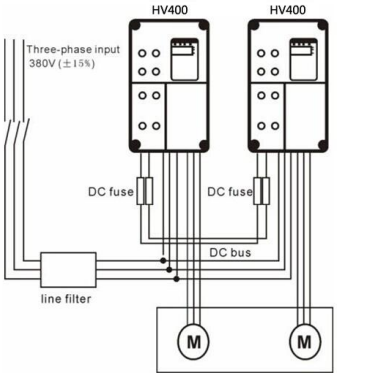


Fig. 4-7 The Connection of Common DC Bus

**Note: If selecting two frequency converters with common DC bus, it is preferred to select those of the same type, and which should be electrified synchronously.**

### 4.4.5 Connection of ground Wire (PE)

For ensuring the safety and preventing the accidents of electric shock and fire, the ground terminal E of the frequency converter must be grounded properly with the ground resistance less than **10Ω**. The ground wire should be thick and short, which should be multiple copper cores more than **3.5mm²**. When several frequency converters are grounded, common ground wire is not recommended, so as to avoid the ground wire forming a circuit.

## 4.5 Connection of Control Loop

**4.5.1** Precautions

Please use multi-core shielded cable or twisted pair cable to connect the control terminals. When using the shielded cable (near one end of the frequency converter), it should be connected with the ground terminal ⏚ of the frequency converter. The controlling cable should be more than **20cm** away from the main circuit and high voltage lines (including power wire, motor wire, relay, contactor cable and the like) during wiring, parallel wiring should be avoided, and vertical wiring is recommended, so as to avoid the malfunction of the frequency converter caused by external disturbance.

## 4.6 Installation Guide in accordance with EMC Requirement

### 4.6.1 General Knowledge about EMC

**EMC** is the abbreviation of electromagnetic compatibility and indicates the ability of running normally in the electromagnetic environment and causing no unbearable electromagnetic disturbance to any matter in such environment of equipment or system. **EMC** includes the contents at two aspects: electromagnetic interference and electromagnetic anti-interference.

There are two types of electromagnetic interference according to the route of transmission: conducted interference and radiated interference.

Conducted interference means the interference transmitted along the conductor, so all conductors, such as conducting wire, transmission line, inductor, capacitor and the like, are the transmission path for conducted interference.

Radiated interference means the interference transmitted in the form of electromagnetic wave, the energy transmitted by which is inversely proportional to the square of distance.

Electromagnetic interference must meet three indispensable conditions also known as elements at the same time: interference source, transmission path and sensitive receiver. **EMC** problem should be mainly solved from these three aspects. For the users, the equipment as the electromagnetic interference source or receiver could not be changed, so it will mainly focus on the transmission path for solving the **EMC** problem.

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Different electric equipments and electronic equipments have different EMC abilities due to the different **EMC** standards or grades carried out by them.

### 4.6.2 The EMC Features of Frequency Converter

Frequency converter is the electromagnetic interference source as well as the electromagnetic receiver in a power distribution system, just like other electric and electronic equipments. The

operating principle of the frequency converter determines that it will generate certain electromagnetic interference noise, and at the same time it must be designed to have certain anti-electromagnetic interference ability for ensuring that the frequency converter is able to work reliably in certain electromagnetic environment. When the frequency converter system is working, its EMC features are mainly reflected from the following aspects:

**4.6.2.1** The input current is generally non-sinusoidal wave, and the current contains abundant higher harmonics which may form the electromagnetic interference to the outside, reduce the power factor of the power grid and increase the line loss.

**4.6.2.2** The output voltage is high frequency **PMW** wave which may cause the temperature rise of the motor and reduce the service life of the motor; it may increase leakage current and cause the malfunction of the leakage protector, and at the same time it forms strong electromagnetic interference to the outside and influences the reliability of other electric equipments in the same system.

**4.6.2.3** As the electromagnetic receiver, the over strong external interference will cause the malfunction of the frequency converter and even damage it and will influence the normal use by the users.

**4.6.2.4** During the system wiring, the external interference of the frequency converter and its own anti-interference performance are supplement each other, so the process of reducing the external interference of the frequency converter is also the process of improving its own anti-interference performance.

**4.6.3 EMC Installation Guide**

Combined with the **EMC** features of the frequency converter, this section will introduce the **EMC** installation method from several aspects such as noise suppression, field wiring, grounding, leakage current, the usage of power filter ant the like, in detail, for reference of field installation, and it will achieve the good EMC effect only by fulfilling these five aspects.

**4.6.3.1** Noise Suppression

All connecting wires for the control terminals of the frequency converter should be shielded wire, the shielding layer of which will be grounded nearby the entrance of the frequency converter,

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and the cable clamping piece is used for grounding to form **360** degree looping-in. It is forbidden to twist the shielding layer as a braid shape and then in ground connection with the frequency converter, which may reduce the shielding effect greatly and even lose the shielding effect.



The connecting wire (motor wire) for the frequency converter and the motor should be shielded wire or independent wiring channel, one end of the shielding layer of the motor wire or the

metal enclosure shall be connected with the frequency converter nearby, and the other end shall be connected with the motor case. It the noise filter is installed at the same time, it will suppress the electromagnetic noise greatly.

**4.6.3.2** Field Wiring

Electrical wiring: In different control systems, the power input wires should be electrified from the power transformer independently, which should be usually five-core wire including three live wires, one null line and one ground wire, and it is forbidden to share a wire as the null line and the ground wire.

Equipment classification: Usually, there are different electrical equipments inside the same control cabinet, such as frequency converter, filter, **PLC**, measuring instrument and the like, which have different abilities of emitting electromagnetic noise and bearing noise, so it is required to classify these equipments into strong noise equipment and noise-sensitive equipment.

The similar equipments should be installed in the same area, and different kinds of equipments should be spaced more than **20cm**.

Wiring inside control cabinet: Usually, there are signal line (weak current) and power line (strong current) inside the control cabinet, and there are incoming line and outgoing line for the frequency converter. The signal line may easily interfered by the power line, which accordingly causes the malfunction of equipment. During wiring, the signal line and the power line should be distributed in different area, it is forbidden to arrange these two kinds of lines in the manner of parallel wiring or staggered wiring within a short distance (less than **20cm**), and it must not bundle them together. If the signal line must run across the power line, a **90**-degree angle should be kept between them. The incoming line and the outgoing line of the power lines should not be staggered for wiring or bundled together, in particular in the occasion of installing a noise filter, which may cause the electromagnetic noise forming coupling due to the distributed capacitance of incoming line and outgoing line and accordingly result in that the noise filter is out of action.

**4.6.3.3** Grounding

The frequency converter must be grounded safely and reliably when working. Grounding is not only for the safety of equipments and personnel, but also the most efficient, simplest method for

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solving **EMC** problem, with least cost, so it is preferred.

There are three ways of grounding: grounding by special grounding electrode, grounding by common grounding electrode and grounding by ground wire in series connection. Different control systems should adopt the grounding by special grounding electrode, different equipments within the same control system should adopt the grounding by common grounding electrode, and

different equipments within the same power supply line should adopt the grounding by ground wire in series connection.

**4.6.3.4** Leakage current

Leakage current includes wire-to-wire leakage current and earth leakage current. Its magnitude is determined by the size of distributed capacitance and the carrier frequency of the frequency converter during system wiring. Earth leakage current means the leakage current flowing over the common ground wire, which may not only flow into the frequency converter system but flow into other equipments via the ground wire, and such leakage current may cause the malfunction of leakage breaker, relay or other equipment. The wire-to-wire leakage current is the leakage current flowing over the distributed capacitance between the cables at the input side and output side of the frequency converter. The magnitude of the leakage current is related to the carrier frequency of the frequency converter, the length of motor cable and the section area of cable, and the higher carrier frequency of the frequency converter, the longer motor cable and the larger section area of cable will result in larger leakage current.

Countermeasure:

The leakage current can be reduced effectively by reducing the carrier frequency. When the motor wire is long (more than **50m**), an AC reactor or sinusoidal wave filter should be installed at the output side of the frequency converter, when the motor wire is longer, it should install one reactor respectively at intervals.

**4.6.3.5** Noise Filter

The noise filter can play a good role of electromagnetic decoupling, so it is recommended to install it even if meeting the working condition.

Actually there are two types of noise filters:

**1.** The noise filter is added at the input terminal of the frequency converter for separating it from other equipments.

**2.** The noise filter or the isolation transformer is added at the input terminal of other equipment for separating it from the frequency converter.

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**4.6.4 Under the precondition of installing and wiring according to the contents of Instruction Manual when installing the frequency converter and EMI filter, it may also meet the requirements of the following specifications:**

**EN61000-6-4**: The Detection of Electromagnetic Interference of Product under Industrial Environment

**EN61800-3**: Meet the **EN61800-3** electromagnetic radiation standard (category-2 environment). It can meet the **EN61000-6-3** electromagnetic radiation standard (residential environment) and the **EN61000-6-4** electromagnetic radiation standard (industrial environment) by equipping with **EMC** filter.

## 4.7 Specifications for Breaker, Cable, Contactor and Reactor

**4.7.1** Specifications for Breaker, Cable and Contactor

| Type | Breaker **(A)** | Incoming Line/Outgoing Line (Copper Cable) **mm²** | Rated Working Current of Contactor **A** (voltage **380** or**220V**) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| HV400-2S/R75G3 | 16 | 2.5 | 10 |
| HV400-2S/1R5G3 | 20 | 4 | 16 |
| HV400-2S/2R2G3 | 32 | 6 | 20 |
| HV400-2S/004G3 | 40 | 6 | 25 |
| HV400-7R5G3/1R5P3 | 16 | 2.5 | 10 |
| HV400-1R5G3/2R2P3 | 16 | 2.5 | 10 |
| HV400-2R2G3/004P3 | 25 | 4 | 16 |
| HV400-004G3/5R5P3 | 25 | 4 | 16 |
| HV400-5R5G3/7R5P3 | 25 | 4 | 16 |
| HV400-7R5G3/011P3 | 40 | 6 | 25 |
| HV400-011G3/015P3 | 63 | 6 | 32 |
| HV400-015G3/185P3 | 63 | 6 | 50 |
| HV400-185G3/220P3 | 100 | 10 | 63 |
| HV400-220G3/300P3 | 100 | 16 | 80 |
| HV400-300G3/370P3 | 125 | 25 | 95 |
| HV400-370G3/450P3 | 160 | 25 | 120 |
| HV400-450G3/550P3 | 200 | 35 | 135 |
| HV400-550G3/750P3 | 200 | 35 | 170 |
| HV400-750G3/900P3 | 250 | 70 | 230 |
| HV400-900G3/110P3 | 315 | 70 | 280 |
| HV400-110G3/132P3 | 400 | 95 | 315 |
| HV400-132G3/160P3 | 400 | 150 | 380 |
| HV400-160G3/185P3 | 630 | 185 | 450 |
| HV400-185G3/200P3 | 630 | 185 | 500 |
| HV400-200G3/220P3 | 630 | 240 | 580 |
| HV400-220G3/250P3 | 800 | 150x2 | 630 |
| HV400-250G3/280P3 | 800 | 150x2 | 700 |
| HV400-280G3/315P3 | 1000 | 185x2 | 780 |

| Type | Breaker (A) | Incoming Line/Outgoing Line (Copper Cable) mm² | Rated Working Current of Contactor A (voltage 380 or220V) |
|---|---|---|---|
| HV400-315G3/350P3 | 1200 | 240x2 | 900 |
| HV400-350G3/400P3 | 1280 | 240x2 | 960 |
| HV400-400G3/500P3 | 1380 | 185x3 | 1035 |
| HV400-500G3/560P3 | 1720 | 185x3 | 1290 |
| HV400-560G3/630P3 | 1900 | 185x3 | 1425 |
| HV400-630G3 | 2200 | 240x3 | 1650 |

**4.7.2** Specifications for Input/output AC Reactor and DC Reactor

| Frequency Converter Capacity KW | Input AC Reactor | | Output AC Reactor | | DC Reactor | |
|---|---|---|---|---|---|---|
| | Current (A) | Inductance (mH) | Current (A) | Inductance (uH) | Current (A) | Inductance (mH) |
| HV400-037G3/045P3 | 75 | 0.24 | 80 | 90 | 100 | 0.85 |
| HV400-045G3/055P3 | 91 | 0.23 | 90 | 80 | 120 | 0.70 |
| HV400-055G3/075P3 | 112 | 0.17 | 150 | 60 | 146 | 0.58 |
| HV400-075G3/090P3 | 150 | 0.16 | 150 | 40 | 200 | 0.47 |
| HV400-090G3/110P3 | 180 | 0.12 | 250 | 35 | 238 | 0.35 |
| HV400-110G3/132P3 | 220 | 0.10 | 250 | 30 | 291 | 0.29 |
| HV400-132G3/160P3 | 265 | 0.09 | 290 | 20 | 326 | 0.24 |
| HV400-160G3/185P3 | 300 | 0.08 | 330 | 16 | 395 | 0.22 |
| HV400-185G3/200P3 | 360 | 0.07 | 400 | 13 | 494 | 0.18 |
| HV400-200G3/220P3 | 360 | 0.06 | 490 | 11 | 494 | 0.14 |
| HV400-220G3/250P3 | 400 | 0.05 | 490 | 9 | 557 | 0.13 |
| HV400-250G3/280P3 | 530 | 0.03 | 530 | 8 | 650 | 0.10 |
| HV400-280G3/315P3 | 560 | 0.02 | 600 | 5.5 | 700 | 0.08 |
| HV400-315G3/350P3 | 660 | 0.02 | 660 | 2 | 800 | 0.06 |
| HV400-350G3/400P3 | 400*2 | 0.04 | 400*2 | 5 | 460*2 | 0.12 |
| HV400-400G3/500P3 | 490*2 | 0.03 | 490*2 | 4 | 460*2 | 0.12 |
| HV400-500G3/560P3 | 530*2 | 0.03 | 530*2 | 3 | 650*2 | 0.11 |
| HV400-560G3/630P3 | 600*2 | 0.02 | 600*3 | 3 | 650*2 | 0.11 |
| HV400-630G3 | 660*2 | 0.02 | 660*2 | 3 | 660*2 | 0.09 |

# 5. Operation

## 5.1 instructions on Operation Panel

### 5.1.1 The Schematic Diagram of Panel

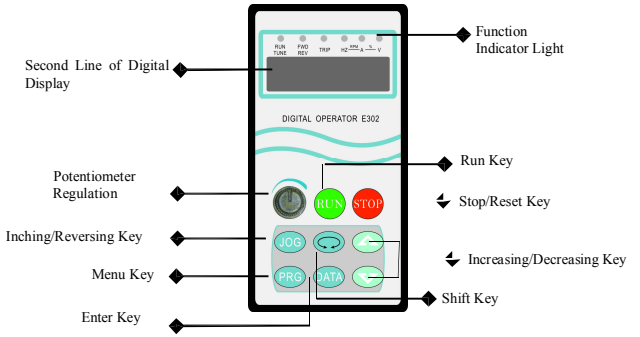



Fig. 5-1 The Schematic Diagram of Operation Panel

### 5.1.2 Description of Key Functions

| Key Symbol | Name | Function Description |
|---|---|---|
| PRG ESC | Programming Key | Entering into or exiting from first menu and deleting shortcut parameters |
| DATA ENT | Enter Key | Entering into the menu screen gradually and confirming the setup parameters |
| ▲ | UP Increasing Key | Increasing data o function code progressively |
| ▼ | DOWN decreasing Key | Decreasing data o function code progressively |
| SHIFT | Shift Key | Being capable of cyclical selection of the display parameter under the stop display interface and run display interface; being capable of selecting the modified bit of parameter for modifying the parameter |
| RUN | Run Key | Being used for running operation under the mode of keyboard operation |
| STOP RST | Stop/Reset Key | Under the running state, it can stop running operation by pressing this key, which is controlled by function code P7.04; under the failure warning state, it can reset the failure by this key, which is not controlled by Function Code P7.04. |
| QUICK JOG | Quick/Jog Key | The function of this key is determined by function code P7.03.<br>0: Switching display state shift key<br>1: Inching operation<br>2:Switching between forwarding and reversing as a forwarding/reversing switching key<br>3: Clearing **UP/DOWN** setting and clearing the frequency value set by **UP/DOWN**<br>4: Fast debug mode (debugging according to the parameters other than factory defaults) |

| Key Symbol | Name | Function Description |
|---|---|---|
| RUN + STOP RST | Combination | The frequency converter will stop freely when **RUN** key and **STOP** key are pressed at the same time |
| | Keypad potentionmeter | The output frequency of HV400 can be changed by the Keypad potentionmeter, It's determined by Function Code P0.07. |

**5.1.3** Description of Indicator Lights

**1)** Description of Function Indicator Lights:

| Name of Indicator Light | Description of Indicator Light |
|---|---|
| RUN | Running state indicator light:<br>Light out means that the frequency converter is in the state of shutdown; Light flicker means that the frequency converter is in the state of parameter self-learning; Light on means that the frequency converter is in the running state; |
| F/R | Forwarding/reversing indicator light:<br>Light out means forwarding state; Light on means reversing state. |
| TRIP | Control mode indicator light:<br>Light out means keyboard control state; Light flicker means terminal control state; Light on means remote communication control state. |

**2)** Description of Unit Indicator Lights

| Name of Indicator Light | Description of Indicator Light |
|---|---|
| Hz | frequency unit |
| A | current unit |
| V | voltage unit |
| RPM | rotation rate unit |
| % | percentage |

**3)** Digital Display Area:

**5** bits of **LED** display can display various supervision data and alarm codes, such as set frequency, output frequency and the like.

## 5.2 Operation Procedure

### 5.2.1 Parameter Setting

Three menus are:

1. Function code group number (first menu);
2. Function code mark number (second menu);
3. Function code set value (third menu).

Explanation: When operating under third menu, it can return to second menu by pressing PRG or DATA, the difference of which lies in that it can store the setup parameter into the control panel, then return to the second menu and remove to next function code automatically by pressing DATA; while it can return to the second menu directly without storing the parameter and keep resting on the current function code by pressing PRG.

Example: changing the setting of function code **P1.01** from **00.00Hz** to **01.05Hz**, for example.

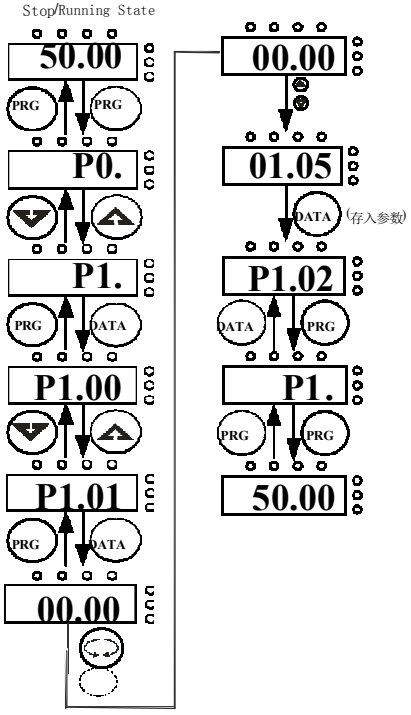



Fig. 5-2 Operation Flow Chart of Third Menu

Under the state of the third menu, if there is no flicker bit in the parameter, it means that it is impossible to modify such function code, and the possible causes include:

**1)** Such function code is non-modifiable parameter, such as actual detecting parameter, operation record parameter and the like;

**2)** Such function code can not be modified under the running state and could be modified only after shutdown.

**5.2.2 Fault Reset**

The frequency converter will prompt relevant fault information after the occurrence of fault. The user can carry out fault reset by the STOP key on the keyboard or the terminal function (Group **P5**), and the frequency converter will become the standby state after fault reset. If the frequency converter is in the fault state, and the user does not process it by fault reset, the frequency converter will become the operation protection state, and the frequency converter will be unable to run.

**5.2.3 Motor Parameter Self-learning**

If it selects the run mode of vector control with PG, the nameplate parameter of motor must be input exactly before the operation of the frequency converter, the frequency converter will match standard motor parameter according such nameplate parameter; the vector control mode relies on the motor parameter strongly, so it must obtain the exact parameter of controlled motor for achieving good control performance.

The operation steps for motor parameter self-learning are as follows:

Firstly, the keyboard command channel shall be selected as the operation command channel selection **(P0.01=0).**

Then, please input the following contents according to the actual motor parameter:

**P2.01**: rated power of motor;

**P2.02**: rated frequency of motor;

**P2.03**: rated revolution of motor;

**P2.04**: rated voltage of motor;

**P2.05**: rated current of motor.

**Note: the motor should be detached from load, and otherwise the motor parameters obtained by self-learning would be incorrect. P0.16** shall be set as **1**, and please refer to the description of function code **P0.16** for the detailed motor parameter self-learning process. Then the frequency converter will calculate the following parameters automatically after the user press the RUN key on the keyboard:

**P2.06**: motor stator resistance;

**P2.07**: motor rotor resistance;

**P2.08**: the inductances of motor stator and rotor;

**P2.09**: the mutual inductance of motor stator and rotor;

**P2.10**: motor no-load current; finishing motor parameter self-learning.

During the process of self-learning, the keyboard will display TUN-0 and TUN-1, when the keyboard displays -END-, the process of motor parameter self-learning will be finished.

**5.2.4 Password Setting:**

**HV400** series frequency converter provides the user password protection function. When **P7.00** is set as non-zero, which will be the user password. After exiting from function code editing state, the password protection will become effective. When PRG key is pressed for entering into the function code editing state, it will show "**0.0.0.0.0**", the operator must input the correct password, and otherwise he could not enter.

It can cancel the password protection function by setting **P7.00** as **00000**. The user password takes no protection function on the parameters in the shortcut menu.

**5.3 Running State**

**5.3.1 Initialization for Electrifying**

As the electrifying process of the frequency converter, the system carries out the initialization firstly, and **LED** shows "**8.8.8.8.8**". After the initialization finished, the frequency converter will be in the standby state, and **LED** will show "**POFF"**, when the voltage does not reach certain value.

**5.3.2 Standby**

Under the shutdown or running state, various state parameters will be displayed. It can select whether these parameters are displayed or not by the function codes **P7.06** and **P7.07** (running parameters) and **P7.08** (shutdown parameter) according to the binary bit, and please refer to the description of function codes **P7.06, P7.07** and **P7.08** for the definition of each bit.

Under the shutdown state, there are eleven shutdown state parameters to be selected whether being displayed or not, including set frequency, bus voltage, input terminal state, output terminal state, **PID** set value, **PID** feedback value, analog **AI1**, analog **AI2**, high-speed pulse **HDI** frequency, current stages of **PLC** and multistage velocity and torque set value. The function code **P7.08** will select whether displaying or not according to bit (translated into binary bit), the selected parameters will be switched to be displayed orderly by pressing >>/SHIFT key, and the selected parameters will be switched to be displayed orderly towards the left by pressing the QUICK/JOG key (**P7.03=0**).

**5.3.3 Operation**

Under the running state, there are twenty two state parameters to be selected whether being displayed or not,

including operation frequency, set frequency, bus voltage, output voltage, output current, operating speed, linear velocity, output power, output torque, **PID** given value, **PID** feedback value, input terminal state, output terminal state, torque set value, current stage of **PLC** or multistage velocity, analog **AI1**, analog **AI2**, high-speed pulse HDI frequency, overload percentage of motor and overload percentage of frequency converter. The function codes **P7.06 and P7.07** will select whether displaying or not according to bit (translated into binary bit), the selected parameters will be switched to be displayed orderly towards the right by pressing >>/SHIFT key, and the selected parameters will be switched to be displayed orderly towards the left by pressing the QUICK/JOG key (**P7.03=0**).

**5.3.4 Fault**

**HV400** series frequency converter provides various kinds of fault information. Please refer to **HV400** Series Frequency Converter Faults and Countermeasures for details.

5**.4 Quick Menu**

The quick menu provides the method for viewing and modifying function parameters faster. After **P7.03** is set as **4**, the frequency converter will search out the current parameters which are different from the factory defaults automatically after the QUICK/JOG key is pressed, and these parameters will be stored in the fast debug menu according to the sequence of function codes for the user to view and set. The length of the quick menu buffer zone is 32, the recorded parameters will be searched according to the sequence of function codes. If the recorded parameters are more than 32, the exceeding parameters will not be displayed. It will enter into the fast debug mode by pressing QUICK/JOG. If it shows "**NULLP**" after pressing QUICK/JOG, it means that all current parameters are identical with the factory defaults. After entering into the fast debug menu, it will exit from the third menu (function code set value) or exit from the mode of quick menu by pressing QUICK/JOG key.

# 6. Function Description in Detail

## Group P0 Basic Function Group

| Function Code | Name | Setting Range |
|---|---|---|
| P0.00 | election of speed control mode | 0~2【0】 |

It is for selecting the speed control mode of the frequency converter.

**0: V/F** Control

**V/F** control is adapted for the speed regulation occasion with not so high requirement on control accuracy and could be also used for the occasion of dragging several motors by one frequency converter.

**1:** Vector Control without **PG**

It is namely open-loop vector, which is adapted for the debugging occasion or the frequency control occasion with not so high requirement on accuracy. The mode of vector control without **PG** is adapted for the high performance general occasion without pulse coder and the occasion with the requirement of large low-frequency torque and the high requirement on speed control accuracy. One frequency converter could drive only one motor, such as the loads of machine tool, centrifugal machine, drawing mill, injection molding machine and the like.

**2:** Torque Control (Vector Control without **PG**)

It is pen-loop vector, which is adapted for the occasion with not so high requirement on accuracy.

**Note:**

**If selecting the mode of vector control, it must set the motor template parameters of motor and the coder parameters correctly and finishing the motor parameter self-learning before operation, so as to get the accurate motor parameters. It may bring the high performance of the vector control into play only on the basis of obtaining accurate motor parameters.**

**The vector control performance can be optimized by adjusting the vector control parameters (Group P3).**

| Function Code | Name | Setting Range |
|---|---|---|
| P0.01 | operation command channel | 0~2【0】 |

It is for selecting the control command channel for the frequency converter. The frequency converter control commands include starting, shutdown, forwarding, reversing, inching, fault reset and the like.

0: Keyboard Command Channel

The RUN and STOP keys on the keyboard panel carry out the command control. If the multifunctional key QUICK/JOG is set as **FWD/REV** switching function (**P7.03** as **2**), it can change the operation direction by this key; **under the running state, the frequency converter can shut down freely by pressing the RUN and STOP keys synchronously.**

**1**: Terminal Command Channel

The multifunctional Digital input terminal carries out the operation command control, such as forwarding, reversing, forward inching, reverse inching and the like.

**2**: Communication Command Channel

The operation command shall be controlled by the upper computer by means of communication.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.02 | keyboard and terminal UP/DOWN setting | 0~3【0】 |

The frequency shall be set by "△" and "▽" on the keyboard and the terminal **UP/DOWN** (increasing the frequency setting progressively/decreasing the frequency setting progressively) function, the authority of which is highest, and they can be combined with any other frequency setting channel. It is mainly used for the fine adjustment of the output frequency of the frequency converter during the process of debugging the control system.

**0:** valid, and the frequency converter will store after power loss. The frequency command can be set, and the frequency converter will store such set frequency value after power down and will automatically combine it with the current set frequency after being electrified next time.

**1**: valid, and the frequency converter will not store after power loss. The frequency command can be set, and this set frequency will not be stored after the frequency converter powers down.

**2**: invalid. The " △ " and " ▽ " on the keyboard and the terminal UP/DOWN function are invalid, and the setting will be cleared automatically.

**3:** being valid while operating. The " △ " and " ▽ " on the keyboard and the terminal UP/DOWN function will be valid when is operates, and the setting will be cleared automatically when it shuts down.

**Note: When the user recover the default values for the function parameters of the frequency converter, the setting of the keyboard and terminal UP/DOWN function will be cleared automatically.**

| Function Code | Name | Setting Range |
|---|---|---|
| P0.03 | maximum output frequency | 10.00~600.00Hz【50.00Hz】 |

It is used for setting the maximum output frequency of the frequency converter. It is the basis for frequency setting as well as the basis of the speed of acceleration and deceleration, so the users should pay attention to it.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.04 | upper limit of operation frequency | P0.05～P0.03【50.00Hz】 |

It is the upper limit of the output frequency of the frequency converter. This value should be less than or equal to the maximum output frequency.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.05 | lower limit of operation frequency | 0.00～P0.04【0.00Hz】 |

It is the lower limit of the output frequency of the frequency converter.

It can be selected by the function code **P1.12**, when the set frequency is lower than the

action at the lower limiting frequency, it will operate, shut down or sleep according to the lower limiting frequency. Wherein, the maximum output frequency will be ≥ upper limiting frequency and ≥ lower limiting frequency.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.06 | setting frequency by keyboard | 0.00~P0.03 【50.00Hz】 |

When the frequency A command selection is "keyboard setting", this function code value will set the initial value for the frequency number of the frequency converter.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.07 | frequency A command selection | 0~8【0】 |

It is for selecting frequency **A** command input channel for the frequency converter**.** There are totally 8 main given frequency channels:

**0:** keyboard setting

It can achieve the aim of setting frequency via keyboard by modifying the value of function code **P0.06** "setting frequency by keyboard".

**1**:Keypad potentiometer Setting

**2**: Analog **AI1** Setting
**3**: Analog **AI2** Setting

It means that the frequency shall be set by the analog input terminal. The standard configuration of **HV400** series frequency converter provides **2** paths of analog input terminal, wherein, **AI1** is the input of **-10V~10V**voltage; and **AI2** is the input of **0~10V/0(4)~20mA**. The current /voltage input can be switched by the jumper **J9**.

**Note: When analog AI2 selects the input of 0~20mA, the voltage corresponding to 20mA is 5V.**

**100.0%** of analog input is corresponding to the maximum frequency (Function Code **P0.03),** and **-100.0%** is corresponding to the reversed maximum frequency (Function Code **P0.03)**.

**4:** High-speed Pulse Setting **(HDI)**

The frequency is given by the input of terminal high-speed pulse. The standard configuration of **HV400** series frequency converter provides 1 path of high-speed pulse input **(HDI)**.

Pulsed voltage: **15~30V**; pulsed frequency: **0.0~50.0 kHz**.

**100.0%** of the pulse input setting is corresponding to the maximum frequency, and **-100.0%** of the pulse input setting is corresponding to the reversed maximum frequency.

Note: The pulse setting could only be input from the multifunctional terminal HDI, **HDI** is set as high-speed pulse input (**P5.00=0**), and **HDI** function is selected as "setting input".

5: Simple **PLC** Program Setting

When this frequency setting method is selected, the frequency converter will run in the form of simple PLC program. It is required to set the parameters of group **PA** "simple **PLC** and multistage velocity control group" for confirming the given frequency, operation direction and even the time for acceleration/deceleration for each stage. Please refer to the introduction on the

function of group **PA** for details.

**6:** Multistage Velocity Running Setting

When this frequency setting method is selected, the frequency converter will run in the form of multistage velocity. It is required to set the parameters of groups **P5** and **PA** for confirming the given frequency. If **P0.07** has not been set as multistage velocity setting, the multistage velocity setting will have priority, but its priority level will be still lower than inching running. When multistage velocity setting has priority, only **1~15** stages could be set. If **P0.07** is set as multistage velocity setting, it may set **0~15** stages.

**7: PID** Control Setting

When this parameter is selected, the running mode of the frequency converter will be process **PID** control. Then, it is required to set group **P9** "**PID** control group". The operation frequency of the frequency converter shall be the frequency value after **PID** regulation. Wherein, for the meanings of **PID** given source, given amount, feedback source and the like, please refer to the introduction on the "**PID** function" of group **P9**.

**8:** Remote Communication Setting

The frequency command shall be given by the upper computer by means of communication. Please refer to chapter **9** the Frequency Converter **Modbus** Communication Protocol.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.08 | frequency B command | 0~2【0】 |
| | selection | |

**0**: Analog **AI1** Setting

**1**: Analog **AI2** Setting

**2**: High-speed Pulse (**HDI**) Setting

When frequency **B** command is used as independent frequency setting channel (given channel **B** is selected as the frequency setting source), its usage is the same as that of frequency command **A**. Please refer to **P0.07** description concretely.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.09 | selection of reference object for frequency B command | 0~1【0】 |

**0**: maximum output frequency, **100%** of frequency **B** setting is corresponding to the maximum output frequency.

**1:** frequency **A** command, **100%** of frequency **B** setting is corresponding to the maximum output frequency. This setting could be selected for regulating on the basis of frequency **A** command.

**Note: When 0~20mA input is selected as analog AI2, the voltage corresponding to 20mA shall be 5A. The function code P0.09 will be applied only when the frequency B command is used as superposition setting.**

| Function Code | Name | Setting Range |
|---|---|---|
| P0.10 | combination mode of setting sources | 0~3【0】 |

**0: A**, the current frequency setting channel is frequency **A** command.

**1: B**, the current frequency setting channel is

frequency **B** command.

**2: A+B**, the current frequency setting channel is frequency **A** command + frequency **B** command.

**3: Max (A, B)** : Indicating that frequency **A** command will be the set frequency, if frequency **A** command is larger than frequency **B** command. Otherwise, frequency **B** command will be the set frequency.

Note: the combination mode of (**0, 1 and 2**) can be switched by terminal function (group **P5**).

| Function Code | Name | Setting Range |
|---|---|---|
| P0.11 | time for acceleration 0 | 0.1~3600.0s【determined by model】 |
| P0.12 | time for deceleration 0 | 0.1~3600.0s【determined by model】 |

Time for acceleration means the time for the frequency converter to accelerate from **0Hz** to the maximum output frequency (**P0.03**).

Time for deceleration means the time for the frequency converter to decelerate from the maximum output frequency (**P0.03**) to **0Hz.**

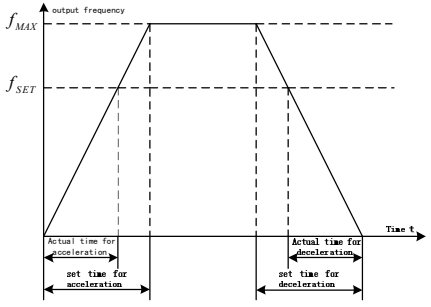



Fig. 6-1 The Schematic Diagram of Time for Acceleration/deceleration

When the set frequency is equal to the maximum frequency, the actual time for acceleration/deceleration is consistent with the set time for acceleration/deceleration.

When the set frequency is less than the maximum frequency, the actual time for acceleration/deceleration is less than the set time for acceleration/deceleration.

Actual time for acceleration/deceleration=set time for acceleration/deceleration× (set frequency/maximum frequency)

**HV400** series frequency converter has **4** sets of time for acceleration or deceleration.

Group one: **P0.11, P0.12**;

Group two: **P8.00, P8.01**;

Group three: **P8.02, P8.03**;

Group four: **P8.04, P8.05**.

The time for acceleration/deceleration can be selected by the combination of the selection terminal of time for acceleration/deceleration in the multifunctional digital input terminal.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.13 | selection of operation direction | 0~2【0】 |

**0**: running towards default direction. After being electrified, the frequency converter will run towards the actual direction.

**1**: running towards opposite direction. It is used for changing the motor steering, and its function is to change the direction of rotation of motor by adjusting any two motor wires.

**Note: After the initialization of parameters, the running direction of the motor will restore to the original state.**

**Please use with caution for the occasion that it is forbidden to changing the motor steering after the system is debugged.**

**2**: forbidding reverse running. The reverse running of the frequency converter is forbidden, and it shall be applied to the specific occasion of forbidding reverse running.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.14 | carrier frequency setting | 1.0~15.0kHz【determined by model】 |

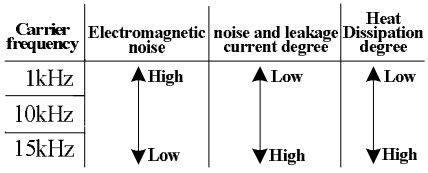



Fig. 6-2 The Diagram of the Influence of Carrier Frequency on Environment

The Table of Relation between Model and Carrier Frequency

| carrier frequency / model | Maximum carrier frequency (kHz) | Minimum carrier frequency (kHz) | Factory default (kHz) |
|---|---|---|---|
| 0.4~11kW | 15 | 1.0 | 5 |
| 15~55kW | 8 | 1.0 | 4 |
| 75~630kW | 6 | 1.0 | 2 |

The advantages of high carrier frequency: ideal current wave form, less current harmonic wave, low noise of motor;

The disadvantages of high carrier frequency: Increased switching loss, increased temperature rise of the frequency converter, influencing the output capability of the frequency converter, (it is required to use the frequency converter by derating under the high carrier frequency), increased leakage current of the frequency converter, and the increased electromagnetic interference to the outside.

The case of low carrier frequency will be contrary to the above situation, the over low carrier frequency will cause the instability of running at low frequency, the reduced torque and even the oscillation phenomenon.

The carrier frequency has been set reasonably, before the frequency converter leaves factory. Generally, the user doesn't have to modify this parameter.

If the user uses at the carrier frequency over the default value, it is required to use by derating, and **20%** should be derated for increasing every **1k** carrier frequency.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.15 | AVR function selection | 0~2【1】 |

**AVR** function is the function of regulating output voltage automatically. When **AVR** function is invalid, the output voltage will change along with the input voltage (or the voltage of DC bus); when **AVR** function is valid, the output voltage will not change along with the input voltage (or the voltage of DC bus), and the output voltage will be essentially constant within the range of output capability. If the time for deceleration is too long and could not meet the field demand, the AVR function could be canceled, which is conductive to shortening the time for deceleration.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.16 | motor parameter self-learning | 0~2【0】 |

**0**: no operation.

**1**: comprehensive parameter self-learning

Before the motor parameter self-learning, the motor nameplate parameters (**P2.01 — P2.05**) must be input correctly, the motor must be detached from load to leave it in still or unloaded state, and otherwise the motor parameters obtained by self-learning would be incorrect.

Before the motor parameter self-learning, the time for acceleration/deceleration (**P0.11, P0.12**) should be set properly according to the inertness of motor, and otherwise there would be the faults of over current and over voltage during the process of motor parameter self-learning.

Setting **P0.16** as **1** and then press DATA for starting motor parameter self-learning, then LED will display "-TUN-" and flicker, pressing RUN for carrying out the parameter self-learning, and it will display "TUN-0". After it displays "TUN-1", the motor will run, while the light "RUN/TUNE" flickers. It will display "-END-" at the end of the parameter self-learning, and finally it will display returning to the interface of down state. When "-TUN-" is flickering, you can PRG press for exiting from the state of parameter self-learning.

It can press STOP during the process of parameter self-learning for stopping the operation of parameter self-learning.

**Note: The starting and stopping of parameter self-learning could only be controlled by the keyboard; this function code will restore to 0 after the parameter self-learning is finished.**

2: Static Parameter Self-learning

It is unnecessary to detach the motor form the load during the static parameter self-learning of motor. Before motor parameter self-learning, the motor nameplate parameters (**P2.01 — P2.05**) must be input correctly, and it should detect the stator resistance and rotor resistance of the motor and the leakage inductance of the motor after self-learning. The mutual inductance and no-load current of the motor will be unable to be measured, and the user can input corresponding values as a matter of experience.

| Function Code | Name | Setting Range |
|---|---|---|
| P0.17 | functional parameter reset | 0~2【0】 |

**0**: no operation

**1**: the frequency converter will recover all parameters to default values

**2**: the frequency converter will clear the recent fault record

This function code will recover to 0 automatically after the operation of selected function finished.

## P1Group Start-stop Group

| Function Code | Name | Setting Range |
|---|---|---|
| P1.00 | operation mode of starting | 0~2【0】 |

**0**: starting directly. It means starting with the starting frequency.

**1**: DC braking before starting. It shall begin with DC braking (pay attention to set the parameters **P1.03, P1.04**), and then it shall run by starting the motor at the start frequency. It is adapted for the occasion that the small inertia load may reverse at the time of starting.

**2:** speed tracking before starting. The frequency converter will calculate the speed and direction of the motor firstly and then starting running at the current speed, so as to realize the smooth shock-free starting of the motor. It is adapted for restarting after momentary interruption of great inertia load. This function is limited to the models higher than **11KW**.

| Function Code | Name | Setting Range |
|---|---|---|
| P1.01 | start frequency for direct starting | 0.00~10.00【1.50Hz】 |
| P1.02 | retention time of starting frequency | 0.0~50.0s【0.0s】 |

It is used for setting proper starting frequency and can increase the torque at the time of starting. The frequency converter will start running at the starting frequency (P1.01) over the retention time of starting frequency (P1.02) and then will accelerate to the target frequency for the set time for acceleration. If the target frequency is less than the starting frequency, the frequency converter will be in the standby state. The value of starting frequency is not limited by the lower limiting frequency. The starting frequency will act during the process of forwarding/reversing switching.

| Function Code | Name | Setting Range |
|---|---|---|
| P1.03 | braking current before starting | 0.0~150.0%【0.0%】 |
| P1.04 | braking time before starting | 0.0~50.0s【0.0s】 |

P1.03 is the added value of DC current at the time of DC braking before starting is the percentage of the rated current of the frequency converter.

P1.04 is the duration of DC current. If DC braking time is set as 0, DC braking will be invalid.

If the DC braking current is larger, the braking force will be larger.

| Function Code | Name | Setting Range |
|---|---|---|
| P1.05 | selection of accelerating/decelerating mode | 0~1【0】 |

It is used for selecting the changing mode of frequency during the processes of starting and running.

0: linear type

The output frequency will increase or decrease progressively in a linear way.

1: retaining

| Function Code | Name | Setting Range |
|---|---|---|
| P1.06 | selection of shutdown mode | 0~1【0】 |

**0**: ramp shutdown

After the shutdown command becomes effective, the frequency converter will reduce the output frequency according to the mode of decelerating and the defined time for deceleration and will shut down when the frequency is reduced to **0**.

**1**: free shutdown

After the shutdown command becomes effective, the frequency converter will stop outputting immediately. The load will shut down freely according to the mechanical

| Function Code | Name | Setting Range |
|---|---|---|
| P1.07 | start frequency for shutdown braking | 0.00~P0.03【0.00Hz】 |
| P1.08 | latency time for shutdown braking | 0.0~50.0s【0.0s】 |
| P1.09 | DC braking current for shutdown | 0.0~150.0%【0.0%】 |
| P1.10 | DC braking time for shutdown | 0.0~50.0s【0.0s】 |

Start frequency for shutdown braking: during the process of decelerating for shutdown, it will start shutdown DC braking when reaches this frequency. If the start frequency for shutdown braking is 0, DC braking will be invalid, and the frequency converter will shut down according to the set time for deceleration.

Latency time for shutdown braking: before starting shutdown DC braking, the frequency converter will block the output and will start DC braking after such latency time. It is used for preventing the fault of over current caused by starting DC braking at high speed.

DC braking current for shutdown: indicating the added quantity of DC braking. If this value is higher, the braking torque will be larger.

DC braking time for shutdown: the duration of DC braking quantity

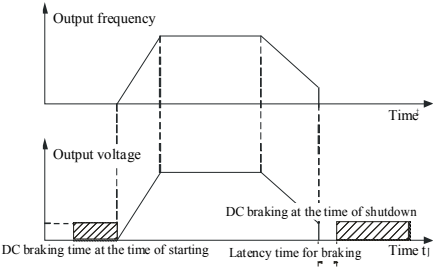



Fig. 6-3 The Schematic Diagram of DC Braking

| Function Code | Name | Setting Range |
|---|---|---|
| P1.11 | dead-time for forwarding and reversing | 0.0~3600.0s【0.0s】 |

It is used for setting the transient time for the part of outputting zero frequency during the transient process of forwarding and reversing, which is shown as follows:

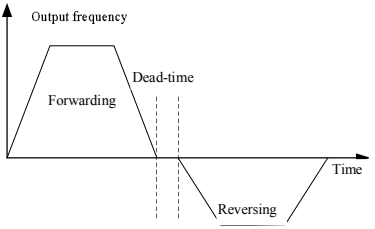



Fig. 6-4 The Schematic Diagram of Dead-time for Forwarding and Reversing

| Function Code | Name | Setting Range |
|---|---|---|
| P1.12 | action at the operation frequency lower than the lower limit of frequency | 0~2【0】 |

This function code is used for confirming the running state of the frequency converter when the set frequency is lower than the lower limit of frequency.

**0**: running at the lower limit of frequency.

**1**: shutdown.

**2**: sleep and standby. When the set frequency is lower than the lower limit of frequency, the frequency converter will shut down freely; and when the set frequency is larger than or equal to the lower limit of frequency, the frequency converter will run automatically.

**Note: this function will be valid only when the lower limiting frequency is lareger than zero.**

| Function Code | Name | Setting Range |
|---|---|---|
| P1.13 | latency time for sleep and wake | 0.0~3600.0s 【0.0s】 |

When **P1.12=2**, the frequency converter will start running only when the time, during which the set frequency is larger than or equal to the lower limiting frequency, exceeds the value set by **P1.13**.

**Note: it is valid when P1.12 is 2.**

| Function Code | Name | Setting Range |
|---|---|---|
| P1.14 | Selection of restart after power down | 0~1【0】 |

0: forbidding restarting. It means that the frequency converter will not start automatically once being electrified again after the power down of the frequency converter.

1: allowing restarting. It means that the frequency converter will restore the former running state automatically once being electrified again after the power down of the frequency converter, which means that it will delay for the latency time for restarting (**P1.15**) and then start running automatically after being electrified again if it was the running start before power down (it must ensure that the operating terminal is still in the closed state, when it is controlled by the terminal), and it was the shutdown state before power down, the frequency converter will not start automatically after being electrified again.

**Note: this function is limited to the model higher than 132kW only. The user must select the function of allowing restarting prudently, and otherwise it will cause a serious consequence.**

| Function Code | Name | Setting Range |
|---|---|---|
| P1.15 | latency time for restarting | 0.0~3600.0s 【0.0s】 |

**Note: it is valid when P1.14 is 1.l**

| Function Code | Name | Setting Range |
|---|---|---|
| P1.16 | selection of terminal function detection during electrifying | 0~1【0】 |

When the operation command channel is terminal control, the system will detect the state of operating terminals automatically during the process of electrifying.

**0**: terminal operation command is invalid during electrifying. The frequency converter is in the shutdown state after being electrified, which is unrelated to whether the operation command terminal is valid ore not at the time of electrifying. It must enable this terminal again (to be invalid and then valid) for running the frequency converter.

**1**: terminal operation command is valid

during electrifying. The running state of the frequency converter after being electrified is consistent with the state of operation command terminal, and it will run in case of being valid and shut down in case of being invalid.

**Note: the user must select this function prudently, and otherwise it will cause a serious consequence.**

| Function Code | Name | Setting Range |
|---|---|---|
| P1.17~ P1.19 | **Reserve** | |

## Group P2 Motor Parameter Group

| Function Code | Name | Setting Range |
|---|---|---|
| P2.00 | selection of motor model | 0~2【0】 |

**0**: **G** type machine, it is fit for the load of constant torque

**1**: **P** type machine, it is fit for constant power load (fan, water pump loads)

**HV400** series frequency converter adopts the form of combined **G/P**, which means that the adaptive motor power for the load of constant torque (**G** type) is one gear less than that for fan and water pump loads (**P** type).

The factory default of the frequency converter is set as **G** type. If you want to select P type machine, this function code should be set as **1**, and the motor parameters of group **P2** should be set again.

For example: the model of **HV400-3T0055G/0075P** has been set as **5.5kW G** type machine, if you want to change it into 7**.5kW P** type machine, it is required to set **P2.00** as **1**, and the motor parameters of group **P2** should be set again.

| Function Code | Name | Setting Range |
|---|---|---|
| P2.01 | rated power of motor | 0.4~630.0kW 【determined by model】 |
| P2.02 | rated frequency of motor | 0.01Hz~P0.03 【50.00Hz】 |
| P2.03 | rated speed of motor | 0~36000rpm 【determined by model】 |
| P2.04 | rated voltage of motor | 0~800V 【determined by model】 |
| P2.05 | Rated current of motor | 0.8~1100.0A 【determined by model】 |

**Note: please set in accordance with the motor nameplate parameters. It required accurate motor parameters for the excellent control performance of control.**

The frequency converter provides the parameter self-learning function. The accurate parameter self-learning is from the correct setting of motor nameplate parameters.

Please try to ensure that the frequency converter is matched with the motor power for ensuring the control performance. If there is an over large difference between them, the control performance of the frequency converter will be reduced significantly.

**Note: resetting the rated power of motor (P2.01) can initialize motor parameters P2.06~P2.10.**

| Function Code | Name | Setting Range |
|---|---|---|
| P2.06 | motor stator resistance | 0.001~65.535Ω 【determined by |

| | | |
|---|---|---|
| | | model】 |
| P2.07 | motor rotor resistance | 0.001~65.535Ω【determined by model】 |
| P2.08 | inductances of motor stator and rotor | 0.1~6553.5mH【determined by model】 |
| P2.09 | mutual inductance of motor stator and rotor | 0.1~6553.5mH【determined by model】 |
| P2.10 | no-load current of motor | 0.1~6553.5A【determined by model】 |

After the motor parameter self-learning finished normally, the set values of **P2.06**—**P2.10** will update automatically. These parameters are the reference parameters of high-performance V/F control and will influence the control performance directly.

**Note: the user should not modify the parameter of this group at will.**

## Group P3 Vector Control Function Group

| Function Code | Name | Setting Range |
|---|---|---|
| P3.00 | speed loop proportional gain 1 | 0~100【20】 |
| P3.01 | speed loop integration time 1 | 0.01~10.00s【0.50s】 |
| P3.02 | switching low-point frequency | 0.00~F3.05【5.00Hz】 |
| P3.03 | speed loop proportional gain 2 | 0~100【25】 |
| P3.04 | speed loop integration time 2 | 0.01~10.00s【1.00s】 |
| P3.05 | Switching high-point frequency | F3.02~F0.09【10.00Hz】 |

The above parameters are only adapted for the vector control mode. Under the switching frequency **1** (**P3.02**), the speed loop **PI** parameters will be **P3.00** and **P3.01**. Above the switching frequency **2** (**P3.05**), the speed loop **PI** parameters will be **P3.03** and **P3.04**. The **PI** parameters will be gained by the linear change of two groups of parameters at the frequency between the above switching frequencies, which is shown as follows:

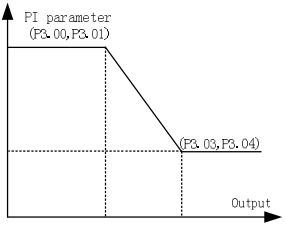



Fig. 6-5 The Schematic Diagram of PI Parameter

The dynamic response features of speed loop of vector control could be regulated by setting the proportionality coefficient and integration time of speed regulator. Both increasing the proportional gain and decreasing the integration time could accelerate the dynamic response of the speed loop, however the over large proportional gain or over short integration time will cause the system oscillation and excessive overshoot easily. Over small proportional gain may also cause the system steady oscillation easily, and there may be static error of speed.

Speed loop PI parameters are closely related to the system inertia, so it is required to be adjusted based on the default PI parameters

according to different load features, so as to meet the requirements of various occasions.

| Function Code | Name | Setting Range |
|---|---|---|
| P3.06 | VC slip compensation factor | 50%~200% 【100%】 |

Slip compensation factor is used for adjusting the slip frequency for vector control and improving the speed control accuracy of system, and it can restrain the static error of speed effectively by adjusting this parameter.

| Function Code | Name | Setting Range |
|---|---|---|
| P3.07 | setting upper limit of torque | 0.0~200.0% 【set according to model】 |

When it is set as **100.0%**, it is corresponding to the rated output current of the frequency converter. **G** type machine: **150.0%**; **P** type machine: **120.0%**.

**Note: both P3.07 and P3.09 will be related to the torque setting under the torque control.**

| Function Code | Name | Setting Range |
|---|---|---|
| P3.08 | selection of torque setting mode | 0~5【0】 |

**0**: setting torque by keyboard (P3.09)

**1**: setting torque by analog **AI1**

**2**: setting torque by analog **AI2**

**3**: setting torque by high-speed pulse **HDI**

**4**: multistage torque setting

**5**: setting torque by remote communication

**1~5**: it is valid under the torque control and defines the torque command input channel for the frequency converter. When the torque is set as negative number, the motor will reverse.

Under the speed control, the frequency converter will output frequency according to set frequency command, and the output torque will be matched with the load torque automatically. However, the output torque will be limited to the upper limit (**P3.07**) of torque, if the load torque is larger than the set upper limit of torque, the output torque of the frequency converter will be restrained, and the motor speed will change automatically.

Under the torque control, the frequency converter will output torque according to set torque command, and the output frequency is limited to the upper and lower limiting frequencies. If the set torque is larger than the load torque, the output frequency of the frequency converter will increase until the upper limiting frequency; if the set torque is lower than the load torque, the output frequency of the frequency converter will decrease until the lower limiting frequency. If the output frequency of the frequency converter is limited, its output torque will not be equal to the set torque any more.

**Note:**

**It can use the multifunctional input terminal for switching between torque control and speed control.**

**1~5: 100% is corresponding to twice rated current of the frequency converter.**

**During decelerating for shutdown, the frequency converter will switch from the mode of torque control to the mode of speed control automatically.**

| Function Code | Name | Setting Range |
|---|---|---|
| P3.09 | setting torque by keyboard | -200.0~200.0% 【50.0%】 |
| P3.10 | selection of setting source for upper limiting frequency | 0~5 【0】 |

**0**: setting upper limiting frequency by keyboard (P0.04)

**1**: setting upper limiting frequency by analog **AI1**

**2**: setting upper limiting frequency by analog **AI2**

**3**: setting upper limiting frequency by high-speed pulse **HDI**

**4**: setting upper limiting frequency by multistage

**5**: setting upper limiting frequency by remote communication

**Note: 1~4: 100% is corresponding to the maximum frequency.**

## Group P4 V/F Control Function Group

The function code of this group will be valid only under **V/F** control, namely **P0.00=0**.

| Function Code | Name | Setting Range |
|---|---|---|
| P4.00 | V/F curve setting | 0~4【0】 |

**0:** linear **V/F** curve. It is fit for the load of constant torque.

**1**: multipoint **V/F** curve. **V/F** curve can be defined by setting (**P4.03~P4.08**).

**2~4**: multi-power **V/F** curve. It is fit for the occasion of the load of changeable torque, such as fan, water pump and the like. The curves of various powers are shown in the following figure:

**Note: $V_b$ is corresponding to the rated voltage of motor, and $f_b$ is corresponding to the rated frequency of motor, in the following figure.**

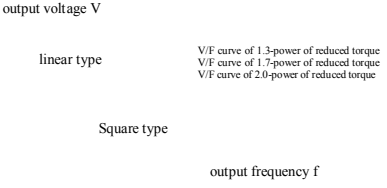



Fig. 6-6 The Schematic Diagram of V/F Curve

| Function Code | Name | Setting Range |
|---|---|---|
| P4.01 | torque boost | 0.0~10.0% 【0.5%】 |
| P4.02 | cutoff point for torque boost | 0.0~50.0% 【20.0%】 |

Torque boost is mainly applied to the occasion under the cutoff frequency (**P4.02**), **V/F** curve after boost is shown in the following figure, and the torque boost can improved the features of **V/F** low-frequency torque.

The amount of torque should be selected according to the size of load properly, the boost for larger load can be increased, but the boosting value should not be set over

large, because the overlarge torque boost will result in the overexcitation operation of motor, the current output by the frequency converter will be increased to increase the heating of motor and reduce the efficiency.

When the torque boost is set as **0.0%**, the frequency converter will be automatic torque boost.

Cutoff point for torque boost: the torque boost will be valid under this point of frequency, and the torque boost will be invalid beyond this set frequency.

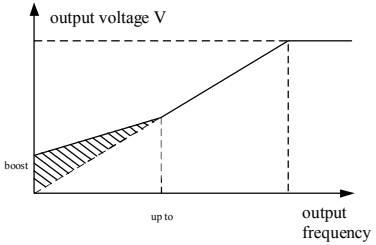



Fig. 6-7 The Schematic Diagram of Manual Torque Boost

| Function Code | Name | Setting Range |
|---|---|---|
| P4.03 | V/F frequency point 1 | 0.00~P4.05 【0.00Hz】 |
| P4.04 | V/F voltage point 1 | 0.0~100.0% 【0.0%】 |
| P4.05 | V/F frequency point 2 | P4.03~P4.07 【0.00Hz】 |
| P4.06 | V/F voltage point 2 | 0.0~100.0% 【0.0%】 |
| P4.07 | V/F frequency point 3 | P4.05~P2.02 【0.00Hz】 |
| P4.08 | V/F voltage point 3 | 0.0~100.0% 【0.0%】 |

The above six parameters **P4.03~P4.08** define the multipoint **V/F** curve.

The value of **V/F** curve is usually set according to the load features of motor.

**Note: V1 < V2 < V3, and f1 < f2 < f3. It may cause the overheating and even overburning of the motor, and it may also cause the overcurrent stall or overcurrent protection of the frequency converter, if the low-frequency voltage is set too high.**

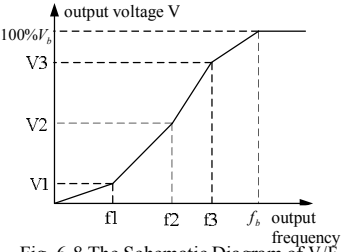



Fig. 6-8 The Schematic Diagram of V/F Curve Setting

| Function Code | Name | Setting Range |
|---|---|---|
| P4.09 | limiting V/F slip compensation | 0.0~200%【0.0%】 |

It can compensate the change of motor speed because of carrying load under **V/F** control by setting this parameter, so as to improve the rigidity of mechanical features of motor. This value should be set as the rated slip frequency of motor which is calculated as follows:

**P4.09=fb-n*p/60**

Wherein: **fb** is the rated frequency of motor and is corresponding to the function code **P2.02**; **n** is the rated speed of motor and is corresponding to the function code **P2.03**; and **p** is the number of pole-pairs of motor.

| Function Code | Name | Setting Range |
|---|---|---|
| P4.10 | selection of energy-saving operation | 0~1【0】 |

**0**: no action

**1**: operation of automatic energy-saving

During the process of no-load or light-load operation of motor, it can achieve the aim of saving energy automatically by detecting the load current and adjusting the output voltage properly.

**Note: this function is particularly effective to the loads such as fan and pump.**

| Function Code | Name | Setting Range |
|---|---|---|
| P4.11 | motor low-frequency oscillation suppression factor | 0~10【2】 |
| P4.12 | motor high-frequency oscillation suppression factor | 0~10【0】 |
| P4.13 | demarcation point for motor oscillation suppression | 0.00Hz~P0.03【30.00Hz】 |

**P4.11~P4.12** will be valid only under the mode of **V/F** control. When **P4.11** and **P4.12** are 0, the oscillation suppression will be invalid, the larger these parameters, the stronger suppression on motor oscillation. Normally, it will take effect of suppressing oscillation by setting these values between **1 and 3**, and the over large setting may increase the motor oscillation. When the operation frequency is lower than **P4.13,** the low--frequency oscillation suppression factor (**P4.11**) will be valid, and when the operation frequency is higher than **P4.13,** the high--frequency oscillation suppression factor (**P4.12**) will be valid.

## Group P5 Input Terminal Group

There are **8** multifunctional digital input terminals (wherein, **HDI** can be used as a high-speed pulse input terminal) and **2** analog input terminals in the **HV400** series frequency converter.

| Function Code | Name | Setting Range |
|---|---|---|
| P5.00 | selection of HDI input type | 0~1【0】 |

**0: HDI** is high-speed pulse input

**1: HDI** is on-off input

| Function Code | Name | Setting Range |
|---|---|---|
| P5.01 | function selection for terminal S1 | 0~39【1】 |
| P5.02 | function selection for terminal S2 | 0~39【4】 |
| P5.03 | function selection for terminal S3 | 0~39【7】 |
| P5.04 | function selection for | 0~39【0】 |

| Function Code | Name | Setting Range |
|---|---|---|
| | terminal S4 | |
| P5.05 | function selection for terminal S5 | 0~39【0】 |
| P5.06 | function selection for terminal S6 | 0~39【0】 |
| P5.07 | function selection for terminal S7 | 0~39【0】 |
| P5.08 | on-off input function selection for terminal HDI | 0~39【0】 |

The parameters of this group are used for setting the corresponding functions of multifunctional digital input terminals.

**0**: non-function

**1**: forwarding operation (**FWD**)

**2**: reversing operation (**REV**)

When the operation command channel is terminal control, the operation command of the frequency converter will be set by the above terminal function.

**3**: three-wire operation control

It is three-wire control input terminal. Refer to the introduction on three-wire system function code **P5.10** for specific information of three-wire control input terminal.

**4**: forwarding inching

**5**: reversing inching

Refer to the description of **P8.06~P8.08** for specific inching frequency and time for acceleration/deceleration.

**6**: free shutdown

The frequency converter will block the output immediately after the command become valid, and the stopping process of motor will not be controlled by the frequency converter. It is recommended to adopt this mode for the load of large inertia in case of no requirement on stopping time, and this mode is identical with the meaning of free shutdown described for **P1.06**.

**7**: fault reset

It is external fault reset function, which is used for remote fault reset and is identical with the function of STOP key on the keyboard.

**8**: suspension of operation

The frequency converter will decelerate for shutdown, but all operation parameters will be in memory status, such as **PLC** parameter, swing frequency parameter and **PID** parameter. After this single disappears, the frequency converter will restore to the operating state before stopping.

**9**: inputting external fault

After this signal become valid, the frequency converter will report external fault (**EF**) and shut down.

**10**: increasing frequency setting progressively (**UP**)

**11**: decreasing frequency setting progressively (**DOWN**)

**12**: clearing the increased and decreased frequency settings

The above three functions are mainly used for realizing the modification of given frequency by external terminal. **UP** is the command of increasing progressively,

**DOWN** is the command of decreasing progressively, and the command of clearing the increased and decreased frequency settings is used for clearing the frequency values set by **UP/DOWN**, so as to restore the given frequency to the frequency given by frequency command channel.

**13**: switching between setting **A** and setting **B**

**14**: switching between setting **A** and setting **A+B**

**15**: switching between setting **B** and setting **A+B**

The above three functions are mainly used for realizing the switching of frequency setting channels. For example, if it is the frequency given by channel **A** at present, it can be switched to the channel **B** by the function number **13** and switched to channel **A+B** by the function number **14**, and the function number **15** will be invalid. The logic for other cases is similar.

**16, 17, 18 and 19**: multistage velocity terminals **1~4**

It can realize the setting of 16-stage velocity by combining the states of these four terminals.

**Note: multistage velocity terminal 1 is low position, and multistage velocity terminal 4 is high position.**

| multistage velocity4 | multistage velocity3 | multistage velocity2 | multistage velocity1 |
|---|---|---|---|
| BIT3 | BIT2 | BIT1 | BIT0 |

**20**: suspension of multistage velocity

It shields the function of multistage velocity selection terminal and keeps the set value at the current state.

**21 and 22**: terminals for selecting time for acceleration/deceleration **1 and 2**

It selects 4 groups of time for acceleration/deceleration by the combination state of these two terminals:

| terminal 2 | terminal 1 | selection of time for acceleration/ deceleration | corresponding parameter |
|---|---|---|---|
| OFF | OFF | time for acceleration/ deceleration 0 | P0.11 P0.12 |
| OFF | ON | time for acceleration/ deceleration 1 | P8.00 P8.01 |
| ON | OFF | time for acceleration/ deceleration 2 | P8.02 P8.03 |
| ON | ON | time for acceleration/ deceleration 3 | P8.04 P8.05 |

**23**: resetting of simple **PLC**

It restarts the simple **PLC** process and clears the former **PLC** state memory information.

**24**: suspension of simple **PLC**

The program of **PLC** suspends during the process of implementing, and it will always run at the current velocity state. After this function is cancelled, the simple **PLC** will continue.

**25**: suspension of **PID** control

**PID** will suspend temporarily, and the frequency converter will maintain the current frequency output.

**26**: suspension of swing frequency

The frequency converter suspends at the

current output. After this function is cancelled, it will start swing frequency running at the current frequency continuously.

**27**: resetting of swing frequency

The set frequency of the frequency converter returns to the center frequency.

**28**: resetting of counter

It clears the counter state.

**29**: forbidding torque control

It forbids the frequency converter taking the mode of torque control, and the frequency converter will switch to the mode of speed control.

**30**: forbidding accelerating and decelerating

It ensures that the frequency converter would not be influenced by external signals (except shutdown command) and will maintain the current output frequency.

**31**: triggering counter

It is the count pulse input port for internal counter with the maximum frequency of **200Hz**.

**32**: temporarily clearing the frequency increased/decreased setting

When the terminal is switched on, it can clear the frequency values set by **UP/DOWN**, so as to restore the given frequency to the frequency given by the frequency command channel. When the terminal is switched off, it will return to the frequency value after frequency increased/decreased setting again.

34~39: retaining

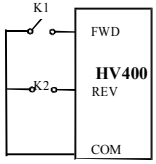
| Function Code | Name | Setting Range |
|---|---|---|
| P5.09 | on-off filtering time | 0~10【5】 |

It is used for setting **S1~S4,** as the filtering time for **HDI** terminal sampling. In case of strong interference, this parameter should be increased, so as to prevent malfunction.

| Function Code | Name | Setting Range |
|---|---|---|
| P5.10 | running mode under terminal control | 0~3【0】 |

This parameter defines four different running modes of the frequency converter by external terminal control.

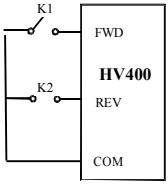
**0**: two-wire control 1. It enables unifying with direction. This mode is the most frequently used two-wire mode. The forwarding or reversing of motor shall be determined by defined **FWD and REV** terminal commands.




| K1 | K2 | running command |
|---|---|---|
| OFF | OFF | stopping |
| ON | OFF | forwarding |
| OFF | ON | reversing |
| ON | ON | stopping |

Fig. 6-9 The Schematic Diagram of Two-wire Operation Mode 1

**1**: two-wire control **2**. It enables separating from direction. **FWD** defined by this mode is the enabling terminal. The direction shall be determined by the state of defined **REV.**




| K1 | K2 | running command |
|---|---|---|
| OFF | OFF | stopping |
| OFF | ON | stopping |
| ON | OFF | forwarding |
| ON | ON | reversing |

Fig. 6-10 The Schematic Diagram of Two-wire Operation Mode 2

**2:** three-wire control **1**. In this mode, **Sin** is enabling terminal, operation command is generated by **FWD**, and the direction shall be controlled by **REV**.

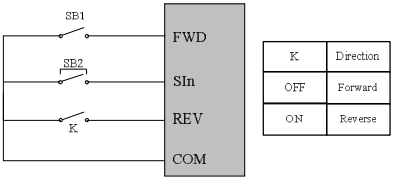



Fig. 6-11 The Schematic Diagram of three-wire Operation Mode 1

Wherein: **K**: forwarding/reversing switch; **SB1**: run button; **SB2**: stop button(Normal Closed).

Sin is the multifunctional input terminal set as function number **3** "three-wire running control".

**3**: three-wire control **2**. In this mode, Sin is enabling terminal, the operation command is generated by SB1 or SB3, and both of which control the operation direction at the same time. The shutdown command is generated by normally closed input SB2.

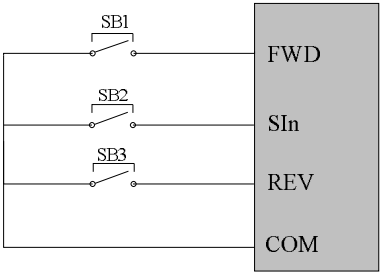



Fig. 6-12 The Schematic Diagram of three-wire Operation Mode 2

Wherein: **SB1**: button for forward run

**SB2**: button for shutdown

**SB3:** button for reverse run

**Note: under the operation mode of two-wire system, if FWD/REV terminal is valid, the shutdown command will be generated by other sources to shut down the frequency converter. Even if the control terminal FWD/REV is still valid, the frequency converter would not run any more after the shutdown command disappeared. It is required to trigger FWD/REV again for enabling the frequency converter to run, such as PLC single loop shutdown, fixed-length shutdown, valid STOP shutdown under terminal control (see P7.04).**

| Function Code | Name | Setting Range |
|---|---|---|
| P5.11 | Change rate of frequency increment by terminal UP/DOWN | 0.01~50.00Hz/s 【0.50Hz/s】 |

It adjusts the change rate for setting frequency by the function of terminal **UP/DOWN**.

| Function Code | Name | Setting Range |
|---|---|---|
| P5.12 | AI1 lower limiting value | 0~10.00V 【0.00V】 |
| P5.13 | corresponding setting for AI1 lower limit | -100.0~100.0% 【0.0%】 |
| P5.14 | AI1 upper limiting value | 0~10.00V 【10.00V】 |

| | | |
|---|---|---|
| P5.15 | corresponding setting for AI1 upper limit | -100.0~100.0 【100.0%】 |
| P5.16 | filtering time for AI1 input | 0.00~10.00s 【0.10s】 |

The above mentioned function codes define the relation between the analog input voltage and the set value corresponding to analog input. If the analog input voltage exceeds the range of maximum input or minimum input, the exceeding part will be counted as the maximum input or minimum input.

The analog input **AI1** could only provide voltage input within the range of 0V~10Vvoltage.

**Note: It will be allowed to input negative value only when the corresponding setting is negative value.**

For different applications, **100.0%** of analog setting is corresponding to different nominal values, and please refer to the descriptions of respective application.

The following graphic symbols explain several setting cases:

**Note: the lower limiting value of AI1 must be less than or equal to the upper limiting value of AI1.**

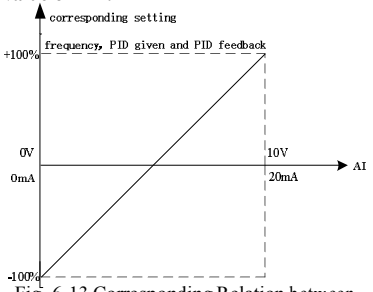



Fig. 6-13 Corresponding Relation between Analog Given and Set Amounts

Filtering time for **AI1** input: for adjusting the sensitivity of analog input. Increasing this value properly will increase the anti-interference ability of analog but will also reduce the sensitivity of analog input.

| Function Code | Name | Setting Range |
|---|---|---|
| P5.17 | AI2 lower liming value | 0.00~10.00V 【0.00V】 |
| P5.18 | corresponding setting for AI2 lower limit | -100.0~100.0 【0.0%】 |
| P5.19 | AI2 upper limiting value | 0.00~10.00V 【10.00V】 |
| P5.20 | corresponding setting for AI2 upper limit | -100.0~100.0 【100.0%】 |
| P5.21 | filtering time for AI2 input | 0.00~10.00s 【0.10s】 |

The function of **AI2** is similar to the setting method of **AI1**. **Analog AI2 can support 0~10V/0~20mA input, and when it selects 0~20mA input as AI2, 20mA is corresponding to the voltage of 5V.**

| Function Code | Name | Setting Range |
|---|---|---|
| P5.22 | HDI lower limiting frequency | 0.00~50.00kHz 【0.00kHz】 |
| P5.23 | corresponding setting for HDI lower limiting frequency | -100.0~100.0 【0.0%】 |
| P5.24 | HDI upper limiting frequency | 0.00~50.00kHz 【50.00kHz】 |

| Function Code | Name | Setting Range |
|---|---|---|
| P5.25 | corresponding setting for HDI upper limiting frequency | -100.0~100.0 【100.0%】 |
| P5.26 | filtering time for HDI frequency input | 0.00~10.00s 【0.10s】 |

The function codes of this group define the corresponding relation in case of using **HDI** pulse as the input mode of setting. The functions of this group are similar as those of **AI1** and **AI2**.

## Group P6 Output Terminal Group

There are **2** multifunctional relay output terminals, **1 HDO** terminal (which can be used as either high-speed pulse output or open collector output) and **2** multifunctional analog output terminals in the standard unit of **HV400** series frequency converter.

| Function Code | Name | Setting Range |
|---|---|---|
| P6.00 | selection of HDO output | 0~1【0】 |

**HDO** terminal is a programmable multiplex terminal.

**0**: open collector high-speed pulse output: maximum pulse frequency is **50.00 kHz**. See **P6.06** for related functions.

**1**: open collector output: see **P6.01** for related functions

| Function Code | Name | Setting Range |
|---|---|---|
| P6.01 | selection of HDO open collector output | 0~20【1】 |
| P6.02 | selection of relay 1 output | 0~20【4】 |
| P6.03 | selection of relay 2 output | 0~20【0】 |

The functions of open collector output are shown in the following table:

**0**: no-output.

**1**: the frequency converter in operation, if there is output from the frequency converter, it will output **ON** signal.

**2**: the frequency converter in forwarding operation, if there is output frequency from the frequency converter in forwarding operation, it will output **ON** signal.

**3**: the frequency converter in reversing operation, if there is output frequency from the frequency converter in reversing operation, it will output **ON** signal.

**4**: fault output, if there is any fault occurring in the frequency converter, it will output **ON** signal.

**5**: frequency level detection **FDT** output, please refer to the detailed description of function codes **P8.21 and P8.22**.

**6**: reaching frequency, please refer to the detailed description of function code **P8.23**.

**7**: under zero-speed operation, if both the output frequency of the frequency converter and the set frequency are zero, it will output

**ON** signal.

**8:** reaching set count pulse value, if the count value reaches the value set in **P8.18**, it will output **ON** signal.

**9:** reaching specific count pulse value, if the count value reaches the value set in **P8.19**, it will output **ON** signal. Please refer to the function description of group **P8** for the count function.

**10:** pre-alarming for frequency converter overload, it will output **ON** signal after exceeding the pre-alarming time according to the pre-alarming point of the frequency converter.

**11:** finishing simple **PLC** stage, it will output a pulse signal with the width of **500ms** after the simple PLC operation finishes one stage.

**12:** finishing simple **PLC** cycle, it will output a pulse signal with the width of **500ms** after the simple PLC operation finishes one stage.

**13**: reaching operation time, if the total operation time of the frequency converter exceeds the time set in **P8.20**, it will output **ON** signal.

**14:** reaching upper limiting frequency, if the operation frequency reaches the upper limiting frequency, it will output **ON** signal.

**15**: reaching lower limiting frequency, if the operation frequency reaches the lower limiting frequency, it will output **ON** signal.

**16**: ready for operation, when the major loop and control loop power supplies are created, the protection function of the frequency converter takes no effect, and the frequency converter is in the runnable state, it will output **ON** signal.

**17~20**: retaining

| Function Code | Name | Setting Range |
|---|---|---|
| P6.04 | selection of AO1 output | 0~11【0】 |
| P6.05 | selection of AO2 output | 0~11【0】 |
| P6.06 | selection of HDO open collector high-speed pulse output | 0~11【0】 |

The standard output of analog output is **0~20mA** (or **0~10V**), **AO1** can select current/voltage output by jumper **J15**, and **AO2** is voltage output. The range of high-speed pulse output of **HDO** open collector is set between **0 kHz** and **50.00 kHz**.

The corresponding amounts indicated by them are shown in the following table:

| Setting Value | Function | Range |
|---|---|---|
| **0** | operation frequency | 0~maximum output frequency |
| **1** | set frequency | 0~maximum output frequency |
| **2** | running speed | 0~2 times of rated speed of motor |
| **3** | output current | 0~2 times of rater current of frequency |

| | | converter |
|---|---|---|
| **4** | output voltage | 0~1.5 times of rated voltage of frequency converter |
| **5** | output frequency | 0~2 times of rated power |
| **6** | set torque | 0~2 times of rater current of motor |
| **7** | output torque | 0~2 times of rater current of motor |
| **8** | analog AI1 input | 0V~10V |
| **9** | analog AI2 input | 0~10V/0~20mA |
| **10** | high-speed pulse HDI input | 0.1Hz~50.00kHz |

| Function Code | Name | Setting Range |
|---|---|---|
| **P6.07** | **AO1 output lower limit** | **0.0~100.0%【0.0%】** |
| **P6.08** | **AO1 output corresponding to lower limit** | **0.00~10.00V【0.00V】** |
| **P6.09** | **AO1 output upper limit** | **0.0~100.0%【100.0%】** |
| **P6.10** | **AO1 output corresponding to upper limit** | **0.00~10.00V【10.00V】** |

The above mentioned function codes define the relation between the output values and the output values corresponding to analog output. If the output value exceeds the set range of maximum output or minimum output, the exceeding part will be counted as the maximum output or minimum output.

If the analog output is current output, **1mA** current is corresponding to **0.5V**voltage.

For different applications, **100.0%** of output value is corresponding to different analog outputs, and please refer to the descriptions of respective application for detail.

The following graphic symbols explain several setting cases:

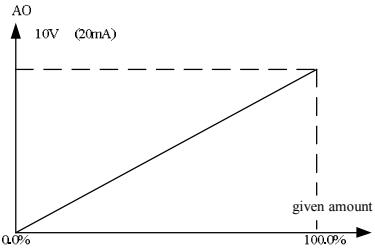



Fig. 6-14 The Corresponding Relation between Given Amount and Analog Output

| Function Code | Name | Setting Range |
|---|---|---|
| P6.11 | AO2 output lower limit | 0.0~100.0%【0.0%】 |
| P6.12 | AO2 output corresponding to lower limit | 0~10.00V【0.00V】 |
| P6.13 | AO2 output upper limit | 0.0~100.0%【100.0%】 |
| P6.14 | AO2 output corresponding to upper limit | 0.00~10.00V【10.00V】 |
| P6.15 | HDO output lower limit | 0.0~100.0%【0.0%】 |
| P6.16 | HDO output corresponding to HDO lower limit | 0.00~50.00kHz【0.00kHz】 |
| P6.17 | HDO output upper limit | 0.0~100.0%【100.0%】 |
| P6.18 | HDO output corresponding to HDO upper | 0.00~50.00kHz【50.00kHz】 |

| Function Code | Name | Setting Range |
|---|---|---|
| | limit | |

The corresponding relation between these outputs is similar to AO.

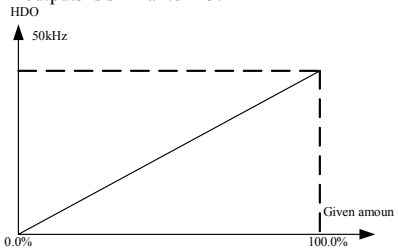



Fig. 6-15 The Corresponding Relation between Given Amount and High-speed Pulsed Quantity Output

## Group P7 Human-machine Interface Group

| Function Code | Name | Setting Range |
|---|---|---|
| P7.00 | user password | 0~65535【0】 |

The password protection function will take effect, if it is set as any nonzero number.

00000: clearing the user password set previously and invalidating the function of password protection. It may also clear the password by restoring the factor fault.

After the user password is set and takes effect, the user could not access the parameter menu in case of inputting incorrect user password, and the user could review and modify the parameters only by inputting correct user password. Please remember the user password you set.

The password protection will take effect one minute after exiting from function code editing state. When the password takes effect, it will display "0.0.0.0.0." if you press PRG/ESC key and enter into function code editing state, so the operator must input the user password correctly, and otherwise it can not be accessed.

| Function Code | Name | Setting Range |
|---|---|---|
| P7.01 | retaining | 0~1【0】 |
| P7.02 | retaining | 0~2【0】 |
| P7.03 | JOG function selection | 0~4【0】 |

JOG multifunctional key. The functions of the keyboard JOG can define by parameter setting.

**0:** switching display states by shift key

**1:** Inching operation. The key JOG realizes inching operation.

**2:** Switching between forwarding and reversing. The key JOG realizes the switching of the direction of frequency command, which is valid only under the keyboard control.

**3:** Clearing **UP/DOWN** setting. The key JOG clears the setting value of **UP/DOWN**.

**4:** Fast debug mode (debugging according to the parameter other then the factory defaults)

| Function Code | Name | Setting Range |
|---|---|---|
| P7.04 | STOP key stop function selection | 0~3【0】 |

The function code defines valid selections of STOP halting functions.

**0:** Only valid on panel control

**1：** Simultaneously valid on panel and terminal control

**2**：Simultaneously valid on panel and communication control

**3**：Valid on all control modes

For fault reset, the key of STOP is valid at any condition.

| Function Code | Name | Set Range |
|---|---|---|
| P7.05 | Keyboard Display Selection | 0~3【0】 |

**0**：External keyboard pre-enabled

**1**：When the native and external keyboards display simultaneously, only external keys are valid.

**2**：When the native and external keyboards display simultaneously, only native keys are valid.

**3**：When the native and external keyboards display simultaneously, all keys are valid (the relationship between the two is logical or).

**Notes: The function of No. 3 should be used carefully. Misoperation may cause serious consequences.**

| Function Code | Name | Set Range |
|---|---|---|
| P7.06 | Parameter Selection 1 Displayed in Operation Status | 0~0xFFFF【0x07FF】 |

When the frequency converter of HV400 series is in operation state, the parameter display is subject to the function code. For a 16-bit binary number, if one bit is 1, the corresponding parameter of this bit can be checked through key of while the frequency converter is in operation. If the bit is 0, the corresponding parameter will not be displayed. During its set, the function code has to be input after the binary system is converted into the hexadecimal system.

Display contents represented by P7.06 are as follows:

| BIT15 | BIT14 | BIT13 | BIT12 | BIT11 | BIT10 |
|---|---|---|---|---|---|
| Current Number of Segments of PLC Multi-segment Speed | Count Value | Torque Set Value | State of Output Terminal | State of Input Terminal | PID Feedback Value |
| **BIT9** | **BIT8** | **BIT7** | **BIT6** | **BIT5** | **BIT4** |
| PID Set Value | Output Torque | Output Power | Linear Velocity | Operating Rotational Speed | Output Current |
| **BIT3** | **BIT2** | **BIT1** | **BIT0** | | |
| Output Voltage | Busbar Voltage | Set Frequency | Operating Frequency | | |

The state of input/output terminal is displayed by decimal system. **S1**（**HDO**）corresponds to the least significant digit. For example, the input status displays 3. That means terminals **S1 and S2** are closed and other terminals are disconnected. Please refer to introductions of **P7.23 and P7.24** for detains.

| Function Code | Name | Set Range |
|---|---|---|
| P7.07 | Parameter Selection 2 Displayed in Operation Status | 0~0xFFFF 【0x0000】 |

When the frequency converter of HV400 series is in operation state, the parameter display is subject to the function code. For a 16-bit binary number, if one bit is 1, the corresponding parameter of this bit can be checked through key of while the frequency converter is in operation. If the bit is 0, the corresponding parameter will not be displayed. During its set, the function code has to be input after the binary system is converted into the hexadecimal system.

Display contents represented by **P7.07** are as follows:

| BIT15 | BIT14 | BIT13 | BIT12 | BIT11 | BIT10 |
|---|---|---|---|---|---|
| Reserved | Reserved | Reserved | Reserved | Reserved | Reserved |
| BIT9 | BIT8 | BIT7 | BIT6 | BIT5 | BIT4 |
| Reserved | Reserved | Reserved | Reserved | Reserved | Overload Percentage of Frequency Converter |
| BIT3 | BIT2 | BIT1 | BIT0 | | |
| Overload Percentage of Motor | High Speed Pulse HDI Frequency | Value of Analog Quantity AI1 | Value of Analog Quantity AI2 | | |

| Function Code | Name | Set Range |
|---|---|---|
| P7.08 | Parameter Selection displayed in halt mode | 0~0xFFFF 【0x00FF】 |

The set of this function is the same with **P7.06** except that the parameter display is subject to the function mode when the frequency converter of **HV400** series is in halt mode.

Contents displayed in halt mode are as follows:

| BIT15 | BIT14 | BIT13 | BIT12 | BIT11 | BIT10 |
|---|---|---|---|---|---|
| | Reserved | Reserved | Reserved | Reserved | Torque Value |
| BIT9 | BIT8 | BIT7 | BIT6 | BIT5 | BIT4 |
| Current Number of Segments of PLC Multi-segment Speed | High Speed Pulse HDI Frequency | Value of Analog Quantity AI2 | Value of Analog Quantity AI1 | PID Feedback Value | PID Set Value |
| BIT3 | BIT2 | BIT1 | BIT0 | | |
| State of Output Terminal | State of Input Terminal | Busbar Voltage | Set Frequency | | |

| Function Code | Name | Set Range |
|---|---|---|

| | | |
|---|---|---|
| P7.09 | Rotational Speed Display Coefficient | 0.1~999.9% 【100.0%】 |

Mechanical Rotational Speed=120*Operation Frequency***P7.09**/Pole Number of Motor，and the function mode which has no effect on actual rotational speed is used for correcting display errors of rotational speed scale.

| Function Code | Name | Set Range |
|---|---|---|
| P7.10 | Linear Velocity Display Coefficient | 0.1~999.9% 【1.0%】 |

Linear Velocity=Mechanical Rotational Speed*P7.10，the function mode is used for correcting display errors of linear velocity scale.

| Function Code | Name | Set Range |
|---|---|---|
| P7.11 | Rectifier Module Temperature | 0~100.0℃ |
| P7.12 | Contravariant Module Temperature | 0~100.0℃ |
| P7.13 | Software Release | |
| P7.14 | Rated Power of Frequency Converter | 0~630kW 【Model confirmed】 |
| P7.15 | Rated Current of Frequency Converter | 0.0~1100A 【Model confirmed】 |
| P7.16 | Native Accumulated Operation Time | 0~65535h |

These function codes can only be checked but not modified.

Rectifier module temperature: represents the temperature of the rectifier module, and the over-temperature protection values of rectifier modules of different models may be different.

Contravariant module temperature: displays the temperature of contravariant module **IGBT**. And the over-temperature protection values of contravariant module **IGBT** of different models may be different.

Software release: Software release number.

Native accumulated operation time: displays the accumulated operation time of the frequency converter up to now.

| Function Code | Name | Set Range |
|---|---|---|
| P7.17 | Last two fault types | 0~25 |
| P7.18 | Last fault type | 0~25 |
| P7.19 | Current fault type | 0~25 |

To record the latest three fault types of the frequency converter: **0** means no fault and **1~25** means **25** different faults. Please refer to fault analysis for details.

| Function Code | Name | Set Range |
|---|---|---|
| P7.20 | Current Fault Operation Frequency | |

| | | |
|---|---|---|
| P7.21 | Current Fault Output Current | |
| P7.22 | Current Fault Busbar Voltage | |
| P7.23 | Current Fault Input Terminal State | |
| P7.24 | Current Fault Output Terminal State | |

The input terminal state of current fault is decimal system number. All states of number impute terminals during the last fault are displayed and the sequence is:

| BIT7 | BIT6 | BIT5 | BIT4 |
|---|---|---|---|
| HDI | S7 | S6 | S5 |
| BIT3 | BIT2 | BIT1 | BIT0 |
| S4 | S3 | S2 | S1 |

When the input terminal is **ON**, the corresponding bit is **1**, and the corresponding bit of **OFF** is **0**. The state of the figure input signal during the fault can be known through the value.

The state of output terminal during the current fault is displayed by **decimal system** figures. The state of all figure output terminals during the last fault is displayed, and the sequence is:

| BIT3 | BIT2 | BIT1 | BIT0 |
|---|---|---|---|
| Reserved | RO2 | RO1 | HDO |

When the input terminal is **ON**, the corresponding bit is **1**, and the corresponding bit of **OFF** is **0**. The state of the figure input signal during the fault can be known through the value.

## Group P8 Enhanced Function Group

| Function Code | Name | Set Range |
|---|---|---|
| P8.00 | Acceleration Time 1 | 0.1~3600.0s【Model confirmed】 |
| P8.01 | Deceleration Time 1 | 0.1~3600.0s【Model confirmed】 |
| P8.02 | Acceleration Time 2 | 0.1~3600.0s【Model confirmed】 |
| P8.03 | Deceleration Time 2 | 0.1~3600.0s【Model confirmed】 |
| P8.04 | Acceleration Time3 | 0.1~3600.0s【Model confirmed】 |
| P8.05 | Deceleration Time3 | 0.1~3600.0s【Model confirmed】 |

The acceleration time and the deceleration time can be selected among **P0.11, P0.12** and the three groups of the acceleration and deceleration times. Meanings are the same. Please refer to relevant instructions of **P0.11** and **P0.12**.

The acceleration time and the deceleration time **0~3** can be selected through different combinations of multifunctional figure input terminals during the operation process of the frequency converter.

| Function Code | Name | Set Range |
|---|---|---|
| P8.06 | Inch Operation Frequency | 0.00~F0.09 【Model confirmed】 |
| P8.07 | Inch Operation Acceleration Time | 0.1~3600.0s 【Model confirmed】 |
| P8.08 | Inch Operation Deceleration Time | 0.1~3600.0s 【Model confirmed】 |

Given frequency and acceleration and deceleration time of the frequency converter in the inch operation are defined. The start-stop mode in the inch operation is: direct start mode and deceleration stop mode.

Inch acceleration time refers to the time required for the acceleration of the frequency converter from **0Hz** to the maximum output frequency (**P0.03).**

Inch deceleration time refers to the time required for the deceleration of the frequency converter from the maximum output frequency (**P0.03)** to **0Hz**.

| Function Code | Name | Set Range |
|---|---|---|
| P8.09 | Hopping Frequency 1 | 0.00~P0.03 【0.00Hz】 |
| P8.10 | Hopping Frequency 2 | 0.00~P0.03 【0.00Hz】 |
| P8.11 | Hopping Frequency Range | 0.00~P0.03 【0.00Hz】 |

When the set range is within the hopping frequency, the actual operation frequency will be the boundary of the hopping frequency.

By set the hopping frequency, the frequency converter is made to avoid the laden mechanical resonance point. The frequency converter can be provided with two hopping frequency points. If the two hopping frequency points are all set to **0**, this function doesn't work.

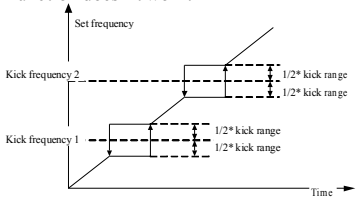



Diagram 6-16 Hopping Frequency Sketch Map

| Function Code | Name | Set Range |
|---|---|---|
| P8.12 | Swing Frequency Range | 0.0~100.0% 【0.0%】 |
| P8.13 | Kick Frequency Range | 0.0~50.0% 【0.0%】 |
| P8.14 | Rise Time of Swing Frequency | 0.1~3600.0s 【5.0s】 |
| P8.15 | Fall Time of Swing Frequency | 0.1~3600.0s 【5.0s】 |

The swing frequency function is applicable to industries of spinning and chemical fiber and occasions when transverse and winding functions are needed.

The swing frequency function means the output frequency of the frequency converter swings up and down centered on the set frequency. The track of the operation frequency at the timer shaft is shown in the flowing diagram, wherein, the swing range

is set by **P8.12**. When **P8.12** is set to **0** or when the swing is **0**, the swing frequency does not work.

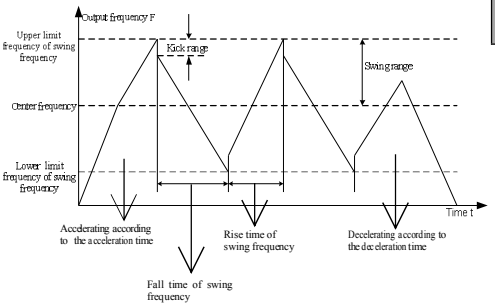



Diagram 6-17 Sketch Map of Swing Frequency Operation

Swing frequency range: The swing frequency range is restrained by upper limit frequency and lower limit frequency.

Swing relative to center frequency: swing **AW** = Center Frequency×Swing Range **P8.12**。

Kick Frequency = Swing **AW**×Kick Frequency Range **P8.13**. That is the value of Kick Frequency relative to the swing range during the swing frequency operation.

Rise Time of Swing Frequency: time required for the operation of the swing frequency from the lowest point to the highest point.

Fall Time of Swing Frequency: time required for the operation of the swing frequency from the highest point to the lowest point.

| Function Code | Name | Set Range |
|---|---|---|
| P8.16 | Fault Automatic Reset Times | 0~3【0】 |
| P8.17 | Interval Time | 0.1~100.0s【1.0s】 |
| | Set of Fault Automatic Reset | |

Fault Automatic Reset Times: when the frequency converter selects the fault automatic reset, it is used for setting the automatic reset times. When it exceeds this value, the frequency converter breaks down and stands by, waiting to be repaired.

Interval Time Set of Fault Automatic Reset: to select the interval time from the fault start to the automatic reset operation.

| Function Code | Name | Set Range |
|---|---|---|
| P8.18 | Set Count Value | P8.19~65535【0】 |
| P8.19 | Assigned Count Value | 0~P8.18【0】 |

The count value is counted by a counter in a multifunctional on-off input terminal through inputting terminal input impulse signals.

When the count value reaches to the set count value, the on-off input terminal outputs the signal of the value which the count value reaches. The counter is reset and goes on counting when the next impulse comes.

The Set Count Value means that **HDO, RO1** or **RO2** outputs a signal for indicating how many impulses are input from the impulse input terminal (counting trigger signal input function has to be selected).

Assigned Count Value means that **HDO, RO1** or **RO2** outputs a signal for indicating how many impulses are input

from the impulse input terminal (counting trigger signal input function has to be selected) until the set count value is reached. After the set count value is reached, the counter is reset and goes on counting when the next impulse comes.

The assigned count value **P8.19** should not be larger than the set count value **P8.18**.

This function is illustrated in the following diagram:

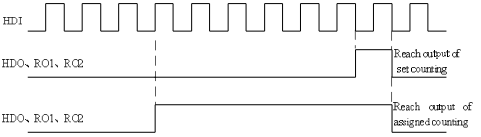



Diagram 6－18 Sketch Map of Set Count Value and Assigned Count Value

| Function Code | Name | Set Range |
|---|---|---|
| P8.20 | Set Operation Time | 0~65535h【65535h】 |

To pre-set the operation time of the frequency converter.

When the accumulated operation time reaches the set operation time, the frequency converter multifunctional figure output terminal outputs the reach signal of the operation time.

| Function Code | Name | Set Range |
|---|---|---|
| P8.21 | FDT Level Detection Value | 0.00~F0.09【50.00Hz】 |
| P8.22 | FDT Lag Detection Value | 0.0~100.0【5.0%】 |

To set the detection value of the output frequency and the lagged value of the output operation relief as follows:

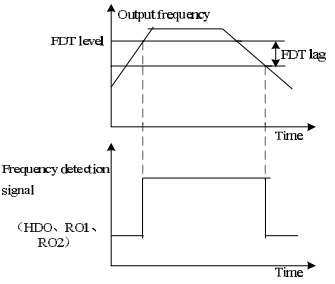



Diagram 6-19 Sketch Map of FDT Level

| Function Code | Name | Set Range |
|---|---|---|
| P8.23 | Frequency Reaching Detection Amplitude | 0.0~100.0%【0.0%】 |

As is shown in the following diagram, when the output frequency of the frequency converter reaches the set frequency value, this function can be used for adjusting the detection amplitude.

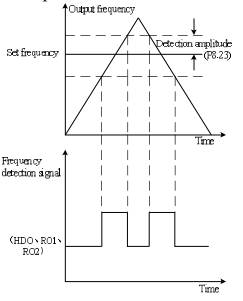



Diagram6-20 Sketch Map of Frequency Reaching Detection Amplitude

| Function Code | Name | Set Range |
|---|---|---|
| P8.24 | Droop Control | 0.00~10.00Hz【0.00Hz】 |

This parameter adjusts the frequency variation of the frequency converter whose speed is drooping.

When multiple frequency converters drive the same load, the frequency converter with faster speed bears heavier load because of the load unbalance distribution caused by different speeds. With the increase of the load, the droop control characteristic results in the drooping variation of the speed. And the power balance distribution can be achieved. During the debugging, this parameter can be adjusted gradually from small to large. The relationship between the load and the output frequency is shown in the following diagram:

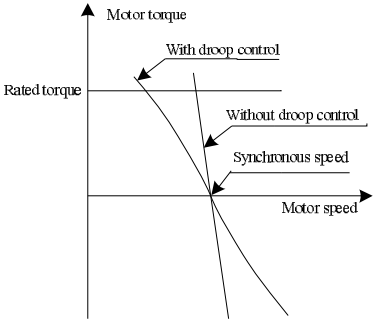



Diagram 6-21 Sketch Map of Characteristics of Droop Control Motor

| Function Code | Name | Set Range |
|---|---|---|
| P8.25 | Brake Threshold Voltage | 115.0~140.0% 【Model Set】 |

**Factory defaults of 380V** type: **130%**.

**Factory defaults of 220V** type: **120%**。

Function fade is the initial busbar voltage for setting dynamic braking, wherein **100%** is corresponding to the standard busbar. Proper adjustment on the value can effectively brake the load.

| Function Code | Name | Set Range |
|---|---|---|
| P8.26 | Operation Mode of Cooling Fan | 0~1【0】 |

**0**：Normal operation mode. When the frequency converter is in operation, the fan is also in operation. When the frequency converter is stopped, the operation and the stop of the fan are determined by the module temperature.

**1**： When the power is on, the fan is always in operation.

| Function Code | Name | Set Range |
|---|---|---|
| P8.27 | Overmodulation Function Selection | 0~1【0】 |

**0**：Overmodulation function is invalid.

**1**：Overmodulation function is valid.

When working under long-term low voltage and heavy load, the frequency converter can improve the output voltage through improving the use ratio of its busbar voltage.

| Function Code | Name | Set Range |
|---|---|---|
| P8.28 | PWM Mode Selection | 0~2【0】 |

**0**：**PWM** mode **1** is a normal PWM mode, wherein the noise of the motor is lower under low frequency, and the noise of

the motor is louder under high frequency.

**1**：**PWM** mode **2**. If the motor is in operation in this mode, the noise is lower but the temperature rise is high. If this function is selected, the frequency converter should be used at derating voltage.

**2**：**PWM** mode **3**. If the motor is in operation in this mode, the noise is louder but the motor oscillation can be restrained.

## Group P9 PID Control Group

As a common method used for process control, **PID** control can adjust the output frequency of the frequency converter through implementing proportion, integration and differential operations on feedback signals of controlled volumes and signals of target volumes. Thus, a negative feedback system is formed and the controlled volumes are stabilized on the target volumes. The PID control is appropriate for process controls of flow control, pressure control and temperature control, etc. The control fundamental functional block diagram is shown as follows:

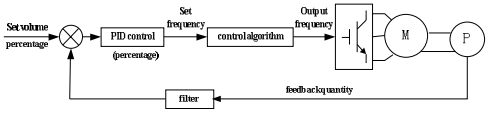



Diagram 6-22 Functional Block Diagram of Process PID

| Function Code | Name | Set Range |
|---|---|---|
| P9.00 | PID Setting Source Selection | 0~5【0】 |

**0**：Keyboard setting（**P9.01**）

**1**：Analog channel **AI1** setting

**2**：Analog channel **AI2** setting

**3**：Impulse frequency setting（**HDI**）

**4**：Multistage setting

**5**：Telecommunication setting

When **PID** is selected as the frequency source (**P0.07=6**), this function group does work. This parameter determines the setting channel of target volumes of process PID.

The set target volume of the process **PID** is a relative value. The set **100%** is corresponding to **100%** of the feedback signals of the controlled system; the system always operate according to the relative value (**0~100%**). Every setting and feedback volume of **PID** is relative to **10.0V** in **100.0%**.

| Function Code | Name | Set Range |
|---|---|---|
| P9.01 | Keyboard preset of PID fix | 0.0~100.0%【0.0%】 |

When **P9.00=0** is selected, which means the target source is keyboard setting, this parameter is required to be set.

The fiducial value of the parameter is the feedback volume of the system.

| Function Code | Name | Set Range |
|---|---|---|
| P9.02 | PID Feedback Source Selection | 0~4【0】 |

**0**：Analog channel **AI1** feedback

**1**：Analog channel **AI2** feedback

**2**：**AI1+AI2** feedback

**3**：Impulse frequency feedback (**HDI**)

**4**：Telecommunication feedback

**PID** feedback channel is selected according to this parameter.

**Notes: Set channel and feedback channel cannot coincide. Otherwise, PID cannot be controlled effectively.**

| Function Code | Name | Set Range |
|---|---|---|
| P9.03 | PID Output Characteristic Selection | 0~1【0】 |

**0**： When **PID** output is of positive characteristic and the feedback signal is larger than the set of **PID**, the frequency converter is required to lower the output frequency to achieve the balance of **PID**. For example, the reeled-in tension **PID** control.

**1**： When **PID** output is of negative characteristic and the feedback signal is larger than the set of **PID**, the frequency converter is required to increase the output frequency to achieve the balance of **PID**. For example, the reeled-out tension **PID** control.

| Function Code | Name | Set Range |
|---|---|---|
| P9.04 | Proportional Gain（Kp） | 0.00~100.00【0.10】 |
| P9.05 | Integral Time（Ti） | 0.01~10.00s【0.10s】 |
| P9.06 | Differential Time（Td） | 0.00~10.00s【0.00s】 |

Proportional Gain（**Kp**）: determines the adjusting strength of the whole **PID** adjuster. The larger the **P**, the stronger the adjusting strength. The this parameter is **100**, it means that when the deviation between the **PID** feedback volume and the set volume is **100%,** the adjusting amplitude of the **PID** adjuster on output frequency commands is of the maximum frequency (ignoring the integral action and the differential action).

Integral Time（**Ti**）: determines the integral adjusting speed of the **PID** adjuster on the deviation between the feedback volume and the set volume. The integral time means that when the deviation between the **PID** feedback volume and the set volume is **100%**, the adjusting amplitude of the integral adjuster（ignoring proportional action and differential action）reaches to the maximum frequency（**P0.03**）through the process control within this time period. The shorter the integral time, the stronger the adjusting strength.

Differential Time（**Td**）: determines the adjusting strength of the **PID** adjuster on the deviation varying rate of **PID** feedback volume and set volume. The differential time means that if the feedback volume varies for **100%** within this time period, the adjusting amplitude of the differential adjuster is of the maximum frequency（**P0.03**）（ignoring the proportional action and the integral action）. The longer the differential time, the stronger the adjusting strength.

**PID** is most common method in the process control. Every part of it plays a different role. In the following part, a simple introduction on operating principle brief and adjust method is made:

Proportional Control (**P**): when deviation between the feedback and the set

appears, adjusting volume in proportion to the deviation is output. If the deviation is constant, the adjusting volume is also constant. The proportional control can respond to the feedback varies rapidly. But the indifference control cannot be realized only through proportional control. The more the proportional gain, the faster the adjusting speed of the system. However, too more will cause oscillation. The adjust method is to set the long integral time and set the differential time as zero. Then use only proportional adjustment for starting the system, change the set volume and observe the stable deviation (static deviation) between the feedback signal and the set volume. If the static deviation is at the varying direction of the set volume (for example, if the set volume is increased, the feedback volume is always smaller than the set volume when the system is stable), the proportional gain is increased continuously whereas the proportional gain is decreased. The above process is just repeated until the static deviation is relatively small (no static deviation is hard to be realized).

Integral Time（**I**）：When deviation between the feedback and the set appears, the output adjusting volume is continuously accumulated. If the deviation still exists, the adjusting volume is continuously increased until no deviation appears. The integral adjuster can eliminate static deviation effectively. If the integral adjuster is too strong, iterative overstrike will appear and the system is always unstable until the oscillation appears. The characteristics of the oscillation caused by the too strong integral action include that the feedback signal swings up and down around the set volume and the swing gradually becomes larger until oscillation appears. The integral time parameter is usually adjusted from big to small. The integral time is adjusted gradually. The effect of the system adjustment is observed until the stable speed of the system meets requirement.

Differential Time（**D**）：When the deviation between the feedback and the set varies, the adjusting volume in proportion to the deviation varying ratio is output. This adjusting volume only relates to the varying direction and magnitude of the deviation but has no relation with its own direction and magnitude of the deviation. The function of the differential adjustment is that when the feedback signal varies, the adjustment is implemented according to the varying trend, thereby restraining the variation of the feedback signal. The differential adjuster should be used carefully because the differential adjustment can enlarge the interference of the system, especially the interference of high varying frequency.

| Function Code | Name | Set Range |
|---|---|---|
| P9.07 | Sampling Period（T） | 0.01~100.00s【0.10s】 |
| P9.08 | Deviation Limit of PID Control | 0.00~100.00%【0.0%】 |

Sampling Period（**T**）: refers to the sampling period of the feedback volume.

The adjuster operates once every sampling period. The longer the sampling period, the slower the response.

Deviation Limit of **PID** Control**:** refers to the allowable maximum deviation volume of **PID** system output volume relative to closed loop set value. As is shown in the following diagram, **PID** adjuster stops adjusting within the deviation limit. The precision and the stability of **PID** system can be adjusted through proper set of the function code.

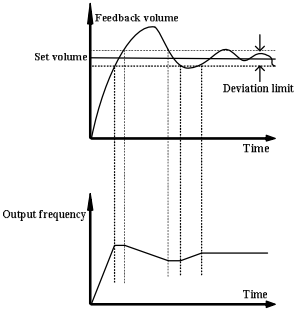



Diagram 6-23 Corresponding Relationship between Deviation Limit and Output Frequency

| Function Code | Name | Set Range |
|---|---|---|
| P9.09 | Feedback Disconnection Detection Value | 0.0~100.0% 【0.0%】 |
| P9.10 | Feedback Disconnection Detection Time | 0.0~3600.0s 【1.0s】 |

Feedback Disconnection Detection Value: the detection value is relatively full range (**100%**). The system always detects the feedback volume of **PID**. When the feedback value is smaller than the feedback disconnection detection value, the system starts the detection timing. When the detection time exceeds the feedback disconnection detection time, the system will alarm **PID** feedback disconnection error (**PIDE**).

## Group PA Simple PLC and Multistage Velocity Control Group

The simple **PLC** function is to set a programmable logic controller (**PLC**) inside the frequency converter to finish the automatic control on the multistage frequency logic. The operating time, the operating direction and the operating frequency can be set to satisfy technical requirements.

The frequency converter can realize 16-stage speed variation control and is provided with four kinds of acceleration and deceleration time for selection.

When the set **PLC** finishes a loop, an **ON** signal is output by multifunctional figure output terminal or multifunctional relay.

| Function Code | Name | Set Range |
|---|---|---|
| PA.00 | Simple PLC Operation Mode | 0~2【0】 |

**0**：stop after one time of operation. The frequency converter will stop automatically after finishing a single loop and will start when given an operation order again.

**1**： Always run at end value after one time of operation. The frequency converter will keep the operation frequency and direction at the last stage after finishing a single loop.

**2**： Loop operation. The frequency

converter will go on with the next loop automatically after finishing one loop and will not stop until the stop order is received.

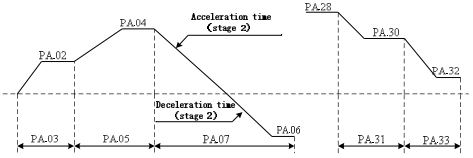



Diagram 6-24 Simple PLC Sketch Map

| Function Code | Name | Set Range |
|---|---|---|
| PA.01 | Simple PLC Memory Selection | 0~1【0】 |

**0**：Power-down no-memory

**1**：Power-down memory

**PLC** power-down memory means to remember the operation stage and the operation frequency of **PLC** before the power is down.

| Function Code | Name | Set Range |
|---|---|---|
| PA.02 | Multistage Speed 0 | -100.0~100.0%【0.0%】 |
| PA.03 | Operation Time at Stage 0 | 0.0~6553.5s【0.0s】 |
| PA.04 | Multistage Speed 1 | -100.0~100.0%【0.0%】 |
| PA.05 | Operation Time at Stage 1 | 0.0~6553.5s【0.0s】 |
| PA.06 | Multistage Speed 2 | -100.0~100.0%【0.0%】 |
| PA.07 | Operation Time at Stage 2 | 0.0~6553.5s【0.0s】 |
| PA.08 | Multistage Speed 3 | -100.0~100.0%【0.0%】 |
| PA.09 | Operation Time at Stage 3 | 0.0~6553.5s【0.0s】 |
| PA.10 | Multistage Speed 4 | -100.0~100.0%【0.0%】 |
| PA.11 | Operation Time at Stage 4 | 0.0~6553.5s【0.0s】 |
| PA.12 | Multistage Speed 5 | -100.0~100.0%【0.0%】 |
| PA.13 | Operation Time at Stage 5 | 0.0~6553.5s【0.0s】 |
| PA.14 | Multistage Speed 6 | -100.0~100.0%【0.0%】 |
| PA.15 | Operation Time at Stage 6 | 0.0~6553.5s【0.0s】 |
| PA.16 | Multistage Speed 7 | -100.0~100.0%【0.0%】 |
| PA.17 | Operation Time at Stage 7 | 0.0~6553.5s【0.0s】 |
| PA.18 | Multistage Speed 8 | -100.0~100.0%【0.0%】 |
| PA.19 | Operation Time at Stage 8 | 0.0~6553.5s【0.0s】 |
| PA.20 | Multistage Speed 9 | -100.0~100.0%【0.0%】 |
| PA.21 | Operation Time at Stage 9 | 0.0~6553.5s【0.0s】 |
| PA.22 | Multistage Speed 10 | -100.0~100.0%【0.0%】 |
| PA.23 | Operation Time at Stage 10 | 0.0~6553.5s【0.0s】 |
| PA.24 | Multistage Speed 11 | -100.0~100.0%【0.0%】 |
| PA.25 | Operation Time | 0.0~6553.5s |

| Function Code | Name | Set Range |
|---|---|---|
| | at Stage 11 | 【0.0s】 |
| PA.26 | Multistage Speed 12 | -100.0~100.0% 【0.0%】 |
| PA.27 | Operation Time at Stage 12 | 0.0~6553.5s 【0.0s】 |
| PA.28 | Multistage Speed 13 | -100.0~100.0% 【0.0%】 |
| PA.29 | Operation Time at Stage 13 | 0.0~6553.5s 【0.0s】 |
| PA.30 | Multistage Speed14 | -100.0~100.0% 【0.0%】 |
| PA.31 | Operation Time at Stage 14 | 0.0~6553.5s 【0.0s】 |
| PA.32 | Multistage Speed15 | -100.0~100.0% 【0.0%】 |
| PA.33 | Operation Time at Stage 15 | 0.0~6553.5s 【0.0s】 |

The frequency set corresponds to the maximum frequency（**P0.03**）in**100.0%**.

When **PLC** operation mode is confirmed, it is required to set **PA.02~PA.33** to confirm its characteristics.

Illustration: Simple **PLC** operation direction depends on the code of the multistage set value. If the value is negative, it means operation in opposite direction.

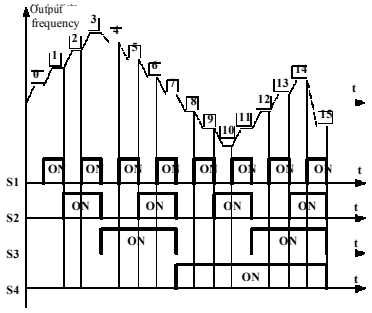



Diagram 6-25 Multistage Speed Operation Logic Diagram

The multistage speed can be set continuously within the range of **-Fmax~Fmax**. The frequency converter of **HV400** serial can be set at **16** stages of speed which are selected by combined codes of external terminals of **S1, S2, S3** and **S4** respectively corresponding to multistage speed 0 to multistage speed **15**. Diagram **6-25** is Multistage Speed Operation Logic Diagram.

When **S1=S2=S3=S4=OFF**, the frequency input mode is selected by code **P0.06**. When terminals of **S1, S2, S3** and **S4** are partially **OFF**, the system runs in multistage speed. And the priority of the multistage speed is higher than keyboard, simulation, high speed impulse, **PLC** and communication frequency input. Through the combined codes of **S1, S2, S3** and **S4, 16** stages of speed can be selected at most.

The start-stop at the multistage speed operation can also be confirmed by the function code **P0.06**. The multistage speed control process is shown in diagram **6-24**. The relationship between the terminals of **S1, S2, S3** and **S4** and the multistage speed

stages is shown in the following table.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S1 | OFF | ON | OFF | ON | OFF | ON | OFF | ON |
| S2 | OFF | OFF | ON | ON | OFF | OFF | ON | ON |
| S3 | OFF | OFF | OFF | OFF | ON | ON | ON | ON |
| S4 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Stage | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| S1 | OFF | ON | OFF | ON | OFF | ON | OFF | ON |
| S2 | OFF | OFF | ON | ON | OFF | OFF | ON | ON |
| S3 | OFF | OFF | OFF | OFF | ON | ON | ON | ON |
| S4 | ON | ON | ON | ON | ON | ON | ON | ON |
| Stage | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |

| Function Code | Name | Set Range |
|---|---|---|
| PA.34 | Simple PLC Acceleration and Deceleration Time Selection at stages 0~7 | 0~0xFFFF【0】 |

Detail description is shown in the flowing table:

| Binary Digit | | Stages | Acceleration and Deceleration Time 0 | Acceleration and Deceleration Time 1 | Acceleration and Deceleration Time 2 | Acceleration and Deceleration Time 3 |
|---|---|---|---|---|---|---|
| BIT1 | BIT0 | 0 | 00 | 01 | 10 | 11 |
| BIT3 | BIT2 | 1 | 00 | 01 | 10 | 11 |
| BIT5 | BIT4 | 2 | 00 | 01 | 10 | 11 |
| BIT7 | BIT6 | 3 | 00 | 01 | 10 | 11 |
| BIT9 | BIT8 | 4 | 00 | 01 | 10 | 11 |
| BIT11 | BIT10 | 5 | 00 | 01 | 10 | 11 |
| BIT3 | BIT12 | 6 | 00 | 01 | 10 | 11 |
| BIT15 | BIT14 | 7 | 00 | 01 | 10 | 11 |

| Function Code | Name | Set Range |
|---|---|---|
| PA.35 | Simple PLC Acceleration and Deceleration Time Selection at stages 8~15 | 0~0xFFFF【0】 |

Detail description is shown in the flowing table:

| Binary Digit | | Stages | Acceleration and Deceleration Time 0 | Acceleration and Deceleration Time 1 | Acceleration and Deceleration Time 2 | Acceleration and Deceleration Time 3 |
|---|---|---|---|---|---|---|
| BIT1 | BIT0 | 8 | 00 | 01 | 10 | 11 |
| BIT3 | BIT2 | 9 | 00 | 01 | 10 | 11 |

| Binary Digit | | Stages | Acceleration and Deceleration Time 0 | Acceleration and Deceleration Time 1 | Acceleration and Deceleration Time 2 | Acceleration and Deceleration Time 3 |
|---|---|---|---|---|---|---|
| BIT5 | BIT4 | 10 | 00 | 01 | 10 | 11 |
| BIT7 | BIT6 | 11 | 00 | 01 | 10 | 11 |
| BIT9 | BIT8 | 12 | 00 | 01 | 10 | 11 |
| BIT11 | BIT10 | 13 | 00 | 01 | 10 | 11 |
| BIT3 | BIT12 | 14 | 00 | 01 | 10 | 11 |
| BIT15 | BIT14 | 15 | 00 | 01 | 10 | 11 |

When users have finished the selection of acceleration and deceleration time of corresponding stages, the combined 16-bit binary digit is converted into decimal number and corresponding code is set.

| Function Code | Name | Set Range |
|---|---|---|
| PA.36 | PLC Restart Mode Selection | 0~1【0】 |

**0**： Start from the first stage; if halt (caused by halt order, fault or power down) happens during the operation, start from the first stage after the restart.

**1**：Continuously run at the frequency at the break period; if halt (caused by halt order or fault) happens during the operation, the frequency converter will automatically record the operational time at the current stage, enter this stage after the restart and runs continuously at the frequency defined at this stage, as shown in the diagram below.

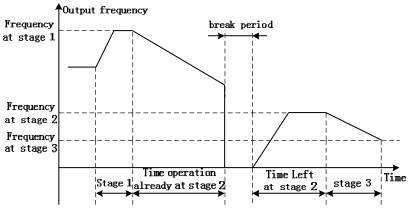



Diagram 6-26 Simple PLC Start Mode1

| Function Code | Name | Set Range |
|---|---|---|
| PA.37 | Multistage Time Unit Selection | 0~1【0】 |

**0**：Second

**1**：Minute

Time units of **PLC** operation stages are defined.

## Group Pb Protection Parameter Group

| Function Code | Name | Set Range |
|---|---|---|
| Pb.00 | Input Default Phase Protection | 0~1【1】 |
| Pb.01 | Output Default Phase Protection | 0~1【1】 |

**0**：Protection forbidden

**1**：Protection allowed

Input Default Phase Protection: to select whether to protect the condition of input default phase.

Output Default Phase Protection: to select whether to protect the condition of output default phase.

**Notes: there is no input default protect function.**

| Function Code | Name | Set Range |
|---|---|---|
| Pb.02 | Selection of Motor Overload Protection | 0~2【2】 |

**0**： No protection. There is no motor overload protection characteristic (used carefully). At this moment, the frequency converter has no overload protection on the load motor.

**1**： Common motor (with low velocity compensation). Since the heat dissipation effect of the common motor becomes worse at low velocity, the corresponding thermal protection value should also be adjusted properly. The said With Low Velocity Compensation character here means to lower the overload protection valve value of the motor whose operation frequency is lower than **30Hz**.

**2**： Variable frequency motor (without low velocity compensation). Since the heat dissipation of the variable frequency motor cannot be affected by rotation speed, no adjustment on protection value at low velocity operation is needed.

| Function Code | Name | Set Range |
|---|---|---|
| Pb.03 | Motor Overload Protection Current | 20.0~120.0%【100.0%】 |

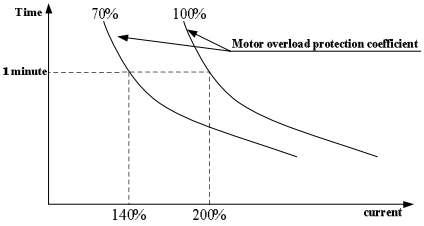



Diagram 6-27 Set of Motor Overload Protection Coefficient

This value can be confirmed by the following formula:

Motor Overload Protection Current=(allowable maximum load current /rated current of frequency converter ) ***100%**.

This function is mainly applied to occasions when small motor is driven by large frequency converter and should be set correctly to protect the motor.

| Function Code | Name | Set Range |
|---|---|---|
| Pb.04 | Instant Power-down Frequency Reduction Point | 70.01~10.0%【80.0%】 |
| Pb.05 | Rate of Descent of Instant Power-down Frequency | 0.00Hz~P0.03【0.00Hz】 |

**100% in Pb.04 corresponds to standard busbar voltage.**

When **Pb.05** is **0**, the instant power-down frequency reduction function is invalid.

Instant Power-down Frequency Reduction Point: means that when the power

is down and the busbar voltage decreases to the instant power-down frequency reduction point, the frequency converter begins to decrease the operation frequency according to the rate of descent of instant power-down frequency (**Pb.05**). Thus, the motor can generate electricity and the feedback electricity can maintain the busbar voltage to ensure the normal operation of the frequency converter until the power of the frequency converter is on again.

**Notes: Proper adjustment on the two parameters can well realize the power switch without production halt caused by the protection of the frequency converter.**

| Function Code | Name | Set Range |
|---|---|---|
| Pb.06 | Overvoltage Stall Protection | 0~1【1】 |

**0**：Forbid

**1**：Allow

| Function Code | Name | Set Range |
|---|---|---|
| Pb.07 | Protection Voltage of Overvoltage Stall | 110~150%【120%( 220V)】 |
| | | 110~150%【130% (380V)】 |

When the frequency converter is in slowdown operation, the actual rate of descent of the motor rotation speed may be lower than the rate of descent of output frequency due to the effect of load inertia. For the time being, the electrode will feedback the electric energy to the frequency converter, causing the rise of the busbar voltage of the frequency converter. If no measures are taken, the busbar overvoltage fault will be caused, thereby causing the trip of the frequency converter.

During the operation of the frequency converter, the protection function of overvoltage stall detects the busbar voltage and compares the busbar with the stall overvoltage point defined by **Pb.07**（corresponding to standard busbar voltage）. If it exceeds the stall overvoltage point, the output frequency of the frequency converter stops decelerating. When detected again, the output frequency will be decelerated again if the bustar voltage is lower than the overvoltage stall point, as is shown in the following diagram:

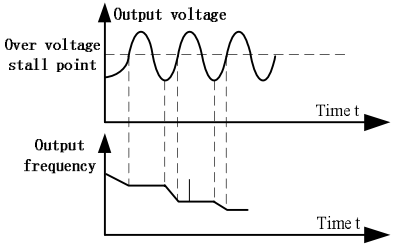



Diagram 6-28 Over voltage Stall Function

| Function Code | Name | Set Range |
|---|---|---|
| Pb.08 | Automatic Current-Limiting | 50.0~200.0%【Model Confirmed】 |

The factory default of the automatic current limiting in **Pb.08** relates to models, wherein, model G is **160%** and model **P** is **120%**.

| Function Code | Name | Set Range |
|---|---|---|

| | | |
|---|---|---|
| Pb.09 | Descent Rate of Frequency in Current-limitin g | 0.00~50.00Hz/s 【10.00Hz/s】 |
| Pb.10 | Current-limitin g Action Selection | 0~1【0】 |

**0**：Current-limiting function is always valid.

**1**：Current-limiting function is invalid during the constant speed.

When the frequency converter is in operation, the actual ascent rate of the motor rotation speed is lower than the ascent rate of the output frequency due to the overload. If no measures are taken, acceleration overcurrent fault will be caused, thereby causing the trip of the frequency converter.

During the operation of the frequency converter, the automatic current-limiting protection function detects the output current and compares it with the current-limiting level point defined in **Pb.08**. If exceeding the current-limiting level point, the output frequency of the frequency converter will descend according to the descent rate of frequency in current-limiting（**Pb.09**）. As is shown in the following diagram, when detected again, the output current will restore to normal operation if it is lower than the current-limiting level point:

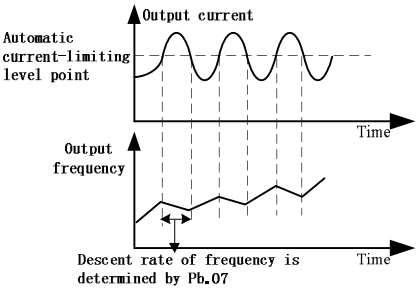



Diagram 6-29 Sketch Map of Current-limiting Protection Function

If the descent rate of frequency is too small during the automatic current-limiting operation, the automatic current-limiting state cannot be avoided, which may result in overload fault. If the descent rate **Pb.09** is two large, the frequency adjusting degree will be aggravated and the frequency converter may be at electricity generation state which may cause overvoltage protection.

The automatic current-limiting function is always valid under acceleration and deceleration states. However, whether the automatic current-limiting function is valid during constant speed operation is determined by automatic current-limiting action selection (**Pb.10**).

**Pb.10 ＝ 0** means that the automatic current-limiting is valid;

**Pb.10 ＝ 1** means that the automatic current-limiting is invalid during constant speed operation.

When the automatic current-limiting acts, the output frequency may vary. Therefore, on occasions demanding stable output frequency during constant speed

operation, it is inadvisable to use the automatic current-limiting function.

When the automatic current-limiting is valid, lower set of the current-limiting level may affect the overload capacity of the frequency converter.

| Function Code | Name | Set Range |
|---|---|---|
| Pb.11 | Over Torque Action Selection (OL3) | 0~4【1】 |

**0**：No detection.

**1**：When the frequency converter is in operation, the over torque detection is valid. And after the detection, the frequency converter goes on running.

**2**：When the frequency converter is in operation, the over torque detection is valid. And after the detection, the frequency converter gives an alarm and stops.

**3**：When the frequency converter is in constant speed operation, the over torque detection is valid. And after the detection, the frequency converter goes on running.

**4**：When the frequency converter is in constant speed operation, the over torque detection is valid. And after the detection, the frequency converter gives an alarm and stops.

| Function Code | Name | Set Range |
|---|---|---|
| Pb.12 | Over Torque Detection Level | 10.0%~200.0%【Model confirmed】 |

The factory default of over torque detection level relates to model types, wherein, type of **G**：1**50.0%**；type of **P**：**120.0%**。

| Function Code | Name | Set Range |
|---|---|---|
| Pb.13 | Over Torque Detection Time | 0.1~60.0s【0.1s】 |

Torque

PB. 12

Output logic

PB. 13

Diagram 6-30 Sketch Map of Over Torque Control

As is shown in the diagram, when the over torque action selection is selected to be 2 and 4, if the output torque value of the frequency converter reaches to the over torque level (**Pb.12**) and then is delayed by over torque detection time (**Pb.13**), the over torque signal will be output and at this moment the light TRIP on the keyboard starts flickering. If the function selection of output terminals **P6.01~P6.03** is **10**, the output is valid.

When the over torque action selection is selected to be **2 and 4** and the over torque signal reaches the output condition, the frequency converter will give a fault warning signal (**OL3**) and simultaneously stops output.

## Group PC Serial Communication Group

| Function Code | Name | Set Range |
|---|---|---|
| PC.00 | Native Communication Address | 0~247【1】 |

When the main machine is compiling a frame and the communication address of the slave machine is set to **0** which means the broadcast communication address, all slave machines on **Modbus** will accept this frame but do not respond. Please note that the address of the slave machines cannot be set to **0**.

The native communication address on the communication network is provided with uniqueness which is the basis for realizing the point-to-point communication between the upper computer and the frequency converter.

| Function Code | Name | Set Range |
|---|---|---|
| PC.01 | Communication Baud Rate Selection | 0~5【4】 |

**0：1200bps**
**1：2400bps**
**2：4800bps**
**3：9600bps**
**4：19200bps**
**5：38400bps**

This parameter is used for setting the data transfer rate. Please note that the Baud rate set by the upper computer must be in accordance with the Baud rate set by the frequency converter. Otherwise, communication cannot be realized. If the Baud rate is larger, the communication peed will be faster.

| Function Code | Name | Set Range |
|---|---|---|
| PC.02 | Data Bits Efficacy Set | 0~5【1】 |

**0**: No check（N，8，1）for RTU
**1**: Even parity check（E，8，1）for RTU
**2**: Odd parity check（O，8，1）for RTU
**3**: No check（N，8，2）for RTU
**4**: Even parity check（E，8，2）for RTU
**5**: Odd parity check（O，8，2）for RTU

Data forms set by the upper computer and the frequency converter must be in accordance with each other. Otherwise, the communication cannot be realized.

| Function Code | Name | Set Range |
|---|---|---|
| PC.03 | Communication Response Delay | 0~200ms【5ms】 |

Response Delay refers to the interval time between the time when data acceptance of the frequency converter is over and the time when the upper computer sends response data. If shorter than the system processing time, the response delay should be subject to the system processing time. If the response delay is longer than the system processing time, the system, having finished the data processing, has to wait and cannot send data to the upper computer until the response delayed time is up.

| Function Code | Name | Set Range |
|---|---|---|
| PC.04 | Communication Timeout Fault Time | 0.0~100.0s【0.0s】 |

When this function code is set to **0.0s**, the time parameter of communication timeout is invalid.

When this function code is set to a valid value, the system will give a communication error（**CE**）report if the

interval time of communication between this time and the next time exceeds the communication time out.

It is usually set to be invalid. If this parameter is set in a continuous communicating system, the communication condition can be monitored.

| Function Code | Name | Set Range |
|---|---|---|
| PC.05 | Transmission Error Processing | 0~3【1】 |

**0**：Give an alarm and halt freely

**1**：Give no alarm and keep on running

**2**：Give no alarm and halt according to halt mode （ only under communication control mode）

**3**：Give no alarm and s halt according to halt mode（under all control modes）

Under abnormal communication condition, the frequency converter can be selected to shield CE fault, halt or go on running through the set of communication error processing action.

| Function Code | Name | Set Range |
|---|---|---|
| PC.06 | Selection of Communication Processing Action | 00~11【0000】 |

**LED** unit

**0**：Write operation has response. When the function code **LED** unit is set to **0**, the frequency converter responds to read-write commands of the upper computer.

**1**：Write operation has no response. When the function code LED unit is set to 1, the frequency converter has no response to write commands but to read commands, thereby improving the communication efficiency.

**LED** decade

**0**：The communication set value cannot be stored when power is down. When the function code **LED** decade is set to **1**, the frequency converter has no response to write commands but to read commands, thereby improving the communication efficiency.

**1**：The communication set value can be stored when power is down. When the function code **LED** decade is set to **1**, the frequency converter will store the communication set value when the power is down.

## Group Pd Reserved Function Group

| Function Code | Name | Set Range |
|---|---|---|
| Pd.00~ Pd.09 | Reserved | |

## Group PE Manufacture Function Group

| Function Code | Name | Set Range |
|---|---|---|
| PE.00 | Password of Manufacturer | 0~65535 【*****】 |

This group is manufacturer parameter group. Users please do not try to open this group of parameters. Otherwise, the frequency converter cannot be in normal operation or will break down.

# 7 Fault Examination and Elimination

## 7.1 Fault Information and Elimination Methods

| Fault Code | Fault Type | Possible Fault Causes | Countermeasures |
|---|---|---|---|
| OUt1 | Inversion Unit Fault | 1. Output three phases have interphase short circuit or grounded short circuit<br>2. IGBT internal breakdown<br>3. Control panel is abnormal.<br>4. Drive wires are poorly connected.<br>5. Interference causes malfunction.<br>6. Whether the ground connection is fine. | 1. Wiring again.<br>2. Changing power unit.<br>3. Changing main control panel.<br>4. Please examine drive wires.<br>5. Examining if there is strong interference source from peripheral equipment. |
| OUt2 | Ground Connection or Overcurrent | The grounding current on the output side of the frequency converter exceeds 50% of the rated current of the frequency converter. | Investigating causes and resetting after implementing the countermeasure. |
| OC1 | Overcurrent in Acceleration Operation | 1. Accelerating too fast.<br>2. Network voltage is too low.<br>3. The power of the frequency converter is too low. | 1. Increasing acceleration time.<br>2. Examining input power.<br>3. Using the frequency converter with larger power. |
| OC2 | Overcurrent in Deceleration Operation | 1. Decelerating too fast.<br>2. The load inertia torque is large.<br>3. The frequency converter power of the frequency converter is too low. | 1. Increasing deceleration time.<br>2. Adding appropriate dynamic braking assembly.<br>3. Using the frequency converter with larger power. |
| OC3 | Overcurrent in Constant Speed Operation | 1. Load is changed suddenly or becomes abnormal.<br>2. Network voltage is too low.<br>3. The frequency converter power of the frequency converter is too low. | 1. Examining the load or reduce sudden changes of the load.<br>2. Examining the input power.<br>3. Using the frequency converter with larger power. |

| Fault Code | Fault Type | Possible Fault Causes | Countermeasures |
|---|---|---|---|
| OV1 | Overvoltage in Acceleration Operation | 1. The input voltage is abnormal.<br>2. After instant power down, restart the rotating motor. | 1. Examining the input power.<br>2. Avoiding restart after halt. |
| OV2 | Overvoltage in Deceleration Operation | 1. Deceleration is too fast.<br>2. The load inertia is large.<br>3. The input voltage is abnormal. | 1. Increasing deceleration time.<br>2. Adding dynamic braking assembly.<br>3. Examining the input power. |
| OV3 | Overvoltage in Constant Speed Operation | 1. The input voltage is changed abnormally.<br>2. The load inertia is large. | 1. Installing input electric reactor.<br>2. Adding appropriate dynamic braking assembly. |
| UV | Undervoltage in Operation | Network voltage is too low. | Examining the network input power. |
| POFF | Busbar Under Voltage | The frequency converter gives under voltage alarm according to the set value.<br>R, S and T have phase loss or large fluctuation. | Examining the under voltage alarm point.<br>Examining the input power. |
| OL1 | Motor Overload | 1. The network voltage is too low.<br>2. The rated current of the motor is set incorrectly.<br>3. The sudden change of the motor stalling or overload is too large.<br>4. Big Mara Trolleys | 1. Examining the network input voltage.<br>2. Reinstall the rated current of the motor.<br>3. Examining the load and adjusting the torque lifting capacity.<br>4. Choosing proper motor. |
| OL2 | Frequency Converter Overload | 1. Accelerating too fast.<br>2. Restart the rotating motor.<br>3. The network voltage is too low.<br>4. Load is too large. | 1. Increasing the acceleration time.<br>2. Avoiding restart after halt.<br>3. Examining the network input voltage.<br>4. Using the frequency converter with larger power. |
| SPO | Phase Loss at Output Side | Phase Loss Output of U,V and W (or load three phases are asymmetric seriously) | 1. Examining output wiring.<br>2. Examining motor and cables. |

| Fault Code | Fault Type | Possible Fault Causes | Countermeasures |
|---|---|---|---|
| OH2 | Inverter Overheat | 1. Air line is blocked or fan breaks down.<br>2. Environmental temperature is too high.<br>3. Long term overloading | 1. Unblocking the air line or change a fan.<br>2. Lowering the environmental temperature. |
| EF | External Fault | External fault input terminal acts. | Examining external equipment input. |
| CE | Communication Fault | 1. The Baud rate is set inappropriately.<br>2. Adopting communication errors of serial communication.<br>3. Long time interrupt of communication | 1．Setting proper Baud rate.<br>2．Pressing the key of STOP to reset and examining the communication interface wiring.<br>3．Examining the communication interface wiring. |
| ItE | Current Sensing Circuit Fault | 1. Poor contact of the connector of the control panel<br>2. The Hall device breaks down.<br>3. The amplifying circuit is abnormal. | 1. Examining the connector and plug again.<br>2. Replacing Hall.<br>3. Replacing the main control panel. |
| tE | Motor Self-learning Fault | 1．The capacity of the motor does not match the capacity of the frequency converter.<br>2．The rated parameter of the motor is set inappropriately.<br>3．Deviation between the self-learned parameter and standard parameter is too large.<br>4．Self-learning time is out. | 1．Replacing the model of the frequency converter.<br>2．Setting the rated parameter according to the nameplate.<br>3．Letting the motor on no-load state and rectifying again.<br>4．Examining the motor wiring and the parameter setting. |
| EEP | EEPROM Write-read Fault | 1. The write-read of the control parameter goes wrong.<br>2. EEPROM breaks down. | 1．Pressing the key of STOP to reset.<br>2．Replacing the main control panel. |
| PIDE | PID Feedback Disconnection | 1．PID feedback is off line.<br>2．PID feedback source | 1．Examining PID feedback signal line. |

| Fault Code | Fault Type | Possible Fault Causes | Countermeasures |
|---|---|---|---|
| | Fault | disappears. | 2 . Examining PID feedback source. |
| END | The set time of the manufacturer is up. | The try out time of users is up. | Seeking the supplier to adjust the set operation time. |
| OL3 | Over Torque | 1. Accelerating too fast.<br>2. Restart the rotating motor.<br>3. The network voltage is too low.<br>4. Load is too large. | 1. Increasing the acceleration time.<br>2. Avoiding restart after halt.<br>3. Examining the network input voltage.<br>4. Using the frequency converter with larger power.<br>5. Adjusting Pb.11 to a proper value. |

## 7.2 Common Faults and Disposal Methods

You may meet with the following fault conditions during the operation of the frequency converter. Please analyze simple faults according to the following methods:

**●No display when power is on:**

◆To use a multimeter to examine whether the input power of the frequency converter is consistent with the rated voltage of the frequency converter. Please examine and dispose problems.

◆To examine whether the three-phase rectifier bridge is in good condition. If the rectifier bridge is exploded, please seek services.

◆ To examine whether the POWER light is on. If the light is not on, please seek services.

**●The power air-switch trips when the power is on:**

◆To examine if there is grounding or short circuit condition among input power sources and eliminate the existing problems.

◆To examine whether the rectifier bridge breaks down. If yes, please seek services.

**●The motor does not rotate when the frequency converter is in operation:**

◆ To examine if there is three-phase output among U, V and W. If yes, please examinewhether the motor breaks down or the rotor of the motor is locked. If no, please make sure the motor parameter is set correctly.

◆If there is output but the three phases are unbalanced, please seek services.

◆If no voltage is output, please seek services.

● **The frequency converter is normal when the power is on, but the power air-switch trips when the frequency converter starts running:**

◆To examine if there is short-circuit condition among output modules. If yes, please seek services.

◆To examine if there is grounding or short circuit condition among motor leads. If yes, please eliminate it.

◆If it trips occasionally and the motor is far away from the frequency converter, you should think about adding an output interflow electric reactor.

# 8 Maintenance

**Warnings**

- **Maintenance personnel must follow the specified methods for maintenance.**
- **Maintenance personnel should be professional and qualified.**
- **Before the maintenance, be sure to cut off the power of the frequency converter and start the work after ten minutes.**
- **Do not touch components on PCB panel, otherwise the frequency converter can be easily damaged by static electricity.**
- **When the maintenance is finished, make sure that all screws are tightened.**

## 8.1 Daily Maintenance

In order to avoid faults of the frequency converter, ensure the normal operation of equipments and prolong the service life of the frequency converter, daily maintenance is necessary for the frequency converter. The contents of the daily maintenance are shown in the following table:

| Examine Items | Contents |
|---|---|
| Temperature /Humidity | Make sure that the environmental temperature is between **0**℃ **and 40**℃ and the humidity is between **20% and 90%.** |
| Oil Mist and Dust | Make sure that there are no oil mist, dust and condensed water in the frequency converter. |
| Frequency Converter | Examine whether the frequency converter has abnormal heating or vibration. |
| Fan | Make sure the fan is in normal operation and no sundries are locked. |
| Input Power | Make sure the voltage and the frequency of the input power is within allowable range. |
| Motor | Examine whether the motor has problems of abnormal vibration, heating and noises and phase loss, etc. |

## 8.2 Regular Maintenance

In order to avoid faults of the frequency converter and ensure the long time stable operation with high performance, it is necessary for users to examine the frequency converter at regular intervals (within half a year). The examine contents are shown in the following table:

| Examine Items | Examine Contents | Eliminating Methods |
|---|---|---|
| Screws of External Terminals | Whether the screws become loose. | Tightening |
| PCB Panel | Dusts and dirt | Using dry compressed air to clear away the sundries totally. |
| Fan | Abnormal noises and vibration and whether the accumulated time exceeds 20,000 hours. | 1、Clearing away the sundries.<br>2、Replacing the fan. |
| Electrolytic Capacitor | If there are discoloration and peculiar smell. | Replacing the electrolytic capacitor. |
| Radiator | Dusts and dirt | Using dry compressed air to clear away the sundries totally. |
| Power Components | Dusts and dirt | Using dry compressed air to clear away the sundries totally. |

## 8.3 Replacement of Wearing Parts of Frequency Converter

The fan and the electrolytic capacitor in the frequency converter are easily damageable parts. In order to ensure the long time, safe and fault-free operation of the frequency converter, the easily damageable parts should be replace regularly. The replacing time of the easily damageable parts is:

◆Fan: must be replaced after being used for over 20,000 hours.

◆Electrolytic Capacitor: must be replaced after being used for 30,000~40,000hours.

# 9 Communication Protocol

HV400 series frequency converter provides an RS485 communication interface. And the international standard Modbus communication protocol is adopted for the principal and subordinate communication. Users can realize centralized control (setting the control commands and the operation frequency of the frequency converter, the modification of relative function code parameters, the monitoring of the operation status and the fault information of the frequency converter, etc.) through PC/PLC or the control of the upper computer to adapt to specific application requirements.

## 9.1 Protocol Contents

The Modbus serial communication protocol defines the frame content and the using form of asynchronous transmission in the serial communication, including: the forms of host poll and broadcast frame and slave response frame; the frame contents of the host group include: slave address (or broadcast address), executive commands, data and error checking, etc. The same structure is also adopted for the slave response, and the contents include: action confirmation, feedback data and error checking, etc. If error happens when the slave is receiving frames or actions required by the host cannot be finished, the slave will organize a fault frame as a response to be fed back to the host.

## 9.2 Application Modes

HV400 series frequency converter can access to “single-host and multi-slave” control network with RS485 bus.

## 9.3 Bus Structure

（1）Interface means RS485 hardware interface

（2）Transmission mode

Asynchronous serial, half-duplex transmission mode. Only one of the host and the slave can send data and the other one receive data at the same time. The data in the serial asynchronous communication process is sent one frame by one frame in from of message.

（3）Topological structure

Single-hoast multi-slave system. The Set Range of the slave address is 1~ 247 and 0 is the broadcast mailing address. The address of every slave is unique, which is the basis for ensuring Modbus serial communication in the network.

## 9.4 Protocol Specification

The communication protocol of HV400 series frequency converter is an asynchronous serial host-slave Modbus communication protocol. In the network, only one device (host) can establish protocol (which is called “query/order”). Other devices (slaves) can respond to the “query/order” of the host only by providing data or act correspondingly according to the “query/order” of the host. The host here refers to personal computer (PC), industrial control equipment or programmable logic

controller (PLC), etc. The slave refers to HV400 series frequency converter or other control equipment with the same communication protocol. The host can both communicate with a slave independently and send broadcast information to all slaves. For independent accessing "query/order" of the host, the slave has to feedback a message (which is called response. And for the broadcast information sent by the host, the slaves do not have to feedback response information to the host.

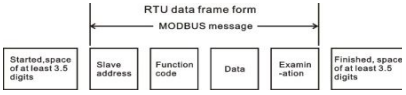
## 9.5 Communication Frame Structure

The Modbus protocol communication data form of HV400 series frequency converter is RTU（Remote Terminal Unit） mode.

In RTU mode, the form of every digit is shown as follows:

Coding system: 8-bit binary system. Every 8-bit frame includes two hexadecimal characters: hexadecimal 0~9 and A~F.

In RTU mode, new frame always starts with transmission time silence of at least 3.5 digits. In the network which calculates the transmission rate by Baud rate, the transmission time of 3.5 digits can be held easily. And then the transmission data fields successively are the slave address, the operating command code and data and CRC check word. The transmission digits of personal field are all 0...9 and A...F of hexadecimal. Network devices always monitor the activities of the communication bus. When receiving the first field (address information), every network device affirms this digit. With the finish of the last digit's transmission, another similar transmission time interval of 3.5 digits is provided for representing the finish of the frame. After that, the transmission of a new frame will start.




The information of a frame must be transmitted as a continuous data flow. If there is a time interval over 1.5 digits before the transmission of the whole frame is finished, the receiving device will eliminate these incomplete information and wrongly regard the next digit as the address field part of the new frame. Similarly, if the time interval between the start of the new frame and the previous frame is shorter than the time of 3.5 digits, the receiving device will regard it as the continuation of the previous frame. Due to the confusion of the frames, the final CRC checksum will be incorrect, thereby causing the communication fault.

Standard structure of RTU frame:

| | |
|---|---|
| Frame Header START | T1-T2-T3 （ transmission time of 3.5 digits） |
| Slave Address Field ADDR | Communication Address: 0~247（decimal system） （ 0 is the broadcast address） |
| Functional | 03H：Reading parameters |

| | |
|---|---|
| Domain CMD | of the slaves;<br>06H：Writing parameters of the slaves. |
| Data Field DATA（N-1）… DATA（0） | Data of 2*N digits. This part is both the main content of communication and the core of data exchange in communication. |
| CRC CHK Low Order | Examined Value: CRC checksum（16BIT） |
| CRC CHK High Order | |
| Frame End END | T1-T2-T3（transmission time of 3.5 digits） |

## 9.6 Command Code and Communication Data Description

### 9.6.1 Command Code: 03H（0000 0011），reading N words（Word）（Being able to continuously read 16 digits at most）

For example: the RAM starting address of the frequency converter whose slave address is 01H is 0003. Two digits are read continuously. And then the structure description of the frame is shown in the following table:

RTU host command information:

| | |
|---|---|
| START | T1-T2-T3 |
| ADDR | 01H |
| CMD | 03H |
| Starting Address High Order | 00H |
| Starting Address Low Order | 03H |
| Data Number Digh Order | 00H |
| Data Number Low Order | 02H |
| CRC CHK Low Order | 34H |
| CRC CHK Digh Order | 0BH |
| END | T1-T2-T3 |

RTU slave response information:

| | |
|---|---|
| START | T1-T2-T3 |
| ADDR | 01H |
| CMD | 03H |
| Digit Number | 04H |
| Data Address 0004H High Order | 13H |
| Data Address 0004H Low Order | 88H |
| Data Address 0005H High Order | 13H |
| Data Address 0005H Low Order | 88H |
| CRC CHK Low Order | 73H |
| CRC CHK High Order | CBH |
| END | T1-T2-T3 |

### 9.6.2 Command Code: 06H（0000 0110），write one digit（Word）

For example: writing 5000 （1388H）into the keyboard set frequency （0006H）address of the slave address 02H frequency converter. And then the structure description of the frame is shown in the following table:

RTU host command information:

| | |
|---|---|
| START | T1-T2-T3 |
| ADDR | 02H |
| CMD | 06H |
| Write Data Address | 00H |

| | |
|---|---|
| High Order | |
| Write Data Address Low Order | 06H |
| Data Content High Order | 13H |
| Data Content Low Order | 88H |
| CRC CHK Low Order | 64H |
| CRC CHK High Order | AEH |
| END | T1-T2-T3 |

RTU slave response information:

| | |
|---|---|
| START | T1-T2-T3 |
| ADDR | 02H |
| CMD | 06H |
| Write Data Address High Order | 00H |
| Write Data Address Low Order | 06H |
| Data Content High Order | 13H |
| Data Content Low Order | 88H |
| CRC CHK Low Order | 64H |
| CRC CHK High Order | AEH |
| END | T1-T2-T3 |

**9.6.3 Command Code: 08H（0000 1000）, diagnostic function**

Meaning of sub-function code:

| Sub-function Code | Introductions |
|---|---|
| 0000 | Feedback query information data |

For example: the word string content of the loop detection query information to the actuator address 01H is the same with the word string content of the response information. Its form is shown in the following table:

RTU host command information:

| | |
|---|---|
| START | T1-T2-T3 |
| ADDR | 01H |
| CMD | 08H |
| Sub-function Code High Order | 00H |
| Sub-function Code Low Order | 00H |
| Data Content High Order | 12H |
| Data Content Low Order | ABH |
| CRC CHK Low Order | ADH |
| CRC CHK High Order | 14H |
| END | T1-T2-T3 |

RTU slave response information:

| | |
|---|---|
| START | T1-T2-T3 |
| ADDR | 01H |
| CMD | 08H |
| Sub-function Code High Order | 00H |
| Sub-function Code Low Order | 00H |
| Data Content High Order | 12H |
| Data Content Low Order | ABH |
| CRC CHK Low Order | ADH |
| CRC CHK High Order | 14H |
| END | T1-T2-T3 |

**9.6.4 Error check mode of communication frames**

The error check mode of frames mainly includes two parts: bit check of digits (odd parity check/even parity check) and the whole data check of the frames (CRC check or LRC check).

9.6.4.1 Bit check of digits

Uses can choose different bit check modes according to the need and can also choose no check, which will affect the check bit set of every digit.

Meaning of even parity check: an even parity check bit is added before the data transmission for indicating that if the number of “1” in the transmission data is odd or even. If it is even, the check bit is "0". Otherwise, the check bit is "1". Thus the parity of data is kept unchanged.

Meaning of odd parity check: an odd parity check bit is added before the data transmission for indicating that if the number of “1” in the transmission data is odd or even. If it is odd, the check bit is "0". Otherwise, the check bit is "1". Thus the parity of data is kept unchanged.

For example, "11001110" which contains 5 "1" is required to be transmitted. With the even parity check used, the even check bit is "1". If the odd parity check used, the odd check bit is "0". During data transmission, the parity check bit is calculated and put in the position of the check bit of frame. Receiving devices also need odd-even check. If the parity of the received data is found to be inconsistent with the preset one, it is believed that the communication goes wrong.

7.6.4.2 CRC check mode---CRC（Cyclical Redundancy Check）：

With RTU frame form used, the frame includes the frame error detection field calculated according to CRC method. CRC field detects the content of the whole frame. CRC field includes two digits, containing 16-bit binary system value. It is added into the frame after being calculated by transmission device. The receiving device recalculates the CRC of the received frame and compares it with the value of the received CRC field. If the two CRC values are not equal, it means the transmission is wrong.

CRC is stored into 0xFFFF first and then a procedure is called for processing over 6 continuous digits in the frame and the value in the current register. Only 8Bit data in every digit is effective to CRC. The start bit, the stop bit and the parity check bit are all invalid.

In the generation process of CRC, every 8-bit byte independently XOR of the content of register. The result moves towards the least significant bit, and the most significant bit is filled with 0. LSB is extracted to be checked. If LSB is 1 and the registry independently XOR the preset value or if LSB is 0, no action is taken. The whole process has to be repeated for 8 times. After the last bit (the eighth bit) is finished, the

next 8-bit byte independently XOR the current value of the register. The final value in the register is the CRC value after all bytes in the frame are executed.

Internal standard CRC check rule is adopted in the calculation method of CRC. When compiling CRC algorithm, uses can refer to relative standard CRC algorithm and write out truly satisfactory CRC calculation procedure.

Now we provide a simple function of CRC calculation to users for reference (using C language to program):

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

In ladder logic, CKSM calculates CRC value according to frame content and adopts table look-up scheme for calculation. The method has advantages of simple procedure and fast calculation speed. However, the procedure occupies large ROM space. Therefore, the method should be used carefully in occasions having requirement for procedure space.

**9.6.5 Definition of communication data address**

This part is the address definition of communication data and is used for controlling the operation of the frequency converter, obtaining the state information of the frequency converter and setting relative function parameters of the frequency converter, etc.

（1）Presentation rules for parameter address of function code

The relative address of the function code is taken as the address of the corresponding register but has to be converted into hexadecimal. For example, the address of the function code **P5.05** presented in hexadecimal is **0505H**.

Ranges of high and low bytes respectively are: high byte——00~FF; low byte——00~FF.

**Notes: FE group is manufacturer set parameter, and this group of parameters can be read and written only when the manufacturer code is input correctly; some parameters cannot be changed when the frequency converter is in operation; some parameters cannot be changed no matter the frequency converter is at any state; when changing function code parameters, you have to pay attention to**

**the set range, the unit and relative introductions of the parameters.**

（2）Address instructions of other functions:

| Function Instructions | Address Definition | Instructions of Data Significance | R/W Features |
|---|---|---|---|
| Communication Control Command | 1000H | 0001H: Foreward Operation | W/R |
| | | 0002H: Reversal Operation | |
| | | 0003H: Normal Inching Turning | |
| | | 0004H：Reversal Inching | |
| | | 0005H：Deceleration Halt | |
| | | 0006H：Free Halt（Emergency Stop） | |
| | | 0007H：Fault Resetting | |
| | | 0008H：Inching Stop | |
| Status of Frequency Converter | 1001H | 0001H：in Foreward Operation | R |
| | | 0002H：in Reversal Operation | |
| | | 0003H：Frequency Converter Halt | |
| | | 0004H：in Fault | |
| | | 0005H：POFF Status of Frequency Converter | |
| | 2000H | Communication Set Frequency（-10000~10000，10000 corresponding to 100.00%，-10000 | W/R |
| Address of Communication Set Value | | corresponding to -100.00%） | |
| | 2001H | PID set, range（0~1000 1000 corresponding to 100.0%） | |
| | 2002H | PID set, range（0~1000，1000 corresponding to 100.0%） | W/R |
| | 2003H | Torque Set Value（-1000~1000，1000 corresponding to 100.0%） | W/R |
| | 2004H | Set Value of Upper Limiting Frequency（0~Fmax） | W/R |
| Operation/Halt Parameter Address Instructions | 3000H | Operation Frequency | R |
| | 3001H | Set Frequency | R |
| | 3002H | Busbar Voltage | R |
| | 3003H | Output Voltage | R |
| | 3004H | Output Current | R |
| | 3005H | Operation Rotate Speed | R |
| | 3006H | Output Power | R |
| | 3007H | Output Torque | R |
| | 3008H | PID Set Value | R |
| | 3009H | PID Feedback Value | R |
| | 300AH | Input Terminal Status | R |
| | 300BH | Output Terminal Status | R |

| Function Instructions | Address Definition | Instructions of Data Significance | R/W Features |
|---|---|---|---|
| | 300CH | Value of Analog Quantity AI1 | R |
| | 300DH | Value of Analog Quantity AI2 | R |
| | 300EH | Reserved | R |
| | 300FH | Reserved | R |
| | 3010H | Value of High Speed Impulse HDI | R |
| | 3011H | Reserved | R |
| | 3012H | Current Stage Number of PLC and Multistage Speed | R |
| | 3013H | Reserved | R |
| | 3014H | External Count Value | R |
| | 3015H | Torque Set Value | R |
| | 3016H | Device Code | R |
| Frequency Converter Fault Address | 5000H | The fault message code is consistant with the serial number of the fault type in the Function Code menu. But what is feedback to the upper computer here is not fault character but data in hexadecimal. | R |

**Notes: The following table is the comparison between digits read from 5000H and actural faults:**

| Digits | Fault Type |
|---|---|
| 0x00 | Fault-free |
| 0x01 | Inversion Short-circuit Protection（OUT1） |
| 0x02 | Inversion Short-circuit Protection（OUT2） |
| 0x03 | Reserved |
| 0x04 | Acceleration Over Current（OC1） |
| 0x05 | Deceleration Over Current（OC2） |
| 0x06 | Constant Speed Over Current（OC3） |
| 0x07 | Acceleration Over Voltage（OV1） |
| 0x08 | Deceleration Over Voltage（OV2） |
| 0x09 | Constant Speed Over Voltage（OV3） |
| 0x0A | Bus Undervoltage Fault（UV） |
| 0x0B | Motor Over Load（OL1） |
| 0x0C | Frequency Converter Overload（OL2） |
| 0x0D | Reserved |
| 0x0E | Stop Phase at Output Side（SPO） |
| 0x0F | Reserved |
| 0x10 | Overheating Fault of Inversion Module（OH2） |
| 0x 11 | External Fault（EF） |
| 0x 12 | Communication Error（CE） |
| 0x 13 | Current Detection Error（ItE） |
| 0x 14 | Motor Self-learning Error（tE） |
| 0x 15 | EEPROM Operating Error |

| Digits | Fault Type |
|---|---|
| | （EEP） |
| 0x 16 | PID Feedback Disconnection Error（PIDE） |
| 0x 17 | Reserved |
| 0x 18 | Run Time Arrived (END) |
| 0x 19 | Over Torque Fault（OL3） |

**Parameters which are shown in hexadecimal are read from the frequency converter. And the numerical values of the parameters are actual value*$10^k$, wherein k refers to digits after the decimal point of the parameter.**

9.6.6 Response of Error Messages

When responding, the device uses function code field and error address for indicating if it is normal response (error free) or errors happen (called exception response). For normal response, the device responds corresponding function code and data address or sub-function code. For exception response, a code which equals to a normal code is feedback. But the first position is logic 1.

For example: a host device sends a message to a slave device demanding to read a group of function code address data of the frequency converter. The following function code will be produced:

0 0 0 0 0 0 1 1 （hexadecimal 03H）

For normal response, the device responds the same function code. For exception response, it feeds back:

1 0 0 0 0 0 1 1 （hexadecimal 83H）

Except that the function code is modified due to the exception error, the device will respond a byte exception code. This defines the generation reason of the exception.

When the host device application procedure gets exception response, typical processing procedure is to resend message or make command change according to relevant fault.

**Meaning of Error Code**

| Modbus Exception Code | | |
|---|---|---|
| **Code** | **Name** | **Meaning** |
| 01H | Illegal Function | If the function code received from the upper computer is unallowed operation, it may be because the function code is only applicable to a new device but is not realized in this device; at the same time this kind of request may also be processed in error condition. |
| 02H | Illegal Data Address | For the frequency converter, the request data address of the upper computer is unallowed address; especially the combination of the register address with the number of transmitted bytes is invalid. |
| 03H | Illegal Data Value | The received data field contains unallowed value which indicates the residual |

| Modbus Exception Code | | |
|---|---|---|
| Code | Name | Meaning |
| | | structure error in the combination request. Notes: it definitely does not mean the submitted and stored data item in the register has a value beyond the application procedure desire. |
| 06H | Slave device is busy | The frequency converter is busy（EPPROM is in process of storing） |
| 10H | Password Error | The password written from the password check address is different from the password set by P7.00 users. |
| 11H | Check Error | In the frame message sent by the upper computer, when the CRC check bit in RTU form is different from the check computation number of the lower computer, check error message is reported. |
| 12H | Parameter change is invalid | In the parameter write order sent by the upper computer, the sent data is beyond the parameter range, or the write address cannot be changed at present or the write input terminal selection function has been occupied by other terminals. |
| 13H | System is locked | When the upper computer reads or writes, the system will be reported to be locked if user |

| Modbus Exception Code | | |
|---|---|---|
| Code | Name | Meaning |
| | | sets a password but does not unlock the password lock. |

## Appendix 1 Brief Table of Function Parameters

According to function, the function parameters of HV400 series frequency converter can be divided into 15 groups from P0 to PE. Every function group contains several function codes. Function code adopts three-level menu. For example, "P0.15" refers to No. 15 function code of group P0; PE is a manufacturer function parameter and users have no right to access this group of parameters.

In order to make the set of the function code easier during the operation of the keyboard, function group number is corresponding to the first level menu, the function code number is corresponding to the second level menu and the function code parameter is corresponding to the third level menu.

1、Column contents of the function table are explained as follows:

"Function Code" in the first column： is the function parameter group and the number of parameters；

"Name" in the second column：is the complete name of the function parameter；

"Parameter detailed description"：is the detailed description of the function parameter；

"Set Range" in the fourth column：is the effective set value range of the function parameter which is displayed on keyboard LCD (Liquid Crystal Display)；

"Default Value" in the fifth column：is the factory reset value of the function parameter；

"Alteration"： is the alteration property of the function parameter（means whether the alteration is allowed and the alteration conditions, as is illustrated below：

"○"：means the set value of the parameter can be altered when the frequency converter is halted or in operation；

"◎"： means the set value of the parameter cannot be altered when the frequency converter is in operation；

"●"：means the value of the parameter is practical check recorded value which cannot be altered；

（The frequency converter has implemented automatic check restrain on the alteration property of every parameter to help uses to avoid wrong alteration.）

"Serial Number" in the seventh column： is the rank serial number of the function code in the whole function codes.

2、"Parameter System" is decimal (DEC). If hexadecimal is adopted for indicating parameter, the data of every single bit are independent of each other during the parameter compiling and the value range of partial bits can be hexadecimal (0~F).

3、"Default Value" refers to the refreshed value of the function code parameter when the manufacturer parameter is reset. However, the actual checked parameter value or recorded value will not be refreshed.

4、In order to protect parameters more effectively, the frequency converter provides password protection to the function code. When a user password is set (the parameter of the user password is not 0) and the user presses the key of PRG to enter the function code compiling status, the system will enter the user password authentification state and "0. 0. 0. 0. 0." is displayed. Operators have to input the user password correctly, otherwise no entry is allowed. For the manufacturer set parameter area, the manufacturer password should be input correctly for the entry. (We're here to remind users not to try to alter the manufacturer set parameter. Improper parameter set may easily result in abnormal operation even damage of the frequency converter). When the password protection is in unlock state, the user password can be altered at any time and subjects to the value which is input for the last time. If P7.00 is set to 0, the user password can be cancelled; if P7.00 is not 0 when the power is on, the parameter is protected by the password.

5、When the function code parameter is altered through the serial communication, the function of the user password should also follows the above rules.

| Function Code | Name | Parameter detailed description | Set Range | Default Value | Alteration | Serial Number |
|---|---|---|---|---|---|---|
| **Group P0 Basic Function Group** | | | | | | |
| P0.00 | Mode Selection of Speed Control | 0：V/F control<br>1：PG-free vector control<br>2： Torque control （PG-free vector control） | 0~2 | 0 | ◎ | 0. |
| P0.01 | Operation Command Channel | 0 ： Keyboard command channel（LED is out）<br>1：Terminal command channel （LED twinkles）<br>2： Communication command channel（LED is lightened） | 0~2 | 0 | ◎ | 1. |
| P0.02 | Keyboard and Terminal UP/DOWN Set | 0 ： Valid and the frequency converter can store when power is down.<br>1 ： Valid and the frequency converter cannot store when power is down.<br>2：Invalid<br>3 ： Valid in operation and cleared in halt state | 0~3 | 0 | ○ | 2. |
| P0.03 | Maximum Output Frequenc | 10.00~400.00Hz | 10.00~400.00 | 50.00Hz | ◎ | 3. |
| P0.04 | Upper Limit of Operation Frequency | P0.05~P0.03 (maximum frequency) | P0.05~P0.03 | 50.00Hz | ○ | 4. |
| P0.05 | Lower Limit of Operation | 0.00 Hz~P0.04（upper limit of operation frequency） | 0.00~P0.04 | 0.00Hz | ○ | 5. |

| Function Code | Name | Parameter detailed description | Set Range | Default Value | Alteration | Serial Number |
|---|---|---|---|---|---|---|
| P0.06 | Keyboard Set Frequency | 0.00 Hz~P0.03(maximum frequency) | 0.00~P0.03 | 50.00Hz | ○ | 6. |
| P0.07 | A Frequency Command Selection | 0：Set of keyboard<br>1：Set of analog quantity AI1<br>（**Notes: in J8 jumper, PANEL is connected with AI1 for the keyboard potentiometer input, and PORT is connected with AI1 for the external terminal AI1 input**）<br>2：Set of analog quantity AI2<br>3：Set of high-speed impulse（HDI）<br>4：Set of Simple PLC procedure<br>5：Set of multistage speed operation<br>6：PID control set<br>7：Telecommunication set | 0~7 | 0 | ○ | 7. |
| P0.08 | B Frequency Command Selection | 0：Set of analog quantity AI1<br>（**Notes: in J8 jumper, PANEL is connected with AI1 for the keyboard potentiometer input, and PORT is connected with AI1 for the external terminal AI1 input**）<br>1：Set of analog quantity AI2<br>2：Set of high-speed impulse（HDI） | 0~2 | 0 | ○ | 8. |
| P0.09 | Reference Object Selection of B Frequency Command | 0: Maximum output frequency<br>1：A frequency command | 0~1 | 0 | ○ | 9. |

| Function Code | Name | Parameter detailed description | Set Range | Default Value | Alteration | Serial Number |
|---|---|---|---|---|---|---|
| P0.10 | Compound Mode of Set Source | 0：A<br>1：B<br>2：A+B<br>3：Max(A，B) | 0~3 | 0 | ○ | 10. |
| P0.11 | Acceleration Time 0 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 11. |
| P0.12 | Deceleration Time 0 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 12. |
| P0.13 | Selection of Operation Direction | 0 ： Operation of default direction<br>1 ： Operation of opposite direction<br>2：Reverse operation forbidden | 0~2 | 0 | ◎ | 13. |
| P0.14 | Set of Carrier Frequency | 1.0~15.0kHz | 1.0~15.0 | Model confirmed | ○ | 14. |
| P0.15 | AVR Function Selection | 0：Invalid<br>1：Globally effective<br>2 ： Invalid only during the deceleration | 0~2 | 1 | ○ | 15. |
| P0.16 | Motor Parameter Self-learning | 0：No operation<br>1 ： Parameter overall self-learning<br>2: Parameter static self-learning | 0~2 | 0 | ◎ | 16. |
| P0.17 | Function Parameter Restore | 0：No operation<br>1：Restore default value<br>2：Eliminate fault files | 0~2 | 0 | ◎ | 17. |

| Group P1 Start-Stop Control Group | | | | | | |
|---|---|---|---|---|---|---|
| P1.00 | Start Operation Mode | 0：Start directly<br>1： First DC brake and then start<br>2：Track rotate speed and then start (for type of 132kW and above only) | 0~2 | 0 | ◎ | 18. |
| P1.01 | Initial Frequency of Direct Start | 0.00~10.00Hz | 0.00~10.00 | 1.50Hz | ◎ | 19. |
| P1.02 | Hold Time of Start Frequency | 0.0~50.0s | 0.0~50.0 | 0.0s | ◎ | 20. |
| P1.03 | Braking Current before Start | 0.0~150.0% | 0.0~150.0 | 0.0% | ◎ | 21. |
| P1.04 | Braking Time before Start | 0.0~50.0s | 0.0~50.0 | 0.0s | ◎ | 22. |
| P1.05 | Acceleration and Deceleration Mode Selection | 0：Linear type<br>1：Reserved | 0~1 | 0 | ◎ | 23. |
| P1.06 | Stop Mode Selection | 0：Decelerate stop<br>1：Free stop | 0~1 | 0 | ○ | 24. |
| P1.07 | Initial Frequency of Parking Brake | 0.00~P0.03 | 0.00~P0.03 | 0.00Hz | ○ | 25. |
| P1.08 | Latency Time of Parking Brake | 0.0~50.0s | 0.0~50.0 | 0.0s | ○ | 26. |
| P1.09 | Stop DC Braking Current | 0.0~150.0% | 0.0~150.0 | 0.0% | ○ | 27. |
| P1.10 | Stop DC Braking Time | 0.0~50.0s | 0.0~50.0 | 0.0s | ○ | 28. |
| P1.11 | Counter Rotating Dead Time | 0.0~3600.0s | 0.0~3600.0 | 0.0s | ○ | 29. |
| P1.12 | Actions when | 0： Operating at the frequency | 0~2 | 0 | ◎ | 30. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | operation frequency is lower than the frequency lower limit（valid when the frequency lower limit is larger than 0） | lower limit<br>1：Stop<br>2：Sleep and stand by | | | | |
| P1.13 | Delay Time of Sleep Awakening | 0.0~3600.0s（valid when P1.12 is 2） | 0.0~3600.0 | 0 | ◎ | 31. |
| P1.14 | Power Failure Restart Selection (for type of 132kW and above only) | 0：Restart forbidden<br>1：Restart allowed | 0~1 | 0 | ○ | 32. |
| P1.15 | Restart Waiting Time | 0.0 ～ 3600.0s (valid when P1.14 is 1) | 0.0～3600.0 | 0.0s | ○ | 33. |
| P1.16 | Check Selection of Terminal Function When Power is on | 0 ： Terminal operation command is invalid when power is on.<br>1 ： Terminal operation command is valid when power is on. | 0~1 | 0 | ○ | 34. |
| P1.17 | Reserved | Reserved | | | ◎ | 35. |
| P1.18 | Reserved | Reserved | | | ◎ | 36. |
| P1.19 | Reserved | Reserved | | | ◎ | 37. |
| **Group P2 Motor Parameter Group** | | | | | | |
| P2.00 | Frequency Converter Type | 0：G type<br>1：P type | 0~1 | Model confirmed | ◎ | 38. |
| P2.01 | Rated Power of Motor | 0.4~630.0kW | 0.4~630 | Model confirmed | ◎ | 39. |
| P2.02 | Rated Frequency | 10.00Hz~P0.03 （ maximum frequency） | 10.00~P0.03 | 50.00Hz | ◎ | 40. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | of Motor | | | | | |
| P2.03 | Rated Rotate Speed of Motor | 0~36000rpm | 0～36000 | Model confirmed | ◎ | 41. |
| P2.04 | Rated Voltage of Motor | 0～800V | 0～800 | Model confirmed | ◎ | 42. |
| P2.05 | Rated Current of Motor | 0.8～1100.0A | 0.8～1100 | Model confirmed | ◎ | 43. |
| P2.06 | Stator Resistance of Motor | 0.001～65.535Ω | 0.001～65.535 | Model confirmed | ○ | 44. |
| P2.07 | Rotor Resistance of Motor | 0.001～65.535Ω | 0.001～65.535 | Model confirmed | ○ | 45. |
| P2.08 | Rotor and Stator Inductance of Motor | 0.1～6553.5mH | 0.1～6553.5 | Model confirmed | ○ | 46. |
| P2.09 | Rotor and Stator Mutual Inductance of Motor | 0.1～6553.5mH | 0.1～6553.5 | Model confirmed | ○ | 47. |
| P2.10 | No-load Current of Motor | 0.1～6553.5A | 0.1～6553.5 | Model confirmed | ○ | 48. |
| **Group P3 Vector Control Function Group** | | | | | | |
| P3.00 | Proportional Gain 1 of Speed Ring | 0~100 | 0~100 | 20 | ○ | 49. |
| P3.01 | Integral Time 1 of Speed Ring | 0.01~10.00s | 0.01~10.00s | 0.50s | ○ | 50. |
| P3.02 | Switch of Low Point Frequency | 0.00Hz~P3.05 | 0.00~P3.05 | 5.00Hz | ○ | 51. |
| P3.03 | Proportional Gain 2 of Speed Ring | 0~100 | 0~100 | 25 | ○ | 52. |
| P3.04 | Integral Time 2 of Speed Ring | 0.01~10.00s | 0.01~10.00 | 1.00s | ○ | 53. |

| | | | | | | |
|---|---|---|---|---|---|---|
| P3.05 | Switch of High Point Frequency | P3.02~P0.03 (maximum frequency) | P3.02~P0.03 | 10.00Hz | ○ | 54. |
| P3.06 | VC Slip Compensation Factor | 50%~200% | 50~200 | 100% | ○ | 55. |
| P3.07 | Upper Limit Set of Torque | 0.0~200.0%（rated current of frequency converter） | 0.0~200.0 | G type：150.0%<br>P type：120.0% | ○ | 56. |
| P3.08 | Selection of Torque Set Mode | 0：Keyboard Set Torque（Corresponding to P3.09）<br>1：Set torque of analog quantity AI1<br>（**Notes: in J8 jumper, PANEL is connected with AI1 for the keyboard potentiometer input, and PORT is connected with AI1 for the external terminal AI1 input**）<br>2：Set torque of analog quantity AI2<br>3：Set torque of high-speed impulse HDI<br>4: Multistage torque set<br>5：Set torque of remote communication<br>（1~5: 100% corresponding to 2 times of the rated current of the frequency converter） | 0~5 | 0 | ○ | 57. |
| P3.09 | Keyboard Set Torque | -200.0%~200.0%（frequency converter） | -200.0~200.0 | 50.0% | ○ | 58. |
| P3.10 | Set Source Selection of Upper Limit Frequency | 0：Upper limit frequency set by keyboard（P0.04）<br>1：Upper limit frequency set by analog quantity AI1<br>2：Upper limit frequency set by analog quantity AI2 | 0~5 | 0 | —<br>○ | 59. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 3：Upper limit frequency of high-speed impulse HDI<br>4：Upper limit frequency set by multistage<br>5：Upper limit frequency set by telecommunication<br>（1~4：100% corresponding to maximum frequency） | | | | |
| **Group P4 V/F Control Function Group** | | | | | | |
| P4.00 | V/F Curve Setting | 0：Straight line V/F curve<br>1：Multipoint V/F curve<br>2：1.3 power torque descending V/F curve<br>3：1.7 power torque descending V/F curve<br>4：2.0 power torque descending V/F curve | 0~4 | 0 | ◎ | 60. |
| P4.01 | Torque Promoting | 0.0%: (automatic)<br>0.1%~10.0% | 0.0~10.0 | 0.5% | ○ | 61. |
| P4.02 | End of Torque Promoting | 0.0%~50.0%(corresponding to the rated frequency of the motor) | 0.0~50.0 | 20.0% | ◎ | 62. |
| P4.03 | V/F Frequency Point 1 | 0.00Hz~P4.05 | 0.00~P4.05 | 0.00Hz | ○ | 63. |
| P4.04 | V/F Voltage Point 1 | 0.0%~100.0%（rated voltage of motor） | 0.0~100.0 | 00.0% | ○ | 64. |
| P4.05 | V/F Frequency Point 2 | P4.03~P4.07 | P4.03~P4.07 | 00.00Hz | ○ | 65. |
| P4.06 | V/F Voltage Point 2 | 0.0%~100.0%（rated voltage of motor） | 0.0~100.0 | 00.0% | ○ | 66. |
| P4.07 | V/F Frequency Point 3 | P4.05~ P2.02（rated frequency of motor） | P4.05~P2.02 | 00.00Hz | ○ | 67. |

| | | | | | | |
|---|---|---|---|---|---|---|
| P4.08 | V/F Voltage Point 3 | 0.0%~100.0%（rated voltage of motor） | 0.0~100.0 | 0.0% | ○ | 68. |
| P4.09 | V/F Slip Compensation Limit | 0.0~200.0% | 0.0~200.0 | 0.0% | ○ | 69. |
| P4.10 | Energy-saving Operatioin | 0：No action<br>1： Automatic energy-saving operation | 0~1 | 0 | ◎ | 70. |
| P4.11 | Motor Low Frequency Reject Oscillation Factor | 0~10 | 0~10 | 2 | ○ | 71. |
| P4.12 | Motor High Frequency Reject Oscillation Factor | 0~10 | 0~10 | 0 | ○ | 72. |
| P4.13 | Motor Reject Oscillation Demarcation Point | 0.00Hz~P0.03 （ maximum frequency） | 0.00~P0.03 | 30.00 Hz | ○ | 73. |
| **Group P5 Input Terminal Group** | | | | | | |
| P5.00 | HDI Input Type Selection | 0：HDI is high-speed impulse input<br>1：HDI is on-off input | 0~1 | 0 | ◎ | 74. |
| P5.01 | Function Selection of S1 Terminal | 0： No function<br>1： Foreward operation<br>2： Inversion operation<br>3 ： Three-way operation control<br>4： Foreward inch<br>5： Inversion inch<br>6： Free stop | 0~39 | 1 | ◎ | 75. |
| P5.02 | Function Selection of S2 Terminal | | 0~39 | 4 | ◎ | 76. |
| P5.03 | Function Selection of S3 | | 0~39 | 7 | ◎ | 77. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Terminal | 7： Fault reset<br>8： Operation pause<br>9： External fault input<br>10：Frequency set increasing（UP）<br>11：Frequency set decreasing（DOWN）<br>12 ： Eliminate frequency increase and decrease set<br>13：Switch between A set and B set<br>14：Switch beween（A+B）set and A set<br>15: Switch beween（A+B）set and B set<br>16: Multistage speed terminal 1<br>17: Multistage speed terminal 2<br>18: Multistage speed terminal 3<br>19: Multistage speed terminal 4<br>20: Multistage speed pause<br>21: Acceleration and deceleration time selection 1<br>22: Acceleration and deceleration time selection 2<br>23:Simple PLC halt reset<br>24:Simple PLC pause<br>25:PID control pause<br>26:Swing frequency pause（ pausing at the current frequency）<br>27:Swing frequency reset | | | | |
| P5.04 | Function Selection of S4 Terminal | | 0~39 | 0 | ◎ | 78. |
| P5.04 | Function Selection of S5 Terminal | | 0~39 | 0 | ◎ | 79. |
| P5.06 | Function Selection of S6 Terminal | | 0~39 | 0 | ◎ | 80. |
| P5.07 | Function Selection of S7 Terminal | | 0~39 | 0 | ◎ | 81. |
| P5.08 | HDI Terminal On-off Input Function Selection | | 0~39 | 0 | ◎ | 82. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | （ back to the center frequency）<br>28:Counter reset<br>29: Torque control forbidden<br>30:Acceleration and deceleration forbidden<br>31:Counter triggered<br>32: Temporarily eliminate frequency increase and decrease set<br>33～39:Reserved | | | | |
| P5.09 | Filtering Times of On-off | 1~10 | 1~10 | 5 | ○ | 83. |
| P5.10 | Terminal Control Operation Mode | 0：Two-wire control 1<br>1：Two-wire control 2<br>2：Three-wire control 1<br>3：Three-wire control 2 | 0~3 | 0 | ◎ | 84. |
| P5.11 | Increment Change Rate of Terminal UP/DOWN Frequency | 0.01~50.00Hz/s | 0.01~50.00 | 0.50Hz/s | ○ | 85. |
| P5.12 | AI1 Lower Limit Value | -10.00V~10.00V | -10.00~10.00 | 0.00V | ○ | 86. |
| P5.13 | AI1 Lower Limit Corresponding Set | -100.0%~100.0% | -100.0~100.0 | 0.0% | ○ | 87. |
| P5.14 | AI1 Upper Limit Value | 0.00V~10.00V | 0.00~10.00 | 10.00V | ○ | 88. |
| P5.15 | AI1 Upper Limit Corresponding Set | -100.0%~100.0% | -100.0~100.0 | 100.0% | ○ | 89. |

| | | | | | | |
|---|---|---|---|---|---|---|
| P5.16 | AI1 Input Filtering Time | 0.00s~10.00s | 0.00~10.00 | 0.10s | ○ | 90. |
| P5.17 | AI2 Lower Limit Value | 0.00V~10.00V | 0.00~10.00 | 0.00V | ○ | 91. |
| P5.18 | AI2 Lower Limit Corresponding Set | -100.0%~100.0% | -100.0~100.0 | 0.0% | ○ | 92. |
| P5.19 | AI2 Upper Limit Value | 0.00V~10.00V | 0.00~10.00 | 10.00V | ○ | 93. |
| P5.20 | AI2 Upper Limit Corresponding Set | -100.0%~100.0% | -100.0~100.0 | 100.0% | ○ | 94. |
| P5.21 | AI2 Input Filtering Time | 0.00s~10.00s | 0.00~10.00 | 0.10s | ○ | 95. |
| P5.22 | HDI Lower Limit Frequency | 0.00kHz~50.00kHz | 0.00~50.00 | 0.00kHz | ○ | 96. |
| P5.23 | Corresponding Set of HDI Lower Limit Frequency | -100.0%~100.0% | -100.0~100.0 | 0.0% | ○ | 97. |
| P5.24 | HDI Upper Limit Frequency | 0.00kHz~50.00kHz | 0.00~50.00 | 50.00kHz | ○ | 98. |
| P5.25 | Corresponding Set of HDI Upper Limit Frequency | -100.0%~100.0% | -100.0~100.0 | 100.0% | ○ | 99. |
| P5.26 | Filtering Time of HDI Frequency Input | 0.00s~10.00s | 0.00~10.00 | 0.10s | ○ | 100. |
| **Group P6 Output Terminal Group** | | | | | | |
| P6.00 | HDO Output Selection | 0：Open collector high-speed impulse output<br>1：Open collector output | 0~1 | 0 | ○ | 101. |

| | | | | | | |
|---|---|---|---|---|---|---|
| P6.01 | Output Selection of HDO Open Collector | 0：No output<br>1：Frequency converter is in operation<br>2：Frequency converter is in foreward operation<br>3：Frequency converteris in inversion operation<br>4：Fault output<br>5：Frequency level detection FDT output<br>6：Frequency is reached<br>7：In zero-speed operation<br>8：Set count value is reached<br>9：Specified count value is reached<br>10：Overload pre-alarm<br>11：SimplePLC stage finished<br>12：SimplePLC loop finished<br>13：Operation time is reached<br>14：Upper limit frequency is reached<br>15：Lower limit frequency is reached<br>16：Operation is ready<br>17~20：Reserved | 0~20 | 1 | ○ | 102. |
| P6.02 | Output Selection of Relay 1 | | 0~20 | 4 | ○ | 103. |
| P6.03 | Output Selection of Relay 2 | | 0~20 | 0 | ○ | 104. |
| P6.04 | AO1 Output Selection | 0：Operation frequency<br>1：Set frequency<br>2：Operation rotate speed<br>3：Output current<br>4：Output voltage<br>5：Output power<br>6：Set torque<br>7：Output torque<br>8：Simulate AI1 input value<br>9：Simulate AI2 input value | 0~11 | 0 | ○ | 105. |
| P6.05 | AO2 Output Selection | | 0~11 | 0 | ○ | 106. |
| P6.06 | Output Selection of HDO Open Collector High-speed Impulse | | 0~11 | 0 | ○ | 107. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 10： Impulse frequency HDI input value | | | | |
| P6.07 | AO1 Output Lower Limit | 0.0%~100.0% | 0.0~100.0 | 0.0% | ○ | 108. |
| P6.08 | AO1 Output corresponding to Lower Limit | 0.00V ~10.00V | 0.00~10.00 | 0.00V | ○ | 109. |
| P6.09 | AO1 Output Upper Limit | 0.0%~100.0% | 0.0~100.0 | 100.0% | ○ | 110. |
| P6.10 | AO1 Output corresponding to Upper Limit | 0.00V~10.00V | 0.00~10.00 | 10.00V | ○ | 111. |
| P6.11 | AO2 Output Lower Limit | 0.0%~100.0% | 0.0~100.0 | 0.0% | ○ | 112. |
| P6.12 | AO2 Output corresponding to Lower Limit | 0.00V ~10.00V | 0.00~10.00 | 0.00V | ○ | 113. |
| P6.13 | AO2 Output Upper Limit | 0.0%~100.0% | 0.0~100.0 | 100.0% | ○ | 114. |
| P6.14 | AO2 Output corresponding to Upper Limit | 0.00V ~10.00V | 0.00~10.00 | 10.00V | ○ | 115. |
| P6.15 | HDO Output Lower Limit | 0.00%~100.0% | 0.00~100.00 | 0.00% | ○ | 116. |
| P6.16 | HDO Output Corresponding to Lower Limit | 0.000~ 50.00kHz | 0.000~50.000 | 0.00kHz | ○ | 117. |
| P6.17 | HDO Output Upper Limit | 0.00%~100.0% | 0.000~100.00 | 100.0% | ○ | 118. |
| P6.18 | HDO Output Corresponding to | 0.0 ~ 50.00kHz | 0.000~50.000 | 50.00kHz | ○ | 119. |

| | Upper Limit | | | | | |
|---|---|---|---|---|---|---|
| **Group P7 Human-Machine Interface Group** | | | | | | |
| P7.00 | User Password | 0~65535 | 0~65535 | 0 | ○ | 120. |
| P7.01 | Reserved | Reserved | Reserved | Reserved | | 121. |
| P7.02 | Reserved | Reserved | Reserved | Reserved | | 122. |
| P7.03 | Function Selection of JOG Key | 0：Switch display state of left shift key<br>1：Inch Operation<br>2：Switch of foreward and inversion<br>3：Eliminate UP/DOWN set<br>4：Fast debug mode（debug according to non-factory parameter） | 0~4 | 0 | ○ | 123. |
| P7.04 | Halt Function Selection of STOP Key | 0：Only valid to keyboard control<br>1：Simultaneously effective to keyboard and terminal control<br>2：Simultaneously effective to keyboard and communication control<br>3：Effective to all control modes | 0~3 | 0 | ○ | 124. |
| P7.05 | Keyboard Display Selection | 0：Outer keyboard priority enable<br>1：When the native and outer keyboards display simultaneously, only outer keys are valid.<br>2：When the native and outer keyboards display simultaneously, only native keys are valid. | 0~3 | 0 | ○ | 125. |

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|---|---|---|---|---|---|---|
| | | 3：When the native and outer keyboards display simultaneously, all keys are valid（the relationship between the two is logic or） | | | | |
| P7.06 | Parameter Selection 1 of Operation State Display | 0~0XFFFF<br>BIT0：Operation frequency<br>BIT1：Set frequency BIT2：Busbar voltage BIT3：Output voltage BIT4：Output current<br>BIT5：Operation rotate speed<br>BIT6：Linear velocity<br>BIT7：Output power BIT8：Output torque BIT9：PID set value BIT10：PID feedback value BIT11：Input terminal status<br>BIT12: Output terminal status<br>BIT13：Torque set value<br>BIT14：Count value BIT15：PLC and current stage number of multistage speed | 0～0XFFFF | 0X07FF | ○ | 126. |
| P7.07 | Parameter Selection 2 of Operation State Display | 0~0XFFFF<br>BIT0：Analog quantity AI1 value<br>BIT1：Analog quantity AI2 value<br>BIT2：High-speed impulse HDI frequency BIT3：Overload percentage of motor<br>BIT4：Overload percentage of | 0~0XFFFF | 0 | ○ | 127. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | frequency converter<br>BIT5~15：Reserved | | | | |
| P7.08 | Parameter Selection of Halt State Display | 0~0XFFFFF BIT0：Set frequency BIT1：Busbar voltage BIT2：Input terminal status BIT3：Output terminal status BIT4：PID set value<br>BIT5：PID feedback value<br>BIT6：Analog quantity AI1 value<br>BIT7：Analog quantity AI2 value<br>BIT8：High-speed impulse HDI frequency<br>BIT9：PLC and current stage number of multistage speed<br>BIT10：Torque set value<br>BIT11~BIT15：Reserved | 0~0XFFFF | 0x00FF | ○ | 128. |
| P7.09 | Rotate Speed Display Coefficient | 0.1~999.9%<br>Mechanical rotate speed=120*operation frequency*P7.09/motor pole pairs | 0.1~999.9 | 100.0% | ○ | 129. |
| P7.10 | Linear Velocity Display Coefficient | 0.1~999.9%<br>Linear Velocity = mechanical rotate speed x P7.10 | 0.1~999.9 | 1.0% | ○ | 130. |
| P7.11 | Module Temperature of Rectifier Bridge | 0~100.0℃ | | | ● | 131. |
| P7.12 | Inversion Module Temperature | 0~100.0℃ | | | ● | 132. |
| P7.13 | Software Release | | | | ● | 133. |

| | | | | | | |
|---|---|---|---|---|---|---|
| P7.14 | Rated Power of Frequency Converter | 0.4~630.0kW | 0.4~630.0 | Model confirmed | • | 134. |
| P7.15 | Rated Current of Frequency Converter | 0.0~1100.0A | 0.0~1100.0 | Model confirmed | • | 135. |
| P7.16 | Native Accumulated Operation Time | 0~65535h | | | • | 136. |
| P7.17 | Type of Prior Two Faults | 0：Fault-free<br>1：Inversion unit protection（OUt1）<br>2：Overcurrent protection（Out2）<br>3：Reserved<br>4：Overcurrent caused by acceleration operation（OC1）<br>5：Overcurrent caused by deceleration operation（OC2）<br>6：Overcurrent caused by constant speed operation（OC3）<br>7：Over voltage caused by acceleration operation（OV1）<br>8：Over voltage caused by deceleration operation（OV2）<br>9：Constant speed over voltage（OV3）<br>10：Busbar undervoltage fault（UV）<br>11：Motor overload（OL1）<br>12：Frequency converter overload（OL2）<br>13：Reserved | | | • | 137. |
| P7.18 | Type of Previous Fault | | | | • | 138. |
| P7.19 | Type of Current Fault | | | | • | 139. |

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|---|---|---|---|---|---|---|
| | | 14： Default phase at output side（SPO）<br>15：Reserved<br>16 ： Overheating fault of inverter（OH2）<br>17：External fault（EF）<br>18：Communication error（CE）<br>19 ： Current detection error（ItE）<br>20：Self-learning error（tE）<br>21 ： EEPROM operation fault（EEP）<br>22 ： PID feedback disconnection fault（PIDE）<br>23：Reserved<br>24 ： Manufacturer operation time is out (END)<br>25：Over torque fault（OL3） | | | | |
| P7.20 | Operation Frequency of Current Fault | | | | ● | 140. |
| P7.21 | Output Current of Current Fault | | | | ● | 141. |
| P7.22 | Busbar Voltage of Current Fault | | | | ● | 142. |
| P7.23 | Input Terminal State of Current Fault | | | | ● | 143. |
| P7.24 | Output Terminal State of Current Fault | | | | ● | 144. |
| **Group P8 Enhanced Function Group** | | | | | | |
| P8.00 | Acceleration | 0.1~3600.0s | 0.1~3600.0 | Model | ○ | 145. |

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|---|---|---|---|---|---|---|
| | Time 1 | | | confirmed | | |
| P8.01 | Deceleration Time 1 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 146. |
| P8.02 | Acceleration Time 2 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 147. |
| P8.03 | Deceleration Time 2 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 148. |
| P8.04 | Acceleration Time 3 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 149. |
| P8.05 | Deceleration Time 3 | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 150. |
| P8.06 | Inch Operation Frequency | 0.00~P0.03 （maximum frequency） | 0.00~P0.03 | 5.00Hz | ○ | 151. |
| P8.07 | Inch Operation Acceleration Time | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 152. |
| P8.08 | Inch Operation Deceleration Time | 0.1~3600.0s | 0.1~3600.0 | Model confirmed | ○ | 153. |
| P8.09 | Hopping Frequency1 | 0.00~P0.03 （maximum frequency） | 0.00~ P0.03 | 0.00Hz | ○ | 154. |
| P8.10 | Hopping Frequency2 | 0.00~P0.03 （maximum frequency） | 0.00~ P0.03 | 0.00Hz | ○ | 155. |
| P8.11 | Hopping Frequency Range | 0.00~P0.03 （maximum frequency） | 0.00~ P0.03 | 0.00Hz | ○ | 156. |
| P8.12 | Swing Frequency Range | 0.0~100.0%（corresponding set frequency） | 0.0~100.0 | 0.0% | ○ | 157. |
| P8.13 | Kick Frequency Range | 0.0~50.0% （corresponding Swing Frequency Range） | 0.0~50.0 | 0.0% | ○ | 158. |
| P8.14 | Rise Time of Swing Frequency | 0.1~3600.0s | 0.1~3600.0 | 5.0s | ○ | 159. |

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|---|---|---|---|---|---|---|
| P8.15 | Fall Time of Swing Frequency | 0.1~3600.0s | 0.1~3600.0 | 5.0s | ○ | 160. |
| P8.16 | Automatic Reset Times of Fault | 0~3 | 0~3 | 0 | ○ | 161. |
| P8.17 | Interval Time Set of Fault Automatic Reset | 0.1~100.0s | 0.1~100.0 | 1.0s | ○ | 162. |
| P8.18 | Set Count Value | P8.19~65535 | P8.19~65535 | 0 | ○ | 163. |
| P8.19 | Specified Count Value | 0~ P8.18 | 0~ P8.18 | 0 | ○ | 164. |
| P8.20 | Set Operation Time | 0~65535h | 0~65535 | 65535h | ○ | 165. |
| P8.21 | FDT Level Detection Value | 0.00~ P0.03 （ maximum frequency） | 0.00~ P0.03 | 50.00Hz | ○ | 166. |
| P8.22 | FDT Lag Detection Value | 0.0~100.0%（FDT Level） | 0.0~100.0 | 5.0% | ○ | 167. |
| P8.23 | Frequency Reach Detection Range | 0.0~100.0% （ maximum frequency） | 0.0~100.0 | 0.0% | ○ | 168. |
| P8.24 | Droop Control | 0.00~10.00Hz | 0.00~10.00 | 0.00Hz | ○ | 169. |
| P8.25 | Brake Threshold Voltage | 115.0~140.0% （ standard busbar voltage ）（ type of 380V） | 115.0~140.0 | 130.0% | ○ | 170. |
| | | 115.0~140.0% （ standard busbar voltage ）（ type of 220V） | 115.0~140.0 | 120.0% | | |
| P8.26 | Operation Mode of Fan | 0：Normal operation mode<br>1 ： Always operating when power is on | 0~1 | 0 | ○ | 171. |
| P8.27 | Overmodulation Function Selection | 0：Overmodulation Function is invalid<br>1：Overmodulation Function is | 0~1 | 0 | ○ | 172. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | valid | | | | |
| P8.28 | PWM Selection | 0：PWM Mode 1<br>1：PWM Mode 2<br>2：PWM Mode 3 | 0~2 | 0 | ◎ | 173. |
| **Group P9 PID Control Group** | | | | | | |
| P9.00 | PID Set Source Selection | 0：Keyboard set（P9.01）<br>1：Analog channel AI1 set<br>（**Notes: in J8 jumper, PANEL is connected with AI1 for the keyboard potentiometer input, and PORT is connected with AI1 for the external terminal AI1 input**）<br>2：Analog channel AI2 set<br>3：Impulse frequency set（HDI）<br>4：Multistage set<br>5：Telecommunication set | 0~5 | 0 | ○ | 174. |
| P9.01 | Keyboard Preset PID Given | 0.0%~100.0% | 0.0~100.0 | 0.0% | ○ | 175. |
| P9.02 | PID Feedback Source Selection | 0：Analog channel AI1 feedback<br>（**Notes: in J8 jumper, PANEL is connected with AI1 for the keyboard potentiometer input, and PORT is connected with AI1 for the external terminal AI1 input**）<br>1：Analog channel AI2 feedback<br>2：AI1+AI2 feedback<br>3：Impulse frequency feedback（HDI）<br>4：Telecommunication feedback | 0~4 | 0 | ○ | 176. |
| P9.03 | PID Output | 0：PID output is positive characteristic | 0~1 | 0 | ○ | 177. |

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|---|---|---|---|---|---|---|
| | Characteristic Selection | 1： PID output is negative characteristic | | | | |
| P9.04 | Proportional Gain（Kp） | 0.00~100.00 | 0.00~100.00 | 0.10 | ○ | 178. |
| P9.05 | Integral Time（Ti） | 0.01~10.00s | 0.01~10.00 | 0.10s | ○ | 179. |
| P9.06 | Derivative Time（Td） | 0.00~10.00s | 0.00~10.00 | 0.00s | ○ | 180. |
| P9.07 | Sampling Period（T） | 0.00~100.00s | 0.00~100.00 | 0.10s | ○ | 181. |
| P9.08 | PID Control Deviation Limit | 0.0~100.0% | 0.0~100.0 | 0.0% | ○ | 182. |
| P9.09 | Detection Value of Feedback Disconnection | 0.0~100.0% | 0.0~100.0% | 0.0% | ○ | 183. |
| P9.10 | Detection Time of Feedback Disconnection | 0.0~3600.0s | 0.0~3600.0 | 1.0s | ○ | 184. |
| **Group PA Simple PLC and Multistage Velocity Control Group** | | | | | | |
| PA.00 | SimplePLC Mode | 0：Run for one time and then stop<br>1：Run for one time and then keey running<br>2：Run in cycle | 0~2 | 0 | ○ | 185. |
| PA.01 | SimplePLC Storage Selection | 0：Do not store when power is down<br>1：Store when power is down | 0~1 | 0 | ○ | 186. |
| PA.02 | Multistage Speed 0 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 187. |
| PA.03 | Operation Time at Stage 0 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 188. |

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|---|---|---|---|---|---|---|
| PA.04 | Multistage Speed 1 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 189. |
| PA.05 | Operation Time at Stage 1 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 190. |
| PA.06 | Multistage Speed2 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 191. |
| PA.07 | Operation Time at Stage 2 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 192. |
| PA.08 | Multistage Speed3 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 193. |
| PA.09 | Operation Time at Stage 3 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 194. |
| PA.10 | Multistage Speed4 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 195. |
| PA.11 | Operation Time at Stage 4 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 196. |
| PA.12 | Multistage Speed5 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 197. |
| PA.13 | Operation Time at Stage 5 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 198. |
| PA.14 | Multistage Speed6 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 199. |
| PA.15 | Operation Time at Stage 6 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 200. |
| PA.16 | Multistage Speed7 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 201. |
| PA.17 | Operation Time at Stage 7 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 202. |
| PA.18 | Multistage Speed8 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 203. |
| PA.19 | Operation Time | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 204. |

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|---|---|---|---|---|---|---|
| | at Stage 8 | | | | | |
| PA.20 | Multistage Speed9 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 205. |
| PA.21 | Operation Time at Stage 9 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 206. |
| PA.22 | Multistage Speed10 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 207. |
| PA.23 | Operation Time at Stage 10 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 208. |
| PA.24 | Multistage Speed11 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 209. |
| PA.25 | Operation Time at Stage 11 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 210. |
| PA.26 | Multistage Speed12 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 211. |
| PA.27 | Operation Time at Stage 12 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 212. |
| PA.28 | Multistage Speed13 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 213. |
| PA.29 | Operation Time at Stage 13 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 214. |
| PA.30 | Multistage Speed14 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 215. |
| PA.31 | Operation Time at Stage 14 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 216. |
| PA.32 | Multistage Speed15 | -100.0~100.0% | -100.0~100.0 | 0.0% | ○ | 217. |
| PA.33 | Operation Time at Stage 15 | 0.0~6553.5s（m） | 0.0~6553.5 | 0.0s | ○ | 218. |
| PA.34 | Acceleration and Deceleration | 0~0XFFFF | 0~0XFFFF | 0 | ○ | 219. |

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|---|---|---|---|---|---|---|
| | Time Selection of SimplePLC at Stage 0~7 | | | | | |
| PA.35 | Acceleration and Deceleration Time Selection of SimplePLC at Stage 8~15 | 0~0XFFFF | 0~0XFFFF | 0 | ○ | 220. |
| PA.36 | PLC Restart Mode Selection | 0：Restart from stage 1<br>1： Go on running with the stage frequency at the break time | 0~1 | 0 | ◎ | 221. |
| PA.37 | Multistage Time Unit Selection | 0：Second<br>1：Minute | 0~1 | 0 | ◎ | 222. |
| **Group Pb Protection Parameter Group** | | | | | | |
| Pb.00 | Reserved | Reserved | Reserved | Reserved | ○ | 223. |
| Pb.01 | Output Phase Loss Protection | 0：Forbid<br>1：Allow | 0~1 | 1 | ○ | 224. |
| Pb.02 | Selection of Motor Overload Protection | 0：No protection<br>1：Common motor（with low speed compensation）<br>2： Variable frequency motor (without low speed compensation） | 0~2 | 2 | ◎ | 225. |
| Pb.03 | Motor Overload Protection Current | 20.0%~120.0%（rated current of motor） | 20.0~120.0 | 100.0% | ○ | 226. |
| Pb.04 | Instant Power-down Decimation Point | 70.0~110.0%（standard busbar voltage） | 70.0~110.0 | 80.0% | ○ | 227. |
| Pb.05 | Instant Power-down | 0.00~P0.03 （ maximum frequency） | 0.00~P.03 | 0.00Hz/s | ○ | 228. |

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|---|---|---|---|---|---|---|
| | Frequency Drop Rate | | | | | |
| Pb.06 | Over Voltage Stall Protection | 0：Forbit<br>1：Allow | 0~1 | 1 | ○ | 229. |
| Pb.07 | Protection Voltage of Over Voltage Stall | 110~150% | 110～150%（220V series） | 120% | ○ | 230. |
| | | | 110～150%（380V series） | 130% | | |
| Pb.08 | Automatic Current Limiting Level | 50~200% | 50~200 | Type of G：160%<br>Type of P：120% | ○ | 231. |
| Pb.09 | Frequency Drop Rate during Current Limiting | 0.00~50.00Hz/s | 0.00～50.00Hz/s | 10.00Hz/s | ○ | 232. |
| Pb.10 | Current Limiting Action Selection | 0：Current limiting is always valid<br>1：Current limiting is invalid at constant speed | 0~1 | 0 | ○ | 233. |
| Pb.11 | Over Torque Action Selection（OL3） | 0：No detection<br>1：Detection of the over torque is valid during the operation and after the detection, the operation goes on.<br>2：Detection of the over torque is valid during the operation and after the detection, the frequency converter gives alarm（OL3）and stop.<br>3：Detection of the over torque is valid during the operation at the constant speed and after the detection, the operation | 0~4 | 1 | ○ | 234. |

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|---|---|---|---|---|---|---|
| | | goes on.<br>4：Detection of the over torque is valid during the operation at the constant speed and after the detection, the frequency converter gives alarm（OL3）and stop. | | | | |
| Pb.12 | Over Torque Detection Level | 1.0%~200.0%（corresponding to the rated current of the frequency converter） | 1.0%~200.0% | Type of G：150.0%<br>Type of P：120.0% | ○ | 235. |
| Pb.13 | Over Torque Detection Time | 0.1~60.0s | 0.1~60.0 | 0.1s | ○ | 236. |
| Pb.14 | Reserved | | | | ● | 237. |
| Pb.15 | Reserved | | | | ● | 238. |
| **Group PC Serial Communication Group** | | | | | | |
| PC.00 | Native Communication Address | 1~247，0 is broadcast address | 0~247 | 1 | ○ | 239. |
| PC.01 | Set of Communication Baud Rate | 0：1200BFS<br>1：2400BFS<br>2：4800BFS<br>3：9600BFS<br>4：19200BFS<br>5：38400BFS | 0~5 | 4 | ○ | 240. |
| PC.02 | Set of Data Bits Check | 0:No check（N，8，1）for RTU<br>1:Even parity check（E，8，1 for RTU<br>2:Odd parity check（O，8，1）for RTU<br>3: No check（N，8，2）for RTU<br>4: Even parity check（E，8，2 | 0~5 | 1 | ○ | 241. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | for RTU<br>5: Odd parity check（O，8，2 for RTU | | | | |
| PC.03 | Communication Response Delay | 0~200ms | 0~200 | 5ms | ○ | 242. |
| PC.04 | Time of Communication Timeout Fault | 0.0（invalid），0.1~100.0s | 0.0~100.0 | 0.0s | ○ | 243. |
| PC.05 | Transmission Error Processing | 0：Give alarm and stop freely<br>1：Give no alarm and go on running<br>2：Give no alarm and stop in halt mode（only under communication control mode）<br>3：Give no alarm and stop in halt mode（under all control modes） | 0~3 | 1 | ○ | 244. |
| PC.06 | Selection of Communication Processing Action | LED unit<br>0：Write operation has response<br>1：Write operation has no response<br>LED decade<br>0：Communication set value is not stored when power is down.<br>1：Communication set value is stored when power is down. | 00~11 | 00 | ○ | 245. |
| **Group Pd Reserved Function Group** | | | | | | |
| **Group PE Manufacture Function Group** | | | | | | |

# Appendix 2 Model Selection of Brake Resistor/Brake Unit

## 1 Model Selection Reference

When the control device driven by the frequency converter needs fast braking, the brake unit has to release the energy fed back to the direct current bus during the motor braking. Specifications of HV400 series frequency converters of 220V with voltage level of 0.4～7.5KW and 380V with voltage level of 0.4 ～ 18.5KW are equipped with brake units inside. If fast halt is required, please directly connect brake resistors. For specifications of HV400 series frequency converters of 220V with voltage level of 11KW above and 380V with voltage level of 22KW above, if fast halt is required, please choose proper brake units and brake resistors according to the capacity of the frequency converter.

**Usage Specifications and Model Selection Reference of 220V Level**

| Power of Frequency Converter KW | Brake Unit | Brake Resistors（To brake torque in 10%） | | |
|---|---|---|---|---|
| | | Equivalent Brake Resistor Value | Equivalent Brake Power | Quantity （number） |
| 0.4 | Built-in | 200Ω | 80W | 1 |
| 0.75 | | 200Ω | 80W | 1 |
| 1.5 | | 100Ω | 260W | 1 |
| 2.2 | | 70Ω | 260W | 1 |
| 3.7 | | 40Ω | 390W | 1 |
| 5.5 | | 30Ω | 520W | 1 |
| 7.5 | | 20Ω | 780W | 1 |
| 11 | Circumscribed | 13.6Ω | 2400W | 1 |
| 15 | | 10Ω | 3000W | 1 |
| 18.5 | | 8Ω | 4000W | 1 |
| 22 | | 6.8Ω | 4800W | 1 |
| 30 | | 5Ω | 6000W | 1 |
| 37 | | 4Ω | 9600W | 1 |
| 45 | | 3.4Ω | 9600W | 1 |

**Usage Specifications and Model Selection Reference of 380V Level**

| Capacity of Frequency Converter KW | Brake Unit | Brake Resistors（To brake torque in 10%） | | |
|---|---|---|---|---|
| | | Equivalent Brake Resistor Value | Equivalent Brake Power | Quantity （number） |
| 0.4 | Built-in | 750Ω | 80W | 1 |
| 0.75 | | 750Ω | 80W | 1 |
| 1.5 | | 400Ω | 260W | 1 |
| 2.2 | | 250Ω | 260W | 1 |
| 3.7 | | 150Ω | 390W | 1 |
| 5.5 | | 100Ω | 520W | 1 |
| 7.5 | | 75Ω | 780W | 1 |
| 11 | | 50Ω | 1040W | 1 |
| 15 | | 40Ω | 1560W | 1 |
| 18.5 | | 32Ω | 4800W | 1 |
| 22 | Circumscribed | 27.2Ω | 4800W | 1 |
| 30 | | 20Ω | 6000W | 1 |
| 37 | | 16Ω | 9600W | 1 |
| 45 | | 13.6Ω | 9600W | 1 |
| 55 | | 10Ω | 12000W | 1 |
| 75 | | 6.8Ω | 12000W | 1 |
| 90 | | 6.8Ω | 12000W | 1 |
| 110 | | 6Ω | 20000W | 1 |
| 132 | | 6Ω | 20000W | 1 |
| 160 | | 5Ω | 25000W | 2 |
| 185 | | 4Ω | 30000W | 3 |
| 200 | | 4Ω | 30000W | 3 |
| 220 | | 4Ω | 30000W | 3 |
| 250 | | 3Ω | 40000W | 4 |
| 280 | | 3Ω | 40000W | 5 |
| 315 | | 3Ω | 40000W | 5 |
| 350 | | 3Ω | 40000W | 5 |

Notes:

- Please choose the resistor value and the wattage formulated by our company.

- The resistance value may affect the braking torque. The table above is the resistance powerwhich is designed according to braking torque of 10 % . If needing larger braking torque, users can properly reduce the resistance value of the brake resistor and amplify the

  power.

## 2 Connection Method

### 2.1 Connection of Brake Resistor

The connection of the brake resistor of HV400 frequency converter with built-in brake unit is illustrated as diagram 2.2.

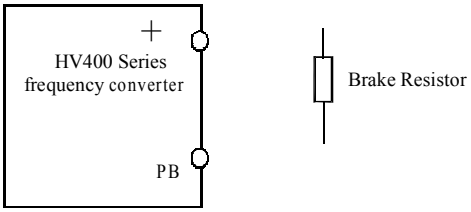


Diagram 2.1 Installation of Brake Resistor

### 2.2 Connection of Brake Unit

The connection between HV400 series frequency converter and the brake unit is illustrated as diagram 2.2.

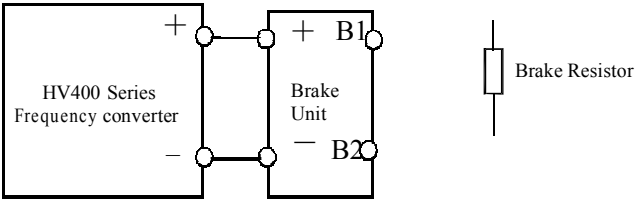


Diagram 2.2 Connection of Brake Unit

### 2.2 Parallel Connection of Brake Unit

The connection between HV400 series frequency converter and the brake unit is illustrated as diagram 2.2.

The maximum applying power of one brake unit is 45KW. If a frequency converter of higher specification needs energy for braking, two or more brake units are required to be parallelly connected for use as is illustrated in diagram 2.3.

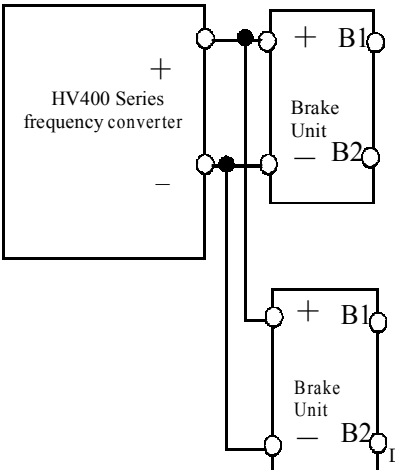


Diagram 2.3 Parallel Connection of Brake Unit

# Appendix 3 Quality Assurance and Product Warranty Regulations

一、 This regulation is a protocol between the manufacturer who produces the product (hereinafter refered to as manufacturer) and the user who uses the product (hereinafter refered to as user). Any user whoever purchases and uses the product provided by the manufacturer is regarded as knowing and agreeing with the protocol.

## 二、 About Product Quality and Warranty

1. The manufacturer provides complete and available product.
2. The manufacturer is not responsible for the problems and losses due to the following reasons:

（1） All operations not according to the specification and incorrect operation and installation; problems and losses caused by self-maintenance which is not permitted by the manufacturer.

（2） Expired for the warranty period locked in this regulation.

（3） Problems and losses due to artificial or natural irresistible reasons after the purchase.

（4） Problems and losses due to the installation and the use of the product not under product required environment by the user.

## 三、 Contents of Warranty on Product Made by Manufacturer

1. For domestic use：

1) Change, repair and return are guaranteed within 1 week since the delivery.

2) Change and repair are guaranteed within 1 month since the delivery.

3) Repair is guaranteed within 12 months since the delivery.

4) For those expired for the warranty period or warranty scope, we have to charge the cost.

2. For products exported overseas, repair is guaranteed within 3 months since the delivery.
3. The user can enjoy lifetime paid services whenever and wherever using products of our brand.
4. All sales organizations, productive facilities and agencies of our company across the country can provide after-sale services for our product.
5. For products out of order, our

company has the right to authorize others to be responsible for affairs of warranty, etc.

## 四、Rights Reserved by Manufacturer and Immunity Affairs

1. The manufacture is not liable for compensation for all direct and indirect problems and losses caused by the installation and the use of the user of our product.
2. All rights for the product are reserved by the manufacturer. The product may be changed without further notification. Please make the object as the standard.
3. The manufacturer has the final power of interpretation on the product.
4. The regulations are available to other products of the manufacturer.
5. The terms above will be executed since November 22, 2012.