XINJE

VH1 series inverter
User manual

Basic description

- Thank you for purchasing XINJE VH1 series inverter. Please read this product manual carefully before carrying out relevant operation.
- The manual mainly provides users with relevant guidance and instructions for the correct use and maintenance of the inverter. The manual involves the functions of the inverter capability, usage, installation and maintenance, etc.
- The contents in the manual are only applicable to the inverter products of Xinje company.

Notice to users

This manual is applicable to the following personnel:

- The installation personnel of inverter
- Engineering and technical personnel (electrical engineer, electrical operator, etc.)
- The designer

Before the above personnel operate or debug the inverter, please carefully read the chapter of safety precautions in this manual.

statusment of responsibility

- Although the contents of the manual have been carefully checked, errors are inevitable, and we can not guarantee the complete consistency.
- We will check the contents of the manual frequently and make corrections in subsequent versions. We welcome your valuable comments.
- The contents described in the manual are subject to change without prior notice.

Contact us

If you have any questions about the use of this product, please contact the agent that purchased the product, or you can contact XINJE company directly.

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Catalog

Attention

Safety precautions

(1) Definition of safety information

	Notice	Steps taken to ensure proper operation.
⚠	Danger	If you do not comply with the relevant requirements, it will cause serious personal injury, or even death.
⚠	Warning	Failure to comply with the requirements may result in personal injury or equipment damage.

(2) Safety notice

- Unpacking check

⚠ **Notice**

1. Before unpacking, please check whether the outer package of the product is in good condition, and whether there is damage, moisture, deformation, etc.
2. Before unpacking, please check whether the external model identification of the packing box is consistent with that of the ordered model.
3. When unpacking, please check the surface of products and accessories for damage, corrosion, bruise, etc.
4. After unpacking, please check whether the product name plate label is consistent with the external model label.
5. After unpacking, check whether the internal accessories are complete, including operation panel and expansion card.

Note: If any of the above five points appear during unpacking, please contact us in time, and we will solve the problem for you as soon as possible.

- Installation

⚠ **Notice**

1. When carrying, please hold the bottom of the machine.
   If you only hold the panel, there is a risk that the main body will fall and hurt your feet.
2. Please install it on the plate of metal and other non combustible materials.
   If it is installed on flammable materials, there is a risk of fire.
3. When more than two inverters are installed in the same control cabinet, please set the cooling fan and keep the air temperature at the air inlet below 40 ℃.
   Due to overheating, it can cause fire and other accidents.

- Wiring

⚠ **Notice**

1. Please confirm whether the rated voltage of AC main circuit power supply is consistent with that of inverter.
   Danger of injury and fire.
2. Do not do voltage withstand test on the inverter.
   Will cause damage to semiconductor components, etc.

3. Please connect the brake resistor or brake unit according to the wiring diagram.

   There is a risk of fire.

4. Please use the screw driver with specified torque to fasten the terminal.

   There is a risk of fire.

5. Do not connect the input power line to the output U, V and W terminals.

   If the voltage is applied to the output terminal, the inverter will be damaged internally.

6. Do not connect the phase-shifting capacitor and LC / RC noise filter to the output circuit.

   It will cause internal damage to the inverter.

7. Do not connect the electromagnetic switch and contactor to the output circuit.

   When the inverter is running with load, the surge current generated by the action of electromagnetic switch and electromagnetic contactor will cause the over-current protection circuit of the inverter to act.

8. Do not remove the front panel cover.

   May cause internal damage to the inverter.

⚡ Danger

1. Before wiring, please make sure that the input power has been cut off.

   Danger of electric shock and fire.

2. Ask electrical engineering professionals to do wiring operation.

   Danger of electric shock and fire.

3. The grounding terminal must be reliably grounded.

   Danger of electric shock and fire.

4. After the emergency stop terminal is connected, be sure to check whether its action is valid.

   There is a risk of injury. (the responsibility for wiring shall be borne by the user)

5. Do not touch the output terminal directly, do not connect the output terminal of the inverter with the cover, and do not short circuit between the output terminals. There is danger of electric shock and short circuit.

6. After cutting off the AC power supply, before the indicator light of the AC motor driver goes out, it means that there is still high voltage inside the AC motor driver, which is very dangerous. Please do not touch the internal circuit and components.

● Maintenance and inspection

⚠ Notice

1. The keyboard, control circuit board and driver circuit board are equipped with CMOS integrated circuits. Please pay special attention when using.

   If you touch the circuit board directly with your fingers, static induction may damage the integrated chip on the circuit board.

2. Do not change the wiring or remove the terminal wiring during power on. Do not check the signal during operation. It will damage the equipment.

⚡ Danger

1. Do not touch the terminal of the inverter, there is high voltage on the terminal.

   Danger of electric shock.

2. Before power on, be sure to install the terminal cover. When removing the cover, be sure to disconnect the power supply.

   Danger of electric shock.

3. Non professional technicians are not allowed to carry out maintenance and inspection.

   Danger of electric shock.

Precautions for use

- Constant torque and low speed operation

When the inverter with ordinary motor runs at low speed for a long time, the motor life will be affected due to the poor heat dissipation effect. If low speed constant torque long-term operation is needed, special frequency conversion motor must be selected.

- Confirmation of motor insulation

When using VH1 series inverter, please confirm the insulation of the motor before connecting the motor, so as to avoid damaging the equipment. In addition, when the motor is in a bad environment, please check the insulation of the motor regularly to ensure the safe operation of the system.

- Negative torque load

For such occasions as lifting the load, there will often be negative torque, and the inverter will trip due to over-current or over-voltage fault. At this time, the selection of braking resistance should be considered.

- Mechanical resonance point of load device

In a certain output frequency range, the inverter may encounter the mechanical resonance point of the load device, which must be avoided by setting the jump frequency.

- Capacitors or varistors to improve power factor

As the output voltage of the inverter is pulse wave type, if the output side is installed with capacitors to improve the power factor or varistors for lightning protection, it will cause the inverter fault trip or device damage. Please remove it. In addition, it is recommended not to add air switch and contactor and other switching devices on the output side.

- The use of derating when setting the fundamental frequency

When the fundamental frequency is lower than the rated frequency, please pay attention to the derating of the motor to avoid overheating and burning.

- Operate at frequency above 50 Hz

If the frequency exceeds 50 Hz, in addition to considering the vibration and noise increase of the motor, it is also necessary to ensure the speed range of the motor bearing and mechanical device, and make sure to check in advance.

- Electronic thermal protection value of motor

When selecting the suitable motor, the inverter can implement thermal protection for the motor. If the rated capacity of motor and inverter does not match, the protection value must be adjusted or other protection measures must be taken to ensure the safe operation of motor.

- Altitude and derating

In the area with altitude more than 1000 meters, the heat dissipation effect of inverter becomes worse due to the thin air, so it is necessary to reduce the rating.

- About the protection level

The protection grade IP20 of VH1 series inverter is achieved when the status display unit or keyboard is selected.

Notes on scrapping

When scrapping the inverter, please pay attention to:

When the electrolytic capacitors in the main circuit and printed circuit board are burned, they may explode. Toxic gases are produced when plastic parts are burned. Please treat as industrial waste.

1. Product introduction

1-1. Product overview
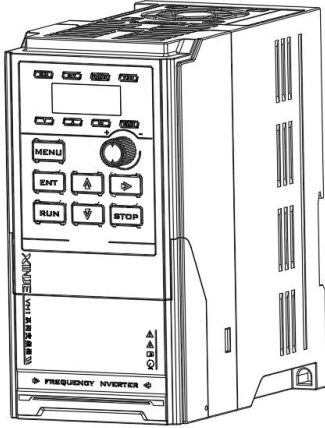
VH1 series is a universal open-loop vector inverter developed by XINJE company. The product adopts vector control technology, which realizes the open-loop vector control of asynchronous motor, and also strengthens the reliability and environmental adaptability of the product.

1-1-1. Naming rule

$$\text{VH}\underline{1} - \underline{4}\,\underline{0.7\text{G}/1.5\text{P}} - \underline{\text{B}}$$

① ② ③ ④ ⑤

①	Product identification	VH: General inverter
②	Product series	1: Open-loop vector inverter
③	Input voltage level	4: AC 380V 2: AC 220V
④	Power level	P: Light load G: Heavy load
⑤	Brake unit	B: Built-in brake unit Blank: None

1-2. Specification

1-2-1. Technical specification

Model VH1-＿＿＿＿-B	20P4	20P7	40.4G/0.7P	40.7G/1.5P	41.5G/2.2P	42.2G/3.7P	43.7G/5.5P
Adaptive motor (KW)	0.4	0.75	0.4	0.75	1.5	2.2	3.7
Input rated current (A)	1.3	9.8	1.8	2.3	4.4	5.8	10.5
Power supply capacity (KVA)	1	1.5	1	1.5	3.0	4.0	5.9
Output rated current (A)	2.5	4.0	1.5	2.1	3.8	5.1	9.0

1-2-2. General specification

Item		Specification
Power range		0.4kW~55kW
Input	Rated voltage, frequency	380V: Three phase 380V, 50Hz/60Hz
		220V: Single phase 220V, 50Hz/60Hz

Item		Specification
Output	Allowable voltage fluctuation range	Three phase 380V: 320～460V Single phase 220V: 187～253V
	Voltage	0~input voltage
	Frequency	0~600Hz
Control	Control motor type	Asynchronous motor, synchronous motor
	Control performance	V/F control (VVF), vector control
	Speed accuracy	±1%
	Speed fluctuation	±0.5%
	Speed range	1: 50
	Startup torque	1.0Hz: 150%
	Torque accuracy	//
	Torque response	//
	Overload ability	G type: 150% of rated current: 60s P type: 120% of rated current: 60s
	Frequency accuracy	Low frequency operation mode: 0.01Hz High frequency operation mode: 0.1Hz
	Frequency resolution	Low frequency operation mode: digital setting--0.01Hz, Analog setting – max frequency×0.1% High frequency operation mode: digital setting--0.1Hz, Analog setting -- max frequency ×0.1%
Control terminal input	Digital input channel	Up to 5 channels digital input X, X1~X5 support NPN and PNP inputs
	Analog input channel	Up to 2 channel analog input AI, AI1 support 0~10V/0~20mA signal and AI2 support 0~10V signal
Control terminal output	Digital output channel	Up to 2 channels digital output
	Analog output channel	Up to 1 channel analog output, only support 0~10V voltage
Function	Startup command setting	Communication setting (Modbus), operate panel setting, terminal setting
	Frequency setting mode	Communication setting (Modbus), operate panel setting, terminal setting, analog AI setting, multi-speed setting, simple PLC setting, PID setting, main and auxiliary seting
	Typical function	Frequency main and auxiliary operation, reverse inhibition, torque boost, nine kinds of V/F curve settings, five segments of AI curve settings, acceleration and deceleration curve settings, terminal delay and filtering, terminal multi-function input and output, DC braking, energy consumption braking, inching operation, 16 segments of speed, built-in two channels of PID, speed tracking restart, carrier modulation, fault recording, fault self reset, pre-excitation start, 30 groups of user defined parameters
	Important function	Carrier modulation, torque control, motor auto-tuning, current limiting control, over-voltage control, under voltage control, speed tracking, droop control, vibration suppression, over-voltage and over-current stall control, automatic voltage regulation (AVR), automatic energy-saving operation, etc

Item		Specification
	Protection function	Power on motor short-circuit detection, over-current protection, over-voltage protection, under voltage protection, overheat protection, overload protection, under load protection, over-current and voltage stall protection, relay closing protection, terminal protection, instantaneous power failure non stop, etc
	Energy consumption braking	Built-in braking unit as standard, can connect external brake resistor
Special functions	LCD panel	LCD display, parameter setting, status monitoring, parameter copy, fault analysis and location, program download, mass storage of parameters
	Non stop when instantaneous power failure	In case of instantaneous power failure, the load feedback energy compensates for the decrease of voltage and keeps the inverter running for a short time
	Timing control	Timing control function: the time range is 0.1Min~6500.0Min
	Multi-motor switching	Two sets of motor parameters, can realize the switching control of two motors
	Flexible and diversified terminal functions	Multi function terminal, has logic function selection, meet the general inverter control function requirements
	Communication customization parameters	It is convenient for users to read and write the inverter parameters continuously
	Software	Rich background monitoring function, convenient for field data collection and debugging
Display and keyboard	Keyboard display	It can display the set frequency, output frequency, output voltage, output current, input and output status and other parameters
	Button locking	Realize the partial or total locking of keys to prevent false triggering
	Parameter copy	Standard LED single display digital potentiometer keyboard, support LCD Chinese and English display keyboard (parameter download)
	Optional accessories	LCD keyboard, LED knob keyboard and extermal network cable
Environment	Using place	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil mist, water vapor, dripping or salt, etc
	Altitude	Below 1000 meters. (derating is required when the height is higher than 1000m, and the output current will be reduced by about 10% of the rated current when the height is increased every 1000m.)
	Ambient temperature	-10℃~+40℃ (When the ambient temperature is between 40℃ and 50℃, please reduce the rating or enhance the heat dissipation)
	Ambient humidity	Less than 95% RH, no condensation
	Vibration	Less than 5.9 m/s² (0.6G)
	Storage temperature	-40℃~+70℃
	Protection level	IP20
	Cooling mode	Forced air cooling
Installation mode		Wall mounted and rail mounted

2. Installation and wiring

2-1. Installation environment

2-1-1. Environment requirements

◆ It should be installed in a well ventilated indoor place, and the ambient temperature should be within the range of -10°C ~ 40°C. If the temperature exceeds 40°C, it needs external forced cooling or derating.

◆ Avoid installation in places with direct sunlight, dusty, floating fiber and metal powder.

◆ It is strictly forbidden to install in places with corrosive and explosive gas.

◆ The humidity should be lower than 95% RH without condensation.

◆ It is installed in the place where the fixed vibration is less than 5.9m/s² (0.6G).

◆ Be far away from EMI sources and other electronic equipment sensitive to EMI.

2-1-2. Installation space and direction

◆ Generally, it should be installed vertically.

◆ Minimum requirements for installation spacing and distance.

◆ When multiple inverters are installed up and down, the middle part shall be equipped with guide plate.

2-1-3. Single installation
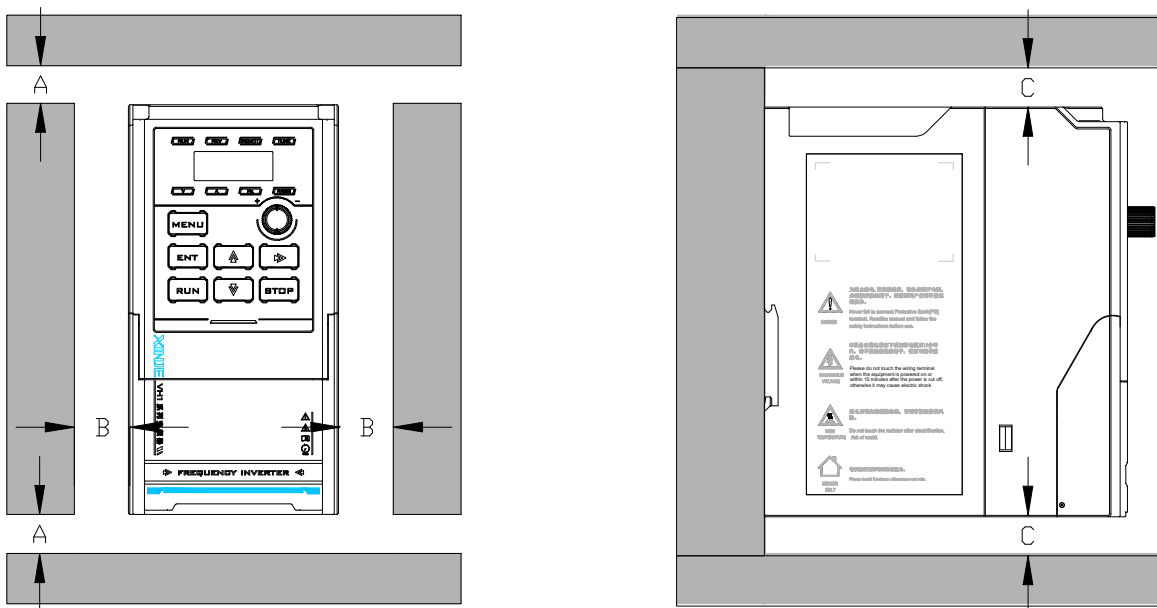
Note: The dimensions of A and B are above 50mm, while the dimensions of C are above 100mm.

2-1-4. Multiple installation
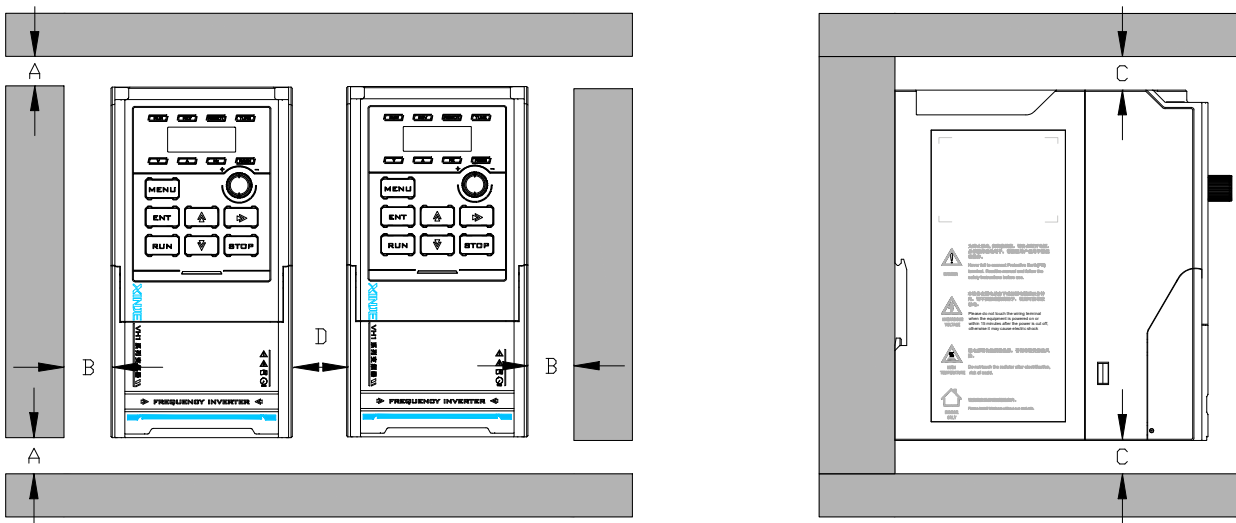
Note: The dimensions of A and B are above 50mm, while the dimensions of C are above 100mm.

2-1-5. Vertical installation
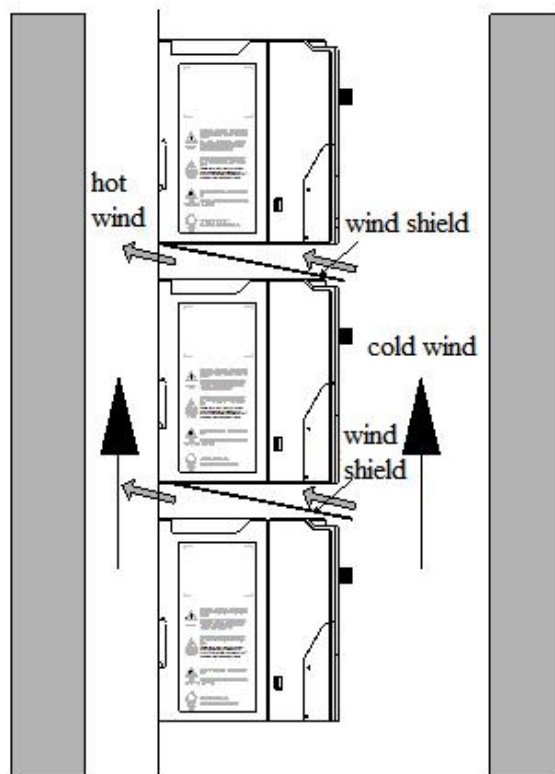
Note: when installing vertically, the wind shield must be added, otherwise it will cause mutual influence between multiple inverters, resulting in poor heat dissipation.

2-1-6. Panel installation

The inverter panel does not support external connection, but there is a network port left for external connection. After the external LCD panel/knob panel is connected to the network port, both the inverter body and the external panel can be operated (after the external LED panel is introduced, the body panel does not work) and is displayed synchronously.

In addition, the network port also supports: LCD panel external connection, firmware update, and upper computer software connection.

The specific network interface definition is as follows:

Pin number	Definition	Functional application
1	VCC	Provide LED panel+5V power supply
2	SPI four pins	Communication between LED panel (VH6-PE100/VH5-PE100) and CPU board
3		
4		
5		
6	TXD	Connect LCD panel(VH6-PC100), LED panel(VH6-PE200/VH1-PE100), firmware update, upper computer software connection (only one function can be selected at the same time).
7	RXD	
8	GND	

Model of panel bracket and accessories: VH6-DPANEL, please refer to Chapter 6-2 for panel mounting bracket dimensions.

Panel extension cable models: JC-RD-20 (2 meters), JC-RD-30 (3 meters), only available in lengths of 2 or 3 meters. If other lengths of extension cables are needed, ordinary network cables can be used instead.

2-2. Wiring notice

⚠ Notice

◆ Ensure that the power supply has been completely cut off for more than 15 minutes before wiring, otherwise there is a risk of electric shock.

◆ It is strictly forbidden to connect the power cable with the output terminal U, V and W of the inverter.

◆ There is leakage current in the inverter itself. In order to ensure safety, the inverter and motor must be grounded safely. Generally, the diameter of grounding wire is more than 3.5mm² copper wire, and the grounding resistance is less than 10Ω.

◆ The inverter has passed the withstand voltage test before leaving the factory, and the user cannot carry out the withstand voltage test on the inverter.

◆ The electromagnetic contactor, absorption capacitor or other resistance capacitance absorption device shall not be installed between the inverter and the motor.

◆ In order to provide the convenience of input side over-current protection and power failure maintenance, the inverter shall be connected with the power supply through the circuit breaker.

◆ The input and output circuits of control terminals shall be connected with twisted wires or shielded wires of more than 0.75mm². One end of the shielding layer shall be suspended, and the other end shall be connected with the grounding terminal PE of inverter, and the wiring length shall be less than 50m.

⚠ Danger

◆ Ensure that the power supply of the inverter has been completely cut off, all LED indicators of the operation keyboard are off, and wait for more than 15 minutes before wiring operation.

◆ The internal wiring can be started only after the DC voltage between P+ and P- of the internal electrolytic capacitor of the inverter is reduced to less than DC36V.

◆ The wiring operation can only be carried out by trained and authorized qualified professionals.

◆ Before power on, pay attention to check whether the voltage level of the inverter is consistent with the supply voltage, otherwise it may cause casualties and equipment damage.

2-3. Main circuit wiring

2-3-1. Wiring diagram
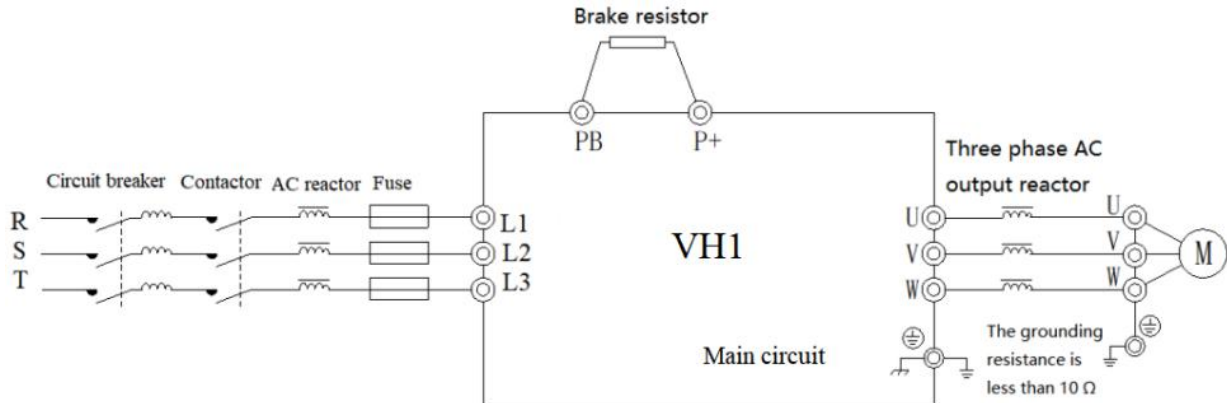
Note: circuit breaker, contactor, fuse, brake resistor and output reactor are optional parts. Please refer to chapter 6 for details.

2-3-2. Arrangement and description of main circuit terminals

● VH1-20P4-B// VH1-20P7-B// VH1-40.4G/0.7P-B// VH1-40.7G/1.5P-B// VH1-41.5G/42.2P-B main circuit terminals:

● VH1-42.2G/3.7P-B// VH1-43.7G/45.5P-B main circuit terminals:
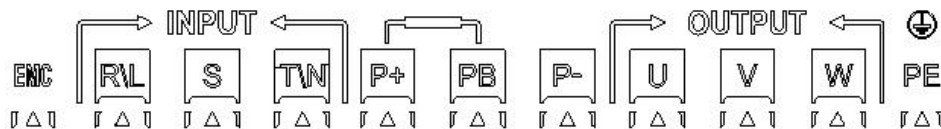
● Main circuit terminal description

Terminal	Name	Description
R, S, T/ L1, L2, L3	Three phase power supply input	AC three phase power supply input
L1, L3	Single phase power supply input	AC single phase power supply input
U, V, W	VFD output terminal	Connect to the three phase motor
PE	Grounding terminal	Connect to the ground
P+, PB	Brake resistor terminal	Connect to the brake resistor
P+, P-	DC bus +, -	Common DC bus input
EMC	EMC selective grounding screw	Connecting internal EMC filters

Note:

(1) Input power supply L1, L2, L3 or L1, L3 or R, S, T

① There is no phase sequence requirement for input side wiring of inverter.

When the inverter supplies single-phase 220V power, connect the L1 and L3 terminals. When the inverter supplies three-phase 380V power, connect L1, L2, L3 or R, S, T. The terminal locations are detailed in the main circuit terminal diagram above.

② Circuit breaker, contactor, AC reactor, fuse, brake resistor and output reactor are optional parts. Please refer to chapter 6 for details.

(2) P+, PB

① Refer to the recommended value for brake resistance selection, and the wiring distance is less than 5m, otherwise the inverter may be damaged.

(3) Output U, V, W

① Please refer to chapter 6 for output cable.

② No capacitor or surge absorber can be connected to the output side of the inverter, otherwise the inverter will be damaged.

③ When the length of motor cable is more than 100m, it is easy to produce electrical resonance due to the influence of distributed capacitance, so it is necessary to install AC output reactor near the inverter.

(4) Grounding terminal PE

① The terminal must be reliably grounded, and the grounding resistance must be less than 10Ω. Otherwise, the equipment will work abnormally or even be damaged.

② It is not allowed to share the grounding terminal PE and the power zero cable N terminal.

③ The impedance of protective grounding conductor must meet the requirement of withstanding large short-circuit current in case of fault.

④ The size of protective grounding conductor shall be selected according to the table below.

Sectional area of single phase cable (S)	Minimum sectional area of protective conductor (S_p)
$S \leq 16mm^2$	S
$16mm^2 < S \leq 35mm^2$	$16mm^2$
$35mm^2 < S$	S/2

⑤ Yellow and green cable must be used for protective grounding.

(5) P+, P-

① After the power failure, there is residual voltage between P+ and P-, all the LED indicator lights of the operation keyboard go out, and wait for more than 15 minutes before wiring operation.

② Don't connect the brake resistor directly to the bus, otherwise the inverter will be damaged or even fire.

(6) EMC

① In IT or angular power grid systems, please disconnect the EMC optional grounding screw, otherwise it may cause equipment damage or even personal injury.

② Instantaneous power on trip leakage protection, attempting to disconnect EMC screws.

③ During operation, the leakage protection was tripped. A single frequency converter confirmed that the EMC screws were tightened, and multiple frequency converters attempted to disconnect the EMC screws.

2-3-3. Wiring process of main circuit

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┌─────────────────────────────────────────────────────────────┐
│                  Wiring of the main circuit                   │
└─────────────────────────────────────────────────────────────┘
                              ↓
╱─────────────────────────────────────────────────────────────╲
│  The grounding wire of input power cable is directly connected with the
│         grounding terminal PE of frequency converter
╲─────────────────────────────────────────────────────────────╱
                              ↓
╱─────────────────────────────────────────────────────────────╲
│   Connect the three-phase input cables to R, S and T and fasten them
╲─────────────────────────────────────────────────────────────╱
                              ↓
╱─────────────────────────────────────────────────────────────╲
│    Connect the ground wire of the motor cable to the ground terminal of
│                          the inverter
╲─────────────────────────────────────────────────────────────╱
                              ↓
╱─────────────────────────────────────────────────────────────╲
│   Connect the motor three-phase cable to the U, V and W terminals and
│                          fasten them
╲─────────────────────────────────────────────────────────────╱
                              ↓
╱─────────────────────────────────────────────────────────────╲
│  Connect the brake resistor with cable and other options to the specified
│                          position
╲─────────────────────────────────────────────────────────────╱
                              ↓
╱─────────────────────────────────────────────────────────────╲
│                  Mechanically secure all cables
╲─────────────────────────────────────────────────────────────╱
                              ↓
╭─────────────────────────────────────────────────────────────╮
│  Refer to Appendix for tightening torque of inverter power input cable, output
│              cable and brake resistor terminal
╰─────────────────────────────────────────────────────────────╯
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2-4. Configuration and wiring of the control circuit

2-4-1. Control circuit terminals

(1) VH1 series inverter control terminal

| TA | TB | X4 | X5 | Y1 | AI2 | AI1 | GND | AO |

| X1 | X2 | X3 | 24V | COM | 0V | 10V | B | A |

(2) Control loop terminal description

NO.	Name	Description	Notes
1	A	RS485 communication terminal	Without isolation
2	B		
3	24V	X1-X5 bidirectional input, only support normal input, not support high-speed pulse input	24V and COM are short circuited to form NPN input, 0V and COM are short circuited to form PNP input
4	COM		
5	X1		
6	X2		
7	X3		
8	X4		
9	X5		
10	0V	Only support open collector output, not support high-speed pulse	
11	Y1		
12	TA	Relay output, contact drive capability: AC 250V, 3A; DC 30V, 1A	1 CH normal ON point
13	TB		
14	10V	10V-GND outputs 10V voltage externally AI1, AI2-GND input to inverter 0-10V AO1-GND inverter outputs 0-10V externally	AI1 supports 0-10V and 0-20mA, with switching by jump cap (the upper two pins are in current mode, and the lower two pins are in voltage mode). AI2 doesn't support current, only support voltage.
15	AI1		
16	AI2		
17	GND		
18	AO		

Note: Before the inverter is put into use, the terminal wiring and all jumper switches on the control board should be set correctly.

2-4-2. Digital I/O wiring

(1) Digital input terminal

Generally, shielded cables are required, and the wiring distance should be as short as possible, not more than 20m. When active driving mode is selected, necessary filtering measures should be taken for the crosstalk of power supply. The contact control mode is recommended, and the specific wiring diagram is as follows:

● Single inverter leakage wiring mode
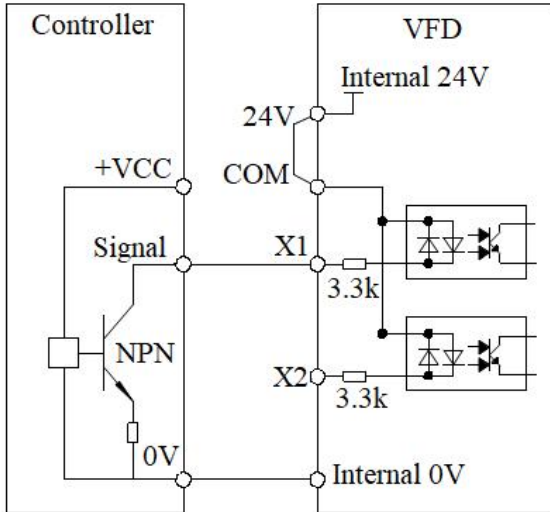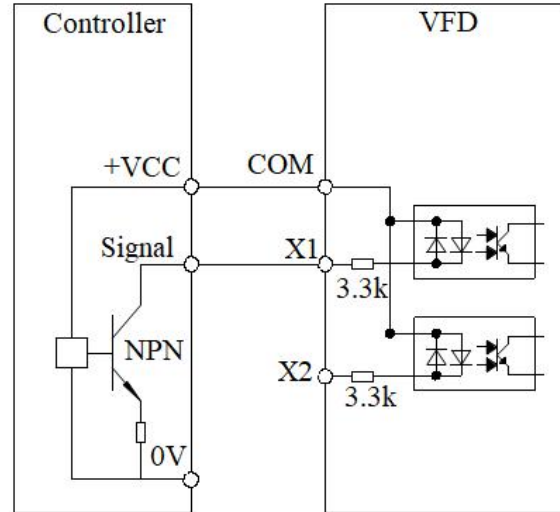
Single VFD uses expansion card 24V leakage wiring   Single VFD uses external 24V leakage wiring

The use of an internal 24V power supply from a inverter is the most common wiring method. Short circuit the COM of the inverter to 24V, connect the 0V of the inverter to the 0V of the external controller, connect the X terminal to the signal terminal of the external controller, and control the inverter through the on-off of the circuit.

If using external 24V, it is necessary to connect the COM terminal of the inverter to the external 24V, and the external power supply 0V is connected to the corresponding X terminal through the external controller control contact.

● Multi-inverter leakage wiring mode
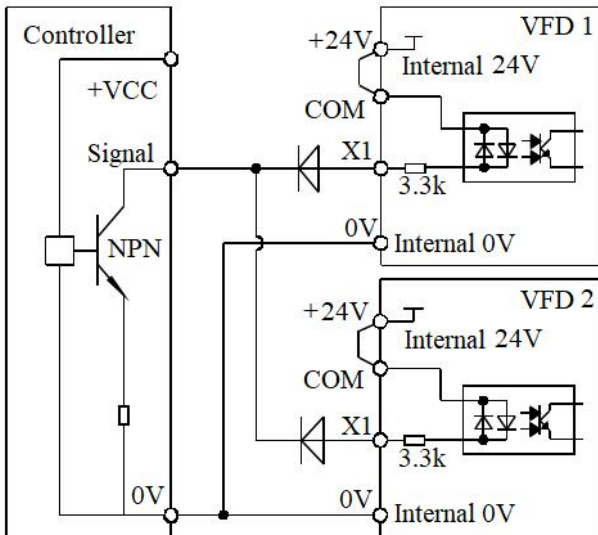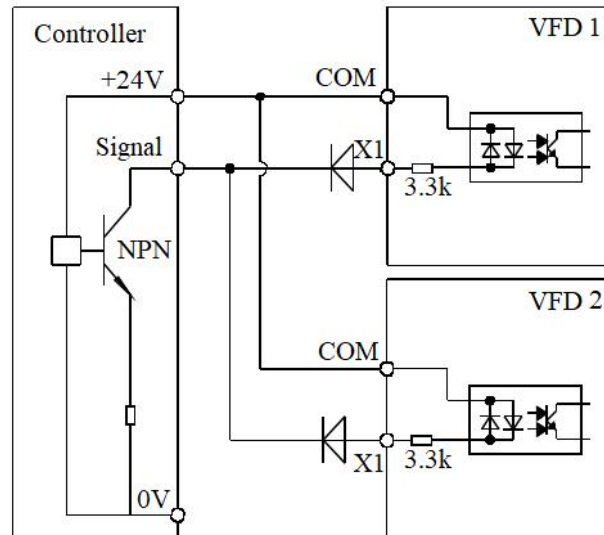
Multi VFD uses expansion card 24V leakage wiring   Multi VFD uses external 24V leakage wiring

Note: In this wiring method, the X terminals of different inverters cannot be connected in parallel, otherwise it may cause X malfunction: if X terminals need to be connected in parallel (between different inverters), a diode (anode connected to X) needs to be connected in series at the X terminal for use. The diode needs to meet the requirements of IF>40mA and VR>40V.

● Single inverter source wiring mode
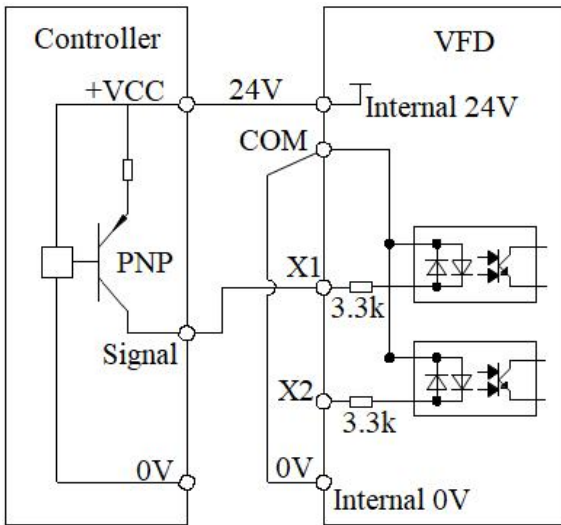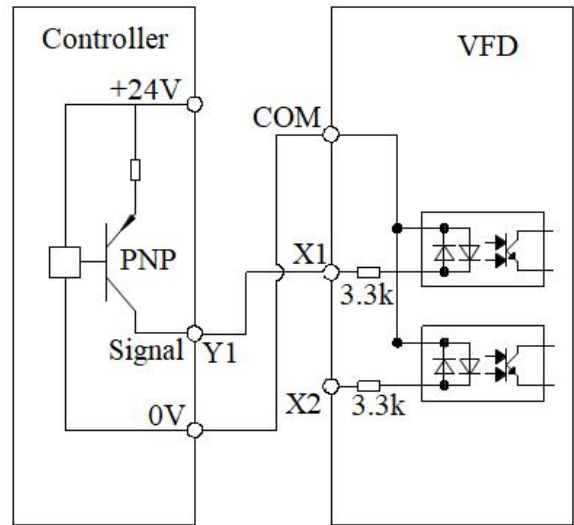
Single VFD uses expansion card 24V source wiring   Single VFD uses external 24V source wiring

If using the internal 24V power supply of the inverter, it is necessary to short circuit the 0V of the inverter to COM, connect the 24V of the inverter to the common terminal of the external controller, and connect the X terminal to the signal terminal of the external controller. The inverter is controlled through the on-off of the circuit.

If using external 24V, it is necessary to connect the COM terminal of the inverter to the external 0V, and the external 24V power supply is connected to the corresponding X terminal through the control contact of the external controller.

● Multi-inverter source wiring mode
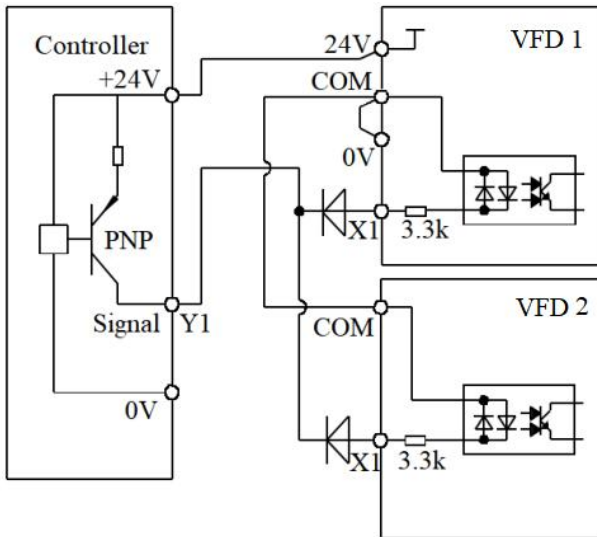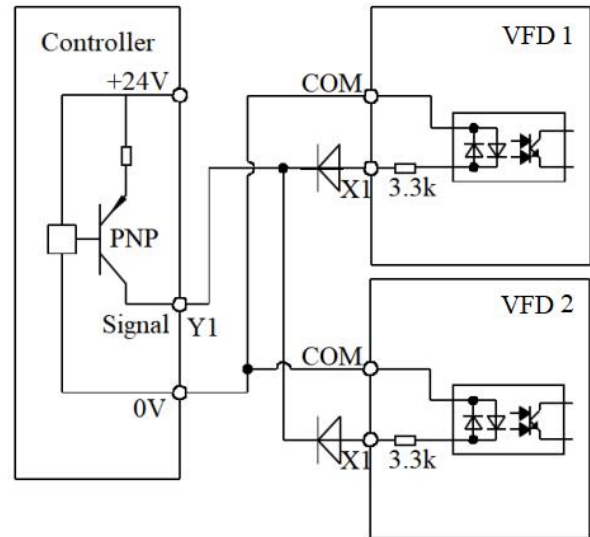
Multi VFD uses expansion card 24V source wiring   Multi VFD uses external 24V source wiring

Note: In this wiring method, the X terminals of different inverters cannot be connected in parallel, otherwise it may cause X malfunction: If X terminals need to be connected in parallel (between different inverters), a diode (anode connected to X) needs to be connected in series at the X terminal for use. The diode needs to meet the following requirements: IF>40mA, VR>40V.

(2) Digital output terminal

When the digital output terminal needs to drive a DC inductive load, a continuous current diode should be installed. Otherwise, it may cause damage to the DC 24V power supply. The driving capacity shall not exceed

50mA.

Note: It is necessary to correctly install the polarity of the freewheeling diode. As shown in the following figure. Otherwise, when the digital output terminal has output, it will immediately burn out the DC 24V power supply. The selection criteria for freewheeling diodes: the reverse withstand voltage is 5-10 times greater than the load voltage, and the current is greater than the load current.
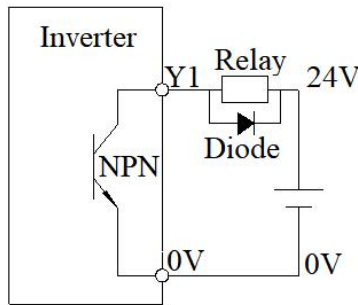
(3) Relay output terminal

Inductive loads (relays, motors, indicator lights) can cause voltage spikes when the current is cut off. Use varistors for protection at relay contacts, and install absorption circuits on inductive loads, such as varistors, RC absorption circuits, diodes, etc., to ensure minimal interference current during stop.
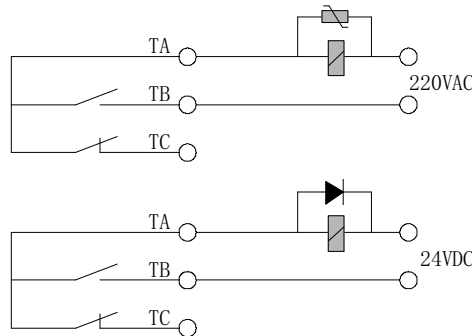
(4) Multiple inverters can be connected together through RS485 and controlled by PLC (or upper computer), as shown in the figure. With the increase of the number of connections, the communication system is more vulnerable to interference. It is suggested that the following wiring methods be adopted:
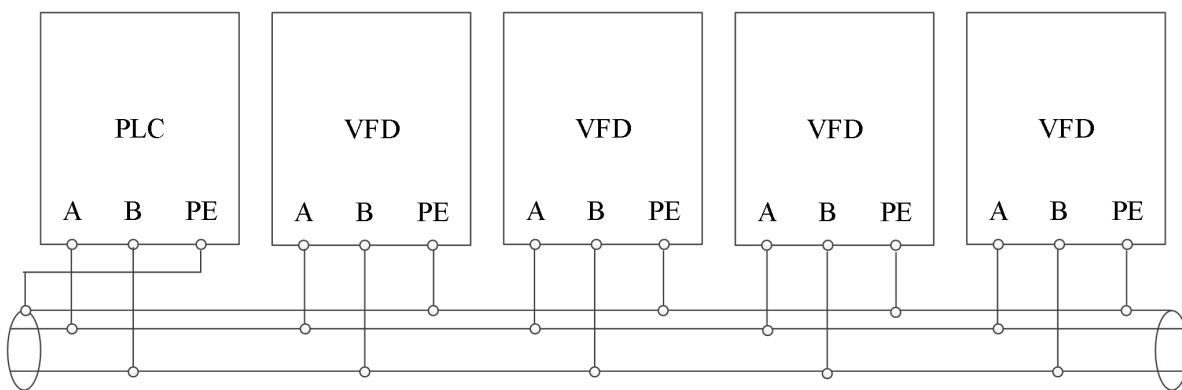
2-4-3. Analog I/O wiring

(1) Analog input terminal AI wiring

AI1/AI2 terminal receives analog signal input, AI1 selects input voltage (0-10V) or current (0-20mA) through jump cap selection, AI2 only support voltage. The specific wiring is shown in the figure below:
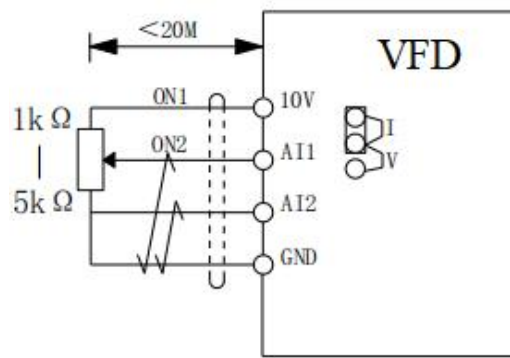
(2)   Analog output terminal AO wiring

AO1 external analog meter can indicate a variety of physical quantities, AO1 only support output voltage (0 ~ 10V, external load 2KΩ ~ 1MΩ). The terminal wiring mode is shown in the figure below.
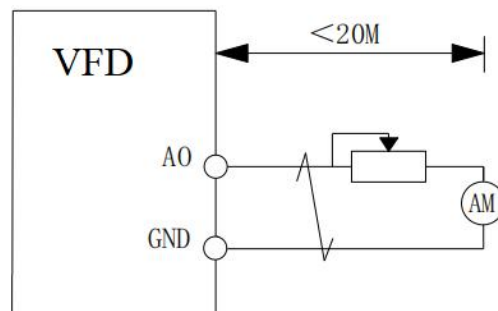
Note:

①   When using analog input, filter capacitor or common mode inductor should be installed between AI and GND.

②   The resistance ranges of the potentiometer connected between the control terminal 10V and GND is 1 ~ 5K.

③   Analog input and output signals are vulnerable to external interference. Shielded cables must be used for wiring and well grounded. The length of wiring should be as short as possible and no more than 20m.

3. Operation and application

3-1. Operation panel

3-1-1. Appearance

The operation panel and control terminal of the inverter can control the starting, speed regulating, stopping, braking, operation parameter setting and peripheral equipment of the motor. The appearance of the operation panel is shown in the figure below.
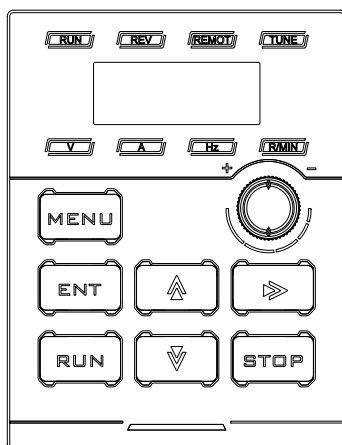
3-1-2. Keyboard

There are 8 keys on the inverter operation panel, and the functions are defined as follows:

Button	Name	Function
MENU	Programming/exit	Enter or exit the programming status
ENT	Save/switch	Save the parameter or enter next menu in programming status
RUN	Forward run	Press this button to run forward in operation panel running command mode
STOP	Stop/reset	Stop/reset the fault
⇑	Increase	Increase the value or pause frequency in operation
⇓	Decrease	Decrease the value or pause frequency in operation
⇒	Shift/monitor	In the editing status, you can choose to set the modification bit of the data; in other statuss, you can switch the display status and monitor parameters
⊙	Frequency setting	The operating frequency is timed by the panel potentiometer to adjust the frequency.

3-1-3. LED lights

There are 5-digit 7-segment LED digital tubes, 4 status indicators and 4 unit indicators on the inverter

operation panel.

The four status indicators are located above the LED tube, from left to right: RUN, REV, REMOT, TUNE. The following table describes the indicator lights.

Indicator lights	Meaning	Function
RUN	Operation indicator	ON: running OFF: stop
REV	Forward/reverse operation indicator	ON: reverse operation OFF: forward operation Flashing: status switching
REMOT	Command source indicator	OFF: panel start/stop ON: terminal start/stop Flashing: communication start/stop
TUNE	Tuning indicator	Flash slowly: tuning status Flash quickly: fault status ON: torque status

The four unit indicators are located below the LED digital tube, from left to right: V, A, Hz, R/MIN. The following table is a description of unit indicators.

Indicator lights	Meaning	Function
V	Voltage	ON: Display voltage
A	Current	ON: Display current
Hz	Frequency	OFF: Display frequency
R/MIN	Speed/%	ON: Display motor speed Flash: Display %

3-1-4. Operation method

Through the operation panel, the inverter can be operated in various ways, for example:

(1) Parameter display and switch

Method 1:

Press ⬚ key, switch LED display parameter, set running display parameter P8-07 and P8-08, set stop display parameter P8-09.

When checking status monitoring parameters, you can press ⬚ key to switch back to the default display status of monitoring parameters. The default monitoring parameter of stop status is the setting frequency, and the default monitoring parameter of operation status is output frequency.

Method 2:

Check Group U0 parameters, for example, U0-02.
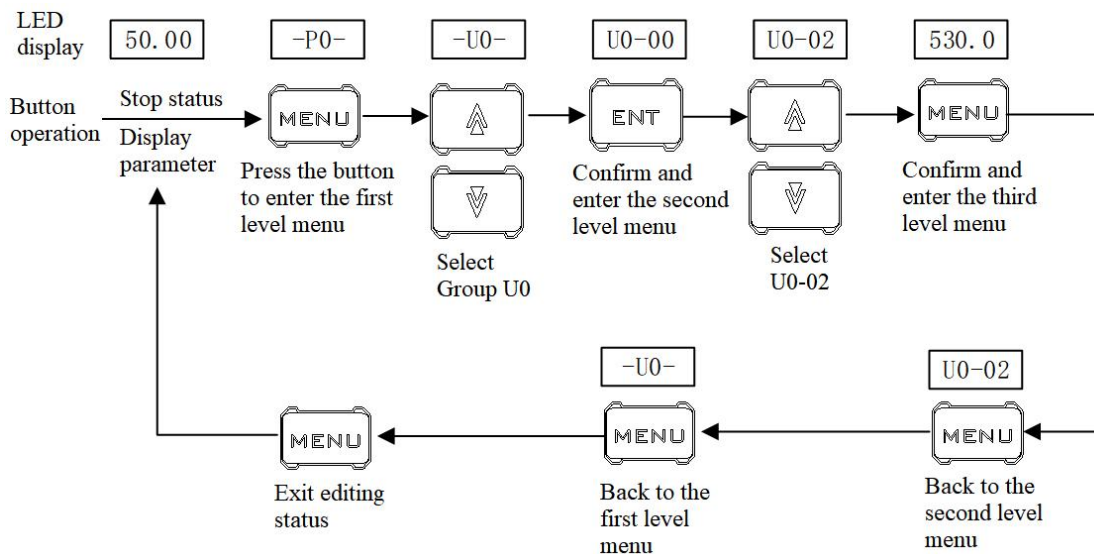
(2) Set the parameter

For example, the parameter PC-00 (jog frequency) is changed from 5.00Hz to 8.05Hz.

LED display	50.00		-P0-		-PC-		PC-00		PC-00		05.00		05.00

Button operation: Stop status / Display parameter

MENU — Enter editing status and display the first level menu

▲ — Select PC

ENT — Confirm, enter the second menu

▲ — Select PC-00

ENT — Confirm, enter the third menu

≫ — Parameter modification and perform the parameter bit selection

-PC-	PC-01	8.05	08.00	08.00

MENU — Exit editing status

MENU — Back to the first level menu

ENT — Save and back to the second menu

▲ — Modify the parameter 0→5

≫ — Parameter modification and perform the parameter bit selection

▲ — Modify the parameter 5→8

In the three-level menu, if the parameter has no flashing bit, it means that the parameter cannot be modified. The possible reasons are as follows:

① The parameters are not modifiable, such as the actual detection status parameters, operation record parameters, etc;

② This parameter can not be modified in the running status, and can be modified only after stop.

Under the second level menu, you can modify the first level menu and modify the function code group number.

For example, suppose you want to set the value of PC-00 while panel displays P4-00 , press the left key to move the cursor to the "4" position for adjustment. The specific operations are as follows:

LED display	50.00	-P0-	-P4-	P4-00	P4-00	PC-00	05.00

Button operation: Stop status / Display parameter

MENU — Confirm, enter the first level menu

▲ ▼ — Select Group P4

ENT — Enter editing status and display the second level menu

≫ — Move the cursor to '4' position

▲ ▼ — Modify the parameter 4→C

ENT — Confirm, set the parameter to 05.00
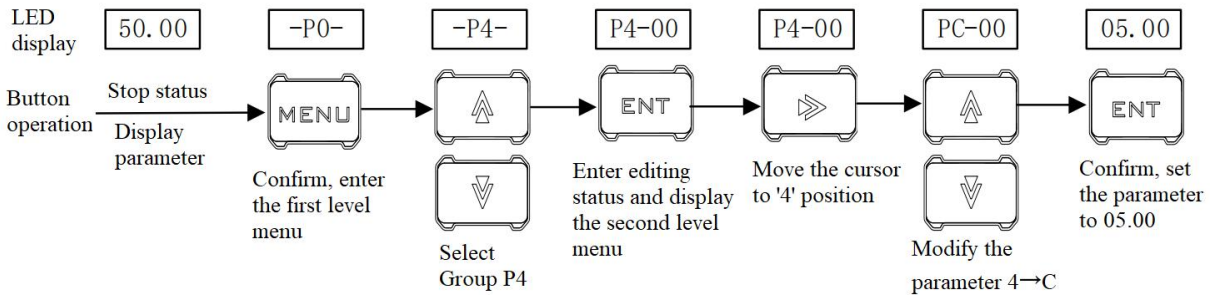
(3) Set user password

Suppose that user password P8-03 has been set to 02345. The numbers in bold in the figure below indicate the flash position.

LED display | 50.00 | 0.0.0.0.0 | 0.0.0.0.5 | 0.0.0.0.5 | 0.2.0.0.5

Button operation Stop status Display ☐ parameter

MENU

User password valid and enter user password verification status

⬆ ⬇

First, one bit flashing, increase to 5

⏩

Move the cursor to thousands bit

⬆ ⬇

Increase to 2

| 0.2.3.4.5 | 0.2.3.0.5 | 0.2.3.0.5 | 0.2.0.0.5 |

ENT

Confirm and verify, enter editing status

⬆ ⬇

Increase to 4

⏩

Move the cursor to tens bit

⬆ ⬇

Increase to 3

⏩

Move the cursor to hundreds bit

(4) Check fault status and parameters

The method of fault status query is the same as group U0 monitoring parameters.

Note:

① User pressed ⏩ in fault status to check group P7 parameters.

② When the user checks the fault parameters, user can directly switch back to the fault code display status by pressing the MENU button.

3-1-5. Quick reference of parameters

There are many function codes in VH1 series. In order to facilitate users to quickly find the function codes, the inverter provides a method to quickly find the function codes.

Users can select and customize the commonly used function codes, up to 32 of which can be customized to form a user-defined function code group. Users can determine the function parameters to be displayed through PE group.

3-2. Power on

3-2-1. Inspection after power on

Please wiring according to the operation requirements provided in "EMC" of this manual.

3-2-2. Initial power on operation

After checking the wiring and power supply, close the AC power switch on the input side of the inverter and power on the inverter. The LED on the operation panel of the inverter displays the dynamic picture of starting up, and the contactor pulls in normally. When the display character changes to the set frequency, it indicates that the inverter has been initialized. The initial power on operation process is shown in the figure below:

```
                    ┌─────────┐
                    │  Start  │
                    └────┬────┘
                         ▼
        ┌──────────────────────────────┐
   ┌───▶│   Wiring as requirements     │
   │    └──────────────┬───────────────┘
   │                   ▼
   │ No         ╱  Wiring correct?  ╲
   ├───────────◇                    ◇
   │            ╲                  ╱
   │                   │ Yes
   │                   ▼
   │ No         ╱ Input voltage normal? ╲
   └───────────◇                        ◇
                ╲                      ╱
                       │ Yes
                       ▼
            ╱ Display power on screen? ╲    No
           ◇                           ◇──────┐
            ╲                         ╱        │
                   │ Yes                       │
                   ▼                           │
            ╱ Contactor Pull-in sound? ╲   No  │
           ◇                           ◇───────┤
            ╲                         ╱        │
                   │ Yes                       │
                   ▼                           │
            ╱  Display set frequency  ╲    No  │
           ◇                          ◇────────┤
            ╲                        ╱         │
                   │ Yes                       ▼
                   ▼                  ┌────────────────┐
         ┌────────────────┐          │  Power on      │
         │   Power on     │          │  failed        │
         │   succeeded    │          └───────┬────────┘
         └────────────────┘                  ▼
                                     ┌────────────────┐
                                     │  Check the     │
                                     │  reason        │
                                     └────────────────┘
```
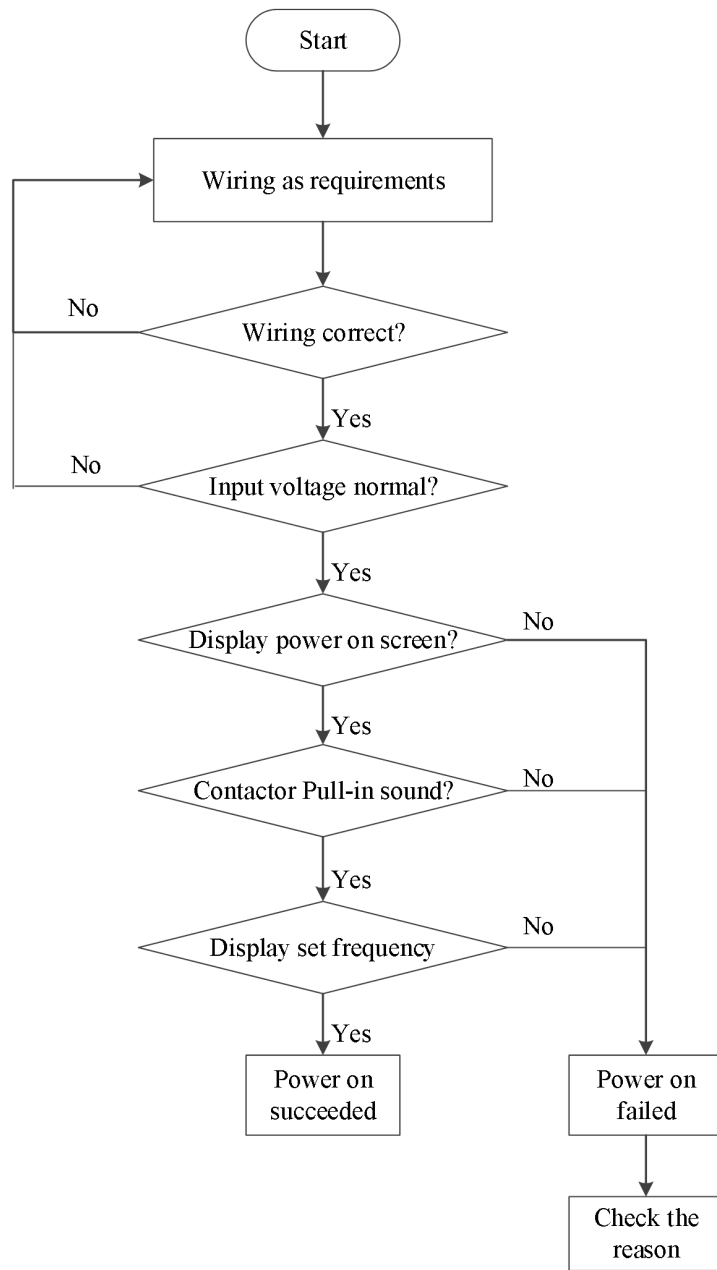
3-2-3. Start to debug
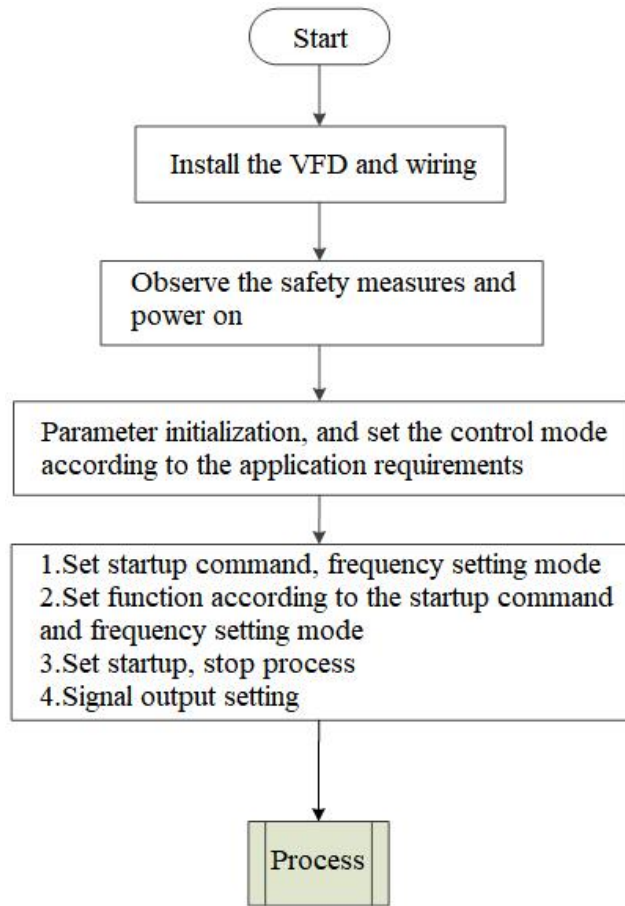
3-2-4. Debugging process
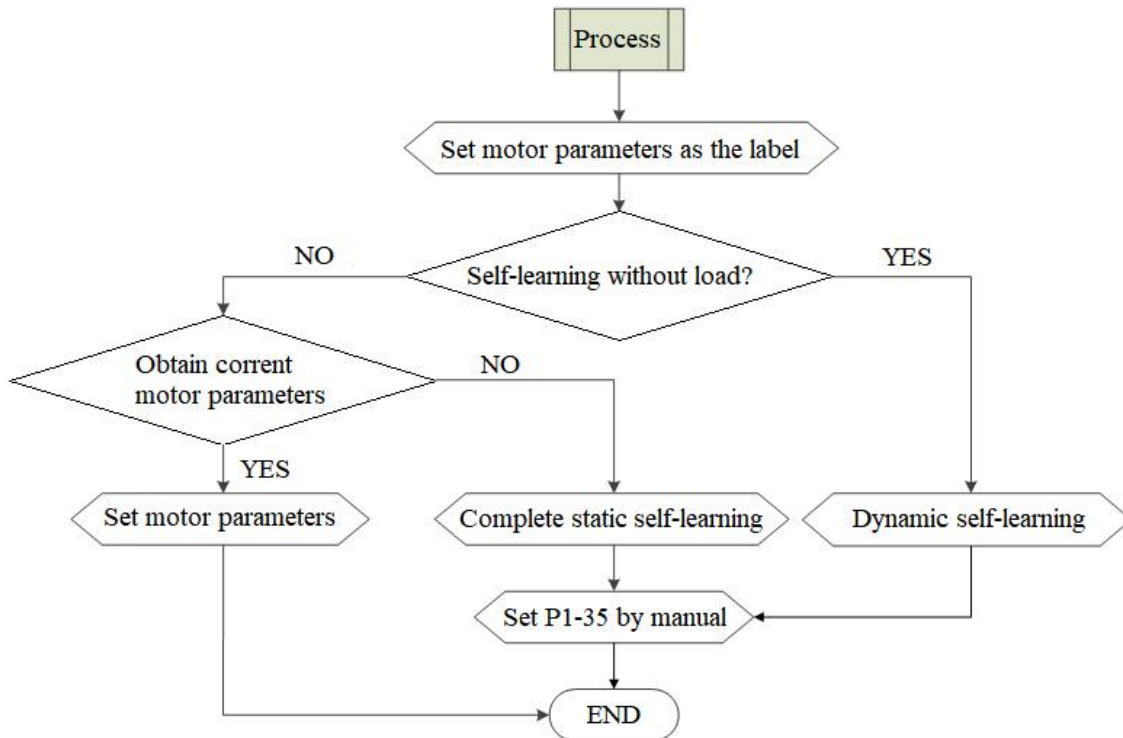
3-3. Start stop of the VFD

3-3-1. Start stop signal

There are three kinds of start stop signal sources of inverter, which are panel start stop, terminal start stop and communication start stop. They are selected by function parameter P0-02.

3-3-1-1. Panel start stop

The key on the panel is used for command control, and the run key on the keyboard is pressed to start the operation of the inverter. While the inverter is running, the stop key on the keyboard is pressed to stop the operation of the inverter.

Parameter	Name	Setting value	Note
P0-02	Operation command channel selection	0	Operation panel

3-3-1-2. Terminal start stop

VH1 inverter provides a variety of terminal control modes. The switch signal mode is determined by function code P2-10, and the input port of start stop control signal is determined by function code P2-00 ~ P2-09.

Example 1: Two-wire control, forward signal connected to X1, reverse signal connected to X2.

Parameter	Name	Setting value	Note
P0-02	Operation command channel selection	1	Terminal operation
P2-10	XI terminal command mode	0	Two-wire mode 1
P2-00	X1 function selection	1	Forward run
P2-01	X2 function selection	2	Reverse run

Example 2: Three-wire control, forward signal connected to X1, reverse signal connected to X2, stop signal connected to X3.

Parameter	Name	Setting value	Note
P0-02	Operation command channel selection	1	Terminal operation
P2-10	XI terminal command mode	2	Three-wire mode 1
P2-00	X1 function selection	1	Forward run
P2-01	X2 function selection	2	Reverse run
P2-02	X3 function selection	3	Three-wire mode run

3-3-1-3. Communication start stop

VH1 supports Modbus-RTU/ASCII mode to communicate with the host computer. The built-in communication port of inverter is Modbus-RTU/ASCII slave protocol, and the host computer must use Modbus-RTU/ASCII master protocol to communicate with it.

Example of communication parameter setting:

Parameter	Name	Setting value	Note
P0-02	Operation command channel selection	2	Communication operation
P9-00	Communication protocol selection	0	Modbus-RTU
P9-01	Local address	1	Station number 1
P9-02	Baud rate	6	19200BPS
P9-03	Data format	1	8-E-1

3-3-2. Start mode

There are three starting modes of inverter, which are direct starting, speed tracking restart and asynchronous machine pre-excitation starting. They are selected by function parameter P4-00.

3-3-2-1. Direct start

Parameter	Name	Setting value	Note
P4-00	Start mode	0	Direct start mode is applicable to most small inertia loads. The frequency curve of start-up process is shown in the following figure. The "DC braking" function before startup is applicable to the driving of elevator and heavy load; the starting frequency is applicable to the equipment which needs to impact start, such as cement mixer equipment.
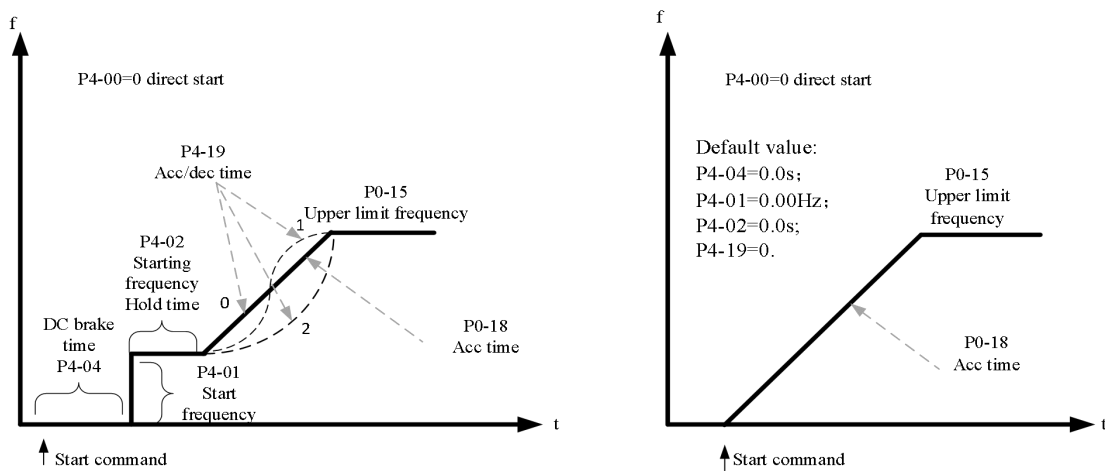
3-3-2-2. Speed tracking restart

Parameter	Name	Setting value	Note
P4-00	Start mode	1	Speed tracking restart mode is applicable to the large inertia mechanical load. The frequency curve of starting process is shown in the following figure. If the load motor is still running on inertia when the inverter is started, the speed tracking and restart can avoid the over-current.
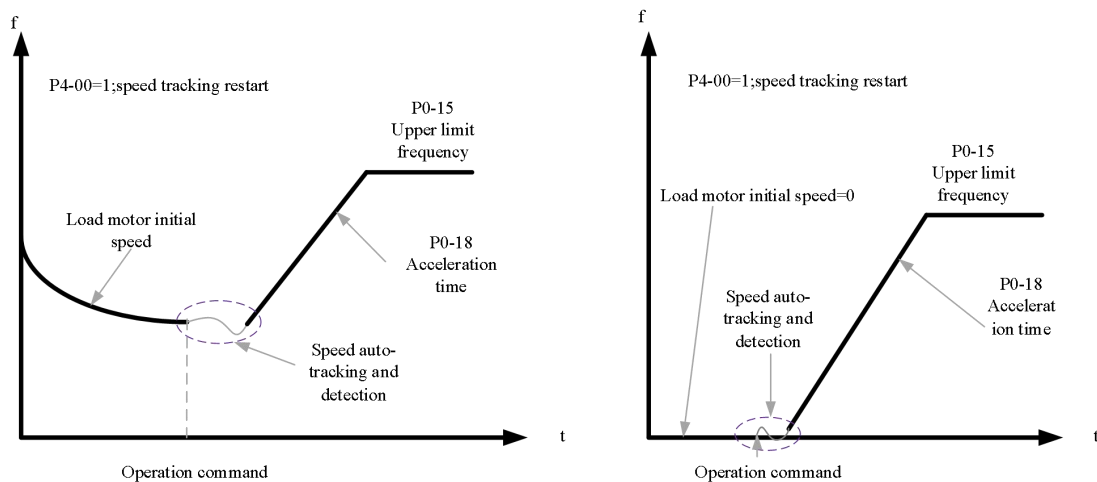
3-3-2-3. Pre-excitation start

Parameter	Name	Setting value	Note
P4-00	Start mode	2	Pre-excitation starting mode is only suitable for asynchronous motor load. Pre-excitation before starting can improve the fast response characteristics of induction motor and meet the application requirements of short acceleration time.
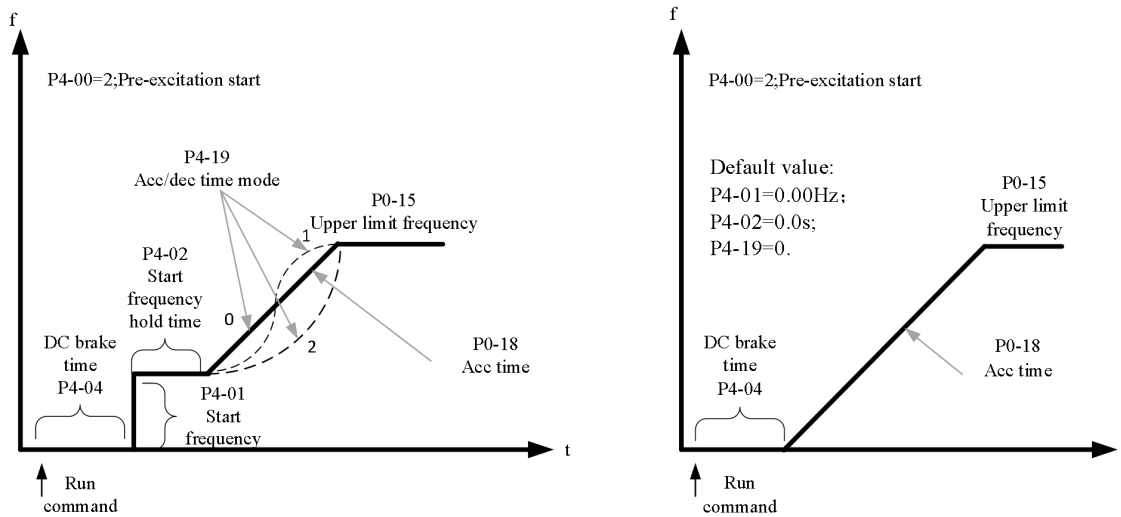
If the actual acceleration time of the motor is found to be much greater than the set acceleration time under V/F control mode, the following measures can be taken:

Frequency setting	Measure
The target frequency is less than 2 times the rated frequency	Increase the over current stall action current of P5-19 by 10% each time. If the P5-19 set value exceeds 170%, it can easily cause the inverter to alarm ERR10.
The target frequency is 3 or 4 times the rated frequency or above	During rapid acceleration, there is a high possibility of motor stall. This can be achieved by adjusting the P5-22 overcurrent stall action current compensation coefficient to a set value of 100%.

3-3-3. Stop mode

There are two stop modes of inverter, namely deceleration stop and free stop, which are selected by function code P4-22.

Parameter	Name	Setting value	Note
P4-22	Stop mode	0	The inverter stops according to the deceleration time.
		1	Free stop, inverter stop output immediately, motor stop freely by inertia.
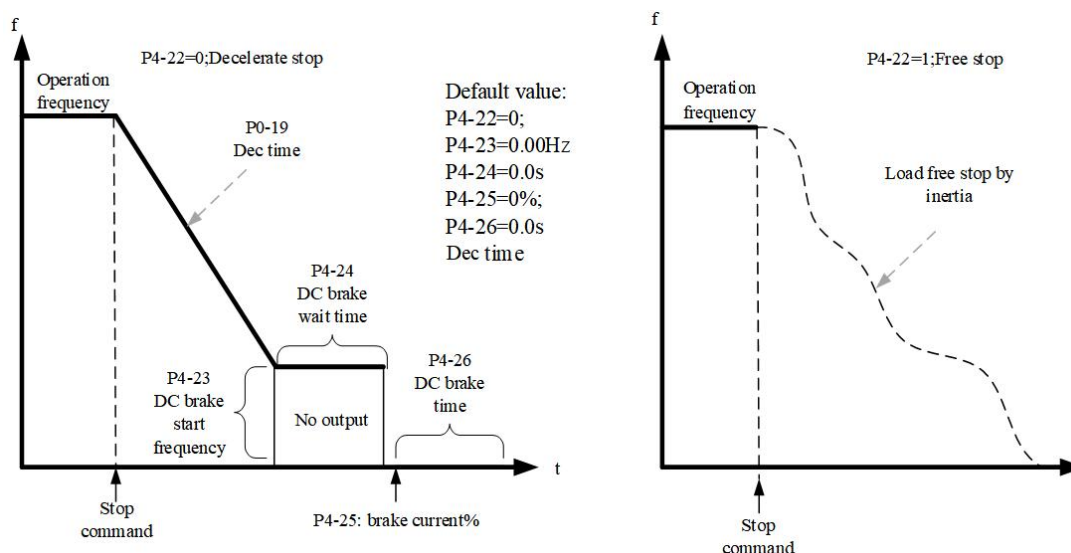
Under the VF control mode, if it is found that the actual deceleration time of the motor is much longer than the set deceleration time, the following measures can be taken:

Braking resistor / Energy feedback unit	Measures
None	The set value of P5-16 (VF over excitation gain) can be increased by ± 20 each time. After increasing the over excitation gain, if the motor oscillation overvoltage fault is caused, please reduce the set value of P5-26(Over voltage stall suppression voltage gain).
Yes (VFD input voltage is 323~437V)	Adjust P7-52 to 690V and P5-16 (Overexcitation gain) to 0.
	Using stop DC braking, the recommended setting values: P4-23 = 0.5Hz, P4-25= 50%, P4-26= 1s

Note: when using braking resistor: P5-16 (Overexcitation gain) is set to 0, otherwise it is easy to cause excessive current during operation. P5-24 (Overvoltage stall enable) is set to 0, otherwise the deceleration time may be too long.

3-4. VFD operation frequency

The inverter is equipped with two frequency setting channels, named as main frequency source A and auxiliary frequency source B, which can work in a single channel or switch at any time, or even set calculation method for combination, so as to meet the different control requirements of the application site.

Set through function code P0-05.

Parameter	Range	Note
P0-05	Ones bit (0~2)	0: main frequency source A
		1: main frequency source operation result
		2: switch between main frequency source A and auxiliary frequency source B
	Tens bit (0~3)	0: A+B
		1: A-B
		2: maximum value of A and B
		3: minimum value of A and B

3-5. Swing frequency function

The swing frequency function refers to the frequency output of the inverter, which swings up and down with the set frequency as the center. In the textile and chemical fiber processing equipment, the frequency swing function can improve the evenness of the spindle winding. The relevant parameters are as follows:

Parameter	Name	Range
A0-05	Swing frequency setting mode	0: Relative to center frequency 1: Relative to the max frequency
A0-06	Swing frequency amplitude	0.0%～100.0%
A0-07	Jump frequency amplitude	0.0%～50.0%
A0-08	Swing frequency period	0.1s～3600.0s
A0-09	Triangular rise time of swing frequency	0.1%～100.0%

The reference value of swing amplitude is determined by parameter A0-05.

0: Relative to the center frequency (P0-05 frequency source), variable swing system. The swing varies with the center frequency (set frequency).

1: Relative to the maximum frequency (P0-13) is a fixed swing amplitude system.

When the swing frequency is relative to the center frequency (A0-05 = 0), the trajectory on the time axis is shown as follows:
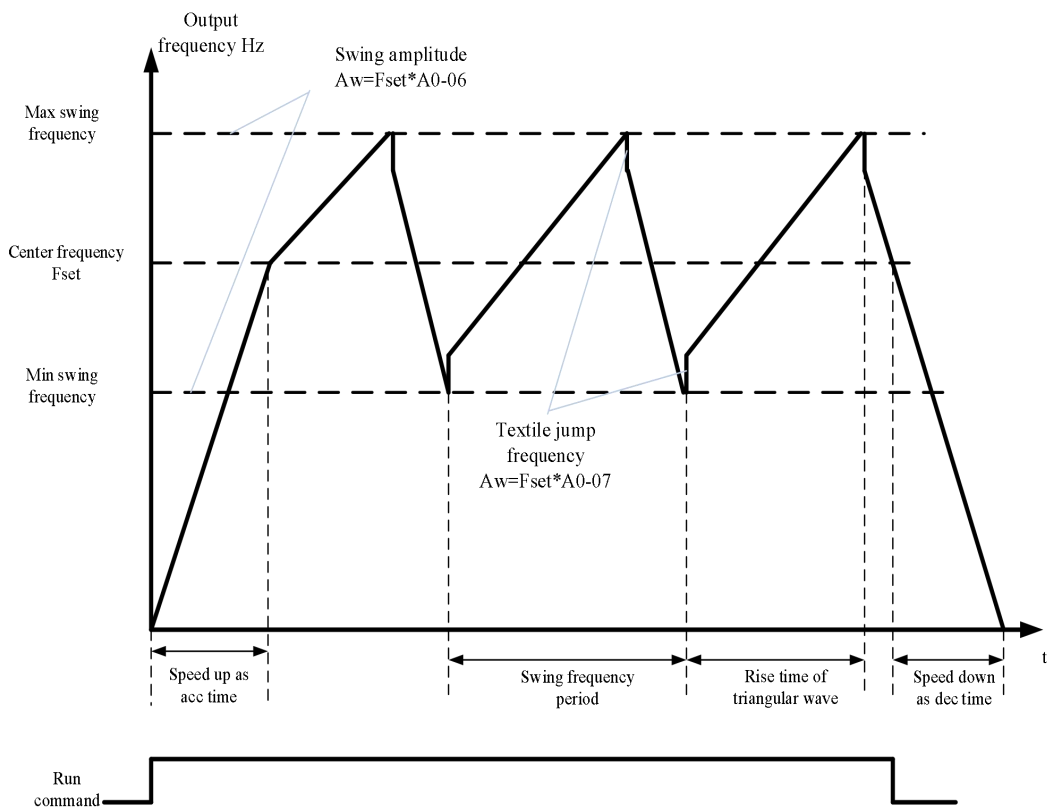
A0-06 swing amplitude AW:

When swing amplitude is relative to the center frequency (A0-05=0), AW = frequency source P0-05×A0-06; When swing amplitude is relative to the max frequency (A0-05=1), AW＝max frequency P0-13 × A0-06.

A0-08 swing frequency period: time value of a complete frequency swing period.

A0-07 Jump frequency amplitude:

The jump frequency amplitude is the percentage of the jump frequency relative to the swing amplitude when the swing frequency is running, that is, the jump frequency = swing amplitude AW × jump frequency amplitude A0-07.

If the swing is relative to the center frequency (A0-05=0), the jump frequency is the variable value. If the swing is relative to the maximum frequency (A0-05=1), the jump frequency is a fixed value. The swing operating frequency is constrained by the upper and lower limit frequencies.

A0-09 triangle wave rise time coefficient: it is the time percentage of triangle wave rise time relative to

frequency swing period A0-08.

Triangle wave rise time (s) ＝swing frequency period A0-08× triangular wave rise time coefficient A0-09;

Triangle wave fall time (s) ＝swing frequency period A0-08× (1- A0-09).

3-6. Fixed length control

Parameter	Name	Range
A0-00	Setting length	0m～65535m
A0-01	Actual length (Increment value)	0m～65535m
A0-02	Pulse per meter	0.1～6553.5

The above parameters are used for fixed length control.

In the application, it is necessary to set the corresponding input terminal function as "length counting input" (function 22). The actual length A0-01 can be calculated by dividing the number of pulses sampled by terminals and A0-02 pulse number per meter. When the actual length is greater than the set length A0-00, the multi-function digital output "length arrival" on signal. In the process of fixed length control, the length reset operation can be performed through the multi-function X terminal (function 23). The function sequence diagram is shown in the following figure:
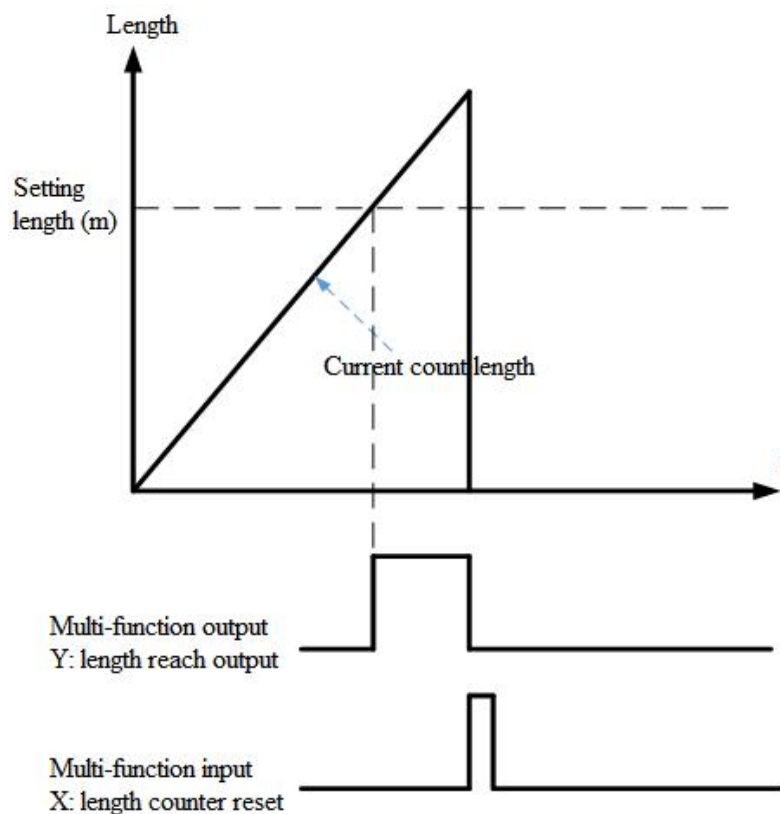
3-7. VFD counting function

Parameter	Name	Range
A0-03	Setting counting value	1～65535
A0-04	Specified counting value	1～65535

In the application, the corresponding input terminal function needs to be set as "counter input" (function 20).

When the count value reaches the specified count value A0-04, the multi-function digital Y outputs the "specified count value reaches" on signal. At this time, the counter continues to count. When the count value reaches the set count value A0-03, the multi-function digital Y outputs the "set count value reaches" on signal.

The count value can be reset through the multi-function X terminal (function 21). The function sequence diagram is as follows:
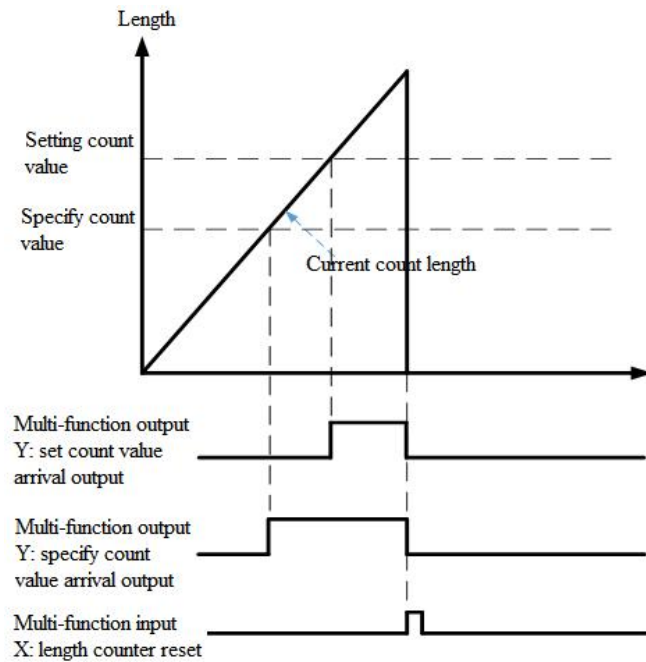
3-8. Motor parameters and tuning

3-8-1. Motor parameter setting

When the inverter operates in vector control (P0-01 = 1 or 2) mode, it is required to set correct motor parameters, which is different from VF (P0-01 = 0) mode.

Motor parameters 1	Description	Note
P1-01~P1-05	Motor rated power / voltage / current / frequency / speed	Model parameters, manual input
P1-06~P1-10	Equivalent stator resistance, inductance and rotor inductance of the motor	Tuning parameters, tuning obtained

Motor parameters 2 for multi-motor system

Motor parameters 2	Description	Note
A2-01~A2-05	Motor rated power / voltage / current / frequency / speed	Model parameters, manual input
A2-06~A2-10	Equivalent stator resistance, inductance and rotor inductance of the motor	Tuning parameters, tuning obtained

3-8-2. Motor tuning

The methods to get the internal electrical parameters of the controlled motor are: dynamic tuning, static tuning, manual input of motor parameters and so on.

Tuning mode	Suitable condition	Effect
No load dynamic tuning	It is suitable for asynchronous motor. The situation where the motor and application system are easy to separate.	Best
With load dynamic tuning	It is suitable for asynchronous motor. The situation where the motor and application system are not easy to separate	General
Static tuning 1	It is only suitable for asynchronous motor, where motor and load are difficult to separate and dynamic tuning operation is not allowed, P1-09 and P1-10	General

	are not tuned.	
Static tuning 2	It is only suitable for asynchronous motor, where motor and load are difficult to separate and dynamic tuning operation is not allowed. Compared with static tuning 1, the tuning time is relatively long and the tuning effect is good. This mode is recommended for static tuning.	Better
Manual input parameters	When it is difficult to separate the motor from the application system, copy the motor parameters of the same model that have been successfully tuned by the inverter to the corresponding function codes. Asynchronous motor: input P1-00 ~ P1-10 corresponding parameters Synchronous motor: input P1-00 ~ P1-05 and P1-15 ~ P1-20 corresponding parameters	General

The automatic tuning procedure of motor parameters is as follows:

The following is an example of parameter tuning method of default motor 1. The tuning method of motor 2 is the same as that, but the function code number should be changed accordingly.

Step 1: if the motor can be completely disconnected from the load, in case of power failure, the motor is separated from the load part mechanically, so that the motor can rotate freely without load.

Step 2: after power on, select the first motor control mode (P0-01) as open-loop vector, and then select command source of inverter (P0-02) as the operation panel.

Step 3: input the nameplate parameters of the motor accurately (for example P1-00 ~ P1-05), please input the following parameters according to the actual parameters of the motor (select according to the current motor):

Motor selection	Parameter	
Motor 1	P1-00: motor type	P1-01: motor rated power
	P1-02: motor rated voltage	P1-03: motor rated current
	P1-04: motor rated frequency	P1-05: motor rated speed
Motor 2	A2-00～A2-05: same to above definitions	

Step 4:

Parameter	Name	Note
P1-35	Self learning of motor parameters	Ones bit: 0: No operation 1: Static tuning 1 (part of parameters) 2: Dynamic tuning 3: Static tuning 2

If it is an asynchronous motor, P1-35 (tuning selection, motor 2 corresponds to A2-35) please select 2 (dynamic tuning), press ENT button to confirm, at this time, the panel displays TUNE.

Then press RUN button on the keyboard panel, the inverter will drive the motor to accelerate and decelerate, forward and reverse operation, the operation indicator will light up, and the tuning operation lasts for about 2 minutes. When the above display information disappears, it will return to the normal parameter display status, indicating that the tuning is completed.

After the dynamic tuning, the inverter will automatically calculate the following parameters of the motor:

Motor selection	Parameter
Motor 1	P1-06: Asynchronous motor stator resistance P1-07: Asynchronous motor rotor resistance P1-08: Asynchronous motor leakage inductance P1-09: Asynchronous motor interaction inductive reactance P1-10: Asynchronous motor no load current

Motor 2	A2-06~A2-10: same to above definition

If the motor cannot be completely disconnected from the load, P1-35 (motor 2 is PA-35) please select 1 (static tuning), and then press RUN button on the keyboard panel to start the tuning operation of motor parameters.

3-9. Using method of terminal X

When out of factory, P2-16 = 0000, P2-17 = 0000. When X is short circuited, the signal is valid (logic 1), when X terminal is suspended, the signal is invalid (logic 0).

The user can also change the valid mode of the X terminal, when X terminal is short circuited, the singal is invalid (logic 0), when X terminal is suspended, the signal is valid (logic 1). At this time, the corresponding bits of P2-16 and P2-17 need to be changed to 1.

The inverter also has software filtering time (P2-12) for the input signal of the X terminal, which can improve the anti-interference level.

For the X1~X3 input terminals, the port signal delay function is specially provided to facilitate some applications requiring delay processing.

The functions of the above four X terminals can be defined in P2-00 ~ P2-03, and each X can be selected from 51 functions as required. Refer to the detailed description of P2-00 ~ P2-03 for details.

As the design of hardware features, only X4 can accept high-frequency pulse signal, for the need for high-speed pulse counting applications, please arrange in X4.

3-10. Using method of terminal Y

The VH1 series inverter can use two channels outputs, which are Y1 and TA/TB. Y1 is a transistor output, which can drive 24VDC low-voltage signal circuit. And TA/TB is a relay output, which can drive 220VAC control circuit or DC24 control circuit.

By setting the value of P3-01 to P3-05, output function of each channel can be defined. It can be used to indicate various working statuss and alarms of the inverter. There are about 40 function settings in total, so that the user can realize specific automatic control requirements. Please refer to the detailed description of group P3 parameters.

3-11. Using method of terminal AI

Standard input and output supports 2 channels of AI terminal.

Terminal	Input signal
AI1-GND	Voltage 0～10V/ Current 0～20mA
AI2-GND	Voltage 0～10V

AI can be used when using external voltage and current signal to set frequency, torque, voltage of VF separated, PID or feedback. The voltage or current value corresponding to the actual given or feedback physical quantity relationship is set through P2-18 ~ P2-45.

The sampling value of AI can be read in U group function code; the converted calculation value is used for internal subsequent calculation, and users cannot read it directly.

3-12. Using method of terminal AO

Terminal	Output signal
AO1-GND	Voltage 0～10V

AO1 can be used to indicate the internal operation parameters in analog mode. The indicated parameter attributes can be modified through P3-13 before output. The modified characteristic curve Y = kX + b, where X is the operation parameter to be output, and the k and b of AO1 can be set by function codes P3-15 and P3-16.

4. Function parameters

4-1. Function code list

'○': Parameters can be modified during operation.

'×': Parameters cannot be modified during operation.

'—': Read only, user cannot change.

Group P0: Basic operation parameters

Parameter	Name	Setting range	Default value	Modify	Modbus address
		Group P0: Basic operation parameters			
P0-01	First motor control mode selection	0: VF control mode 1: No speed sensor vector control (SVC)	0	×	0001H
P0-02	Operation command channel selection	0: Operation panel 1: Terminal operation 2: Communication	0	○	0002H
P0-03	Main frequency source A channel selection	0: Digital setting (Power-off no memory) 1: Digital setting (Power-off memory) 2: AI1 3: AI2 4: Body panel potentiometer knob setting 6: Communication setting 7: Multi-segment command setting 8: PID setting 9: Simple PLC operation 10:Specific mode for wire drawing and winding 11: External panel potentiometer knob setting	0	×	0003H
P0-04	Auxiliary frequency source B channel selection	0: Digital setting (Power-off no memory) 1: Digital setting (Power-off memory) 2: AI1 3: AI2 4: Body panel potentiometer knob setting 6: Communication setting 7: Multi-segment command setting 8: PID setting 9: Simple PLC operation 10:Specific mode for wire drawing and winding (supported by **3740 and above versions**) 11:External panel potentiometer knob setting (supported by **3740 and above versions**)	0	×	0004H
P0-05	Frequency source superposition selection	Ones bit: Frequency source selection 0: Main frequency source A 1: Calculation results of main and auxiliary frequency sources	00	○	0005H

Group P0: Basic operation parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address

		2: Switching between main frequency source A and auxiliary frequency source B
		Tens bit: The operation relationship of main and auxiliary frequency sources
		   0: A+B
		   1: A-B
		   2: Max (A, B)
		   3: Min (A, B)			

P0-06	Auxiliary frequency source B range selection	0: Relative to the max output frequency 1: Relative to the main frequency source A	0	○	0006H
P0-07	Auxiliary frequency source B range	0%~150%	100%	○	0007H
P0-09	Digital setting of auxiliary frequency source offset when superposition	0.00Hz~max output frequency P0-13	0.00Hz	○	0009H
P0-10	Preset frequency	0.00Hz~max output frequency P0-13	50Hz	○	000AH
P0-11	Frequency instruction decimal point	1: 1 decimal point 2: 2 decimal point	2	×	000BH
P0-12	Frequency stop memory selection for digital setting	0: No memory 1: Memory	1	○	000CH
P0-13	Max output frequency	50.00Hz~600.00Hz	50.00Hz	×	000DH
P0-14	Upper limit frequency source	0: Set by P0-15 1: AI1 setting 2: AI2 setting 3: Body panel potentiometer knob setting 5: Communication setting	0	×	000EH
P0-15	Upper limit frequency	Lower limit frequency P0-17 ~ max output frequency P0-13	50.00Hz	○	000FH
P0-16	Upper limit frequency offset	0.00Hz ~ max output frequency (P0-13)	0.00Hz	○	0010H
P0-17	Lower limit frequency	0.00Hz ~ upper limit frequency P0-15	0.00Hz	○	0011H
P0-18	Acceleration time 1	0~65000s (PC-09=0) 0.0~6500.0s (PC-09=1) 0.00~650.00s (PC-09=2)	Model setting	○	0012H
P0-19	Deceleration time 1	0~65000s (PC-09=0) 0.0~6500.0s (PC-09=1) 0.00~650.00s (PC-09=2)	Model setting	○	0013H
P0-20	Operation direction	Ones bit: Operation direction 0: Default operation direction 1: Run in the opposite direction to the default direction Tens bit: Prohibit inversion 0: Invalid 1: Valid	00	○	0014H

Group P0: Basic operation parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P0-21	Reverse frequency prohibition	0: Invalid 1: Valid	0	○	0015H
P0-22	Dead time of forward and reverse rotation	0.0s~3600.0s	0.0s	○	0016H
P0-23	Frequency command UP/DOWN base when operation	0: Operating frequency 1: Set frequency	0	×	0017H
P0-25	Motor parameter group selection	0: Motor parameter group 1 1: Motor parameter group 2	0	×	0019H

Group P1: First motor parameters

Group P1: First motor parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P1-00	Motor type selection	0: Common asynchronous motor 1: Permanent magnet synchronous motor	0	×	0100H
P1-01	Motor rated power	0.1kW~650.0kW	Model setting	×	0101H
P1-02	Motor rated voltage	1V~1200V	Model setting	×	0102H
P1-03	Motor rated current	0.01A~655.35A (VFD power ≤55kW) 0.1A~6553.5A (VFD power >55kW)	Model setting	×	0103H
P1-04	Motor rated frequency	0.01Hz~ max output frequency	Model setting	×	0104H
P1-05	Motor rated speed	1rpm~65535rpm	Model setting	×	0105H
P1-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω (VFD power ≤55kW) 0.0001Ω~6.5535Ω (VFD power >55kW)	Tuning parameter	×	0106H
P1-07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω (VFD power ≤55kW) 0.0001Ω~6.5535Ω (VFD power >55kW)	Tuning parameter	×	0107H
P1-08	Leakage inductance of asynchronous motor	0.01mH~655.35mH (VFD power ≤55kW) 0.001mH~65.535mH (VFD power >55kW)	Tuning parameter	×	0108H
P1-09	Mutual inductance of asynchronous motor	0.01mH~655.35mH (VFD power ≤55kW) 0.001mH~65.535mH (VFD power >55kW)	Tuning parameter	×	0109H
P1-10	No load current of asynchronous motor	0.01A~P1-03 (VFD power ≤55kW) 0.1A~P1-03 (VFD power >55kW)	Tuning parameter	×	010AH
P1-35	Self learning of motor parameters	0: No operation 1: Static tuning 1 2: Dynamic tuning 3: Static tuning 2	0	×	0123H

Group P2: Input terminal function parameters

Parameter	Name	Setting range	Default value	Modify	Modbus address
		Group P2: Input terminal function parameters			
P2-00	Input terminal X1 function selection	0: No function 1: FWD or RUN command	01	×	0200H
P2-01	Input terminal X2 function selection	2: REV or FWD/REV operation direction (Note: when it is set to 1 or 2, it should be used with P2-10. See the parameter for details)	02	×	0201H
P2-02	Input terminal X3 function selection	3: Three wire mode operation control	10	×	0202H
P2-03	Input terminal X4 function selection	4: Forward jog (FJOG) 5: Reverse jog (RJOG)	00	×	0203H
P2-04	Input terminal X5 function selection	6: Terminal UP 7: Terminal DOWN 8: UP/DOWN setting clear 9: Free stop 10: Fault reset 11: Frequency source switching 12: Multi-segment command terminal 1 13: Multi-segment command terminal 2 14: Multi-segment command terminal 3 15: Multi-segment command terminal 4 16: Acc/Dec time selection terminal 1 17: Acc/Dec time selection terminal 2 18: Acc/Dec prohibit 20: Counter input 21: Counter reset 22: Length counter input 23: Length counter reset 24: Swing frequency pause 25: Operation pause 26: PLC status reset 27: Run command switch to keyboard 28: Run command switch to communication 29: Torque control prohibited 30: Switch between speed control and torque control 32: PID pause 33: PID reverse direction of action 34: PID integral pause 35: PID parameter switching 36: External fault normally open input 37: External fault normally close input 38: User-defined fault 1 39: User-defined fault 2 40: Motor parameter selection 41: Switch between main frequency source A and preset frequency 42: Switch between auxiliary frequency	00	×	0204H

Parameter	Name	Setting range	Default value	Modify	Modbus address
		source B and preset frequency 43: Frequency setting valid terminal 44: DC braking 45: Deceleration DC braking 46: Emergency stop 47: External stop terminal 1(only valid for panel control) 48: External stop terminal 2(according to deceleration time 4) 49: Prohibit inversion 50: The running time is cleared 51: Two wire / three wire switching			
P2-10	XI terminal command mode	0: Two wire mode 1 1: Two wire mode 2 2: Three wire mode 1 3: Three wire mode 2	0	×	020AH
P2-11	XI terminal UP/DOWN changing rate	0.001Hz/s~50.000Hz/s	1.000Hz/s	○	020BH
P2-12	XI terminal filtering time	0.000s~1.000s	0.010s	○	020CH
P2-13	X1 delay time	0.0s~3600.0s	0.0s	×	020DH
P2-14	X2 delay time	0.0s~3600.0s	0.0s	×	020EH
P2-15	X3 delay time	0.0s~3600.0s	0.0s	×	020FH
P2-16	XI terminal valid status selection 1	0: Low level valid 1: High level valid Ones bit: X1 Tens bit: X2 Hundreds bit: X3 Thousands bit: X4 Ten thousands bit: X5	00000	×	0210H
P2-18	AI curve 1 min setting	0.00V~P2-20	0.00V	○	0212H
P2-19	AI curve 1 min setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	0213H
P2-20	AI curve 1 max setting	P2-18~+10.00V	10.00V	○	0214H
P2-21	AI curve 1 max setting corresponding frequency percent	-100.0%~+100.0%	100.0%	○	0215H
P2-22	AI curve 2 min setting	0.00V~P2-24	0.00V	○	0216H
P2-23	AI curve 2 min setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	0217H
P2-24	AI curve 2 max setting	P2-22~+10.00V	10.00V	○	0218H
P2-25	AI curve 2 max setting corresponding frequency	-100.0%~+100.0%	100.0%	○	0219H

Group P2: Input terminal function parameters

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
	percentage				
P2-26	AI curve 3 min setting	0.00V~P2-28	0V	○	021AH
P2-27	AI curve 3 min setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	021BH
P2-28	AI curve 3 max setting	P2-26~+10.00V	10.00V	○	021CH
P2-29	AI curve 3 max setting corresponding frequency percentage	-100.0%~+100.0%	100.0%	○	021DH
P2-30	AI curve 4 min setting	0.00V~P2-32	0.00V	○	021EH
P2-31	AI curve 4 min setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	021FH
P2-32	AI curve 4 inflection point 1 setting	P2-30~P2-34	3.00V	○	0220H
P2-33	AI curve 4 inflection point 1 setting corresponding frequency percentage	-100.0%~+100.0%	100.0%	○	0221H
P2-34	AI curve 4 inflection point 2 setting	P2-32V~P2-36	6.00V	○	0222H
P2-35	AI curve 4 inflection point 2 setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	0223H
P2-36	AI curve 4 max setting	P2-34~+10.00V	10.00V	○	0224H
P2-37	AI curve 4 max setting corresponding frequency percentage	-100.0%~+100.0%	100.0%	○	0225H
P2-38	AI curve 5 min setting	-10.00V~P2-40	-10V	○	0226H
P2-39	AI curve 5 min setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	0227H
P2-40	AI curve 5 inflection point 1 setting	P2-38~P2-42	-3.00V	○	0228H
P2-41	AI curve 5 inflection point 1 setting corresponding frequency percentage	-100.0%~+100.0%	100.0%	○	0229H
P2-42	AI curve 5 inflection point 2 setting	P2-40~P2-44	3.00V	○	022AH
P2-43	AI curve 5 inflection point 2 setting corresponding frequency percentage	-100.0%~+100.0%	0.0%	○	022BH
P2-44	AI curve 5 max setting	P2-42~+10.00V	10.00V	○	022CH
P2-45	AI curve 5 max setting	-100.0%~+100.0%	100.0%	○	022DH

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
	corresponding frequency percentage				
P2-54	AI curve selection	Ones bit: AI1 curve selection 1: Curve 1 (2 points, see P2-18 ~ P2-21) 2: Curve 2 (2 points, see P2-22 ~ P2-25) 3: Curve 3 (2 points, see P2-26 ~ P2-29) 4: Curve 4 (4 points, see P2-30 ~ P2-37) 5: Curve 5 (4 points, see P2-38 ~ P2-45) Tens bit: AI2 curve selection, ditto	321	○	0236H
P2-55	AI below minimum input setting selection	Ones bit: AI1 below minimum input setting selection 0: Corresponding minimum input setting 1: 0.0% Tens bit: AI2 below minimum input setting selection	000	○	0237H
P2-56	AI1 filter time constant	0.00s~10.00s	0.10s	○	0238H
P2-57	AI2 filter time constant	0.00s~10.00s	0.10s	○	0239H
P2-59	AI mode switch	Ones bit: AI1 0: Voltage 1: Current	000	○	023BH
P2-60	AI1 jump point	-100.0% ~ +100.0%	0.0%	○	023CH
P2-61	AI1 jump range	0.0% ~ 100.0%	0.5%	○	023DH
P2-62	AI2 jump point	-100.0% ~ +100.0%	0.0%	○	023EH
P2-63	AI2 jump range	0.0% ~ 100.0%	0.5%	○	023FH

Group P3: Output terminal function parameters

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P3-00	Y1 output mode	0: Common terminal output	0	○	0300H
P3-01	Y1 output function selection	0: No output	01	○	0301H
P3-04	Relay 1 output function selection	1: Inverter in operation 2: Fault output (stop fault) 3: Frequency level detection FDT1 output 4: Frequency level detection FDT2 output 5: Frequency arrival 6: Zero speed operation (no output when stop) 7: Zero speed operation 2 (output when stop) 8: Upper limit frequency arrival 9:Lower limit frequency arrival (no output when stop) 10: Motor overload alarm 11: Inverter overload alarm	02	○	0304H

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
		12: Communication setting 13: In torque limit 15: Frequency 1 arrival output 16: Frequency 2 arrival output 17: Current 1 arrival output 18: Current 2 arrival output 19: Set counting value arrival 20: Specified counting value arrival 21: Ready for operation 23: AI1 input overrange 24: Under voltage status output 25: Cumulative power on time arrival 26: Timing arrival output 27: Length arrival output 28: Simple PLC cycle completed 29: Cumulative running time arrival 32: Lower limit frequency arrival (output when stop) 33: Fault output (stop fault and no output under voltage) 34: Module temperature arrival 35: Fault output (output only after fault stop) 37: In reverse operation 39: Output current overrange 40: Zero current status 41: Current operation time arrival 42: Bus voltage arrival			
P3-06	Y1 output delay time	0.0s~3600.0s	0.0s	○	0306H
P3-09	Relay 1 output delay time	0.0s~3600.0s	0.0s	○	0309H
P3-11	Y terminal valid status selection	0: Positive logic 1: Negative logic Ones bit: Y1 Thousands bit: Relay 1	00000	○	030BH
P3-13	AO1 output selection	0: Operating frequency 1: Set frequency 2: Output current 3: Motor output torque (absolute value, percentage relative to motor) 4: Output power 5: Output voltage 6: AI1 7: AI2 10: Output speed 11: Communication control output 12: Count value 13: Length	00	○	030DH

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P3-15	AO1 zero bias coefficient	-100.0% ~ +100.0%	0.0%	○	030FH
P3-16	AO1 gain	-10.00 ~ +10.00	1.00	○	0310H

Group P4: Start stop mode

Group P4: Start stop mode					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P4-00	Start mode	0: Direct start 1: Speed tracking restart 2: Pre-excitation start (AC asynchronous motor)	0	○	0400H
P4-01	Starting frequency	0.00Hz~10.00Hz	0.00Hz	○	0401H
P4-02	Start frequency duration	0.0s~100.0s	0.0s	×	0402H
P4-03	Starting DC brake current/ pre-excitation current percentage	20%~100%	20%	×	0403H
P4-04	DC braking time during startup/ pre-excitation time	0.0s~100.0s	0.0s	×	0404H
P4-05	Start protection selection	0: No protection 1: Protection	0	×	0405H
P4-06	Speed tracking mode	0: Start from stop frequency 1: Start from power frequency 2: Start from maximum output frequency	0	×	0406H
P4-07	Speed tracking speed	1~100	20	○	0407H
P4-10	Speed tracking closed loop current	30%~200%	Model confirmed	×	040AH
P4-19	Acceleration and deceleration mode	0: Linear acceleration and deceleration 1: Continuous S-curve acceleration and deceleration 2: Intermittent S-curve acceleration and deceleration	0	×	0413H
P4-20	S curve start segment proportion	0.0% ~ (100.0% - P4-21)	30.0%	×	0414H
P4-21	S curve end segment proportion	0.0% ~ (100.0% - P4-20)	30.0%	×	0415H
P4-22	Stop mode	0: Deceleration stop 1: Free stop	0	○	0416H
P4-23	Starting frequency of DC braking during stop	0.00Hz~P0-13	0.00Hz	○	0417H
P4-24	DC braking waiting time during stop	0.0s~100.0s	0.0s	○	0418H
P4-25	Percentage of DC braking current during stop	0%~100%	0%	○	0419H
P4-26	DC braking time during stop	0.0s~100.0s	0.0s	○	041AH

Group P5: VF parameters

Parameter	Name	Setting range	Default value	Modify	Modbus address
		Group P5: VF parameters			
P5-00	VF curve setting	0: Linear VF 1: Multipoint VF 2: Square VF 3: The 1.2nd power VF 4: The 1.4th power VF 6: The 1.6th power VF 8: The 1.8th power VF 10: VF complete separation mode 11: VF half separation mode	00	×	0500H
P5-01	Multipoint VF frequency point F1	0.00Hz~P5-03	0.00Hz	×	0501H
P5-02	Multipoint VF voltage point V1	0.0~100.0%	0.0%	×	0502H
P5-03	Multipoint VF frequency point F2	P5-01~P5-05	0.00Hz	×	0503H
P5-04	Multipoint VF voltage point V2	0.0~100.0%	0.0%	×	0504H
P5-05	Multipoint VF frequency point F3	P5-05~P1-04 (motor rated frequency)	0.00Hz	×	0505H
P5-06	Multipoint VF voltage point V3	0.0~100.0%	0.0%	×	0506H
P5-07	Torque boost	0.0% (automatical torque boost) 0.1%~30.0%	Model setting	○	0507H
P5-08	Torque boost cut-off frequency	0.00Hz~P0-13	50.00Hz	×	0508H
P5-09	The voltage source of VF separation	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Multi-speed command 7: PID setting 8: Simple PLC operation	0	○	0509H
P5-10	Voltage source digital setting of VF separation	0 ~ motor rated voltage	0V	○	050AH
P5-11	Voltage acceleration time of VF separation	0.0s~1000.0s	0.0s	○	050BH
P5-12	Voltage deceleration time of VF separation	0.0s~1000.0s	0.0s	○	050CH
P5-13	VF separated stop mode selection	0: The frequency voltage reduced to 0 independently 1: When the voltage decreases to 0, the frequency begins to decrease	0	○	050DH
P5-14	VF slip compensation gain	0.0%~200.0%	0.0%	○	050EH
P5-15	Slip compensation time constant	0.1~10.0s	0.1s	○	050FH
P5-16	VF over excitation gain	0~200	64	○	0510H
P5-17	VF oscillation suppression gain	0~100	Model setting	○	0511H

Group P5: VF parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P5-18	VF oscillation suppression mode selection	0~4	3	×	0512H
P5-19	VF over current stall action current	50~200%	150%	×	0513H
P5-20	VF over current stall suppression enable	0: Invalid 1: Valid	1	×	0514H
P5-21	VF over current stall suppression gain	0~100	10	○	0515H
P5-22	VF over current stall action current compensation coefficient	50%~200%	50	×	0516H
P5-23	VF over voltage stall action voltage	200.0V~2000.0V	Model setting	×	0517H
P5-24	VF over voltage stall suppression enable	0: Invalid 1: Valid	1	×	0518H
P5-25	WF over voltage stall suppression frequency gain	0~100	30	○	0519H
P5-26	VF over voltage stall suppression voltage gain	0~100	30	○	051AH
P5-27	VF over voltage stall maximum rise frequency limit	0~50Hz	5Hz	×	051BH
P5-34	PID stop reference voltage (3742 and above versions support)	0.0~1000.0V	780V	○	0522H
P5-35	PID stop proportional gain (3742 and above versions support)	0~65535	500	○	0523H
P5-36	PID stop integral gain (3742 and above versions support)	0~65535	200	○	0524H
P5-37	PID stop differential gain (3742 and above versions support)	0~65535	100	○	0525H
P5-38	Parabolic stop reference time (3742 and above versions support)	0.0~4200.0s	20.0s	○	0526H
P5-39	Stop deceleration method selection (3742 and above versions support)	0: Linear deceleration stop 1: Parabola deceleration stop 2: PID deceleration stop	0	○	0527H

Group P6: Vector control parameters

Group P6: Vector control parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P6-00	Speed loop proportional gain 1	1~100	20	○	0600H
P6-01	Speed loop integral time 1	0.01s~10.00s	0.50s	○	0601H
P6-02	Speed loop proportional gain 2	1~100	6	○	0602H
P6-03	Speed loop integral time 2	0.01s~10.00s	1.00s	○	0603H
P6-04	Switching frequency 1	0.00~P6-05	5.00Hz	○	0604H
P6-05	Switching frequency 2	P6-04~ P0-13	10.00Hz	○	0605H

Group P6: Vector control parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P6-06	Speed loop integral attribute	Ones bit: integral separation 0: Invalid 1: Valid	0	○	0606H
P6-07	Vector slip compensation gain	50%~200%	Model setting	○	0607H
P6-08	SVC speed feedback filter time	0 ~ 50s	50s	○	0608H
P6-10	Speed control (drive) torque upper limit source	0: Set by P6-11 1: AI1 2: AI2 4: PULSE setting 5: Communication setting 6: Min(AI1,AI2) 7: Max(AI1,AI2)	0	○	060AH
P6-11	Speed control (drive) torque upper limit digital setting	0.0%~200.0%	150.0%	○	060BH
P6-14	Excitation regulation proportional gain	0 ~ 60000	2000	○	060EH
P6-15	Excitation regulation integral gain	0 ~ 60000	1300	○	060FH
P6-16	Torque regulation proporti onal gain	0 ~ 60000	2000	○	0610H
P6-17	Torque regulation integral gain	0 ~ 60000	1300	○	0611H

Group P7: Fault parameters

Group P7: Fault parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P7-00	Third (last) time fault type	0: No fault	-	-	-
P7-01	Second time fault type	1: Acceleration over current	-	-	-
P7-02	First time fault type	2: Deceleration over current 3: Constant speed over current 4: Acceleration over voltage 5: Deceleration over voltage 6: Constant speed over voltage 7: Buffer resistance overload fault 8: Under voltage fault 9: Inverter overload 10: Motor overload 11: Input phase loss 13: Radiator overheating 14: Contactor fault 16: Motor tuning fault 18: Short circuit fault of motor to ground 19: Load drop	-	-	-

Group P7: Fault parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
		20: Wave by wave current limiting fault 21: Magnetic pole position detection failed 23: Brake resistance short circuit 26: SVC stall fault 43: External fault 44: Communication fault 45: EEPROM read / write fault 46: Operation time arrival 47: Power on time arrival 48: User defined fault 1 49: User defined fault 2 50: PID feedback loss during operation 51: Switch motor during operation 52: Speed feedback deviation too large 53: Motor over speed 54: Motor over temperature fault 56: Power on lock time arrival			
P7-03	Third (last) time fault frequency	-	-	-	-
P7-04	Third (last) time fault current	-	-	-	-
P7-05	Third (last) time fault bus voltage	-	-	-	-
P7-06	Third (last) time fault input terminal status	-	-	-	-
P7-07	Third (last) time fault output terminal status	-	-	-	-
P7-08	Third (last) time fault VFD status	-	-	-	-
P7-09	Third (last) time fault power on time	Unit: minute	-	-	-
P7-10	Third (last) time fault operation time	Unit: minute	-	-	-
P7-11	Location information of the third (last) time fault	-	-	-	-
P7-13	Second time fault frequency	-	-	-	-
P7-14	Second time fault current	-	-	-	-
P7-15	Second time fault bus voltage	-	-	-	-
P7-16	Second time fault input terminal status	-	-	-	-
P7-17	Second time fault output terminal status	-	-	-	-
P7-18	Second time fault VFD status	-	-	-	-
P7-19	Second time fault power on time	Unit: minute	-	-	-
P7-20	Second time fault operation time	Unit: minute	-	-	-

		Group P7: Fault parameters				
Parameter	Name	Setting range	Default value	Modify	Modbus address
P7-21	Location information of the second time fault	-	-	-	-
P7-23	First time fault frequency	-	-	-	-
P7-24	First time fault current	-	-	-	-
P7-25	First time fault bus voltage	-	-	-	-
P7-26	First time fault input terminal status	-	-	-	-
P7-27	First time fault output terminal status	-	-	-	-
P7-28	First time fault VFD status	-	-	-	-
P7-29	First time fault power on time	Unit: minute	-	-	-
P7-30	First time fault operation time	Unit: minute	-	-	-
P7-31	Location information of the first time fault	-	-	-	-
P7-33	Motor overload protection mode selection	0: Forbid 1: Allow	1	○	0721H
P7-34	Motor overload protection gain	0.20~10.00	1.00	○	0722H
P7-35	Motor overload warning coefficient	50%~100%	80%	○	0723H
P7-39	Input phase lossing/contactor closing protection selection	Ones bit: Input phase lossing protection Tens bit: Contactor closing protection 0: Forbid 1: Allow	11	○	0727H
P7-40	Output phase lossing protection selection	0: Forbid 1: Allow	1	○	0728H
P7-41	Power on ground short circuit protection function	0: Invalid 1: Valid	1	○	0729H
P7-42	Action selection of fault relay during automatic fault reset	0: No action 1: Action	0	○	072AH
P7-43	Interval time of fault automatic reset	0.1s~60.0s	1.0s	○	072BH
P7-44	Fault automatic reset times	0~20	0	○	072CH

P7-45	Protection action selection 1 when fault	Ones bit: Motor overload (Err 10)
		  0: Free stop
		  1: Stop as stop mode
		Tens bit: Input phase loss (Err11)
		  0: Free stop
		  1: Stop as stop mode
		Hundreds bit: Output phase loss (Err12)
		  0: Free stop
		  1: Stop as stop mode
		Thousands bit: Output load drop (Err19)
		  0: Free stop
		  1: Stop as stop mode
			00000	○	072DH

Group P7: Fault parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address

		Ten thousand bit: Pole position detection failed (Err21)
		  0: Free stop
		  1: Stop as stop mode			

P7-46	Protection action selection 2 when fault	Ones bit: External fault 1 (Err43)
		  0: Free stop
		  1: Stop as stop mode
		Tens bit: Communication fault (Err44)
		  0: Free stop
		  1: Stop as stop mode
		Hundreds bit: EEPROM read/write fault (Err45)
		  0: Free stop
		  1: Stop as stop mode
		Thousands bit: Operation time arrival (Err46)
		  0: Free stop
		  1: Stop as stop mode
		Ten thousand bit: Power on time arrival (Err47)
		  0: Free stop
		  1: Stop as stop mode
			00000	○	072EH

P7-47	Protection action selection 3 when fault	Ones bit: User defined fault 1 (Err48)
		  0: Free stop
		  1: Stop as stop mode
		Tens bit: User defined fault 2 (Err49)
		  0: Free stop
		  1: Stop as stop mode
		Hundreds bit: PID feedback loss during operation (Err50)
		  0: Free stop
		  1: Stop as stop mode
		Thousands bit: Speed deviation too large (Err52)
		  0: Free stop
		  1: Stop as stop mode
		Ten thousand bit: Motor over speed (Err53)
		  0: Free stop
		  1: Stop as stop mode
			00000	○	072FH

P7-48	Protection action selection 4 when fault	Ones bit: Motor over temperature (Err54)	00	○	0730H

Group P7: Fault parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
		0: Free stop 1: Stop as stop mode			
P7-52	Brake starting voltage	200.0V ~ 2000.0V	Model setting	○	0734H
P7-53	Brake utilization rate	0 ~ 100%	100%	○	0735H
P7-55	Over voltage stall gain	0 ~ 100	30	○	0737H
P7-56	Over voltage stall protection voltage	200.0V ~ 2000.0V	Model setting	○	0738H
P7-61	Load drop detection level	0.0%~100.0%	10.0%	○	073DH
P7-62	Load drop detection time	0.0~60.0s	1.0s	○	073EH
P7-63	Over speed detection value	0.0% ~ 50.0% (unit is max output frequency P0-13)	20.0%	○	073FH
P7-64	Over speed detection time	0.0s~60.0s	1.0s	○	0740H
P7-65	Excessive speed deviation detection value	0.0% ~ 50.0% (unit is max output frequency P0-13)	20.0%	○	0741H
P7-66	Excessive speed deviation detection time	0.0s ~ 60.0s	5.0s	○	0742H
P7-67	Selection of instantaneous stop non-stop function	0: Transient power failure invalid 1: Deceleration in case of instantaneous power failure 2: Deceleration stop in case of instantaneous power failure	0	×	0743H
P7-68	Pause judgement voltage of transient stop action	80.0%~100.0%	85.0%	×	0744H
P7-69	Judgment time of instantaneous stop non-stop voltage rising	0.0s~30.0s	0.5s	×	0745H
P7-70	Judgement voltage of instantaneous stop non-stop action	60.0%~100.0% (standard bus voltage)	80.0%	○	0746H
P7-71	Proportional gain of instantaneous stop non-stop	0 ~ 100	40	○	0747H
P7-72	Integral coefficient of instantaneous stop non-stop	0 ~ 100	30	○	0748H
P7-73	Deceleration time of instantaneous stop non-stop	0 ~ 300.0s	20.0	×	0749H

Group P8: Keyboard and display

Group P8: Keyboard and display					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P8-01	STOP key function selection	0: Only in keyboard operation mode, STOP key stop function is valid 1: In any operation mode, STOP key is valid	1	○	0801H
P8-02	Parameter initialization	0: No operation	0	×	0802H

Parameter	Name	Setting range	Default value	Modify	Modbus address
	Group P8: Keyboard and display				
		1: Restore factory parameters, excluding motor parameters, P0-13 and P0-15 2: Clear record information 3: Restore factory parameters (including motor parameters)			
P8-03	User password	0~65535	00000	○	-
P8-06	Parameter modification attribute	0: Modifiable 1: Not modifiable	0	○	-
P8-07	LED operation display parameter 1 (Low 16 bits)	The bit meaning Bit0: Operating frequency	001F	○	0807H
P8-08	LED operation display parameter 2 (High 16 bits)	Bit1: Setting frequency Bit2: Bus voltage Bit3: Output current Bit4: Output voltage Bit5: Output torque Bit6: Output power Bit7: X input status Bit8: Y output status Bit9: AI1 voltage Bit10: AI2 voltage Bit12: PULSE input pulse frequency, the unit is 0.01KHz Bit13: PULSE input pulse frequency, the unit is 1Hz Bit14: PID setting Bit15: PID feedback Bit16: Load speed display Bit17: Feedback speed, the unit is 0.1Hz Bit18: Actual feedback speed Bit19: Line speed Bit20: PLC stage Bit21: Counting value Bit22: Length value Bit23: Main frequency A display Bit24: Auxiliary frequency B display Bit25: Communication setting value Bit26: Voltage before AI1 correction Bit27: Voltage before AI2 correction Bit29: Remaining running time Bit30: Current power on time Bit31: Current running time	0000	○	0808H
P8-09	LED stop display parameters	The bit meaning Bit0: Setting frequency	0033	○	0809H

Group P8: Keyboard and display					
Parameter	Name	Setting range	Default value	Modify	Modbus address
		Bit1: Bus voltage Bit2: X input status Bit3: Y output status Bit4: AI1 voltage Bit5: AI2 voltage Bit7: PULSE input pulse frequency Bit8: PID setting Bit9: Load speed display Bit10: PLC Step Bit11: Counting value Bit12: Length value			
P8-10	Accumulated running time	0h~65535h	-	-	080AH
P8-11	Accumulated power on time	0h~65535h	-	-	080BH
P8-12	Accumulated power consumption	0~65535 degree	-	-	080CH
P8-15	Software version	-	-	-	080FH
P8-16	Firmware version	-	-	-	0810H
P8-19	Inverter module radiator temperature	0.0℃~100.0℃	-	-	0813H
P8-20	Output power factor	0.0% ~ 200.0%	100.0	○	0814H
P8-21	Load speed display factor	0.0001~6.5000	1.0000	○	0815H
P8-22	Number of decimal points for load speed display	Ones bit: Number of decimal points of U0-16 0: 0 decimal points 1: 1 decimal point 2: 2 decimal points Tens bit: Number of decimal points of U0-17 1: 1 decimal point 2: 2 decimal points	11	○	0816H

Group P9: Communication parameters

Group P9: Communication parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
P9-00	Serial communication protocol selection	0: Modbus-RTU protocol 2: ASCII mode (3742 and above versions support)	0	×	0900H
P9-01	Local address	0: Broadcast address 1 ~ 247 (Modbus valid)	1	○	0901H
P9-02	Communication baud rate	Ones bit: MODBUS 0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS	06	○	0902H

Parameter	Name	Setting range	Default value	Modify	Modbus address
		4: 4800BPS			
		5: 9600BPS			
		6: 19200BPS			
		8: 57200BPS(3742 and above versions support)			
		9: 115200BPS(3742 and above versions support)			
P9-03	MODBUS data format	0: No parity (8-N-2) (RTU)	1	○	0903H
		1: Even parity (8-E-1) (RTU)			
		2: Odd parity (8-O-1) (RTU)			
		3: No parity (8-N-1) (RTU)			
		4: Even parity (7-E-1) (ASCII)			
P9-04	Communication timeout	0.0: Invalid	0.0	○	0904H
		0.1~60.0s			
P9-05	MODBUS response delay	0~20ms (Modbus valid)	2	○	0905H
P9-07	VB3/VB5/V5 communication control words (3742 and above versions support)	Ten bit:	00	○	0907H
		0: Disable			
		1: Enable			

Group PA: Process control closed-loop parameters

Group PA: Process control closed-loop parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PA-01	Setting channel selection	0: PA-05 setting	0	○	0A01H
		1: AI1			
		2: AI2			
		5: Communication setting			
		6: Multi-segment command setting			
PA-02	Feedback channel selection	0: AI1	0	○	0A02H
		1: AI2			
		3: AI1-AI2			
		4: AI1+AI2			
		6: Communication setting			
PA-03	PID feedback filter time	0.00s~30.00s	0.00s	○	0A03H
PA-04	PID output filter time	0.00s~30.00s	0.00s	○	0A04H
PA-05	PID value setting	0.0%~100.0%	50.0%	○	0A05H
PA-06	PID setting change time	0.00s~300.00s	0.00s	○	0A06H
PA-07	PID reverse cut-off frequency	0.00Hz~ max output frequency	0.00Hz	○	0A07H
PA-08	PID deviation limit	0.0%~100.0%	0.0%	○	0A08H
PA-09	PID differential limit	0.00%~100.00%	0.10%	○	0A09H
PA-10	Proportional gain P	0.0~100.0	20.0	○	0A0AH
PA-11	Integral time I	0.01s~10.00s	2.00s	○	0A0BH
PA-12	Differential time D	0.000s~10.000s	0.000s	○	0A0CH
PA-13	PID parameter switching condition	0: Don't switch	0	○	0A0DH
		1: Switch through X terminal			
		2: Switch automatically according to			

Group PA: Process control closed-loop parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
		deviation 3: Switch automatically according to the operation frequency			
PA-14	PID parameter switching deviation 1	0.0%~PA-15	20.0%	○	0A0EH
PA-15	PID parameter switching deviation 2	PA-14~100.0%	80.0%	○	0A0FH
PA-16	Proportional gain P2	0.0~100.0	20.0	○	0A10H
PA-17	Integral time I2	0.01s~10.00s	2.00s	○	0A11H
PA-18	Differential time D2	0.000s~10.000s	0.000s	○	0A12H
PA-19	PID action direction	0: Positive action 1: Negative action	0	○	0A13H
PA-20	PID given feedback range	0~65535	1000	○	0A14H
PA-21	PID maximum deviation between two outputs	0.00%~100.00%	1.00%	○	0A15H
PA-22	PID minimum deviation between two outputs	0.00%~100.00%	1.00%	○	0A16H
PA-23	PID initial value	0.0%~100.0%	0.0%	○	0A17H
PA-24	PID initial value holding time	0.00s~600.00s	0.00s	○	0A18H
PA-25	PID operation mode (whether to operate when stop)	0: Not operate when stop 1: Operate when stop	0	○	0A19H
PA-26	PID integral attribute	Ones bit: Integral separation 0: Invalid 1: Valid Tens bit: Whether to stop integration after output to limit value 0: Continue to integral 1: Stop integral	00	○	0A1AH
PA-27	PID feedback lost detection value	0.0%: Not judge the feedback lost 0.1%~100.0%	0.0%	○	0A1BH
PA-28	PID feedback lost detection time	0.0s~30.0s	0.0s	○	0A1CH

Group PB: Multi-speed and simple PLC operation parameters

Parameter	Name	Setting range	Default value	Modify	Modbus address
	Group PB: multi-speed and simple PLC operation parameters				
PB-00	Multi-segment frequency 0	-100.0%~+100.0%	0.0%	○	0B00H
PB-01	Multi-segment frequency 1	-100.0%~+100.0%	0.0%	○	0B01H
PB-02	Multi-segment frequency 2	-100.0%~+100.0%	0.0%	○	0B02H
PB-03	Multi-segment frequency 3	-100.0%~+100.0%	0.0%	○	0B03H
PB-04	Multi-segment frequency 4	-100.0%~+100.0%	0.0%	○	0B04H
PB-05	Multi-segment frequency 5	-100.0%~+100.0%	0.0%	○	0B05H
PB-06	Multi-segment frequency 6	-100.0%~+100.0%	0.0%	○	0B06H
PB-07	Multi-segment frequency 7	-100.0%~+100.0%	0.0%	○	0B07H
PB-08	Multi-segment frequency 8	-100.0%~+100.0%	0.0%	○	0B08H
PB-09	Multi-segment frequency 9	-100.0%~+100.0%	0.0%	○	0B09H
PB-10	Multi-segment frequency 10	-100.0%~+100.0%	0.0%	○	0B0AH
PB-11	Multi-segment frequency 11	-100.0%~+100.0%	0.0%	○	0B0BH
PB-12	Multi-segment frequency 12	-100.0%~+100.0%	0.0%	○	0B0CH
PB-13	Multi-segment frequency 13	-100.0%~+100.0%	0.0%	○	0B0DH
PB-14	Multi-segment frequency 14	-100.0%~+100.0%	0.0%	○	0B0EH
PB-15	Multi-segment frequency 15	-100.0%~+100.0%	0.0%	○	0B0FH
PB-16	Multi-segment frequency 0 setting mode	0: PB-00 setting 2: AI 5: PID setting 6: Preset frequency P0-10	0	○	0B10H
PB-17	Simple PLC segment 0 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B11H
PB-18	Simple PLC segment 0 acc/dec time	0~3	0	○	0B12H
PB-19	Simple PLC segment 1 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B13H
PB-20	Simple PLC segment 1 acc/dec time	0~3	0	○	0B14H
PB-21	Simple PLC segment 2 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B15H
PB-22	Simple PLC segment 2 acc/dec time	0~3	0	○	0B16H
PB-23	Simple PLC segment 3 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B17H
PB-24	Simple PLC segment 3 acc/dec time	0~3	0	○	0B18H
PB-25	Simple PLC segment 4 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B19H
PB-26	Simple PLC segment 4 acc/dec time	0~3	0	○	0B1AH
PB-27	Simple PLC segment 5 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B1BH
PB-28	Simple PLC segment 5 acc/dec time	0~3	0	○	0B1CH
PB-29	Simple PLC segment 6 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B1DH
PB-30	Simple PLC segment 6 acc/dec time	0~3	0	○	0B1EH
PB-31	Simple PLC segment 7 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B1FH
PB-32	Simple PLC segment 7 acc/dec time	0~3	0	○	0B20H
PB-33	Simple PLC segment 8 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B21H
PB-34	Simple PLC segment 8 acc/dec time	0~3	0	○	0B22H
PB-35	Simple PLC segment 9 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B23H
PB-36	Simple PLC segment 9 acc/dec time	0~3	0	○	0B24H

Group PB: multi-speed and simple PLC operation parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PB-37	Simple PLC segment 10 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B25H
PB-38	Simple PLC segment 10 acc/dec time	0~3	0	○	0B26H
PB-39	Simple PLC segment 11 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B27H
PB-40	Simple PLC segment 11 acc/dec time	0~3	0	○	0B28H
PB-41	Simple PLC segment 12 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B29H
PB-42	Simple PLC segment 12 acc/dec time	0~3	0	○	0B2AH
PB-43	Simple PLC segment 13 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B2BH
PB-44	Simple PLC segment 13 acc/dec time	0~3	0	○	0B2CH
PB-45	Simple PLC segment 14 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B2DH
PB-46	Simple PLC segment 14 acc/dec time	0~3	0	○	0B2EH
PB-47	Simple PLC segment 15 operation time	0.0~6500.0s(h)	0.0s(h)	○	0B2FH
PB-48	Simple PLC segment 15 acc/dec time	0~3	0	○	0B30H
PB-49	Simple PLC operation mode	0:Stop at the end of single operation 1: Keep the final value at the end of single operation 2: Cycle all the time	0	○	0B31H
PB-50	Simple PLC operation time unit	0: Second 1: Hour	0	○	0B32H
PB-51	Simple PLC power-off memory selection	Ones bit: Power-off memory 0: Not memory 1: Memory Tens bit: Stop memory 0: Not memory 1: Memory	00	○	0B33H

Group PC: Auxiliary operation parameters

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PC-00	Jog frequency	0.00Hz ~ P0-13	2.00Hz	○	0C00H
PC-01	Jog acceleration time	0.0s~6500.0s	20.0s	○	0C01H
PC-02	Jog deceleration time	0.0s~6500.0s	20.0s	○	0C02H
PC-03	Acceleration time 2	0.1s~6500.0s	Model setting	○	0C03H
PC-04	Deceleration time 2	0.1s~6500.0s	Model setting	○	0C04H
PC-05	Acceleration time 3	0.1s~6500.0s	Model setting	○	0C05H
PC-06	Deceleration time 3	0.1s~6500.0s	Model setting	○	0C06H
PC-07	Acceleration time 4	0.1s~6500.0s	Model setting	○	0C07H
PC-08	Deceleration time 4	0.1s~6500.0s	Model setting	○	0C08H
PC-09	The unit of acc/dec time	0: 1s 1: 0.1s 2: 0.01s	1	×	0C09H
PC-10	The base frequency of acc/dec	0: Max output frequency	0	×	0C0AH

Group PC: auxiliary operation parameters						
Parameter	Name	Setting range	Default value	Modify	Modbus address
	time	1: Setting frequency 2: 50Hz			
PC-11	Switching frequency point between acceleration time 1 and acceleration time 2	0.00Hz~max output frequency	0.00Hz	○	0C0BH
PC-12	Switching frequency point between deceleration time 1 and deceleration time 2	0.00Hz~ max output frequency	0.00Hz	○	0C0CH
PC-13	Jump frequency 1	0.00Hz~ max output frequency	0.00Hz	○	0C0DH
PC-14	Jump frequency 2	0.00Hz~ max output frequency	0.00Hz	○	0C0EH
PC-15	Jump frequency range	0.00Hz~ max output frequency	0.00Hz	○	0C0FH
PC-16	Whether the jump frequency is valid during acceleration and deceleration	0: Invalid 1: Valid (in vector condition)	0	○	0C10H
PC-17	Frequency arrival detection range	0.0%~100.0%	0.0%	○	0C11H
PC-18	Frequency detection value (FDT1 voltage level)	0.00Hz~max output frequency	50.00Hz	○	0C12H
PC-19	Frequency detection hysteresis value (FDT1 voltage level)	0.0%~100.0% (PC-18)	5.0%	○	0C13H
PC-20	Frequency detection value (FDT2 voltage level)	0.00Hz~ max output frequency	50.00Hz	○	0C14H
PC-21	Frequency detection hysteresis value (FDT2 voltage level)	0.0%~100.0% (PC-20)	5.0%	○	0C15H
PC-22	Frequency arrival detection value 1	0.00Hz~ max output frequency	50.00Hz	○	0C16H
PC-23	Frequency arrival detection 1 range	0.0%~100.0% (max output frequency)	0.0%	○	0C17H
PC-24	Frequency arrival detection value 2	0.00Hz~ max output frequency	50.00Hz	○	0C18H
PC-25	Frequency arrival detection 2 range	0.0%~100.0% (max output frequency)	0.0%	○	0C19H
PC-26	Timing function selection	0: Invalid 1: Valid	0	×	0C1AH
PC-28	Setting operation time	0.0Min~6500.0Min	0.0Min	×	0C1CH
PC-29	Present operation arrival time	0.0Min~6500.0Min	0.0Min	×	0C1DH
PC-30	Setting power on arrival time	0 ~ 65000h	0	×	0C1EH
PC-32	Setting operation arrival time	0 ~ 65000h	0	×	0C20H
PC-34	Current arrival detection value 1	0.0%~300.0% (motor rated current)	100.0%	○	0C22H
PC-35	Current arrival detection 1 range	0.0%~300.0% (motor rated current)	0.0%	○	0C23H
PC-36	Current arrival detection value 2	0.0%~300.0% (motor rated current)	100.0%	○	0C24H
PC-37	Current arrival detection 2 range	0.0%~300.0% (motor rated current)	0.0%	○	0C25H
PC-38	Zero current detection value	0.0%~300.0% (motor rated current)	5.0%	○	0C26H

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PC-39	Zero current detection delay time	0.01s~600.00s	0.10s	○	0C27H
PC-40	Software overcurrent point	0: 0.0% (not detect) 1: 0.1% ~ 300.0% (motor rated current)	200.0%	○	0C28H
PC-41	Software overcurrent detection delay time	0.00s~600.00s	0.00s	○	0C29H
PC-42	AI1 input voltage lower limit	0.00V~PC-43	3.10V	○	0C2AH
PC-43	AI1 input voltage upper limit	PC-42~10.50V	6.80V	○	0C2BH
PC-44	Overvoltage point setting	220V mode: 200~400V 380V mode: 540~810V	220V : 400V 380V : 810V	×	0C2CH
PC-45	Undervoltage point setting	220V mode: 200~400V 380V mode: 200~537V	220V : 200V 380V : 350V	×	0C2DH
PC-46	Operation action when the frequency is lower than lower limit frequency	0: Run at lower limit frequency 1: Stop 2: Run at zero speed	0	○	0C2EH
PC-47	Module temperature arrival	0℃~100℃	75	○	0C2FH
PC-48	Fan control	0: The fan runs during operation 1: The fan is running all the time	0	○	0C30H
PC-49	Droop control	0.00Hz~10.00Hz	0.00Hz	○	0C31H
PC-50	Terminal jog run priority	0: Invalid 1: Valid	0	○	0C32H
PC-51	SVC optimization selection	1: Optimization mode 1 2: Optimization mode 2	2	○	0C33H
PC-52	Dead area compensation mode	0: No compensation 1: Compensation mode 1	1	○	0C34H
PC-54	Modulation mode	0: Asynchronous Modulation 1: Synchronous modulation	0	○	0C36H
PC-55	DPWM switching upper limit frequency	5.00Hz~max output frequency	12.00Hz	○	0C37H
PC-56	Random PWM depth	0: Random PWM invalid 1~10: PWM carrier frequency random depth	0	○	0C38H
PC-57	Wake up frequency	Dormancy frequency PC-59~max output frequency P0-13	0.00Hz	○	0C39H
PC-58	Wake up delay time	0.0s~6500.0s	0.0s	○	0C3AH
PC-59	Dormancy frequency	0.00Hz~wake up frequency PC-57	0.00Hz	○	0C3BH
PC-60	Dormancy delay time	0.0s~6500.0s	0.0s	○	0C3CH
PC-61	Wave by wave current limiting enable	0: Not enable 1: Enable	1	○	0C3DH
PC-62	Overmodulation coefficient	100~110	105	○	0C3EH
PC-65	Bus voltage arrival value	Unit is 0.1V	500.0	○	0C41H
PC-66	Bus voltage arrival hysteresis value	Unit is 0.1V	50.0	○	0C42H

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PC-67	Carrier frequency	0.5K~16.0K	Model setting	○	0C43H
PC-68	Carrier frequency adjusted with temperature	0: Invalid 1: Valid	1	○	0C44H
PC-72	External linear speed given source	0:Don't use external linear speed 1: AI1 2: AI2 5: Communication	0	○	0C48H
PC-73	Allowed update maximum deviation of main frequency	0.00%～10.00%	0.10%	○	0C49H
PC-74	Allowed update time interval of main frequency	0.00s~200.00s	3.00s	○	0C4AH
PC-75	Differential time of external linear speed change	0.00s~50.00s	1.00s	○	0C4BH
PC-76	External linear speed change value	0.00Hz~50.00Hz	1.00Hz	○	0C4CH

Group PE: User optional parameters

Group PE: user optional parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PE-00	User optional parameters 0	P0.00 ~ PF.xx A0.00 ~ A2.xx A9.00 ~ Ad.xx U0.00 ~ U0.xx U4.00 ~ U5.xx	U4-00	○	0E00H
PE-01	User optional parameters 1	Same to PE-00	U4-01	○	0E01H
PE-02	User optional parameters 2	Same to PE-00	U4-08	○	0E02H
PE-03	User optional parameters 3	Same to PE-00	U4-09	○	0E03H
PE-04	User optional parameters 4	Same to PE-00	U4-10	○	0E04H
PE-05	User optional parameters 5	Same to PE-00	U4-03	○	0E05H
PE-06	User optional parameters 6	Same to PE-00	U4-06	○	0E06H
PE-07	User optional parameters 7	Same to PE-00	P0-00	○	0E07H
PE-08	User optional parameters 8	Same to PE-00	P0-00	○	0E08H
PE-09	User optional parameters 9	Same to PE-00	P0-00	○	0E09H
PE-10	User optional parameters 10	Same to PE-00	P0-00	○	0E0AH
PE-11	User optional parameters 11	Same to PE-00	P0-00	○	0E0BH
PE-12	User optional parameters 12	Same to PE-00	P0-00	○	0E0CH
PE-13	User optional parameters 13	Same to PE-00	P0-00	○	0E0DH
PE-14	User optional parameters 14	Same to PE-00	P0-00	○	0E0EH
PE-15	User optional parameters 15	Same to PE-00	P0-00	○	0E0FH
PE-16	User optional parameters 16	Same to PE-00	P0-00	○	0E10H
PE-17	User optional parameters 17	Same to PE-00	P0-00	○	0E11H
PE-18	User optional parameters 18	Same to PE-00	P0-00	○	0E12H

Group PE: user optional parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PE-19	User optional parameters 19	Same to PE-00	P0-00	○	0E13H
PE-20	User optional parameters 20	Same to PE-00	U0-67	○	0E14H
PE-21	User optional parameters 21	Same to PE-00	U0-68	○	0E15H
PE-22	User optional parameters 22	Same to PE-00	U0-69	○	0E16H
PE-23	User optional parameters 23	Same to PE-00	U0-70	○	0E17H
PE-24	User optional parameters 24	Same to PE-00	U0-74	○	0E18H
PE-25	User optional parameters 25	Same to PE-00	U0-00	○	0E19H
PE-26	User optional parameters 26	Same to PE-00	U0-55	○	0E1AH
PE-27	User optional parameters 27	Same to PE-00	U0-56	○	0E1BH
PE-28	User optional parameters 28	Same to PE-00	P0-00	○	0E1CH
PE-29	User optional parameters 29	Same to PE-00	P0-00	○	0E1DH
PE-30	User optional parameters 30	Same to PE-00	P0-00	○	0E1EH
PE-31	User optional parameters 31	Same to PE-00	P0-00	○	0E1FH

Group PF: Torque control

Group PF: torque control					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PF-00	Torque control	0: Speed control 1: Torque control	0	×	0F00H
PF-01	Upper limit source of driver torque	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Min(AI1, AI2) 7: Max(AI1, AI2) (the full scale of option 1~7 correspond to PF-02 digital setting)	0	×	0F01H
PF-02	Driver torque upper limit	-200.0%~200.0%	150.0%	○	0F02H
PF-03	Torque control forward maximum frequency source	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Min(AI1, AI2) 7: Max(AI1, AI2) (the full scale of option 0~7 correspond to P0-13 digital setting)	0	○	0F03H
PF-04	Torque control forward maximum frequency	0.00Hz~max output frequency	50.00Hz	○	0F04H
PF-05	Torque control reverse maximum frequency source	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Min(AI1, AI2) 7: Max(AI1, AI2) (the full scale of option 0~7 correspond to P0-13 digital setting)	0	○	0F05H
PF-06	Torque control reverse maximum frequency	0.00Hz~max output frequency	50.00Hz	○	0F06H

Group PF: torque control					
Parameter	Name	Setting range	Default value	Modify	Modbus address
PF-07	Torque acceleration time	0.00s～650.00s	0.00s	○	0F07H
PF-08	Torque deceleration time	0.00s～650.00s	0.00s	○	0F08H

Group A0: Textile

Group A0: textile					
Parameter	Name	Setting range	Default value	Modify	Modbus address
A0-00	Setting length	0m~65535m	1000m	○	A000H
A0-01	Actual length	0m~65535m	0m	○	A001H
A0-02	Pulse number per meter	0.1~6553.5	100.0	○	A002H
A0-03	Setting count value	1~65535	1000	○	A003H
A0-04	Specified count value	1~65535	1000	○	A004H
A0-05	Swing frequency setting mode	0: Relative to center frequency 1: Relative to maximum output frequency	0	○	A005H
A0-06	Swing frequency range	0.0%~100.0%	0.0%	○	A006H
A0-07	Jump frequency range	0.0%~50.0%	0.0%	○	A007H
A0-08	Swing frequency period	0.1s~3600.0s	10.0s	○	A008H
A0-09	Triangular wave rise time of swing frequency	0.1%~100.0%	50.0%	○	A009H

Group A1: Virtual IO

Group A1: Virtual IO					
Parameter	Name	Setting range	Default value	Modify	Modbus address
A1-00	Function selection of virtual X1 terminal	0~51: See group P2 physical X input selection	00	×	A100H
A1-01	Function selection of virtual X2 terminal		00	×	A101H
A1-02	Function selection of virtual X3 terminal		00	×	A102H
A1-03	Function selection of virtual X4 terminal		00	×	A103H
A1-04	Function selection of virtual X5 terminal		00	×	A104H
A1-05	Virtual X terminal valid status source	Ones bit: Virtual X1 0: The validity is determined by the state of virtual Y1 1: The validity is determined by function code A1-06 Tens bit: Virtual X2 Hundreds bit: Virtual X3 Thousands bit: Virtual X4 Ten thousands bit: Virtual X5	00000	×	A105H
A1-06	Virtual X terminal status setting	Ones bit: Virtual X1 0: Invalid 1: Valid Tens bit: Virtual X2 Hundreds bit: Virtual X3	00000	×	A106H

Group A1: Virtual IO					
Parameter	Name	Setting range	Default value	Modify	Modbus address
		Thousands bit: Virtual X4 Ten thousands bit: Virtual X5			
A1-07	Function selection of AI1 terminal as X terminal	0~51	00	×	A107H
A1-08	Function selection of AI2 terminal as X terminal	0~51	00	×	A108H
A1-10	Selection of valid mode when AI is used as X terminal	Ones bit: AI1 Tens bit: AI2 0: High level valid 1: Low level valid	000	×	A10AH
A1-11	Virtual Y1 output function selection	0: Connect with physical X1 inside 1~42: See group P3 physical Y output selection	00		A10BH
A1-12	Virtual Y2 output function selection	0: Connect with physical X2 inside 1~42: See group P3 physical Y output selection	00	○	A10CH
A1-13	Virtual Y3 output function selection	0: Connect with physical X3 inside 1~42: See group P3 physical Y output selection	00	○	A10DH
A1-14	Virtual Y4 output function selection	0: Connect with physical X4 inside 1~42:See group P3 physical Y output selection	00	○	A10EH
A1-15	Virtual Y5 output function selection	0: Connect with physical X5 inside 1~42:See group P3 physical Y output selection	00	○	A10FH
A1-16	Virtual Y1 output delay time	0.0s ~ 3600.0s	0.0s	○	A110H
A1-17	Virtual Y2 output delay time	0.0s ~ 3600.0s	0.0s	○	A111H
A1-18	Virtual Y3 output delay time	0.0s ~ 3600.0s	0.0s	○	A112H
A1-19	Virtual Y4 output delay time	0.0s ~ 3600.0s	0.0s	○	A113H
A1-20	Virtual Y5 output delay time	0.0s ~ 3600.0s	0.0s	○	A114H
A1-21	Virtual Y terminal valid status selection	Ones bit: Virtual Y1 0: Positive logic 1: Negative logic Tens bit: Virtual Y2 Hundreds bit: Virtual Y3 Thousands bit: Virtual Y4 Ten thousands bit: Virtual Y5	00000	○	A115H

Group A2: Second motor parameters

Parameter	Name	Setting range	Default value	Modify	Modbus address
		Group A2: Second motor parameters			
A2-00	Motor type selection	0: Common asynchronous motor	0	×	A200H
A2-01	Motor rated power	0.1KW~650.0KW	Model setting	×	A201H
A2-02	Motor rated voltage	1V~1200V	Model setting	×	A202H
A2-03	Motor rated current	0.01A~655.35A (VFD power ≤55kW) 0.1A~6553.5A (VFD power >55kW)	Model setting	×	A203H
A2-04	Motor rated frequency	0.01Hz~max output frequency	Model setting	×	A204H
A2-05	Motor rated speed	1rpm~65535rpm	Model setting	×	A205H
A2-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω (VFD power ≤55kW) 0.0001Ω~6.5535Ω (VFD power >55kW)	Tuning parameters	×	A206H
A2-07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω (VFD power ≤55kW) 0.0001Ω~6.5535Ω (VFD power >55kW)	Tuning parameters	×	A207H
A2-08	Asynchronous motor leakage inductance	0.01mH~655.35mH (VFD power ≤55kW) 0.001mH~65.535mH (VFD power >55kW)	Tuning parameters	×	A208H
A2-09	Asynchronous motor mutual inductance	0.01mH~655.35mH (VFD power ≤55kW) 0.001mH~65.535mH (VFD power >55kW)	Tuning parameters	×	A209H
A2-10	Asynchronous motor current without load	0.01A~A2-03 (VFD power ≤55kW) 0.1A~A2-03 (VFD power >55kW)	Tuning parameters	×	A20AH
A2-35	Motor 2 parameter self learning	0: No operation 1: Static tuning 1 2: Dynamic tuning 3: Static tuning 2	0	×	A223H
A2-36	Motor 2 control mode	0: VF control mode 1: No speed sensor vector control (SVC)	0	×	A224H
A2-37	Motor 2 acc/dec time selection	0: Same to first motor 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	0	○	A225H
A2-38	Motor 2 torque boost	0.0%: Automatic torque boost 0.1%~30.0%	Model setting	○	A226H
A2-40	Motor 2 oscillation suppression gain	0~100	Model setting	○	A228H
A2-41	Speed loop proportion gain 1	1~100	30	○	A229H
A2-42	Speed loop integral time 1	0.01s~10.00s	0.50	○	A22AH
A2-43	Speed loop proportion gain 2	1~100	20	○	A22BH
A2-44	Speed loop integral time 2	0.01s~10.00s	1.00	○	A22CH
A2-45	Switching frequency 1	0.00~A2-46	5.00	○	A22DH

Group A2: Second motor parameters					
Parameter	Name	Setting range	Default value	Modify	Modbus address
A2-46	Switching frequency 2	A2-45~max output frequency (P0-13)	10.00	○	A22EH
A2-47	Speed loop integral property	Ones bit: Integral separation 0: Invalid 1: Valid	0	○	A22FH
A2-48	Slip gain of vector control	50%~200%	100%	○	A230H
A2-49	SVC speed feedback filter time	0.000s~0.100s	0.015	○	A231H
A2-51	Torque upper limit source under speed control mode	0: Parameter setting (A2-52) 1: AI1 2: AI2 5: Communication setting 6: Min(AI1,AI2) 7: Max(AI1,AI2) (the full scale of option 0~7 correspond to A2-53 digital setting)	0	○	A233H
A2-52	Digital setting of torque upper limit in speed control mode	0.0%~200.0%	150.0%	○	A234H
A2-55	Proportional gain of excitation regulation	0 ~ 60000	2000	○	A237H
A2-56	Integral gain of excitation regulation	0 ~ 60000	1300	○	A238H
A2-57	Proportional gain of torque regulation	0 ~ 60000	2000	○	A239H
A2-58	Integral gain of torque regulation	0 ~ 60000	1300	○	A23AH

Group A4: Password countdown lock

Group A4: Password countdown lock					
Parameter	Name	Setting range	Default value	Modify	Modbus address
A4-00	Parameter group access verification	0~65000	0	○	-
A4-01	Parameter group lock password	0~65000	0	○	-
A4-02	Total power on time before locking	0~7200	0h	○	-
A4-03	Remaining time of power on locking	0~7200	0h	○	-

Group A9: Communication address mapping

Group A9: Communication address mapping					
Parameter	Name	Setting range	Default value	Modify	Modbus address
A9-00	Communication address mapping selection	0: Communication mapping function does not take effect 1: Communication mapping function takes effect	0	○	A900H

Group A9: Communication address mapping					
Parameter	Name	Setting range	Default value	Modify	Modbus address
A9-01	Communication address mapping primitive 1	0x0000~0xFFFF	0x0000	○	A901H
A9-02	Communication address mapping primitive 2	0x0000~0xFFFF	0x0000	○	A902H
A9-03	Communication address mapping primitive 3	0x0000~0xFFFF	0x0000	○	A903H
A9-04	Communication address mapping primitive 4	0x0000~0xFFFF	0x0000	○	A904H
A9-05	Communication address mapping primitive 5	0x0000~0xFFFF	0x0000	○	A905H
A9-06	Communication address mapping primitive 6	0x0000~0xFFFF	0x0000	○	A906H
A9-07	Communication address mapping primitive 7	0x0000~0xFFFF	0x0000	○	A907H
A9-08	Communication address mapping primitive 8	0x0000~0xFFFF	0x0000	○	A908H
A9-09	Communication address mapping primitive 9	0x0000~0xFFFF	0x0000	○	A909H
A9-10	Communication address mapping primitive 10	0x0000~0xFFFF	0x0000	○	A90AH
A9-11	Communication address mapping primitive 11	0x0000~0xFFFF	0x0000	○	A90BH
A9-12	Communication address mapping primitive 12	0x0000~0xFFFF	0x0000	○	A90CH
A9-13	Communication address mapping primitive 13	0x0000~0xFFFF	0x0000	○	A90DH
A9-14	Communication address mapping primitive 14	0x0000~0xFFFF	0x0000	○	A90EH
A9-15	Communication address mapping image 1	0x0000~0xFFFF	0x0000	○	A90FH
A9-16	Communication address mapping image 2	0x0000~0xFFFF	0x0000	○	A910H
A9-17	Communication address mapping image 3	0x0000~0xFFFF	0x0000	○	A911H
A9-18	Communication address mapping image 4	0x0000~0xFFFF	0x0000	○	A912H
A9-19	Communication address mapping image 5	0x0000~0xFFFF	0x0000	○	A913H
A9-20	Communication address mapping image 6	0x0000~0xFFFF	0x0000	○	A914H
A9-21	Communication address mapping image 7	0x0000~0xFFFF	0x0000	○	A915H
A9-22	Communication address mapping image 8	0x0000~0xFFFF	0x0000	○	A916H
A9-23	Communication address mapping image 9	0x0000~0xFFFF	0x0000	○	A917H
A9-24	Communication address mapping image 10	0x0000~0xFFFF	0x0000	○	A918H
A9-25	Communication address mapping image 11	0x0000~0xFFFF	0x0000	○	A919H
A9-26	Communication address mapping image 12	0x0000~0xFFFF	0x0000	○	A91AH
A9-27	Communication address mapping image 13	0x0000~0xFFFF	0x0000	○	A91BH
A9-28	Communication address mapping image 14	0x0000~0xFFFF	0x0000	○	A91CH

Group AD: AIAO correction

Group AD: AIAO correction					
Parameter	Name	Setting range	Default value	Modify	Modbus address
AD-00	AI1 measured voltage 1	0.500V~4.000V	Factory calibration	○	AD00H
AD-01	AI1 display voltage 1	0.500V~4.000V	Factory calibration	○	AD01H
AD-02	AI1 measured voltage 2	6.000V~9.999V	Factory calibration	○	AD02H
AD-03	AI1 display voltage 2	6.000V~9.999V	Factory calibration	○	AD03H
AD-04	AI2 measured voltage 1	0.500V~4.000V	Factory calibration	○	AD04H
AD-05	AI2 display voltage 1	0.500V~4.000V	Factory calibration	○	AD05H
AD-06	AI2 measured voltage 2	6.000V~9.999V	Factory calibration	○	AD06H
AD-07	AI2 display voltage 2	6.000V~9.999V	Factory calibration	○	AD07H
AD-12	AO1 target voltage 1	0.500V~4.000V	Factory calibration	○	AD0CH
AD-13	AO1 measured voltage 1	0.500V~4.000V	Factory calibration	○	AD0DH

Group AD: AIAO correction					
Parameter	Name	Setting range	Default value	Modify	Modbus address
AD-14	AO1 target voltage 2	6.000V~9.999V	Factory calibration	○	AD0EH
AD-15	AO1 measured voltage 2	6.000V~9.999V	Factory calibration	○	AD0FH

Group U0: Monitor parameters

Group U0: monitor parameters				
Parameter	Name	Min unit	Modbus address	Display range
U0-00	Operation frequency (Hz)	0.01Hz	7000H	0.00~600.00Hz
U0-01	Setting frequency (Hz)	0.01Hz	7001H	0.00~600.00Hz
U0-02	Bus voltage (V)	0.1V	7002H	0.0~1024.0
U0-03	Output current (A)	0.01A	7003H	0.0~655.35A
U0-04	Output voltage (V)	1V	7004H	0V~1140V
U0-05	Output torque (%) percentage output value of motor rated torque	0.1%	7005H	-200.0%~200.0%
U0-06	Output power (kW)	0.1kW	7006H	0~32767
U0-07	X input status	1	7007H	0x0000~0x7FFF
U0-08	Y output status	1	7008H	0x0000~0x03FF
U0-09	AI1 voltage (V)/current(mA)	0.01V/0.01mA	7009H	0.00V ~10.57V/ 0.00mA~20.00mA
U0-10	AI2 voltage (V)/current (mA)	0.01V/0.01mA	700AH	0.00V ~10.57V/ 0.00mA~20.00mA
U0-14	PID setting	1	700EH	0~65535
U0-15	PID feedback	1	700FH	0~65535
U0-16	Load speed display	Depend on P8-22	7010H	0~65535
U0-17	Feedback speed (Hz)	Depend on P8-22	7011H	-600.00~600.00Hz
U0-20	PLC stage	1	7014H	0~15
U0-21	Count value	1	7015H	0~65535
U0-22	Length value	1	7016H	0~65535
U0-23	Main frequency A display	0.01Hz	7017H	0.01~ max output frequency
U0-24	Auxiliary frequency B display	0.01Hz	7018H	0.01~ max output frequency
U0-25	Communication setting value	0.01%	7019H	-100.00%~100.00%
U0-26	AI1 voltage/current before calibration	0.001V/0.001mA	701AH	0.000V~10.570V/ 0.000mA~20.000mA
U0-27	AI2 voltage/current before calibration	0.001V/0.001mA	701BH	0.000V~10.570V/ 0.000mA~20.000mA
U0-29	Remaining running time	0.1Min	701DH	0.0~6500.0min
U0-30	Present power on time	1Min	701EH	0~65000min
U0-31	Present operation time	0.1Min	701FH	0.0~6500.0min
U0-33	Present fault	1	7021H	1~56
U0-34	Fault information	1	7022H	-
U0-35	Target torque (%)	0.1%	7023H	-200.0%~200.0%
U0-36	Torque upper limit	0.01%	7024H	-200.00%~200.00%

Group U0: monitor parameters				
Parameter	Name	Min unit	Modbus address	Display range
U0-41	Power factor angle	0.1°	7029H	-
U0-42	Setting frequency (%)	0.01%	702AH	-100.00%~100.00%
U0-43	Operation frequency (%)	0.01%	702BH	-100.00%~100.00%
U0-44	VF separate target voltage	1V	702CH	0V ~motor rated voltage
U0-45	VF separate output voltage	1V	702DH	0V~motor rated voltage
U0-47	Motor serial number	0: Motor 1 1: Motor 2	702FH	-
U0-48	Check any memory address value	1	7030H	-
U0-66	Motor speed	1RPM	7042H	0~ motor rated speed
U0-70	Communication feedback motor speed 1	0.1Hz	7046H	-
U0-71	Communication feedback motor speed 2	1RPM	7047H	0~motor rated speed
U0-72	Special current display for communication card	-	7048H	-
U0-73	Communication card error status	-	7049H	-
U0-74	Motor actual output torque	0.01%	704AH	-200.00% ~ 200.00%
U0-75	Fault code	-	704BH	1~56
U0-76	Operation status word	Bit0	0: stop 1: In operation	704CH	0x0000~0xFFFF
		Bit1	Normal operation(not jog, tune)		
		Bit2	Jog operation		
		Bit3	Tuning operation		
		Bit4	Jog during operation		
		Bit5~ Bit6	Running status 00: Constant speed process 01: Acceleration process 10: Deceleration process		
		Bit7	PLC operation		
		Bit8	PID operation		
		Bit9	Torque control		
		Bit10	Set frequency direction		
		Bit11	Current frequency operation direction		

Group U0: monitor parameters				
Parameter	Name	Min unit	Modbus address	Display range
		Bit12	Running reverse flag 0:Forward 1:Reverse		
		Bit13	Final frequency setting reverse		

4-2. Parameter explanation

4-2-1. Group P0 basic operation parameter

Parameter	Name	Setting range	
P0-01	First motor control mode selection	0	VF control mode
		1	No speed sensor vector control (SVC)

0: VF control

VF control is suitable for low-speed occasions where the control accuracy is not high, and can also be used for occasions where one inverter drives multiple motors. It is recommended to set P1-00 ~ P1-05 in VF control.

1: No speed sensor vector control (SVC)

It refers to the open-loop vector control, which can be applied to high-performance general occasions without pulse encoder, occasions requiring low-frequency large torque and high speed control accuracy, such as machine tools, centrifuges, wire drawing machines, injection molding machines, etc.

For vector control of inverter, only one motor can be driven by one inverter, so accurate parameters of controlled motor must be obtained for self tuning. See P1-35 for specific tuning method.

Parameter	Name	Range	
P0-02	Operation command channel selection	0	Operation panel
		1	Terminal operation
		2	Communication

0: Operate panel

Controlled by the key on the operate panel.

1: Terminal

Controlled by multi-function terminals.

2: Communication

Controlled by upper PC via communication.

Parameter	Name	Setting	Choose setting channel
P0-03	Main frequency source A channel selection	0	Digital setting (Power-off no memory)
		1	Digital setting (Power-off memory)
		2	AI1
		3	AI2
		4	Body panel potentiometer knob setting
		6	Communication setting
		7	Multi-segment command setting
		8	PID setting
		9	Simple PLC operation
		10	Specific mode for wire drawing and winding
		11	External panel potentiometer knob setting

0: Digital setting (Power-off no memory)

Set frequency in P0-10, and adjust by keyboard increase and decrease key (or up/down terminal), after power

off and power on, the frequency will return to the value of P0-10.

1: Digital setting (Power-off memory)

After setting the frequency in P0-10, press increase, decrease key through the keyboard, or after up/down adjustment, the frequency of the inverter will return to the adjusted value after power down. This parameter setting is only used for power down, not for stop. The stop frequency memory setting can be modified in parameter P0-12.

2: AI1

3: AI2

Support 0V~10V voltage input. The corresponding relationship between the input voltage value of AI and the target frequency is curve 2, and the corresponding parameters are set between P2-22 and P2-25. When AI is used as frequency setting, voltage/current input corresponding to 100.0% of setting refers to the percentage relative to the max output frequency P0-13.

4: Body panel potentiometer knob setting

6: Communication setting

Set to Modbus-RTU communication, modify frequency through RS485 communication, address H1000. Write 5000 to the address, which means 50.00% of the maximum frequency. If the maximum frequency is 50 Hz, then the frequency is 25 Hz. Communication parameters can be set in group P9.

7: Multi-segment command setting

When setting to multi segment commands, set the X terminal function selection to 12~15. The non-zero combination of input terminals correspond to different frequencies and acceleration and deceleration time, up to 16 frequency segments can be set.

8: PID setting

Generally used in the field of closed-loop control, such as constant pressure closed-loop control, constant tension closed-loop control and other occasions. Closed loop control parameters can be set in group PA. VH1 has two groups of PID parameters to switch.

9: Simple PLC operation

When the frequency source is simple PLC, the inverter operates according to the specified frequency, specified time and specified acceleration and deceleration time. The specific parameters can be set through group PB, and can run for up to 16 sections.

10: Specific mode for wire drawing and winding

PC-72~PC-76 and group PA parameters shall be set for relevant parameters. This function is only supported in software versions 3740 and later.

11: External panel potentiometer knob setting (Supported in versions 3740 and above)

The setting frequency can be adjusted through the panel knob, without the need for an external potentiometer to adjust.

Parameter	Name	Range
P0-04	Auxiliary frequency source B channel selection	0~11
P0-05	Frequency source superposition selection	Ones bit: Frequency source selection 0: Main frequency source A 1: Calculation results of main and auxiliary frequency sources (determined by tens bits) 2: Switching between main frequency source A and auxiliary frequency source B
		Tens bit: Operation relationship of main and auxiliary frequency sources

		0: A+B
		1: A-B
		2: Max(A,B)
		3: Min(A,B)

The using method of auxiliary frequency channel is similar to the main frequency input channel P0-03.

Note: when the frequency source superposition is selected (P0-05 ones bit is 1), that is, when the inverter frequency is set by superposition of main and auxiliary frequency:

(1) The auxiliary frequency input channel is digital setting (P0-04 = 0 or 1), and the preset frequency (P0-10) does not work any more. The frequency adjustment made by the user through keyboard keys (or up and down of X terminal) is directly based on the main frequency.

(2) The auxiliary frequency input channel is analog or pulse setting (P0-04 = 3). 100% of the input setting corresponds to the range of auxiliary frequency source B, which is set through P0-06 and P0-07.

(3) The main and auxiliary frequency sources cannot be set to the same channel, otherwise it is easy to cause confusion.

Parameter	Name	Range
P0-06	Auxiliary frequency source B range selection	0: Relative to the max output frequency 1: Relative to the main frequency source A
P0-07	Auxiliary frequency source B range	0%~150%

When the frequency source is selected as "frequency superposition" (P0-05 ones bit is 1), these two parameters are used to determine the adjustment range of the auxiliary frequency source.

P0-06 is used to determine the object corresponding to the range of the auxiliary frequency source. It can be selected as relative to the maximum frequency or relative to the main frequency source A. If it is selected as relative to the main frequency source, the range of the auxiliary frequency source will change with the change of the main frequency source A.

Parameter	Name	Range
P0-09	Digital setting of auxiliary frequency source offset when superposition	0.00Hz~max output frequency (P0-13)

This parameter is only valid when the frequency source is selected as the main and auxiliary operation (P0-05 ones bit is 1).

When the frequency source is used as the main and auxiliary operation, P0-09 is used as the bias frequency, and the superposition of the main and auxiliary operation results is used as the final frequency setting value, which makes the frequency setting more flexible.

Parameter	Name	Range
P0-10	Preset frequency	0.00Hz~max output frequency (P0-13)

When the frequency input channel is set to digital setting, the parameter value is the initial value of frequency digital setting.

Parameter	Name	Range
P0-11	Frequency instruction decimal point	1: 1 decimal point 2: 2 decimal point

Parameter	Name	Range	
P0-12	Frequency stop memory selection for digital setting	0	No memory
		1	Memory

Memory and no memory refers to the frequency adjustment by key (or up and down of X terminal) during operation, and whether the changed frequency is memorized during stop. When no memory is selected, the frequency will return to the set value of P0-10 (preset frequency) after stop.

When P0-12=1. PB-16=6, after modifying the frequency through the up and down keys on the panel, the modified frequency will display a power failure memory.

Note: When memory is selected, it is only applicable to normal stop. If power is cut off suddenly during operation, the frequency will not be memorized after power is turned on again.

Parameter	Name	Range
P0-13	Max output frequency	50.00Hz~600.00Hz

Used to set the maximum output frequency of inverter.

Parameter	Name	Range	
P0-14	Upper limit frequency source	0	Set by P0-15
		1	AI1
		2	AI2
		3	Body panel potentiometer knob setting
		5	Communication setting

The default upper limit frequency is set by P0-15. It can also be set by analog quantity (AI1, AI2), pulse and communication. When the operating frequency reaches the upper limit frequency, the upper limit frequency will be maintained. Analog and PULSE set upper limit frequency source, please refer to P2-01~P2-70.

Parameter	Name	Range
P0-15	Upper limit frequency	Lower limit frequency P0-17~ max output frequency P0-13

Set the upper limit frequency, the setting range is from lower limit frequency P0-17 to max output frequency P0-13.

Parameter	Name	Range
P0-16	Upper limit frequency offset	0.00Hz~max output frequency (P0-13)

When the upper limit frequency source P0-14 is set to analog or pulse setting, P0-16 is used as the offset of the set value, the offset frequency is added with the upper limit frequency value set by P0-14 to get the set value of the final upper limit frequency.

For example: the operation frequency is given as P0-10 = 30, P0-14 = 4 (pulse setting), P0-16 = 10. At this time, if the pulse frequency is not given, the inverter can only run to 10Hz. If the pulse frequency is given to 25Hz, the upper limit frequency is P0-16 + P0-14 (pulse) = 10 + 25 = 35Hz, it can run to the preset frequency 35Hz.

Parameter	Name	Range
P0-17	Lower limit frequency	0.00Hz~upper limit frequency (P0-15)

Set the lower limit frequency. The range is from 0.00Hz to upper limit frequency (P0-15).

Parameter	Name	Range
P0-18	Acceleration time 1	0 ~ 65000s (PC-09=0)
		0.0 ~ 6500.0s (PC-09=1)
		0.00 ~ 650.00s (PC-09=2)
P0-19	Deceleration time 1	0 ~ 65000s (PC-09=0)
		0.0 ~ 6500.0s (PC-09=1)
		0.00 ~ 650.00s (PC-09=2)

Acceleration time refers to the time required for the inverter to accelerate from 0Hz to the acceleration/deceleration base frequency (PC-10). Similarly, deceleration time refers to the time required for the inverter to decelerate from the acceleration/deceleration base frequency to 0Hz; As shown in the figure, T1 and T3 are the actual acceleration and deceleration time, T2 and T4 are the set acceleration and deceleration time. The other three kinds of acceleration and deceleration time (PC-03 ~ PC-08) are the same.
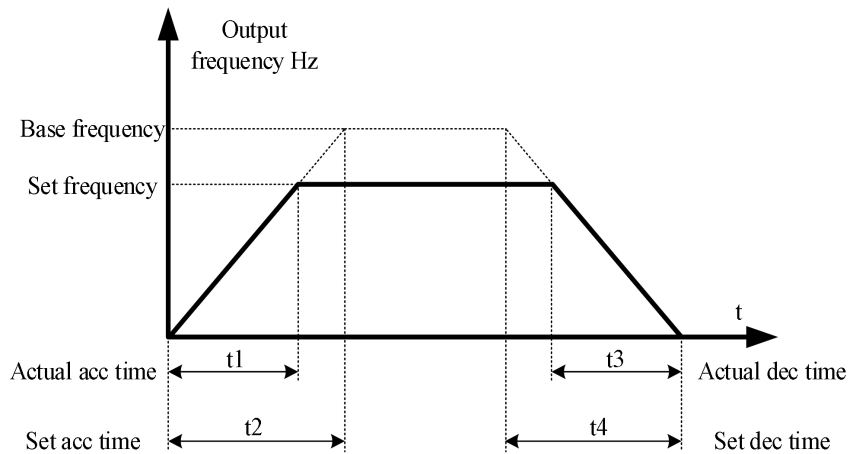
Parameter	Name	Range	
P0-20	Ones bit: Operation direction	0	Default operation direction
		1	Run in the opposite direction to the default direction
	Tens bit: Prohibit inversion	0	Invalid
		1	Valid

By changing the function code, the motor direction can be changed without changing the motor wiring, which is equivalent to changing the phase sequence of any two phases in the motor (U, V, W) to realize the conversion of motor rotation direction.

Note: after parameter initialization, the motor running direction will return to the original status. It is strictly forbidden to change the direction of the motor when the system is debugged.

Parameter	Name	Range	
P0-21	Reverse frequency prohibition	0	Invalid
		1	Valid

When the motor is not allowed to run in the reverse direction, the parameter should be set to 1.

When operation command control through the terminal, if reverse operation is required, the function code P0-21 must be set to 0 (reverse frequency suppression is invalid).

If P0-21=0 (reverse frequency prohibition is invalid), the operation frequency of the inverter by communication setting is negative or reverse operation command by external setting, and the inverter will operate in reverse.

If P0-21=1 (reverse frequency prohibition is valid), the operation frequency of the inverter by communication setting is negative or reverse operation command by external setting, and the inverter will operate at 0Hz.

The function of input terminal 49 "prohibit inversion" is the same as that of P0-21.

For applications where motor reverse rotation is not allowed, please don't modify the function code to change the steering, because the parameter setting will be reset after restoring factory settings.

Parameter	Name	Range
P0-22	Dead time of forward and reverse rotation	0.0s~3600.0s

The transition time at the output 0Hz during the process of forward and reverse rotation is shown as t1 in the figure.
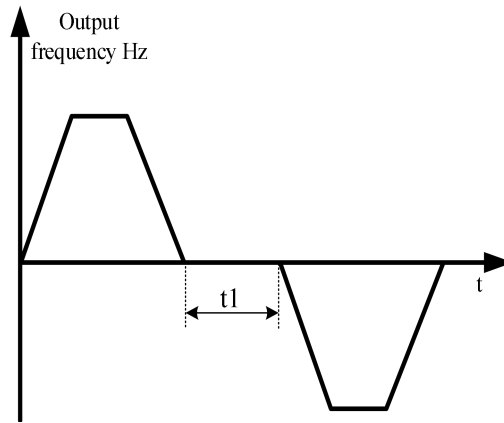
Parameter	Name	Range	
P0-23	Frequency command UP/DOWN base when operation	0	Operation frequency
		1	Setting frequency

This parameter is only valid when the frequency source is digital setting.

This parameter is used to confirm the mode to modify the setting frequency when the keyboard terminal UP/DOWN acted, which means the target frequency is increased or decreased based on the operating frequency or the set frequency.

The difference between the two settings is obvious when the inverter is in the process of acceleration and deceleration, that is, if the operating frequency of the inverter is different from the set frequency, the different selection of this parameter is very different.

Parameter	Name	Range	
P0-25	Motor parameter group selection	0	Motor parameter group 1
		1	Motor parameter group 2

VH1 series inverter can save two groups of motor parameters, and select the current working motor parameter group through P0-25. Two motors can set their own name plate parameters, and need to complete their own parameter tuning before operation. The parameters of motor parameter group 1 are P1 parameters, and the parameters of motor parameter group 2 are A2 parameters.

4-2-2. Group P1 First motor parameters

Parameter	Name	Range
P1-00	Motor type selection	0: Common asynchronous motor
P1-01	Motor rated power	0.1kW~650.0kW
P1-02	Motor rated voltage	1V~1200V
P1-03	Motor rated current	0.01A~655.35A (VFD power ≤55kW） 0.1A~6553.5A (VFD power >55kW）
P1-04	Motor rated frequency	0.01Hz~max output frequency
P1-05	Motor rated speed	1rpm~65535rpm

P1-00 ~ P1-05 are the parameters on the motor nameplate. It is recommended to input these parameters manually after getting the new product.

Parameter	Name	Range
P1-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω (VFD power≤55kW) 0.0001Ω~6.5535Ω (VFD power>55kW)
P1-07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω (VFD power≤55kW) 0.0001Ω~6.5535Ω (VFD power>55kW)
P1-08	Leakage inductance of asynchronous	0.01mH~655.35mH (VFD power≤55kW)

	motor	0.001mH~65.535mH (VFD power>55kW)
P1-09	Mutual inductance of asynchronous motor	0.01mH~655.35mH (VFD power≤55kW) 0.001mH~65.535mH (VFD power>55kW)
P1-10	No load current of asynchronous motor	0.01A~P1-03 (VFD power≤55kW) 0.1A~P1-03 (VFD power>55kW)

Generally, P1-06~P1-10 cannot be viewed on the motor body, and the response data will be automatically calculated and generated after the motor is tuned.

parameter	Name	Range
P1-35	Self learning of motor parameters	0: No operation 1: Static tuning 1 2: Dynamic tuning 3: Static tuning 2

Generally speaking, the effect of dynamic tuning is better than that of static tuning. It is suggested to choose dynamic tuning, but dynamic tuning should separate the load from the motor. If it is difficult to separate the load from the motor, only static tuning can be selected. Static tuning 2 has a longer tuning time and better tuning effect compared to static tuning 1. Both static tuning and dynamic tuning are only valid in vector mode, that is, when P0-01 is set to 1 or 2.

Steps for tuning the insensitivity vector mode:

(1) Set P0-01 to 1, no speed sensor vector mode. Set P0-02 to 0, panel control.

(2) Set P1-00 ~ P1-05 according to the motor nameplate in turn.

(3) If it is convenient to separate the load from the motor, select dynamic tuning. If it is not convenient to separate, select static tuning.

(4) Take dynamic tuning as an example, set P1-35 to 2, then press the ENT key. The panel will display TUNE, then press the RUN key, the tuning will start. The TUNE light will flash slowly, and the tuning will be completed in about 2 minutes. After completion, the TUNE will disappear and the panel will display the frequency.

4-2-3. Group P2 Input terminal multi-function parameters

VH1 series inverter can be equipped with 5 multifunctional digital input terminals and 2 analog input terminals. Table 4-1 provides a detailed description of each function.

parameter	Name	Range
P2-00	Input terminal X1 function selection	
P2-01	Input terminal X2 function selection	
P2-02	Input terminal X3 function selection	0~51
P2-03	Input terminal X4 function selection	
P2-04	Input terminal X5 function selection	

Setting value	Function	Explanation
0	No function	The unused terminals can be set as "no function" to prevent misoperation.
1	FWD or RUN command	Control the inverter forward and reverse operation through the external terminal
2	REV or FWD/REV operation direction	
3	Three wire mode operation control	Set the inverter operation mode to three wire control mode through this terminal. Please refer to the description of function code P2-10

Setting value	Function	Explanation
		("terminal command mode") for details.
4	Forward jog (FJOG)	FJOG is forward jog operation, RJOG is reverse jog operation. Please refer to the description of function code PC-01 and PC-02 for jog operation frequency and jog acceleration and deceleration time.
5	Reverse jog (RJOG)	
6	Terminal UP	When the frequency is set by the external terminal, the command to increase and decrease the frequency. When the frequency source is set to digital setting, the setting frequency can be adjusted up and down.
7	Terminal DOWN	
8	UP/DOWN setting clear (terminal, keyboard)	When the frequency is set through digital frequency, this terminal can clear the frequency value changed by terminal up/down or keyboard up/down, and make the setting frequency return to the value set by P0-10.
9	Free stop	The inverter blocks the output, and the motor stop process is not controlled by the inverter. This mode has the same meaning as free stop in P4-22.
10	Fault reset (RESET)	Use the terminal to reset the fault. It has the same function as the RESET key on the keyboard. With this function, remote fault reset can be realized.
11	Frequency source switching	Main and auxiliary frequency source switching
12	Multi-segment command terminal 1	Through the 16 statuss of the four terminals, the setting of 16 segment speed or 16 other commands can be realized. See the attached table for details.
13	Multi-segment command terminal 2	
14	Multi-segment command terminal 3	
15	Multi-segment command terminal 4	
16	Acceleration/deceleration time selection terminal 1	Through the four statuss of the two terminals, four kinds of acceleration and deceleration time can be selected. See the attached table for details.
17	Acceleration/deceleration time selection terminal 2	
18	Acceleration and deceleration prohibit	Ensure that the inverter is not affected by external signals (except stop command), and maintain the current output frequency.
20	Counter input	Input terminal of count value.
21	Counter reset	Clear the count value.
22	Length counter input	Input terminal of length counter value.
23	Length counter reset	Clear the length counter status.
24	Swing frequency pause	The inverter outputs at the center frequency. The swing function is paused.
25	Operation pause	The inverter decelerates and stops, but all operating parameters are memorized. Such as PLC parameters, swing frequency parameters, PID parameters. After the signal of this terminal disappears, the inverter will return to the running status before stop

Setting value	Function	Explanation
26	PLC status reset	PLC pauses during operation. When it operates again, the inverter can be restored to the initial status of simple PLC through this terminal
27	Run command switch to keyboard	When the terminal is valid, the operation command is switched to the keyboard.
28	Run command switch to communication	When the terminal is valid, the operation command is switched to communication
29	Torque control prohibited	It is forbidden for the inverter to control the torque, and the inverter enters the speed control mode
30	Switch between speed control and torque control	The converter is switched between torque control and speed control. When the terminal is invalid, the inverter operates in the mode defined by (PF-00). If the terminal is valid, it will be switched to another mode. During operation, it can be switched through the terminal, and the switch will take effect immediately
32	PID pause	PID is temporarily invalid, the inverter maintains the current output frequency, and no longer adjusts the PID of frequency source.
33	PID reverse direction of action	When the terminal is valid, the PID function reverses
34	PID integral pause	When the terminal is valid, the integral regulation function of PID is suspended, but the proportional regulation and differential regulation function of PID are still valid.
35	PID parameter switching	When the PID parameter switching condition is terminal X (PA-13), and the terminal is invalid, the PID parameters use PA-10 ~ PA-12; When the terminal is valid, PA-16 ~ PA-18 are used.
36	External fault normally open input	When the signal is sent to the inverter, the inverter will report the fault Err43 and deal with the fault according to the action mode of fault protection (see function code P7-46 for details).
37	External fault normally close input	When the normally closed signal of external fault is sent to the inverter, the inverter reports the fault err43 and stops.
38	User-defined fault 1	When user defined fault 1 and 2 are valid, the inverter alarms Err48 and Err49 respectively. The inverter will handle according to the action mode selected by fault protection action selection (P7-47).
39	User-defined fault 2	
40	Motor parameter selection terminal	Two groups of motor parameters can be switched through the two statuss of terminals.
41	Switch between main frequency source A and preset frequency	If the terminal is valid, frequency source A is replaced by preset frequency (P0-10)
42	Switch between auxiliary frequency source B and preset frequency	If the terminal is valid, frequency source B is replaced by preset frequency (P0-10)
43	Frequency setting valid terminal	When the terminal is valid, it is allowed to modify the frequency; If it is invalid, it is forbidden to modify the frequency.
44	DC brake	When the terminal is valid, the inverter will switch to DC braking status directly
45	Deceleration DC braking	When the terminal is valid, the inverter first decelerates to the

Setting value	Function	Explanation
		starting frequency of DC braking, and then switches to the DC braking status.
46	Emergency stop	When the terminal is valid, the inverter stops at the fastest speed, and the current is in the upper limit of the set current during the stop process. This function is used to meet the needs of the inverter to stop as soon as possible when the system is in emergency.
47	External stop terminal 1	When keyboard control, the terminal can be used to stop the inverter, which is equivalent to the function of stop key on the keyboard
48	External stop terminal 2	In any control mode (panel control, terminal control, communication control), the terminal can be used to slow down the inverter, and the deceleration time is fixed as deceleration time 4.
49	Prohibit inversion	When the terminal is valid, the inverter reverse rotation is prohibited
50	The running time is cleared	When the terminal is valid, the inverter operation time is cleared. This function needs to be matched and used with the timing operation (PC-28) and the current operation time (PC-29).
51	Two wire / three wire switching	Used to switch between two-wire and three-wire mode

Four multi-segment command terminals can be combined into 16 statuss, each of which corresponds to 16 command settings. The details are as follows:

K4	K3	K2	K1	Command setting	Parameter
OFF	OFF	OFF	OFF	Multi-segment command 0	PB-00 (PB-16=0)
OFF	OFF	OFF	ON	Multi-segment command 1	PB-01
OFF	OFF	ON	OFF	Multi-segment command 2	PB-02
OFF	OFF	ON	ON	Multi-segment command 3	PB-03
OFF	ON	OFF	OFF	Multi-segment command 4	PB-04
OFF	ON	OFF	ON	Multi-segment command 5	PB-05
OFF	ON	ON	OFF	Multi-segment command 6	PB-06
OFF	ON	ON	ON	Multi-segment command 7	PB-07
ON	OFF	OFF	OFF	Multi-segment command 8	PB-08
ON	OFF	OFF	ON	Multi-segment command 9	PB-09
ON	OFF	ON	OFF	Multi-segment command 10	PB-10
ON	OFF	ON	ON	Multi-segment	PB-11

				command 11	
ON	ON	OFF	OFF	Multi-segment command 12	PB-12
ON	ON	OFF	ON	Multi-segment command 13	PB-13
ON	ON	ON	OFF	Multi-segment command 14	PB-14
ON	ON	ON	ON	Multi-segment command 15	PB-15

When the frequency source is multi-speed, 100.0% of the function code PB-00 ~ PB-15 corresponds to the max output frequency P0-13. In addition to the function of multi-stage speed, the multi-stage instruction can also be used as the given source of PID, or as the voltage source of VF separation control, so as to meet the needs of switching between different given values.

Terminal 2	Terminal 1	Acc/dec time	Parameter
OFF	OFF	Acc/Dec time 1	P0-18, P0-19
OFF	ON	Acc/Dec time 2	PC-03, PC-04
ON	OFF	Acc/Dec time 3	PC-05, PC-06
ON	ON	Acc/Dec time 4	PC-07, PC-08

Parameter	Name	Function
P2-10	Terminal command mode	0: Two-wire mode 1 1: Two-wire mode 2 2: Three-wire mode 1 3: Three-wire mode 2

This parameter defines four different ways to control the operation of the inverter through the external terminal.

Note: for the convenience of explanation, the following three terminals X1, X2 and X3 of the multifunctional input terminals X1 ~ X4 are randomly selected as the external terminals. That is to say, the functions of X1, X2 and X3 are selected by setting the values of P2-00 ~ P2-02. See the setting range of P2-00 ~ P2-03 for detailed function definition.

0: Two-wire mode 1

This mode is the most commonly used two-wire mode. The forward and reverse operation of the motor is determined by terminals X1 and X2. The function code setting is as follows:

Parameter	Name	Range	Function
P2-10	Terminal command mode	0	Two-wire mode 1
P2-00	X1 function selection	1	Forward run
P2-01	X2 function selection	2	Reverse run

K1	K2	Command
1	0	Forward
0	1	Reverse
1	1	Stop
0	0	Stop

NPN leakage wiring

PNP source wiring
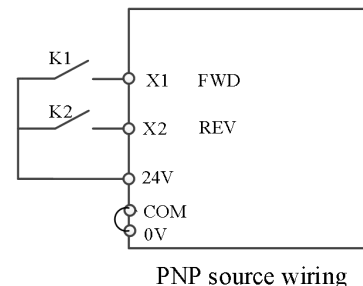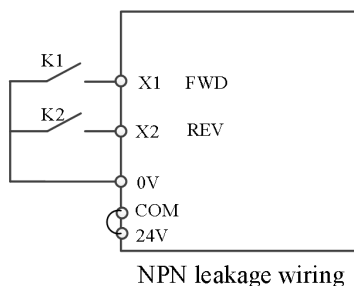
As shown in the figure, in this control mode, when K1 is closed, the inverter runs in forward direction. When K2 is closed, the inverter runs in reverse.When K1 and K2 are closed or disconnected at the same time, the inverter stops running.

1: Two-wire mode 2

In this mode, X1 terminal function is enable terminal, while X2 terminal function determines operation direction. The function code setting is as follows:

Parameter	Name	Range	Function
P2-10	Terminal command mode	1	Two-wire mode 2
P2-00	X1 function selection	1	Operation enable
P2-01	X2 function selection	2	FWD/REV operation direction

K1	K2	Command
1	0	Forward
1	1	Reverse
0	0	Stop
0	1	Stop
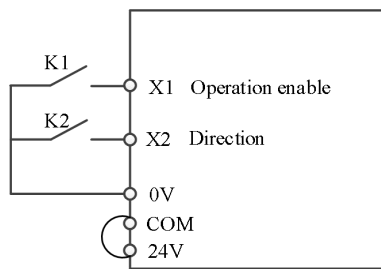
NPN leakage wiring   PNP source wiring
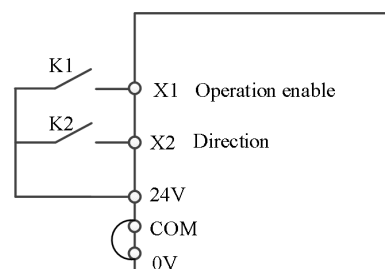
As shown in the figure, in the control mode of K1 closed status, K2 opens and the inverter rotates forward, K2 closes and the inverter reverses. K1 is disconnected and the inverter stops.

2: Three-wire mode 1

In this mode X3 is enable terminal, X1 and X2 control the direction.

The function code setting is as follows:

Parameter	Name	Range	Function
P2-10	Terminal command mode	2	Three-wire mode 1
P2-00	X1 function selection	1	Forward run
P2-01	X2 function selection	2	Reverse run
P2-02	X3 function selection	3	Three-wire control mode
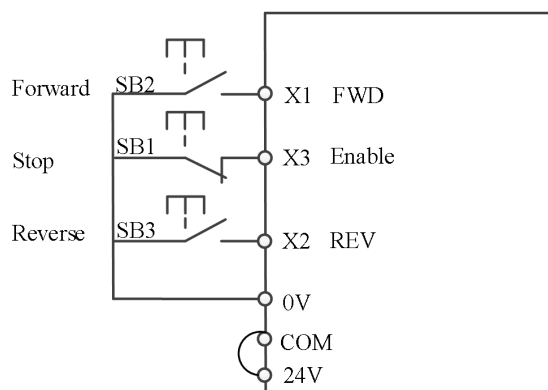
NPN leakage wiring   PNP source wiring
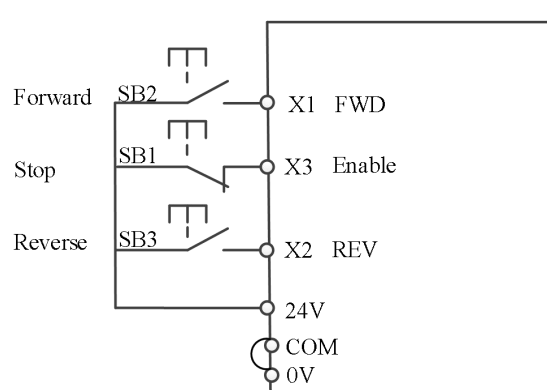
As shown in the figure, in the control mode, when SB1 button is closed, press SB2 button, the inverter rotates forward, and then press SB3 button, the inverter reverses, SB1 button is disconnected, and the inverter stops. During normal start-up and operation, SB1 button must be kept closed, SB2 and SB3 button commands will take effect at the closing action edge, and the operation status of inverter is subject to the last action of the three buttons.

3: Three-wire control mode 2

In this mode, X2 is enable terminal, X1 controls the operation, X3 controls the direction.

The function code setting is as follows:

Parameter	Name	Range	Function
P2-10	Terminal command mode	3	Three-wire mode 2
P2-00	X1 function selection	1	Enable
P2-01	X2 function selection	3	Three-wire control mode
P2-02	X3 function selection	2	Direction

NPN leakage wiring   PNP source wiring
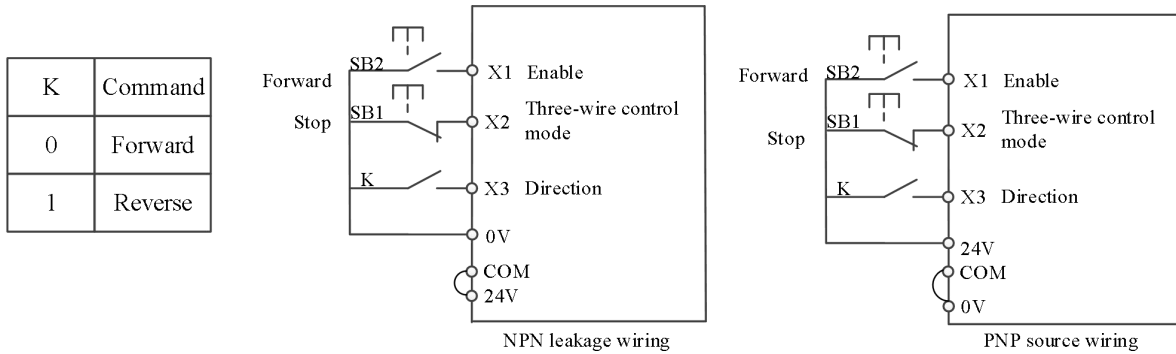
As shown in the figure, in the SB1 button closed status, press the SB2 button, the inverter runs, K opens the inverter forward, K closes the inverter reverse; When SB1 button is off, the inverter stops. During normal start-up and operation, SB1 button must be kept closed, and SB2 button command will take effect at the closing action edge.

Parameter	Name	Range
P2-11	Terminal UP/DOWN changing rate	0.001Hz/s~50.000Hz/s

It is used to set the speed of frequency change when the terminal up / down adjusts the set frequency, that is, the change of frequency per second.

Parameter	Name	Range
P2-12	X terminal filtering time	0.000s~1.000s

Set the software filter time of X terminal status. If the input terminal is easy to be disturbed and cause misoperation, this parameter can be increased to enhance the anti-interference ability. However, the increase of the filtering time will slow down the response of the X terminal.

Parameter	Name	Range
P2-13	X1 delay time	0.0s~3600.0s
P2-14	X2 delay time	0.0s~3600.0s
P2-15	X3 delay time	0.0s~3600.0s

It is used to set the delay time of inverter when the status of X terminal changes.

At present, only X1, X2 and X3 have the function of setting the delay time.

Parameter	Name	Content	Range
P2-16	X1 terminal valid status setting	Ones bit	0: Low level valid 1: High level valid
	X2 terminal valid status setting	Tens bit	0: Low level valid 1: High level valid
	X3 terminal valid status setting	Hundreds bit	0: Low level valid 1: High level valid
	X4 terminal valid status setting	Thousands bit	0: Low level valid 1: High level valid
	X5 terminal valid status setting	Ten thousands bit	0: Low level valid

			1: High level valid

This function code is used to set the valid status of the input terminal of the inverter.

Parameter	Name	Range
P2-22	AI curve 2 min setting	0.00V~P2-24
P2-23	AI curve 2 min setting corresponding frequency percentage	-100.0%~+100.0%
P2-24	AI curve 2 max setting	P2-22~+10.00V
P2-25	AI curve 2 max setting corresponding frequency percentage	-100.0%~+100.0%

AI curve parameters are used to set the relationship between analog input voltage and its representative setting value, as shown in the figure below.

When the analog input is greater than the maximum setting (less than the minimum setting), it is calculated according to the maximum setting (minimum setting). Two typical settings are provided as follows:
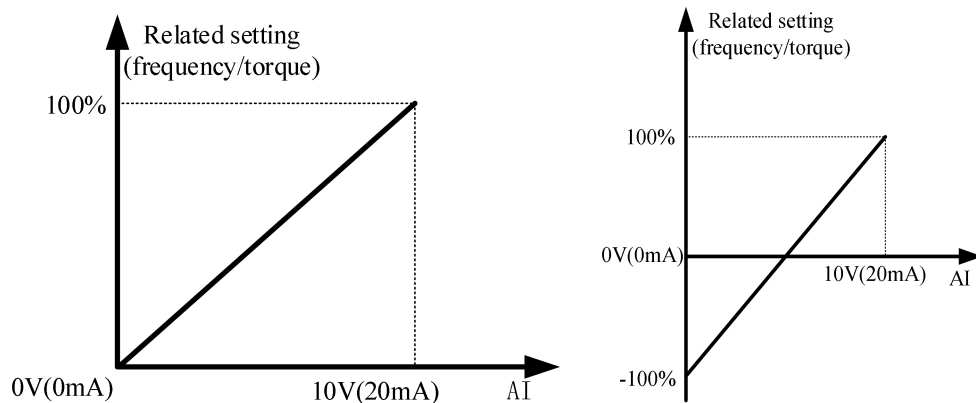
The functions of AI curve 1 (P2-18~P2-21) /AI curve 3 (P2-26~P2-29) are same to AI curve 2.

By default, the correspondence between the input voltage value of AI and the target frequency is curve 2, with corresponding parameters set between P2-22 and P2-25.

Parameter	Name	Range
P2-30	AI curve 4 min input	0V~P2-32
P2-31	AI curve 4 minimum input corresponding setting	-100.0%~+100.0%
P2-32	AI curve 4 inflection point 1 input	P2-30~P2-34
P2-33	AI curve 4 inflection point 1 input corresponding setting	-100.0%~+100.0%
P2-34	AI curve 4 inflection point 2 input	P2-32 ~ P2-36
P2-35	AI curve 4 inflection point 2 input corresponding setting	-100.0% ~ +100.0%
P2-36	AI curve 4 max input	P2-34 ~ +10.00V
P2-37	AI curve 4 max input corresponding setting	-100.0% ~ +100.0%
P2-38	AI curve 5 min input	-10.00V ~ P2-40
P2-39	AI curve 5 minimum input corresponding setting	-100.0% ~ +100.0%
P2-40	AI curve 5 inflection point 1 input	P2-38 ~ P2-42
P2-41	AI curve 5 inflection point 1 input corresponding setting	-100.0% ~ +100.0%
P2-42	AI curve 5 inflection point 2 input	P2-40 ~ P2-44
P2-43	AI curve 5 inflection point 2 input corresponding setting	-100.0% ~ +100.0%
P2-44	AI curve 5 max input	P2-42 ~ +10.00V
P2-45	AI curve 5 max input corresponding setting	-100.0% ~ +100.0%

Curve 4 is determined by four points, which is more flexible.

The voltage/current should meet the requirement: AI min input (P2-30) ＜AI curve inflection point 1 input (P2-32) ＜AI curve inflection point 2 input (P2-34) ＜AI max input (P2-36).

Curve 5 please refer to the explanation of curve 4.
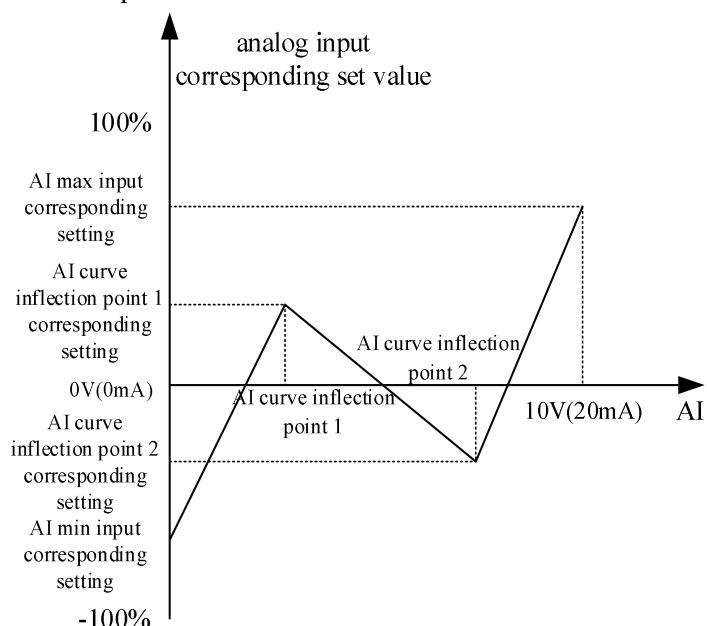
Parameter	Name	Range	
P2-54	AI curve selection	Ones bit	AI1 curve selection
		1	Curve 1 (2 points, refer to P2-18~P2-21)
		2	Curve 2 (2 points, refer to P2-22~P2-25)
		3	Curve 3 (2 points, refer to P2-26~P2-29)
		4	Curve 4 (4 points, refer to P2-30~P2-37)
		5	Curve 5 (4 points, refer to P2-38~P2-45)
		Tens bit	AI2 curve selection, ditto

Curve 1, curve 2 and curve 3 are linear relations determined by two coordinate points. Curve 4 and curve 5 are broken line relations determined by four coordinate points.

Parameter	Name	Range	
P2-55	AI below minimum input setting selection	Ones bit	AI1 below minimum input setting selection
		0	Corresponding minimum input setting
		1	0.0%
		Tens bit	AI2 below minimum input setting selection, ditto

The ones and tens bits of the parameter correspond to the analog input AI1 and AI2 respectively.

If 0 is selected, when AI input is lower than "minimum input", the corresponding setting of the analog quantity is the "minimum input corresponding setting" (P2-18, P2-22, P2-26) of the curve determined by the parameters.

If 1 is selected, when AI input is lower than the minimum input, the corresponding setting of the analog quantity is 0.0%.

Parameter	Name	Range
P2-56	AI1 filter time constant	0.00s~10.00s
P2-57	AI2 filter time constant	0.00s~10.00s

AI1 filtering time constant is used to set the software filtering time of AI1. When the on-site analog quantity is easy to be interfered, please increase the filtering time to make the detected analog quantity tend to be stable, but the larger the filtering time, the slower the response speed of analog quantity detection.

Parameter	Name	Range
P2-59	AI mode switch	Ones bit: AI1 0: Voltage

		1: Current

AI mode switching refers to when using the AI1 function, setting it to voltage or current based on the input analog quantity, and switching the trip cap according to the corresponding mode.

Parameter	Name	Range
P2-60	AI1 jump point	-100%~+100.0%
P2-61	AI1 jump range	0.0%~100.0%
P2-62	AI2 jump point	-100%~+100.0%
P2-63	AI2 jump range	0.0%~100.0%

The jump function is to fix the corresponding setting value of the analog quantity to the jump point when the corresponding setting of the analog quantity changes in the upper and lower intervals of the jump point.

For example: the voltage of analog input AI fluctuates up and down at 5.00V, the fluctuation range is 4.90V ~ 5.10V, the minimum input of AI 0.00V corresponds to 0.0%, and the maximum input of AI 10.00V corresponds to 100%. Then the detected AI corresponding setting fluctuates between 49.0% and 51.0%.

Set AI jump point P2-60 to 50.0%, set AI jump range P2-61 to 1.0%, then the AI input is fixed to 50.0%, after jump function processing, AI is transformed into a stable input, and the fluctuation is eliminated.

4-2-4. Group P3 Output terminal multi-function parameters

By setting the values of functional parameters P3-01 and P3-04, various output functions can be defined.

Parameter	Name	Range
P3-00	Y1 output mode selection	0: High speed pulse output

Parameter	Name	Range
P3-01	Y1 output function selection	0~42 code functions are as follows
P3-04	Relay 1 output function selection	

Setting value	Function	Explanation
0	No output	The output terminal has no function
1	Inverter in operation	Indicates that the inverter is in operation status, with output frequency (can be zero), output ON signal.
2	Fault output (stop fault)	When the inverter fails and stops, the ON signal is output.
3	Frequency level detection FDT1 output	Refer to PC-18, PC-19 explanation.
4	Frequency level detection FDT2 output	Refer to PC-20, PC-21 explanation.
5	Frequency arrival	When the inverter operates and arrives the setting frequency, the ON signal is output.
6	Zero speed operation (no output when stop)	When the inverter opreates and the output frequency is 0, the ON signal is output. When the inverter is in the stop status, the signal is OFF.
7	Zero speed operation 2 (output when stop)	When the inverter output frequency is 0, the ON signal is output. The signal is also ON in the stop status.
8	Upper limit frequency arrival	When the operating frequency reaches the upper frequency, the ON signal is output.
9	Lower limit frequency arrival (no	When the operating frequency reaches the lower limit

Setting value	Function	Explanation
	output when stop)	frequency or below, the ON signal is output. The signal is OFF in the stop status.
10	Motor overload alarm	Before the motor overload protection action, it is judged according to the threshold of overload warning, and the ON signal is output after exceeding the threshold. Refer to function code P7-33-P7-35 for setting motor overload parameters.
11	Inverter overload alarm	The ON signal is output 10s before the overload protection of inverter.
12	Communication setting	Refer to communication protocol.
13	In torque limit	When the set frequency exceeds the upper or lower frequency, and the frequency of the inverter also reaches the upper or lower frequency, the ON signal is output.
15	Frequency 1 arrival output	Refer to PC-22, PC-23.
16	Frequency 2 arrival output	Refer to PC-24, PC-25.
17	Current 1 arrival output	Refer to PC-34, PC-35.
18	Current 2 arrival output	Refer to PC-36, PC-37.
19	Set counting value arrival	When the count value reaches the value set by A0-03, the ON signal is output.
20	Specified counting value arrival	When the count value reaches the value set by A0-04, the ON signal is output. The counting function is shown in the function description of group A0.
21	Ready for operation	When the power supply of the main circuit and control circuit of the inverter is stable, and the inverter does not detect any fault information, and the inverter is in the operational status, the ON signal is output.
23	AI1 input overrange	When the value of analog input AI1 is greater than PC-43 (upper limit of AI1 input protection) or less than PC-42 (lower limit of AI1 input protection), the ON signal is output.
24	Under voltage status output	When the inverter is under voltage, the ON signal is output.
25	Cumulative power on timne arrival	When the cumulative power on time of the inverter (U0-30) exceeds the set time of PC-30, the ON signal is output.
26	Timing arrival output	When the timing function (PC-26) is valid, the inverter will output ON signal when the operation time reaches the set timing time (PC-28).
27	Length arrival output	When the actual length detected exceeds the length set by A0-00, the ON signal is output.
28	Simple PLC cycle completed	When the simple PLC completes a cycle, it outputs a pulse signal with a width of 250ms.
29	Cumulative running time arriwal	When the cumulative operation time of the inverter(P8-10) exceeds the set time of PC-32, the ON signal is output.

Setting value	Function	Explanation
32	Lower limit frequency arrival (output when stop)	When the operating frequency reaches the lower frequency, the ON signal is output.
33	Fault output (stop fault and no output under voltage)	Stop fault and no output when under voltage.
34	Module temperature arrival	When the inverter module radiator temperature (P8-19) reaches the set module temperature (PC-47), the ON signal is output.
35	Fault output (output only after fault stop)	When the inverter fails, the inverter alarm output.
36	Motor over temperature alarm	Motor temperature acquisition value is greater than P7-37 value, alarm output
37	In reverse operation	When the inverter is in reverse operation, the ON signal is output.
38	Load dropping	Load suddenly unloaded
39	Output current overrange	Refer to PC-40, PC-41.
40	Zero current status	Refer to PC-38, PC-39.
41	Current operation time arrival	When the starting time of the inverter exceeds the time set by PC-29, the ON signal is output.
42	Bus voltage arrival	Refer to PC-65, PC-66

Parameter	Name	Range
P3-06	Y1(Ordinary terminal) output delay time	0.0~3600.0s
P3-09	Relay 1 output delay time	0.0~3600.0s

It is used to set the delay time when the status of Y terminal changes.

Parameter	Name	Range
P3-11	Y terminal valid status selection	Ones bit: Y1 Thousands bit: Relay 1 0: Positive logic close valid / open invalid 1: Negative logic close invalid/open valid
P3-13	AO1 output function selection	0~13 parameters and functions are shown in the table below

Setting value	Function	Explanation
0	Operation frequency	0 ~ max output frequency
1	Set frequency	0 ~ max output frequency
2	Output current	0 ~ 2 times motor rated current
3	Motor output torque (absolute, percentage relative to motor)	0 ~ 2 times motor rated torque
4	Output power	0 ~2 times rated power
5	Output voltage	0 ~1.2 times VFD rated voltage
6	AI1	0V ~ 10V (or 0 ~ 20mA)
7	AI2	
10	Output speed	0 ~ Output speed corresponding to maximum

		output frequency
11	Communication control output	0.0%~100.0%
12	Counting value	0 ~ max counting value
13	Length	0 ~ max setting length

Parameter	Name	Range
P3-15	AO1 zero bias coefficient	-100.0 ~ +100.0%
P3-16	AO1 gain	-10.00 ~ +10.00

The above function codes are generally used to correct the zero drift of analog output and the deviation of output amplitude. It can also be used to customize the required AO output curve.

If the bias is represented by b, the gain is represented by k, the actual output is represented by Y, and the standard output is represented by X, then the actual output is:

$$Y = kX + b$$

Among them, 100% of the bias coefficient of AO1 corresponds to 10V (or 20mA), and the standard output refers to the amount of 0V ~ 10V (or 0mA ~ 20mA) corresponding to the analog output without bias and gain correction.

For example, if the analog output content is the operating frequency, and you want the actual output to be 8V (or 16mA) when the frequency is 0, as shown in the figure below, you need to set the zero offset to "80%"; If you want to output 3V (or 6mA) at the maximum frequency, as shown in the figure below, you need to set the gain to "- 0.50".
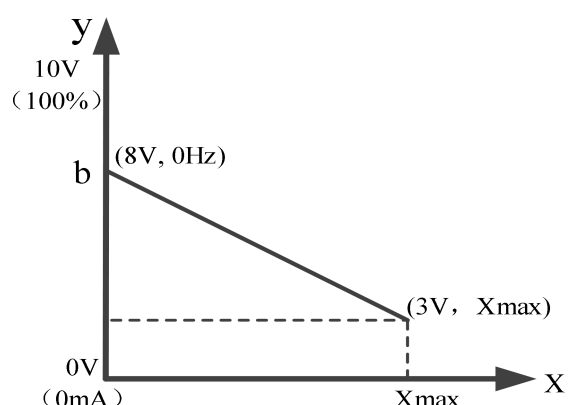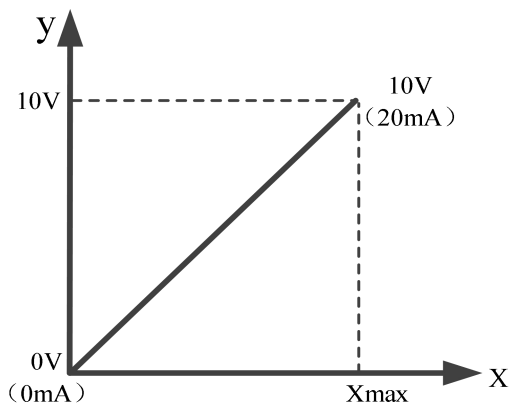
$$\text{Zero bias coefficient} = \frac{\text{output at 0Hz}}{\text{max output}} \times 100\%$$

$$\text{Gain} = \frac{\text{output at max frequency- output at 0Hz}}{\text{max output}}$$

4-2-5. Group P4 Startup brake parameters

Parameter	Name	Range
P4-00	Start mode	0: Direct start 1: Speed tracking restart 2: Pre-excitation start (AC asynchronous motor)

Note: This parameter needs to be modified in vector control mode (P0-01=1 or 2) (3742 and above versions support modification in VF mode)

0: Direct start

Suitable for small inertia load

1: Speed tracking restart

It is suitable for the case of instantaneous power loss and restart of large inertia load. At this time, the corresponding parameters of P4 group should be set correctly.

2: Pre-excitation start (AC asynchronous motor)

It is only valid for AC asynchronous motor, and magnetic field is established before motor is running.

If the pre-excitation time P4-04 is not 0, the dynamic response performance of the motor can be improved by pre-excitation and then starting.

If the pre-excitation time is set to 0, the inverter cancels the pre-excitation process and starts from the start frequency.

Parameter	Name	Range
P4-01	Starting frequency	0.00Hz~10.00Hz
P4-02	Start frequency duration	0.0s~100.0s
P4-03	Starting DC brake current/Pre-excitation current percentage	0%~100%
P4-04	DC braking time during startup/pre-excitation time	0.0s~100.0s

If the starting DC braking time is set to 0, the inverter starts to run from the starting frequency.

If the starting DC braking time is not 0, the DC braking is performed first, and then run at the starting frequency. It is suitable for small inertia load, where the motor may rotate when starting.

Starting DC braking is only valid when the starting mode is direct starting. At this time, the inverter starts DC braking according to the set starting DC braking current, and then starts to run after starting DC braking time. If the DC braking time is set to 0, it will start directly without DC braking. The greater the DC braking current is, the greater the braking force is.

If the starting mode is pre-excitation starting of asynchronous motor, the inverter first establishes the magnetic field according to the set pre-excitation current P4-03, and then starts to run after the set pre-excitation time P4-04. If the pre-excitation time is set to 0, it will start directly without pre-excitation process.

When the rated current of the motor is less than or equal to 80% of the rated current of the inverter, it is the percentage base value relative to the rated current of the motor; When the motor rated current is greater than 80% of the rated current of the inverter, it is relative to 80% of the rated current of the inverter as the percentage base value.

Parameter	Name	Range
P4-05	Start protection selection	0: No protection 1: Protection

If P4-05 is set to 1, when the inverter start-up and stop is set to terminal start-up and stop, the start-up terminal will be triggered again after power failure and restart.

Parameter	Name	Range
P4-06	Speed tracking mode (Only valid for asynchronous motors)	0: Starting from the stop frequency 1: Starting from power frequency 2: Starting from maximum output frequency
P4-07	Speed tracking speed	1~100

In order to realize the smooth and shock free starting of the rotating motor. The inverter first judges the speed and direction of the motor, and then starts the motor with the tracking frequency. There are three ways to track the speed:

0: Track down from the frequency of power failure, which is usually selected.

1: It can be used when the power frequency is switched, and it can be used when the power is cut off for a long time.

2: Track down from the maximum frequency, often used by power generating load.

P4-07 is used to set the tracking speed when the speed tracking is restarted. The larger the parameter setting value is, the faster the tracking speed is. However, too much leads to unreliable tracking effect.

Parameter	Name	Range
P4-10	Speed tracking closed loop current	30%~200%

The maximum current in the speed tracking process is limited within the set value of "speed tracking current". If the setting value is too small, the effect of speed tracking will be worse.

Parameter	Name	Range
P4-19	Acceleration and deceleration mode	0: Linear acceleration and deceleration 1: Continuous S-curve acceleration and deceleration 2: Intermittent S-curve acceleration and deceleration

0: Linear acceleration and deceleration

The output frequency increases or decreases linearly. Four kinds of acceleration and deceleration time (P0-18 ~ P0-19, PC-03 ~ PC-08) can be selected through the multi-function input terminal (P2-00 ~ P2-09).

1: Continuous S-curve acceleration and deceleration

When the target frequency is fixed, the output frequency is increased or decreased according to the S curve. It is suitable for the case of slow start or stop.

2: Intermittent S-curve acceleration and deceleration

It is suitable for the real-time change of target frequency and rapid response. The output frequency is increased or decreased in real time according to S curve. It is suitable for occasions with high comfort requirements and fast response.

Parameter	Name	Range
P4-20	S curve start segment proportion	0.0%~ (100.0%-P4-21)
P4-21	S curve end segment proportion	0.0%~ (100.0%-P4-20)

When selecting static S-curve, the sum of parameters P4-20 and P4-21 must be less than or equal to 100%.

In the figure, t1 is the proportion of the beginning segment of S-curve defined by P4-20, t2 is the proportion of the end segment of S-curve defined by P4-21, and the slope of output frequency change between t1 and t2 is a fixed value, which is linear acceleration and deceleration. As shown in the figure.
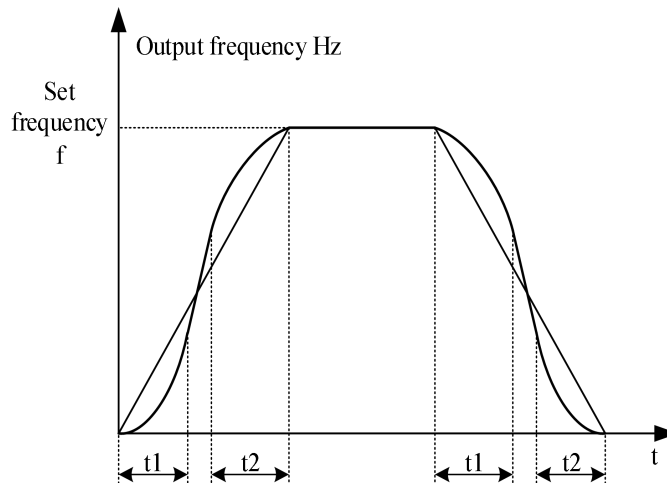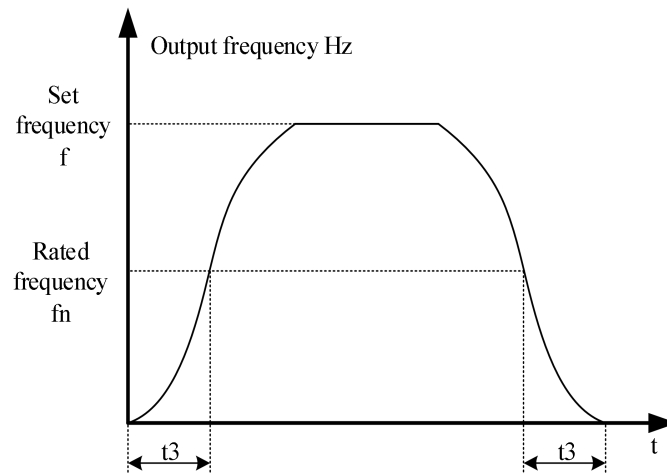
Parameter	Name	Range
P4-22	Stop mode	0: Deceleration stop 1: Free stop
P4-23	Starting frequency of DC braking during stop	0.00Hz~max output frequency P0-06
P4-24	DC braking waiting time during stop	0.0s~100.0s
P4-25	Percentage of DC braking current during stop	0%~100%
P4-26	DC brake time during stop	0.0s~100.0s

When the stop mode is deceleration stop, stop the machine according to the set deceleration time.

DC braking is suitable for situations where the motor is running freely after braking first and then starting: suitable for situations where torque needs to be maintained after braking to zero speed, not suitable for large inertia loads or rapid braking, not suitable for braking when the motor is running at high speed, and does not require a braking resistor.

Braking process: the inverter drops according to the set deceleration time. When the frequency drops to P4-23, wait for the time set by P4-24, and then brake with the current set in P4-25. The braking time is P4-26. The braking effect depends on the actual operating conditions. If the machine does not stop within the DC braking time, the stop state will automatically switch to free stop.

4-2-6. Group P5 VF parameters

Parameter	Name	Range	
P5-00	VF curve setting	0	Linear VF
		1	Multipoint VF
		2	Square VF
		3	The 1.2nd power VF
		4	The 1.4th power VF
		6	The 1.6th power VF
		8	The 1.8th power VF
		10	VF complete separation mode
		11	VF half separation mode

0: Linear VF

Suitable for common constant torque load.

1: Multipoint VF

Suitable for dehydrator, centrifuge and other special loads. By setting P5-01 ~ P5-06 parameters, any VF relation curve can be obtained.

2: Square VF

Suitable for centrifugal loads such as fans and pumps.

3: The 1.2nd power VF/ 4: The 1.4th power VF/ 6: The 1.6th power VF/ 8: The 1.8th power VF

VF relationship curve between line VF and square VF.

10: VF complete separation mode

The output frequency and voltage of the inverter are independent of each other. The output frequency is determined by the frequency source and the output voltage is determined by P5-09 (the voltage source of VF separation).

11: VF half separation mode

In the VF half separation mode, V and F are proportional, but the proportional relationship can be set through the voltage source P5-09, and the relationship between V and F is also related to the rated voltage and rated frequency of the motor in group F1.

The relationship between inverter output voltage V and frequency F:

$$\frac{V}{F} = \frac{2 \times A \times \text{motor rated voltage}}{\text{motor rated power}}$$

, A is percentage of voltage source input (0~100%).

Parameter	Name	Range
P5-01	Multipoint VF frequency point F1	0.00Hz~P5-03
P5-02	Multipoint VF voltage point V1	0.0~100.0%
P5-03	Multipoint VF frequency point F2	P5-01~P5-05
P5-04	Multipoint VF voltage point V2	0.0~100.0%
P5-05	Multipoint VF frequency point F3	P5-05~P1-04(motor rated frequency)
P5-06	Multipoint VF voltage point V3	0.0~100.0%

When P5-00 = 1, the VF curve user-defined multi-point VF curve, as shown in the figure below, the user uses (V1, F1), (V2, F2), (V3, F3) three-point broken line mode to define the VF curve to adapt to the special load requirements.
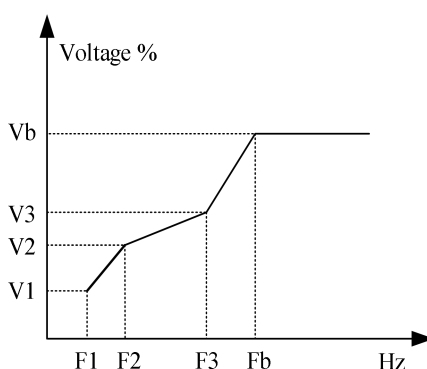
Note: V1 ~ V3: voltage percentage of section 1 ~ 3 of multipoint VF curve. F1 ~ F3: frequency point of section 1 ~ 3 of multipoint VF curve.

Parameter	Name	Range
P5-07	Torque boost	0.0% (automatical torque boost) 0.1%~30.0%
P5-08	Torque boost cut-off frequency	0.00Hz~P0-13(max output frequency)

Torque boost can improve the low frequency torque characteristics of VF, reduce the torque boost when the load is light, and increase when the load is heavy and the starting torque is not enough. When the torque boost is too large, the motor will be over excited, the output current of the inverter will increase, the motor heating will increase, and the efficiency will decrease.
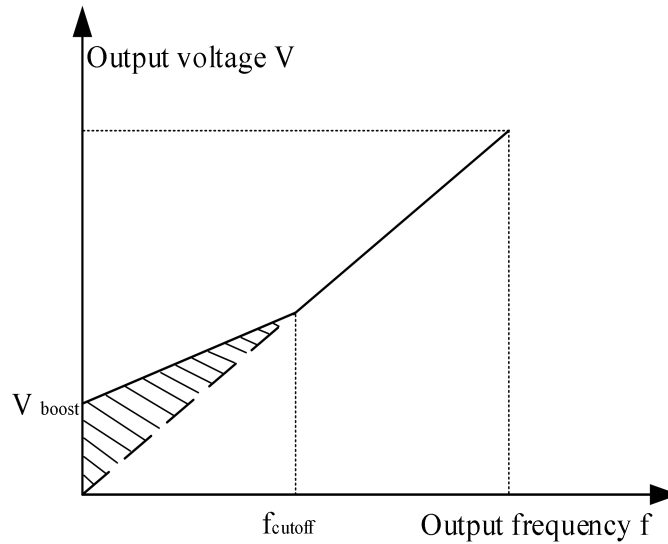
Parameter	Name	Range	
P5-09	The voltage source of VF separation	0	Digital setting (P5-10)
		1	AI1
		2	AI2
		5	Communication setting
		6	Multi-segment command
		7	PID setting
		8	Simple PLC operation
		100.0% corresponding to motor rated voltage (P1-02, A2-02)	
P5-10	Voltage source digital setting of VF separation	0V~motor rated voltage	

VF separation is generally used in induction heating, inverter power supply and torque motor control.

When VF separation control is selected, the output voltage can be set by parameter P5-10, or from analog quantity, multi-section instruction, PLC, PID or communication. When non digital setting is used, 100% of each setting corresponds to the rated voltage of the motor. When the percentage of analog output setting is negative, the absolute value is taken as the valid setting value.

Parameter	Name	Range
P5-11	Voltage acceleration time of VF separation	0.0s~1000.0s Note: it indicates the time when 0V changes to the motor rated voltage
P5-12	Voltage deceleration time of VF separation	0.0s~1000.0s Note: it indicates the time when 0V changes to the motor rated voltage

The voltage rise time of VF separation refers to the time required for the output voltage to accelerate from 0 to the motor rated voltage, as shown in t1 in the figure below.

The voltage drop time of VF separation refers to the time required for the output voltage to decelerate from the motor rated voltage to 0, as shown in t2 in the figure below.
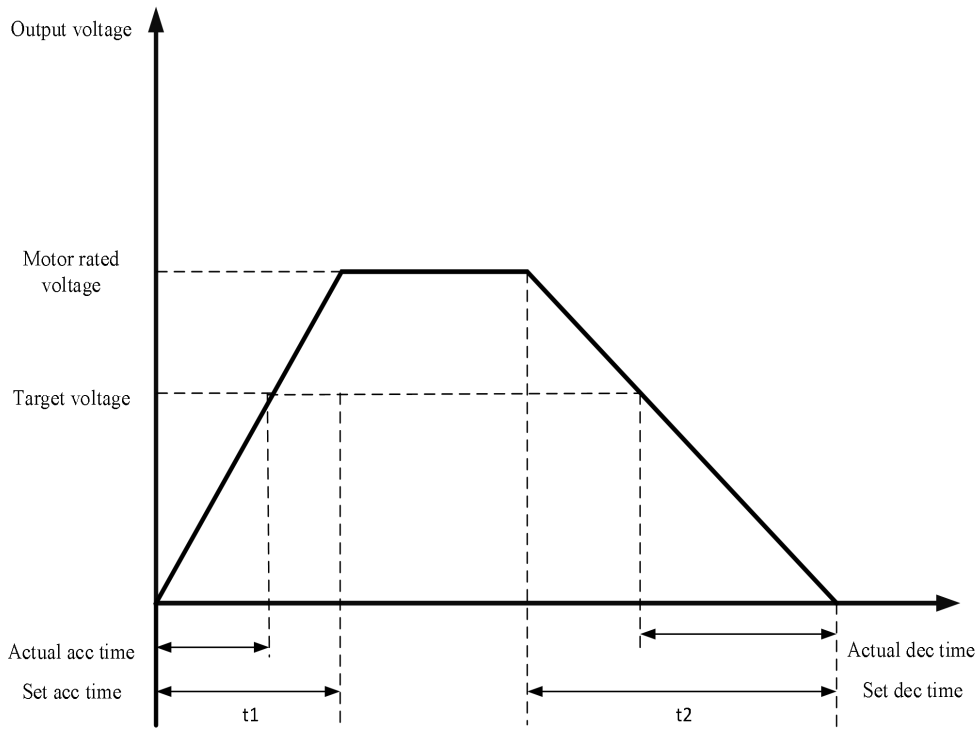
Parameter	Name	Range
P5-13	VF separation stop mode selection	0: The frequency voltage reduced to 0 independently 1: When the voltage decreases to 0, the frequency begins to decrease

0: The frequency voltage reduced to 0 independently

The output voltage of VF separation decreases to 0V according to the voltage drop time (P5-12). The output frequency of VF separation decreases to 0Hz according to deceleration time (P0-19).
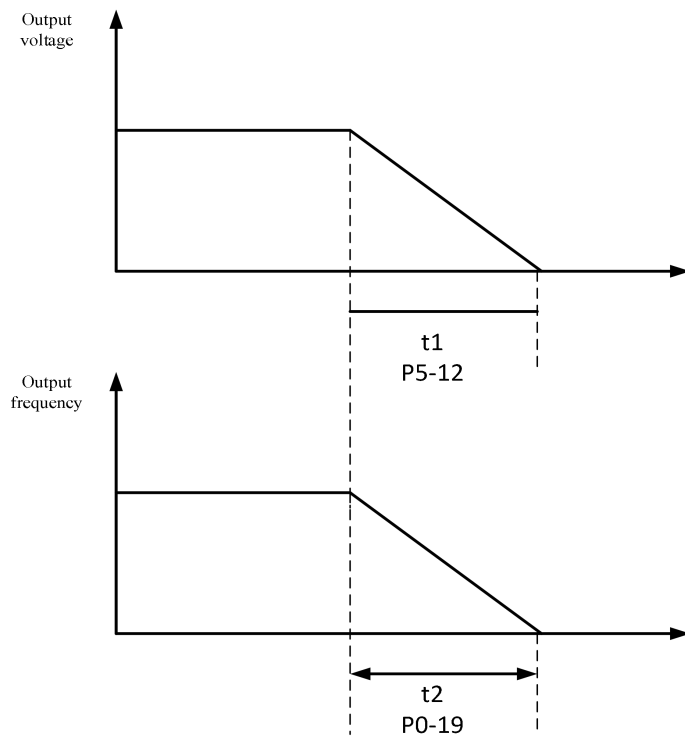
1: When the voltage decreases to 0, the frequency begins to decrease

The output voltage of VF separation first decreases to 0V according to the voltage drop time (P5-12), then the frequency decreases to 0Hz according to the deceleration time (P0-19).
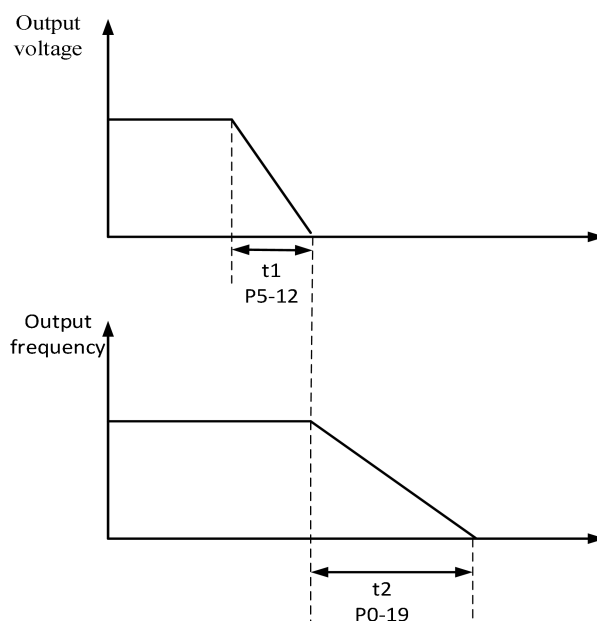
Parameter	Name	Range
P5-14	VF slip compensation gain	0%~200%

This parameter is only valid for asynchronous motor, which compensates the motor speed deviation when the load increases, so that the motor speed can be basically stable when the load changes.

Parameter	Name	Range
P5-15	Slip compensation time constant	0.1~10.0s

The smaller the response time value of slip compensation is set, the faster the response speed is.

Parameter	Name	Range
P5-16	VF over excitation gain	0~200

In the process of inverter deceleration, the over excitation gain can inhibit the rise of bus voltage, but the larger the over excitation gain is, the larger the output current will increase. In the case of braking resistance or small inertia, which is not easy to produce overvoltage, it can be set to 0.

Parameter	Name	Range
P5-17	VF oscillation suppression gain	0~100

The gain is selected as small as possible on the premise of validly suppressing the oscillation, so as to avoid adverse effects on VF operation. When there is no electrical oscillation, please set the gain to 0. Only when the motor oscillates obviously, the gain should be increased appropriately. The larger the gain is, the more obvious the suppression of oscillation is.

When using the function of suppressing oscillation, the parameters of rated current and no-load current should be accurate, otherwise the effect of VF oscillation suppression is not good.

Parameter	Name	Range
P5-18	VF oscillation suppression mode selection	0~4
P5-19	VF over current stall action current	50%~200%
P5-20	VF over current stall suppression enable	0: Invalid 1: Valid
P5-21	VF over current stall suppression gain	0~100

P5-22	VF over current stall action current compensation coefficient	50%~200%

In the high frequency region, the motor drive current is small. Below the rated frequency, the speed of the motor drops greatly with the same stall current. In order to improve the operation characteristics of the motor, the stall action current above the rated frequency can be reduced. In some centrifuges with high operation frequency, several times weak magnetic field and large load inertia are required, this method has a good effect on acceleration performance.

Transition stall action current over rated frequency = (fs/fn) * k * LimitCur.

fs: running frequency, fn: motor rated frequency, k: P5-22(Current compensation coefficient of double speed overcurrent stall action), LimitCur: P5-19(overcurrent stall action current).
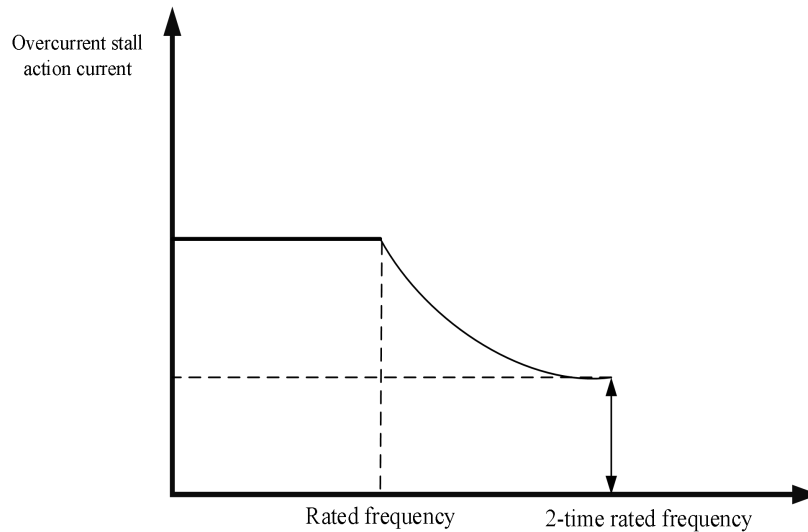
Note:

(1) 150% of over-current stall action current means 1.5 times of rated current of inverter;

(2) The carrier frequency of high-power motor is below 2kHz. Due to the increase of pulsating current, the wave by wave current limiting response precedes the over-current stall to prevent action starting, resulting in insufficient torque. In this case, please reduce the over-current stall to prevent action current.

Parameter	Name	Range
P5-23	VF over voltage stall action voltage	200.0V~2000.0V
P5-24	VF over voltage stall suppression enable	0: Invalid 1: Valid
P5-25	VF over voltage stall suppression frequency gain	0~100
P5-26	VF over voltage stall suppression voltage gain	0~100
P5-27	VF over voltage stall maximum rise frequency limit	0~50Hz

When the motor speed is higher than the output speed, the motor is in the status of power generation. In order to suppress the continuous rise of bus voltage, the inverter will adjust the output frequency to consume more electric energy. The actual deceleration time will be automatically extended to avoid tripping. If the actual deceleration time can not meet the requirements, the over excitation gain can be appropriately increased.

Group P5 **overvoltage** stall parameters are valid in **VF** mode, and stall **overcurrent** parameters are both valid in **VF and vector** mode.

If it is found that the **actual acceleration time** of the motor is **much longer** than the acceleration time under **V/F** control mode, the following measures can be taken:

(1) If the target frequency is less than 2 times the rated frequency, the over-current stall action current of P5-19 can be increased by 10% each time. If the set value of P5-19 exceeds 170%, it is easy to cause the frequency

inverter to alarm ERR10 (overload).

(2) If the target frequency is 3 times or more than 4 times the rated frequency, during the rapid acceleration process, Motor stall is likely to occur, which can adjust P5-22 over-current stall action current compensation coefficient, and the set value is 100%.

If it is found that the **actual deceleration time** of the motor is **much longer** than the deceleration time under **V/F** control mode, the following measures can be taken:

(1) If there is no braking resistor or energy feedback unit, the set value of P5-16 overexcitation gain can be increased by ± 20 each time. If the increase of overexcitation gain causes motor oscillation overvoltage fault, please reduce the setting value of overvoltage stall suppression voltage gain P5-26.

(2) If the braking resistor or energy feedback unit is added, and the input voltage level of the inverter is 323~437V, adjust the P7-53 braking starting voltage setting value to 690V, and set P5-16 (overexcitation gain) to 0. Use stop DC braking, and the recommended setting values are: P4-23 (stop DC braking starting frequency) =0.5Hz, P4-25 (stop DC braking current percentage) = 50%, P4-26 (stop DC braking time)= 1s.

Note: when using the brake resistor: P5-16 (over excitation gain) is set to 0, otherwise it is easy to cause excessive current in operation. P5-24 (overvoltage stall enable) is set to 0, otherwise the deceleration time may be too long.

Parameter	Name	Range
P5-34	PID stop reference voltage	0.0~1000.0V
P5-35	PID stop proportional gain	0~65535
P5-36	PID stop integral gain	0~65535
P5-37	PID stop differential gain	0~65535
P5-38	Parabolic stop reference time	0.0~4200.0s
P5-39	Stop deceleration method selection	0: Linear deceleration stop 1: Parabola deceleration stop 2: PID deceleration stop

Linear deceleration stop: stop the machine at uniform speed according to the set deceleration time.

Parabola deceleration stop: use the parabola deceleration stop, the frequency drops faster and faster. When the deceleration time is set at the same time as the reference time of the parabolic stop, it becomes a straight down frequency. The greater the parabolic stop reference time, the frequency drops slowly in the first time after the deceleration begins, and the frequency drops faster the later.

Parabolic deceleration stop
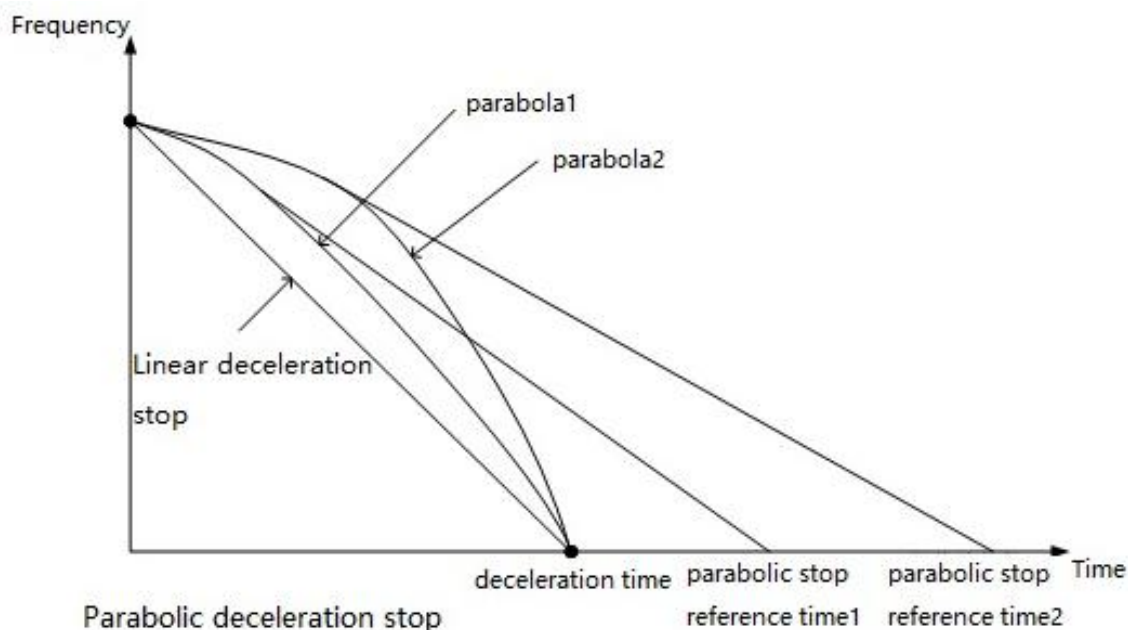
PID deceleration stop: The deceleration time is shortened by adjusting the proportional, integral and differential gain of PID stop. It is suitable for large inertia requiring quick stop, need to be connected to the brake resistor(need to set the P5-16 overexcitation gain to 0). The deceleration time should be adjusted according to the working conditions, and the deceleration time should be set within10s. The proportional integral differential adjustment direction can first adjust the proportional gain of PID stop. Adjust 100 each time, adjust to a better effect, and then fine-tune. The integral gain of PID stop can be fine-tuned, and the differential gain of PID stop is generally not adjusted.

Stop performance: Linear deceleration stop ≤ Parabola deceleration stop ≤ PID deceleration stop

Stop stability: PID deceleration stop ≤ Parabola deceleration stop ≤ Linear deceleration stop

The parabola stop method has better performance than the linear stop method, while the PID deceleration stop method has better performance than the parabola stop method. However, its stability is worse than that of the parabola stop method, and PID deceleration stop cannot be used under certain working conditions.

Notes:

(1) Use PID deceleration stop, need to close over current stall suppression enable(P5-20=0) and over voltage stall suppression enable(P5-24=0), the deceleration time should be adjusted according to the actual working conditions.

(2) The PID reference voltage must be greater than braking start voltage(P7-52 defaults to 690V). Use PID deceleration stop, the PID deceleration reference voltage need to set above 690V, otherwise the effect of quick stop will be played.

(3) Use PID deceleration stop, need to slow down within 10s.

4-2-7. Group P6 Vector parameters

Parameter	Name	Range
P6-00	Speed loop proportional gain 1	1~100
P6-01	Speed loop integral time 1	0.01s~10.00s
P6-02	Speed loop proportional gain 2	1~100
P6-03	Speed loop integral time 2	0.01s~10.00s
P6-04	Switching frequency 1	0.00~P6-05
P6-05	Switching frequency 2	P6-04~P0-13(max output frequency)

Different PI parameters of speed loop can be selected when the inverter operates at different frequencies. When the operating frequency is less than the switching frequency 1 (P6-04), the PI regulation parameters of the speed loop are P6-00 and P6-01. When the operating frequency is greater than the switching frequency 2, the PI regulation parameters of the speed loop are P6-02 and P6-03. The PI parameters of speed loop between switching frequency 1 and switching frequency 2 are linear switching of two groups of PI parameters, as shown in the figure below:
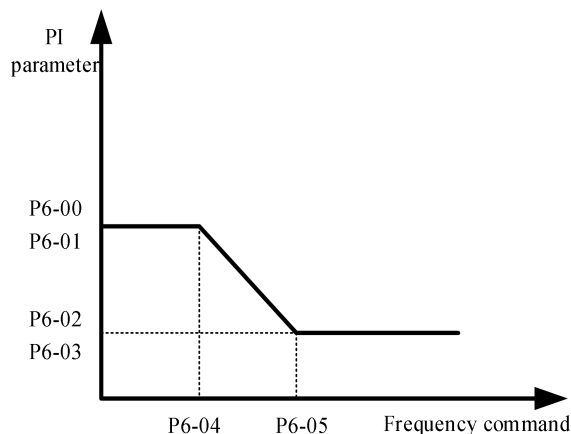
By setting the proportional coefficient and integral time of the speed regulator, the speed dynamic response characteristics of the vector control can be adjusted.

Increasing the proportional gain and decreasing the integration time can accelerate the dynamic response of the speed loop. Improper setting of PI parameters may lead to excessive speed overshoot. Even when the overshoot falls back, overvoltage fault occurs.

The recommended adjustment method is as follows:

If the factory parameters can not meet the requirements, fine-tuning should be carried out on the basis of the factory parameters. Firstly, the proportional gain should be increased to ensure that the system does not oscillate; Then, the integration time is reduced to make the system have faster response characteristics and smaller overshoot.

Parameter	Name	Range
P6-06	Speed loop integral attribute	Ones bit: integral separation 0: Invalid 1: Valid
P6-07	Vector slip compensation gain	50%~200%

For vector control (P0-01=1 or 2), this parameter can adjust the speed stabilization accuracy of the motor. For example, when the motor operating frequency is lower than the output frequency, this parameter can be increased.

For vector control with speed sensor (P0-01=2), this parameter can adjust the output current of inverter under the same load. For example, in high-power inverter, if the load capacity is weak, this parameter can be gradually reduced.

Note: In general, it is not necessary to adjust this parameter.

Parameter	Name	Range
P6-08	SVC speed feedback filter time	0.000s~0.100s

The speed feedback filtering time of SVC takes effect only when P0-01 = 1. Increasing P6-08 can improve the stability of the motor, but the dynamic response becomes weak. On the contrary, the dynamic response becomes stronger, but too small will cause the motor vibration. In general, it no needs to adjust.

Parameter	Name	Range	
P6-10	Speed control (drive) torque upper limit source	0	Set by P6-11
		1	AI1
		2	AI2
		4	PULSE setting
		5	Communication setting
		6	Min(AI1, AI2)
		7	Max(AI1, AI2)
		Full scale of 1~7 corresponds to P6-11	
P6-11	Speed control (drive) torque upper limit digital setting	0.0%~200.0%	

In speed control mode, the maximum output torque of the inverter is controlled by the torque upper limit source.

P6-10 is used to select the setting source of torque upper limit. When setting through the analog quantity, pulse and communication, the corresponding setting 100% corresponds to P6-11, while the 100% of P6-11 corresponds to the rated output current of the inverter.

The setting of AI1 and AI2 is described in the relevant description of AI curve of group P2 (corresponding curve is selected through P2-54), and pulse is described in P2-66~P2-70.

When the torque upper limit source is set as communication setting, the torque value is given through the

mapped U4-06.

Parameter	Name	Range
P6-14	Excitation regulation proportional gain	0~60000
P6-15	Excitation regulation integral gain	0~60000
P6-16	Torque regulation proportional gain	0~60000
P6-17	Torque regulation integral gain	0~60000

The PI parameter of vector control current loop can be obtained automatically after the dynamic tuning of asynchronous motor, which generally does not need to be modified.

It should be noted that the integral regulator of the current loop does not use the integral time as the dimension, but directly sets the integral gain. If the PI gain of current loop is too large, the whole control loop may oscillate. Therefore, when the current oscillation or torque fluctuation is large, the PI proportional gain or integral gain can be reduced manually.

4-2-8. Group P7 Fault and protection

Parameter	Name	Fault code
P7-00	Third (last) time fault type	
P7-01	Second time fault type	0~56
P7-02	First time fault type	

Record the latest three fault types of inverter, 0 is no fault. For the possible causes and solutions of each fault code, please refer to the relevant fault description.

Parameter	Name	Meaning
P7-03	Third (last) time fault frequency	Frequency of the last time fault
P7-04	Third (last) time fault current	Current of the last time fault
P7-05	Third (last) time fault bus voltage	Bus voltage of the last time fault
P7-06	Third (last) time fault input terminal status	The input terminal status of the last time fault, the order is: 	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	 	X10	X9	X8	X7	X6	X5	X4	X3	X2	X1	 When the input terminal is ON, the corresponding binary bit is 1, and OFF is 0. The status of all X is converted to decimal number display.
P7-07	Third (last) time fault output terminal status	The output terminal status of the last time fault, the order is: 	BIT4	BIT3	BIT2	BIT1	BIT0	 	Relay 2	Relay 1	Y3	Y2	Y1	 When the output terminal is ON, the corresponding binary bit is 1, and OFF is 0. The status of all Y is converted to decimal number display.
P7-08	Third (last) time fault VFD status	Reserved
P7-09	Third (last) time fault power on time	Present power on time of the last time fault
P7-10	The time of the third fault	Present operation time of the last time fault
P7-11	Location information of the third (last) time fault	Location information of the last time fault
P7-13	Second time fault frequency	Same to P7-03~P7-11

P7-14	Second time fault current	
P7-15	Second time fault bus voltage	
P7-16	Second time fault input terminal status	
P7-17	Second time fault output terminal status	
P7-18	Second time fault VFD status	
P7-19	Second time fault power on time	
P7-20	Second time fault operation time	
P7-21	Location information of the second time fault	
P7-23	First time fault frequency	
P7-24	First time fault current	
P7-25	First time fault bus voltage	
P7-26	First time fault input terminal status	
P7-27	First time fault output terminal status	Same to P7-03~P7-11
P7-28	First time fault VFD status	
P7-29	First time fault power on time	
P7-30	First time fault operation time	
P7-31	Location information of the first time fault	

Parameter	Name	Range
P7-33	Motor overload protection mode selection	0: Forbid 1: Allow
P7-34	Motor overload protection gain	0.20~10.00
P7-35	Motor overload warning coefficient	50%~100%

When P7-33 is set to 0, the motor has no overload protection function, it is recommended to install the heating relay before the motor.

When P7-33 is set to 1, the inverter has the ability to protect the motor overload. Refer to P7-34 and P7-35 for protection settings.

In order to protect different load motors validly, it is necessary to set the parameters according to the overload capacity of the motor. The inverse time limit curve of motor overload protection is shown in the figure below.
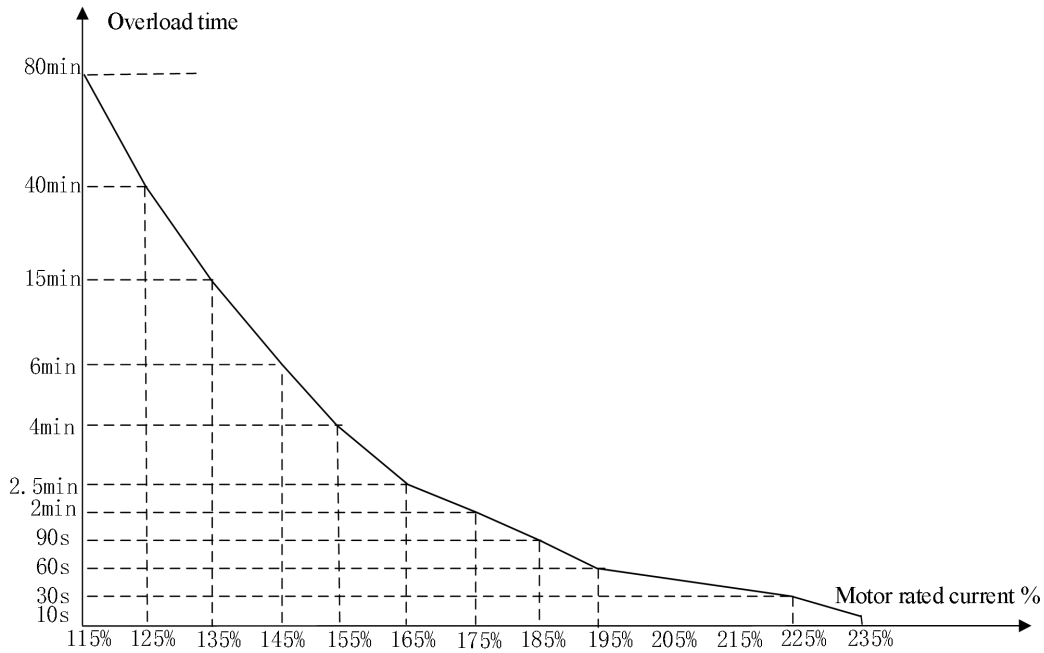
(1) When the running current of the motor reaches 175% times of the rated current of the motor, the motor overload (Err10) will be reported after continuous running for 2 minutes; When the running current of the motor reaches 115% of the rated current of the motor, the motor overload (Err10) will be reported after continuous operation for 80 minutes.

The maximum overload time is 80 minutes and the minimum overload time is 10 seconds.

(2) For example, motor overload protection adjustment: it is required that the motor should operate for 2 minutes under 150% motor current to report overload. According to the motor overload curve diagram, 150% (I) current is in the current range of 145% (I1) and 155% (I2), 145% of current is overloaded for 6 minutes (T1), 155% of current is overloaded for 4 minutes (T2), so the 150% overload of the rated current for 5 minutes under the default setting is calculated as follows:

$$T=T1+(T2-T1)*(I-I1)/(I2-I1)=4+(6-4)*(150\%-145\%)/(155\%-145\%)=5 \text{ minutes}$$

It can be concluded that the motor needs to report overload in 2 minutes under the condition of 150% motor current. Motor overload protection gain: P7-34=2÷5=0.4

Note: the user needs to set the value of P7-34 correctly according to the actual overload capacity of the motor. If the parameter is set too large, it is easy to cause the motor overheating damage and the inverter does not alarm and protect in time!

Parameter	Name	Range
P7-39	Input phase lossing/contactor closing protection selection	Ones bit: Input phase lossing protection Tens bit: Contactor closing protection 0: Forbid 1: Allow

Select whether to protect the input phase lossing or contactor closing.

Parameter	Name	Range
P7-40	Output phase lossing protection selection	0: Forbid 1: Allow

Select whether to protect the output phase lossing. If select 0, the fault will not be reported when the actual output phase lossing occurs. At this time, the actual current is larger than the current displayed on the panel. There is a risk. Please use it cautiously.

Parameter	Name	Range

	Power on ground short circuit protection function	0: Invalid
P7-41		1: Valid

When the inverter is powered on, it can detect whether the motor is short circuited to the ground.

If this function is valid, the UVW end of the inverter will have voltage output for a period of time after power on.

Parameter	Name	Range
P7-42	Action selection of fault relay during automatic fault reset	0: No action 1: Action

If the inverter is equipped with automatic fault reset function, fault Y action during automatic fault reset can be set through P7-42 (P7-42 is only valid for Y terminal).

Parameter	Name	Range
P7-43	Interval time of fault automatic reset	0.1s~60.0s

The parameter is used as the wait time from the fault occurrence to the automatic reset of the fault.

Parameter	Name	Range
P7-44	Fault automatic reset times	0~20

The parameter is used as the times of automatic reset after the failure of the inverter, and the inverter maintains the failure status after exceeding the set value.

Parameter	Name	Range

P7-45	Protection action selection1 when fault	Ones bit: Motor overload (Err 10)
		  0: Free stop
		  1: Stop as stop mode
		Tens bit: Input phase loss (Err11)
		  0: Free stop
		  1: Stop as stop mode
		Hundreds bit: Output phase loss (Err12)
		  0: Free stop
		  1: Stop as stop mode
		Thousands bit: Output load drop (Err19)
		  0: Free stop
		  1: Stop as stop mode
		Ten thousand bit: Pole position detection failed (Err21)
		  0: Free stop
		  1: Stop as stop mode

P7-46	Protection action selection 2 when fault	Ones bit: External fault 1 (Err43)
		  0: Free stop
		  1: Stop as stop mode
		Tens bit: Communication fault (Err44)
		  0: Free stop
		  1: Stop as stop mode
		Hundreds bit: EEPROM read/write fault (Err45)
		  0: Free stop
		  1: Stop as stop mode
		Thousands bit: Operation time arrival (Err46)
		  0: Free stop
		  1: Stop as stop mode
		Ten thousand bit: Power on time arrival (Err47)

Parameter	Name	Range
		0: Free stop
		1: Stop as stop mode

P7-47	Protection action selection 3 when fault	Ones bit: User defined fault 1 (Err48)
		  0: Free stop
		  1: Stop as stop mode
		Tens bit: User defined fault 2 (Err49)
		  0: Free stop
		  1: Stop as stop mode
		Hundreds bit: PID feedback loss during operation (Err50)
		  0: Free stop
		  1: Stop as stop mode
		Thousands bit: Speed deviation too large (Err52)
		  0: Free stop
		  1: Stop as stop mode
		Ten thousand bit: Motor over speed (Err53)
		  0: Free stop
		  1: Stop as stop mode

P7-48	Protection action selection 4 when fault	Ones bit: Motor over temperature (Err54)
		  0: Free stop
		  1: Stop as stop mode

P7-52	Brake starting voltage	200.0~2000.0V
P7-53	Brake utilization rate	0~100%

When the bus voltage reaches the P7-52 setting value, the brake resistance starts to work, and the service rate of the brake resistance is adjusted through P7-53. For frequent braking situations that require external braking, the braking effect can be adjusted by adjusting this parameter.

Parameter	Name	Range
P7-55	Over voltage stall gain	0~100
P7-56	Over voltage stall protection voltage	200.0V~2000.0V

Parameter	Name	Range
P7-63	Over speed detection value	0.0%~50.0% (max output frequency)
P7-64	Over speed detection time	0.0s~60.0s

This function is only valid when the inverter is running with speed sensor vector control.

When the inverter detects that the actual speed of the motor exceeds the maximum frequency, the exceeding value is greater than the over speed detection value P7-63, and the duration is greater than the over speed detection time P7-64, the inverter fault alarms Err53 and it shall be handled according to the action mode of fault protection.

When the over speed detection time is 0.0s, the over speed fault detection is cancelled.

Parameter	Name	Range
P7-65	Excessive speed deviation detection value	0.0%~50.0% (max output frequency)
P7-66	Excessive speed deviation detection time	0.0s~60.0s

This function is only valid when P0-01=1 or 2.

When the inverter detects that the actual speed of the motor deviates from the set frequency, the deviation is greater than the detection value P7-65, and the duration is greater than the detection time P7-66, the inverter fault alarms Err52 and it shall be handled according to the action mode of fault protection.

When the detection time of speed deviation is 0.0s, the fault detection of excessive speed deviation is cancelled.

Parameter	Name	Range
P7-67	Selection of instantaneous stop non-stop function	0: Transient power failure invalid 1: Deceleration in case of instantaneous power failure 2: Deceleration stop in case of instantaneous power failure
P7-68	Pause judgement voltage of transient stop action	80.0%~100.0%
P7-69	Judgment time of instantaneous stop non-stop voltage rising	0.0s~30.0s
P7-70	Judgement voltage of instantaneous stop non-stop action	60.0%~100.0% (standard bus voltage)
P7-71	Proportional gain of instantaneous stop non-stop	0~100
P7-72	Integral coefficient of instantaneous stop non-stop	0~100
P7-73	Deceleration time of instantaneous stop non-stop	0~300.0s

The purpose of instantaneous stop non-stop is to ensure that when the power supply of the power grid is abnormal, the motor can decelerate and stop normally, so that the motor can start immediately after the power supply of the power grid is restored, and it will not stop freely because of the sudden undervoltage fault when the power supply of the power grid is abnormal. In the large inertia system, it takes a long time for the motor to stop freely. When the power supply of the power grid is normal, because the motor is still rotating at high speed, it is easy to cause overload or over-current fault when starting the motor.

4-2-9. Group P8 Keyboard and display

Parameter	Name	Range
P8-01	STOP key function selection	0: Only in keyboard operation mode, STOP key stop function is valid 1: In any operation mode, STOP key is valid
P8-02	Parameter initialization	0: No operation 1: Restore factory parameters, excluding motor parameters, P0-13 and P0-15 2: Clear record information 3: Restore factory parameters (including motor parameters)

1. Restore factory settings, excluding motor parameters, P0-13 and P0-15

After P8-02 is set to 1, most of the functional parameters of the frequency converter have been restored to

the manufacturer's factory parameters, but the motor parameters and the values of P0-13 and P0-15 have not been restored.

2. Clear record information

Clear the inverter fault record information, cumulative operation time (P8-10), cumulative power on time (P8-11), cumulative power consumption (P8-12).

3.Restore factory parameters (including motor parameters)

After setting P8-02=3, most of the functional parameters of the inverter including motor parameters are stored to the factory parameters. But some parameters such as fault record information, cumulative operation time (P8-10), cumulative power on time(P8-11), cumulative power consumption (P8-12),module radiator temperature (P8-19) are not restored.

Parameter	Name	Range
P8-03	User password	0~65535

If any non-zero number is set in P8-03, the password protection function will take effect. The next time you enter the menu, you must input the password correctly, otherwise you can't view and modify the function parameters. Please remember the user password.

If P8-03 is set to 00000, the set user password will be cleared and the password protection function will be invalid.

Parameter	Name	Range
P8-06	Parameter modification attribute	0: Modifiable 1: Not modifiable

Users can set whether the function code parameters can be modified to prevent the risk of function parameters being changed by mistake.

If the function code is set to 0, all function codes can be modified; When it is set to 1, all function codes can only be viewed and cannot be modified.

Parameter	Name	Range
P8-07	LED operation display parameter 1	0000 ~ FFFF
P8-08	LED operation display parameter 2	0000 ~ FFFF

Bit definition
P8-07

```
Bit:   7   6   5   4   3   2   1   0
                               └──── Operate frequency
                           └──────── Set frequency
                       └──────────── Bus voltage
                   └──────────────── Output current
               └──────────────────── Output voltage
           └──────────────────────── Output torque
       └──────────────────────────── Output power
   └──────────────────────────────── X input status

Bit:  15  14  13  12  11  10   9   8
                               └──── Y output status
                           └──────── AI1 voltage
                       └──────────── AI2 voltage
                   └──────────────── AI3 voltage
               └──────────────────── Pulse input pulse
           └──────────────────────── PULSE input pulse frequency
       └──────────────────────────── PID setting
   └──────────────────────────────── PID feedback
```

P8-08

```
Bit:  23  22  21  20  19  18  17  16
                               └──── Load speed
                           └──────── Feedback speed
                       └──────────── Actual feedback speed
                   └──────────────── Line speed
               └──────────────────── PLC stage
           └──────────────────────── Counting value
       └──────────────────────────── Length value
   └──────────────────────────────── Main frequency A

Bit:  31  30  29  28  27  26  25  24
                               └──── Auxiliary frequency B
                           └──────── Communication setting
                       └──────────── Voltage before AI1 correction
                   └──────────────── Voltage before AI2 correction
               └──────────────────── Voltage before AI3 correction
           └──────────────────────── Runtime remaining
       └──────────────────────────── Present power on time
   └──────────────────────────────── Present runtime
```

Parameter	Name	Range	Bit definition

P8-09	LED stop display parameters	0000~FFFF	

Bit:
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

- Set frequency
- Bus voltage
- X input status
- Y output status
- AI1 voltage
- AI2 voltage
- AI3 voltage
- PULSE input pulse frequency

Bit:
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 |

- PID setting
- Load speed
- PLCStep
- Counting value
- Length value
- reserved
- reserved
- reserved
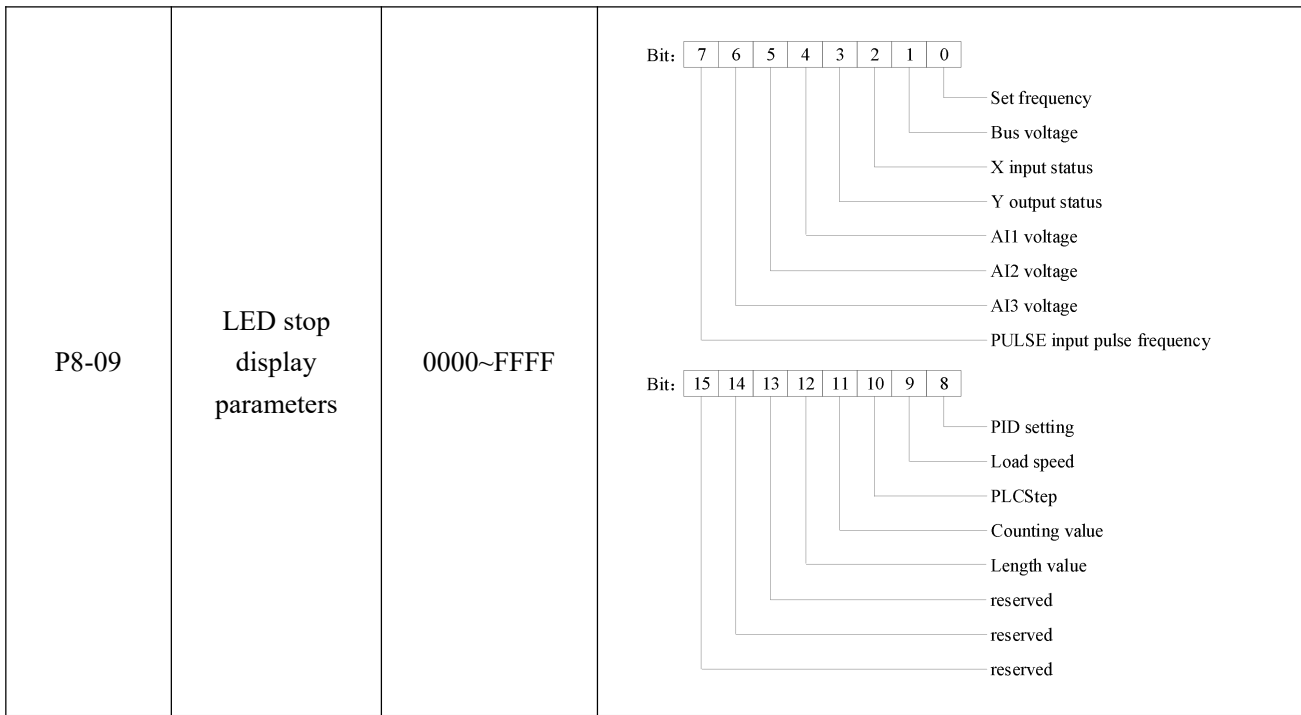
During stop or operation, multiple status parameters can be displayed by using the [»] key on the operation panel to switch.

If the above parameters need to be displayed during operation, set the corresponding position to 1, convert the binary number to hexadecimal and set it to P8-09. The default value of P8-09 is 0.

Parameter	Name	Range
P8-10	Accumulated running time	0h~65535h

Display the accumulated running time of inverter. When the running time reaches the set running time PC-32, the multi-function digital output function of inverter outputs ON signal.

Parameter	Name	Range
P8-11	Accumulated power on time	0~65535 hours

Display the cumulative power on time of inverter since leaving factory.

When this time reaches the set power on time (PC-30), the multi-function digital output function of inverter outputs ON signal.

Parameter	Name	Range
P8-12	Accumulated power consumption	0~65535 KWh

Display the cumulative power consumption of the inverter so far.

Parameter	Name	Range
P8-15	Software version	-
P8-16	Firmware version	-

Parameter	Name	Range
P8-19	Inverter module radiator temperature	0.0℃~100.0℃

Displays the temperature of IGBT inverter module.

Parameter	Name	Range
P8-20	Output power factor	0.0%~200.0%

When the output power (U0-06) does not correspond to the expected value, the output power can be linearly corrected by this value.

Parameter	Name	Range

P8-21	Load speed display factor	0.0001~6.5000
P8-22	Number of decimal points for load speed display	Ones bit: Number of decimal points of U0-16 0: 0 decimal points 1: 1 decimal point 2: 2 decimal points Tens bit: Number of decimal points of U0-17 1: 1 decimal point 2: 2 decimal points

- **3731version:** When the load speed needs to be displayed, the corresponding relationship between the output frequency of the inverter and the load speed can be adjusted through this parameter.

  Ones bit:

  Used to set the decimal places for displaying load speed, the following examples illustrate the calculation method of load speed:

  If the load speed display coefficient P8-21 is 2.0000 and the decimal points of load speed P8-22 are 2 (2 decimal points), when the inverter operates at 40.00Hz, the load speed: 40.00*2.0000=80.00 (2 decimal places display).

  If the inverter is in the stop status, the load speed is displayed as the speed corresponding to the set frequency, that is, "set load speed". For example, if the frequency is set to 50.00Hz, the load speed in stop status is: 50.00*2.000=100.00 (2 decimal places display).

  For example, the rated speed of the motor is 1500r/min, and the rated frequency is 50HZ. If the user want to display the load speed, P8-22=11, it is necessary to set P8-21= 3.0. Then U0-16 (load speed display) value is 1500.0.

- **3742 and above versions:** When the load speed needs to be displayed, the corresponding relationship between the motor speed and the load speed can be adjusted through this parameter.

  Ones bit:

  Used to set the decimal places for displaying load speed, the following examples illustrate the calculation method of load speed:

  If the load speed display coefficient P8-21 is 2.0000 and the decimal points of load speed P8-22 are 2 (2 decimal points), when the motor speed at 40.00RPM, the load speed: 40.00*2.0000=80.00 (2 decimal places display).

  Tens bit:

  1: U0-17 and U0-18 are both displayed with 1 decimal point, respectively.

  2: U0-17 and U0-18 are both displayed with 2 decimal points, respectively.

4-2-10. Group P9 Communication protocol

Parameter	Name	Range
P9-00	Serial communication protocol selection	0: Modbu-RTU protocol 1:2: ASCII mode

When P9-00=0, the communication protocol is Modbus RTU. Please refer to Appendix A-3 for communication introduction.

When P9-00=2, the communication protocol is ASCII mode.

Parameter	Name	Range
P9-01	Local address	1~247, 0 is broadcast address
P9-02	Communication baud rate	Ones bit: MODBUS 0: 300BPS 1: 600BPS

		2: 1200BPS
		3: 2400BPS
		4: 4800BPS
		5: 9600BPS
		6: 19200BPS
		8: 57200BPS
		9: 115200BPS
P9-03	MODBUS data format (Modbus valid)	0: No parity (8-N-2) (RTU)
		1: Even parity (8-E-1) (RTU)
		2: Odd parity (8-O-1) (RTU)
		3: No parity (8-N-1) (RTU)
		4: Even parity (7-E-1) (ASCII)

When P9-00=0, ones bits of P9-02 is valid, and the factory value of P9-02 is 06.

When P9-00=2, P9-03=4, ASCII mode will be enabled.

Group P9 parameters are the communication selection parameters of this model. The necessary conditions for serial communication are communication protocol, local station number, baud rate and data format.

Parameter	Name	Range
P9-04	Communication timeout	0.0 s (invalid)
		0.1 ~ 60.0s

When the function code is set to 0.0 s, the communication timeout parameter is invalid.

When the function code is set to a valid value, if the interval between one communication and the next exceeds the communication timeout, the system will report a communication timeout (Err44). Usually, it is set to invalid.

Parameter	Name	Range
P9-05	MODBUS response delay	0~20ms (Modbus valid)

Response delay: it refers to the interval between the end of data receiving of inverter and the sending of data to upper computer. If the response delay is less than the system processing time, the response delay is subject to the system processing time. If the response delay is longer than the system processing time, the system will wait until the response delay time arrival, and then send the data to the upper computer.

Parameter	Name	Range
P9-07	VB3/VB5/V5 communication control words (supported in versions 3740 and above)	Tens bit:
		0: Disable
		1: Enable

Set the tenth digit of the value in P9-07 to 1, enable the VH series frequency converter to replace the function of the modbus communication command control word of VB3/VB5/V5/B5N. Input the control word of VB5 to execute the corresponding function.

4-2-11. Group PA PID parameters of process control

Parameter	Name	Range
PA-01	Setting channel selection	0: PA-05 setting
		1: AI1
		2: AI2
		5: Communication setting
		6: Multi-segment command setting
PA-02	Feedback channel selection	0: AI1
		1: AI2

		3: AI1-AI2
		4: AI1+AI2
		6: Communication setting

PA-01 is used to select the target given channel of process PID. PA-02 is used to select the feedback channel of process PID.

The setting target value of process PID is relative value, and the setting range is 0.0% ~ 100.0%. Similarly, the feedback quantity of PID is also relative quantity, and the goal of PID is to make the two relative quantities the same.

Note: when PA-01 is set to 6, PB-16 cannot be set to 5.

Parameter	Name	Range
PA-03	PID feedback filter time	0.00s~30.00s
PA-04	PID output filter time	0.00s~30.00s

PA-03 is used to filter the PID feedback, which is helpful to reduce the influence of the disturbance on the feedback, but it will lead to the degradation of the response performance of the process closed-loop system.

PA-04 is used to filter the PID output frequency, which will weaken the mutation of the inverter output frequency, but it will also lead to the degradation of the response performance of the process closed-loop system.

Parameter	Name	Range
PA-05	PID value setting	0.0%~100.0%

When PA-01 is set to 0, this parameter needs to set.

Parameter	Name	Range
PA-06	PID setting change time	0.00s~300.00s

The given change time of PID refers to the time required for the given value of PID to change from 0.0% to 100.0%.

When the given value of PID changes, the given value of PID changes linearly according to the given change time to reduce the adverse impact of the given mutation on the system.

Parameter	Name	Range
PA-07	PID reverse cut-off frequency	0.00Hz~max output frequency

In some cases, only when the PID output frequency is negative (i.e. inverter reversal), PID can control the quantitative and feedback quantity to the same status, but the high reverse frequency is not allowed for some occasions, and PA-07 is used to determine the upper limit of reverse frequency.

When the frequency source is PID, the frequency output range is as follows:

For example: frequency source is pure PID or main + PID

(1) The reverse cutoff frequency is 0 (PA-07=0) or reverse is forbidden (P0-21=1). Output range: lower frequency to upper frequency (i.e. P0-17~P0-15).

(2) The reverse cut off frequency is not 0 and reverse running is not prohibited (PA-07 ≠ 0, P0-21=0). Output range: - reverse cut off frequency ~ upper limit frequency.

Parameter	Name	Range
PA-08	PID deviation limit	0.0%~100.0%

When the deviation between the given quantity and the feedback quantity of PID is less than PA-08, the PID stops adjusting. In this way, the output frequency is stable when the deviation between given and feedback is small, which is very valid for some closed-loop control situations.

Parameter	Name	Range
PA-09	PID differential limit	0.00%~100.00%

In PID regulator, the function of differential is sensitive and easy to cause system oscillation. Therefore,

the function of PID differential is generally limited to a small range. PA-09 is used to set the output range of PID differential.

Parameter	Name	Range
PA-10	Proportional gain P	0.0~100.0
PA-11	Integral time I	0.01s~10.00s
PA-12	Differential time D	0.000s~10.000s

Proportional gain P:

It determines the regulation intensity of the whole PID regulator. The greater the P is, the greater the regulation intensity is. The parameter 100.0 means that when the deviation between the PID feedback quantity and the given quantity is 100.0%, the adjustment amplitude of the PID regulator to the output frequency command is the maximum frequency.

Integral time I:

Determine the intensity of integral regulation of PID regulator. The shorter the integration time, the greater the adjustment intensity. The integral time means that when the deviation between PID feedback and given quantity is 100.0%, the integral regulator continuously adjusts the time and the adjustment quantity reaches the maximum frequency.

Differential time D:

Determine the strength of PID regulator deviation change rate. The longer the differential time is, the stronger the regulation is. Differential time means that when the feedback value changes by 100.0% in this time, the adjustment value of differential regulator is the maximum frequency.

Parameter	Name	Range
PA-13	PID parameter switching condition	0: Don't switch 1: Switch through X terminal 2:Switch automatically according to deviation 3:Switch automatically according to the operation frequency
PA-14	PID parameter switching deviation 1	0.0%~PA-15
PA-15	PID parameter switching deviation 2	PA-14~100.0%

In some applications, a group of PID parameters can not meet the needs of the whole operation process, so different PID parameters need to be used in different situations. The parameters can be switched through the X terminal (function 35) of the multi-function terminal, or according to the deviation.

(1) Switch through multi-function terminal X

When switching through the function 35 of the multi-function terminal, the terminal signal off corresponds to the first group of PID parameters, and the terminal signal ON corresponds to the second group of PID parameters;

(2) Switch automatically according to deviation

When the absolute value of deviation between given and feedback is less than PID parameter switching deviation 1 (PA-14), the first group of PID parameters is selected for PID parameters; When the absolute value of deviation between given and feedback is greater than PID switching deviation 2 (PA-15), the second group of PID parameters is selected. When the deviation between given and feedback is between switching deviation 1 and switching deviation 2, PID parameters are linear interpolation values of two groups of PID parameters, as shown in the figure below.
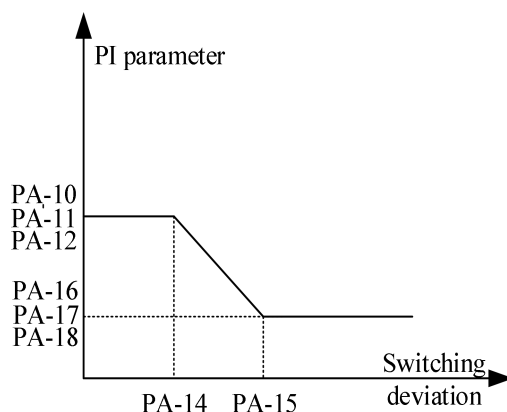
Parameter	Name	Range
PA-16	Proportional gain P2	0.0~100.0
PA-17	Integral time I2	0.01s~10.00s
PA-18	Differential time D2	0.000s~10.000s

Same to PA-10~PA-12, the second set of PID parameters.

Parameter	Name	Range
PA-19	PID action direction	0: Positive action 1: Negative action

Positive action: when the feedback signal of PID is less than the given quantity, the output frequency of inverter rises. Such as winding tension control occasions.

Negative action: when the feedback signal of PID is less than the given quantity, the output frequency of inverter decreases. Such as unwinding tension control occasions.

The function is affected by the reverse action direction of the multi-function terminal PID, which needs attention in use.

Parameter	Name	Range
PA-20	PID given feedback range	0~65535

PID given feedback range is a dimensionless unit, used for PID given display U0-14 and PID feedback display U0-15.

The relative value of the given feedback of PID is 100.0%, corresponding to the given feedback range PA-20.

For example, if PA-20 is set to 2000, when PID is given 100.0%, U0-14 is 2000.

Parameter	Name	Range
PA-21	PID maximum deviation between two outputs	0.00%~100.00%
PA-22	PID minimum deviation between two outputs	0.00%~100.00%

Parameter	Name	Range
PA-23	PID initial value	0.0%~100.0%
PA-24	PID initial value holding time	0.00s~600.00s

When the VFD is started, PID output is fixed to PID initial value PA-23, and PID does not start closed-loop adjustment operation until the initial value of PID is maintained for PA-24. The following figure shows the function diagram of the initial PID value.

Output frequency

PID initial value
PA-23

PID initial value holding time
PA-24

t
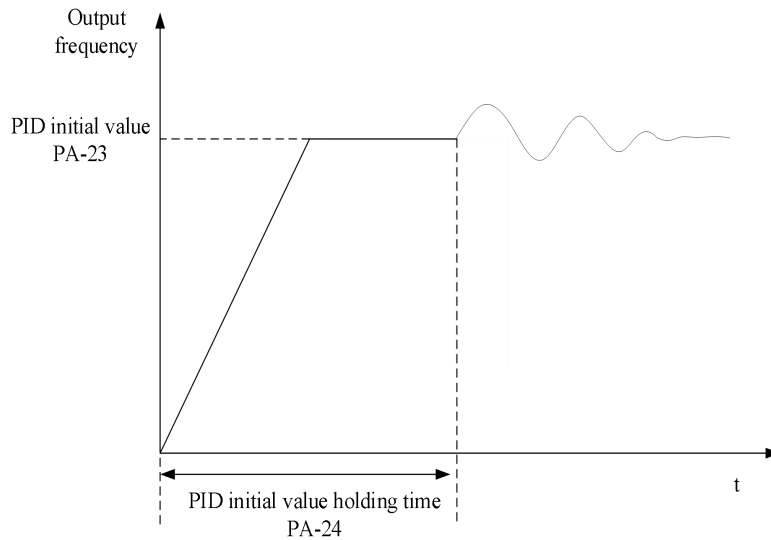
Parameter	Name	Range
PA-25	PID operation mode (whether to operate when stop)	0: Not operate when stop 1: Operate when stop

It is used to select whether the PID continues to calculate in PID stop status. In general application, PID should stop operation in stop status.

Parameter	Name	Range
PA-26	PID integral attribute	Ones bit: Integral separation 0: Invalid 1: Valid Tens bit: Whether to stop integration after output to limit value 0: Continue to integral 1: Stop integral

Integral separation:

If the integral separation is set to be valid, when the X terminal integral pause (function 34) is valid, the integral of PID stops operation, and at this time, only the proportional and differential functions of PID are valid.

When the integral separation is invalid, the integral separation is invalid no matter whether the multi-function digital DI is valid or not.

Whether to stop integration after output arrival limit value:

After the PID operation output reaches the maximum or minimum value, you can choose whether to stop the integral action. If stop integral is selected, PID integral calculation will stop at this time, which may help to reduce PID overshoot.

Parameter	Name	Range
PA-27	PID feedback lost detection value	0.0%: Not judge the feedback lost 0.1%~100.0%
PA-28	PID feedback lost detection time	0.0s~30.0s

This function code is used to judge whether PID feedback is lost.

When the PID feedback value is less than the feedback loss detection value PA-27 and the duration exceeds the PID feedback loss detection time PA-28, the VFD will alarm the fault Err50.

4-2-12. Group PB Multi-speed and simple PLC

Parameter	Name	Range
PB-00	Multi-segment frequency 0	-100.0% ~ +100.0%
PB-01	Multi-segment frequency 1	-100.0% ~ +100.0%
PB-02	Multi-segment frequency 2	-100.0% ~ +100.0%
PB-03	Multi-segment frequency 3	-100.0% ~ +100.0%
PB-04	Multi-segment frequency 4	-100.0% ~ +100.0%
PB-05	Multi-segment frequency 5	-100.0% ~ +100.0%
PB-06	Multi-segment frequency 6	-100.0% ~ +100.0%
PB-07	Multi-segment frequency 7	-100.0% ~ +100.0%
PB-08	Multi-segment frequency 8	-100.0% ~ +100.0%
PB-09	Multi-segment frequency 9	-100.0% ~ +100.0%
PB-10	Multi-segment frequency 10	-100.0% ~ +100.0%
PB-11	Multi-segment frequency 11	-100.0% ~ +100.0%
PB-12	Multi-segment frequency 12	-100.0% ~ +100.0%
PB-13	Multi-segment frequency 13	-100.0% ~ +100.0%
PB-14	Multi-segment frequency 14	-100.0% ~ +100.0%
PB-15	Multi-segment frequency 15	-100.0% ~ +100.0%
PB-16	Multi-segment frequency 0 setting mode	0: PB-00 setting 2: AI 5: PID setting 6: Preset frequency P0-10

According to the different statuss of multi-function digital X, the multi-segment instruction needs to be switched and selected. For details, please refer to the relevant instructions of group P2.

Parameter	Name	Range
PB-17	Simple PLC segment 0 operation time	0.0~6500.0s(h)
PB-18	Simple PLC segment 0 acc/dec time	0~3
PB-19	Simple PLC segment 1 operation time	0.0~6500.0s(h)
PB-20	Simple PLC segment 1 acc/dec time	0~3
PB-21	Simple PLC segment 2 operation time	0.0~6500.0s(h)
PB-22	Simple PLC segment 2 acc/dec time	0~3
PB-23	Simple PLC segment 3 operation time	0.0~6500.0s(h)
PB-24	Simple PLC segment 3 acc/dec time	0~3
PB-25	Simple PLC segment 4 operation time	0.0~6500.0s(h)
PB-26	Simple PLC segment 4 acc/dec time	0~3
PB-27	Simple PLC segment 5 operation time	0.0~6500.0s(h)
PB-28	Simple PLC segment 5 acc/dec time	0~3
PB-29	Simple PLC segment 6 operation time	0.0~6500.0s(h)
PB-30	Simple PLC segment 6 acc/dec time	0~3
PB-31	Simple PLC segment 7 operation time	0.0~6500.0s(h)
PB-32	Simple PLC segment 7 acc/dec time	0~3
PB-33	Simple PLC segment 8 operation time	0.0~6500.0s(h)
PB-34	Simple PLC segment 8 acc/dec time	0~3
PB-35	Simple PLC segment 9 operation time	0.0~6500.0s(h)

Parameter	Name	Range
PB-36	Simple PLC segment 9 acc/dec time	0~3
PB-37	Simple PLC segment 10 operation time	0.0~6500.0s(h)
PB-38	Simple PLC segment 10 acc/dec time	0~3
PB-39	Simple PLC segment 11 operation time	0.0~6500.0s(h)
PB-40	Simple PLC segment 11 acc/dec time	0~3
PB-41	Simple PLC segment 12 operation time	0.0~6500.0s(h)
PB-42	Simple PLC segment 12 acc/dec time	0~3
PB-43	Simple PLC segment 13 operation time	0.0~6500.0s(h)
PB-44	Simple PLC segment 13 acc/dec time	0~3
PB-45	Simple PLC segment 14 operation time	0.0~6500.0s(h)
PB-46	Simple PLC segment 14 acc/dec time	0~3
PB-47	Simple PLC segment 15 operation time	0.0~6500.0s(h)
PB-48	Simple PLC segment 15 acc/dec time	0~3
PB-49	Simple PLC operation mode	0: Stop at the end of single operation 1: Keep the final value at the end of single operation 2: Cycle all the time

Simple PLC function has two functions: as a frequency source or as a voltage source of VF separation.

When simple PLC is used as frequency source, the positive and negative values of PB-00 ~ PB-15 determine the operation direction. If the value is negative, it means that the inverter runs in the opposite direction.

As a frequency source, PLC has three operation modes, but as a VF voltage source, it has no such mode. Among them:

0: Stop at the end of single operation

The inverter stops automatically after completing a single cycle and needs to give the operation command again to start.

1: Keep the final value at the end of single operation

After completing a single cycle, the frequency and direction of the last section will be maintained automatically.

2: Cycle all the time

After the inverter completes one cycle, it will start the next cycle automatically until there is a stop command.

The figure below is the schematic diagram of simple PLC as frequency source. When simple PLC is used as frequency source, the positive and negative values of PB-00 ~ PB-15 determine the operation direction. If the value is negative, it means that the inverter runs in the opposite direction.
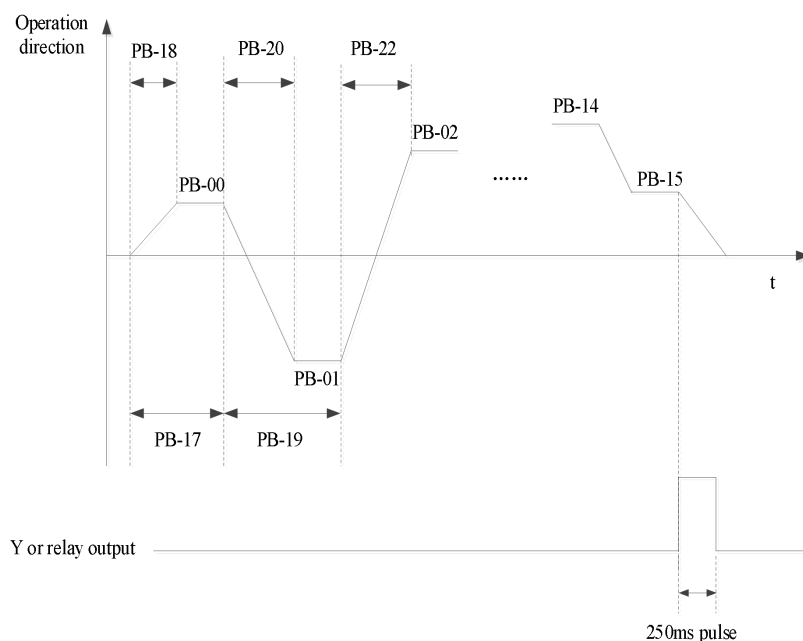
Parameter	Name	Range
PB-50	Simple PLC operation time unit	0: Second 1: Hour
PB-51	Simple PLC power-off memory selection	Ones bit: Power-off memory 0: Not memory 1: Memory Tens bit: Stop memory 0: Not memory 1: Memory

PLC power down memory refers to memorizing the operation stage and frequency of PLC before power down, and continuing to run from the memory stage when next power on. If no memory is selected, the PLC process will be restarted every time when the power is on.

PLC stop memory is to record the previous PLC operation stage and frequency during stop, and continue to run from the memory stage during the next operation. If no memory is selected, the PLC process will be restarted every time.

4-2-13. Group PC Auxiliary function

Parameter	Name	Range
PC-00	Jog frequency	0.00Hz~P0-13
PC-01	Jog acceleration time	0.0s~6500.0s
PC-02	Jog deceleration time	0.0s~6500.0s

Define the given frequency and acceleration and deceleration time of inverter when jogging.

During jog operation, the start mode is fixed as direct start mode (P4-00 = 0), and the stop mode is fixed as deceleration stop mode (P4-22 = 0).

Parameter	Name	Range
PC-03	Acceleration time 2	0. 1s~6500.0s
PC-04	Deceleration time 2	0. 1s~6500.0s
PC-05	Acceleration time 3	0. 1s~6500.0s
PC-06	Deceleration time 3	0. 1s~6500.0s
PC-07	Acceleration time 4	0. 1s~6500.0s

PC-08	Deceleration time 4	0. 1s~6500.0s

VH1 provided four groups of acceleration and deceleration time, which are P0-18/P0-19 and above parameters.

Parameter	Name	Range
PC-09	The unit of acc/dec time	0: 1s 1: 0.1s 2: 0.01s

PC-09 is used to set the unit of acceleration and deceleration time for four groups.

Parameter	Name	Range
PC-10	The base frequency of acc/dec time	0: Max output frequency P0-13 1: Setting frequency 2: 50Hz

The acceleration and deceleration time is the time accelerating from 0 to the frequency set by PC-10. If PC-10 is 1, the acceleration of the motor changes.

Parameter	Name	Range
PC-11	Switching frequency point between acceleration time 1 and acceleration time 2	0.00Hz~max output frequency
PC-12	Switching frequency point between deceleration time 1 and deceleration time 2	0.00Hz~ max output frequency

When controlling motor 1, you can choose different acceleration and deceleration time.

Note: when using this function, the multi-function terminal function cannot select the acceleration and deceleration time switching.

Parameter	Name	Range
PC-13	Jump frequency 1	0.00Hz~max output frequency
PC-14	Jump frequency 2	0.00Hz~max output frequency
PC-15	Jump frequency range	0.00Hz~max output frequency

When the set frequency is within the range of jumping frequency, the actual running frequency will run at the jumping frequency close to the set frequency. By setting the jumping frequency, the inverter can avoid the mechanical resonance point of the load.

VH1 can set two jump frequency points. If both jump frequencies are set to 0, the jump frequency function will be cancelled.

Please refer to the figure below for the principle of jump frequency and jump frequency amplitude.
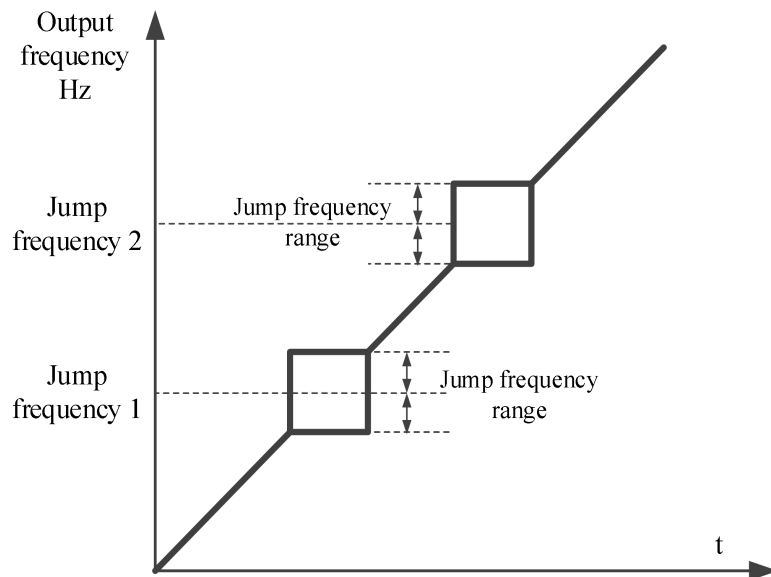
Parameter	Name	Range
PC-16	Whether the jump frequency is valid during acceleration and deceleration	0: Invalid 1: Valid (in vector condition)

Set whether the jump frequency is valid during acceleration and deceleration.

Parameter	Name	Range
PC-17	Frequency arrival detection range	0.00~100% (max output frequency P0-13)

When the operation frequency of the inverter is in a certain range of the target frequency, the multi-function Y terminal of the inverter outputs ON signal.

This parameter is used to set the detection range of frequency, which is the percentage relative to the maximum frequency. The figure below is the schematic diagram of frequency arrival.
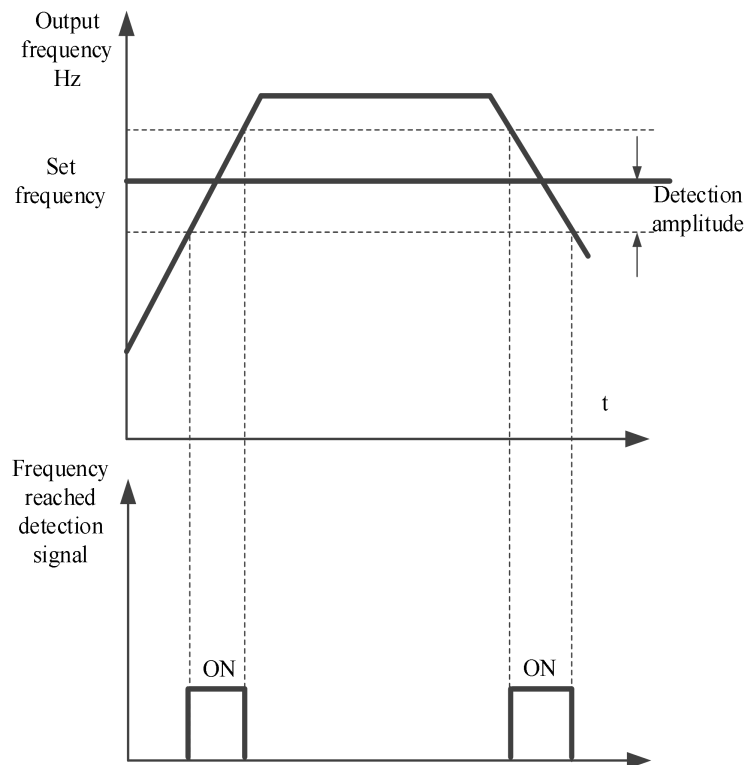
Parameter	Name	Range
PC-18	Frequency detection value (FDT1 voltage level)	0.00Hz~max output frequency

PC-19	Frequency detection hysteresis value (FDT1 voltage level)	0.0%~100.0% (PC-18)

When the operating frequency is higher than the frequency detection value, the inverter multi-function output Y outputs ON signal, and when the frequency is lower than the detection value, the Y terminal output ON signal is cancelled.

The above parameters are used to set the detection value of output frequency and the hysteresis value of output action release. Where PC-19 is the percentage of the hysteresis frequency relative to the frequency detection value PC-18.

Parameter	Name	Range
PC-20	Frequency detection value (FDT2 voltage level)	0.00Hz~max output frequency
PC-21	Frequency detection hysteresis value (FDT2 voltage level)	0.0%~100.0% (PC-20)

The frequency detection function is the same as that of FDT1. Please refer to the relevant description of function code PC-18 and PC-19.

Parameter	Name	Range
PC-22	Frequency arrival detection value 1	0.00Hz~ max output frequency
PC-23	Frequency arrival detection 1 range	0.0%~100.0% (max output frequency)
PC-24	Frequency arrival detection value 2	0.00Hz~ max output frequency
PC-25	Frequency arrival detection 2 range	0.0%~100.0% (max output frequency)

When the output frequency of the inverter is within the positive and negative detection range of frequency detection value, the multi-function Y outputs the ON signal.

VH1 provides two groups of frequency arrival detection parameters, setting frequency value and frequency detection range respectively. The figure below is the schematic diagram of this function.
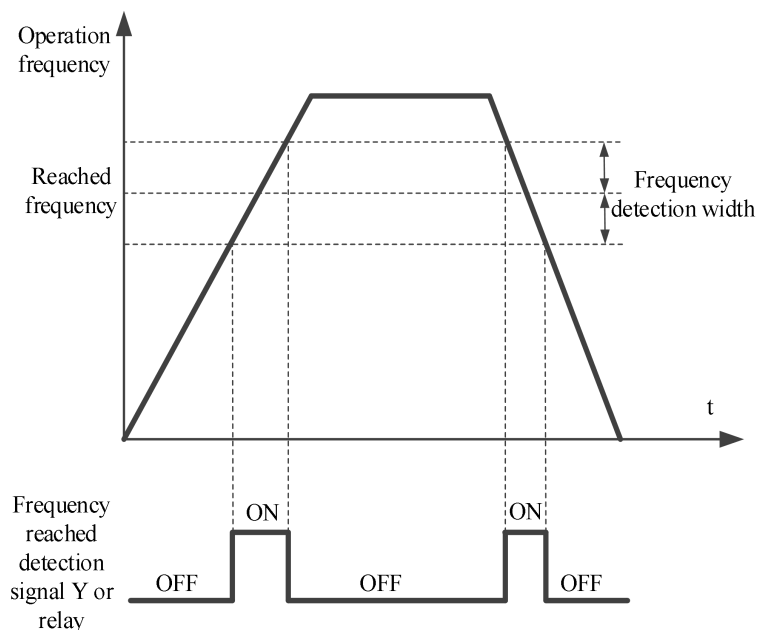
Parameter	Name	Range
PC-26	Timing function selection	0: Invalid 1: Valid
PC-28	Setting operation time	0.0Min~6500.0Min
PC-29	Present operation arrival time	0.0Min~6500.0Min

When PC-26 = 1, the timing function is turned on, the current running time U0-31 is greater than the value set by PC-28, the inverter stops running, and Y outputs ON signal by assigning function code 26 to Y terminal.

The value of current time U0-31 is greater than the value set by PC-29. By assigning function code 41 to Y terminal, Y outputs ON signal, but the inverter will not stop running.

Parameter	Name	Range
PC-30	Setting power on arrival time	0~65000h
PC-32	Setting operation arrival time	0~65000h

When the accumulated operation time of P8-10 is greater than the set operation arrival time of PC-32, the inverter will stop operation. By assigning function code 29 to the Y terminal, the Y terminal will output ON signal.

When the cumulative power on time of P8-11 is greater than the power on arrival time set by PC-30, the inverter will stop running. By assigning function code 25 to the Y terminal, the Y terminal will output ON signal.

Parameter	Name	Range
PC-34	Current arrival detection value 1	0.0%~300.0% (motor rated current)
PC-35	Current arrival detection 1 range	0.0%~300.0% (motor rated current)
PC-36	Current arrival detection value 2	0.0%~300.0% (motor rated current)
PC-37	Current arrival detection 2 range	0.0%~300.0% (motor rated current)

When the output current of the inverter is within the set positive and negative detection width of current arrival, the multi-function Y outputs ON signal.

VH1 provides two groups of arrival current and detection width parameters. The following figure is the function diagram.
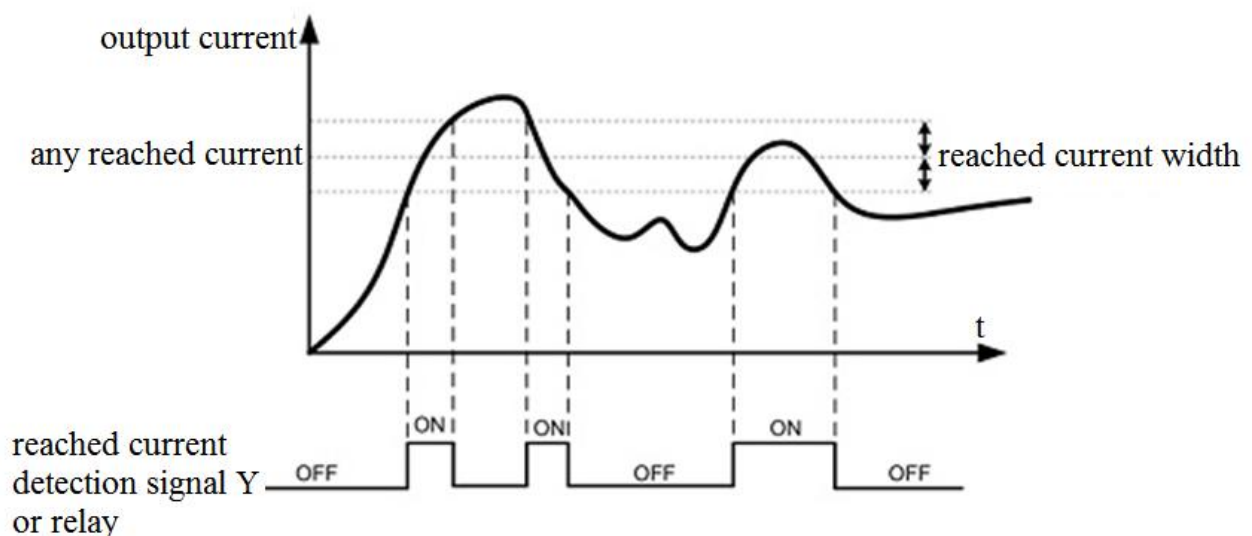
Parameter	Name	Range
PC-38	Zero current detection value	0.0%~300.0% (motor rated current)
PC-39	Zero current detection delay time	0.01s~600.00s

When the output current of the inverter is less than or equal to the zero current detection level and the duration exceeds the zero current detection delay time, the Y terminal of the inverter outputs ON signal.

Parameter	Name	Range
PC-40	Software overcurrent point	0：0.0% (not detect) 1：0.1%~300.0% (motor rated current)
PC-41	Software overcurrent detection delay time	0.00s~600.00s

When the output current of the inverter is greater than or exceeds the limit detection point, and the duration exceeds the software over-current point detection delay time, the Y terminal of the inverter outputs ON signal.

Parameter	Name	Range
PC-42	AI1 input voltage lower limit	0.00V~PC-43
PC-43	AI1 input voltage upper limit	PC-42~10.50V

When the value of analog input AI1 is greater than PC-43, or AI1 input is less than PC-42, Y terminal of inverter outputs "AI1 input overrun" ON signal, which is used to indicate whether the input voltage of AI1 is within the set range.

Parameter	Name	Range
PC-44	Overvoltage point setting	220V mode: 200~400V 380V mode: 540~810V

It is used to set the voltage value of inverter overvoltage fault. The factory value of 380V voltage level inverter overvoltage point is 810V, and the factory value of 220V voltage level inverter overvoltage point is 400V.

Parameter	Name	Range
PC-45	Undervoltage point setting	220V mode: 200~400V 380V mode: 200~537V

It is used to set the voltage value of the inverter under voltage fault Err08. The factory value of the 380 V voltage level inverter is 350 V, and the factory value of the 220 V voltage level inverter is 200 V.

Parameter	Name	Range
PC-46	Operation action when the frequency is lower than lower limit frequency	0: Run at lower limit frequency 1: Stop 2: Run at zero speed

Parameter	Name	Range
PC-47	Module temperature arrival	0°C~100°C

When the inverter radiator temperature reaches the temperature, the inverter Y terminal outputs the "module temperature reaches" ON signal.

Parameter	Name	Range
PC-48	Fan control	0: The fan runs during operation 1: The fan is running all the time

It is used to select the action mode of the cooling fan. When 0 is selected, the fan runs in the running status of the inverter. When the radiator temperature is higher than 40°C, the fan runs. When the radiator temperature is lower than 40°C, the fan does not run.

When it is selected as 1, the fan will run after power on.

Parameter	Name	Range
PC-49	Droop control	0.00Hz~10.00Hz

The droop rate allows a small speed difference between the master station and the slave station, thus avoiding conflicts between them. The default value for this parameter is 0.

Only when the master and slave adopt the speed control mode, the droop rate needs to be adjusted. For each transmission process, the appropriate droop rate needs to be gradually found in practice. It is suggested that the PC-49 should not be set too large, otherwise the steady-status speed will drop obviously when the load is large. The droop rate must be set for both the master and slave.

Droop speed = Synchronization frequency× output torque × droop rate ÷ 10

Eg.: PC-49 = 1.00, Synchronization frequency=50Hz, output torque=50%, then

Droop speed = 50Hz×50%×1.00÷10=2.5Hz

VFD actual frequency = 50Hz – 2.5Hz = 47.5Hz

Parameter	Name	Range
PC-50	Terminal jog run priority	0: Invalid 1: Valid

This parameter is used to set whether the terminal jog function has the highest priority.

When the terminal jog priority is valid, if the terminal jog command appears in the operation process, the inverter will switch to the terminal jog operation status.

Parameter	Name	Range
PC-51	SVC optimization selection	1: Optimization mode 1 2: Optimization mode 2

The SVC optimization mode of asynchronous motor, it does not need to be adjusted generally.

Parameter	Name	Range
PC-52	Dead area compensation mode	0: No compensation 1: Compensation mode 1

Parameter	Name	Range
PC-54	Modulation mode	0: Asynchronous Modulation 1: Synchronous modulation

It is only valid for VF control.

Synchronous modulation means that the carrier frequency changes linearly with the output frequency transformation to ensure that the ratio (carrier wave ratio) remains unchanged. It is generally used when the output frequency is higher, which is conducive to the quality of output voltage. When the output frequency is lower (below 100Hz), generally synchronous modulation is not needed, because the ratio of carrier frequency to output frequency is higher, and the advantage of asynchronous modulation is more obvious.

When the operating frequency is higher than 85Hz, the synchronous modulation will take effect, and the asynchronous modulation mode is adopted below this frequency.

Parameter	Name	Range
PC-55	DPWM switching upper limit frequency	5.00Hz~max output frequency

It is only valid for VF control. Generally, it does not need to be modified.

The modulation mode of asynchronous motor is determined by the VF wave generation mode. When the value is lower than PC-55, the switching loss of inverter is large, but the current ripple is small; When it is larger than PC-55, it is opposite, but it is easy to cause unstable operation of motor at high frequency.

When VF control operation is unstable, please refer to parameter P5-17. For inverter loss and temperature rise, please refer to PC-67.

Parameter	Name	Range
PC-56	Random PWM depth	0: Random PWM invalid 1~10: PWM carrier frequency random depth

When the random PWM depth is set to 0, the random PWM is invalid.

By adjusting the random PWM depth, the monotonous and harsh sound of the motor can be softened and the external electromagnetic interference can be reduced.

Parameter	Name	Range
PC-57	Wake up frequency	Dormancy frequency PC-59~max output frequency P0-13
PC-58	Wake up delay time	0.0s~6500.0s
PC-59	Dormancy frequency	0.00Hz~wake up frequency PC-57

PC-60	Dormancy delay time	0.0s~6500.0s
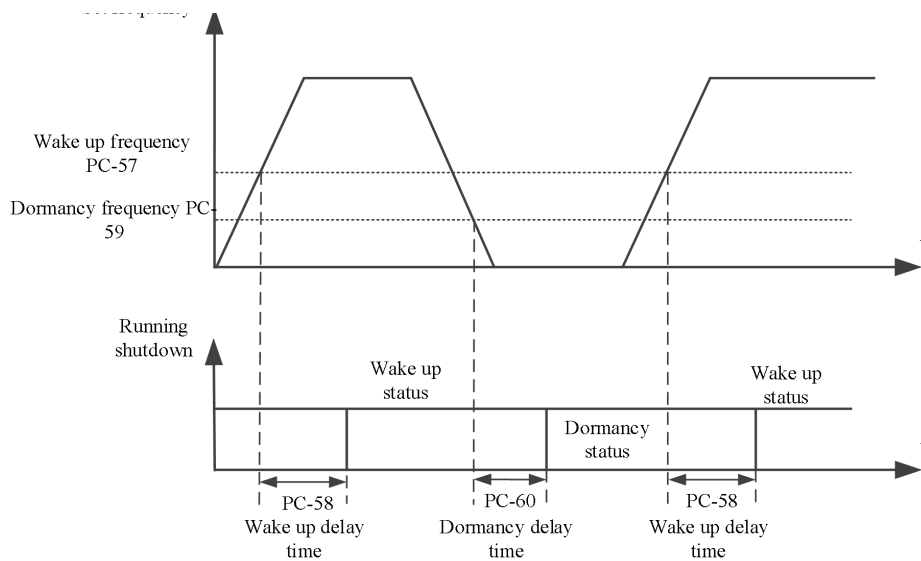
This set of parameters is used to realize the dormancy and wake-up function in water supply application.

During the operation of the inverter, when the set frequency is less than or equal to Dormancy frequency (PC-59), after the delay time(PC-60), the inverter enters the dormancy status and stops automatically.

If the inverter is in dormancy status and the current operation command is valid, when the set frequency is greater than or equal to the wake-up frequency(PC-57), the inverter starts to restart after the Wake up delay time(PC-58).

In general, please set the wake-up frequency to be greater than or equal to the dormancy frequency. Set the wake-up frequency and dormancy frequency to 0.00Hz, then the dormancy and wake-up functions are invalid.

Note: when the dormancy function is enabled, if the frequency source uses PID, it is necessary to select the operation when the PID stops (PA-25 = 1).

Parameter	Name	Range
PC-61	Wave by wave current limiting enable	0: Not enable 1: Enable

The fast current limiting function can minimize the over-current fault of the inverter and ensure the uninterrupted operation of the inverter.

If the inverter is in the fast current limiting status for a long time, the inverter may be damaged by overheating, which is not allowed. Therefore, when the inverter is in the fast current limiting status for a long time, it will give an alarm, indicating that the inverter is overloaded and needs to be shut down.

Parameter	Name	Range
PC-62	Overmodulation coefficient	100~110

Overmodulation function refers to the ability of the inverter to increase the output voltage by adjusting the utilization rate of the bus voltage when the input voltage is relatively low or when the frequency converter operates under heavy loads for a long time. When overmodulation is effective, the output current harmonics will slightly increase.

Parameter	Name	Range
PC-65	Bus voltage arrival value	Unit: 0.1V
PC-66	The bus voltage arrival hysteresis value	Unit: 0.1V

When the bus voltage reaches (PC-65-PC-66~PC-65+PC66), the Y terminal outputs ON signal by assigning function code 42 to Y terminal.

Parameter	Name	Range
PC-67	Carrier frequency	0.5K~16.0K

By adjusting the carrier frequency of the inverter, the noise of the motor can be reduced, the resonance point of the mechanical system can be avoided, the line leakage current to the ground and the interference of the inverter can be reduced. When the carrier frequency is high, the motor loss and the motor temperature rising decrease, but the inverter loss increases, the inverter temperature rising increases, and the interference increases.

If the carrier frequency is set higher than the factory value, the temperature rising of the inverter radiator will be increased. At this time, the user needs to use the inverter derating.

Parameter	Name	Range
PC-68	Carrier frequency adjusted with temperature	0: Invalid
		1: Valid

When PC-68 is 0, the carrier of inverter is determined by the set value and will not change during operation.

When PC-68 is 1, when the operating process of the inverter detects that the temperature of its radiator is high, the carrier frequency will be automatically reduced to reduce the temperature rising of the converter. When the temperature of the radiator is detected to be low, the carrier frequency will automatically return to the set value.

Parameter	Name	Range
PC-72	External linear speed given source	0: Don't use external linear speed 1: AI1 2: AI2 5: Communication
PC-73	Allowed update maximum deviation of main frequency	0.00%～10.00%
PC-74	Allowed update time interval of main frequency	0.00s~200.00s
PC-75	Differential time of external linear speed change	0.00s~50.00s
PC-76	External linear speed change value	0.00Hz~50.00Hz

When P0-03=10 (main frequency source A selects the special mode for wire drawing and winding), P0-04=8 (auxiliary frequency is adjusted by PID), P0-05=1, the inverter will use the main frequency+auxiliary frequency method to control the winding.

The control mode is as follows: the main frequency is roughly adjusted, the auxiliary frequency is precisely regulated by PID. Final output frequency=main frequency+auxiliary frequency.

PC-73~PC-74 control the update interval and value of the main frequency. If the external linear speed changes too much (judged by PC-75~PC-76), the auxiliary frequency will not work, and the main frequency will directly control the winding in the form of a certain proportion of synchronous changes with the linear speed (suitable for the control of acceleration and deceleration stages).

PC-72: If PC-72 is set to 0, it means that it does not use external linear velocity. If it is set to non-0, select the external linear velocity setting source.

PC-73: It means that when the deviation between PID setting and feedback is less than the deviation set by PC-73, the main frequency will be allowed to be updated.

PC-74: When the deviation between PID given and feedback is less than the deviation set by PC-73, the main frequency is updated every PC-74 time interval.

PC-75~PC-76: judge the linear velocity change of the external silk thread.

PC-75: Unit time of external linear speed change.

PC-76: change of external linear speed in unit time, unit: 0.01Hz. If the external linear speed change is greater than the value set by PC-76, the auxiliary frequency will not work, and the main frequency will change

synchronously with the linear speed in a certain proportion.

The current frequency change can be viewed through U0-23 and U0-24. When the feedback value is equal to the target frequency, U0-23 is the same as the current operating frequency of the inverter, and U0-24 is 0. When the feedback value is less than the target frequency, U0-23 value remains unchanged, and U0-24 increases; When the feedback value is greater than the target frequency, the U0-23 value remains unchanged and the U0-24 value decreases.

4-2-14. Group PE User optional parameters

Parameter	Name	Range
PE-00	User optional parameters 0	
PE-01	User optional parameters 1	
PE-02	User optional parameters 2	
PE-03	User optional parameters 3	
PE-04	User optional parameters 4	
PE-05	User optional parameters 5	
PE-06	User optional parameters 6	
PE-07	User optional parameters 7	
PE-08	User optional parameters 8	
PE-09	User optional parameters 9	
PE-10	User optional parameters 10	
PE-11	User optional parameters 11	
PE-12	User optional parameters 12	
PE-13	User optional parameters 13	
PE-14	User optional parameters 14	P0.00 ~ PF.xx
PE-15	User optional parameters 15	A0.00 ~ A2.xx
PE-16	User optional parameters 16	A9.00 ~ Ad.xx
PE-17	User optional parameters 17	U0.00 ~ U0.xx
PE-18	User optional parameters 18	U4.00 ~ U5.xx
PE-19	User optional parameters 19	
PE-20	User optional parameters 20	
PE-21	User optional parameters 21	
PE-22	User optional parameters 22	
PE-23	User optional parameters 23	
PE-24	User optional parameters 24	
PE-25	User optional parameters 25	
PE-26	User optional parameters 26	
PE-27	User optional parameters 27	
PE-28	User optional parameters 28	
PE-29	User optional parameters 29	
PE-30	User optional parameters 30	
PE-31	User optional parameters 31	

This group of function codes is the user-defined parameter group (P8-00 is set to 0 and P8-05 is set to 11, used together).

Users can select the required parameters to be summarized into PE group in all VH1 function codes, which can be used as user-defined parameters to facilitate the operation of viewing and changing.

PE group provides up to 32 user-defined parameters. When entering user-defined parameter mode, the display function code is defined by PE-00~PE-31, and the sequence is consistent with PE group function code.

This parameter array can map some discontinuous parameters into PE parameters. When the upper computer PLC reads the parameters of the converter, it can read all the discontinuous parameters through one instruction, which can simplify the PLC communication instruction and improve the communication efficiency.

4-2-15. Group PF Torque control

Parameter	Name	Range
PF-00	Torque control	0: Speed control 1: Torque control

It is used to select the control mode of inverter: speed control or torque control, which cannot be switched during the operation of inverter.

The X terminal of VH1 has a function related to torque control: torque control inhibition (function 29).

When the speed control / torque control switching terminal is invalid, the control mode is determined by PF-00. If the speed control / torque control switching is valid, the control mode is equivalent to the reverse value of PF-00.

Parameter	Name	Range
PF-01	Upper limit source of driver torque	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Min(AI1, AI2) 7: Max(AI1, AI2) (the full scale of option 0~7 correspond to PF-02 digital setting)
PF-02	Driver torque upper limit	-200.0%~200.0%

PF-01 is used to select the torque setting source, and there are 8 torque setting methods.

The torque setting adopts relative value, and 100.0% corresponds to the rated torque of the motor. The setting range is -200.0% - 200.0%, indicating that the maximum torque of the inverter is twice the rated torque of the inverter.

When the torque is given as positive, the inverter operates in positive. When the torque is given as negative, the inverter operates in reverse.

The torque setting sources are described as follows:

0: Digital setting (PF-02)

It refers to that the target torque directly uses the PF-02 set value.

1: AI1

2: AI2

When AI is used as the frequency setting, voltage/current input correspond to 100.0% of the setting.It refers to the percentage of relative torque digital setting PF-02.The input voltage values of AI and the corresponding relationship curve with the target torque can be freely selected by the user through P2-54.

VH1 provides five groups corresponding relationship curves, among which three groups of curves are linear relationships (2-point corresponding relationship), and two groups of curves are broken lines with 4-point corresponding relationship. Users can set them through Group P2 parameter.

5: Communication setting

The target torque is given by the communication mode.

When MODBUS is used for communication, the data is given by the host computer through the communication address **H1000**, and the data format is data with 2 decimal places.

Parameter	Name	Range
PF-03	Torque control forward maximum frequency source	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Min(AI1, AI2) 7: Max(AI1, AI2) (the full scale of option 0~7 correspond to P0-13 digital setting)
PF-04	Torque control forward maximum frequency	0.00Hz~max output frequency

It is used to set the maximum forward or reverse operating frequency of the inverter under torque control mode. The acceleration and deceleration time of the upper frequency limit is set in PC-07 (acceleration) /PC-08 (deceleration).

When the inverter is in torque control, if the load torque is less than the motor output torque, the motor speed will continue to rise. In order to prevent the mechanical system from speeding and other accidents, it is necessary to limit the maximum speed of the motor during torque control.

If it is necessary to dynamically and continuously change the maximum frequency of torque control, it can be achieved by controlling the upper limit frequency.

Parameter	Name	Range
PF-05	Torque control reverse maximum frequency source	0: Digital setting 1: AI1 2: AI2 5: Communication setting 6: Min(AI1, AI2) 7: Max(AI1, AI2) (the full scale of option 0~7 correspond to P0-13 digital setting)
PF-06	Torque control reverse maximum frequency	0.00Hz~max output frequency

Under the torque control mode, the difference between the motor output torque and the load torque determines the speed change rate of the motor and the load. The motor speed may change rapidly, causing problems such as noise or excessive mechanical stress. By setting the acceleration and deceleration time of torque control, the motor speed can change smoothly.

Parameter	Name	Range
PF-07	Torque acceleration time	0.00s～650.00s
PF-08	Torque deceleration time	0.00s～650.00s

In the torque control of small torque starting, it is not recommended to set the torque acceleration and deceleration time. If the torque acceleration and deceleration time is set, it is suggested to increase the speed filter coefficient properly. When torque quick response is needed, torque control acceleration and deceleration time is set to 0.00s.

For example, two motors in hard connection drive the same load. In order to ensure the load distribution evenly, one inverter is set as the master, and the speed control mode is adopted, the other is slave and torque control is adopted. The actual output torque of the master is the torque command of the slave. At this time, the torque of the slave needs to follow the master quickly, then the acceleration and deceleration time of torque control of slave is 0.00s.

4-2-16. Group A0 Textile

Parameter	Name	Range
A0-00	Setting length	0m~65535m
A0-01	Actual length	0m~65535m
A0-02	Pulse number per meter	0.1~6553.5

The above parameters are used for fixed length control.

In the application, it is necessary to set the corresponding input terminal function as "length counter input" (function 22). When the pulse frequency is high, the X4 port must be used. The actual length A0-01 can be calculated by dividing the number of pulses sampled at the terminal with the number of pulses per meter A0-02. When the actual length is greater than the set length A0-00, the multi-function digital Y outputs the "length arrival" ON signal. In the process of fixed length control, the length reset operation (function 23) can be carried out through the multi-function X terminal.

Parameter	Name	Range
A0-03	Setting count value	1~65535
A0-04	Specified count value	1~65535

In the application, it is necessary to set the corresponding input terminal function as "counter input" (function 20). When the count value reaches the set count value A0-03, the multi-function terminal Y outputs the "set count value arrival" ON signal, and then the counter stops counting. When the count value reaches the specified count value A0-04, the multi-function terminal Y outputs the "specified count value arrival" ON signal, and the counter continues to count until the counter stops counting when the "set count value" arrival. Counter reset operation (function 21) can be performed through multi-functional X terminal.

Parameter	Name	Range
A0-05	Swing frequency setting mode	0: Relative to center frequency 1: Relative to maximum output frequency

This parameter is used to determine the reference value of swing.

0: Relative to the center frequency (P0-03 frequency source), variable swing range system. The swing varies with the center frequency (set frequency).

1: Relative to the max output frequency (P0-13) is a constant swing range system with fixed swing range.

Parameter	Name	Range
A0-06	Swing frequency range	0.0%~100.0%
A0-07	Jump frequency range	0.0%~50.0%
A0-08	Swing frequency period	0.1s~3600.0s
A0-09	Triangular wave rise time of swing frequency	0.1%~100.0%

A0-06 swing amplitude AW: when setting swing range relative to center frequency (A0-05 = 0), AW = frequency source P0-03 × amplitude A0-06. When setting swing range relative to maximum output frequency (A0-05 = 1), AW = max output frequency P0-13 × swing range PB-21.

A0-08 swing period: the time value of a complete swing period.

A0-07 jump frequency amplitude: the jump frequency amplitude is the frequency percentage of the jump frequency relative to the swing range when the swing frequency is running, that is: jump frequency = AW × jump frequency amplitude A0-07.

If the swing is relative to the center frequency (A0-05 = 0), the jump frequency is a changing value. If the swing is relative to the max output frequency (A0-05 = 1), the jump frequency is a fixed value. The swing operating frequency is constrained by the upper and lower limit frequencies.

A0-09 triangle wave rise time coefficient: it is the time percentage of triangle wave rise time relative to swing period A0-08.

Triangle wave rise time (s) = swing period A0-08 × rise time coefficient of triangular wave A0-09;

Triangle wave falling time (s) = swing period A0-08 × (1 - triangular wave rise time coefficient A0-09).

4-2-17. Group A1 Virtual IO

Parameter	Name	Range
A1-00	Function selection of virtual X1 terminal	0~51: See group P2 physical X input selection

A1-01	Function selection of virtual X2 terminal	
A1-02	Function selection of virtual X3 terminal	
A1-03	Function selection of virtual X4 terminal	
A1-04	Function selection of virtual X5 terminal	
A1-05	Virtual X terminal valid status source	Ones bit: Virtual X1 0: The validity is determined by the state of virtual Y1 1: The validity is determined by function code A1-06 Tens bit: Virtual X2 Hundreds bit: Virtual X3 Thousands bit: Virtual X4 Ten thousands bit: Virtual X5
A1-06	Virtual X terminal status setting	Ones bit: Virtual X1 0: Invalid 1: Valid Tens bit: Virtual X2 Hundreds bit: Virtual X3 Thousands bit: Virtual X4 Ten thousands bit: Virtual X5

Different from ordinary digital input terminal, virtual X can be set in two ways, and can be selected through A1-05.

When X status is determined by the status of corresponding virtual Y, whether X is valid depends on whether Y output is valid or invalid, and X is uniquely bound to Yx (X is 1 ~ 5).

When virtual X terminal status is set by function code, the status of virtual input terminal is determined by binary bit of function code A1-06. The following is an example of how to use the virtual X terminal.

Example 1: when virtual Y status is selected to determine virtual X status, to complete the following functions: when AI1 input exceeds the upper and lower limits, the inverter will give an alarm and shut down. The following setting methods can be adopted:

Set the function of virtual X as "user defined fault 1" (A1-00 = 38).

Set the validity of virtual X terminal is determined by virtual Y (A1-05 = xxx0). Set the output function of virtual Y1 as "AI1 input exceeds the upper and lower limits" (A1-11 = 23).

When the AI1 input exceeds the upper and lower limits, the virtual Y1 output is in the ON status. At this time, the virtual X1 input terminal status is valid. The virtual X1 of the inverter receives the user-defined fault 1, and the inverter will alarm Err48 and shut down.

Example 2: when the function code A1-06 is selected to set the virtual X1 status, the following functions are completed: after the inverter is powered on, it will automatically enter the operation status. The following setting method can be adopted:

Set the function of virtual X1 to "forward operation" (A1-00=1).

Set the validity of virtual X1 terminal as function code (A1-05=xxx1).

Set the virtual X1 terminal status to be valid (A1-06=xxx1). Set the command source to terminal control (P0-02=1).

Set the start protection to "unprotected" (P4-05=0).

After the inverter power on initialization is completed, it is detected that virtual X1 is valid, and the terminal is forward running, which is equivalent to the inverter receiving a terminal forward running command, and the inverter will start to run forward.

Parameter	Name	Range
A1-07	Function selection of AI1 terminal as X terminal	0~51
A1-08	Function selection of AI2 terminal as X terminal	
A1-10	Selection of valid mode when AI is used as X terminal	Ones bit: AI1 Tens bit: AI2 0: High level valid 1: Low level valid

This group of function codes is used to use AI as X. When AI is used as X, if AI input voltage is greater than 7V, AI terminal status is high level. If AI input voltage is lower than 3V, AI terminal status is low level. There is hysteresis between 3V and 7V.

A1-10 is used to determine whether the AI high level is valid or the AI low level is valid when AI is X.

Parameter	Name	Range
A1-11	Virtual Y1 output function selection	0: Connect with physical Xx inside 1~42: See group p3 physical Y output selection
A1-12	Virtual Y2 output function selection	
A1-13	Virtual Y3 output function selection	
A1-14	Virtual Y4 output function selection	
A1-15	Virtual Y5 output function selection	
A1-16	Virtual Y1 output delay time	0.0s~3600.0s
A1-17	Virtual Y2 output delay time	0.0s~3600.0s
A1-18	Virtual Y3 output delay time	0.0s~3600.0s
A1-19	Virtual Y4 output delay time	0.0s~3600.0s
A1-20	Virtual Y5 output delay time	0.0s~3600.0s
A1-21	Virtual Y terminal valid status selection	Ones bit: Virtual Y1 0: Positive logic 1: Negative logic Tens bit: Virtual Y2 Hundreds bit: Virtual Y3 Thousands bit: Virtual Y4 Ten thousands bit: Virtual Y5

Virtual digital output function is similar to Y output function of control board. It can be used to cooperate with virtual digital input X to realize some simple logic control.

When the output function of virtual Y is selected as 0, the output statuss of virtual Y1 ~ Y5 are determined by the input statuss of physical X1 ~ X5 on the control board. At this time, virtual Y corresponds to physical X.

When the virtual Y output function is not 0, the function setting and use method of virtual YI are the same as those of P3 group Y output. Please refer to the description of P3 group Y output.

4-2-18. Group A2 Second motor parameters

VH1 provides two sets of motor control parameters, which can set motor nameplate parameters, encoder parameters and VF vector performance parameters respectively.

Group A2 function code corresponds to motor 2. All parameters and application methods of group A2 are the same as those of motor 1.

Parameter	Name	Range
A2-00	Motor type selection	0: Common asynchronous motor
A2-01	Motor rated power	0.1kW~650.0kW

Parameter	Name	Range
A2-02	Motor rated voltage	1V~1200V
A2-03	Motor rated current	0.01A~655.35A (VFD power ≤55kW) 0.1A~6553.5A (VFD power >55kW)
A2-04	Motor rated frequency	0.01Hz~max output frequency
A2-05	Motor rated speed	1rpm~65535rpm
A2-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω (VFD power ≤55kW) 0.0001Ω~6.5535Ω (VFD power >55kW)
A2-07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω (VFD power ≤55kW) 0.0001Ω~6.5535Ω (VFD power >55kW)
A2-08	Asynchronous motor leakage inductance	0.01mH~655.35mH (VFD power ≤55kW) 0.001mH~65.535mH (VFD power >55kW)
A2-09	Asynchronous motor mutual inductance	0.01mH~655.35mH (VFD power ≤55kW) 0.001mH~65.535mH (VFD power >55kW)
A2-10	Asynchronous motor current without load	0.01A~A2-03 (VFD power ≤55kW) 0.1A~A2-03 (VFD power >55kW)
A2-35	Motor 2 parameter self learning	0: No operation 1: Static tuning 1 2: Dynamic tuning 3: Static tuning 2
A2-36	Motor 2 control mode	0: VF control mode 1: No speed sensor vector control (SVC)
A2-37	Motor 2 acc/dec time selection	0: Same to first motor 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: A cceleration and deceleration time 4
A2-38	Motor 2 torque boost	0.0%: Automatic torque boost 0.1%~30.0%
A2-40	Motor 2 oscillation suppression gain	0~100
A2-41	Speed loop proportion gain 1	1~100
A2-42	Speed loop integral time 1	0.01s~10.00s
A2-43	Speed loop proportion gain 2	1~100
A2-44	Speed loop integral time 2	0.01s~10.00s
A2-45	Switching frequency 1	0.00~A2-46
A2-46	Switching frequency 2	A2-45~max output frequency (P0-13)
A2-47	Speed loop integral property	Ones bit: Integral separation 0: Invalid 1: Valid
A2-48	Slip gain of vector control	50%~200%
A2-49	SVC speed feedback filter time	0.000s~0.100s
A2-51	Torque upper limit source	0: Parameter setting (A2-52)

Parameter	Name	Range
	under speed control mode	1: AI1 2: AI2 4: PULSE setting 5: Communication setting 6: Min(AI1,AI2) 7: Max(AI1,AI2) (the ful scale of option 0-7 correspond to A2-53 digital setting)
A2-52	Digital setting of torque upper limit in speed control mode	0.0%~200.0%
A2-55	Proportional gain of excitation regulation	0~60000
A2-56	Integral gain of excitation regulation	0~60000
A2-57	Proportional gain of torque regulation	0~60000
A2-58	Integral gain of torque regulation	0~60000

4-2-19. Group A4 Password countdown lock

Parameter	Name	Range
A4-00	Parameter group access verification	0～65000
A4-01	Parameter group lock password	0～65000
A4-02	Total power on time before locking	0～7200
A4-03	Remaining time of power on locking	0～7200

In the A4-00 password verification input interface, enter 0. At this point, A4-01 is 0 and verification is successful. You can view and set other parameters for the A4 group.

Set A4-01, A4-02, for example, A4-01=12345, A4-02=3, A4-03 (read-only parameter) will automatically change to 3, and the countdown function will be activated. As long as the total power on time before locking is set to A4-02, the countdown function will be activated.

When the remaining time of locking is 0, Err56 fault is shown. The alarm cannot be cleared, nor can it be cleared after power on again. If want to clear the alarm, you need to enter the password and set A4-02 to 0, press the stop key on the panel to clear the alarm.

Notes:

1. Group A4 parameters cannot be written in communication

2. A4-01 cannot be read by communication

3. A4 group parameters cannot be initialized

4. Err56 cannot be cleared when A4-02 > 0

4-2-20. Group A9 Communication address mapping

Parameter	Name	Setting range
A9-00	Communication address mapping selection	0: Communication mapping function does not take effect 1: Communication mapping function takes effect

A9-01	Communication address mapping primitive 1	0x0000~0xFFFF
A9-02	Communication address mapping primitive 2	0x0000~0xFFFF
A9-03	Communication address mapping primitive 3	0x0000~0xFFFF
A9-04	Communication address mapping primitive 4	0x0000~0xFFFF
A9-05	Communication address mapping primitive 5	0x0000~0xFFFF
A9-06	Communication address mapping primitive 6	0x0000~0xFFFF
A9-07	Communication address mapping primitive 7	0x0000~0xFFFF
A9-08	Communication address mapping primitive 8	0x0000~0xFFFF
A9-09	Communication address mapping primitive 9	0x0000~0xFFFF
A9-10	Communication address mapping primitive 10	0x0000~0xFFFF
A9-11	Communication address mapping primitive 11	0x0000~0xFFFF
A9-12	Communication address mapping primitive 12	0x0000~0xFFFF
A9-13	Communication address mapping primitive 13	0x0000~0xFFFF
A9-14	Communication address mapping primitive 14	0x0000~0xFFFF
A9-15	Communication address mapping image 1	0x0000~0xFFFF
A9-16	Communication address mapping image 2	0x0000~0xFFFF
A9-17	Communication address mapping image 3	0x0000~0xFFFF
A9-18	Communication address mapping image 4	0x0000~0xFFFF
A9-19	Communication address mapping image 5	0x0000~0xFFFF
A9-20	Communication address mapping image 6	0x0000~0xFFFF
A9-21	Communication address mapping image 7	0x0000~0xFFFF
A9-22	Communication address mapping image 8	0x0000~0xFFFF
A9-23	Communication address mapping image 9	0x0000~0xFFFF
A9-24	Communication address mapping image 10	0x0000~0xFFFF
A9-25	Communication address mapping image 11	0x0000~0xFFFF
A9-26	Communication address mapping image 12	0x0000~0xFFFF
A9-27	Communication address mapping image 13	0x0000~0xFFFF
A9-28	Communication address mapping image 14	0x0000~0xFFFF

This function is suitable for applications where the MODBUS address of the control system cannot be changed, but the frequency converter must be replaced. If the communication address is different, the application manufacturer may need to replace it. For example, the frequency communication address of the Xinjie VB5N frequency converter is H2001, and the VH1 communication address is H1000. Without changing the slave address in the control system, the VH1 frequency converter supports communication address mapping function and can communicate normally. If the communication control command is used, it is necessary to understand whether the corresponding BIT bit meaning corresponds. For example, VB5N gives a command to write A to the communication address 2000H as a fault reset command, and VH1 gives a command to write 7 to the communication address 1100H as a fault reset command. The specific instructions are as follows:

When the A9-00 is set to 1, the communication mapping function is enabled, and the data can only be read and written through the mapping address set in A9-01~A9-14. If the communication address in the data frame is inconsistent with the address value set in A9-01~A9-14, the inverter reply frame will report the communication address error, resulting in alarm of normal communication control.

For example, the original control system needs to start and stop (forward rotation) through communication and given frequency. Use VH1 replace VB5N, the frequency address is 0x2000, and the start and stop control address is 0x2001. A9-00 is set to 1, A9-01 is set to 0x2000, A9-02 is set to 0x2001, A9-15 is set to 0x1000 , and A9-16 is set to 0x1100.

Write 50.00Hz data frame: 01 06 20 00 27 10 97 36

Start / Stop   data frame: 01 06 20 01 00 01 12 0A

4-2-21. Group AD AIAO correction parameters

Parameter	Name	Range
AD-00	AI1 measured voltage 1	0.500V~4.000V
AD-01	AI1 display voltage 1	0.500V~4.000V
AD-02	AI1 measured voltage 2	6.000V~9.999V
AD-03	AI1 display voltage 2	6.000V~9.999V
AD-04	AI2 measured voltage 1	0.500V~4.000V
AD-05	AI2 display voltage 1	0.500V~4.000V
AD-06	AI2 measured voltage 2	6.000V~9.999V
AD-07	AI2 display voltage 2	6.000V~9.999V

This group of function codes is used to correct the analog input AI to eliminate the influence of bias and gain of the analog input.

This group of function parameters have been corrected before leaving the factory, and when the factory value is restored, it will return to the factory corrected value. Generally, there is no need for correction in the application site.

The measured voltage refers to the actual voltage measured by the multimeter and other measuring instruments, and the displayed voltage refers to the voltage display value sampled by the inverter. See the voltage (U0-26, U0-27, U0-28) before AI correction of U0 group.

When correcting, input two voltage values at each AI input port, and input the values measured by the multimeter and the values read by U0 group into the above function code, then the inverter will automatically correct the AI bias and gain.

For the case that the user given voltage and the actual sampling voltage of the converter do not match, the field correction method can be adopted to make the sampling value of the converter consistent with the expected value. Taking AI1 as an example, the field correction method is as follows:

Given AI1 voltage signal (about 2V)

The actual measurement of AI1 voltage value is saved in AD-00, U0-26 is saved in AD-01.

Given AI1 voltage signal (about 8V)

The actual measurement of AI1 voltage value is saved in AD-02, U0-26 is saved in AD-03.

When correcting AI2 and AI3, the actual sampling voltage viewing positions are U0-27 and U0-28 respectively. For AI1 and AI2, 2V and 8V are recommended as the correction points, and for AI3, -8V and 8V points are recommended as the correction points.

Parameter	Name	Range
AD-12	AO1 target voltage 1	0.500V~4.000V
AD-13	AO1 measured voltage 1	0.500~4.000V
AD-14	AO1 target voltage 2	6.000V~9.999V
AD-15	AO1 measured voltage 2	6.000V~9.999V

This group of function codes is used to correct the AO of analog output to eliminate the influence of bias and gain of analog output.

This group of function parameters have been corrected before leaving the factory, and when the factory value is restored, it will return to the factory corrected value. Generally, there is no need for correction in the application site.

4-2-22. Group U0 Monitor parameters

The U0 parameter group is used to monitor the operation status information of the frequency converter, and customers can view it through the panel for easy on-site debugging. The minimum unit can be found in the function code table.

Parameter	Name	Range
U0-00	Operation frequency (Hz)	0.00~600.00Hz
U0-01	Setting frequency (Hz)	0.00~600.00Hz
U0-02	Bus voltage (V)	0.0~1024.0V
U0-03	Output current (A)	0.0~655.35A
U0-04	Output voltage (V)	0~1140V
U0-05	Output torque (%) percentage output value of motor rated torque	-200.0~200.0%
U0-06	Output power (kW)	0~32767

Monitor the frequency, bus voltage, current, torque, and output power parameters of the frequency converter during operation.

Parameter	Name	Range
U0-07	X input status	0x0000~0x7FFF

Displays the current X terminal input status value. After hexadecimal conversion to binary data, each bit corresponds to an X input signal. 1 indicates that the input is a high-level signal, and 0 indicates that the input is a low-level signal. The corresponding relationship between each bit and input terminal is as follows:
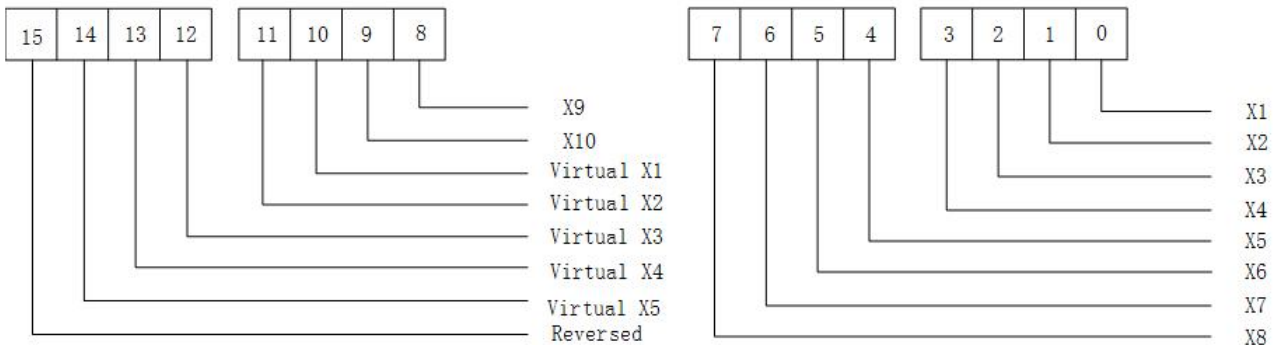
Parameter	Name	Range
U0-08	Y output status	0x0000~0x03FF

Displays the current Y terminal output status value. After hexadecimal conversion to binary data, each bit corresponds to an output signal. 1 indicates that the input is a high-level signal, and 0 indicates that the input is a low-level signal. The corresponding relationship between each bit and input terminal is as follows:
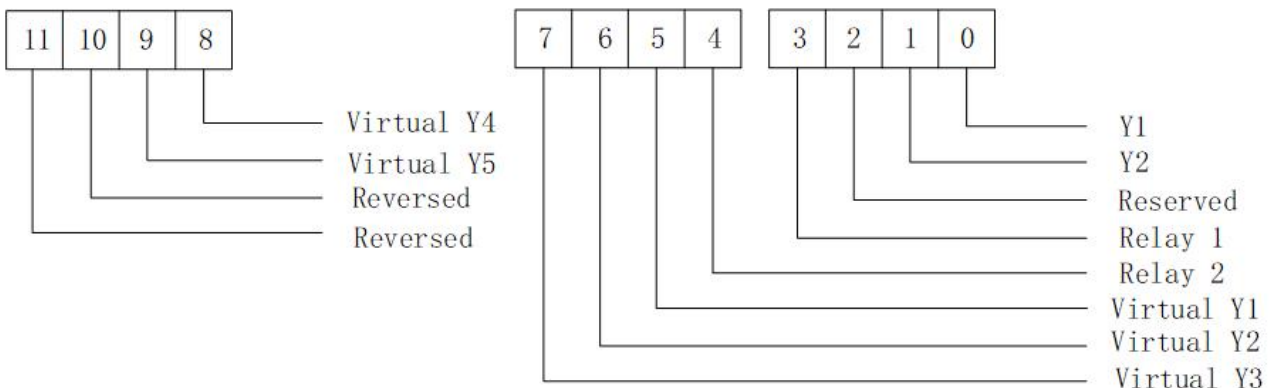
Parameter	Name	Range
U0-09	AI1 voltage (V)/current (mA)	0.00V~10.57V/0.00mA~20.00mA
U0-10	AI2 voltage (V)/current (mA)	0.00V~10.57V/0.00mA~20.00mA

When the input is analog voltage or analog current, the displayed values of the monitoring parameters are all voltage values, and the current value is the displayed value multiplied by 2.

For example: AI1 input 5V analog voltage, U0-09 display value should be 5V, AI2 input 10mA analog current, then U0-10 display value is 5, the calculated analog current is 10mA.

Parameter	Name	Range
U0-14	PID setting	0~65535
U0-15	PID feedback	0~65535

PID setting = PID setting (percentage) *PA-20

PID feedback = PID feedback (percentage) *PA-20

Parameter	Name	Range
U0-16	Load speed display	0~65535

The set load speed is displayed during stop and the running load speed is displayed during operation.

The value displayed by the parameter can be adjusted according to P8-21 and P8-22. See Group P8 parameter description for details.

Parameter	Name	Range
U0-17	Feedback speed (Hz)	-600.00~600.00Hz

Display the given frequency.

Parameter	Name	Range
U0-19	Line speed	0～65535m/Min

Display pulse sampling line speed, which is calculated from the actual number of sampling pulses per minute and A0-02 function code.

Parameter	Name	Range
U0-20	PLC stage	0~15

When using the simple PLC function, monitor the current number of operating segments, parameter PB group parameter settings.

Parameter	Name	Range
U0-21	Count value	0~65535
U0-22	Length value	0~65535

When using the inverter counting and length fixing functions to view the count value and length value received by the sent inverter. Refer to A0 group parameter description.

Parameter	Name	Range
U0-23	Main frequency A display	0.01~max output frequency Hz
U0-24	Auxiliary frequency B display	0.01~max output frequency Hz

Display the set values of main and auxiliary frequency.

Parameter	Name	Range
U0-25	Communication setting value	-100.00%~100.00%

Display the value written in the H1000 through modbus communication.

Parameter	Name	Range
U0-26	AI1 voltage(V)/current (mA) before calibration	0.000V/0.01mA~10.570V/20.000mA
U0-27	AI2 voltage(V)/current (mA) before calibration	0.000V/0.01mA~10.570V/20.000mA

Display the actual value of analog input sampling voltage / current.

The actually used voltage / current has been linearly corrected to make the deviation between the sampled

voltage / current and the actual input voltage / current smaller.

Monitor U0-09 and U0-10 for the actually used correction voltage / current.

Parameter	Name	Range
U0-29	Remaining running time	0.0~6500.0Min

Display the remaining running time when the timing function is running. Refer to PC group timing function parameter settings.

Parameter	Name	Range
U0-30	Present power on time	0~65000Min
U0-31	Present operation time	0.0~6500.0Min

Display the power on time and running time of this power on. This parameter is not memorized when power is off.

Parameter	Name	Range
U0-33	Present fault	0~56

The current fault code is displayed.

Parameter	Name	Range
U0-35	Target torque (%)	-200.0%~200.0%

When PF-01 selects 0, U0-35 is the same value with PF-02.

Parameter	Name	Range
U0-36	Torque upper limit	-200.00%~200.00%

Display the current given torque upper limit value.

Parameter	Name	Range
U0-41	Power factor angle	-

Display the current operating power factor angle.

Parameter	Name	Range
U0-42	Setting frequency (%)	-100.00~100.00%
U0-43	Operation frequency (%)	-100.00~100.00%

The current setting frequency and operating frequency are displayed, and 100.00% corresponds to the maximum frequency of the inverter P0-13.

Parameter	Name	Range
U0-44	VF separate target voltage	0V~motor rated voltage
U0-45	VF separate output voltage	0V~motor rated voltage

Display the target output voltage and current actual output voltage when running in VF separation status. Refer to Group P5 VF separation parameter settings.

Parameter	Name	Range
U0-47	Motor serial number	0: Motor 1 1: Motor 2

Display the current motor parameter selection.

Parameter	Name	Range
U0-65	Cumulative operation time of inverter	0~3600s

When U0-65 reaches 3600s, U0-65 will be cleared, and P8-10 adds 1h.

Parameter	Name	Range
U0-66	Motor speed	0~the speed corresponding to the maximum output frequency(RPM)

Display the current speed of the motor.

Parameter	Name	Unit

Parameter	Name	Unit
U0-70	Communication feedback motor speed 1	0.1Hz

Display the motor speed fed back by communication, unit: Hz.

Parameter	Name	Unit
U0-71	Communication feedback motor speed 2	1RPM

Display the motor speed fed back by communication, unit: rpm.

Parameter	Name	Range
U0-72	Special current display for communication card	-
U0-73	Communication card error status	-
U0-74	Motor actual output torque	-200.00%~200.00%

The output torque is based on the rated current of the inverter, and the maximum value corresponds to P6-11 and PF-02.

Parameter	Name	Range
U0-75	Fault code	0~56
U0-76	Operation status word	0x0000~0xFFFF
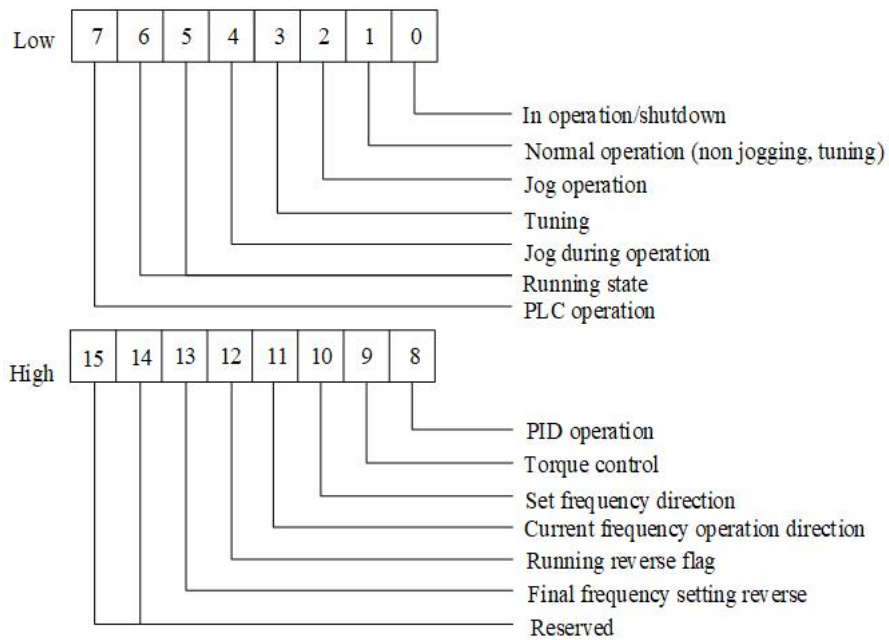
5. EMC

5-1. EMC compliant installation guidelines

The output of the inverter is PWM wave, which will produce electromagnetic noise when it works. In order to reduce the interference of the inverter to the outside world, this section introduces the installation method of EMC in noise suppression, field wiring, grounding, leakage current, power filter use and so on.

5-1-1. Noise suppression

● **Noise type**

The noise generated by the operation of the inverter may affect the nearby instruments and equipment. The degree of influence is related to the control system of the inverter, the anti-noise ability of the equipment, the wiring environment, the safe distance, the grounding method and other factors. The types of noise include: electrostatic induction, circuit transmission, space transmission, electromagnetic induction, etc.
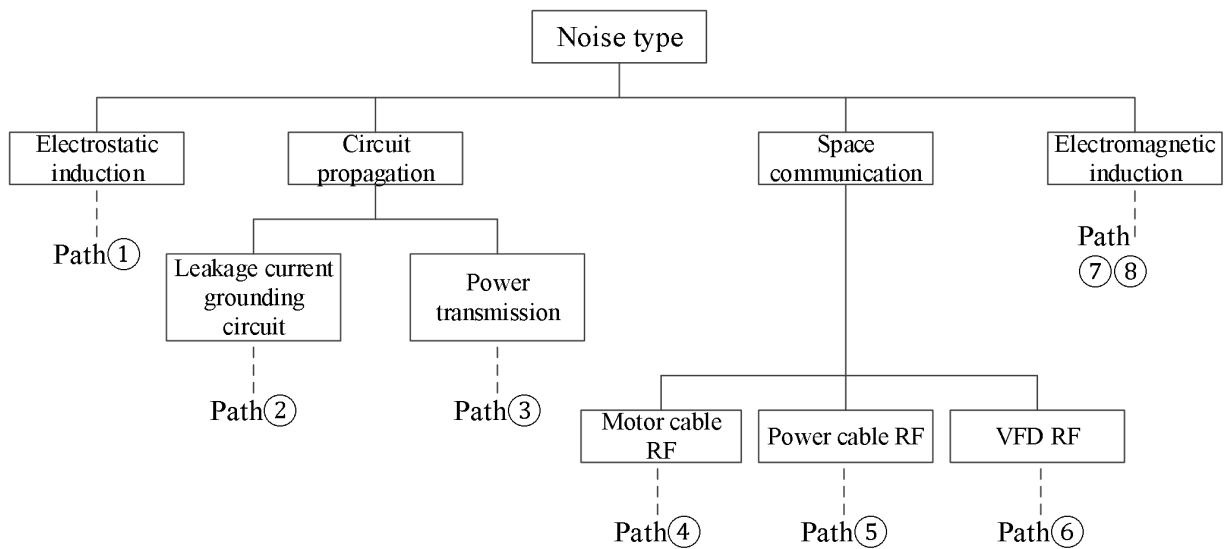
● **Basic countermeasures for noise suppression**

Noise propagation path	Solution
②	When the grounding wire of peripheral equipment and the wiring of inverter form a closed loop, the leakage current of the inverter grounding wire will cause the equipment to misbehave. At this time, if the equipment is not grounded, it will reduce the misoperation.
③	When the power supply of peripheral equipment and the power supply of inverter share the same system, the noise generated by the inverter propagates against the power line, which will disturb other equipment in the same system. The following measures can be taken to suppress the noise: installing electromagnetic noise filter at the input end of the inverter. Use isolation transformer or power filter to isolate other equipment.
④⑤⑥	(1) Equipment and signal lines that are easy to be disturbed should be installed as far away from the inverter as possible. The signal line should use shielded wire, the shielding layer should be single ended grounding, and should be as far away from the inverter and its input and output lines as possible. If the signal wire must intersect with the strong current cable, the two should be kept orthogonal.

	(2) High frequency noise filters (ferrite common mode choke) are installed at the root of the input and output sides of the inverter, which can validly suppress the RF interference of the power line. (3) The motor cable should be placed in the barrier with larger thickness, such as in the pipe with thickness (more than 2mm) or embedded in the cement tank. The power line is sheathed in the metal pipe and grounded with the shielded wire (the motor cable adopts 4-core cable, one of which is grounded on the inverter side and the other side is connected to the motor shell).
①⑦⑧	Avoid parallel wiring or binding of strong and weak current wires. It should be far away from the installation equipment of inverter as far as possible, and its wiring should be far away from the input and output lines of inverter. Shielded wire is used for signal line and power line. For the equipment with strong electric field or magnetic field, pay attention to the relative installation position with inverter, and keep the distance and orthogonality.

5-1-2. Field wiring and grounding

1. The cable (U, V, W terminal outgoing line) from the inverter to the motor should avoid parallel wiring with the power line (L1, L2, L3 or L1, L3 terminal input line) as far as possible. Keep a distance of more than 30cm.

2. The three motor wires of inverter output U, V and W terminals shall be placed in metal tube or metal wiring slot.

3. The control signal line shall be shielded cable, and the shielding layer shall be connected with the PE end of the inverter, and the single end grounding near the side of the inverter.

4. The PE end grounding cable of inverter shall not borrow the grounding wire of other equipment, but must be directly connected with the ground.

5. The control signal line shall not be parallel to the strong current cable (L1, L2, L3 or L1, L2 and U, V, W) for short distance wiring, and shall not be bundled together. The distance above 20 ~ 60 cm (related to the strong current) shall be maintained. If you want to intersect, you should cross each other vertically, as shown in the figure below.

Power cable

Signal cable
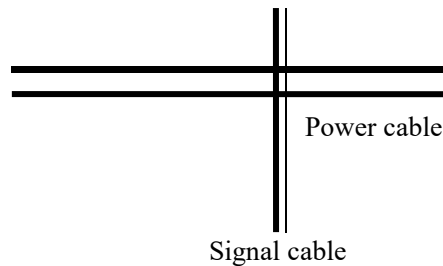
6. Weak current grounding wires such as control signals and sensors must be grounded independently from strong current grounding wires.

7. It is forbidden to connect other devices on the power input terminal (L1, L2, L3 or L1, L2) of inverter.

6. Model and dimension

6-1. VH1 series VFD electrical specification

Voltage level	VFD model	Input power capacity (KVA)	Input current (A)	Output current (A)	Matched motor (kW)
380V 50Hz/60Hz	VH1-40.4G/0.7P-B	1	1.8	1.5	0.4
	VH1-40.7G/1.5P-B	1.5	2.3	2.1	0.75
	VH1-41.5G/2.2P-B	3.0	4.4	3.8	1.5
	VH1-42.2G/3.7P-B	4.0	5.8	5.1	2.2
	VH1-43.7G/5.5P-B	5.9	10.5	9.0	3.7
220V 50Hz/60Hz	VH1-20P4-B	1	1.3	2.5	0.4
	VH1-20P7-B	1.5	9.8	4.0	0.75

6-2. VH1 series VFD dimension

● VH1-20P4//20P7-B, VH1-40.4G/0.7P// 40.7G/1.5P// 41.5G/2.2P-B   Unit: mm
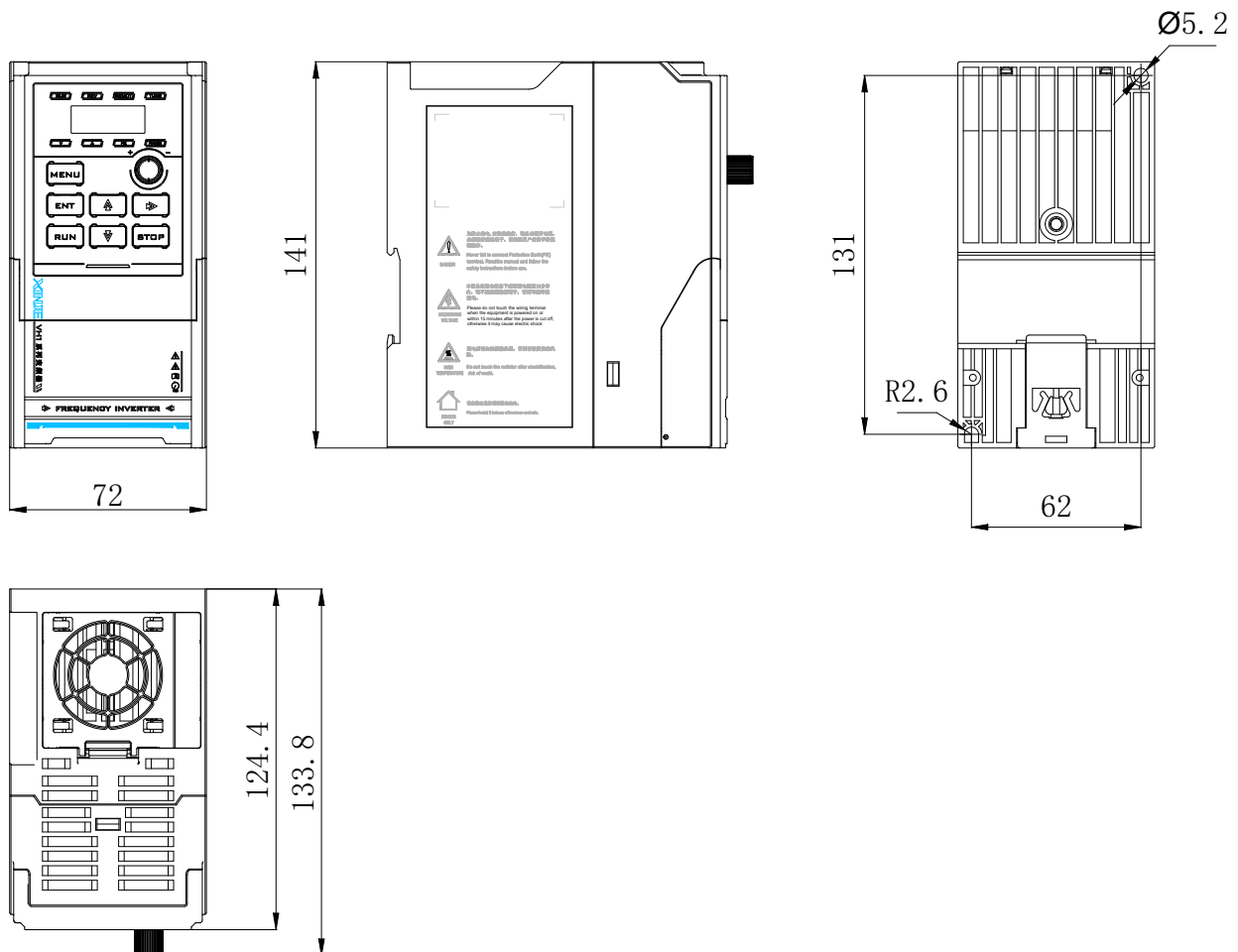
● VH1-42.2G/3.7P// 43.7G/5.5P-B   Unit: mm
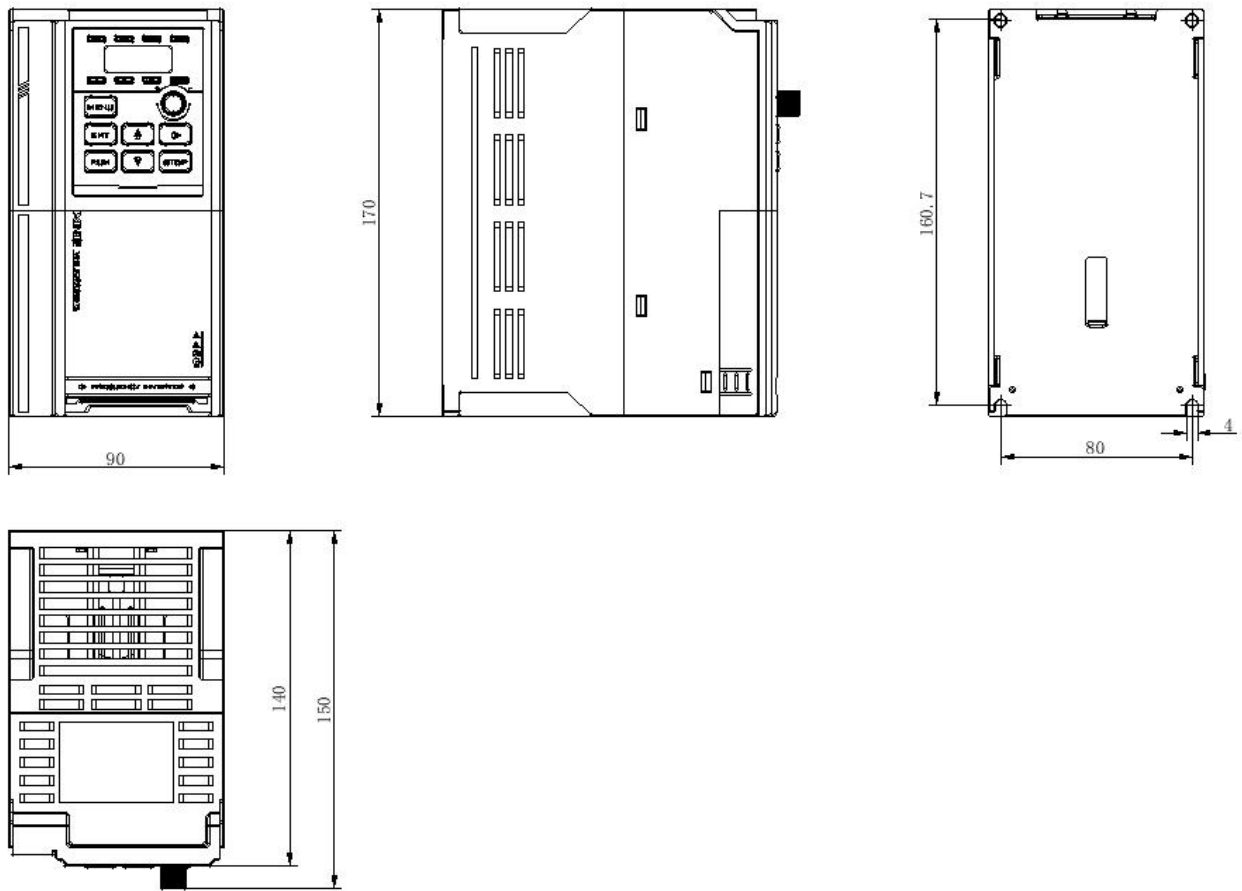
Note: The installation screws are all M4.

● Dimension drawing of operation panel mounting bracket
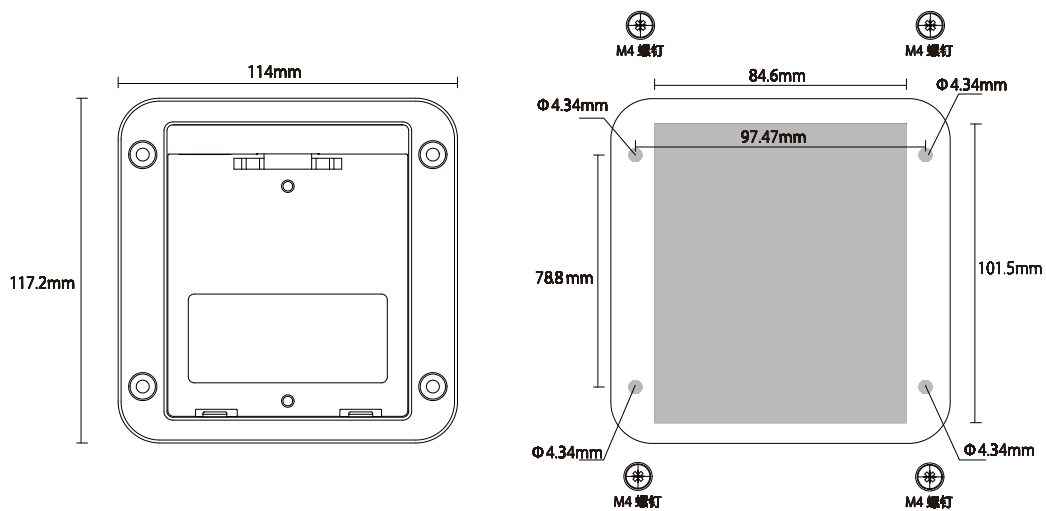
The gray area is the hollowed out part, and the middle hollowed out area is 84.6 × 101.5mm. The diameter of the four corner hollowed out area is 4.34 circle, and M4 screws and nuts are put in to fix the bracket on the panel.

6-3. Accessories selection guide

6-3-1. Accessories functions

Name	Function
Cable	A device for transmitting electrical signals
Circuit breaker	To prevent electric shock and the short circuit to ground which may cause leakage current fire (please select leakage circuit breaker for inverter device and with function of suppressing high harmonic. Rated sensitive current of circuit breaker shall be more than 30mA for one inverter.)
AC contactor	In order to validly cut off the input power of the inverter in case of system failure, an electromagnetic contactor is installed on the input side to control the on-off of the main circuit power supply, so as to ensure safety.
Input reactor DC reactor	It is suitable for improving the power factor of the input side of the inverter and restraining the high-order harmonic current.
Input filter	To suppress the electromagnetic interference of the inverter transmitted to the public power grid through the input power line, please install it as close to the input terminal side of the inverter as possible.
Fuse	It mainly plays the role of overload protection. When the input current of the inverter rises to a certain height and heat, the fuse itself will fuse to cut off the current, which can protect the safe operation of the inverter.
Braking resistor	The regenerative energy of motor is consumed by resistor or resistor unit to shorten deceleration time and avoid over-voltage alarm of inverter.
Output filter	Suppress the interference generated from the output side wiring of the inverter. Please install it close to the output terminal of inverter.
Output choke	It is used to extend the valid transmission distance of the inverter and validly suppress the instantaneous high voltage generated when the IGBT module of the inverter is switched.

6-3-2. Cable selection

● **Power cable**

➢ The size of input power cable and motor cable shall comply with local regulations.

➢ The input power cable and motor cable must be able to withstand the corresponding load current.

➢ The maximum rated temperature margin of motor cable under continuous working condition should not be lower than 70℃.

➢ The conductivity of PE grounding conductor is the same as that of phase conductor.

➢ For EMC requirements, please refer to the chapter "EMC".

➢ In order to meet the EMC requirements of CE, symmetrical shielded motor cable must be used.

➢ Four core cable can be used for input cable, but shielded symmetrical cable is recommended. Compared with four core cable, using symmetrical shielded cable can reduce the loss of motor cable and electromagnetic radiation.
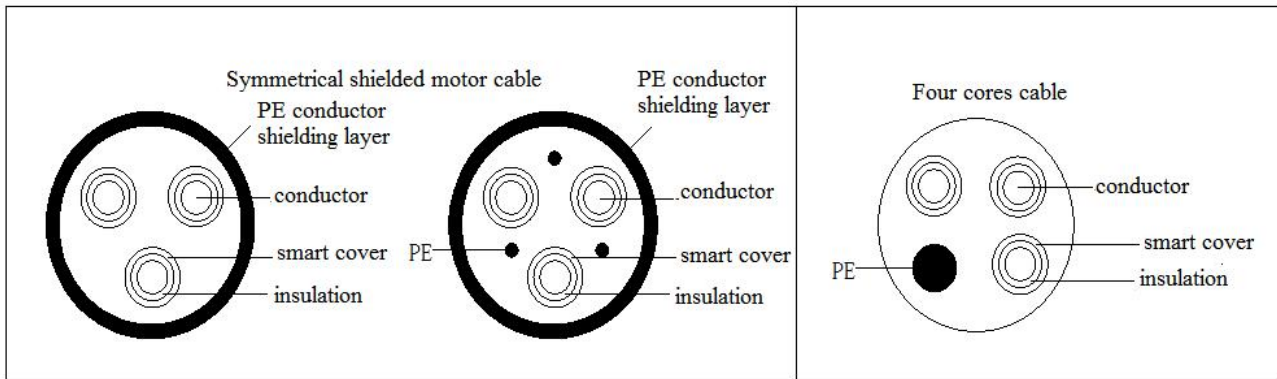
Note: if the conductivity of the shielding layer of the motor cable cannot meet the requirements, a separate PE conductor must be used.

In order to protect the conductor, when the shielding wire and the phase conductor are made of the same material, the cross-sectional area of the shielding wire must be the same as that of the phase conductor, so as to reduce the grounding resistance and improve the impedance continuity.

In order to validly suppress the emission and conduction of radio frequency interference, the conductivity of the shielding wire must be at least 1/10 of that of the phase conductor. For copper or aluminum shielding, this requirement is very easy to meet. The minimum requirements of inverter motor cable are shown in the figure below. The cable contains a spiral copper strip. The tighter the shielding layer is, the better, because the tighter it is, the more validly it can suppress the electromagnetic interference radiation.
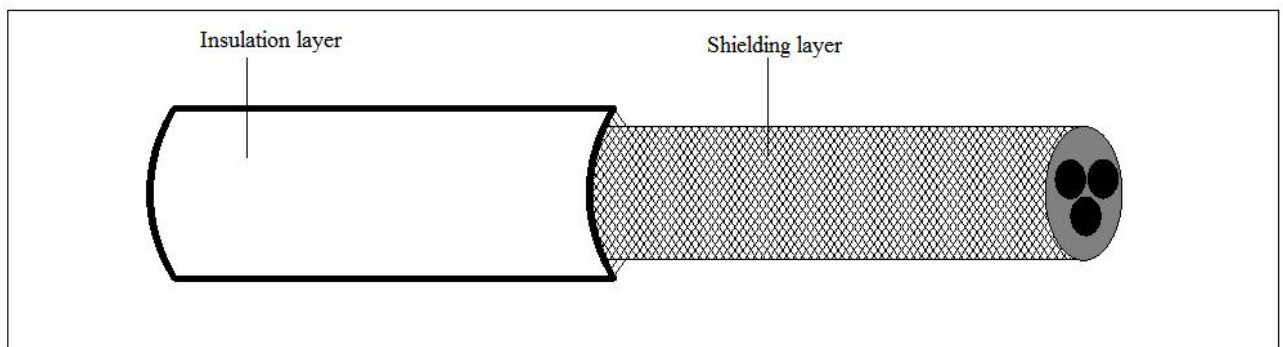
● **Control cable**

All analog control cables and cables used for frequency input must use shielded cables. The analog signal cable uses twisted pair shielded cable. Each signal uses a separate pair of shielded twisted pairs. Do not use the same ground wire for different analog signals.

For low-voltage digital signal, it is better to choose double layer shielded cable, but single shielded or unshielded twisted pair can also be used, but for frequency signal, shielded cable must be used.

Multi twisted pair double shielded cable   Multi twisted pair single shielded cable
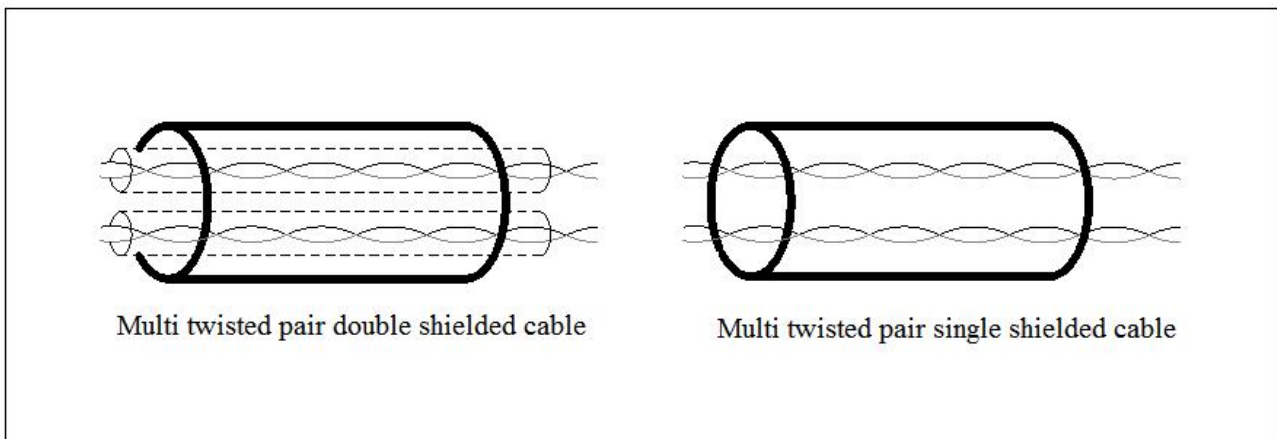
Relay cables need to be shielded with metal braid.

The keyboard needs to use network cable. For the electromagnetic environment, it is recommended to use shielded network wire.

Note:

1)   Analog and digital signals are routed separately using different cables.

2)   Before connecting the input power cable of the inverter, check the insulation of the input power cable according to the local regulations.

● **Cable wiring**

The routing of motor cable must be far away from the routing of other cables. The motor cables of several inverters can be run side by side. It is suggested that the motor cable, input power cable and control cable should be distributed in different trunking. The reason to avoid the side-by-side routing of other cables and motor cables is that the du/dt output from the inverter will increase the electromagnetic interference to other cables.

If the control cable and the power cable must be crossed, the angle between the control cable and the power cable must be 90 degrees.

The cable trunking must be well connected and well grounded. Aluminum trunking can make local equipotential.
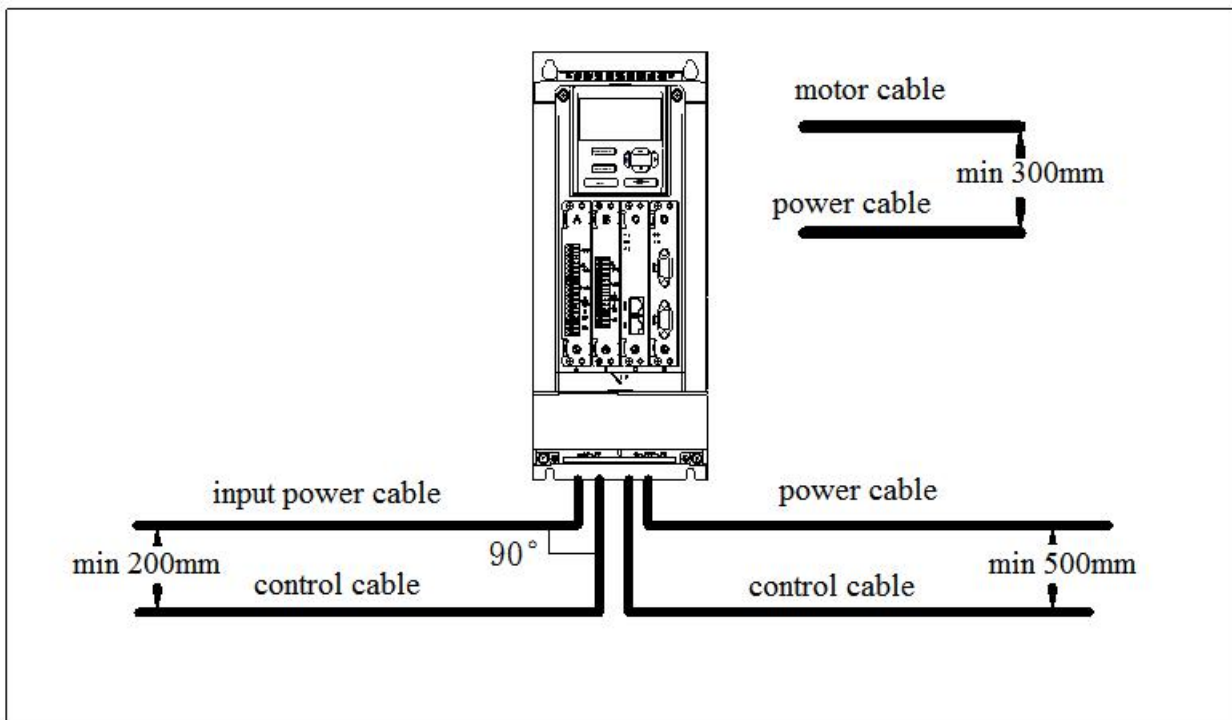
● **Insulation inspection**

Before operation, please check the insulation of motor and motor cable

1)   Make sure that the motor cable is connected to the motor, and then remove the motor from the output terminal UVW of the inverter.

2)   Use a 500VDC megger to measure the insulation resistance between each phase conductor and the protective grounding conductor. For the insulation resistance of the motor, please refer to the motor manufacturer's instructions.

3)   If the inside of the motor is wet, the insulation resistance will decrease. If moisture is suspected, dry the motor and measure again.

6-3-3. Selection guidance of circuit breaker, contactor and fuse

● In order to prevent the overload from damaging the inverter, it is necessary to add a fuse at the incoming end.

● A manually operated power short circuit device (MCCB) needs to be installed between AC power supply and inverter. The circuit breaker equipment must be able to be locked in the cut off position to facilitate installation and maintenance. The capacity of the circuit breaker is generally 1.5-2 times of the rated current of the inverter.

● In order to validly cut off the input power of inverter in case of system failure, AC contactor can be installed on the input side to control the on-off of main circuit power supply, so as to ensure safety.

VFD model	Breaker (A)	Rated current of contactor (A)	Fuse (A)
VH1-20P4-B	10	9	12
VH1-20P7-B	16	12	20
VH1-40.4G/0.7P-B	6	9	5
VH1-40.7G/1.5P-B	6	9	6
VH1-41.5G/2.2P-B	10	9	10
VH1-42.2G/3.7P-B	10	9	10
VH1-43.7G/5.5P-B	16	12	16

Note: the parameters of the options in the table are ideal values, which can be adjusted according to the actual situation, but try not to be lower than the parameters in the table.

6-3-4. Reactor selection guide

● In order to prevent the instantaneous large current from flowing into the input power circuit and damaging the rectifier components when the power grid is under high voltage input, AC reactor should be connected to the input side, which can also improve the power factor of the input side.

● When the distance between the inverter and the motor is more than 50 meters, the leakage current is large due to the parasitic capacitance effect of the long cable to the ground, and the inverter is prone to over-current protection. At the same time, in order to avoid the insulation damage of the motor, the output reactor must be added for compensation. When a inverter is equipped with multiple motors, the sum of the cable length of each motor is considered as the total length of the motor cable. When the total length is greater than 50m, the output reactor must be added at the output side of the inverter.

VFD model	Input reactor	Output reactor
VH1-20P4-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VH1-20P7-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VH1-40.4G/0.7P-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VH1-40.7G/1.5P-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VH1-41.5G/2.2P-B	ACLSG-6A/4.4V	OCLSG-5A/2.2V
VH1-42.2G/3.7P-B	ACLSG-6A/4.4V	OCLSG-6A/2.2V
VH1-43.7G/5.5P-B	ACLSG-10A/4.4V	OCLSG-10A/2.2V

Note: the above options are of Zhengtai brand; users can purchase them according to the model.

6-3-5. Brake resistor selection

When the inverter is slow down with large inertia load or needs to slow down rapidly, the motor will be in power generation status. The load energy will be transmitted to the DC link of the converter through the inverter bridge, which causes the voltage rise of the converter bus. When the value exceeds a certain value, the inverter will report an over-voltage alarm. In order to prevent this phenomenon, the brake components must be configured.

1. The design, installation, commissioning and operation of the equipment must be carried out by trained and qualified professionals.

2. In the process of work, all the provisions in the "warning" must be observed, otherwise serious personal injury or heavy property loss may be caused.

3. Non professional construction personnel are not allowed to conduct wiring, otherwise the circuit of inverter or brake options will be damaged.

4. Before connecting the brake resistor to the inverter, please read the instruction manual of the brake resistor / brake unit carefully.

5. Do not connect the brake resistor to terminals other than PB and P +, and do not connect the brake unit to terminals other than P+ and P-. Otherwise, the brake circuit and inverter may be damaged and fire may be caused.

⚠️ As shown in the wiring diagram, please connect the inverter with the braking resistance. If the wiring is wrong, the inverter or other equipment may be damaged.

- **Brake resistor selection**

When braking, the regenerative energy of the motor is almost all consumed on the braking resistance. According to the formula:

$$U \times U / R \quad = \quad Pb$$

U --- Braking voltage of system stable braking (different system U values are different, the default braking voltage of VH1 series inverter is 690V, which can be adjusted through P7-52),

Pb ---Braking power.

- **Brake resistor power selection**

Theoretically, the power of the braking resistor is the same as that of the braking power, but considering that the derating is A. According to the formula:

$$A \times Pr \quad = \quad Pb \times D$$

A --- Generally, the value is about 50%,

Pr --- Resistor power,

D --- Braking frequency, that is, the proportion of regeneration process in the whole working process

Note: value A is the derating coefficient of the braking resistance. A lower value A can ensure that the braking resistance will not overheat. Users can appropriately increase value A when the braking is good, but it is better not to exceed 50%, otherwise there will be the risk of fire caused by overheated resistance.

- **Typical braking frequency value**

Common applications	Elevator	Unwinding and winding	Centrifuge	Accidental braking load	General occasions
Braking frequency value	20% ~30%	20 ~30%	50%~60%	5%	10%

- **Brake resistor models**

VFD model	Braking unit	Recommended brake resistor specifications		
		Brake resistor (Ω)	Brake resistor power (W)	Brake resistor quantity
VH1-20P4-B	Built-in	≥230	80	1
VH1-20P7-B	Built-in	≥170	80	1
VH1-40.4G/0.7P-B	Built-in	≥345	150	1
VH1-40.7G/1.5P-B	Built-in	≥345	150	1
VH1-41.5G/2.2P-B	Built-in	≥345	150	1
VH1-42.2G/3.7P-B	Built-in	≥200	250	1
VH1-43.7G/5.5P-B	Built-in	≥130	300	1

Note:

1) The values in the table are guidance data. Users can choose different resistance values and power according to the actual situation (but the resistance value must not be less than the recommended value in the table, and the power can be larger). The selection of braking resistance needs to be determined according to the power generated by the motor in the practical application system, which is related to the system inertia, deceleration time, energy of potential energy load, etc, Customers need to choose according to the actual situation. The greater the inertia of the system, the shorter the deceleration time and the more frequent the braking, the greater the power and the smaller the resistance value of the braking resistor.

2) The brake resistance cable shall be shielded cable.

3) All resistors must be installed in a well ventilated place.

4) It is suggested that the material of brake resistor accessories should be flame retardant, and the surface temperature of the resistor is very high. Even the temperature of the air flowing out of the resistance can be as high as several hundred degrees, so the material must be prevented from contacting with the resistance.

5) The brake resistor must be connected to the PB and P + terminals, and the brake unit must be connected to the P+ and P- terminals. As shown in the figure below:
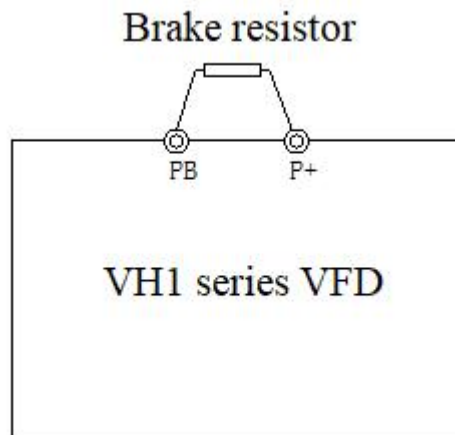
7. Fault and solution

7-1. Fault alarm and solution

When the inverter is abnormal, the LED tube will display the function code and its content of the corresponding fault, the fault relay will act, and the inverter will stop output. In case of fault, if the motor is rotating, it will stop freely until it stops rotating. The possible fault types of inverter are shown in the table. When the inverter fails, the user should first check according to the table, and record the failure phenomenon in detail. If you need technical service, please contact our after-sales service and technical support department or our agents.

Code	Name	Reason	Solution
Err01	Acceleration over current	1. There is grounding or short circuit in the output circuit of inverter 2. The control mode is vector control without parameter tuning 3. The acceleration time is too short 4. Improper manual torque lifting or VF curve 5. The voltage is low 6. Start the rotating motor 7. Sudden loading during acceleration 8. The selection of inverter is too small	1. Remove peripheral faults 2. Tuning of motor parameters 3. Increase acceleration time 4. Adjust the manual lifting torque or VF curve 5. Adjust the voltage to the normal range 6. Select speed tracking start or wait until the motor stops 7. Cancel sudden loading 8. Choose the inverter with higher power level
Err02	Deceleration over current	1. There is grounding or short circuit in the output circuit of inverter 2. The control mode is vector control without parameter tuning 3. The deceleration time is too short 4. The voltage is low 5. Sudden loading during deceleration 6. There is no additional brake unit and brake resistor	1. Remove peripheral faults 2. Tuning of motor parameters 3. Increase deceleration time 4. Adjust the voltage to the normal range 5. Cancel sudden loading 6. Add brake unit and resistor
Err03	Constant speed over current	1. There is grounding or short circuit in the output circuit of inverter 2. The control mode is vector control without parameter tuning 3. The voltage is low 4. Is there sudden load in operation 5. The selection of inverter is too small	1. Remove peripheral faults 2. Tuning of motor parameters 3. Adjust the voltage to the normal range 4. Cancel sudden loading 5. Choose the inverter with higher power level
Err04	Acceleration over voltage	1. High input voltage 2. There is external force to drive the motor during acceleration 3. Acceleration time too short 4. There is no additional brake unit and brake resistor	1. Adjust the voltage to the normal range 2. Cancel additional force or add brake resistor 3. Increase acceleration time 4. Add brake unit and resistor
Err05	Deceleration over voltage	1. High input voltage 2. There is external force to drive the motor during deceleration 3. The deceleration time is too short	1. Adjust the voltage to the normal range 2. Cancel additional force or add brake resistor

Code	Name	Reason	Solution
		4. There is no additional brake unit and brake resistor	3. Increase deceleration time 4. Add brake unit and resistor
Err06	Constant speed over voltage	1. High input voltage 2. In the process of operation, there is external force to drive the motor	1. Adjust the voltage to the normal range 2. Cancel additional force or add brake resistor
Err07	Buffer resistance overload fault	1. Unstable supply voltage 2. The main control board is abnormal	1. Adjust the voltage to the normal range 2. Contact us
Err08	Under voltage fault	1. Instantaneous power failure 2. The input voltage of inverter is not in the range of specification requirements 3. Abnormal bus voltage 4. Abnormal rectifier bridge and buffer resistance 5. Abnormal drive board 6. Abnormal control board	1. Reset fault 2. Adjust the voltage to the normal range 3. Contact us
Err09	Inverter overload	1. Whether the load is too large or the motor stalls 2. The selection of inverter is too small	1. Reduce the load and check the motor and mechanical condition 2. Choose the inverter with higher power level
Err10	Motor overload	1. Is the setting of motor protection parameters appropriate 2. Whether the load is too large or the motor stalls 3. The selection of inverter is too small	1. Set this parameter correctly 2. Reduce the load and check the motor and mechanical condition 3. Choose the inverter with higher power level
Err11	Input phase loss	1. Abnormal three-phase input power supply 2. Abnormal drive board 3. Abnormal lightning protection board 4. The main control board is abnormal	1. Check and eliminate problems in peripheral circuit 2. Contact us
Err12	Output phase loss	1. The lead from inverter to motor is abnormal 2. The three-phase output of inverter is unbalanced when the motor is running 3. Abnormal drive board 4. Module is abnormal	1. Remove peripheral faults 2. Check whether the three-phase winding of the motor is normal and remove the fault 3. Contact us
Err13	Radiator/module overheating	1. The ambient temperature is too high 2. Air duct blocked 3. The fan is damaged 4. Module thermistor damaged 5. Inverter module damaged	1. Reduce the ambient temperature 2. Clean the air duct 3. Replace the fan 4. Replace the thermistor 5. Replace inverter module
Err14	Contactor fault	1. Abnormal drive board and power supply 2. The contactor is abnormal	1. Replace the drive board or power board 2. Replace the contactor
Err15	Current detection fault	1. Check the Hall device 2. Abnormal drive board	1. Replace Hall element 2. Replace the drive plate
Err16	Motor tuning fault	1. The motor parameters are not set according to the nameplate 2. Parameter tuning process timeout	1. Set the motor parameters correctly according to the name plate 2. Check the lead from inverter to motor

Code	Name	Reason	Solution
Err18	Short circuit fault of motor to ground	Motor short circuit to ground	Replace motor or cable
Err19	Load drop	VFD operation current is lower than P7-61	Confirm whether the load is separated or whether the P7-61 and P7-62 parameter settings conform to the actual operating conditions
Err20	Wave by wave current limiting fault	1. Whether the load is too large or the motor stalls 2. The selection of inverter is too small	1. Reduce the load and check the motor and mechanical condition 2. Choose the inverter with higher power level
Err21	Magnetic pole position detection failed	The deviation between the motor parameters and the actual value is too large	Re-determine the motor parameters, focusing on whether the motor rated current is too small
Err23	Brake resistance short circuit	Output current too high	1. Increase acceleration and deceleration time 2. Reduce the load
Err26	SVC stall fault	1. Excessive load 2. Torque limit too small (P6-11)	1. Reduce the load 2. Increase torque limit
Err43	External fault	1. Input the signal of external fault through multi-function terminal X 2. Input external fault signal through virtual Y function	Reset and run again
Err44	Communication (timeout) fault	1. The upper computer is not working properly 2. The communication cable is abnormal 3. Incorrect setting of communication parameter group PC	1. Check the upper computer wiring 2. Check the communication cable 3. Setting communication parameters correctly
Err45	EEPROM read/write fault	EEPROM chip damaged	Replace the main circuit board
Err46	Operation time arrival	The accumulated running time reaches the set value	Use the parameter initialization function to clear the record information
Err47	Power on time arrival	The accumulated power on time reaches the set value	Use the parameter initialization function to clear the record information
Err48	User defined fault 1	1. Input user-defined fault 1 signal through multi-function terminal X 2. Input user defined fault 1 signal through virtual IO function	Reset and run again
Err49	User defined fault 2	1. Input user-defined fault 2 signal through multi-function terminal X 2. Input user defined fault 2 signal through virtual IO function	Reset and run again
Err50	PID feedback loss during operation	PID feedback is less than P7-27 setting value	Check PID feedback signal or set P7-27 to an appropriate value
Err51	Switch motor during operation	In the process of inverter operation, change the current motor selection through the terminal	Switch the motor after the inverter stops
Err52	Speed feedback deviation too	1. Encoder parameter setting incorrect 2. Motor blocked	1. Setting encoder parameters correctly 2. Check whether the machine is

Code	Name	Reason	Solution
	large	3. Incorrect UVW wiring	abnormal 3. Check whether the wiring between inverter and motor is abnormal
Err53	Motor over speed	1. Incorrect setting of encoding parameters 2. The motor is not tuned 3. Unreasonable setting of motor over speed detection parameters P7-63 and P7-64	1. Setting encoder parameters correctly 2. Tuning correctly 3. Set reasonable parameters according to the actual situation
Err54	Motor over temperature fault	1. Loose wiring of temperature sensor 2. Motor temperature too high	1. Check the wiring of temperature sensor 2. Reduce the carrier wave or take other measures to dissipate the motor heat.
Err56	Power on lock time arrival	Power on time arrival	When the usage time arrives, please enter the password in A4-00.

7-2. Fault record query

This series of inverter records the fault codes and operation parameters of the inverter for the last three times. Querying these information is helpful to find out the cause of the fault. All fault information is saved in P7 group parameters. Please refer to the keyboard operation method to enter P7 group parameters to check the information.

7-3. Fault reset

In case of a failure of the inverter, to resume normal operation, you can select any of the following operations:

1) When the fault code is displayed, press stop after confirming that it can be reset.

2) Set any terminal of X1-X4 to reset stop input for external fault, and then disconnect from com terminal after closing.

3) Cut off the power supply.

Note:

1) Before reset, the reason of the fault must be thoroughly identified and eliminated, otherwise, the permanent damage of the inverter may be caused.

2) If the fault cannot be reset, check the reason, and the continuous reset will damage the inverter.

3) When overload and overheating protection acts, it shall be reset 5 minutes later.

7-4. VFD common fault analysis of inverter

7-4-1. Motor not rotate

```
                                    Motor not rotate
                                          │
                                          ▼
                                    Keyboard                  Whether the
                                    can         ──No──►       output side          ──No──►   Close contactor
                                    display?                  empty and
                                       │                      contactor is
                                      Yes                     closed
                                       ▼                         │
  Operation normal no    Find reason    Display       ──Yes──►  Yes
  error                  as fault ◄─Yes─ fault info                │
       ▲                 info                                     ▼
     normal                                  Check RST  ─normal─► VFD fault
       │                                     voltage
    Set                  Communi-     Confirm    │
    parameter   ──No──   cation      run        Error
    again, can           parameters  command     ▼
    run         ◄────    correct?  ──communication── channel   Check power grid
    noraml?                                                     voltage
       │                    │                │
     Error                  No            keyboard        terminal         Operation normal no error
       │                    ▼                ▼                │                    ▲
  Operation    Check    Operation    Press      Check input       normal
  normal no    communi- normal no    RUN to     terminal   ──No error──► Close
  error    ◄── cation  ◄─Normal─ run        terminal,
               wiring                                          can run?
                  ▲                     │                         │
                 error                 error        ───────error────
                  │                     ▼
                              Speed       Set correct
                              command  ──No──► speed command,  ──normal──► run normal
                              ok?              can run?
                                 │
                                Yes
                                 ▼
                              Check UVW  ──error──► VFD fault
                              voltage
                                 │
                               normal
                                 ▼
                              Motor      ──No──► Wiring the motor
                              wiring              correctly
                              ok?
                                 │
                                Yes
                                 ▼
  Motor fault ◄──No──  Load too large?  ──Yes──► Decrease the load
```

7-4-2. Motor vibration

```
┌─────────────────────────────────┐
│  Motor vibration or abnormal noise │
└─────────────────────────────────┘
              │
              ▼
      ⬡ Motor parameters and type ok? ⬡ ──No►  ( Set correct motor parameters )
              │ Yes
              ▼
      ⬡ Carry out parameter self-learning? ⬡ ──No►  ( Carry out parameter self-learning )
              │ Yes
              ▼
      ⬡ Is VF oscillation parameter set normally? ⬡ ──No►  ( Set correct parameters )
              │ Yes
              ▼
      ⬡ Whether the given frequency fluctuates abnormally? ⬡ ──Yes►  ( Check the frequency setting )
              │ No
              ▼
      ⬡ Is the load abnormal fluctuation? ⬡ ──Yes►  ( Check the load )
              │ No
              ▼
         ( VFD fault )
```

7-4-3. Over voltage

```
┌────────────────┐
│  Over voltage  │
└────────────────┘
         │
         ▼
   ⬡ Is the supply voltage in the standard range? ⬡ ──No►  ( Make sure the power supply is in the range )
         │ Yes
         ▼
   ⬡ UVW short circuited to ground? The inverter wiring correct? ⬡ ──Yes►  ( Remove the short circuit )
         │ Yes
         ▼
   ⬡ Too short acceleration/deceleration time? ⬡ ──Yes►  ⬡ Decrease dec time? ⬡ ──Yes►  ( Reduce dec time )
         │ No                                                    │ No
         ▼                                                       ▼
( Check the load ) ◄Yes── ⬡ Is the load motor reversely driven? ⬡   ⬡ Choose brake accessories? ⬡ ──Yes►  ( Add brake accessories )
         │ No                                                    │ No
         ▼                                                       ▼
    ( VFD fault )                                      ( Adjust brake accessories )
```

7-4-4. Motor overheat

```
                    ┌─────────────────────────┐
                    │      Motor overheat      │
                    └─────────────────────────┘
                                 │
                                 ▼
              ⟨ Motor parameter correct? ⟩──No──▶ ( Set correct parameters )
                                 │ Yes
                                 ▼
              ⟨ Do Parameter self-learning? ⟩──No──▶ ( Parameter self-learning )
                                 │ Yes
                                 ▼
         ⟨ Is the frequency converter always running at low speed ⟩
                                 │ Yes
                                 ▼
              ⟨ Is it a variable frequency motor ⟩──No──▶ ( Use variable frequency motor )
                                 │ Yes
                                 ▼
              ⟨ Load too large? ⟩──Yes──▶ ( Reduce the load )
                                 │ No
                                 ▼
              ⟨ Motor 3-phase balance? ⟩──No──▶ ( Replace the motor )
                                 │ Yes
                                 ▼
              ⟨ Is the carrier frequency too low ⟩──Yes──▶ ( Set correct carrier frequency )
                                 │ No
                                 ▼
              ⟨ Motor cable is too long? ⟩──Yes──▶ ( Add output filter )
                                 │ No
                                 ▼
                          ( VFD fault )
```

The "No" branch from "Is the frequency converter always running at low speed" leads to "Load too large?".

7-4-5. Over current

```
                    ┌─────────────────────┐
                    │    Over current     │
                    └─────────────────────┘
                              │
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱  UVW short circuit to   ╲──Yes►   │ Eliminate the short circuit│
             ╲       the ground?       ╱          │    to ground fault       │
              ╲───────────────────────╱          ╰─────────────────────────╯
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱  Motor short circuit to ╲──Yes►   │    Replace the motor     │
             ╲       the ground?       ╱          ╰─────────────────────────╯
              ╲───────────────────────╱
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱     Motor type and      ╲──No►    │  Set correct parameters  │
             ╲   parameters correct?   ╱          │       and types          │
              ╲───────────────────────╱          ╰─────────────────────────╯
                              │ Yes
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱     Do self-learning?   ╲──No►    │      Self-learning       │
             ╲                         ╱          ╰─────────────────────────╯
              ╲───────────────────────╱
                              │ Yes
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱   Acceleration time too ╲──Yes►   │    Adjust the acc time   │
             ╲         short?          ╱          ╰─────────────────────────╯
              ╲───────────────────────╱
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱      Load too large     ╲──Yes►   │      Reduce the load     │
              ╲───────────────────────╱          ╰─────────────────────────╯
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱  Is there any interference╲─Yes►  │   Clear the interference │
             ╲     source around?      ╱          │         source           │
              ╲───────────────────────╱          ╰─────────────────────────╯
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱  Torque boost too large?╲──Yes►   │  Reduce the torque boost │
              ╲───────────────────────╱          ╰─────────────────────────╯
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱   Is the multi-point VF ╲──Yes►   │    Adjust the VF curve   │
             ╲  curve set improperly?  ╱          ╰─────────────────────────╯
              ╲───────────────────────╱
                              │ No
                              ▼
              ╱───────────────────────╲          ╭─────────────────────────╮
             ╱  Whether the motor is   ╲──Yes►   │ Set correct VF oscillation│
             ╲  abnormal oscillation?  ╱          │ suppression parameters   │
              ╲───────────────────────╱          ╰─────────────────────────╯
                              │ No
                              ▼
                    ╭─────────────────────╮
                    │      VFD fault      │
                    ╰─────────────────────╯
```

7-4-6. VFD overheat

```
                    ┌─────────────────────┐
                    │    VFD overheat     │
                    └──────────┬──────────┘
                               │
                               ▼
              ┌─────────────────────────┐
              < Load too large? VFD      >──Yes►  ( Enlarge capacity, reduce the load )
              < capacity too small?      >
              └───────────┬─────────────┘
                         No
                          ▼
              ┌─────────────────────────┐         ( Installation of cooling device or )
              < Ambient temperature too  >──Yes►  ( derating of frequency converter   )
              < high                     >
              └───────────┬─────────────┘
                         No
                          ▼
              ┌─────────────────────────┐
              < Whether the fan of       >
              < frequency converter      >──Yes►  ( VFD fault )
              < makes abnormal noise     >
              └───────────┬─────────────┘
                         No
                          ▼
              ┌─────────────────────────┐
              < Is the radiator blocked  >──Yes►  ( Clean the radiator )
              └───────────┬─────────────┘
                         No
                          ▼
              ┌─────────────────────────┐
              < Is the carrier frequency >──Yes►  ( Reduce the carrier frequency )
              < too large                >
              └───────────┬─────────────┘
                         No
                          ▼
                    (   VFD fault   )
```

7-4-7. The motor stalls during acceleration and deceleration

```
                    ┌──────────────────────────────┐
                    │ The motor stalls during       │
                    │ acceleration and deceleration │
                    └──────────────────────────────┘
                                 │
                                 ▼
              ╱─────────────────────────╲              ╭──────────────────╮
              ╲  Acc/dec time too short  ╱───Yes──────▶│ Increase the     │
              ╱─────────────────────────╲              │ acc/dec time     │
                         │                              ╰──────────────────╯
                         No
                         ▼
              ╱─────────────────────────╲          ╭──────────────────────────────╮
              ╲ Test the motor terminal  ╱──Yes──▶│ Thicken the motor cable,      │
              ╱  voltage is in the range? ╲        │ shorten the wiring distance   │
                         │                         │ and adjust the voltage of      │
                         No                        │ output reactor                │
                         ▼                         ╰──────────────────────────────╯
              ╱─────────────────────────╲          ╱──────────────────────╲          ╭──────────────╮
              ╲ Is the motor load or      ╱──Yes──▶╲  Is it special motor? ╱──Yes──▶│ Contact us   │
              ╱  inertia too large        ╲        ╱──────────────────────╲          ╰──────────────╯
                         │                              │
                         No                             No
                         ▼                              ▼
  ╭──────────────────╮   ╱─────────────────────────╲   ╭──────────────────────────╮
  │ Reduce the load  │◀─Yes─╲  Load torque too large? ╱  │ Reduce inertia of load   │
  │ torque and       │   ╱─────────────────────────╲   │ and increase the VFD      │
  │ increase the VFD │              │                   │ capacity                  │
  │ capacity         │              No                  ╰──────────────────────────╯
  ╰──────────────────╯              ▼
              ╱─────────────────────────╲              ╭──────────────────╮
              ╲  Torque boost too large? ╱───Yes──────▶│ Modify the        │
              ╱─────────────────────────╲              │ torque boost     │
                         │                              ╰──────────────────╯
                         No
                         ▼
              ╱─────────────────────────╲              ╭──────────────────╮
              ╲  Parameter self-learning?╱───No───────▶│ Over current     │
              ╱─────────────────────────╲              ╰──────────────────╯
                         │
                         Yes
                         ▼
                  ╭──────────────────╮
                  │    VFD fault     │
                  ╰──────────────────╯
```

7-4-8. Under voltage

```
                    ┌──────────────────────────────┐
                    │        Under voltage          │
                    └──────────────────────────────┘
                                 │
                                 ▼
              ╱─────────────────────────╲              ╭──────────────────────╮
              ╲ Power voltage is in the   ╱──Yes──────▶│ Make sure the power  │
              ╱  range?                   ╲              │ supply is in the range│
                         │                              ╰──────────────────────╯
                         No
                         ▼
              ╱─────────────────────────╲              ╭──────────────────────╮
              ╲ The input air switch and  ╱──Yes──────▶│ Close air switch or  │
              ╱  contactor are            ╲              │ contactor            │
              ╲  disconnected or abnormal? ╱             ╰──────────────────────╯
                         │
                         No
                         ▼
              ╱─────────────────────────╲              ╭──────────────────────╮
              ╲ VFD operation is          ╱──Yes──────▶│ Adjust the power grid │
              ╱  interrupted              ╲              ╰──────────────────────╯
                         │
                         No
                         ▼
              ╱─────────────────────────╲              ╭──────────────────────╮
              ╲ Does the same power grid  ╱──Yes──────▶│ Confirm the power off │
              ╱  have high power starting? ╲             │ reason               │
                         │                              ╰──────────────────────╯
                         No
                         ▼
                  ╭──────────────────╮
                  │    VFD fault     │
                  ╰──────────────────╯
```

8. Maintenance

The change of the operating environment of the inverter, such as the influence of temperature, humidity, smoke, etc., and aging of the internal components of the converter, may lead to various faults of the inverter. Therefore, the inverter must be checked daily during storage and use, and regular maintenance should be carried out.

8-1. Routine maintenance

When the inverter is turned on normally, please confirm the following items:

1) Whether the motor has abnormal sound and vibration.
2) Whether the inverter and motor have abnormal heating.
3) Whether the ambient temperature is too high.
4) Whether the load ammeter is the same as usual.
5) Check whether the cooling fan of inverter operates normally.

8-2. Regular maintenance

When the inverter is regularly maintained and inspected, it is necessary to cut off the power supply, and the inspection can only be carried out after the monitor is not displayed and the power indicator of the main circuit is off. The inspection contents are shown in the table below.

Item	Contents	Solution
Screw of main circuit terminal and control circuit terminal	Whether the screws are loose	Tighten with a screwdriver
Heat sink	Whether there is dust	Blow off with $4 \sim 6 \text{kgcm}^2$ dry compressed air
PCB board	Whether there is dust	Blow off with $4 \sim 6 \text{kgcm}^2$ dry compressed air
Cooling fan	Whether there is abnormal sound and vibration, and the accumulated operation time is up to 20000 hours	Replace the fan
Power element	Whether there is dust	Blow off with $4 \sim 6 \text{kgcm}^2$ dry compressed air
Aluminum electrolytic capacitor	Whether discoloration, odor, blistering	Replace the Aluminum electrolytic capacitor

In order to make the inverter work normally for a long time, regular maintenance must be carried out according to the service life of the internal electronic components of the inverter. The service life of electronic components of inverter is different because of its different environment and conditions. As shown in the table below, the maintenance period of inverter is only for users' reference.

Component name	Standard replacement years
Cooling fan	2~3 years
Electrolytic capacitor	4~5 years
PCB board	5~8 years
Fuse	10 years

The service conditions for the replacement time of the above inverter components are as follows:

1) Ambient temperature: annual average 30°C.
2) Load factor: below 80%.

3) Operation time: less than 12 hours per day.

8-3. Warranty of inverter

The company will provide warranty service in case of the following conditions:

1) The warranty scope only refers to the inverter body.

2) In normal use, if the inverter fails or is damaged within 15 months, the company is responsible for the warranty. And reasonable maintenance fee will be charged for more than 15 months.

3) Within 15 months, a certain maintenance fee shall also be charged in case of the following situations:

◆ Failure to follow the operation steps in the instruction manual will cause damage to the inverter.

◆ Inverter damage caused by flood, fire, abnormal voltage, etc.

◆ Inverter damage caused by wrong connection cable, etc.

◆ Damage caused by using inverter for abnormal functions.

4) The service fee shall be calculated according to the actual cost. If there is a contract, it shall be handled according to the principle of contract priority.

Appendix

Appendix A. Communication protocol

Appendix A-1. Communication protocol overview

VH1 series inverter provides the general RS485 communication interface in industrial control to users. The communication protocol adopts MODBUS standard communication protocol. The converter can be used as slave and communicate with the upper computer with the same communication interface and the same communication protocol (such as PLC controller and PC) to realize centralized monitoring of the inverter. In addition, the user can also use a inverter as the master, and connect several inverters of our company as slave through RS485, in order to realize the multi-machine linkage of the inverter. The remote control keyboard can also be connected through the communication port to realize the remote operation of the inverter by users.

The Modbus communication protocol of this converter supports RTU and ASCII mode. The following is a detailed description of the communication protocol of the inverter.

Appendix A-2. Communication protocol explanation

Appendix A-2-1. Communication protocol mode

The inverter can be used as the master or slave in RS485 network. When used as the master, it can control other inverters of our company to realize multi-level linkage. When it is used as slave, PC or PLC can be used as the master to control the inverter. The specific communication mode is as follows:

1) The inverter is slave, and the master-slave point-to-point communication is adopted. When the master uses the broadcast address to send commands, the slave does not respond.

2) As the master, the inverter sends commands to the slave using broadcast address, and the slave does not respond.

3) Users can set the local address, baud rate and data format of the converter by keyboard or serial communication.

4) The slave reports the current fault information in the last reply frame to the master.

Appendix A-2-2. Communication port

The communication is RS485 interface, asynchronous serial, half duplex transmission. The default data format is: 1 start bit, 8 data bits and 1 stop bit.

The default baud rate is 19200bps. Please refer to P9 group parameters for communication parameter settings.

Appendix A-3. Modbus-RTU protocol

Appendix A-3-1. Character structure

RTU: (1－8－2, no parity)

Start bit	0	1	2	3	4	5	6	7	Stop bit	Stop bit

RTU: (1－8－1, odd parity)

Start bit	0	1	2	3	4	5	6	7	Odd parity	Stop bit

RTU: (1－8－1, even parity)

Start bit	0	1	2	3	4	5	6	7	Even parity	Stop bit

RTU: (1－8－1, no parity)

Start bit	0	1	2	3	4	5	6	7	Stop bit

ASCII: (1－7－1, even parity)

Start bit	0	1	2	3	4	5	6	Even parity	Stop bit

Appendix A-3-2. Communication data structure

- **RTU mode**

START	Keep no input signal at least 10ms
Address	Communication address: 8-bit binary address
Function	Function code: 8-bit binary address
DATA（n-1）	Data content: N*8-bit data, N<=8, max 8 bytes
……………	
DATA 0	
CRC CHK Low	CRC parity
CRC CHK High	16-bit CRC parity code is composed of two 8-bit binary
END	Keep no IO signal at least 10ms

- **ASCII mode**

START	1 character: Keep no input signal at least 10ms
Address	Communication address: ASCII characters containing two hexadecimal characters
Function	Function code: ASCII characters containing two hexadecimal characters
Address	Address
DATA（n-1）	Data content: N*8-bit data, N<=7, max 7 bytes
……………	
DATA 0	
LRC CHK	1 LRC checksum consisting of ASCII characters of two hexadecimal characters
END	2 characters: Keep no IO signal at least 10ms

- **Communication address**

  00H: All inverter broadcast

  01H: Communicate with 01 address inverter.

  0FH: Communication with 15 address inverter.

  10H: Communication with 16 address inverter. And so on... , up to 254 (FEH).

- **Function code and data**

Function code	Explanation
03H	Read the contents of registers, read multiple registers, but not more than 12 at a time, each time can only read the same group of data

06H	Write data into the register
08H	Loop detection

1) Function code 03H: Read register

For example, read the register address 7000H (operation frequency).

RTU mode:

Format of inquiry information		Format of response information	
Address	01H	Address	01H
Function code	03H	Function code	03H
Register address	70H	Byte number	02H
	00H		
Register quantity	00H	Data contents	00H
	01H		00H
CRC CHECK Low	9EH	CRC CHECK Low	B8H
CRC CHECK High	CAH	CRC CHECK High	44H

2) Function code 06H: Write into the register

For example, write 50.00Hz in the inverter address 1000H(when P0-13=50.00Hz).

RTU mode:

Format of inquiry information		Format of response information	
Address	01H	Address	01H
Function code	06H	Function code	06H
Register address	10H	Register address	10H
	00H		00H
Data contents	27H	Data contents	27H
	10H		10H
CRC CHECK Low	97H	CRC CHECK Low	97H
CRC CHECK High	36H	CRC CHECK High	36H

3) Function code 10H: write the data to multi-group register

For example, write 1 to H0001(P0-01) and write 2 to H0002(P0-02) .

RTU mode:

Format of inquiry information		Format of response information	
Address	01H	Address	01H
Function code	10H	Function code	10H
Register code	00H	Register address	00H
	01H		01H
Register quantity	00H	Register quantity	00H
	02H		02H
Byte quantity	04H(2*Register quantity)	CRC CHECK Low	10H
Data 1 content high	00H	CRC CHECK High	08H
Data 1 content low	01H		
Data 2 content high	00H		
Data 2 content low	02H		
CRC CHECK Low	E2H		
CRC CHECK High	62H		

4) Parity code

RTU mode: Double byte hexadecimal number.

The CRC domain is two bytes, containing 16-bit binary values. It is added to the message after calculation by the sender. The high byte of CRC is the last byte of the sending message. The receiving device recalculates the CRC of the received message and compares it with the value in the received CRC domain. If the two values are different, the received message has an error, discards the message frame, and does not respond to it. The next frame data will be received.

The LRC domain is a byte containing an 8-bit binary value. The LRC value is calculated by the transmission device and placed in the message frame. During the process of receiving the message, the receiving device calculates the LRC and compares it with the value in the LRC domain of the received message. If the two values are not equal, it indicates an error. LRC verification is relatively simple. It is used in the ASCII protocol to detect content in the message field, except for the starting colon and the ending carriage return and line change.

In ASCII mode, each 8-bit byte is split into two ASCII characters for transmission, such as the hexadecimal number 0x03, which is decomposed into ASCII characters "0" and "3" for transmission. The corresponding ASCII codes 0x30 and 0x33 are two bytes (binary transmission 00110000 and 00110011), and the number of characters sent is twice that of the RTU; In RTU mode, each byte can transmit one hexadecimal character, such as the hexadecimal number 0x33, which is directly sent in hexadecimal 0x33 (binary 00110011), with a transmission efficiency twice that of ASCII mode.

For example, reading the contents of register address 7000H (operating frequency).

RTU mode sending data: 01 03 70 00 00 01 9E CA
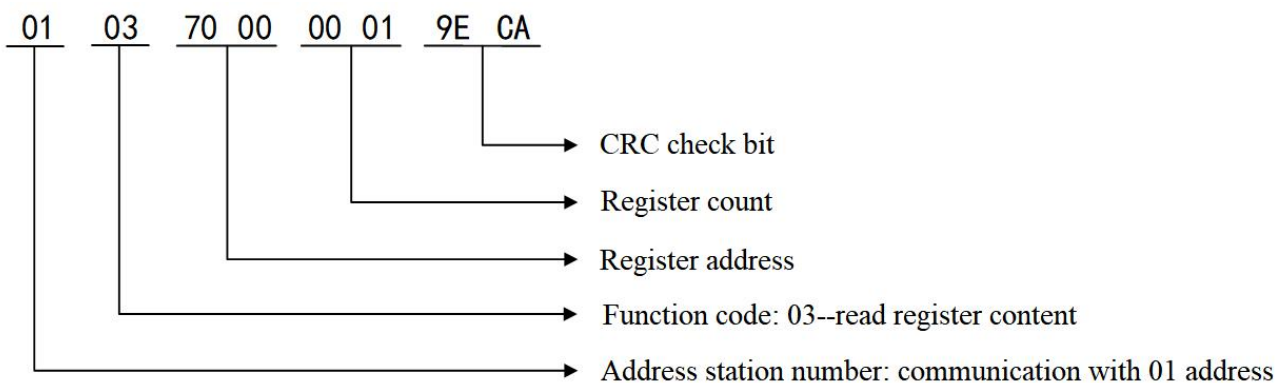
ASCII mode sending data: 3A 30 31 30 33 37 30 30 30 30 31 38 42 0D 0A (01 03 70 00 01 8B)

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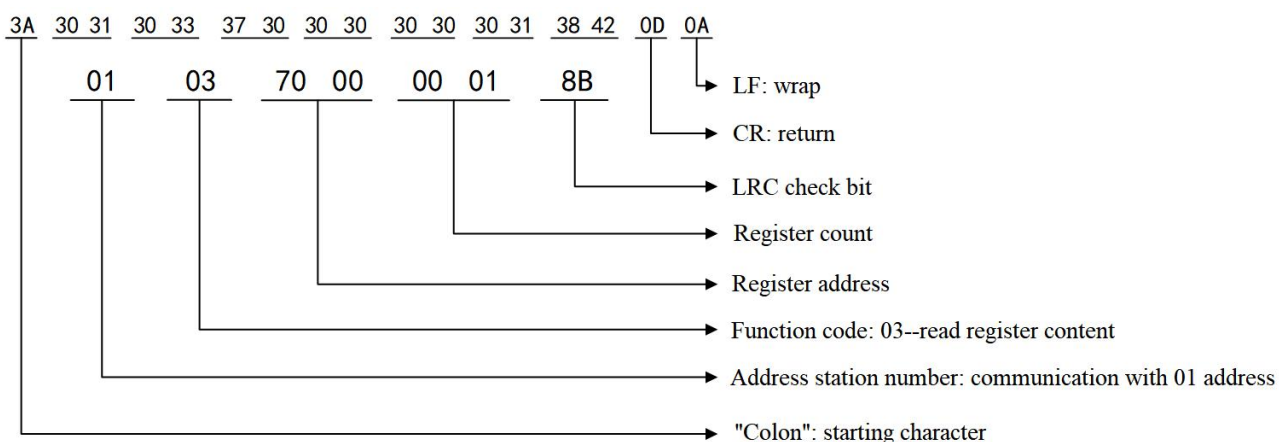
5) Common ASCII code correspondence list

Binary	Decimalism	Hexadecimal	Character	Binary	Decimalism	Hexadecimal	Character
0000 1101	13	0D	CR	0011 1000	56	38	8
0000 1010	10	0A	LF	0011 1001	57	39	9
0011 0000	48	30	0	0011 1010	58	3A	:
0011 0001	49	31	1	0100 0001	65	41	A
0011 0010	50	32	2	0100 0010	66	42	B
0011 0011	51	33	3	0100 0011	67	43	C
0011 0100	52	34	4	0100 0100	68	44	D
0011 0101	53	35	5	0100 0101	69	45	E
0011 0110	54	36	6	0100 0110	70	46	F
0011 0111	55	37	7				

Appendix A-3-3. Communication protocol parameter address

(1) The communication address of the function code parameter is shown in the table below. The high position is the group number and the low position is the parameter serial number.

Parameter group	Power off memory address	Power off no memory address
P0~PF	0x0000~0x0FFF	0x3000~0x3FFF
A0~AF	0xA000~0xAFFF	0x4000~0x4FFF
U0	0x7000~0x70xx	

● When reading function code data through the communication

For group P and group A function code data, the upper 16 bits of the communication address are the group number, and the lower 16 bits are the serial number of the function code in the function group.

For example, P0-16, communication address is 0x0010, 00 represents the function parameter of group P0, and 10 represents the hexadecimal data format of 16.

A0-15, communication address is 0xA00F, A0 represents A0 group function parameter, 0F represents hexadecimal data format of 15.

● When writing function code data through the communication

For group P function code data, the upper 16 bits of its communication address are divided into 0x0000 ~ 0x0FFF or 0x3000 ~ 0x3FFF according to whether it is written into EPPROM. The lower 16 bits are directly the serial number of the function code in the function group, for example:

Write function parameters P0-16:

When it is not necessary to be written in EPPROM, its communication address is 0x3010;

When it is necessary to be written in EPPROM, its communication address is 0x0010.

For group A function code, its communication address high 16 bits can be divided into 0xA000 ~ 0x0FFF or 0x4000 ~ 0x4FFF according to whether it is written into EPPROM. The lower 16 bits are the serial number of the function code in the function group, for example:

Write function parameter A0-15:

When it is not necessary to be written in EPPROM, its communication address is 0x400F;

When it is necessary to be written in EPPROM, its communication address is 0xA00F.

(2) Non function code

Definition	Modbus address	Function	Note
Communication setting	1000H	Communication frequecy	Write

Definition	Modbus address	Function	Note
Control command	1100H	1: Forward operation 2: Reverse operation 3: Forward jog 4: Reverse jog 5: Deceleration stop 6: Free stop 7: Fault reset	Write
Digital output terminal control	1101H	bit0: Y1 output control bit1: Reserved bit2: Reserved bit3: RELAY1 output control bit4: RELAY2 output control	Write
Analog output AO1	1103H	0~7FFF represents 0%~100%	Write
Torque setting	1105H	0~1000 represents 0.0%~100.0%	Write
Operation status	1200H	1: Forward operation 2: Reverse operation 3: Stop	Read
VFD fault	1210H	0000H: No fault 0001H: Acceleration over current 0002H: Deceleration over current 0003H: Constant speed over current 0004H: Acceleration over voltage 0005H: Deceleration over voltage 0006H: Constant speed over voltage 0007H: Buffer resistance overload fault 0008H: Under voltage fault 0009H: Inverter overload 000AH: Motor overload 000BH: Input phase loss 000CH: Output phase loss 000DH: Radiator overheating 000EH: Contactor fault 000FH: Current detection fault 0010H: Motor tuning fault 0011H: Code disk fault 0012H: Short circuit fault of motor to ground 0014H: Wave by wave current limiting fault 0015H: Magnetic pole position detection failed 0016H: UVW signal feedback error 0017H: Brake resistance short circuit 001AH: SVC stall fault 002BH: External fault 002CH: Communication (timeout) fault 002DH: EEPORM read / write fault 002EH: Operation time arrival	Read

Definition	Modbus address	Function	Note
		002FH: Power on time arrival	
		0030H: User defined fault 1	
		0031H: User defined fault 2	
		0032H: PID feedback loss during operation	
		0033H: Switch motor during operation	
		0034H: Speed feedback deviation too large	
		0035H: Motor over speed	
		0036H: Motor over temperature	

When the frequency is set by communication (P0-03=6),

$$Frequency \quad (\text{Hz}) = \frac{Data \times P0-13}{10000}, \text{(Data range: 0~10000)}$$

Data can be register or value, user can calculate the Data value according to the above formula when the frequency is set by communication.

For example, if the maximum output frequency of P0-13 is set to 50.00Hz, write 10000 to the corresponding address H1000 of the frequency, and the actual panel displays the frequency value of 100%*50.00=50.00Hz.

If there is a user password: after writing the correct password, read it within 30s, otherwise it will need to be written again.