



VHL Series Frequency Converter

User Manual

WUXI XINJE ELECTRIC CO., LTD.

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Basic Description

- ◆ Thank you for purchasing XINJE VHL series frequency converter. 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 frequency converter. The manual involves the functions of the frequency converter 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 frequency converter
- ◆ 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.

Statement 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 Way

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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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 manual. 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 °C. 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 frequency converter.
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 frequency converter 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 frequency converter 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 effective.
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 converter motor must be selected.

- Confirmation of motor insulation

When using VHL series frequency converter, 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 frequency converter 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

Since the output voltage of the frequency converter is pulse wave type, if the output side is installed with a capacitor to improve the power factor or a varistor for lightning protection, it will cause the fault tripping of the frequency converter or damage to the components. Please remove it. In addition, it is recommended not to add switches such as air switches and contactors on the output side.

- Derating usage during fundamental frequency setting

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

- Operating at frequencies above 50Hz

If operating above 50Hz, in addition to considering the increase in motor vibration and noise, it is also necessary to ensure the speed range of motor bearings and mechanical devices, and it is necessary to check in advance.

- Electronic thermal protection value of the motor

When selecting an adaptive motor, the frequency converter can provide thermal protection for the motor. If the rated capacity of the motor and frequency converter does not match, it is necessary to adjust the protection value or take other protective measures to ensure the safe operation of the motor.

- Altitude and Derating Usage

In areas with an altitude exceeding 1000 meters, the cooling effect of the frequency converter becomes worse due to the thin air, and it is necessary to reduce the rating for use.

- Protection level

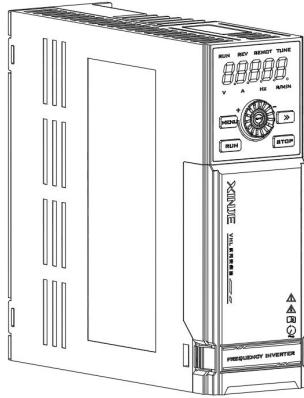
The protection level IP20 of VHL series frequency converters refers to the level achieved when using a status display unit or keyboard.

Scrapping Precautions

When scrapping the frequency converter, please note: The electrolytic capacitor of the main circuit and the electrolytic capacitor on the printed board may explode when burning. Plastic parts can produce toxic gases when burned. Please dispose of it as industrial.

1. Product Introduction

1-1.Product Overview



VHL series is a simple inverter developed by XINJE company. The product adopts vector control technology, which realizes asynchronous open-loop vector control, and strengthens the reliability and environmental adaptability of the product.

1-1-1.Naming Rule

VH L - 4 5P5 - B
 ① ② ③ ④ ⑤

Serial	Description	
①	Product identification	VH: General inverter
②	Product series	L: Book type open-loop vector frequency converter
③	Input voltage level	4: AC 380V 2: AC220V
④	Power level	1P5: 1.5kW 0P7: 0.75kW The decimal point is represented by “P”
⑤	Brake unit	B: Built-in brake unit

1-2. Specification

1-2-1.Technical specification

Model VHL-____-B	20P4	20P7	40P4	40P7	41P5
Adaptive motor (KW)	0.4	0.75	0.4	0.75	1.5
Input rated current (A)	5.4	5.6	1.9	3.4	5
Power supply capacity (KVA)	1	1.5	1	1.5	3
Output rated current (A)	2.3	4.0	1.5	2.1	3.8

Model VHL-____-B		40.4G/0.7P	40.7G/1.5P
Adaptive motor (KW)	G type	0.4	0.75
	P type	0.75	1.5
Input rated current (A)		1.9	3.4
Power supply capacity (KVA)		1	1.5
Output rated current (A)	G type	1.5	2.1
	P type	2.1	3.8

1-2-2. General specification

Item		Specification	
Input	Rated voltage, frequency	380V level: Three-phase 380V, 50Hz/60Hz	
		220V level: Single phase 220V, 50Hz/60Hz	
	Allowable voltage fluctuation range	-15%~+15% Voltage imbalance rate: <3%	
Output	Voltage	0~Input voltage	
	Frequency	0~600Hz	
Control performance	Control motor type	Asynchronous motor	
	Control performance	Vector control without speed sensor (SVC)	V/F control (VF)
	Speed accuracy	±0.5%	±1%
	Speed fluctuations	±0.3%	±0.5%
	Speed range	1:100	1:50
	Startup torque	0.5Hz:150%	1.0Hz:150%
	Torque accuracy	±10% of rated torque	/
	Torque response	≤20ms	/
	Overload ability	SVC:150% rated current 53s; 180% rated current 1s; VF: 150% rated current 74s	
	Frequency accuracy	Low frequency operation mode: 0.01Hz High frequency operation mode: 0.1Hz	
	Frequency resolution	Digital setting: 0.01Hz; Analog setting: max frequency×0.025%	
Control terminal input	Input channel	Up to 5 channels digital input X, 2 channels analog output(0~10V/0~20mA), X4 terminal can support the maximum 50 KHz high-speed pulse input.	
Control terminal output	Output channel	Support 1 channel digital output, 1 channel analog output (0~10V/0~20mA), 1 channel relay output (1 pair of NO, 1 pair of NC) Y1 terminal can support the maximum 50 kHz high-speed pulse output.	

Item		Specification
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 setting
	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
	Protection function	Power on motor short-circuit detection, input and output phase loss protection, 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
	Common DC bus	When the frequency converter decelerates, it shares the regenerative energy, improves the braking ability, achieves the purpose of energy saving and saves the additional space and cost required by the resistance
Special functions	Multi-bus	Main unit Modbus
	LCD panel	LCD display, parameter setting, status monitoring, parameter copying, fault analysis and location, program download, and mass storage of parameters
	Non stop when instantaneous power failure	During an instantaneous power failure, the load feedback energy compensates for the decrease in voltage, maintaining the frequency converter to continue operating for a short period of 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	The multifunctional terminals X have 51 logical function options, Y has 42 logical function options, and AO has 19 logical function options, meeting the conventional control function requirements of general frequency converters
	Communication customization	It is convenient for users to continuously read and write frequency converter parameters

Item		Specification
	Parameters	
	Software	Rich backend monitoring functions, convenient for on-site data collection and debugging
Display and keyboard	Keyboard display	Can display various parameters such as set frequency, output frequency, output voltage, output current, input/output status, etc
	Button locking	Implement partial or complete locking of buttons to prevent accidental triggering
	Parameter copy	Standard LED single display numeric keyboard, optional LCD Chinese and English display keyboard (parameter download)
	Optional accessories	LCD keyboard
Environment	Place of use	Indoor, not exposed to direct sunlight, free from dust, corrosive gases, flammable gases, oil mist, water vapor, dripping water or salt, etc
	Altitude	Below 1000 meters. (When it is higher than 1000 meters, it needs to be derated for use, and the output current will be reduced by about 1% of the rated current for every increase of 100 meters in height)
	Ambient temperature	-10°C ~ +40°C (the ambient temperature is between 40°C and 50°C. Please reduce the rating or enhance heat dissipation)
	Ambient humidity	Less than 95% RH, no condensation of water droplets
	Vibration	Less than 5.9m/s ² (0.6G)
	Storage temperature	-40°C ~ +70°C
	Protection level	IP40
	Cooling method	Forced air cooling
Mounting method		Wall Mounting

2. Installation and wiring

2-1. Installation environment

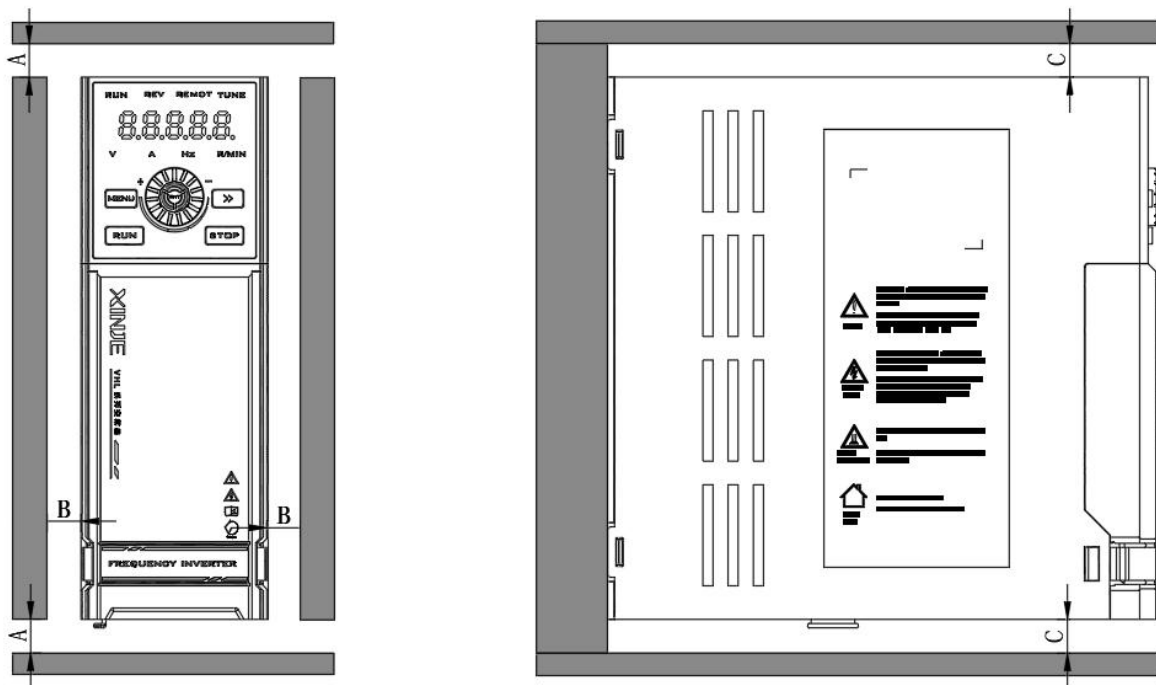
2-1-1. Environment requirements

- ♦ Installed in a well ventilated indoor environment, the ambient temperature is required to be within the range of -10 °C to 40 °C. If the temperature exceeds 40 °C, external forced cooling or derating is required for use.
- ♦ Avoid installation in places with direct sunlight, dust, and floating fibers and metal powders.
- ♦ It is strictly prohibited to install in places with corrosive and explosive gases.
- ♦ The humidity requirement is below 95% RH, and there is no condensation of water droplets.
- ♦ Fixed vibration less than $5.9\text{m/s}^2(0.6\text{G})$ when installed on a flat surface.
- ♦ Try to stay away from electromagnetic interference sources and other electronic instruments and equipment sensitive to electromagnetic interference.

2-1-2. Installation direction and space

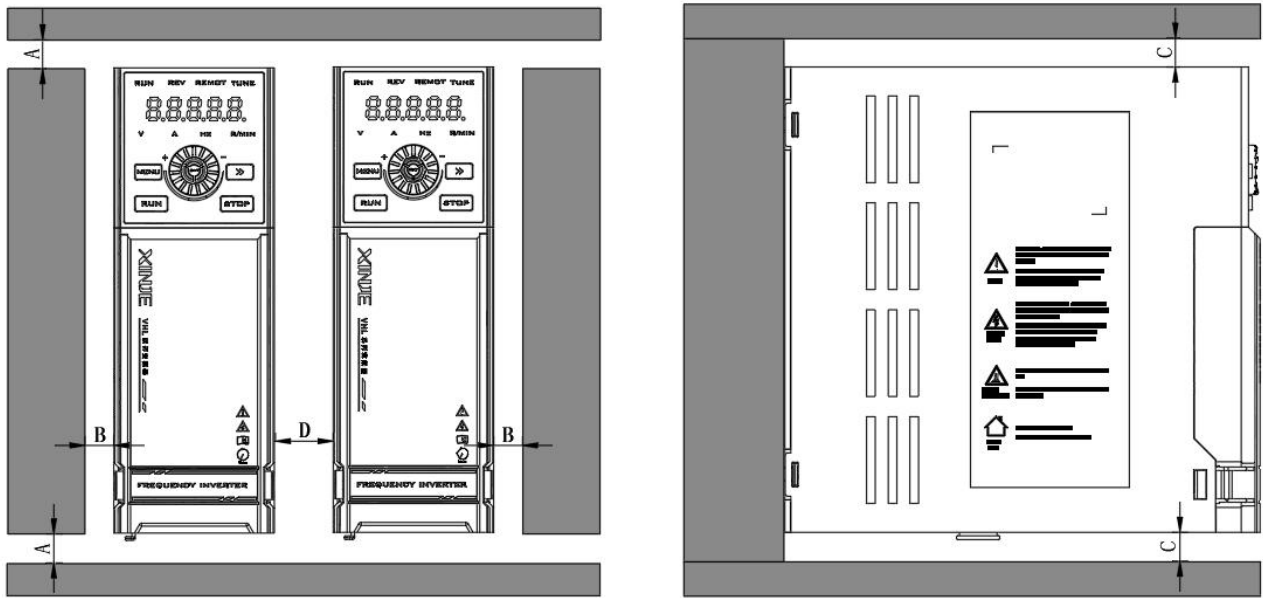
- ♦ Generally, it should be installed vertically.
- ♦ Minimum requirements for installation spacing and distance.
- ♦ When multiple frequency converters are installed up and down, a guide baffle should be used in the middle.

2-1-3. Single installation



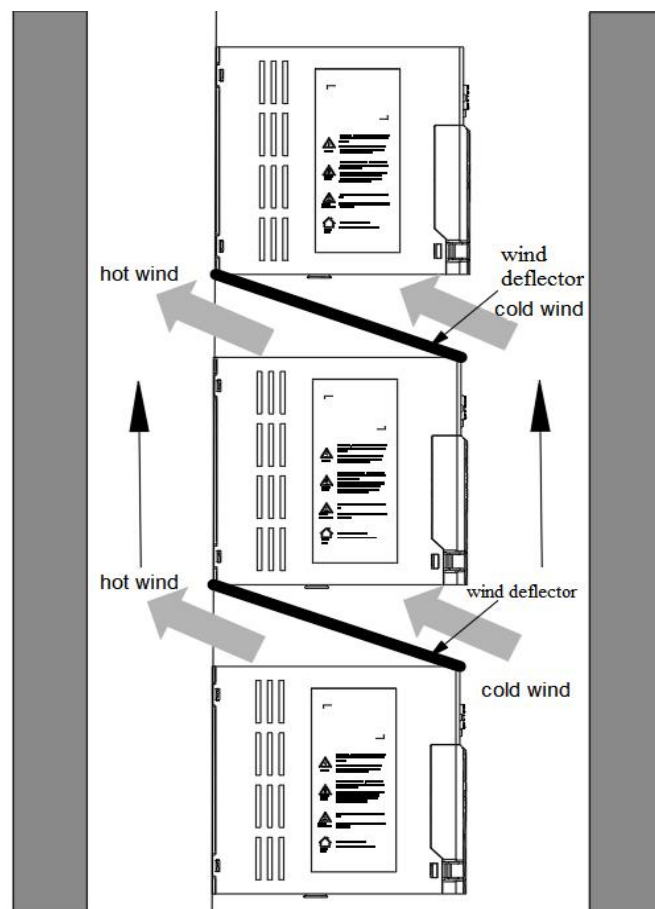
Note: The dimensions of A and B are above 50mm, while the dimensions of C are above 100mm.

2-1-4. Multiple installations



Note: The dimensions of A and B are above 50mm, while the minimum dimensions of C and D are 100mm.

2-1-5. Vertical installation



When installing vertically, it is necessary to add a wind deflector, otherwise it may cause mutual influence between multiple frequency converters and cause poor heat dissipation.

2-1-6. Extend the operate panel

The model of the panel external bracket and related accessories is VH6-DPANEL, and the dimensions of the panel installation bracket are shown in chapter 6-2.

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

2-2. Precautions for wiring



Notice

- Before wiring, ensure that the power supply has been completely cut off for more than 15 minutes, otherwise there is a risk of electric shock.
- It is strictly prohibited to connect the power cord to the output terminals U, V, and W of the frequency converter.

- There is leakage current inside the frequency converter itself. To ensure safety, the frequency converter and motor must be safely grounded, and the grounding wire is generally 3.5mm² and above copper wire in diameter. The grounding resistance is less than 10Ω.
- The frequency converter has passed the voltage withstand test before leaving the factory, and users are no longer allowed to conduct voltage withstand tests on the frequency converter.
- Electromagnetic contactors, absorption capacitors, or other resistance capacitance absorption devices cannot be installed between the frequency converter and the motor.
- To provide input side overcurrent protection and facilitate power outage maintenance, the frequency converter should be connected to the power supply through a circuit breaker.
- The wiring for the input and output circuits of the control terminal should be 0.75mm² and above twisted or shielded wires, with one end of the shielding layer suspended and the other end connected to the grounding terminal PE of the frequency converter, have a wiring length of less than 50m.

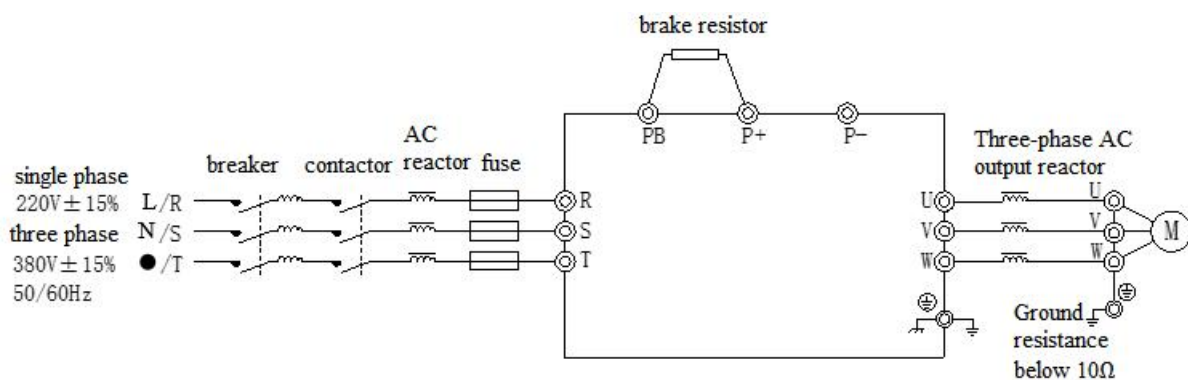


Danger

- Ensure that the power supply to the frequency converter has been completely cut off, all LED indicators on the operating keyboard are turned off, and wait for more than 15 minutes before proceeding with wiring operations.
- Confirm that the DC voltage between P + and P – poles of the internal electrolytic capacitor of the frequency converter has dropped below DC36V before starting the internal wiring work.
- Wiring operations can only be carried out by trained and authorized qualified professionals.
- Before powering on, pay attention to checking whether the voltage level of the frequency converter is consistent with the power supply voltage, otherwise it may cause casualties and equipment damage.

2-3. Main circuit terminal and wiring

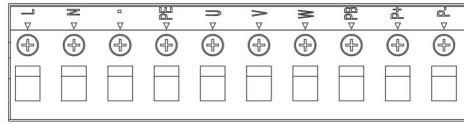
2-3-1. Wiring diagram



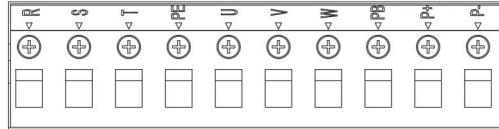
Circuit breakers, contactors, AC reactors, fuses, braking resistors, and output reactors are all optional accessories. Please refer to chapter 6 for detailed guidance on peripheral accessory selection.

2-3-2. Main circuit terminal arrangement and description

- VHL-20P4-B-H and VHL-20P7-B-H main circuit terminal



- VHL-40.4G/0.7P-B and VHL-40.7G/1.5P-B main circuit terminal



- Main circuit terminal explanation

Terminal	Name	Function
R, S, T	Three-phase 380V power input terminal	AC input three-phase 380V power connection point
L, N	Single phase 220V power input terminal	AC input single-phase 220V power connection point
U, V, W	Frequency converter output terminal	Connecting three-phase motors
PE	Grounding terminal	protective earthing
P+, PB	Brake resistor connection terminal	Brake resistor connection terminal
P+, P-	DC bus terminal +, -	Common DC bus input point

1. Input power R, S, T or L, N

- (1) The input side wiring of the frequency converter has no phase sequence requirements; When the frequency converter supplies single-phase 220V power, connect L and N terminals; When the frequency converter supplies three-phase 380V power, connect R, S, and T; Please refer to chapter 2-3-2. Main circuit terminal arrangement and instructions for terminal locations.
- (2) Circuit breakers, contactors, AC reactors, fuses, braking resistors, and output reactors are all optional accessories. For details, please refer to chapter 6.

2. P+, P-

- (1) After a power outage, there is residual voltage between P+ and P-, and all LED indicators on the operating keyboard turn off. Wait for more than 15 minutes before proceeding with wiring operations.
- (2) Do not directly connect the braking resistor to the busbar, otherwise it may cause damage to the frequency converter or even fire.

3. P+, PB

- (1) The recommended value for selection of braking resistor should be referred to, and the wiring distance should be less than 5m, otherwise it may cause damage to the frequency converter.

4. Output side U, V, W

- (1) Please refer to chapter 6 for selection and size of output side cables.
- (2) Capacitors or surge absorbers cannot be connected to the output side of the frequency converter, otherwise it may cause damage to the frequency converter.

- (3) When the length of the motor cable is greater than 100m, it is easy to generate electrical resonance due to the influence of distributed capacitance. Therefore, it is necessary to install an AC output reactor near the frequency converter.

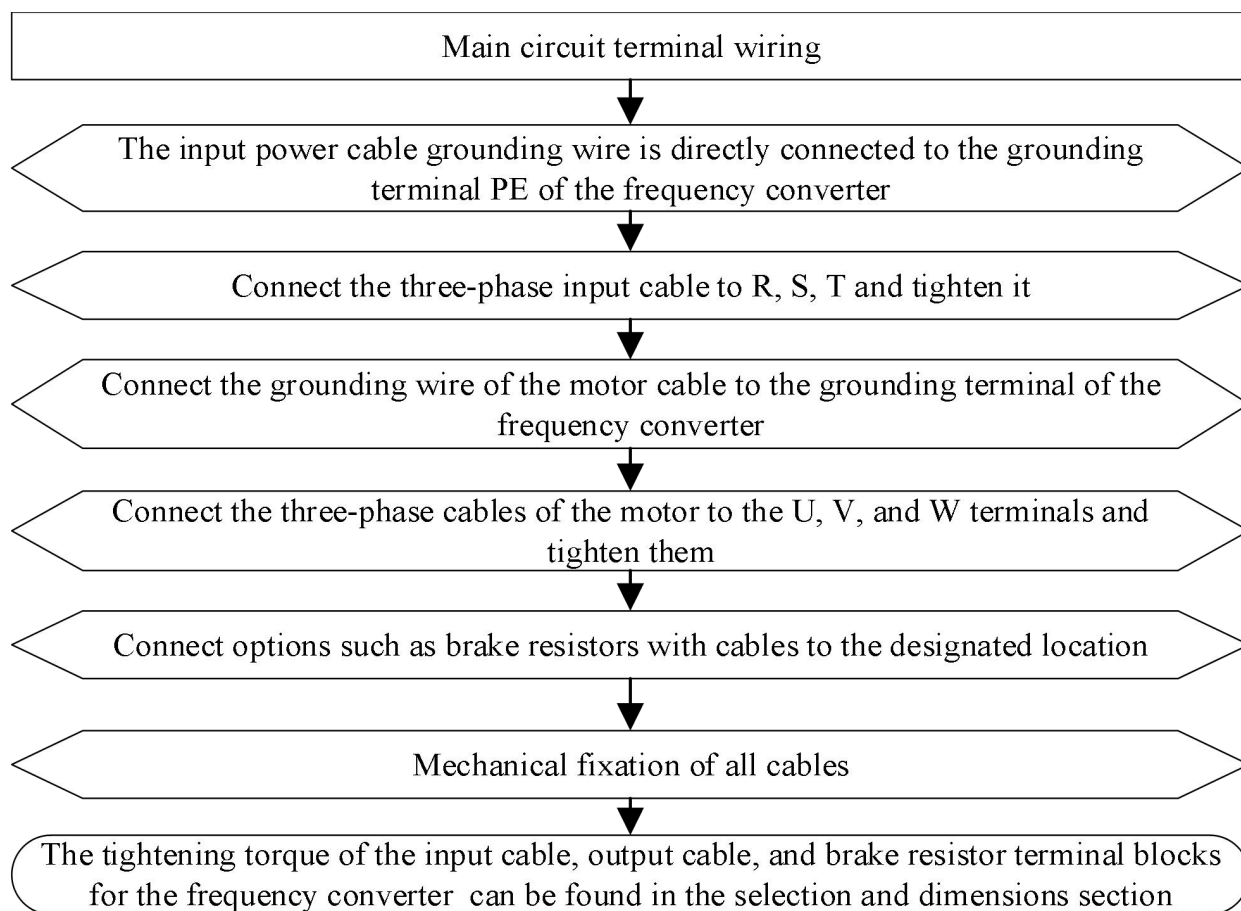
5. Grounding terminal PE

- (1) The terminal must be reliably grounded, and the grounding wire resistance must be less than 10Ω . Otherwise, it may cause abnormal operation or even damage to the equipment.
- (2) Do not share the grounding terminal PE with the power zero line N terminal.
- (3) The impedance of the protective grounding conductor must meet the requirement of being able to withstand the possible large short-circuit current in the event of a fault.
- (4) The size of the protective grounding conductor shall be selected according to the following table.

The cross-sectional area of a single phase line (S)	Minimum cross-sectional area of protective conductor (S_p)
$S \leq 16\text{mm}^2$	S
$16\text{mm}^2 < S \leq 35\text{mm}^2$	16mm^2
$35\text{mm}^2 < S$	$S/2$

- (5) Protective grounding must use yellow and green cables.

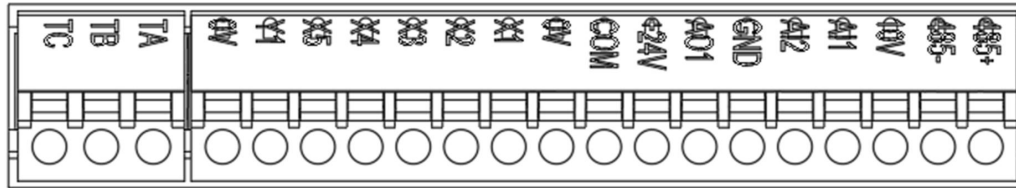
2-3-3. Main circuit terminal wiring process



2-4. Control circuit configuration and wiring

2-4-1. Description and function of control circuit terminals

1. VHL series frequency inverter control terminals



2. Control circuit terminal description

type	terminal	name	terminal functions
communication	485+, 485-	RS485 interface	Standard RS485 communication interface, using twisted pair or shielded wire
power supply	10V-GND	+10V power supply	Provide +10V power supply, maximum output current: 20mA. It is generally used for external potentiometer speed regulation.
	24V-0V	DC 24V power supply	Provide +24V power supply to terminals, maximum output current: 100mA. Generally used as a working power supply for digital input and output terminals. Do not connect external loads.
common terminal	COM	common terminal for X input	When using an internal power supply to drive the X terminal: COM and 24V short circuited to form an NPN input, Short circuit COM and 0V to form PNP input. When using an external power source to drive the X terminal: NPN type input connection method, COM connected to 24V+ of power supply, and disconnected from the 24V terminal of the variable frequency body, PNP type input connection method, COM is connected to the 0V of power supply and disconnected from the 0V terminal of the variable frequency body.
analog input	AI1-GND	analog input AI1	Select voltage/current input by DIP switch, Input voltage range: 0-10V (input impedance: 22kΩ), Input current range: 0-20mA (input impedance: 500Ω).
	AI2-GND	analog input AI2	
analog output	AO1-GND	analog output AO1	Select voltage/current output by the DIP switch, Voltage output range: 0-10V; External load 2kΩ -1MΩ Current output range: 0-20mA; External load less than 500Ω
digital input terminals	X1	digital input terminal 1	Optocoupler isolation input, Input impedance: R=2kΩ, Input voltage range: 9-30V,
	X2	digital input terminal 2	
	X3	digital input terminal 3	

type	terminal	name	terminal functions
	X4	digital input terminal 4	Compatible with bipolar input, In addition to the characteristics of X1-X5, X4 can also serve as a high-speed pulse input channel, the highest frequency is 50kHz.
	X5	digital input terminal 5	
digital output terminals	Y1	digital output terminal 1	Open collector output, Output voltage range: 0-24V, Output current range: 0-50mA.
relay output terminal	TA TB TC	output relay	Programmable defined as multiple electrical output terminals TA-TB: normally open TA-TC: normally close contactor capacity: AC250V/2A (COS Φ =1) AC250V/1A (COS Φ =0.4) DC30V/1A



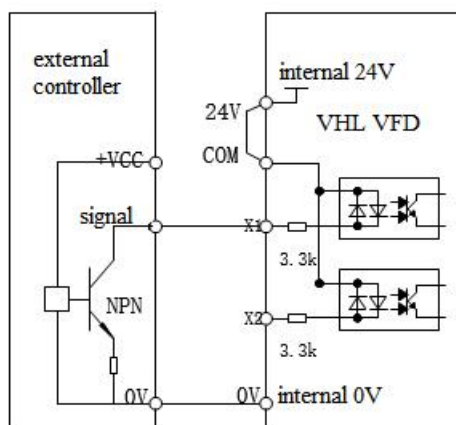
Before putting the frequency converter into use, the terminal wiring and all jumper switches on the control board should be correctly set.

2-4-2. Digital I/O terminal wiring

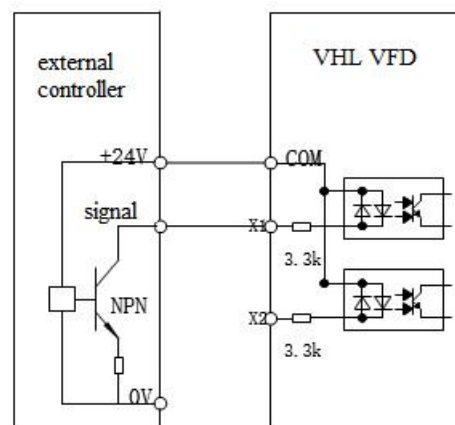
1. Digital input terminal

Generally, shielded cables are required, and the wiring distance should be as short as possible, not exceeding 20m. When using active driving mode, necessary filtering measures need to be taken for the crosstalk of the power supply. It is recommended to use contact control method, and the specific wiring diagram is as follows:

- Single frequency conversion leakage wiring method



Leakage wiring method using 24V power supply on expansion card



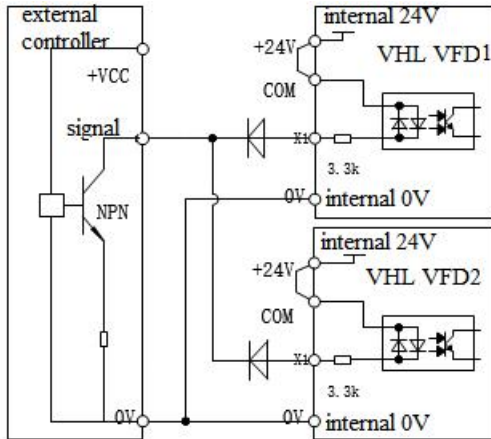
Leakage wiring method using external 24V power supply

The use of internal 24V power supply from the frequency converter is the most common wiring method. Short circuit the COM of the frequency converter to 24V, connect the 0V of the frequency converter to the 0V of the external controller, connect the X terminal to the signal terminal of the external controller, and control the frequency

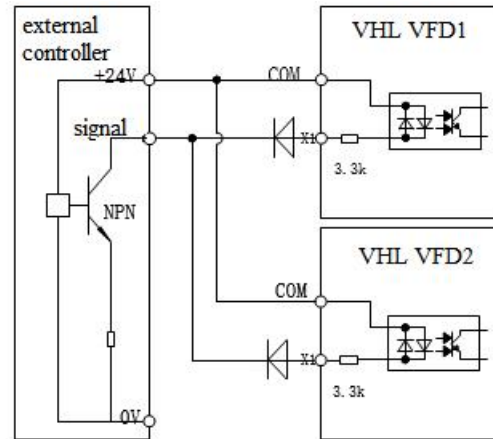
converter through the on-off of the circuit.

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

- Multiple frequency conversion leakage wiring methods



Leakage wiring method for using 24V power supply on expansion cards for multiple frequency converters

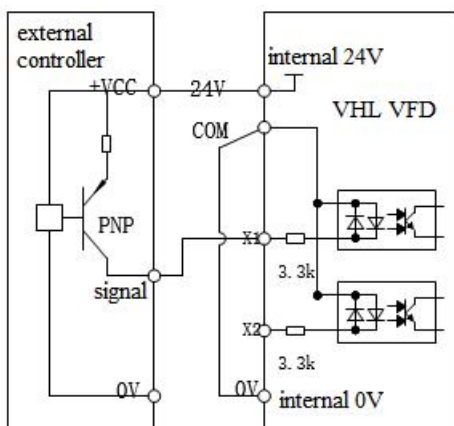


Leakage wiring method for multiple frequency converters using external 24V power supply

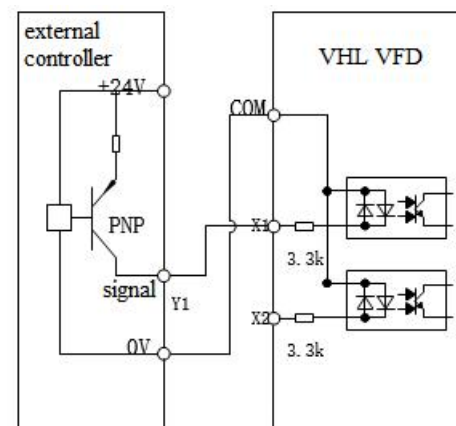


In this wiring method, the X terminals of different inverters cannot be connected in parallel, otherwise it may cause X malfunction. If X terminals need to be connected in parallel (between different inverters), a diode (anode connected to X) needs to be connected in series at the X terminal for use. The diode must meet the requirements of $I_F > 40\text{mA}$ and $V_R > 40\text{V}$.

- Single variable frequency source wiring method



Source wiring method using 24V power supply on expansion card



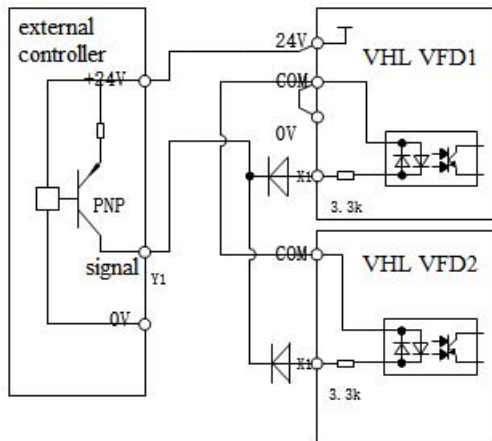
Source wiring method using external 24V power supply

If using the internal 24V power supply of the frequency converter, it is necessary to short circuit the 0V of the frequency converter to COM, connect the 24V of the frequency converter to the common terminal of the external

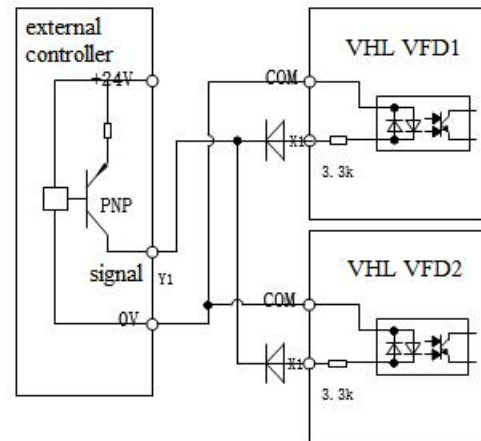
controller, and connect the X terminal to the signal terminal of the external controller. The frequency converter is controlled through the on-off of the circuit.

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

- Multiple variable frequency source wiring methods



Source wiring method for multiple frequency converters using 24V power supply on expansion cards



Source wiring method for multiple frequency converters using external 24V power supply



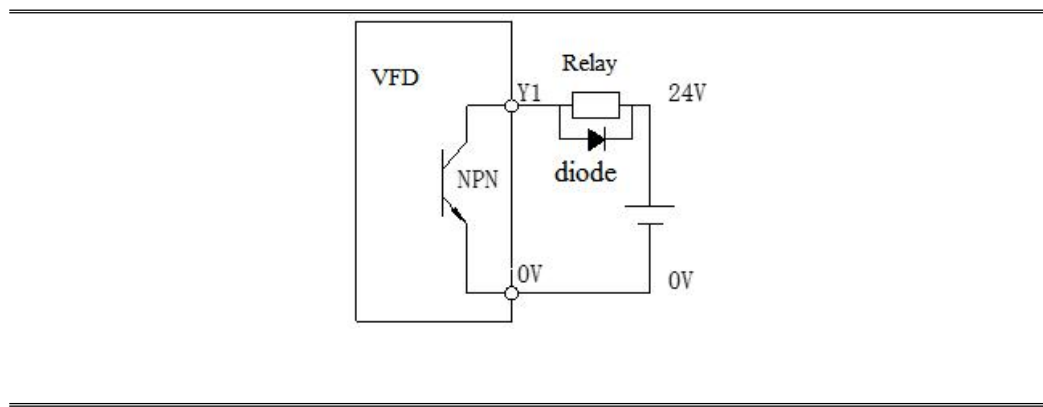
In this wiring method, the X terminals of different inverters cannot be connected in parallel, otherwise it may cause X malfunction. If X terminals need to be connected in parallel (between different inverters), a diode (anode connected to X) needs to be connected in series at the X terminal for use. The diode must meet the requirements of $I_F > 40\text{mA}$ and $V_R > 40\text{V}$.

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.

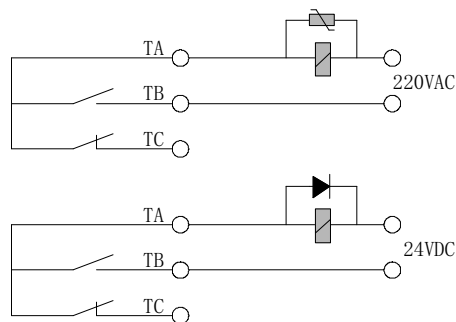


It is necessary to correctly install the polarity of the freewheeling diode. As shown in the following figure. Otherwise, when the digital output terminal has output, it will immediately burn out the DC 24V power supply. The selection criteria for freewheeling diodes: the reverse withstand voltage is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

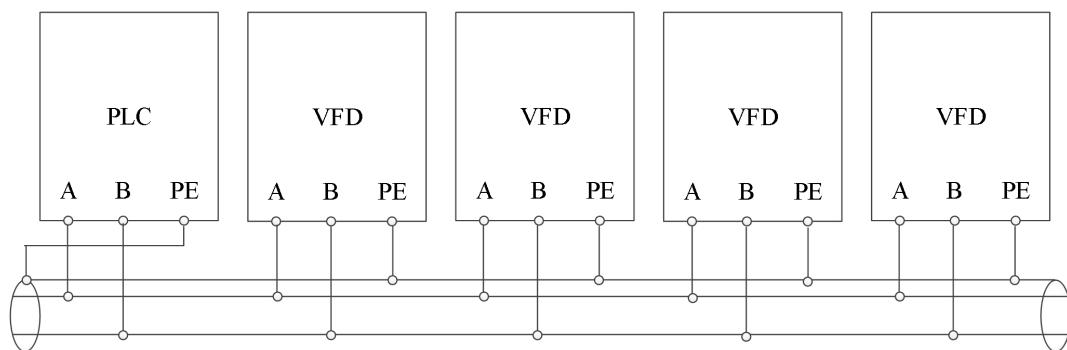


3. Relay output terminal

Inductive loads (relays, motors, indicator lights) can cause voltage spikes when the current is cut off. The relay contact is protected by varistor, and the inductive load is added with absorption circuit, such as varistor, RC absorption circuit, diode, etc., to ensure the minimum interference current when turning off.



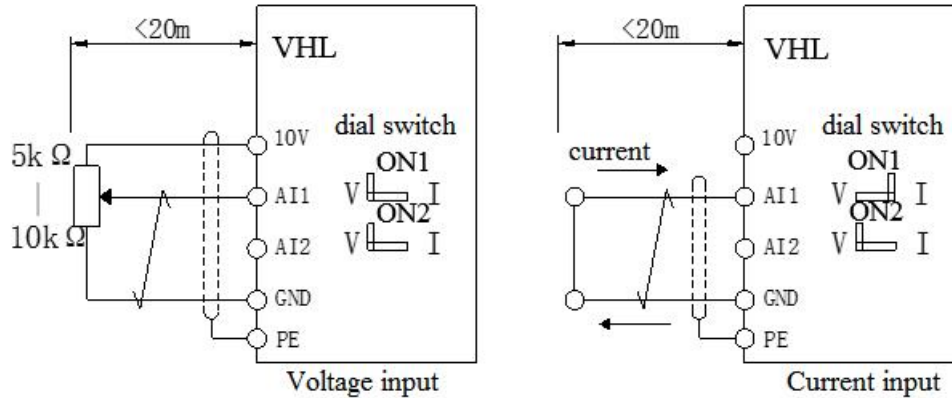
4. Multiple frequency converters can be connected together through RS485 and controlled by a PLC (or upper computer) as the host, as shown in the figure. As the number of connections increases, the communication system becomes more susceptible to interference. It is recommended to wire as follows:



2-4-3. Analog IO terminal wiring

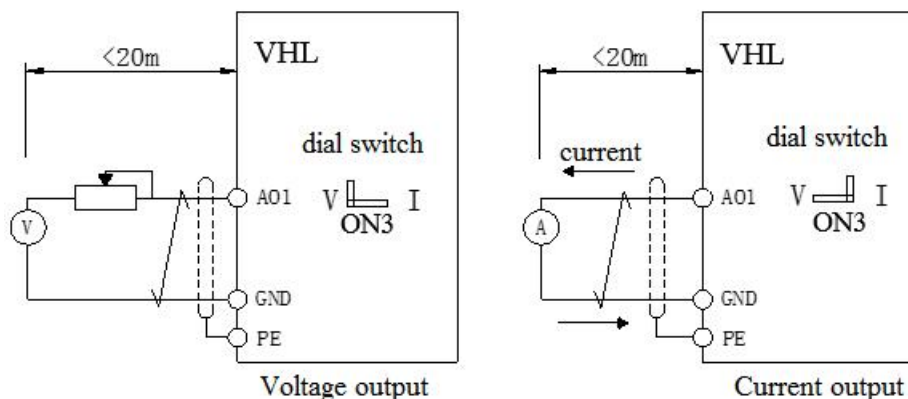
1. Analog input terminal AI wiring

The AI1/AI2 terminal accepts analog signal input, and the AI1/AI2 dial switch selects input voltage (0-10V) or current (0-20mA). The specific wiring is shown in the following figure:



2. Analog output terminal AO wiring

The AO1 connects to external analog meter to indicate various physical quantities. AO1 dial switch selects output voltage (0-10V, external load $2k\Omega$ - $1M\Omega$) or current (0-20mA, external load less than 500Ω). The terminal wiring method is shown in the following figure.



- When using analog input, install filter capacitors or common mode inductors between AI and GND.
- The resistance range of the potentiometer connected between the control terminal 10V and GND is 5~10K.
- Analog input and output signals are prone to external interference. Shielded cables must be used for wiring and well grounded. The wiring length should be as short as possible, not greater than 20m.

Description of dial switch:

ON2: AI2 OFF = 0 - 10V, ON = 0 - 20mA, default is OFF

ON3: AO1 OFF = 0 - 10V, ON = 0 - 20mA, default is OFF

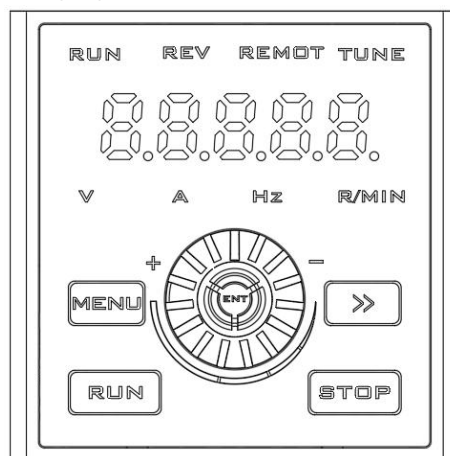
AO: V: 0-10V, MA: 0-20mA, default is V

3. Operating instructions and application examples

3-1. Keyboard operation and use

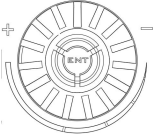
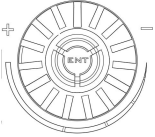
3-1-1. Keyboard layout

The operation panel and control terminals of the frequency converter can control the starting, speed regulation, shutdown, braking, operation parameter setting, and peripheral equipment of the motor. The appearance of the operation panel is shown in the following figure.



3-1-2. Keyboard function

There are 8 buttons on the frequency converter operation keyboard, and their functions are defined as follows:

Key	Name	Function
	Programming/ Exit	Entering or exiting the programming state
	Storage/ switching	In programming mode, used to enter the next level menu or store parameter data
	Forward running	In the command mode of operating the keyboard, press this key to run in the forward direction
	Stop/reset	Shutdown/fault reset
	Increase	Incremental of data and parameters or pause the frequency when operation
	Decrease	Decrement of data and parameters or pause the frequency when operation
	Shift/monitor	When in editing status, you can choose to set the modification bit of the data; In other states, the display of status monitoring parameters can be switched

3-1-3. Description of LED digital display and indicator lights

There are five digit 7-segment LED display, four status indicators and four unit indicators on the inverter operation panel.

The four status indicators are located above the LED display, and from left to right are RUN, REV, REMOT, and TUNE. The following table provides an explanation of the indicator lights.

LED light	Meaning	Function
RUN	Operation indicator	Light on: running status; Light off: shutdown status.
REV	Forward/reverse run indicator	Light on: reverse operation status; Light off: forward running state; Flashing light: switching states.
REMOT	Command source indicator	Off: panel start stop; Always on: Terminal start stop; Flashing: Communication start and stop.
TUNE	Tuning indicator	Slow flashing light: tuning state; Flashing light: fault status; Constant light on: torque state.

The four unit indicators are located below the LED display, which are V, A, Hz and R/MIN from left to right. The following table provides an explanation of the unit indicator lights.

LED light	Meaning	Function
V	Voltage	Always on: Display voltage
A	Current	Always on: Display current
Hz	Frequency	Always on: Display frequency
R/MIN	Speed /%	Always on: Display motor speed Blinking: Display %

3-1-4. Operation panel operation method

Various operations can be performed on the frequency converter through the operation panel, for example:

(1) Switching the display of status parameters

Method 1:

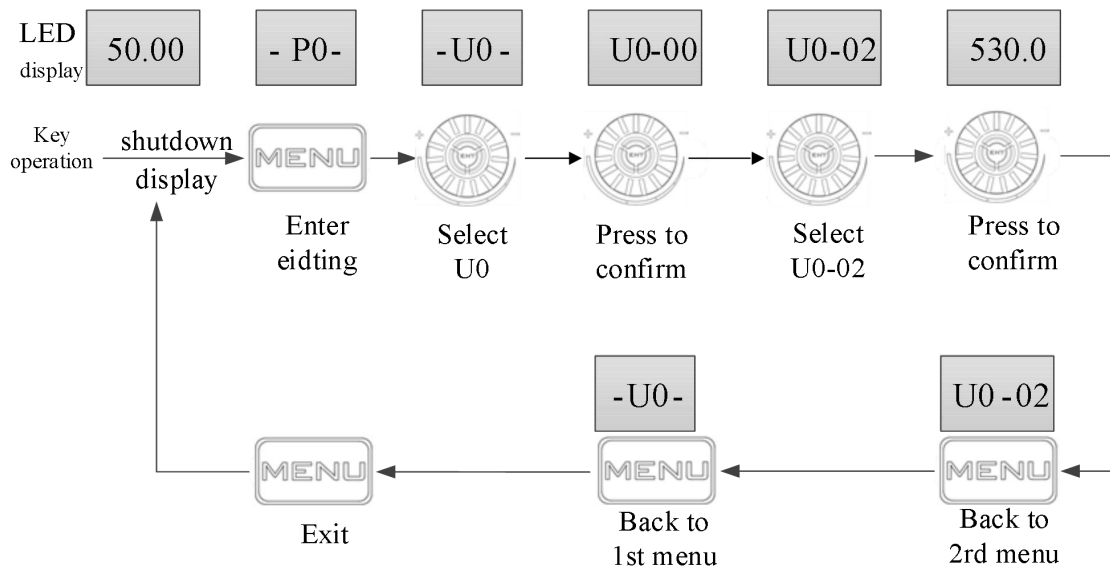
After pressing , switch the LED display parameters, set the running display parameters P8-07 and P8-08, and set the shutdown display parameters P8-09.

When querying status monitoring parameters, you can directly switch back to the default monitoring parameter

display status by pressing . The default monitoring parameter for shutdown status is the set frequency, while the default monitoring parameter for operation status is the output frequency.

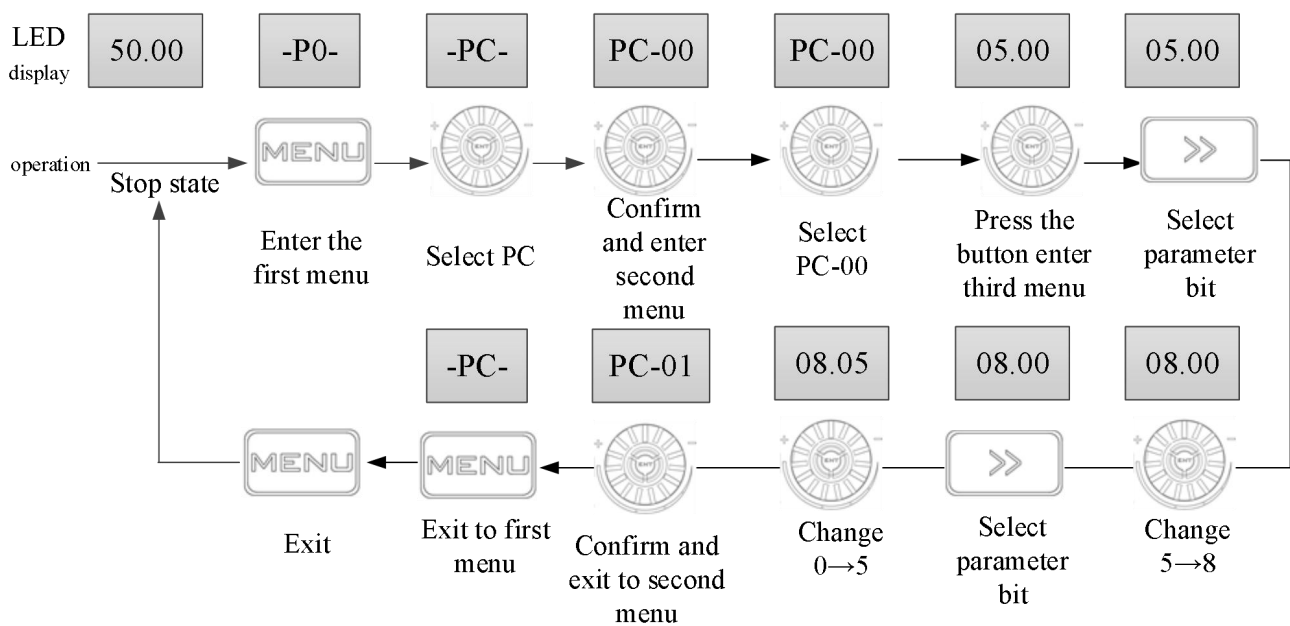
Method 2:

View the U0 group parameters, assuming you are viewing U0-02.



(2) Parameter setting

① Assuming parameter PC-00 (jog frequency) is changed from 5.00Hz to 8.05Hz as an example for explanation.

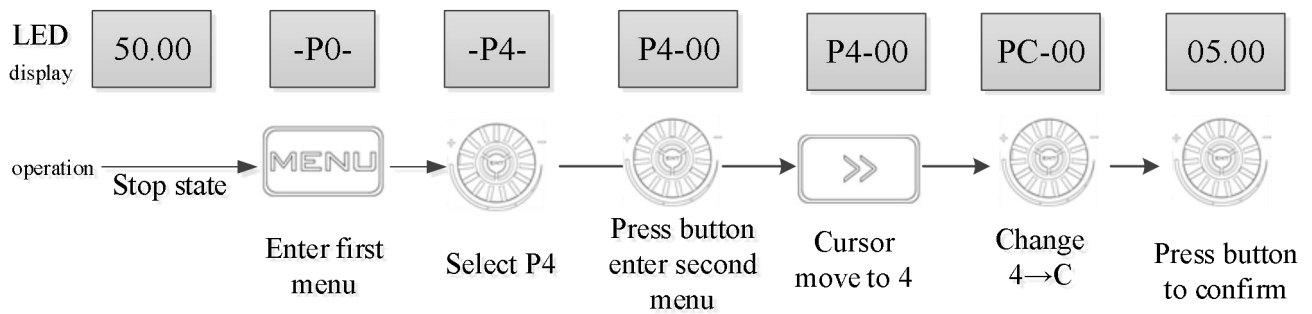


In the third level menu state, if the parameter does not have a flashing bit, it indicates that the parameter cannot be modified. Possible reasons include:

- (1) This parameter is non modifiable, such as the actual detection status parameter, operation record parameter, etc.
- (2) This parameter cannot be modified while in operation and can only be modified after shutdown.

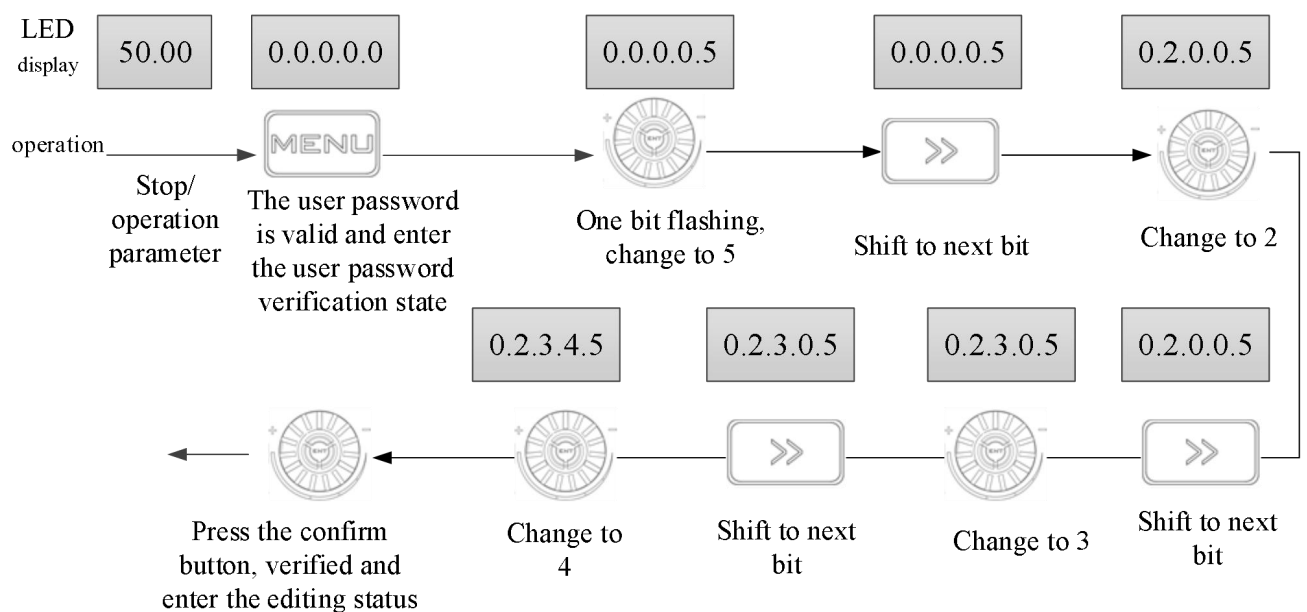
② The function of modifying function code group numbers in the first level menu can be achieved under the second level menu.

For example, in the P4-00 interface, to adjust the value of PC-00, you can press the left button to move the cursor to the position of ""4"" for adjustment. The specific operation is shown in the following figure:



(3) Verifying and unlocking user passwords

Assuming that the 'User Password' P8-03 has been set to '02345'. The bold numbers in the figure below indicate the flashing position.



(4) Fault status query fault parameters

The method for querying fault status is the same as the U0 group monitoring parameters.



- Users can query P6 group parameters by pressing the button while the fault code is displayed.
- When users query fault parameters, they can directly switch back to the fault code display status by pressing the .

3-1-5. Quick parameter lookup

There are many function codes in the VHL series, and for the convenience of users to quickly search, the frequency converter also provides a method for quickly searching function codes:

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

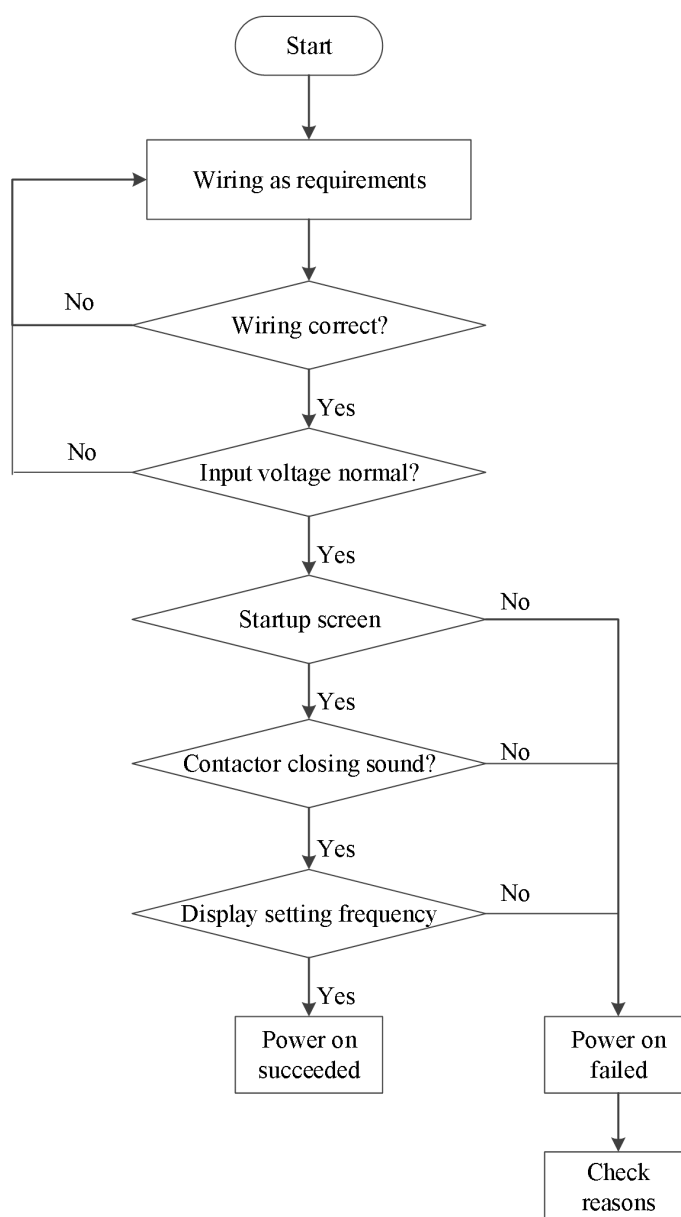
3-2. VFD power on

3-2-1. Inspection after power on

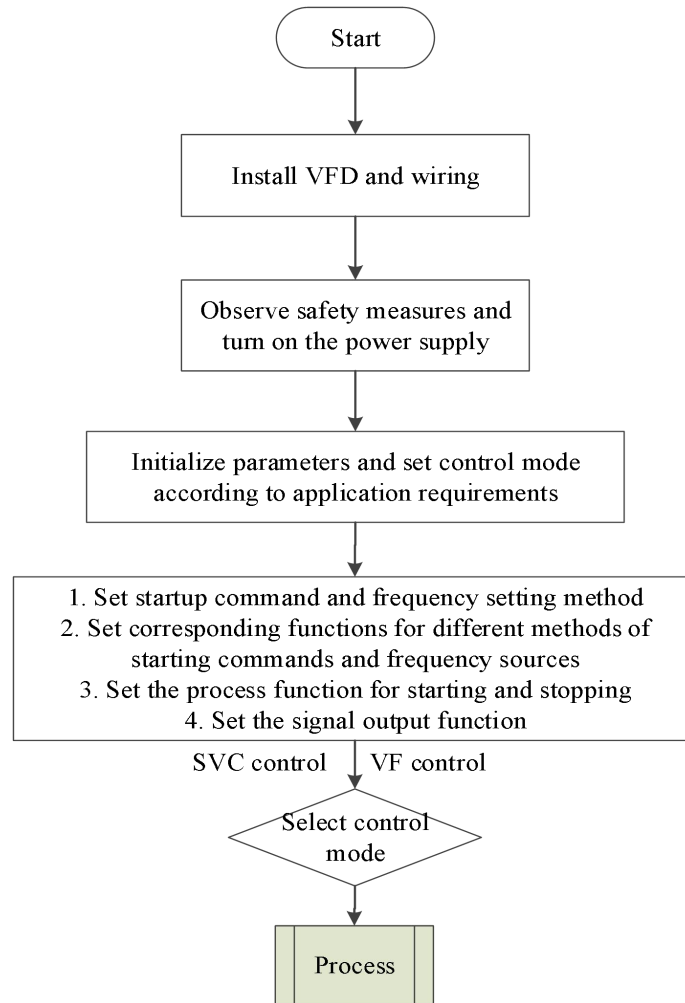
Please follow the operation requirements provided in the ""EMC (Electromagnetic Compatibility)"" section of this manual for wiring connections.

3-2-2. Initial power on operation

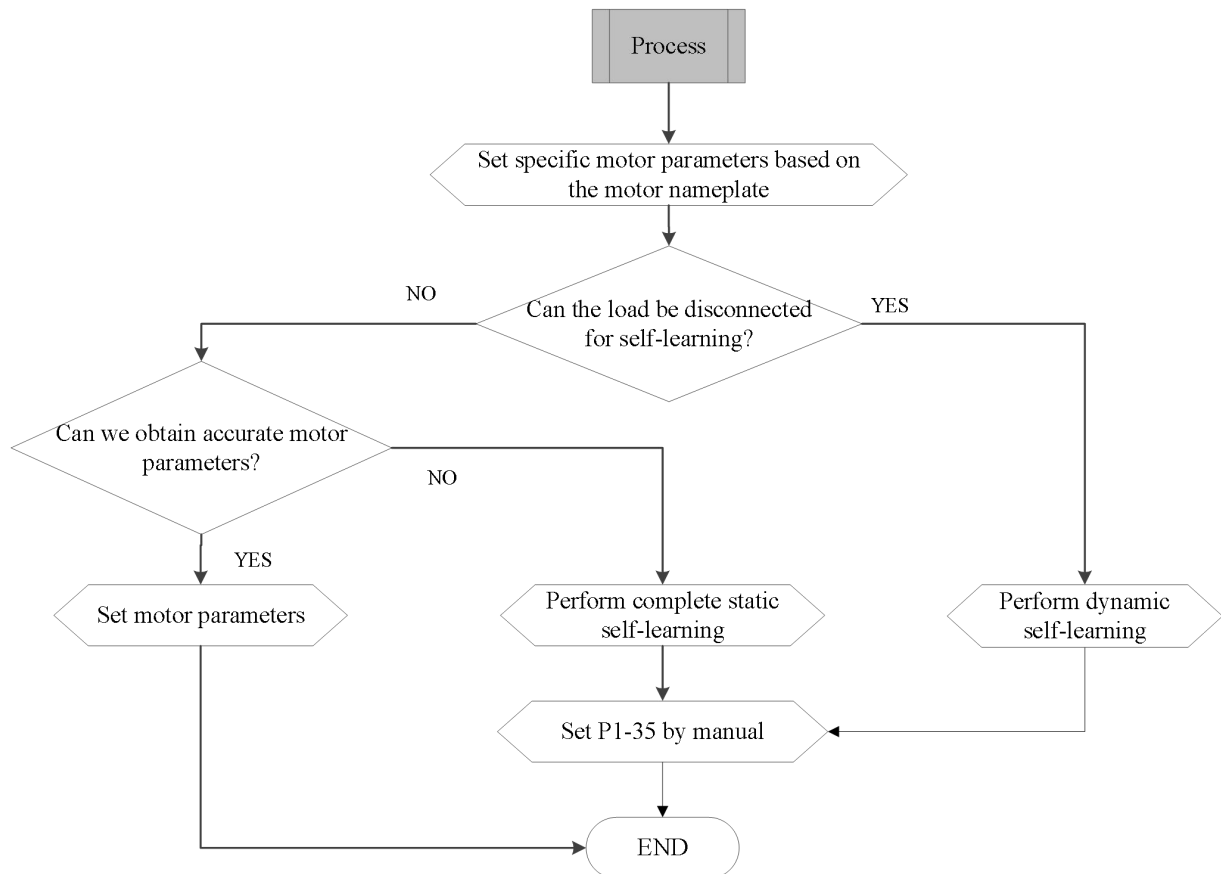
After the wiring and power supply are checked and confirmed to be correct, close the AC power switch on the input side of the inverter and power on the inverter. The LED on the inverter operation keyboard displays the dynamic picture of startup, and the contactor is pulled in normally. When the display 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 following figure:



3-2-3. Start to debug



3-2-4. Debugging process



3-3. VFD start stop control

3-3-1. Source selection of start stop signals

There are three sources of start stop signals for frequency converters, namely panel start stop, terminal start stop, and communication start stop, which are selected through the functional parameter P0-02.

3-3-1-1. Panel start stop control

Command control is carried out by the buttons on the panel. Press the RUN key on the keyboard, and the frequency converter will start running. When the frequency converter is running, press the STOP key on the keyboard to stop the operation of the frequency converter.

parameter	name	set value	note
P0-02	run command channel selection	0	panel command

3-3-1-2. Terminal start stop control

The VHL frequency converter provides multiple terminal control methods, with function codes P2-10 determining the switch signal mode and P2-00 to P2-09 determining the input port for the start stop control signal.

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

parameter	name	set value	note
P0-02	run command channel selection	1	terminal command
P2-10	X1 terminal command method	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, with forward signal connected to X1, reverse signal connected to X2, and stop signal connected to X3.

parameter	name	set value	note
P0-02	run command channel selection	1	terminal command
P2-10	X1 terminal command method	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	stop

3-3-1-3. Communication start stop control

VHL supports Modbus-RTU mode for communication with the upper computer. The communication port of the frequency converter is built-in with the Modbus-RTU slave protocol, and the upper computer must communicate with it using the Modbus-RTU master protocol. The communication address can be found in Appendix B-3-3. Communication Protocol Parameter Address.

Example of setting communication parameters:

parameter	name	set value	note
P0-02	run command channel selection	2	communication command
P9-00	communication protocol selection	0	Modbus-RTU
P9-01	local address	1	station no.1
P9-02	baud rate	6	19200BPS
P9-03	data format	1	8-E-1

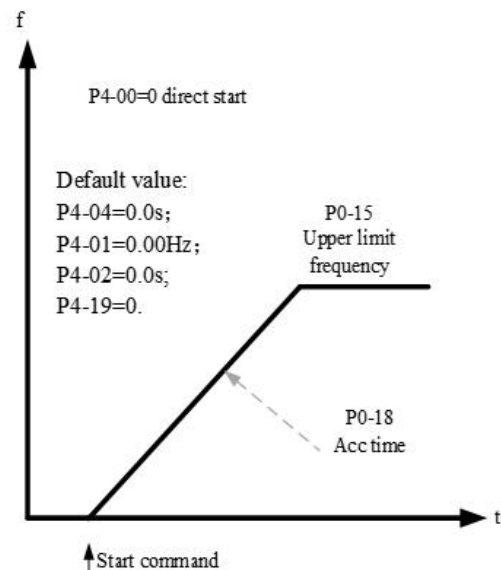
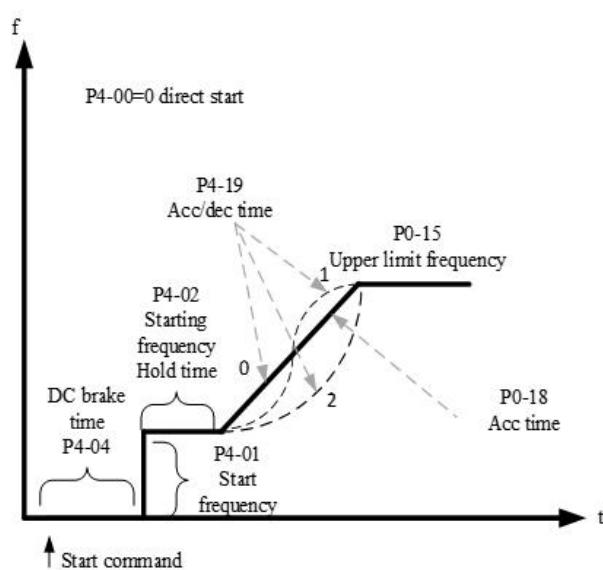
3-3-2. Startup mode

There are three startup modes for frequency converters, namely direct startup, speed tracking restart, and asynchronous machine preexcitation startup, which are selected through functional parameter P4-00.

3-3-2-1. Direct startup

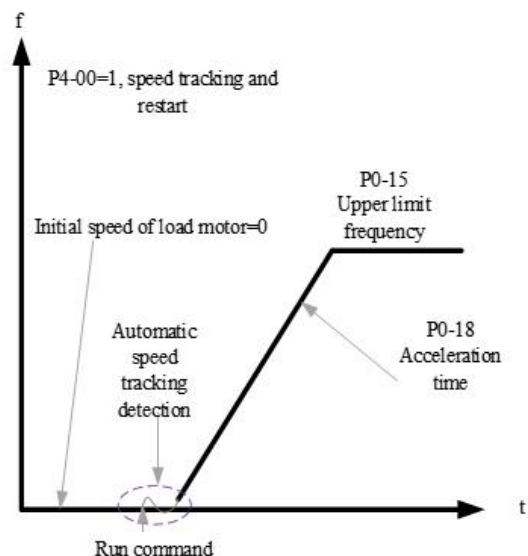
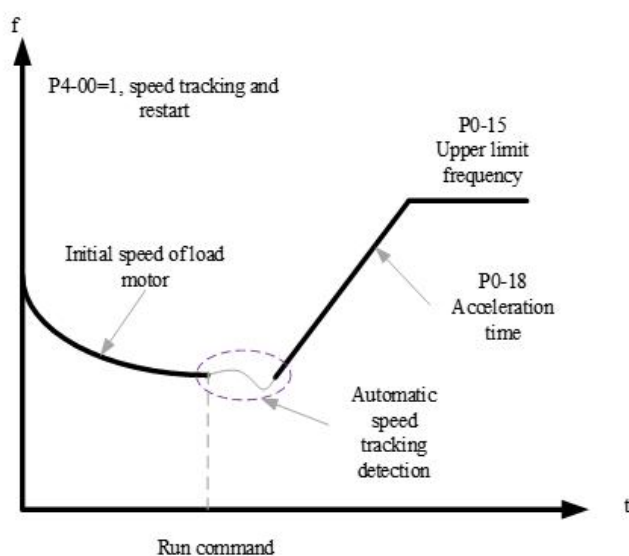
parameter	name	set value	note
P4-00	startup mode	0	The direct start method is suitable for most small inertia loads, and the frequency curve of the start process is shown in the following figure. The ""DC braking"" function before startup is suitable for driving elevators and heavy lifting loads. The ""startup frequency"" is applicable to

equipment that require torque impact starting, such as cement mixer equipment.



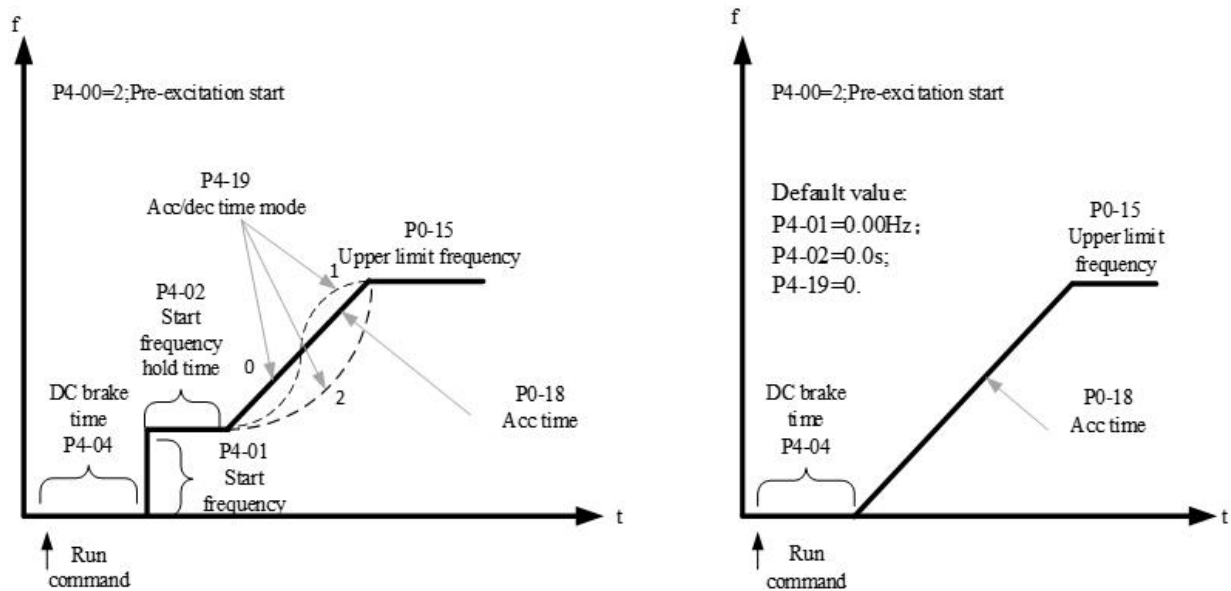
3-3-2-2. Speed tracking restart

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 frequency converter 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.



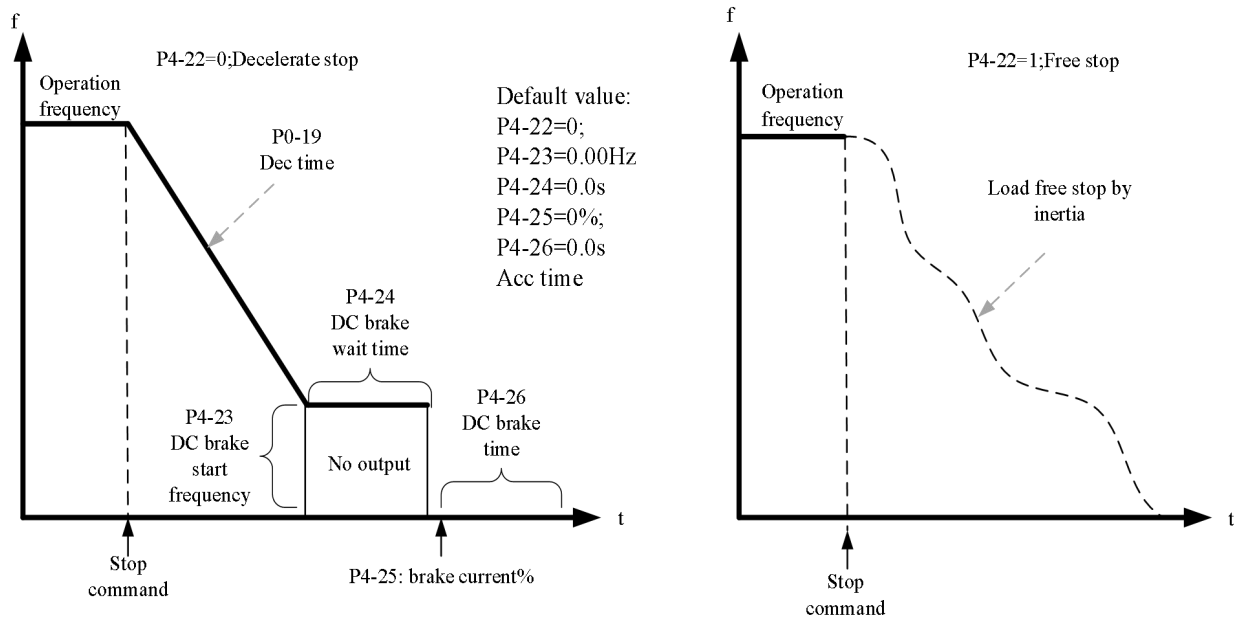
If the actual acceleration time of the motor is found to be much greater than the set acceleration time under V/F control mode, the following measures can be taken:

Frequency setting	Measurement
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 set value of P5-19 exceeds 170%, it can easily cause the frequency converter to alarm ERR10 (frequency converter overload fault)
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 frequency converter, 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 frequency converter stops according to the deceleration time
		1	Free stop, inverter stop output immediately, motor stop freely by inertia



Under the VF control mode, if 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 (input voltage of frequency converter is 323~437V)	Adjust P7-52 to 690V and P5-16 (Overexcitation gain) to 0. Using Shutdown DC braking, the recommended setting values: P4-23 =0.5Hz, P4-25=50%, P4-24= 1s



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 frequency converter 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 place (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 place (0~3)	0: A+B

Parameter	Range	Note
		1: A-B 2: larger one of A and B 3: smaller one of A and B

3-5. Swing frequency function

The swing frequency function refers to the frequency output of the frequency converter, 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:

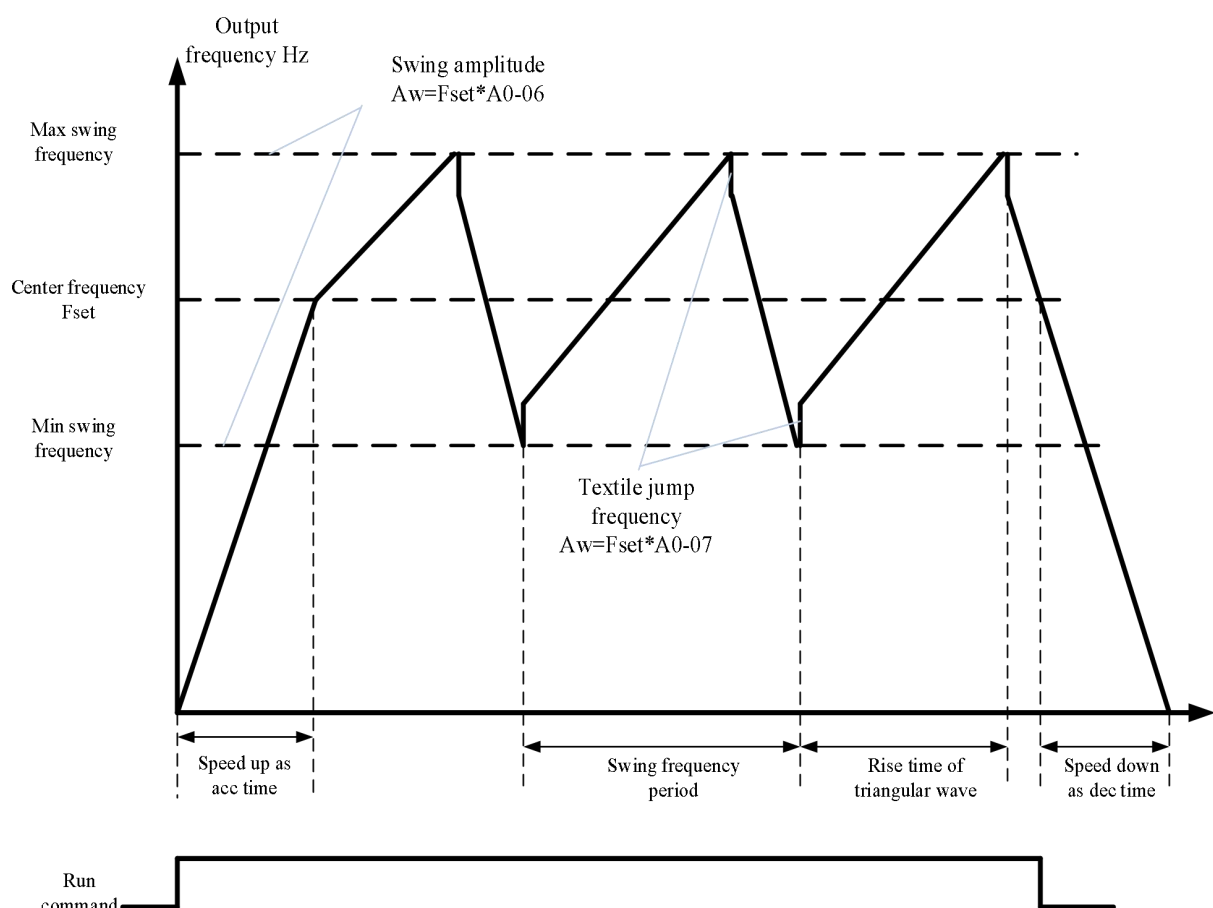
Parameter	Name	Range
A0-05	Swing frequency setting mode	0: relative to center frequency 1: relative to the max frequency
A0-06	Swing frequency amplitude	0.0%~100.0%
A0-07	Jump frequency amplitude	0.0%~50.0%
A0-08	Swing frequency period	0.1s~3600.0s
A0-09	Triangular rise time of swing frequency	0.1%~100.0%

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

0: relative to the center frequency (P0-03 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), $AW = \text{frequency source P0-05} \times A0-06$;

When swing amplitude is relative to the max frequency (A0-05=1), $AW = \text{max frequency P0-06} \times A0-06$.

- 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 $AW \times$ 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 $\times$ A0-09;

triangle wave fall time (s) = swing frequency period A0-08 $\times$ (1 - A0-09).

3-6. Fixed length control

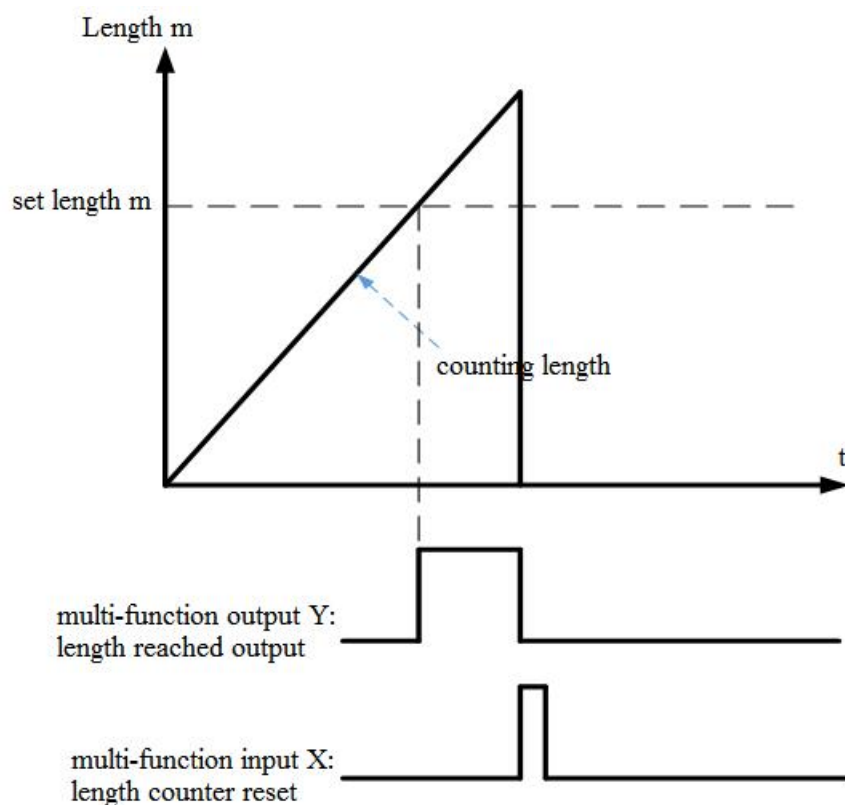
Parameter	Name	Range
A0-00	set length	0m~65535m
A0-01	Actual length (incremental value)	0m~65535m
A0-02	Pulses per meter	0.1~6553.5

The above parameters are used for fixed length control.

In the application, the corresponding input terminal function needs to be set to "length counting 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 by the terminal by the number of pulses per meter A0-02.

When the actual length is greater than the set length A0-00, the multi-functional digital output "length reaches" ON signal. During the fixed length control process, the length reset operation (function 23) can be performed through the multifunctional X terminal, and the function sequence diagram is shown in the following figure:

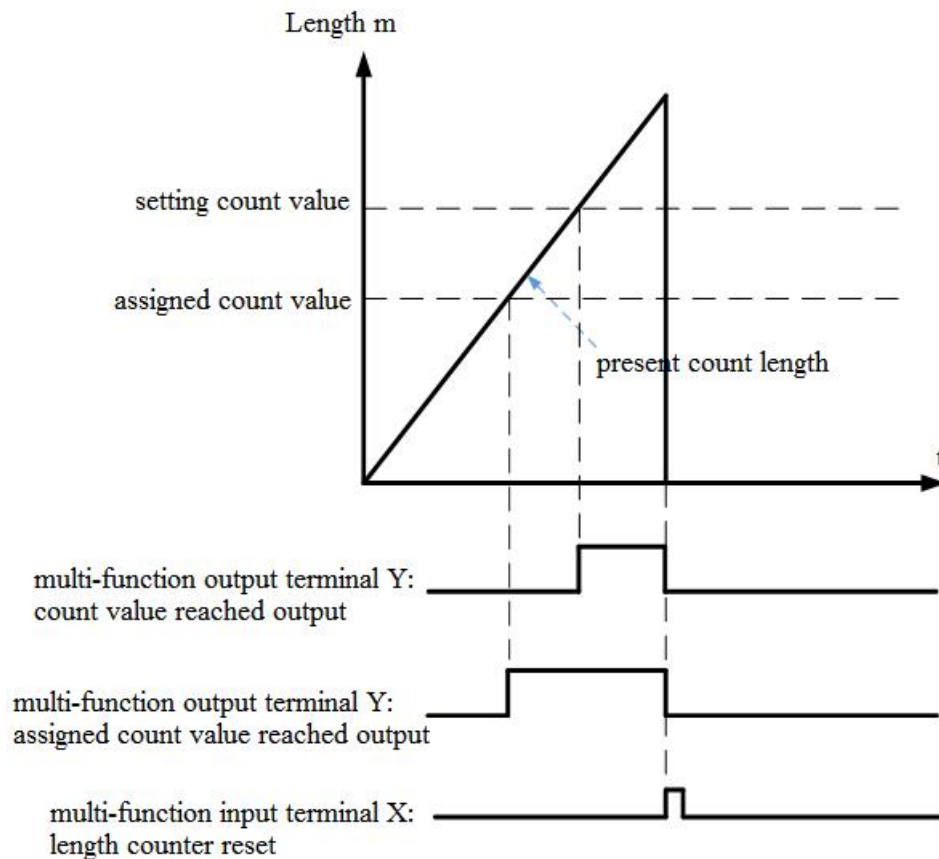


3-7. VFD counting function

parameter	name	range
A0-03	setting counting value	1~65535
A0-04	assigned counting value	1~65535

In the application, the corresponding input terminal function needs to be set to ""counter input"" (function 20). When the pulse frequency is high, the X4 port must be used.

When the count value reaches the specified count value A0-04, the multi-functional digital Y outputs the ""specified count value reaches"" ON signal, and the counter continues to count. When the count value reaches the set count value A0-03, the multi-functional output Y outputs the ""set count value reaches"" ON signal, which can be reset through the multi-functional X terminal (function 21). The function sequence diagram is shown in the following figure:



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 1	Description	Note
PA-01~PA-05	Motor rated power / voltage / current / frequency / speed	Model parameters, manual input
PA-06~PA-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 suitable for motor, where motor and load are difficult to separate and dynamic tuning operation is not allowed, P1-09 and P1-10 are not tuned.	General
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 frequency converter to the corresponding function codes. Asynchronous motor: input P1-00 ~ P1-10 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 the 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	Explanation
P1-35	Motor parameter self-learning	Ones place: 0: no operation 1: Static tuning 1 (some 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 (motor rotation self-learning), press ENT to confirm, at this time, the keyboard displays TUNE.

Then press the RUN key on the keyboard panel, the frequency converter 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 state, 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, select 1 (static tuning of the asynchronous machine) in P1-35 (motor 2 is PA-35), and then press run on the keyboard panel to start the tuning operation of motor parameters.

3-9. Using method of terminal X

In the factory value state, P2-16=0000, P2-17=0000, and when X port is short circuited, it is a valid (logic 1) signal; When port X is suspended, it is an invalid (logic 0) signal.

Users can also change the effective mode of Port X, which means that when Port X is short circuited, it is an invalid (logic 0) signal; When port X is suspended, it is a valid (logic 1) signal. At this time, it is necessary to modify the corresponding bits of P2-16 and P2-17 to 1.

The frequency converter also sets a software filtering time (P2-12) for the input signal of port X, which can improve the anti-interference level.

For the X1-X3 input port, there is also port signal delay function, which is convenient for some applications that require delay processing:

The functions of the four X ports mentioned above can be defined in the P2-00~P2-03 function codes, and each X can be selected from 51 functions as needed. Please refer to the detailed description of P2-00~P2-03 function codes for details.

As the design of hardware features, only X4 can accept high-frequency pulse signals. For applications that require high-speed pulse counting, please arrange it on the X4 port.

3-10. Using method of terminal Y

The VHL series frequency converter can use two channels output, namely Y1 and TA/TB/TC. Y1 is a transistor output that can drive a 24VDC low-voltage signal circuit, and TA/TB/TC is a relay output that can drive a 220VAC control circuit or a DC24 control circuit.

By setting the values of functional parameters P3-01 to P3-05, various output functions can be defined, which can be used to indicate various working states and alarms of the frequency converter. There are about 40 functional settings in total, so that users can achieve specific automatic control requirements. Please refer to the detailed description of P3 group function code parameters for specific settings.

3-11. Using method of terminal AI

Standard IO supports 2 channels of AI.

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

AI2-GND	Voltage 0~10V Current 0~20mA
---------	---------------------------------

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 Current 0~20mA

AO1 can be used to indicate the internal operation parameters in analog mode. The indicated parameter attributes can be modified through P3-13 and P3-14 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

Group P0: Basic operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P0-01	First motor control mode	0: VF control mode 1: No speed sensor vector control (SVC)	0001H	Except version 3742: 0 Version 3742: 1	×
P0-02	Operation command channel selection	0: Operation panel 1: Terminal operation 2: Communication port	0002H	0	○
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 5: Terminal pulse X4 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: Panel knob setting (supported by LED panel with knob)	0003H	0	×
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 5: Terminal pulse X4 setting 6: Communication setting 7: Multi-segment command setting 8: PID setting 9: Simple PLC operation 10: Specific mode for wire drawing and winding (3742 and above can support) 11: Panel knob setting (supported by LED panel with knob) (3742 and above can support)	0004H	0	×
P0-05	Frequency source	Ones place: Frequency source selection	0005H	00	○

Group P0: Basic operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	superposition selection	0: Main frequency source A 1: Calculation results of main and auxiliary frequency sources 2: Switching between main frequency source A and auxiliary frequency source B Tens place: 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 maximum frequency 1: Relative to the main frequency source A	0006H	0	○
P0-07	Auxiliary frequency source B range	0%~150%	0007H	100%	○
P0-09	Digital setting of auxiliary frequency source offset	0.00Hz~max output frequency P0-13	0009H	0.00Hz	○
P0-10	Preset frequency	0.00Hz~max output frequency P0-13	000AH	50Hz	○
P0-11	Frequency command decimal point (supported in version 3742 and above)	1: 1 decimal place 2: 2 decimal place	000BH	2	×
P0-12	Frequency shutdown memory selection for digital setting	0: No memory 1: Memory	000CH	1	○
P0-13	Maximum output frequency	50.00Hz~600.00Hz	000DH	50.00Hz	×
P0-14	Upper limit frequency source	0: Set by P0-15 1: AI1 setting 2: AI2 setting 4: Pulse setting 5: Communication setting	000EH	0	×
P0-15	Upper limit frequency	Lower limit frequency P0-17~Max output frequency P0-13	000FH	50.00Hz	○
P0-16	Upper limit frequency offset	0.00Hz~Max output frequency (P0-13)	0010H	0.00Hz	○

Group P0: Basic operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P0-17	Lower limit frequency	0.00Hz~Upper limit frequency P0-15	0011H	0.00Hz	○
P0-18	Acceleration time 1	0~65000s (PC-09=0) 0.0~6500.0s (PC-09=1) 0.00~650.00s (PC-09=2)	0012H	Model setting	○
P0-19	Deceleration time 1	0~65000s (PC-09=0) 0.0~6500.0s (PC-09=1) 0.00~650.00s (PC-09=2)	0013H	Model setting	○
P0-20	Operation direction	Ones place: running direction 0: Run in the default direction 1: Run in the opposite direction to the default direction Tens place: Reverse inhibit 0: Invalid 1: Valid	0014H	00	○
P0-21	Reverse frequency Prohibition	0: valid 1: invalid	0015H	0	○
P0-22	Dead time of forward and reverse rotation	0.0s~3600.0s	0016H	0.0s	○
P0-23	Run time frequency command up/down reference	0: Operating frequency 1: Set frequency	0017H	0	×
P0-25	Motor parameter group selection	0: Motor parameter group 1 1: Motor parameter group 2	0019H	0	×

Group P1: First motor parameters

Group P1: First motor parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P1-00	Motor type selection	0: Common asynchronous motor 1: Permanent magnet synchronous motor	0100H	0	×
P1-01	Motor rated power	0.1kW~650.0kW	0101H	Model setting	×
P1-02	Motor rated voltage	1V~1200V	0102H	Model setting	×
P1-03	Motor rated current	0.01A~655.35A	0103H	Model setting	×
P1-04	Motor rated frequency	0.01Hz~max output frequency	0104H	Model setting	×
P1-05	Motor rated speed	1rpm~65535rpm	0105H	Model setting	×

Group P1: First motor parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P1-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω	0106H	Tuning parameter	×
P1-07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω	0107H	Tuning parameter	×
P1-08	Asynchronous motor leakage inductance	0.01mH~655.35mH	0108H	Tuning parameter	×
P1-09	Asynchronous motor mutual inductance	0.01mH~655.35mH	0109H	Tuning parameter	×
P1-10	Asynchronous motor no load current	0.01A~P1-03	010AH	Tuning parameter	×
P1-15	Synchronous Motor Stator Phase Resistance	0.001 Ω ~65.535 Ω	010FH	Tuning parameter	×
P1-16	Synchronous Motor D-axis Inductance	0.01mH~655.35mH	0110H	Tuning parameter	×
P1-17	Synchronous Motor Q-axis Inductance	0.01mH~655.35mH	0111H	Tuning parameter	×
P1-19	Synchronous Motor Back EMF	0~6000.0V	0113H	Tuning parameter	×
P1-35	Self learning of motor parameters	Ones place: Tuning Method 0: No operation 1: Static tuning 1 2: Dynamic tuning 3: Static tuning 2 (Applicable to asynchronous motors only) Tens place: Motor Type 0: Asynchronous Motor 1: Synchronous Motor	0123H	00	×

Group P2: Input terminal function parameters

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P2-00	Input terminal X1 function selection	0: no function 1: FWD or run command 2: REV or FWD/REV direction (Note: when it is set to 1 or 2, it	0200H	01	×
P2-01	Input terminal X2 function selection		0201H	02	×

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P2-02	Input terminal X3 function selection	should be used with P2-10. See the parameter for details)	0202H	10	×
P2-03	Input terminal X4 function selection	3: three wire mode operation 4: forward jog (FJOG) 5: reverse jog (RJOG)	0203H	00	×
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 terminal 1 17: acc/dec time terminal 2 18: acc/dec prohibited 19: pulse input 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 X and preset frequency	0204H	00	×

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		42: switch between auxiliary frequency Y and preset frequency 43: frequency setting effective terminal 44: DC braking 45: deceleration DC braking 46: emergency stop 47: external stop terminal (only valid for panel control) 48: external terminal stop (according to deceleration time 4) 49: reverse run prohibited 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	020AH	0	×
P2-11	XI terminal UP/DOWN changing rate	0.001Hz/s~50.000Hz/s	020BH	1.000Hz/s	○
P2-12	XI terminal filtering time	0.000s~1.000s	020CH	0.010s	○
P2-13	X1 delay time	0.0s~3600.0s	020DH	0.0s	×
P2-14	X2 delay time	0.0s~3600.0s	020EH	0.0s	×
P2-15	X3 delay time	0.0s~3600.0s	020FH	0.0s	×
P2-16	XI terminal effective state selection 1	0: Low level valid 1: High level valid Ones place: X1 Tens place: X2 Hundreds place: X3 Thousands place: X4 Ten Thousands place: X5	0210H	00000	×
P2-18	AI curve 1 min setting	0.00V~P2-20	0212H	0.00V	○
P2-19	AI curve 1 min setting corresponding frequency percentage	-100.0%~+100.0%	0213H	0.0%	○
P2-20	AI curve 1 max setting	P2-18~+10.00V	0214H	10.00V	○
P2-21	AI curve 1 max setting corresponding frequency percentage	-100.0%~+100.0%	0215H	100.0%	○
P2-22	AI curve 2 min setting	0.00V~P2-24	0216H	0.00V	○
P2-23	AI curve 2 min setting corresponding frequency	-100.0%~+100.0%	0217H	0.0%	○

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	percentage				
P2-24	AI curve 2 max setting	P2-22 $\sim$ +10.00V	0218H	10.00V	○
P2-25	AI curve 2 max setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	0219H	100.0%	○
P2-26	AI curve 3 min setting	0.00V $\sim$ P2-28	021AH	-10V	○
P2-27	AI curve 3 min setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	021BH	0.0%	○
P2-28	AI curve 3 max setting	P2-26 $\sim$ +10.00V	021CH	10.00V	○
P2-29	AI curve 3 max setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	021DH	100.0%	○
P2-30	AI curve 4 min setting	0.00V $\sim$ P2-32	021EH	0.00V	○
P2-31	AI curve 4 min setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	021FH	0.0%	○
P2-32	AI curve 4 inflection point 1 setting	P2-30 $\sim$ P2-34	0220H	3.00V	○
P2-33	AI curve 4 inflection point 1 setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	0221H	100.0%	○
P2-34	AI curve 4 inflection point 2 setting	P2-32 $\sim$ P2-36	0222H	6.00V	○
P2-35	AI curve 4 inflection point 2 setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	0223H	0.0%	○
P2-36	AI curve 4 max setting	P2-34 $\sim$ +10.00V	0224H	10.00V	○
P2-37	AI curve 4 max setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	0225H	100.0%	○
P2-38	AI curve 5 min setting	-10.00V $\sim$ P2-40	0226H	-10V	○
P2-39	AI curve 5 min setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	0227H	0.0%	○
P2-40	AI curve 5 inflection point 1 setting	P2-38 $\sim$ P2-42	0228H	-3.00V	○
P2-41	AI curve 5 inflection point 1 setting corresponding frequency percentage	-100.0% $\sim$ +100.0%	0229H	100.0%	○
P2-42	AI curve 5 inflection point 2	P2-40 $\sim$ P2-44	022AH	3.00V	○

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	setting				
P2-43	AI curve 5 inflection point 2 setting corresponding frequency percentage	-100.0%~+100.0%	022BH	0.0%	○
P2-44	AI curve 5 max setting	P2-42~+10.00V	022CH	10.00V	○
P2-45	AI curve 5 max setting corresponding frequency percentage	-100.0%~+100.0%	022DH	100.0%	○
P2-54	AI curve selection	Ones place: 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 place: AI2 curve selection, ditto	0236H	321	○
P2-55	AI below minimum input setting selection	Ones place: AI1 below minimum input setting selection 0: Corresponding minimum input setting 1: 0.0% Tens place: AI2 below minimum input setting selection 0: Corresponding minimum input setting 1: 0.0%	0237H	000	○
P2-56	AI1 filter time constant	0.00s~10.00s	0238H	0.10s	○
P2-57	AI2 filter time constant	0.00s~10.00s	0239H	0.10s	○
P2-60	AI1 jump point	-100.0%~+100.0%	023CH	0.0%	○
P2-61	AI1 jump range	0.0%~100.0%	023DH	0.5%	○
P2-62	AI2 jump point	-100.0%~+100.0%	023EH	0.0%	○
P2-63	AI2 jump range	0.0%~100.0%	023FH	0.5%	○
P2-66	PULSE min setting	0.00kHz~P2-68	0242H	0.00kHz	○
P2-67	PULSE min setting corresponding frequency percentage	-100.0%~+100.0%	0243H	0.0%	○

Group P2: Input terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P2-68	PULSE max setting	P2-66~50.0kHz	0244H	50.00kHz	○
P2-69	PULSE max setting corresponding frequency percentage	-100.0%~+100.0%	0245H	100.0%	○
P2-70	PULSE filter time constant	0.00s~10.00s	0246H	0.10s	○
P2-71	X1 Terminal Active Delay (Supported in version 3743 and above)	0.0s~3600.0s	0247H	0.0s	○
P2-72	X1 Terminal Inactive Delay (Supported in version 3743 and above)	0.0s~3600.0s	0248H	0.0s	○
P2-73	X2 Terminal Active Delay (Supported in version 3743 and above)	0.0s~3600.0s	0249H	0.0s	○
P2-74	X2 Terminal Inactive Delay (Supported in version 3743 and above)	0.0s~3600.0s	024AH	0.0s	○
P2-75	X3 Terminal Active Delay (Supported in version 3743 and above)	0.0s~3600.0s	024BH	0.0s	○
P2-76	X3 Terminal Inactive Delay (Supported in version 3743 and above)	0.0s~3600.0s	024CH	0.0s	○
P2-77	X4 Terminal Active Delay (Supported in version 3743 and above)	0.0s~3600.0s	024DH	0.0s	○
P2-78	X4 Terminal Inactive Delay (Supported in version 3743 and above)	0.0s~3600.0s	024EH	0.0s	○
P2-79	X5 Terminal Active Delay (Supported in version 3743 and above)	0.0s~3600.0s	024FH	0.0s	○
P2-80	X5 Terminal Inactive Delay (Supported in version 3743 and above)	0.0s~3600.0s	0250H	0.0s	○

Group P3: Output terminal function parameters

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P3-00	Y1 output format	0: High speed pulse output	0300H	0	○

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		1: Common terminal output			
P3-01	Y1 output function selection	0: No output 1: Inverter in operation 2: Fault output (free stop fault) 3: Frequency level detection FDT1 output 4: Frequency level detection FDT2 output 5: Frequency arrival 6: Zero speed operation (no output during shutdown) 7: Zero speed operation 2 (output when shutdown) 8: Upper limit frequency arrival	0301H	01	○
P3-04	Relay 1 output function selection	9: Lower limit frequency arrival (operation related) 10: Motor overload alarm 11: Frequency converter overload alarm 12: Communication settings 13: In torque limit 15: Frequency 1 reached output 16: Frequency 2 reached output 17: Current 1 reached output 18: Current 2 reached output 19: Set counting value reached 20: Specified counting value reached 21: Ready for operation 23: All input overrange 24: Under voltage state output 25: Cumulative power on time reached 26: Timing arrival output 27: Length arrived 28: Simple PLC cycle completed 29: Cumulative running time arrival 32: Lower limit frequency reached (output when shutdown) 33: Fault output (free stop fault and no output under voltage) 34: Module temperature reached 35: Warning output (all faults) 37: In reverse operation 39: Output current overrange 40: Zero current state 41: This time of running time arrived 42: Bus voltage reaches	0304H	02	○
P3-06	Y1 output delay time	0.0s~3600.0s	0306H	0.0s	○
P3-09	Relay 1 output delay time	0.0s~3600.0s	0309H	0.0s	○

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P3-11	Y terminal effective state selection	0: positive logic 1: negative logic Ones place: Y1 Thousands place: relay 1	030BH	00000	○
P3-12	Y1 (high speed pulse) output selection	0: Operating frequency 1: Set frequency 2: Output current 3: Motor output torque (absolute value, percentage relative to motor)	030CH	00	○
P3-13	AO1 output selection	4: Output power 5: Output voltage 6: AI1 7: AI2 9: PULSE input (100.0% corresponding to 100.0KHz) 10: Output speed 11: Communication control output 12: Count value 13: Length	030DH	00	○
P3-15	AO1 zero bias coefficient	-100.0%~+100.0%	030FH	0.0%	○
P3-16	AO1 gain	-10.00~+10.00	0310H	1.00	○
P3-23	Y1 (high speed pulse) max output pulse frequency	0.01kHz~50.0kHz	0317H	50.0kHz	○
P3-24	Y1 Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	0318H	0.0s	○
P3-25	Y1 Output Inactive Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	0319H	0.0s	○
P3-30	Relay Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	031EH	0.0s	○
P3-31	Relay Output Inactive Delay Time	0.0s~3600.0s	031FH	0.0s	○

Group P3: Output terminal function parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	(Supported in version 3743 and above)				

Group P4: Start stop mode

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

Group P4: Start stop mode					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P4-24	DC braking wait time during shutdown	0.0s~100.0s	0418H	0.0s	○
P4-25	Percentage of DC braking current when shutdown	0%~100%	0419H	0%	○
P4-26	DC braking time during shutdown	0.0s~100.0s	041AH	0.0s	○

Group P5: VF parameters

Group P5: VF parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P5-00	VF curve selection	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 semi separation mode	0500H	00	×
P5-01	Multipoint VF frequency point F1	0.00Hz~P5-03	0501H	0.00Hz	×
P5-02	Multipoint VF voltage point V1	0.0~100.0%	0502H	0.0%	×
P5-03	Multipoint VF frequency point F2	P5-01~P5-05	0503H	0.00Hz	×
P5-04	Multipoint VF voltage point V2	0.0~100.0%	0504H	0.0%	×
P5-05	Multipoint VF frequency point F3	P5-05~P1-04(motor rated frequency)	0505H	0.00Hz	×
P5-06	Multipoint VF voltage point V3	0.0~100.0%	0506H	0.0%	×
P5-07	Torque boost	0.0% (automatical torque boost) 0.1%~30.0%	0507H	model setting	○
P5-08	Cut-off frequency of torque boost	0.00Hz~P0-13	0508H	50.00Hz	×
P5-09	VF separated voltage source	0: Digital setting 1: AI1 2: AI2 4: PULSE setting (X4) 5: Communication setting 6: Multi-speed command 7: PID setting	0509H	0	○

Group P5: VF parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		8: Simple PLC operation			
P5-10	VF separated voltage source digital setting	0~ motor rated voltage	050AH	0V	○
P5-11	VF separated voltage acceleration time	0.0s~1000.0s	050BH	0.0s	○
P5-12	VF separated voltage deceleration time	0.0s~1000.0s	050CH	0.0s	○
P5-13	VF separated stop mode selection	0:The frequency voltage reduced to 0 independently 1: When the voltage decreases to zero, the frequency begins to decrease again	050DH	0	○
P5-14	VF slip compensation gain	0.0%~200.0%	050EH	0.0%	○
P5-15	Slip compensation time constant	0.1~10.0s	050FH	0.1s	○
P5-16	VF over excitation gain	0~200	0510H	64	○
P5-17	VF oscillation suppression gain	0~100	0511H	model setting	○
P5-18	VF oscillation suppression mode selection	0: Oscillation Suppression Disabled 1: Phase Modulation Oscillation Suppression 1 2: Phase Modulation Oscillation Suppression 2 3: Frequency Modulation Oscillation Suppression 1 4: Frequency Modulation Oscillation Suppression 2	0512H	3	×
P5-19	VF over current stall action current	50~200%	0513H	150%	×
P5-20	VF over current stall suppression enable	0: invalid 1: valid	0514H	1	×
P5-21	VF over current stall suppression gain	0~100	0515H	20	○
P5-22	VF over current stall action current compensation coefficient	50%~200%	0516H	50	×
P5-23	Overvoltage stall action voltage	200.0V~2000.0V	0517H	model setting	×
P5-24	Overvoltage stall enable	0: Invalid 1: Valid	0518H	1	×
P5-25	Over voltage stall suppression frequency gain	0~100	0519H	30	○
P5-26	Over voltage stall	0~100	051AH	30	○

Group P5: VF parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	suppression voltage gain				
P5-27	Limit of maximum rise frequency of over voltage stall	0~50Hz	051BH	5Hz	×
P5-34	PID Stop Reference Voltage (Supported in version 3742 and above)	0.0~1000.0V	0522H	780V	○
P5-35	PID Stop Proportional Gain (Supported in version 3742 and above)	0~65535	0523H	500	○
P5-36	PID Stop Integral Gain (Supported in version 3742 and above)	0~65535	0524H	200	○
P5-37	PID Stop Derivative Gain (Supported in version 3742 and above)	0~65535	0525H	100	○
P5-38	Parabolic Stop Reference Time (Supported in version 3742 and above)	0.0~4200.0S	0526H	20.0S	○
P5-39	Stop Deceleration Method Selection (Supported in version 3742 and above)	0: Linear Deceleration Stop 1: Parabolic Deceleration Stop 2: PID Deceleration Stop	0527H	0	○

Group P6: Vector control parameters

Group P6: Vector control parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P6-00	Speed loop proportional gain 1	1~100	0600H	V3742 and below: 30 V3742 and above: 20	○
P6-01	Speed loop integration time 1	0.01s~10.00s	0601H	0.50s	○
P6-02	Speed loop proportional gain 2	1~100	0602H	V3742 and below: 30 V3742 and above: 20	○
P6-03	Speed loop integration time 2	0.01s~10.00s	0603H	1.00s	○
P6-04	Switching frequency 1	0.00~P6-05	0604H	5.00Hz	○
P6-05	Switching frequency 2	P6-04~P0-13	0605H	10.00Hz	○
P6-06	Integral attribute of speed loop	Ones place: integral separation 0: invalid 1: valid	0606H	0	○
P6-07	Vector slip compensation coefficient	50%~200%	0607H	V3742 and below: 30 V3742 and above: 20	○

Group P6: Vector control parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P6-08	SVC speed feedback filter time	0.000s~0.100s	0608H	0.015s	○
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)	060AH	0	○
P6-11	Speed control (drive) torque upper limit digital setting	0.0%~200.0%	060BH	150.0%	○
P6-14	Proportional gain of excitation regulation	0 ~ 60000	060EH	Tuning Parameters	○
P6-15	Integral gain of excitation regulation	0 ~ 60000	060FH	Tuning Parameters	○
P6-16	Torque regulated proportional gain	0 ~ 60000	0610H	Tuning Parameters	○
P6-17	Integral gain of torque regulation	0 ~ 60000	0611H	Tuning Parameters	○

Group P7: Fault parameters

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P7-00	Third time (latest) fault type	0: No fault 1: Accelerated over current 2: Deceleration over current 3: Constant speed over current 4: Acceleration overvoltage 5: Deceleration overvoltage 6: Constant speed overvoltage 7: Buffer resistance overload fault 8: Under voltage fault 9: Inverter overload 10: Motor overload	0700H	-	-

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P7-01	Second time fault type	11: Input phase loss 12: Output phase loss 13: Radiator overheating 14: Contactor fault 15: Current detection fault 16: Motor tuning fault 17: Code disk failure 18: Short circuit fault of motor to ground 19: Load drop 20: Wave by wave current limiting fault 22: UVW signal feedback error 23: Brake resistance short circuit 24: Brake pipe overload 25: Brake pipe straight through 26: SVC stall fault 43: External fault 44: Communication failure 45: EEPROM read / write failure	0701H	-	-
P7-02	First time fault type	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: Running switch motor 52: Speed feedback deviation too large 53: Motor over speed 54: Motor over temperature fault 55: Point to point slave failure 56: Power on lock time reached	0702H	-	-
P7-03	Third time (last time) fault frequency	-	0703H	-	-
P7-04	Third time (last time) fault current	-	0704H	-	-
P7-05	Third time (last time) fault bus voltage	-	0705H	-	-
P7-06	Third time (last time) fault input terminal status	-	0706H	-	-
P7-07	Third time (last time) fault output terminal status	-	0707H	-	-
P7-08	Third time (last time) fault VFD status	-	0708H	-	-
P7-09	Third time (last time) fault power on time	Unit:minute	0709H	-	-

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P7-10	Third time (last time) fault operation time	Unit:minute	070AH	-	-
P7-11	Location information of the third (latest) fault	-	070BH	-	-
P7-13	Second time fault frequency	-	070DH	-	-
P7-14	Second time fault current	-	070EH	-	-
P7-15	Second time fault bus voltage	-	070FH	-	-
P7-16	Second time fault input terminal status	-	0710H	-	-
P7-17	Second time fault output terminal status	-	0711H	-	-
P7-18	Second time fault VFD status	-	0712H	-	-
P7-19	Second time fault power on time	Unit:minute	0713H	-	-
P7-20	Second time fault operation time	Unit:minute	0714H	-	-
P7-21	Location information of the second fault	-	0715H	-	-
P7-23	First time fault frequency	-	0717H	-	-
P7-24	First time fault current	-	0718H	-	-
P7-25	First time fault bus voltage	-	0719H	-	-
P7-26	First time fault input terminal status	-	071AH	-	-
P7-27	First time fault output terminal status	-	071BH	-	-
P7-28	First time fault VFD status	-	071CH	-	-
P7-29	First time fault power on time	Unit:minute	071DH	-	-
P7-30	First time fault operation time	Unit:minute	071EH	-	-
P7-31	Location information of the first fault	-	071FH	-	-
P7-33	Motor overload protection mode selection	0: Forbidden 1: Allow	0721H	1	○
P7-34	Motor overload protection gain	0.20~10.00	0722H	1.00	○

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P7-35	Motor overload warning coefficient	50%~100%	0723H	80%	○
P7-39	Input phase lacking/contacting closing protection selection	Ones place: input phase lacking protection Tens place: Contactor closing protection selection 0: Forbidden 1: Allow	0727H	11	○
P7-40	Output phase lacking protection selection	0: Forbidden 1: Allow	0728H	1	○
P7-41	Power on short circuit protection towards the ground function	0: Invalid 1: Valid	0729H	1	○
P7-42	Action selection of fault relay during automatic fault reset	0: No action 1: Action	072AH	0	○
P7-43	Interval time of automatic fault reset	0.1s~60.0s	072BH	1.0s	○
P7-44	Number of automatic reset of faults	0~20	072CH	0	○
P7-45	Protection action option 1 when fault	Ones place: motor overload (Err 10) 0: Free stop 1: Stop as stop mode Tens place: input phase lacking (Err11) 0: Free stop 1: Stop as stop mode Hundreds place: output phase lacking (Err12) 0: Free stop 1: Stop as stop mode Thousands place: 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	072DH	00000	○
P7-46	Protection action option 2 when fault	Ones place: external fault 1 (Err43) 0: Free stop 1: Stop as stop mode	072EH	00000	○

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		Tens place: communication error (Err44) 0: Free stop 1: Stop as stop mode Hundreds place: EEPROM read write error (Err45) 0: Free stop 1: Stop as stop mode Thousands place: operation time reached (Err46) 0: Free stop 1: Stop as stop mode Ten thousand bit: power on time reached (Err47) 0: Free stop 1: Stop as stop mode			
P7-47	Protection action option 3 when fault	Ones place: user defined fault 1 (Err48) 0: Free stop 1: Stop as stop mode Tens place: user defined fault 2 (Err49) 0: Free stop 1: Stop as stop mode Hundreds place: PID feedback lost in operation (Err50) 0: Free stop 1: Stop as stop mode Thousands place: 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	072FH	00000	○
P7-48	Protection action option 4 when fault	Ones place: motor overheat (Err54) 0: Free stop 1: Stop as stop mode	0730H	00000	○
P7-52	Brake starting voltage	200.0V ~ 2000.0V Default value: 380V power supply model: 690V 220V power supply model: 360V	0734H	Model setting	○
P7-53	Utilization rate of brake resistor	0 ~ 100%	0735H	100%	○

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P7-55	Over voltage stall gain	0 ~ 100	0737H	30	○
P7-56	Over voltage stall protection voltage	200.0V ~ 2000.0V	0738H	Model setting	○
P7-61	Load drop detection level	0.0%~100.0%	073DH	10.0%	○
P7-62	Load drop detection time	0.0~60.0s	073EH	1.0s	○
P7-63	Over speed detection value	0.0% ~ 50.0% (unit is max frequency P0-13)	073FH	20.0%	○
P7-64	Over speed detection time	0.0s~60.0s	0740H	1.0s	○
P7-65	Detection value of excessive speed deviation	0.0% ~ 50.0% (unit is max frequency P0-13)	0741H	20.0%	○
P7-66	Excessive speed deviation detection time	0.0s ~ 60.0s	0742H	5.0s	○
P7-67	Selection of instantaneous stop non-stop function	0:Instantaneous power failure invalid 1:Deceleration in case of instantaneous power failure 2:Deceleration stop in case of instantaneous power failure 3: Automatic deceleration and shutdown upon undervoltage (supported in 3740 and above)	0743H	0	×
P7-68	Pause judgement voltage of transient stop action	80%~100%	0744H	85%	×
P7-69	Judgment time of instantaneous stop non-stop voltage rising	0.0s~30.0s	0745H	0.5s	×
P7-70	Judgement voltage of instantaneous stop non-stop action	60%~100% (bus voltage)	0746H	80%	○
P7-71	Proportional gain of instantaneous stop non-stop	0 ~ 100	0747H	40	○
P7-72	Integral coefficient of instantaneous stop non-stop	0 ~ 100	0748H	30	○
P7-73	Deceleration time of instantaneous stop non-stop	0 ~ 300.0s	0749H	20.0	×
P7-74	DC Bus Voltage Detection Level for Under-voltage Auto	0~500.0V	074AH	300.0V	×

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	Deceleration Stop (Supported in version 3740 and above)				
P7-75	Terminal Protection Mode for Under-voltage Auto Deceleration Stop (Supported in version 3740 and above)	0: Terminal retrigger required 1: No terminal retrigger required; restart when the DC bus voltage exceeds P7-76 2: No terminal retrigger required; restart when the DC bus voltage exceeds P7-76 and remains for the duration of P7-77	074BH	0	○
P7-76	Restart Judgment Voltage for Under-voltage Auto Deceleration Stop (Supported in version 3740 and above)	P7-74~500.0V	074CH	310.0V	×
P7-77	Restart Waiting Time for Under-voltage Auto Deceleration Stop (Supported in version 3740 and above)	0~30.0s	074DH	0.0s	×
P7-78	Frequency Judgment Level for Free Stop During Instantaneous Power Failure (Supported in version 3743 and above)	0.00Hz~20.00Hz	074EH	0.20Hz	
P7-83	Historical Maximum DC Bus Voltage (Supported in version 3743 and above)	-	0753H	-	-
P7-84	Output Current at the Time of Historical Maximum DC Bus Voltage Record (Supported in version 3743 and above)	-	0754H	-	-
P7-85	Accumulated Power-on Time at the Time of Historical Maximum DC Bus Voltage Record (Supported in version 3743 and above)	-	0755H	-	-

Group P7: Fault parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P7-86	Historical Maximum Inverter Temperature (Supported in version 3743 and above)	-	0756H	-	-
P7-87	Output Current at the Time of Historical Maximum Inverter Temperature Record (Supported in version 3743 and above)	-	0757H	-	-
P7-88	Accumulated Power-on Time at the Time of Historical Maximum Inverter Temperature Record (Supported in version 3743 and above)	-	0758H	-	-
P7-89	Historical Maximum Output Current (Supported in version 3743 and above)	-	0759H	-	-
P7-90	Accumulated Power-on Time at the Time of Historical Maximum Output Current Record (Supported in version 3743 and above)	-	075AH	-	-

Group P8: Keyboard and display

Group P8: Keyboard and display					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P8-01	STOP/REST function	0: Only in keyboard operation mode, STOP/REST key shutdown function is effective 1: In any operation mode, STOP/REST key is effective	0801H	1	○
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) 4: Backup current user parameters (only	0802H	0	×

Group P8: Keyboard and display						
Parameter	Name	Setting range		Modbus address	Default value	Modify
		supported by LCD panel) 5: Restore user backup parameters (only supported by LCD panel)				
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-bit)	Display bit	Explanation	0807H	001F	○
P8-08	LED operation display parameter 2 (High 16-bit)	Bit0	Operating frequency	0808H	0000	○
		Bit1	Setting frequency			
		Bit2	Bus voltage			
		Bit3	Output current			
		Bit4	Output voltage			
		Bit5	Output torque			
		Bit6	Output power			
		Bit7	X input state			
		Bit8	Y output state			
		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			
		P8-09	LED stop display parameters			
Bit0	Setting frequency					
Bit1	Bus voltage					
Bit2	X input status					
Bit3	Y input status					
Bit4	AI1 voltage					

Group P8: Keyboard and display					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		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	Cumulative power on time	0h~65535h	080BH	-	-
P8-12	Cumulative power consumption	0~65535 degree	080CH	-	-
P8-14	Product number	-	080EH	-	-
P8-15	Software version	-	080FH	-	-
P8-16	Firmware version	-	0810H	-	-
P8-19	Inverter module radiator temperature	0.0°C~100.0°C	0813H	-	-
P8-20	Output power factor	0.0% ~ 200.0%	0814H	100.0	○
P8-21	Load speed display factor	0.0001~6.5000	0815H	1.0000	○
P8-22	Number of decimal points for load speed display	Ones place:number of decimal points of U0-16 0: 0 decimal places 1: 1 decimal place 2: 2 decimal places Tens place:number of decimal points of U0-17 1: 1 decimal place 2: 2 decimal places	0816H	11	○

Group P9: Communication parameters

Group P9: Communication parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
P9-00	Serial communication protocol selection	0:Modbus-RTU protocol 2: ASCII mode (supported in version 3742 and above)	0900H	0	×
P9-01	Local address	0: Broadcast address 1 ~ 247 (Modbus valid)	0901H	1	○
P9-02	Communication baud rate	Ones place:MODBUS 0:300BPS 1:600BPS 2:1200BPS 3:2400BPS 4:4800BPS 5:9600BPS	0902H	06	○

Group P9: Communication parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		6:19200BPS 7:38400BPS 8: 57200BPS (supported in version 3742 and above) 9: 115200BPS (supported in version 3742 and above)			
P9-03	MODBUS data format	0: No parity (8-N-2) 1: Even parity (8-E-1) 2: Odd parity (8-O-1) 3: No parity (8-N-1) (Modbus valid) 4: Even parity (7-E-1) (ASCII)	0903H	1	○
P9-04	MODBUS Communication timeout	0.0:invalid 0.1~60.0s	0904H	0.0	○
P9-05	MODBUS response delay	0~20ms (Modbus valid)	0905H	2	○
P9-07	Replace VB3/VB5/V5 Communication Control Word (Supported in version 3742 and above)	Tens place: 0: Disabled 1: Enabled	0907H	0	○

Group PA: Process control closed-loop parameters

Group PA: Process control closed-loop parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
PA-01	Setting channel selection	0:PA-05 setting 1:AI1 2:AI2 4: PULSE pulse setting (X4) 5: Communication setting 6: Multi-segment command setting	0A01H	0	○
PA-02	Feedback channel selection	0:AI1 1:AI2 3:AI1-AI2 4:AI1+AI2 5: PULSE pulse setting (X4) 6: Communication setting	0A02H	0	○
PA-03	PID feedback filter time	0.00s~30.00s	0A03H	0.00s	○
PA-04	PID output filter time	0.00s~30.00s	0A04H	0.00s	○

Group PA: Process control closed-loop parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
PA-05	PID value setting	0.0%~100.0%	0A05H	50.0%	○
PA-06	PID setting change time	0.00s~300.00s	0A06H	0.00s	○
PA-07	PID reverse cut-off frequency	0.00Hz~Max output frequency	0A07H	0.00Hz	○
PA-08	PID deviation limit	0.0%~100.0%	0A08H	0.0%	○
PA-09	PID differential limit	0.00%~100.00%	0A09H	0.10%	○
PA-10	Proportional gain P	0.0~100.0	0A0AH	20.0	○
PA-11	Integral time I	0.01s~10.00s	0A0BH	2.00s	○
PA-12	Differential time D	0.000s~10.000s	0A0CH	0.000s	○
PA-13	PID parameter switching condition	0: Do not switch 1: Switch through X terminal 2: Switch automatically according to deviation 3: Switch automatically according to the operation frequency	0A0DH	0	○
PA-14	PID parameter switching deviation 1	0.0%~PA-15	0A0EH	20.0%	○
PA-15	PID parameter switching deviation 2	PA-14~100.0%	0A0FH	80.0%	○
PA-16	PID proportional gain P2	0.0~100.0	0A10H	20.0	○
PA-17	PID integral time I2	0.01s~10.00s	0A11H	2.00s	○
PA-18	PID differential time D2	0.000s~10.000s	0A12H	0.000s	○
PA-19	PID action direction	0: Positive action 1: Negative action	0A13H	0	○
PA-20	PID given feedback range	0~65535	0A14H	1000	○
PA-21	PID maximum deviation between two outputs	0.00%~100.00%	0A15H	1.00%	○
PA-22	PID minimum deviation between two outputs	0.00%~100.00%	0A16H	1.00%	○
PA-23	PID initial value	0.0%~100.0%	0A17H	0.0%	○
PA-24	PID initial value holding time	0.00s~600.00s	0A18H	0.00s	○
PA-25	PID operation mode (whether to operate when stop)	0: Not operation when stop 1: Operation during shutdown	0A19H	0	○
PA-26	PID integral attribute	Ones place: Integral separation 0: Invalid 1: Valid Tens place: Whether to stop integration after output to limit value 0: Continue to integral 1: Stop integral	0A1AH	00	○
PA-27	PID feedback lost detection value	0.0%: not judge the feedback lost 0.1%~100.0%	0A1BH	0.0%	○
PA-28	PID feedback lost detection time	0.0s~30.0s	0A1CH	0.0s	○

Group PB: Multi-speed and simple PLC operation parameters

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

Group PB: multi-speed and simple PLC operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	time				
PB-27	Simple PLC segment 5 operation time	0.0~6500.0s(h)	0B1BH	0.0s(h)	○
PB-28	Simple PLC segment 5 acc/dec time	0~3	0B1CH	0	○
PB-29	Simple PLC segment 6 operation time	0.0~6500.0s(h)	0B1DH	0.0s(h)	○
PB-30	Simple PLC segment 6 acc/dec time	0~3	0B1EH	0	○
PB-31	Simple PLC segment 7 operation time	0.0~6500.0s(h)	0B1FH	0.0s(h)	○
PB-32	Simple PLC segment 7 acc/dec time	0~3	0B20H	0	○
PB-33	Simple PLC segment 8 operation time	0.0~6500.0s(h)	0B21H	0.0s(h)	○
PB-34	Simple PLC segment 8 acc/dec time	0~3	0B22H	0	○
PB-35	Simple PLC segment 9 operation time	0.0~6500.0s(h)	0B23H	0.0s(h)	○
PB-36	Simple PLC segment 9 acc/dec time	0~3	0B24H	0	○
PB-37	Simple PLC segment 10 operation time	0.0~6500.0s(h)	0B25H	0.0s(h)	○
PB-38	Simple PLC segment 10 acc/dec time	0~3	0B26H	0	○
PB-39	Simple PLC segment 11 operation time	0.0~6500.0s(h)	0B27H	0.0s(h)	○
PB-40	Simple PLC segment 11 acc/dec time	0~3	0B28H	0	○
PB-41	Simple PLC segment 12 operation time	0.0~6500.0s(h)	0B29H	0.0s(h)	○
PB-42	Simple PLC segment 12 acc/dec time	0~3	0B2AH	0	○
PB-43	Simple PLC segment 13 operation time	0.0~6500.0s(h)	0B2BH	0.0s(h)	○
PB-44	Simple PLC segment 13 acc/dec time	0~3	0B2CH	0	○
PB-45	Simple PLC segment 14 operation time	0.0~6500.0s(h)	0B2DH	0.0s(h)	○
PB-46	Simple PLC segment 14 acc/dec time	0~3	0B2EH	0	○

Group PB: multi-speed and simple PLC operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
PB-47	Simple PLC segment 15 operation time	0.0~6500.0s(h)	0B2FH	0.0s(h)	○
PB-48	Simple PLC segment 15 acc/dec time	0~3	0B30H	0	○
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	0B31H	0	○
PB-50	Simple PLC operation time unit	0: second 1: hour	0B32H	0	○
PB-51	Simple PLC power-off memory selection	Ones place: power-off memory 0: not memory 1: memory Tens place: stop memory 0: not memory 1: memory	0B33H	00	○

Group PC: Auxiliary operation parameters

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
PC-00	Jog frequency	0.00Hz~P0-13	0C00H	2.00Hz	○
PC-01	Jog acceleration time	0.0s~6500.0s	0C01H	20.0s	○
PC-02	Jog deceleration time	0.0s~6500.0s	0C02H	20.0s	○
PC-03	acceleration time 2	0.1s~6500.0s	0C03H	Model setting	○
PC-04	deceleration time 2	0.1s~6500.0s	0C04H	Model setting	○
PC-05	acceleration time 3	0.1s~6500.0s	0C05H	Model setting	○
PC-06	deceleration time 3	0.1s~6500.0s	0C06H	Model setting	○
PC-07	acceleration time 4	0.1s~6500.0s	0C07H	Model setting	○
PC-08	deceleration time 4	0.1s~6500.0s	0C08H	Model setting	○
PC-09	The unit of acc/dec time	0: 1s 1: 0.1s 2: 0.01s	0C09H	1	×
PC-10	The base frequency of acc/dec time	0: max frequency 1: setting frequency 2: 100Hz	0C0AH	0	×

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
PC-11	Switching frequency point between acceleration time 1 and acceleration time 2	0.00Hz~max output frequency	0C0BH	0.00Hz	○
PC-12	Switching frequency point between deceleration time 1 and deceleration time 2	0.00Hz~max output frequency	0C0CH	0.00Hz	○
PC-13	Jump frequency 1	0.00Hz~max output frequency	0C0DH	0.00Hz	○
PC-14	Jump frequency 2	0.00Hz~max output frequency	0C0EH	0.00Hz	○
PC-15	Jump frequency range	0.00Hz~max output frequency	0C0FH	0.00Hz	○
PC-16	Whether the jump frequency is effective during acceleration and deceleration	0: invalid 1: valid	0C10H	0	○
PC-17	Frequency reaching detection range	0.0%~100.0%	0C11H	0.0%	○
PC-18	Frequency detection value (FDT1 voltage level)	0.00Hz~max output frequency	0C12H	50.00Hz	○
PC-19	Frequency detection hysteresis value (FDT1 voltage level)	0.0%~100.0% (PC-18)	0C13H	5.0%	○
PC-20	Frequency detection value (FDT2 voltage level)	0.00Hz~max frequency	0C14H	50.00Hz	○
PC-21	Frequency detection hysteresis value (FDT2 voltage level)	0.0%~100.0% (PC-20)	0C15H	5.0%	○
PC-22	Frequency reached detection value 1	0.00Hz~max frequency	0C16H	50.00Hz	○
PC-23	Frequency reached detection 1 range	0.0%~100.0% (max frequency)	0C17H	0.0%	○
PC-24	Frequency reached detection value 2	0.00Hz~max frequency	0C18H	50.00Hz	○
PC-25	Frequency reached detection 2 range	0.0%~100.0% (max frequency)	0C19H	0.0%	○
PC-26	Timing function selection	0: invalid 1: valid	0C1AH	0	×
PC-28	Setting operation time	0.0Min~6500.0Min	0C1CH	0.0Min	×
PC-29	Present operation reached time	0.0Min~6500.0Min	0C1DH	0.0Min	×
PC-30	Setting power on reached time	0 ~ 65000h	0C1EH	0	×
PC-32	Setting operation reached	0 ~ 65000h	0C20H	0	×

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	time				
PC-34	Current reached detection value 1	0.0% ~ 300.0% (motor rated current)	0C22H	100.0%	○
PC-35	Current reached detection 1 range	0.0% ~ 300.0% (motor rated current)	0C23H	0.0%	○
PC-36	Current reached detection value 2	0.0% ~ 300.0% (motor rated current)	0C24H	100.0%	○
PC-37	Current reached detection 2 range	0.0% ~ 300.0% (motor rated current)	0C25H	0.0%	○
PC-38	Zero current detection value	0.0% ~ 300.0% (motor rated current)	0C26H	5.0%	○
PC-39	Zero current detection delay time	0.01s~600.00s	0C27H	0.10s	○
PC-40	Software overcurrent point	0:0.0% (not detect) 1:0.1% ~ 300.0% (motor rated current)	0C28H	200.0%	○
PC-41	Software overcurrent detection delay time	0.00s~600.00s	0C1CH	0.00s	○
PC-42	All input voltage lower limit	0.00V~PC-43	0C1DH	3.10V	○
PC-43	All input voltage upper limit	PC-42~10.50V	0C2BH	6.80V	○
PC-44	Overvoltage point	220V models: 200~400V 380V models: 540~810V	0C2CH	220V models:400V 380V models:810V	×
PC-45	Undervoltage point	Versions below 3740: 220V models: 200~400V 380V models: 200~537V Version 3740 and above: 220V models: 50~400V 380V models: 50~537V	0C2DH	220V models:200V 380V models:350V	×
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	0C2EH	0	○
PC-47	Module temperature reached	0°C~100°C	0C2FH	75	○
PC-48	Fan control	0: The fan runs during operation 1: The fan is running all the time	0C30H	0	○
PC-49	Droop control	0.00Hz~10.00Hz	0C31H	0.00Hz	○
PC-50	Terminal jog run priority	0: Invalid 1: Valid	0C32H	0	○
PC-51	SVC optimization selection	1: Optimization mode 1	0C33H	2	○

Group PC: auxiliary operation parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
		2: Optimization mode 2			
PC-52	Dead area compensation mode	0: No compensation 1: Compensation mode 1	0C34H	1	○
PC-54	Modulation mode	0: Asynchronous Modulation 1: Synchronous modulation	0C36H	0	○
PC-55	DPWM switching upper limit frequency	5.00Hz~max output frequency	0C37H	8.00Hz	○
PC-56	Random PWM depth	0: Random PWM invalid 1~10: PWM carrier frequency random depth	0C38H	0	○
PC-57	Wake up frequency	Dormancy frequency PC-59~max output frequency P0-13	0C39H	0.00Hz	○
PC-58	Wake up delay time	0.0s~6500.0s	0C3AH	0.0s	○
PC-59	Dormancy frequency	0.00Hz ~ wake up frequency PC-57	0C3BH	0.00Hz	○
PC-60	Dormancy delay time	0.0s~6500.0s	0C3CH	0.0s	○
PC-61	Wave by wave current limiting enable	0: Not enable 1: Enable	0C3DH	1	○
PC-62	Current detection compensation	0~100	0C3EH	000	○
PC-65	Bus voltage reached value	Unit is 0.1V	0C41H	500.0	○
PC-66	The bus voltage reached hysteresis value	Unit is 0.1V	0C42H	50.0	○
PC-67	Carrier frequency	0.5K~16.0K	0C43H	Model setting	○
PC-68	The carrier frequency is adjusted with temperature	0: Invalid 1: Valid	0C44H	1	○
PC-69	Frequency converter temperature protection alarm threshold	reserved	0C45H	-	-
PC-72	External linear speed given source	0: Do not use external linear 1: AI1 2: AI2 4: Pulse terminal X4 5: Communication setting	0C48H	0	○
PC-73	Maximum allowable update deviation of main frequency	0.00%~10.00%	0C49H	0.10%	○
PC-74	Allowed update interval of main frequency	0.00s~200.00s	0C4AH	3.00s	○
PC-75	Differential time of external linear speed change	0.00s~50.00s	0C4BH	1.00s	○
PC-76	External linear speed change	0.00Hz~50.00Hz	0C4CH	1.00Hz	○

Group PE: User optional parameters

Group PE: user optional parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
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	0E00H	U4-00	○
PE-01	User optional parameters 1	Same to PE-00	0E01H	U4-01	○
PE-02	User optional parameters 2	Same to PE-00	0E02H	U4-08	○
PE-03	User optional parameters 3	Same to PE-00	0E03H	U4-09	○
PE-04	User optional parameters 4	Same to PE-00	0E04H	U4-10	○
PE-05	User optional parameters 5	Same to PE-00	0E05H	U4-03	○
PE-06	User optional parameters 6	Same to PE-00	0E06H	U4-06	○
PE-07	User optional parameters 7	Same to PE-00	0E07H	P0.00	○
PE-08	User optional parameters 8	Same to PE-00	0E08H	P0.00	○
PE-09	User optional parameters 9	Same to PE-00	0E09H	P0.00	○
PE-10	User optional parameters 10	Same to PE-00	0E0AH	P0.00	○
PE-11	User optional parameters 11	Same to PE-00	0E0BH	P0.00	○
PE-12	User optional parameters 12	Same to PE-00	0E0CH	P0.00	○
PE-13	User optional parameters 13	Same to PE-00	0E0DH	P0.00	○
PE-14	User optional parameters 14	Same to PE-00	0E0EH	P0.00	○
PE-15	User optional parameters 15	Same to PE-00	0E0FH	P0.00	○
PE-16	User optional parameters 16	Same to PE-00	0E10H	P0.00	○
PE-17	User optional parameters 17	Same to PE-00	0E11H	P0.00	○
PE-18	User optional parameters 18	Same to PE-00	0E12H	P0.00	○
PE-19	User optional parameters 19	Same to PE-00	0E13H	P0.00	○
PE-20	User optional parameters 20	Same to PE-00	0E14H	U0-67	○
PE-21	User optional parameters 21	Same to PE-00	0E15H	U0-68	○
PE-22	User optional parameters 22	Same to PE-00	0E16H	U0-69	○
PE-23	User optional parameters 23	Same to PE-00	0E17H	U0-70	○
PE-24	User optional parameters 24	Same to PE-00	0E18H	U0-74	○
PE-25	User optional parameters 25	Same to PE-00	0E19H	U0-00	○
PE-26	User optional parameters 26	Same to PE-00	0E1AH	U0-55	○
PE-27	User optional parameters 27	Same to PE-00	0E1BH	U0-56	○
PE-28	User optional parameters 28	Same to PE-00	0E1CH	P0.00	○
PE-29	User optional parameters 29	Same to PE-00	0E1DH	P0.00	○
PE-30	User optional parameters 30	Same to PE-00	0E1EH	P0.00	○
PE-31	User optional parameters 31	Same to PE-00	0E1FH	P0.00	○

Group PF: Torque control

Group PF: Torque control					
Parameter	Name	Setting range	Modbus address	Default value	Modify
PF-00	Torque control	0: Speed control 1: Torque control	0F00H	0	×
PF-01	Upper limit source of driver torque	0: Digital setting 1:AI1 2:AI2 4:PULSE 5: Communication setting 6:min(AI1,AI2) 7:max(AI1,AI2) (the full scale of option 1~7 correspond to PF-02 digital setting)	0F01H	0	×
PF-02	Driver torque upper limit	-200.0%~200.0%	0F02H	150.0%	○
PF-03	Torque control forward direction max frequency source	0: Digital setting 1:AI1 2:AI2 4:PULSE 5: Communication setting 6:min(AI1,AI2) 7:max(AI1,AI2) (the full scale of option 0~7 correspond to P0-13)	0F03H	0	○
PF-04	Torque control forward direction max frequency	0.00Hz~max output frequency	0F04H	50.00Hz	○
PF-05	Torque control reverse direction max frequency source	0: Digital setting 1:AI1 2:AI2 4:PULSE 5: Communication setting 6:min(AI1,AI2) 7:max(AI1,AI2) (the full scale of option 0~7 correspond to P0-13)	0F05H	0	○
PF-06	Torque control reverse direction max frequency	0.00Hz~max output frequency	0F06H	50.00Hz	○
PF-07	Torque acceleration time	0.00s~650.00s	0F07H	0.00s	○
PF-08	Torque deceleration time	0.00s~650.00s	0F08H	0.00s	○

Group A0: Textile

Group A0: textile					
Parameter	Name	Setting range	Modbus address	Default value	Modify
A0-00	Setting length	0m~65535m	A000H	1000m	○
A0-01	Actual length	0m~65535m	A001H	0m	○
A0-02	Pulse number per meter	0.1~6553.5	A002H	100.0	○

Group A0: textile					
Parameter	Name	Setting range	Modbus address	Default value	Modify
A0-03	Setting count value	1~65535	A003H	1000	○
A0-04	Specified count value	1~65535	A004H	1000	○
A0-05	Swing frequency setting mode	0: Relative to center frequency 1: Relative to the maximum frequency	A006H	0	○
A0-06	Swing frequency range	0.0%~100.0%	A007H	0.0%	○
A0-07	Jump frequency amplitude	0.0%~50.0%	A008H	0.0%	○
A0-08	Swing frequency period	0.1s~3600.0s	A009H	10.0s	○
A0-09	Triangular wave rise time of swing frequency	0.1%~100.0%	A006H	50.0%	○

Group A1: Virtual IO

Group A1: Virtual IO					
Parameter	Name	Setting range	Modbus address	Default value	Modify
A1-00	Function selection of virtual X1 terminal	0~51: See group P2 physical X input selection	A100H	00	×
A1-01	Function selection of virtual X2 terminal		A101H	00	×
A1-02	Function selection of virtual X3 terminal		A102H	00	×
A1-03	Function selection of virtual X4 terminal		A103H	00	×
A1-04	Function selection of virtual X5 terminal		A104H	00	×
A1-05	Virtual X terminal effective state source	Ones place: virtual X1 0: The state of virtual Y1 determines whether virtual X1 is valid 1: Function code A1-06 sets whether virtual X1 is valid Tens place: virtual X2 Hundreds place: virtual X3 Thousands place: virtual X4 Ten Thousands place: virtual X5	A105H	00000	×
A1-06	Virtual X terminal status setting	0: Invalid 1: Valid Tens place: virtual X1 Tens place: virtual X2 Hundreds place: virtual X3 Thousands place: virtual X4 Ten Thousands place: virtual X5	A106H	00000	×
A1-07	Function selection of	0~51	A107H	00	×

Group A1: Virtual IO					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	AI1 terminal as X terminal				
A1-08	Function selection of AI2 terminal as X terminal	0~51	A108H	00	×
A1-10	Selection of effective level when AI is used as X terminal	Ones place:AI1 0: Low level valid 1: High level valid Tens place:AI2	A10AH	000	×
A1-11	Virtual Y1 output function selection	0: connect with physical X1 inside 1~42: See group P3 physical Y output selection	A10BH	00	○
A1-12	Virtual Y2 output function selection	0: connect with physical X2 inside 1~42: See group P3 physical Y output selection	A10CH	00	○
A1-13	Virtual Y3 output function selection	0: connect with physical X3 inside 1~42: See group P3 physical Y output selection	A10DH	00	○
A1-14	Virtual Y4 output function selection	0: connect with physical X4 inside 1~42:See group P3 physical Y output selection	A10EH	00	○
A1-15	Virtual Y5 output function selection	0: connect with physical X5 inside 1~42:See group P3 physical Y output selection	A10FH	00	○
A1-16	Virtual Y1 output delay time	0.0s ~ 3600.0s	A110H	0.0s	○
A1-17	Virtual Y2 output delay time	0.0s ~ 3600.0s	A111H	0.0s	○
A1-18	Virtual Y3 output delay time	0.0s ~ 3600.0s	A112H	0.0s	○
A1-19	Virtual Y4 output delay time	0.0s ~ 3600.0s	A113H	0.0s	○
A1-20	Virtual Y5 output delay time	0.0s ~ 3600.0s	A114H	0.0s	○
A1-21	Virtual Y terminal effective state selection	Ones place: virtual Y1 0: Positive logic 1: Negative logic Tens place: virtual Y2 Hundreds place: virtual Y3 Thousands place: virtual Y4 Ten Thousands place: virtual Y5	A115H	00000	○
A1-22	Virtual Y1 Output Active Delay Time (Supported in version	0.0s~3600.0s	A116H	0.0s	○

Group A1: Virtual IO					
Parameter	Name	Setting range	Modbus address	Default value	Modify
	3743 and above)				
A1-23	Virtual Y1 Output Inactive Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A117H	0.0s	○
A1-24	Virtual Y2 Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A118H	0.0s	○
A1-25	Virtual Y2 Output Inactive Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A119H	0.0s	○
A1-26	Virtual Y3 Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A11AH	0.0s	○
A1-27	Virtual Y3 Output Inactive Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A11BH	0.0s	○
A1-28	Virtual Y4 Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A11CH	0.0s	○
A1-29	Virtual Y4 Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A11DH	0.0s	○
A1-30	Virtual Y5 Output Active Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A11EH	0.0s	○
A1-31	Virtual Y5 Output Inactive Delay Time (Supported in version 3743 and above)	0.0s~3600.0s	A11FH	0.0s	○

Group A2: Second motor parameters

Group A2: Second motor parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
A2-00	Motor type selection	0: Common asynchronous motor 1: Permanent magnet synchronous motor	A200H	0	×
A2-01	Motor rated power	0.1kW~650.0kW	A201H	Model setting	×
A2-02	Motor rated voltage	1V~1200V	A202H	Model setting	×
A2-03	Motor rated current	0.01A~655.35A	A203H	Model setting	×
A2-04	Motor rated frequency	0.01Hz~max output frequency	A204H	Model setting	×
A2-05	Motor rated speed	1rpm~65535rpm	A205H	Model setting	×
A2-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω	A206H	Tuning parameters	×
A2-07	Asynchronous motor rotor resistance	0.001Ω~65.535Ω	A207H	Tuning parameters	×
A2-08	Leakage inductance of asynchronous motor	0.01mH~655.35mH	A208H	Tuning parameters	×
A2-09	Asynchronous motor mutual inductance	0.01mH~655.35mH	A209H	Tuning parameters	×
A2-10	Asynchronous motor current without load	0.01A~A2-03	A20AH	Tuning parameters	×
A2-15	Synchronous motor stator phase resistance	0.001 Ω ~ 65.535 Ω	A20FH	Tuning parameters	×
A2-16	Synchronous motor D-axis inductance	0.01mH~655.35mH	A210H	Tuning parameters	×
A2-17	Synchronous motor Q-axis inductance	0.01mH~655.35mH	A211H	Tuning parameters	×
A2-19	Synchronous motor back EMF	0~6000.0V	A213H	Tuning parameters	×
A2-35	Motor 2 parameter self-learning	Ones place: Tuning Method 0: No action 1: Static tuning 1 2: Dynamic tuning 3: Static tuning 2 (Applicable to asynchronous motors only) Tens place: Motor Type 0: Asynchronous Motor 1: Synchronous Motor	A223H	00	×
A2-36	Motor 2 control mode	0: VF control 1: no speed sensor vector control (SVC)	A224H	0	×

Group A2: Second motor parameters					
Parameter	Name	Setting range	Modbus address	Default value	Modify
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	A225H	0	○
A2-38	Motor 2 torque boost	0.0%: Automatic torque boost 0.1%~30.0%	A226H	Model setting	○
A2-40	Motor 2 oscillation suppression gain	0~100	A228H	Model setting	○
A2-41	Speed loop proportion gain 1	1~100	A229H	30	○
A2-42	Speed loop integral time 1	0.01s~10.00s	A22AH	0.50	○
A2-43	Speed loop proportion gain 2	1~100	A22BH	20	○
A2-44	Speed loop integral time 2	0.01s~10.00s	A22CH	1.00	○
A2-45	Switching frequency 1	0.00~A2-46	A22DH	5.00	○
A2-46	Switching frequency 2	A2-45~max output frequency (P0-13)	A22EH	10.00	○
A2-47	Speed loop integral property	Ones place: integral separation 0: invalid 1: valid	A22FH	0	○
A2-48	Slip gain of vector control	50%~200%	A230H	100%	○
A2-49	SVC speed feedback filter time	0.000s~0.100s	A231H	0.015	○
A2-51	Torque upper limit source under speed control mode	0: Parameter setting (A2-52) 1: AI1 2: AI2 4: PULSE setting 5: communication setting 6: min(AI1, AI2) 7: max(AI1, AI2) The full range of options 1-7 corresponds to the A2-53 digital setting	A233H	0	○
A2-52	Digital setting of torque upper limit in speed control mode	0.0%~200.0%	A234H	150.0%	○
A2-55	Proportional gain of excitation regulation	0 ~ 60000	A237H	Tuning Parameters	○
A2-56	Integral gain of excitation regulation	0 ~ 60000	A238H	Tuning Parameters	○
A2-57	Torque regulation proportional gain	0 ~ 60000	A239H	Tuning Parameters	○
A2-58	Integral gain of torque regulation	0 ~ 60000	A23AH	Tuning Parameters	○

Group A4: Password countdown lock

Group A4: Password countdown lock					
Parameter	Name	Setting range	Modbus address	Default value	Modify
A4-00	Parameter group access verification	0~65000	-	0	○

Group A4: Password countdown lock					
Parameter	Name	Setting range	Modbus address	Default value	Modify
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	Modbus address	Default value	Modify
A9-00	Communication address mapping selection	0:disable mapping function 1:enable mapping function	A900H	0	○
A9-01	Communication address mapping primitive 1	0x0000~0xFFFF	A901H	0x0000	○
A9-02	Communication address mapping primitive 2	0x0000~0xFFFF	A902H	0x0000	○
A9-03	Communication address mapping primitive 3	0x0000~0xFFFF	A903H	0x0000	○
A9-04	Communication address mapping primitive 4	0x0000~0xFFFF	A904H	0x0000	○
A9-05	Communication address mapping primitive 5	0x0000~0xFFFF	A905H	0x0000	○
A9-06	Communication address mapping primitive 6	0x0000~0xFFFF	A906H	0x0000	○
A9-07	Communication address mapping primitive 7	0x0000~0xFFFF	A907H	0x0000	○
A9-08	Communication address mapping primitive 8	0x0000~0xFFFF	A908H	0x0000	○
A9-09	Communication address mapping primitive 9	0x0000~0xFFFF	A909H	0x0000	○
A9-10	Communication address mapping primitive 10	0x0000~0xFFFF	A90AH	0x0000	○
A9-11	Communication address mapping primitive 11	0x0000~0xFFFF	A90BH	0x0000	○
A9-12	Communication address mapping primitive 12	0x0000~0xFFFF	A90CH	0x0000	○
A9-13	Communication address mapping primitive 13	0x0000~0xFFFF	A90DH	0x0000	○
A9-14	Communication address mapping primitive 14	0x0000~0xFFFF	A90EH	0x0000	○
A9-15	Communication address mapping image 1	0x0000~0xFFFF	A90FH	0x0000	○
A9-16	Communication address mapping image 2	0x0000~0xFFFF	A910H	0x0000	○
A9-17	Communication address mapping image 3	0x0000~0xFFFF	A911H	0x0000	○
A9-18	Communication address mapping image 4	0x0000~0xFFFF	A912H	0x0000	○
A9-19	Communication address mapping image 5	0x0000~0xFFFF	A913H	0x0000	○
A9-20	Communication address mapping image 6	0x0000~0xFFFF	A914H	0x0000	○

Group A9: Communication address mapping					
Parameter	Name	Setting range	Modbus address	Default value	Modify
A9-21	Communication address mapping image 7	0x0000~0xFFFF	A915H	0x0000	○
A9-22	Communication address mapping image 8	0x0000~0xFFFF	A916H	0x0000	○
A9-23	Communication address mapping image 9	0x0000~0xFFFF	A917H	0x0000	○
A9-24	Communication address mapping image 10	0x0000~0xFFFF	A918H	0x0000	○
A9-25	Communication address mapping image 11	0x0000~0xFFFF	A919H	0x0000	○
A9-26	Communication address mapping image 12	0x0000~0xFFFF	A91AH	0x0000	○
A9-27	Communication address mapping image 13	0x0000~0xFFFF	A91BH	0x0000	○
A9-28	Communication address mapping image 14	0x0000~0xFFFF	A91CH	0x0000	○

Group AD: AIAO correction

Group AD: AIAO correction					
Parameter	Name	Setting range	Modbus address	Default value	Modify
AD-00	AI1 measured voltage 1	0.500V~4.000V	AD00H	Factory calibration	○
AD-01	AI1 display voltage 1	0.500V~4.000V	AD01H	Factory calibration	○
AD-02	AI1 measured voltage 2	6.000V~9.999V	AD02H	Factory calibration	○
AD-03	AI1 display voltage 2	6.000V~9.999V	AD03H	Factory calibration	○
AD-04	AI2 measured voltage 1	0.500V~4.000V	AD04H	Factory calibration	○
AD-05	AI2 display voltage 1	0.500V~4.000V	AD05H	Factory calibration	○
AD-06	AI2 measured voltage 2	6.000V~9.999V	AD06H	Factory calibration	○
AD-07	AI2 display voltage 2	6.000V~9.999V	AD07H	Factory calibration	○
AD-12	AO1 target voltage 1	0.500V~4.000V	AD0CH	Factory calibration	○
AD-13	AO1 measured voltage 1	0.500V~4.000V	AD0DH	Factory calibration	○
AD-14	AO1 target voltage 2	6.000V~9.999V	AD0EH	Factory calibration	○
AD-15	AO1 measured voltage 2	6.000V~9.999V	AD0FH	Factory calibration	○

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 state	1	7007H	0x0000~0x7FFF
U0-08	Y output state	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
U0-12	PULSE input frequency	0.01kHz	700CH	0.00kHz ~ 50.00KHz
U0-13	PULSE input frequency (Hz)	1Hz	700DH	0 ~ 65535Hz
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	-600.00~600.00
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	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

Group U0: monitor parameters				
Parameter	Name	Min unit	Modbus address	Display range
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	-200.0%~200.0%
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
U0-67	Communication Expansion Card Model	-	7043H	-
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	display bit	Explanation	704CH 0x0000~0xFFFF
		Bit0	0: shutdown 1: in operation	
		Bit1	Normal operation (Non jogging, tuning)	
		Bit2	Jog operation	
		Bit3	Tuning operation	
		Bit4	Jog during operation	
		Bit5~Bit6	0: Constant speed 1: Acceleration 2: Deceleration	
		Bit7	PLC operation	
		Bit8	PID operation	
		Bit9	Torque control	
		Bit10	Set frequency direction	

Group U0: monitor parameters					
Parameter	Name	Min unit		Modbus address	Display range
		Bit11	Current frequency operation direction		
		Bit12	Running reverse flag 0:forward 1:reverse		
		Bit13	Final frequency setting direction 0:forward 1: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
		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 frequency converter, only one motor can be driven by one frequency converter, 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	Operate panel
		1	Terminal
		2	Communication port

0: Operate panel

Controlled by the key on the operate panel.

1: Terminal

Controlled by multi-function terminals.

2: Communication port

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)

Parameter	Name	Setting	Choose setting channel
		2	AI1
		3	AI2
		5	X4 terminal pulse 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	LED Panel knob setting

0: Digital setting (Power-off no memory)

Set the frequency in P0-10 and adjust it through the knob (or multifunctional terminal UP/DOWN). The frequency of the frequency converter after power off and on will return to the value of P0-10.

1: Digital setting (Power-off memory)

After setting the frequency in P0-10 and adjusting it through the knob or UP/DOWN, the frequency of the frequency converter will return to the adjusted value after power off and on. This parameter setting is only for power failure and not applicable to shutdown. The shutdown frequency memory setting can be modified in parameter P0-12.

2: AI1 Setting

3: AI2 Setting

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 at P2-22~P2-25. AI is the frequency given, and the voltage/current input corresponds to the set 100.0%, which refers to the percentage of the maximum output frequency P0-13.

5: Terminal pulse X4 setting

High-speed pulse input through X4, support 0 ~ 50KHz, 9V ~ 30V pulse specifications. The pulse frequency and output frequency are corresponded by P2 group pulse parameters.

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. The Modbus address can be found in Appendix B-3-3. Communication Protocol Parameter Address.

7: Multi-segment command setting

When setting to multi-segment commands, set the X terminal function selection to 12-15. By using non zero combinations of input terminals, corresponding to different frequencies, a maximum of 16 frequencies 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. VHL has two groups of PID parameters to switch.

9: Simple PLC operation

When the frequency source is simple PLC, the frequency converter 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

Special mode for wire drawing machine and winding machine, relevant parameters need to be set for PC-72~PC-76 and group PA parameters. This feature is only supported in firmware versions 3740 and later.

11: LED panel with knob, knob given (supported in firmware versions 3740 and later)

The given frequency can be adjusted through the panel knob, without external potentiometer.

parameter	Name	Range
P0-04	Auxiliary frequency source B channel selection	0~11
P0-05	Frequency source superposition selection	Bit 0: frequency source selection 0: main frequency source A 1: Operation results of main and auxiliary frequency sources (determined by Bit 1s) 2: Switching between main frequency A and auxiliary frequency B
		Bit 1: 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.

1. Main Frequency Source A (P0-05 = 0)

The inverter's setting frequency is determined by the set value of the main frequency source A;

2. A+B (P0-05=10)

The inverter's setting frequency is determined by the sum of the set value of main frequency source A and auxiliary frequency source B;

3. A-B (P0-05=11)

The inverter's setting frequency is determined by the difference between the set value of main frequency source A and auxiliary frequency source B;

4. Max (A,B) (P0-05=12)

The inverter's setting frequency is determined by the larger value of main frequency source A and auxiliary frequency source B;

5. Min (A,B) (P0-05=13)

The inverter's setting frequency is determined by the smaller value of main frequency source A and auxiliary frequency source B;

6. A*B/P0-13 (Supported in version 3750 and later) (P0-05=14)

The inverter's setting frequency is determined by the product of main frequency source A and auxiliary frequency source B divided by the maximum output frequency set in P0-13;

7. Switching Between Main Frequency Source A and Auxiliary Frequency Source B (P0-05 = 2)

The inverter determines whether the current setting frequency is provided by main frequency source A or auxiliary frequency source B according to the status of the corresponding X terminal selected by P2-00 to P2-06 for the 11

frequency source switching function.

When the corresponding terminal is inactive, the inverter operates with main frequency source A. When the corresponding terminal is active, the inverter operates with auxiliary frequency source B.



When the frequency source superposition is selected (P0-05 Bit 0 is 1), that is, when the VFD frequency is set by superposition of main and auxiliary frequency:

- 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.
- 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.
- 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 maximum 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 Bit 0 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 Bit 0 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
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P0-11	Frequency Command Decimal Point (Supported in version 3742 and later)	1	1 decimal place
		2	2 decimal places

Range: 1 – 2. The default setting is 2: two decimal places. Change the setting to 1: one decimal place. (Supported in version 3742 and later)

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

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

When P0-12 is set to 1 and PB-16 is set to 6, the frequency value modified by the panel UP/DOWN keys will be stored after power-off.



When memory is selected, it is only applicable to normal shutdown. 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 frequency converter.

Parameter	Name	Range	
P0-14	Upper limit frequency source	0	Set by P0-15
		1	AI1
		2	AI2
		3	AI3
		4	PULSE 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. Set the upper limit through analog quantity and pulse, 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 30Hz.

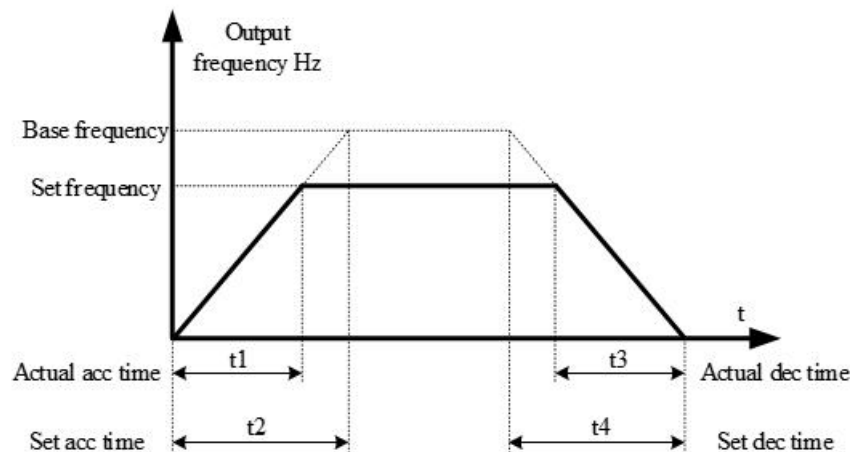
Parameter	Name	Range
P0-17	Lower limit frequency	0.00Hz~upper limit frequency (P0-15)

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 frequency converter to accelerate from 0Hz to the acceleration/deceleration base frequency (PC-10). Similarly, deceleration time refers to the time required for the frequency converter 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.

VHL provides 4 sets of acceleration and deceleration times, while the other three types of acceleration and deceleration times (PC-03 to PC-08) are the same.



Parameter	Name	Range	
P0-20	Bit 0: operation direction	0	Default operation direction
		1	Runs in the opposite direction from the default
	Bit 1: one-key reverse inhibit	0	Invalid
		1	One click to disable all operations in

			the opposite direction
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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.



After parameter initialization, the motor running direction will return to the original state. 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 controlling through terminal commands, if reverse operation is required, function code P0-21 must be set to 0: reverse frequency inhibit is invalid.

If P0-21=0 (negative frequency prohibition is invalid), the operation frequency of the communication given frequency converter is negative or the external given reverse operation command, and the frequency converter operates in reverse.

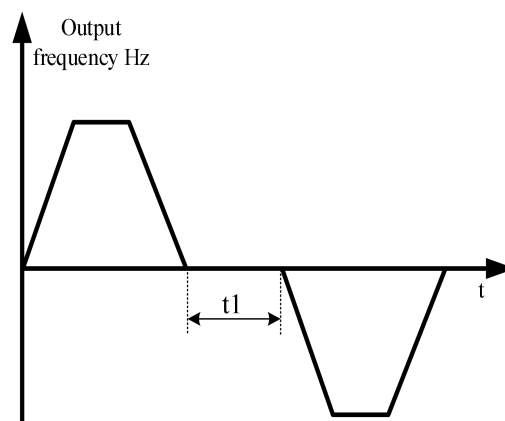
If P0-21=1 (negative frequency prohibition is effective), the operation frequency of the communication given frequency converter is negative or the external given reverse operation command, and the frequency converter operates at 0Hz.

The function of input terminal 49 "reverse frequency static" is the same as that of P0-21.

For applications where motor reverse rotation is not allowed, please don't use parameter P0-21 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 t_1 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 keyboard  or 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 frequency converter is in the process of acceleration and deceleration, that is, if the operating frequency of the frequency converter 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

VHL 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 1: Permanent Magnet Synchronous 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
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.

When setting P1-04 (Motor Rated Frequency), the number of decimal places can be configured through P0-11. The parameters must be modified in the following order: P0-13 first, P0-15 second, and P1-04 last.

Parameter	Name	Range
P1-06	Asynchronous motor stator resistance	0.001Ω~65.535Ω
P1-07	Asynchronous motor stator resistance	0.001Ω~65.535Ω
P1-08	Leakage inductance of asynchronous motor	0.01mH~655.35mH
P1-09	Mutual inductance of asynchronous motor	0.01mH~655.35mH
P1-10	asynchronous motor no load current	0.01A~P1-03

Parameter	Name	Range
P1-15	Synchronous Motor Stator Phase Resistance	0.001Ω~65.535Ω
P1-16	Synchronous Motor D-axis Inductance	0.01mH~655.35mH
P1-17	Synchronous Motor Q-axis Inductance	0.01mH~655.35mH
P1-19	Synchronous Motor Back EMF	0~6000.0V

Generally, P1-06~P1-19 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	Motor parameter self learning	Bit 0: Tuning Method 0: no operation 1: static tuning 1 2: dynamic tuning 3: static tuning 2 Bit 1: Motor Type 0: Asynchronous Motor 1: Synchronous Motor

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. Both static tuning and dynamic tuning are only effective in vector mode, that is, when P0-01 is set to 1 or 2.

Tuning steps of vector control without speed sensor mode:

Step	Description
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, dynamic tuning is used; if it is not convenient to separate, static tuning is used;
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

VHL 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	Terminal X1 function selection	0~51
P2-01	Terminal X2 function selection	
P2-02	Terminal X3 function selection	
P2-03	Terminal X4 function selection	
P2-04	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 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 ("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 given 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 reset (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 given frequency return to the value set by P0-10.
9	Free stop	The inverter blocks the output, and the motor shutdown 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 states 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 states 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 forbidden	Ensure that the frequency converter is not affected by external signals (except shutdown command), and maintain the current output frequency.

Setting value	Function	Explanation
19	Pulse input	X4 functions as the pulse input terminal, supporting a maximum pulse frequency of 50 kHz.
20	Counter input	Input terminal of count value.
21	Counter reset	Clear the count value.
22	Length counting input	Input terminal of length value.
23	Length counting reset	Clear the length counter.
24	Swing frequency pause	The frequency converter outputs at the center frequency. The swing function is suspended.
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 state before shutdown.
26	PLC status reset	PLC pauses in the process of execution. When it runs again, the inverter can be restored to the initial state of simple PLC through this terminal.
27	Operation command switches to keyboard	When the terminal is valid, the operation command is switched to the keyboard.
28	Operation command switches to communication	When the terminal is valid, the operation command is switched to communication
29	Torque control inhibition	It is forbidden for the inverter to control the torque, and the inverter enters the speed control mode.
30	Speed control/torque control switching	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	Reverse action direction of PID	When the terminal is effective, 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 ON input	When the signal is sent to the frequency converter, the frequency converter 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	When the normally closed signal of external fault is sent to the

Setting value	Function	Explanation
	input	inverter, the inverter reports the fault err43 and stops.
38	User defined fault 1	When user defined fault 1 and 2 are valid, the frequency converter alarms Err48 and Err49 respectively. The frequency converter 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 states of terminals.
41	Switching between main frequency source A and preset frequency	If the terminal is valid, frequency source A is replaced by preset frequency (P0-10)
42	Switching between main frequency source B and preset frequency	If the terminal is valid, frequency source B is replaced by preset frequency (P0-10)
43	Frequency setting active 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 state directly
45	Deceleration DC braking	When the terminal is effective, the frequency converter first decelerates to the starting frequency of DC braking, and then switches to the DC braking state.
46	Emergency stop	When the terminal is effective, 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 frequency converter, and the deceleration time is fixed as deceleration time 4.
49	Reverse Rotation Frequency Prohibition	When this terminal is active, reverse frequency operation is prohibited. If the inverter receives a negative running frequency command via communication or an external reverse operation command, it will operate at 0 Hz.
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.



When the UP and DOWN terminal functions are active simultaneously, the frequency will not change.

When the functions of terminals X1 to X4 are configured as P2-00 to P2-03 = 12 to 15 (Multi-step Command Terminals 1 to 4), 16 combinations can be generated. Each combination corresponds to one of the 16 command setting values. K1 to K4 represent Multi-step Command Terminals 1 to 4. The corresponding relationship is shown in the table below:

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 command 11	PB-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
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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 frequency converter through external terminals.

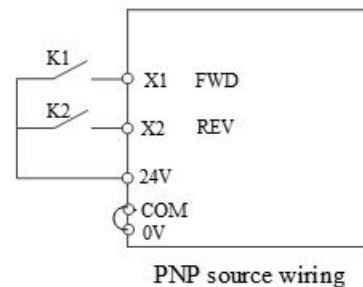
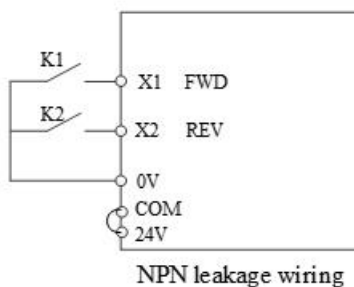
Note: For convenience of explanation, select X1, X2, and X3 from the multi-functional input terminals of X1 to X4 as external terminals. Select the functions of X1, X2, and X3 terminals by setting the values of P2-00 to P2-02. For detailed functional definitions, please refer to the setting range of P2-00 to P2-03. When the X terminal function is set to 51 (two wire/three wire switching function), the switching effect is: switch from two wire 1 to three wire 1; Switch from 2-wire 2 to 3-wire 2; Switch from three wire 1 to two wire 1; Switch from 3-wire 2 to 2-wire 2.

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



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.

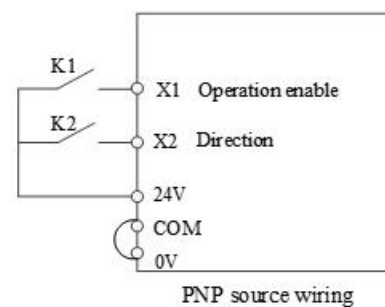
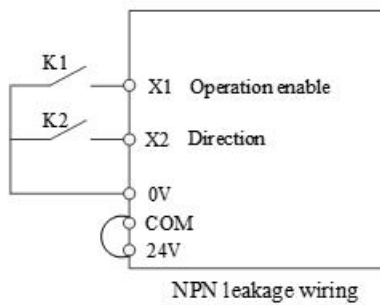
1: Two-wire mode 2

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
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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



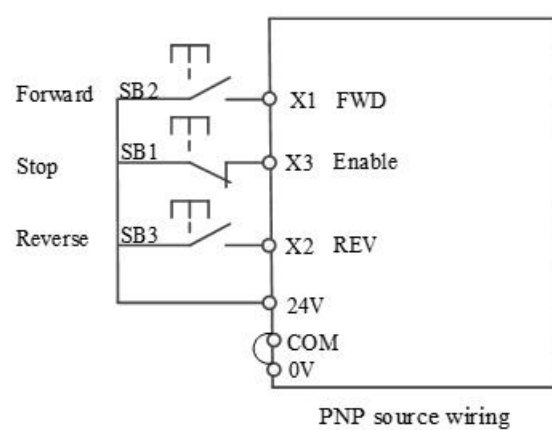
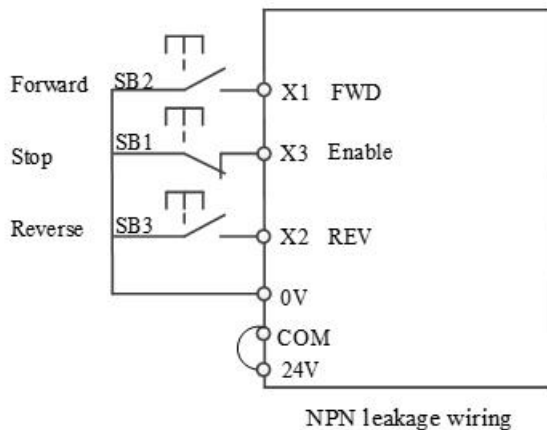
As shown in the figure, in the control mode of K1 closed state, K2 opens and the inverter rotates forward, K2 closes and the inverter reverses; K1 is disconnected and the inverter stops.

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



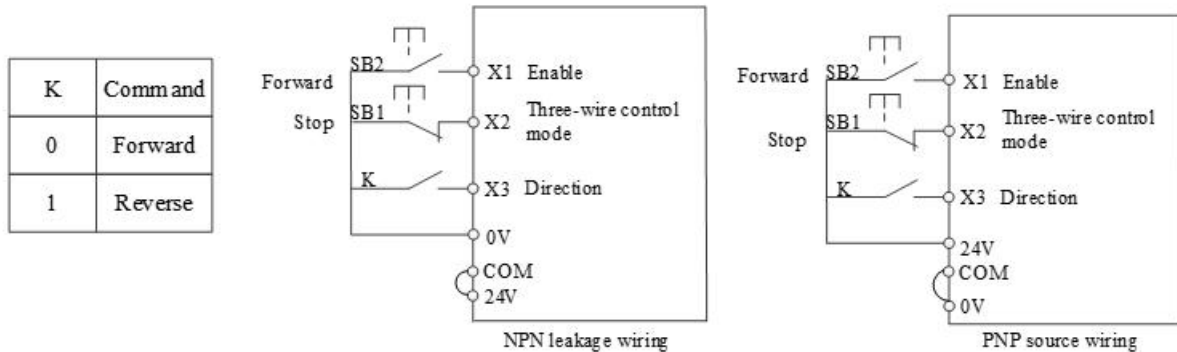
As shown in the figure, in the control mode, when SB1 button is closed, press SB2 button, the frequency converter rotates forward, and then press SB3 button, the frequency converter reverses, SB1 button is disconnected, and the frequency converter stops. During normal start-up and operation, SB1 button must be kept closed, SB2 and SB3 button commands will take effect at the closing action edge, and the operation state 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



As shown in the figure, in the SB1 button closed state, press the SB2 button, the frequency converter runs, K opens the frequency converter forward, K closes the frequency converter 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~50Hz/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 filter time	0.000s~1.000s

Set the software filter time of X terminal state. 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 frequency converter when the state 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 state setting	Bit 0	0: Low level valid; 1: High level valid
	X2 terminal valid state setting	Bit 1	0: Low level valid; 1: High level valid
	X3 terminal valid state setting	Bit 2	0: Low level valid;

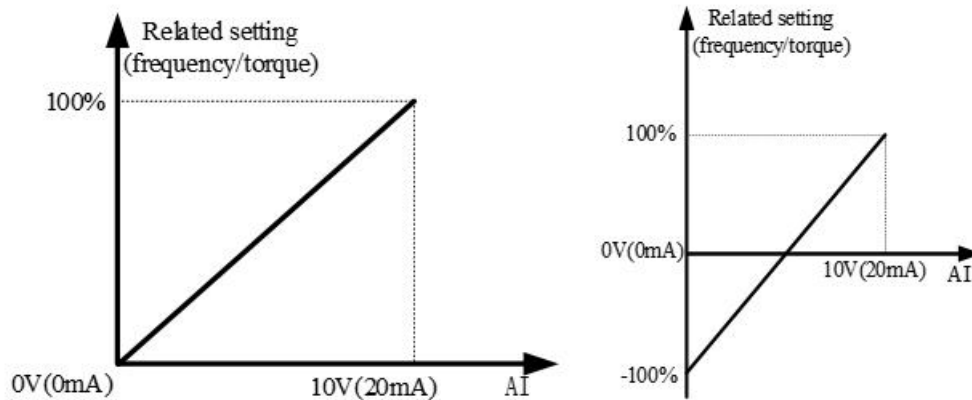
Parameter	Name	Content	Range
			1: High level valid
	X4 terminal valid state setting	Bit 3	0: Low level valid; 1: High level valid
	X5 terminal valid state setting	Ten Bit 3	0: Low level valid; 1: High level valid

This function code is used to set the effective state 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 function of AI curve 1 (P2-18~P2-21)/AI curve 3 (P2-26~P2-29) is the same as AI curve 2, referring to AI curve 2.

By default, the correspondence 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.

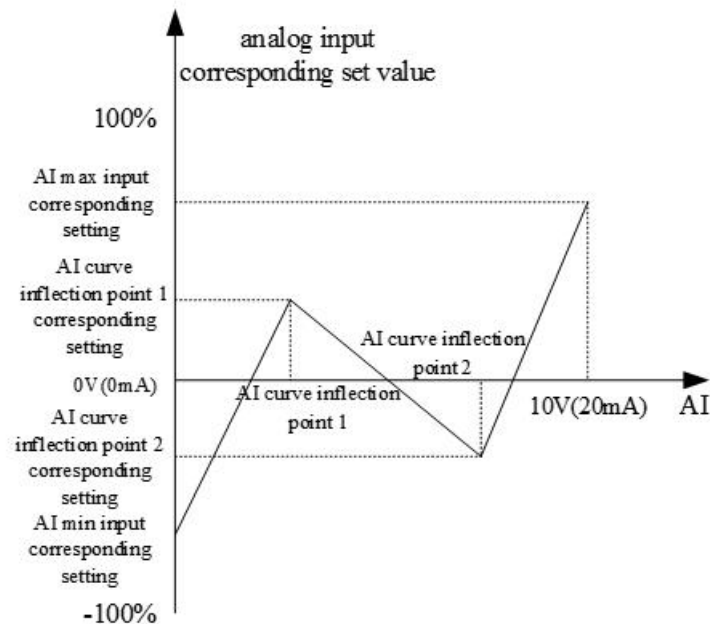
Parameter	Name	Range
P2-30	AI curve 4 min input	0V~P2-32
P2-31	AI curve 4 minimum input corresponding setting	-100.0%~+100.0%
P2-32	AI curve 4 inflection point 1 input	P2-30~P2-34
P2-33	AI curve 4 inflection point 1 input corresponding setting	-100.0%~+100.0%
P2-34	AI curve 4 inflection point 2 input	P2-32 ~ P2-36
P2-35	AI curve 4 inflection point 2 input corresponding setting	-100.0% ~ +100.0%

Parameter	Name	Range
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	Bit 0	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)
		Bit 1	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	Bit 0	AI below minimum input setting selection
		0	Corresponding minimum input setting
		1	0.0%
		Bit 1	AI2 below minimum input setting selection, ditto

The ones, Bit 1s of the parameter correspond to the analog input AI1, 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
P2-60	AI1 jump point	-100.0%~+100.0%
P2-61	AI1 jump range	0.0%~100.0%
P2-62	AI2 jump point	-100.0%~+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 AI1 fluctuates up and down at 5.00V, the fluctuation range is 4.90V ~ 5.10V, the minimum input of AI1 0.00V corresponds to 0.0%, and the maximum input of AI1 10.00V corresponds to 100%. Then the detected AI1 corresponding setting fluctuates between 49.0% and 51.0%.

Set AI1 jump point P2-60 to 50.0%, set AI1 jump range P2-61 to 1.0%, then the AI1 input is fixed to 50.0%, after jump function processing, AI1 is transformed into a stable input, and the fluctuation is eliminated.

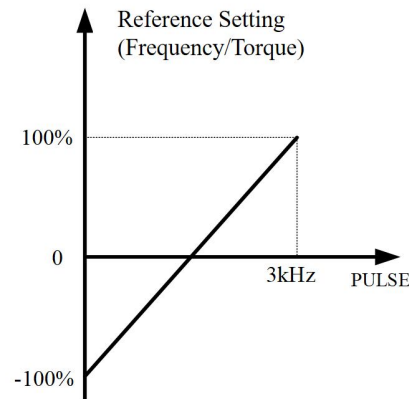
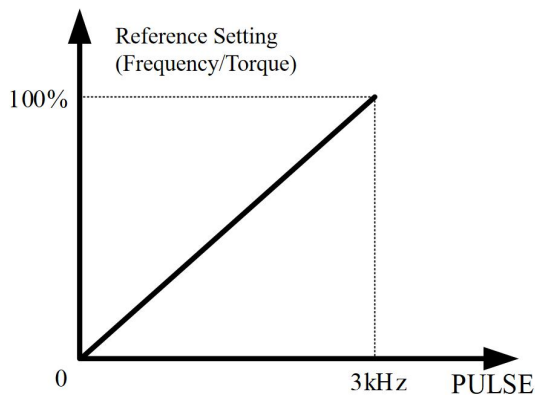
Parameter	Name	Range
P2-66	PULSE min setting	0.00kHz~P2-68
P2-67	PULSE min setting corresponding frequency percentage	-100.0%~+100.0%

P2-68	PULSE max setting	P2-66~50.00kHz
P2-69	PULSE max setting corresponding frequency percentage	-100.0%~+100.0%
P2-70	PULSE filter time constant	0.00s~10.00s

The frequency corresponding to the minimum/maximum PULSE reference is calculated as a percentage of P0-13 Maximum Output Frequency.

This group of parameters is used to set the relationship between the X4 pulse frequency and the corresponding setting. The pulse frequency can only be input into the frequency converter through the X4 terminal.

The application curve for this function group is shown below:



Parameter	Name	Range
P2-71	X1 Terminal Active Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-72	X1 Terminal Inactive Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-73	X2 Terminal Active Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-74	X2 Terminal Inactive Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-75	X3 Terminal Active Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-76	X3 Terminal Inactive Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-77	X4 Terminal Active Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-78	X4 Terminal Inactive Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-79	X5 Terminal Active Delay (Supported in version 3743 and later)	0.0s~3600.0s
P2-80	X5 Terminal Inactive Delay (Supported in version 3743 and later)	0.0s~3600.0s

P2-71 to P2-84 are used to separately control the active delay and inactive delay of X terminal inputs. The functions become effective only when the corresponding terminal parameters P2-13 to P2-15 are set to 0.0s.

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

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

Parameter	Name	Range
P3-00	Y1 output mode selection	0: High speed pulse output 1: Normal terminal output

Y1 terminal can be used as high-speed pulse output terminal or output terminal with collector open circuit. As a pulse output, the maximum frequency of the output pulse is 50KHz.

Parameter	Name	Range
P3-01	Y1 (normal terminal) 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 state, with output frequency (can be zero), output ON signal.
2	Fault output (free 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	Setting frequency reached	When the frequency converter is running and reaches the set frequency, the ON signal is output
6	Zero speed operation (no output during shutdown)	When the frequency converter runs and the output frequency is 0, the ON signal is output. When the frequency converter is in the shutdown state, the signal is off.
7	Zero speed operation 2 (output during shutdown)	When the inverter output frequency is 0, the ON signal is output. The signal is also on in the shutdown state.
8	Upper limit frequency arrival	When the operating frequency reaches the upper frequency, the ON signal is output.
9	Lower limit frequency arrival (no output when shutdown)	When the operating frequency reaches the lower frequency, the ON signal is output. The signal is OFF in the shutdown state.
10	Motor overload forewarning	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 forewarning	The ON signal is output 10s before the overload protection of inverter.
12	Communication setting	Refer to communication protocol.
13	Torque limit	When the set frequency exceeds the upper or lower frequency, and the frequency of the inverter also reaches the upper or lower

Setting value	Function	Explanation
		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	The set value is reached	When the count value reaches the value set by A0-03, the ON signal is output.
20	The specified value arrived	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 to run	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 state, the ON signal is output.
23	AI1 input overrun	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 state output	When the inverter is under voltage, it outputs ON signal.
25	Power on time arrived	When the accumulated power on time (U0-30) of the inverter exceeds the time set by PC-30, the ON signal is output.
26	Timing arrival	When the timing function (PC-26) is valid, the inverter will output ON signal when the running time reaches the set timing time (PC-28).
27	Length arrival	When the actual length detected exceeds the length set by A0-00, the ON signal is output.
28	Simple PLC cycle completion	When the simple PLC completes a cycle, it outputs a pulse signal with a width of 250ms.
29	Run time arrival	When the accumulated operation time P8-10 of the inverter exceeds the time set by PC-32, the ON signal is output.
30	Reserved	Reserved
31	Reserved	Reserved
32	Lower frequency arrival (operation related)	When the operating frequency reaches the lower frequency, the ON signal is output. The signal is off in the shutdown state.
33	Fault output (free shutdown fault and no output when under voltage)	Fault of free shutdown 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 shutdown)	When the frequency converter fails, and the fault processing mode is continue to run, the frequency converter alarm output.
36	Motor over temperature alarm	Motor temperature acquisition value is greater than P7-37 value, alarm output

Setting value	Function	Explanation
37	Speed direction	When the inverter is in reverse operation, it outputs ON signal.
38	Load dropping	Load suddenly unloaded
39	Software overcurrent output	Refer to PC-40, PC-41.
40	Current detection arrival output	Refer to PC-38, PC-39.
41	Current run time arrival	When the starting time of the inverter exceeds the time set by PC-29, the ON signal will be output.
42	Bus voltage reached	Refer to PC-65, PC-66

Parameter	Name	Range
P3-06	Y1 (Normal 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 state of Y terminal changes.

Parameter	Name	Range
P3-11	Y terminal effective state selection	Bit 0:Y1 Bit 2: reserved Bit 3: relay 0: Positive logic close valid/open invalid1: 1: Negative logic close invalid/open valid
P3-12	Y1 (high speed pulse) output function selection	0~13 parameters and functions are shown in the table below
P3-13	AO1 output function selection	

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 motor rated power
5	Output voltage	0~1.2 times VFD rated voltage
6	AI1	0V~10V (or 0~20mA)
7	AI2	
9	PULSE input	0.01kHz~50.00KHz
10	Output speed	0~ Output speed corresponding to maximum frequency
11	Communication control output	0.0%~100.0%
12	Counting value	0~max counting value
13	Length	0~max setting length

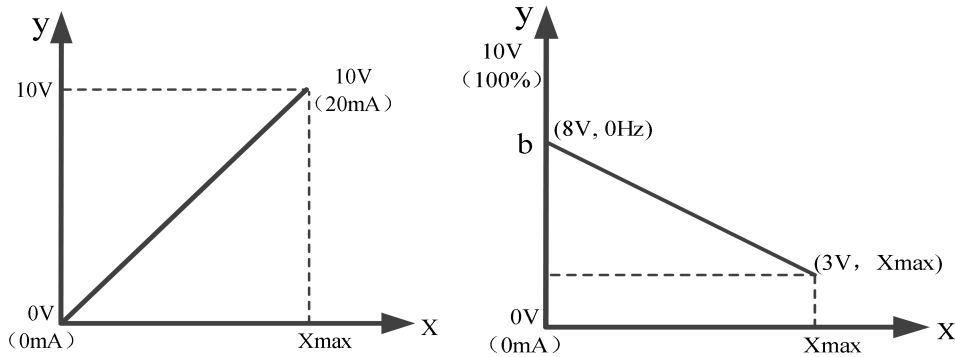
Parameter	Name	Range
P3-15	AO1 zero bias coefficient	-100.0%~+100.0%
P3-16	AO1 gain	-10.00~+10.00

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".



$$\text{Zero bias coefficient} = \frac{\text{output at 0Hz}}{\text{max output}} \times 100\%$$

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

Parameter	Name	Range
P3-23	Y2 (High-Speed Pulse) Maximum Output Frequency	0.01kHz~50.00kHz

When the Y2 terminal is configured as a pulse output terminal, this function code is used to set the maximum output frequency of the pulse signal.

Parameter	Name	Range
P3-24	Y1 输出有效延时时间 (3743 及以上版本支持)	0.0s~3600.0s
P3-25	Y1 输出无效延时时间 (3743 及以上版本支持)	0.0s~3600.0s
P3-30	继电器输出有效延时时间 (3743 及以上版本支持)	0.0s~3600.0s
P3-31	继电器输出无效延时时间 (3743 及以上版本支持)	0.0s~3600.0s

The functions of terminal output active delay and inactive delay can be controlled separately using P3-24 to P3-31. They become effective only when the corresponding terminal parameters P3-06 to P3-09 are set to 0.0s.

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)

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 effective 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 frequency converter 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 effective 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 frequency converter 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
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P4-05	Starting protection selection	0: No protection 1: With protection
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If P4-05 is set to 1, when the frequency converter 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	0: Starting from the shutdown 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 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 shutdown.

2: Intermittent S-curve acceleration and deceleration

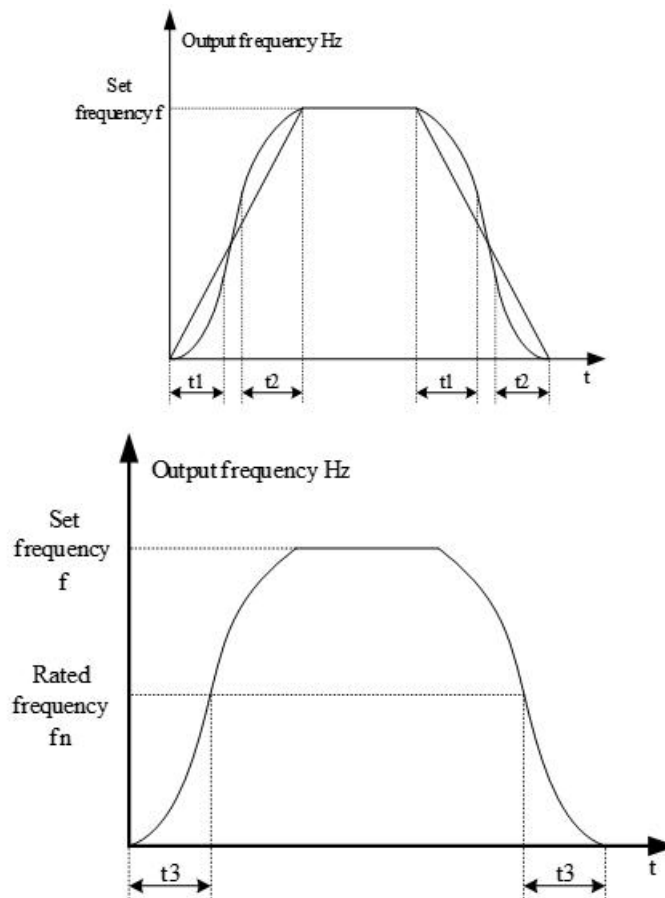
It is suitable for the real-time change of target frequency and rapid response. The output frequency is increased or decreased in real time according to S curve. It is suitable for occasions with high comfort requirements and fast response.

Parameter	Name	Range
P4-20	S curve starting 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 t_1 and t_2 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 shutdown	0.00Hz~max output frequency P0-13
P4-24	DC braking wait time during shutdown	0.0s~100.0s
P4-25	Percentage of DC braking current at shutdown	0%~100%
P4-26	DC brake time during shutdown	0.0s~100.0s

When the shutdown mode is deceleration shutdown, stop the machine according to the set deceleration time; If the lower limit frequency P0-17 is set, decelerate to P0-17 and set the lower limit frequency, followed by free shutdown.

DC braking is suitable for braking before starting the motor in free operation: suitable for situations where torque needs to be maintained after braking to zero speed, not suitable for large inertia loads or fast braking, not suitable for braking when the motor is running at high speed, and does not require a braking resistor.

DC braking process: The frequency converter decreases according to the set deceleration time. When the frequency drops to P4-23, wait for the time set in 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 there is no shutdown within the DC braking time during shutdown, the shutdown state will automatically switch to free shutdown.

4-2-6. Group P5 VF parameters

Parameter	Name	Range	
P5-00	VF curve setting	0	Line VF
		1	Multi-point 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
		9	Reserved
		10	VF complete separation mode
		11	VF half separation mode

0: Line VF

Suitable for common constant torque load.

1: Multi-point 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 (VF separated voltage source).

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 VFD output voltage V and frequency F:

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

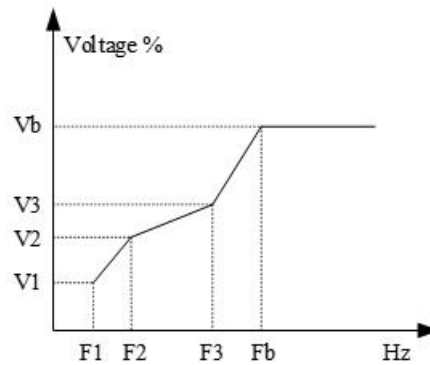
, A is percentage of voltage source input (0~100%).

Parameter	Name	Range
P5-01	Multi-point VF frequency point F1	0.00Hz~P5-03
P5-02	Multi-point VF voltage point V1	0.0~100.0%
P5-03	Multi-point VF frequency point F2	P5-01~P5-05
P5-04	Multi-point VF voltage point V2	0.0~100.0%

P5-05	Multi-point VF frequency point F3	P5-05~ (motor rated frequency) P1-04
P5-06	Multi-point VF voltage point V3	0.0~100.0%

The voltage percentage of the multi-point V/F curve is based on P1-02 Motor Rated Voltage.

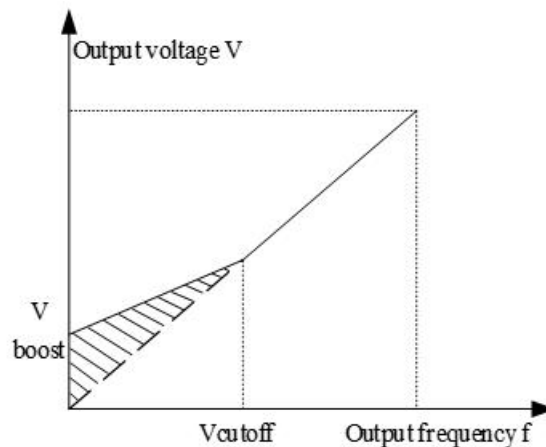
When P5-00 = 1, the VF curve user-defined multi-point VF curve, as shown in the figure below, the user uses (V1, F1), (V2, F2), (V3, F3) three-point broken line mode to define the VF curve to adapt to the special load requirements.



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% (auto torque boost) 0.1%~30.0%
P5-08	Torque boost cutoff frequency	0.00Hz~max output frequency P0-13

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)

Parameter	Name	Range	
		1	AI1
		2	AI2
		4	PULSE setting (X4)
		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	

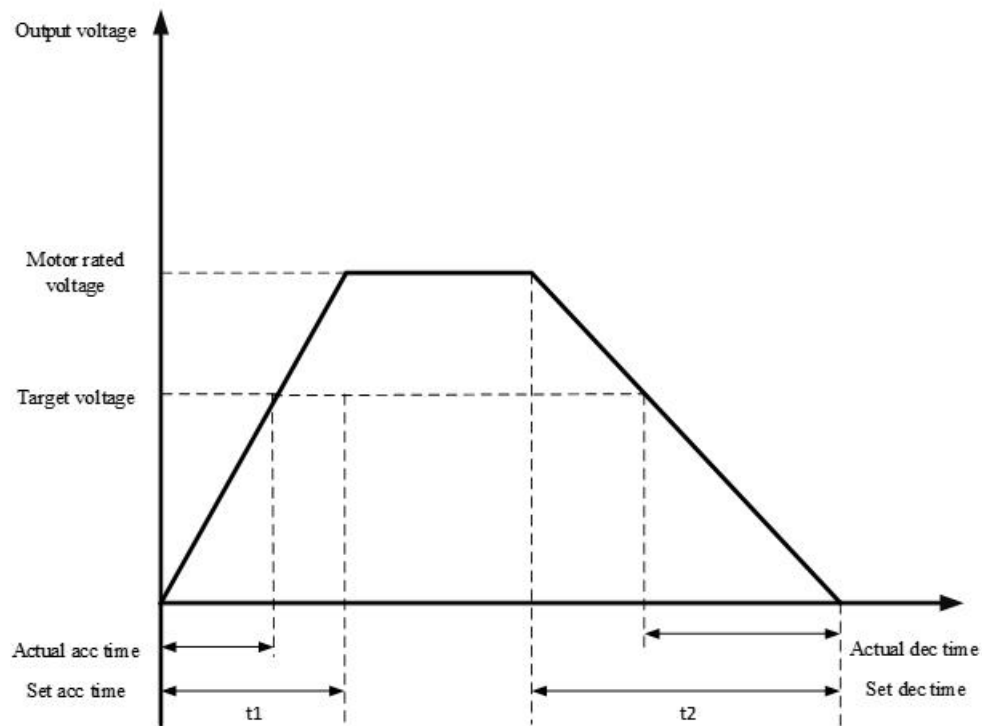
VF separation is generally used in induction heating, inverter power supply and torque motor control.

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 effective 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.

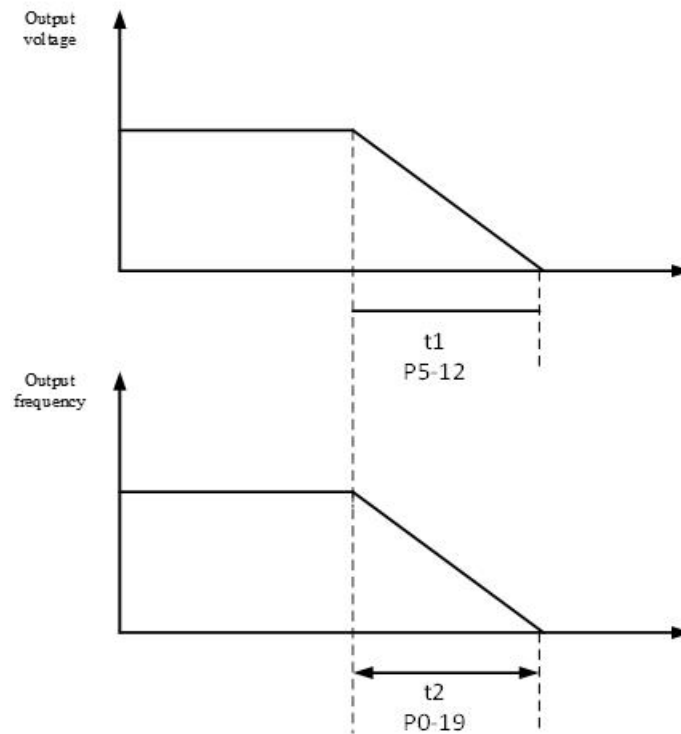
The voltage drop time of VF separation refers to the time required for the output voltage to decelerate from the motor rated voltage to 0, as shown in t2 in the figure below.



Parameter	Name	Range
P5-13	Stop mode of VF separation	0: Frequency voltage independently reduced to 0 1: When the voltage decreases to zero, the frequency begins to decrease

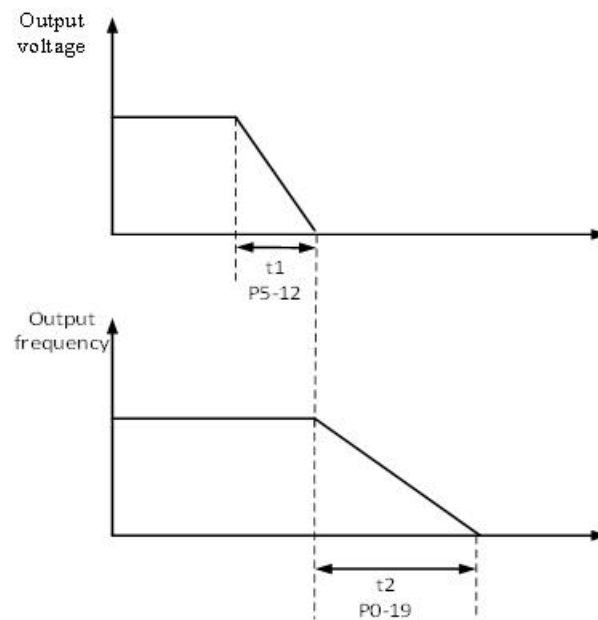
0: Frequency voltage independently reduced to 0

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 zero, 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 control slip compensation gain	0%~200%

When P5-14 is set to 100%, the compensated slip equals the motor rated slip when the motor is running under rated load.

When P5-14 is set to 0, the slip compensation function is disabled.

This parameter is only effective 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.

When there is a deviation between the actual motor speed and the target speed, this parameter can be adjusted. Adjust the parameter according to the motor load. 100% corresponds to the rated load; the heavier the load, the higher the parameter value should be. Increase or decrease the parameter by 5% each time until the actual motor speed matches the target speed.



For high dynamic response applications, vector control mode is recommended.

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. However, during the dynamic operation of the motor, a value that is too small may easily cause oscillation or instability. In this case, the parameter can be increased appropriately.

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 effectively 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.

In phase adjustment oscillation suppression mode (P5-18 = 1/2), increasing P5-17 may cause motor over-excitation, resulting in issues such as overheating and noise. It is recommended to adjust this parameter by ± 5 each time.

In frequency adjustment oscillation suppression mode (P5-18 = 3/4), an excessively high P5-17 value may increase motor oscillation. It is recommended to adjust this parameter by ± 2 each time.

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	0: Oscillation Suppression Disabled 1: Phase Adjustment Oscillation Suppression 1 2: Phase Adjustment Oscillation Suppression 2 3: Frequency Adjustment Oscillation

		Suppression 1 4: Frequency Adjustment Oscillation Suppression 2
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The phase adjustment oscillation suppression principle is to stabilize motor operation by adjusting the motor excitation component and thereby adjusting the output phase. Phase adjustment oscillation suppression 1 takes effect continuously after being enabled. Phase adjustment oscillation suppression 2 takes effect only in automatic torque boost mode (P5-07 = 0) or when the DC bus voltage is relatively high.

The frequency adjustment oscillation suppression principle is to stabilize motor operation by adjusting the output frequency according to the separated excitation current and torque current components. Frequency adjustment oscillation suppression 1 is suitable for general applications, while frequency adjustment oscillation suppression 2 is more suitable for suppressing severe oscillations. When frequency adjustment oscillation suppression does not provide satisfactory results, phase adjustment oscillation suppression can be selected.

Frequency adjustment oscillation suppression is preferred. Enabling oscillation suppression during high-frequency operation may instead cause oscillation. For high-speed asynchronous spindle motors, it is recommended to disable oscillation suppression or select phase adjustment oscillation suppression 1.

Parameter	Name	Range
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%

The V/F over-current stall suppression function is effective only in asynchronous motor V/F mode and works only during acceleration and deceleration. At the same time, over-current stall suppression may cause the actual acceleration/deceleration time to differ from the set time.

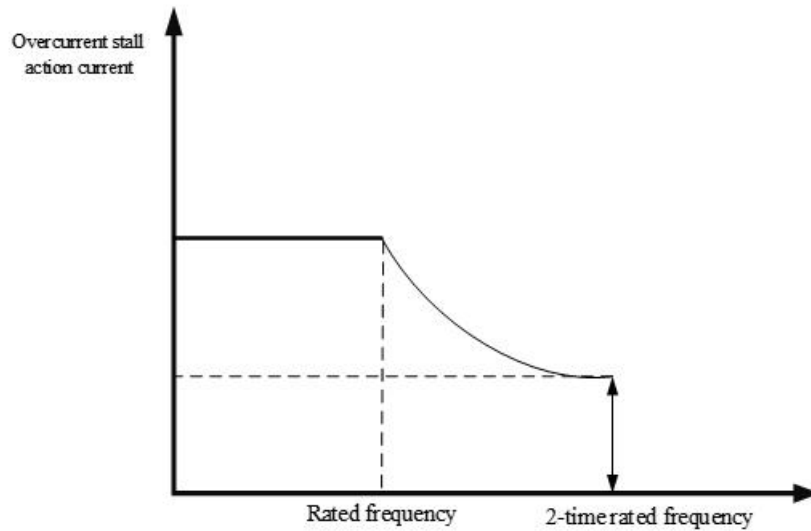
When the motor current exceeds the over-current stall action current (P5-19) during acceleration or deceleration, the inverter enters the over-current stall suppression state and actively suppresses the motor acceleration/deceleration process. This temporarily extends the acceleration/deceleration time to prevent the current from increasing further.

Select an appropriate over-current stall action current according to the actual load condition. The larger the suppression gain, the better the current suppression effect. It is recommended to adjust this parameter by ± 5 each time.

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 = $(f_s/f_n) * k * \text{LimitCur}$.

f_s : running frequency, f_n : motor rated frequency, k : P5-22(Current compensation coefficient of double speed over-current stall action), LimitCur: P5-19(over-current stall action current).



- 150% of over-current stall action current means 1.5 times of rated current of frequency converter;
- 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.
- Please select appropriate motor acceleration and deceleration times according to the load conditions. Excessively short acceleration/deceleration times may cause problems such as over-voltage and over-current, which can reduce the service life of the inverter and motor. For heavy-load applications requiring frequent and rapid start/stop operation, it is recommended to select an inverter with a higher power rating.

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

When the motor is in the regenerative braking state during deceleration, if the power supply does not have regenerative feedback capability, the regenerated energy will be fed back to the DC bus, causing the DC bus

voltage to rise. This phenomenon is particularly significant when the motor has a large inertia and a short deceleration time. If DC bus overvoltage occurs, the V/F overvoltage suppression function can be enabled.

After P5-24 is set to enable the overvoltage suppression function, when the DC bus voltage rises to the overvoltage stall action voltage P5-23, the inverter adjusts the output frequency to maintain DC bus voltage stability and suppress further voltage rise. After this function is enabled, the actual deceleration time will be automatically extended. If the actual deceleration time cannot meet the application requirements, the over-excitation gain P5-16 can be increased appropriately, with each adjustment of 20.

Overvoltage suppression must not be enabled for active lifting loads. When the load descends, the motor remains in the regenerative state. Overvoltage suppression limits the regenerative power, which may result in insufficient driving torque, continuous acceleration, and the risk of motor stall.

When multiple motors are connected in parallel, the overvoltage suppression gain should be increased appropriately. When the motor inertia is large, the overvoltage suppression gain should be reduced appropriately.



- When using a braking resistor: Set P5-16 (Over-Excitation Gain) to 0; otherwise, excessive motor current may occur during operation. Set P5-24 (Overvoltage Stall Enable) to 0; otherwise, the deceleration time may become excessively long.
- The setting value of parameter P5-27 must not exceed the motor rated frequency.
- The overvoltage control function is recommended only when the power supply does not have regenerative feedback capability.
- When using a braking resistor, the braking voltage set in P7-52 must be lower than the overvoltage suppression trigger voltage P5-23, or the overvoltage suppression function must be disabled; otherwise, the deceleration time may become excessively long.

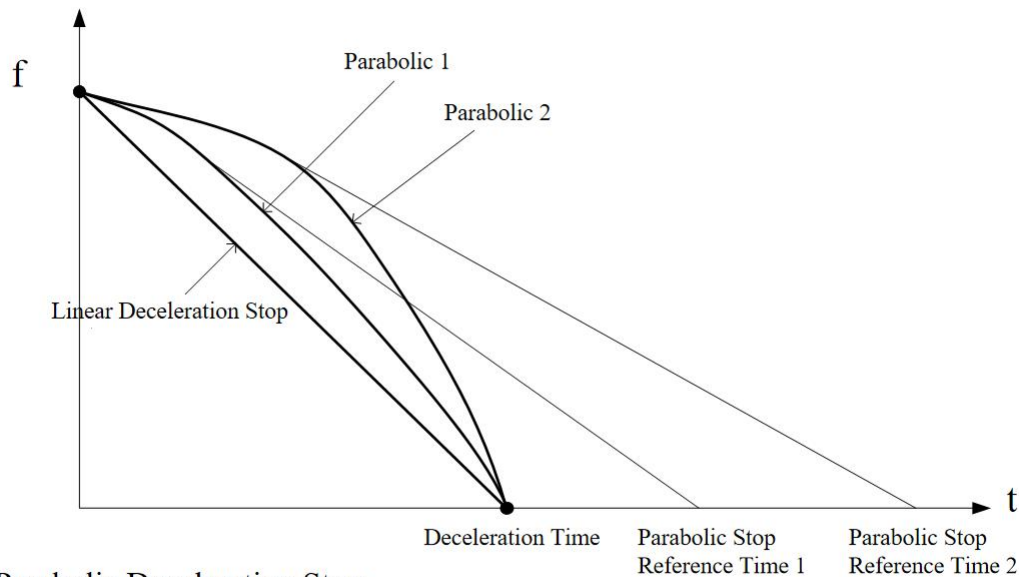
Parameter	Name	Range
P5-34	PID Stop Reference Voltage (Supported in version 3742 and later)	0.0~1000.0V
P5-35	PID Stop Proportional Gain (Supported in version 3742 and later)	0~65535
P5-36	PID Stop Integral Gain (Supported in version 3742 and later)	0~65535
P5-37	PID Stop Derivative Gain (Supported in version 3742 and later)	0~65535
P5-38	Parabolic Stop Reference Time (Supported in version 3742 and later)	0.0~4200.0S
P5-39	Stop Deceleration Method Selection (Supported in version 3742 and later)	0: Linear Deceleration Stop 1: Parabolic Deceleration Stop 2: PID Deceleration Stop

0: Linear Deceleration Stop:

The motor decelerates at a constant rate according to the set deceleration time.

1: Parabolic Deceleration Stop:

When the parabolic deceleration stop mode is used, the frequency reduction rate gradually increases. When the set deceleration time is equal to the parabolic stop reference time, the frequency decreases linearly. The larger the parabolic stop reference time, the slower the frequency decreases at the beginning of deceleration and the faster it decreases later.



Parabolic Deceleration Stop

2: PID Deceleration Stop:

The PID deceleration stop mode shortens the deceleration time by adjusting the proportional, integral, and derivative gains of the PID control during stop. It is suitable for applications requiring rapid stop with large inertia loads. A braking resistor must be connected when using this mode (set P5-16 Over-Excitation Gain to 0). Adjust the deceleration time according to the actual operating conditions, and the deceleration time must be set within 10s.

For PID parameter adjustment, first adjust the PID Stop Proportional Gain. Increase or decrease this parameter by 100 each time until satisfactory performance is achieved, then perform fine adjustments. The PID Stop Integral Gain can be fine-tuned if necessary. The PID Stop Derivative Gain generally does not require adjustment.

Stopping performance:

Linear Deceleration Stop < Parabolic Deceleration Stop < PID Deceleration Stop

Stopping stability:

PID Deceleration Stop < Parabolic Deceleration Stop < Linear Deceleration Stop

The parabolic deceleration stop mode provides better performance than the linear deceleration stop mode. The PID deceleration stop mode provides better performance than the parabolic mode, but with lower stability. Therefore, the PID deceleration stop mode may not be applicable under certain operating conditions.

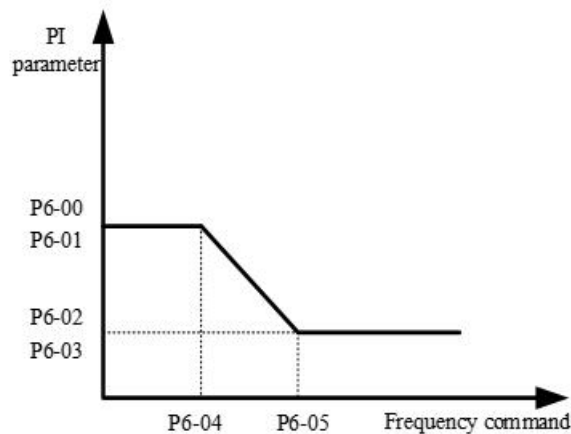


- When using PID deceleration stop, the overvoltage stall suppression function (P5-20 = 0) and overcurrent stall suppression function (P5-24 = 0) must be disabled. Adjust the deceleration time according to the actual operating conditions.
- The PID reference voltage must be set higher than the braking unit starting voltage (P7-52, default: 690V). When using PID deceleration stop mode, the PID deceleration reference voltage must be set above 690V; otherwise, the fast stop performance cannot be achieved.
- When using PID deceleration stop, set the deceleration time 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~max output frequency P0-13

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	Bit 0: 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~1.000s

The speed feedback filtering time of SVC takes effect only when P0-01 = 1 and PC-51=2. 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, 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
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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) fault type	0~56
P7-01	Second fault type	
P7-02	First fault type	

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

Parameter	Name	Description																				
P7-03	Frequency of the third fault	Frequency of last failure																				
P7-04	Current of the third fault	Current of last failure																				
P7-05	Bus voltage of the third fault	Bus voltage of last failure																				
P7-06	Input terminal state of the third fault	The status of digital input terminal in the latest fault, the order is:																				
		<table><tr><td>BIT9</td><td>BIT8</td><td>BIT7</td><td>BIT6</td><td>BIT5</td><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>X10</td><td>X9</td><td>X8</td><td>X7</td><td>X6</td><td>X5</td><td>X4</td><td>X3</td><td>X2</td><td>X1</td></tr></table>	BIT9	BIT8	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0	X10	X9	X8	X7	X6	X5	X4	X3	X2	X1
		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	Output terminal state of the third fault	The status of digital output terminal in the latest fault, the order is:																				
		<table><tr><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>Relay 2</td><td>Relay 1</td><td>Y3</td><td>Y2</td><td>Y1</td></tr></table>	BIT4	BIT3	BIT2	BIT1	BIT0	Relay 2	Relay 1	Y3	Y2	Y1										
		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	VFD state of the third fault	Reserved																				

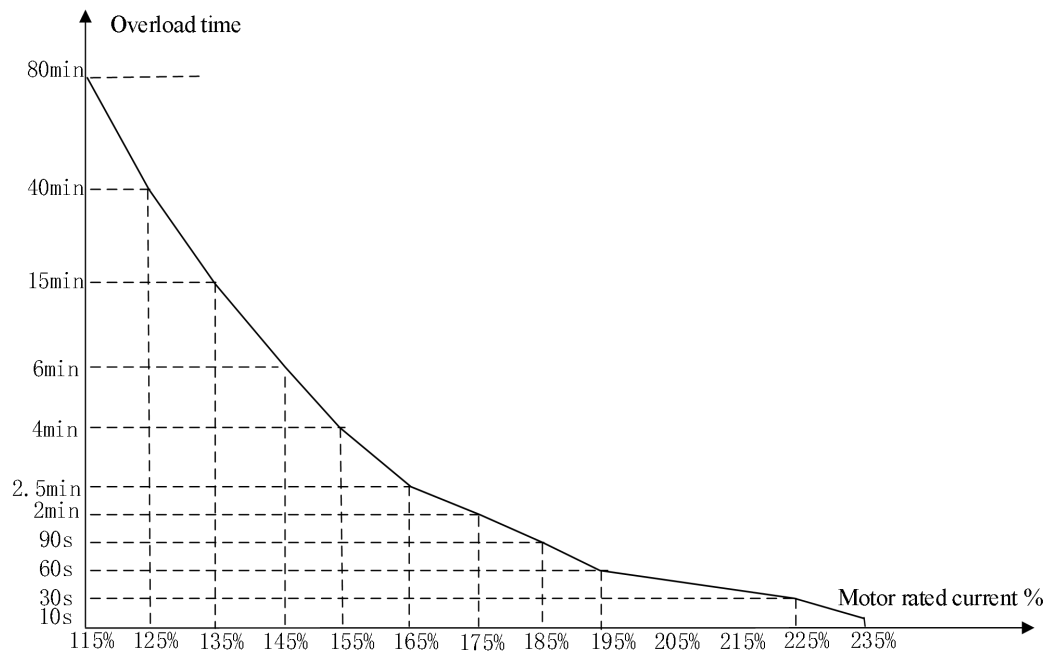
Parameter	Name	Description
P7-09	The power on time of the third fault	Present power on time of the last fault
P7-10	The operation time of the third fault	Present operation time of the last fault
P7-11	Location information during the third (most recent) fault	Location information during the last fault
P7-13	The frequency of the second fault	Same to P7-03~P7-10
P7-14	The current of the second fault	
P7-15	The bus voltage of the second fault	
P7-16	Input terminal state of the second fault	
P7-17	Output terminal state of the second fault	
P7-18	VFD state of the second fault	
P7-19	The power on time of the second fault	
P7-20	The operation time of the second fault	
P7-21	Location information during the second fault	Location information during faults
P7-23	Frequency of the first fault	Same to P7-03~P7-10
P7-24	Current of the first fault	
P7-25	Bus voltage of the first fault	
P7-26	Input terminal state of the first fault	
P7-27	Output terminal state of the first fault	
P7-28	VFD state of the first fault	
P7-29	The power on time of the first fault	
P7-30	The operation time of the first fault	
P7-31	Location information during the first fault	Location information during faults

Parameter	Name	Range
P7-33	Motor overload protection mode selection	0: Forbidden 1: Allowed
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 effectively, 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: $P7-34 = 2 \div 5 = 0.4$

(3) Parameter P7-35 is used to set the advance overload warning time. For example, if 115% current corresponds to an alarm time of 80 min, setting P7-35 to 50% means that when the current remains at 115% for 40 min ($80 \text{ min} \times 50\%$), the inverter multi-function digital output Y terminal will output the overload pre-warning ON signal.



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 frequency converter does not alarm and protect in time!

Parameter	Name	Range
P7-39	Input phase lack protection	Bit 0: input phase lack protection Bit 1: Contactor closing protection selection 0: Forbidden 1: Allowed

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

Parameter	Name	Range
P7-40	Output phase lack protection	0: Forbidden 1: Allowed

Choose whether to protect the output phase lack. If 0 is selected, the fault will not be reported when the actual output phase lack 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
P7-41	Power on short circuit to ground protection function	0: Invalid 1: Valid

When the frequency converter is powered on, it can detect whether the motor is short circuited to the ground. If this function is effective, 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 frequency converter is equipped with automatic fault reset function, fault Y action during automatic fault reset can be set through P7-42 (P7-42 is only effective for Y terminal).

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

This 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

This parameter is used as the times of automatic reset after the failure of the frequency converter, and the frequency converter maintains the failure state after exceeding the set value.

Parameter	Name	Range
P7-45	Protection action 1 when fault	Bit 0: motor overload (Err 10) 0: free stop 1: stop as stop mode Bit 1: input phase lacking (Err11) 0: free stop 1: stop as stop mode Bit 2: output phase lacking (Err12) 0: free stop 1: stop as stop mode Bit 3: output load drop (Err19) 0: free stop 1: stop as stop mode Ten thousand bit: pole position detection failed (Err21) 0: free stop

Parameter	Name	Range
		1: stop as stop mode
P7-46	Protection action 2 when fault	Bit 0: external fault 1 (Err43) 0: free stop 1: stop as stop mode Bit 1: communication error (Err44) 0: free stop 1: stop as stop mode Bit 2: EEPROM read write error (Err45) 0: free stop 1: stop as stop mode Bit 3: operation time reached (Err46) 0: free stop 1: stop as stop mode Ten thousand bit: power on time reached (Err47) 0: free stop 1: stop as stop mode
P7-47	Protection action 3 when fault	Bit 0: user defined fault 1 (Err48) 0: free stop 1: stop as stop mode Bit 1: user defined fault 2 (Err49) 0: free stop 1: stop as stop mode Bit 2: PID feedback lost in operation (Err50) 0: free stop 1: stop as stop mode Bit 3: 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 4 when fault	Bit 0: motor overheat (Err54) 0: free stop 1: stop as stop mode
P7-52	Braking start voltage	200.0~2000.0V
P7-53	Braking service rate	0~100%

When the bus voltage reaches the set value of P7-52, the braking resistor begins to work, and the utilization rate of the braking resistor is adjusted through P7-53. For frequent braking situations that require external braking, the braking effect can be adjusted by adjusting this parameter.

When using a braking resistor, it is recommended to disable the over-excitation function and overvoltage stall

suppression function to avoid excessive motor current during operation or prolonged deceleration time.

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

When the DC bus voltage exceeds P7-56 and overvoltage occurs in vector control mode, the inverter reduces the output torque to decrease the motor regenerative current, thereby reducing the DC bus voltage.

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 effective 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	Detection value of excessive speed deviation	0.0%~50.0% (max output frequency)
P7-66	Detection time of excessive speed deviation	0.0s~60.0s

This function is only effective 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 canceled.

Parameter	Name	Range
P7-67	Selection of instantaneous stop non-stop function	0: Invalid in case of instantaneous power failure 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

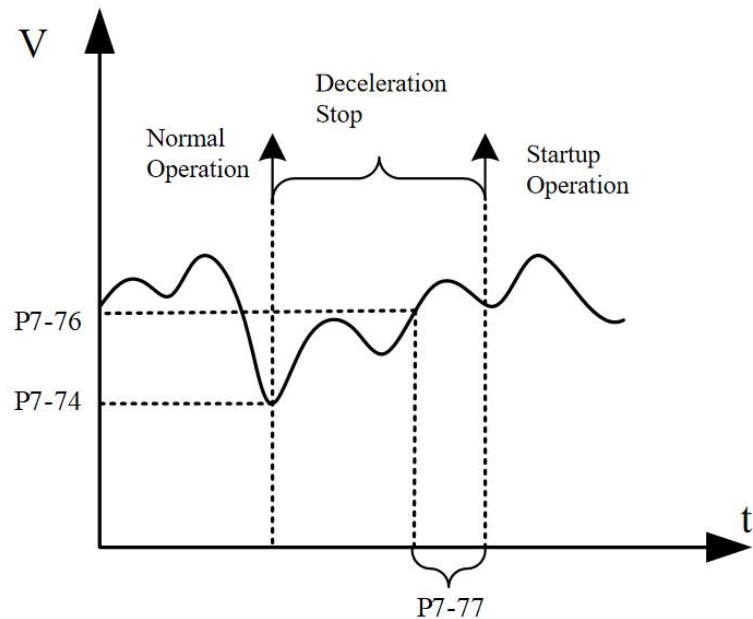
P7-72	Integral coefficient of instantaneous stop non-stop	0~100
P7-73	Deceleration time of instantaneous stop non-stop	0~300.0s
P7-78	Instantaneous Power Loss Free Stop Judgment Frequency (Supported in version 3743 and later)	0.00Hz~20.00Hz

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.

Parameter	Name	Range
P7-74	DC Bus Voltage Detection Value for Undervoltage Automatic Deceleration Stop (Supported in version 3740 and later)	0~500.0V
P7-75	Terminal Protection Mode for Undervoltage Automatic Deceleration Stop (Supported in version 3740 and later)	0: Terminal Retrigger Required 1: Terminal Retrigger Not Required. The inverter restarts when the DC bus voltage exceeds P7-76. 2: Terminal Retrigger Not Required. The inverter restarts when the DC bus voltage exceeds P7-76 and remains above this value for the time specified by P7-77.
P7-76	Restart Judgment Voltage for Undervoltage Automatic Deceleration Stop (Supported in version 3740 and later)	P7-74~500.0V
P7-77	Restart Waiting Time for Undervoltage Automatic Deceleration Stop (Supported in version 3740 and later)	0~30.0s

For the undervoltage automatic deceleration stop function, when the DC bus voltage drops below the value set by P7-74, the inverter automatically starts deceleration stop. The inverter restart operation is determined by the terminal protection mode selected in P7-75.

When P7-75 = 2, the inverter operation is shown in the figure below.



Parameter	Name	Description
P7-83	Historical Maximum DC Bus Voltage (Supported in version 3743 and later)	Records the maximum DC bus voltage value since the inverter was powered on.
P7-84	Output Current at the Time of Historical Maximum DC Bus Voltage Record (Supported in version 3743 and later)	Records the output current at the time when the maximum DC bus voltage was recorded.
P7-85	Cumulative Power-On Time at the Time of Historical Maximum DC Bus Voltage Record (Supported in version 3743 and later)	Records the cumulative power-on time (value of P8-11) at the time when the maximum DC bus voltage was recorded.
P7-86	Historical Maximum Inverter Temperature (Supported in version 3743 and later)	Records the maximum inverter temperature value since the inverter was powered on.
P7-87	Output Current at the Time of Historical Maximum Inverter Temperature Record (Supported in version 3743 and later)	Records the output current at the time when the maximum inverter temperature was recorded.
P7-88	Cumulative Power-On Time at the Time of Historical Maximum Inverter Temperature Record (Supported in version 3743 and later)	Records the cumulative power-on time (value of P8-11) at the time when the maximum inverter temperature was recorded.
P7-89	Historical Maximum Output Current (Supported in version 3743 and later)	Records the maximum output current value since the inverter was powered on.
P7-90	Cumulative Power-On Time at the Time of Historical Maximum Current Record (Supported in version 3743 and later)	Records the maximum output current value since the inverter was powered on.

4-2-9. Group P8 Keyboard and display

Parameter	Name	Range
P8-01	STOP/REST button function selection	0: Only in keyboard operation mode, the STOP/RES key shutdown function is effective 1: The STOP/RES key shutdown function is effective in any operating mode
P8-02	Parameter initialization	0: No action 1: Restore factory parameters, excluding motor parameters and values of P0-13 and P0-15 2: Clear Record Information 3: Restore factory parameters (including motor parameters) 4: Backup current user parameters (supported only on LCD panels) 5: Restore user backup parameters (supported only on LCD panels)

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

After setting P8-02 to 1, most of the functional parameters of the frequency converter are restored to the factory parameters, but the motor parameters and the values of P0-13 and P0-15 are not 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.

4. Backup current user parameters (only supported by LCD panel)

Back up the parameters set by the current user. Back up the settings of all current functional parameters. For the convenience of customers to recover after parameter adjustment is incorrect.

5. Restore user backup parameters (LCD panel support)

Restore the user parameters previously backed up by setting P8-02=4

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

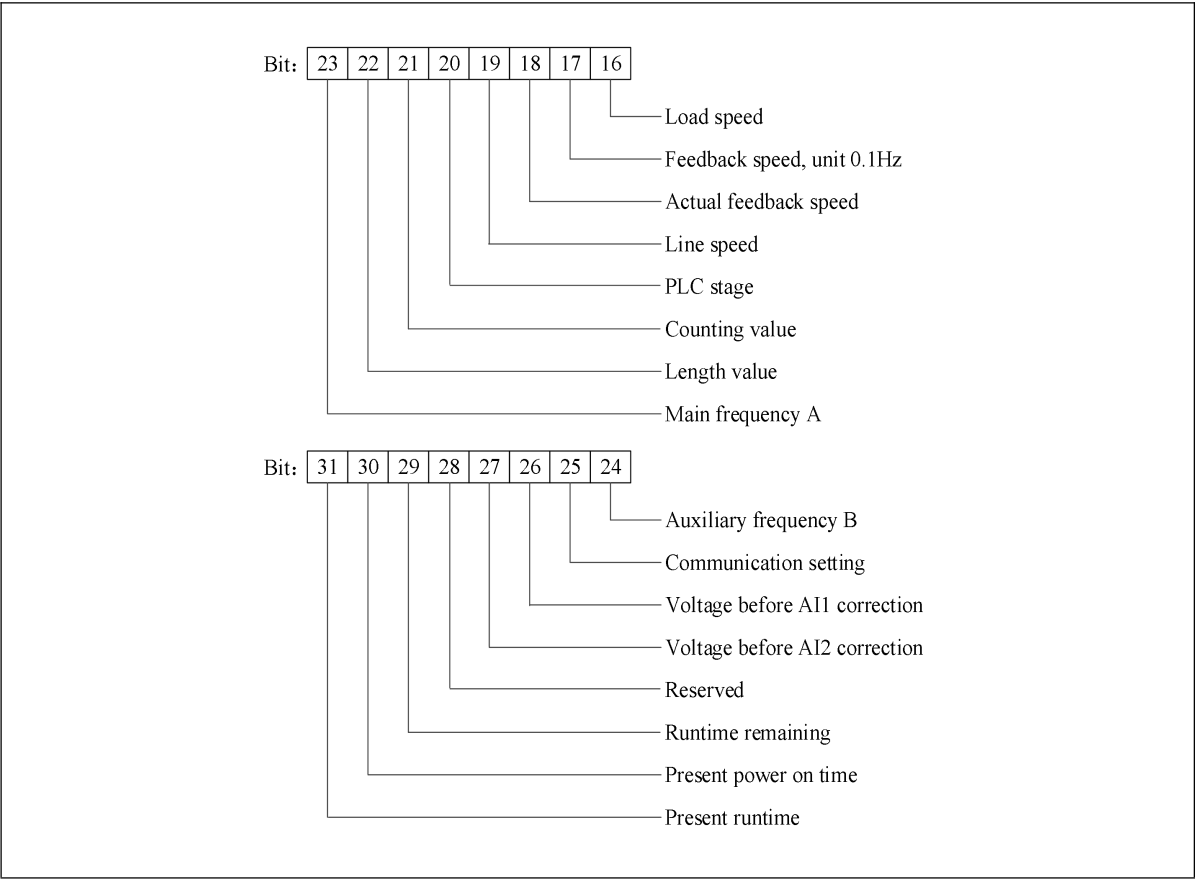
Users can set whether the function code parameters can be modified to prevent the risk of function parameters being changed by mistake.

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

Parameter
P8-07 Bit: 76543210 Operate frequency Set frequency Bus voltage Output current Output voltage Output torque Output power X input status Bit: 15141312111098 Y output status AI1 voltage AI2 voltage Reserved Pulse input pulse,unit 0.01kHz PULSE input pulse frequency, unit 1Hz PID setting PID feedback

Parameter
P8-08



Parameter	Name	Range	Parameter explanation
P8-09	LED shutdown display parameter	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 - Reserved - 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

In the running state, there are 30 running state parameters. If you need to display these parameters, you need to set their corresponding bits to 1. After converting this binary number to hexadecimal, set them to P8-07 and P8-08.

During operation, multiple status parameters can be displayed by switching with  key on the operation panel.

Similarly, in the shutdown state, there are 12 shutdown status parameters. If you need to display these parameters, you need to set their corresponding bits to 1, convert the binary number to hexadecimal, and set them in parameter

P8-09. During shutdown, multiple status parameters can be displayed by switching with  key on the operation panel.

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

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

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

Display the cumulative power on time of frequency converter since leaving factory.

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

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

Display the cumulative power consumption of the inverter so far.

Parameter	Name	Range
P8-13	VFD type display	1: G-type (constant torque load model) 2: P-type (fan, water pump type load models)

This parameter is only for users to view the out of factory model and cannot be changed.

1: Suitable for constant torque loads with specified rated parameters.

2: Suitable for variable torque loads (fan, water pump loads) with specified rated parameters.

Parameter	Name	Range
P8-14	Product number	-
P8-15	Performance version	-
P8-16	Function version	-

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

Displays the temperature of IGBT inverter module.

Parameter	Name	Range
P8-20	Output power factor	00.00%~200.00%

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	Load speed display decimal position	One digits: number of decimal points of U0-16 0: 0 decimal places 1: 1 decimal place 2: 2 decimal places Ten digits: number of U0-17 decimal points 1: 1 decimal place 2: 2 decimal places

● 3731 Version

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.

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: $40.00 \times 2.0000 = 80.00$ (2 decimal places display).

If the inverter is in the shutdown state, 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 shutdown state is: $50.00 \times 2.000 = 100.00$ (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 Version

When the load speed needs to be displayed, use this parameter to adjust the relationship between the motor speed and the load speed.

Units digit:

Used to set the number of decimal places for load speed display. The load speed calculation method is described as follows:

For example, when the load speed display coefficient P8-21 is set to 2.0000 and the load speed decimal places P8-22 is set to 2 (two decimal places), if the motor speed U0-66 is 40 RPM, the load speed is calculated as follows:

Load speed = $40.00 \times 2.0000 = 80.00$ (displayed with two decimal places).

Tens digit:

- 1: U0-17 and U0-18 are displayed with one decimal separator respectively.
- 2: U0-17 and U0-18 are displayed with two decimal separator respectively.

4-2-10. Group P9 Communication protocol

Parameter	Name	Range
P9-00	Serial communication protocol selection	0: Modbu-RTU 2: ASCII Mode (Supported in version 3742 and later)

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

Parameter	Name	Range
P9-01	Local address	1~247, 0 is broadcast address
P9-02	Baud rate	Bit 0: MODBUS 0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS Bit 1: EtherCAT 0: 115200BPS 1: 208300BPS 2: 256000BPS 3: 512000BPS
P9-03	MODBUS data format 1~4	0: No parity, data format <8, N, 2> (RTU) 1: Even parity, data format <8, E, 1> (RTU) 2: Odd parity, data format <8, O, 1> (RTU) 3: No parity, data format <8, N, 1> (RTU) 4: Even parity, data format <7, E, 1> (ASCII)

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

Group P9 parameters are the communication 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	MODBUS Communication timeout	0.0 s (invalid) 0.1 ~ 60.0s

When the function code is set to 0.0 s, MODBUS 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

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 reached, and then send the data to the upper computer.

Parameter	Name	Range
P9-07	Replace VB3/VB5/V5 Communication Control Word	0~1

When the tens digit of P9-07 is set to 1, the function for replacing the VH series communication control word with the VB5 communication control word is enabled. The corresponding functions can then be executed by sending the VB5 control word.

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 4: PULSE pulse setting (X4) 5: Communication setting 6: Multi-segment command setting
PA-02	Feedback channel selection	0: AI1 1: AI2 3: AI1-AI2 4: AI1+AI2 5: PULSE pulse setting (X4) 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.



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 state, 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 $\neq$ 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 effective for some closed-loop control situations.

Parameter	Name	Range
PA-09	PID differential limiting	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 T:

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: Do not 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%

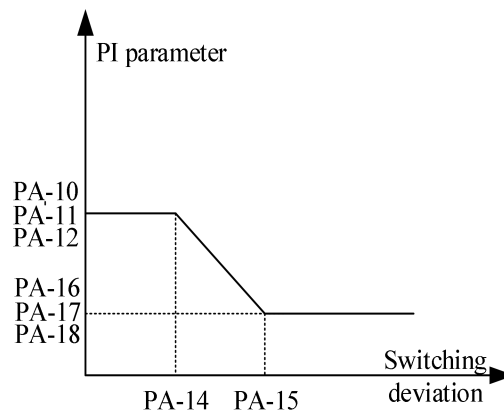
In some applications, a group of PID parameters can not meet the needs of the whole operation process, so different PID parameters need to be used in different situations. The parameters can be switched through the X terminal (function 35) of the multi-function terminal, or according to the deviation.

(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;

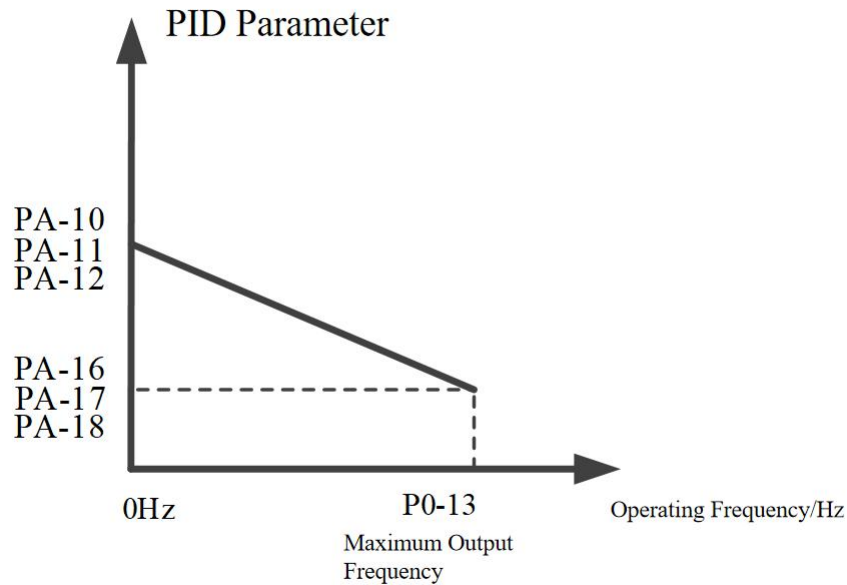
(2) Switch automatically according to deviation

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.



(3) Automatic Switching Based on Running Frequency

When the inverter operates within the range of 0 Hz to the maximum frequency, the two groups of PID parameters are linearly interpolated based on two points on the coordinate axis. The first point is defined by 0 Hz and the first group of PID parameters, and the second point is defined by the maximum frequency and the second group of PID parameters. These two points form a linear function. The current PID parameters are calculated by substituting the current operating frequency into this function.



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 frequency converter 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

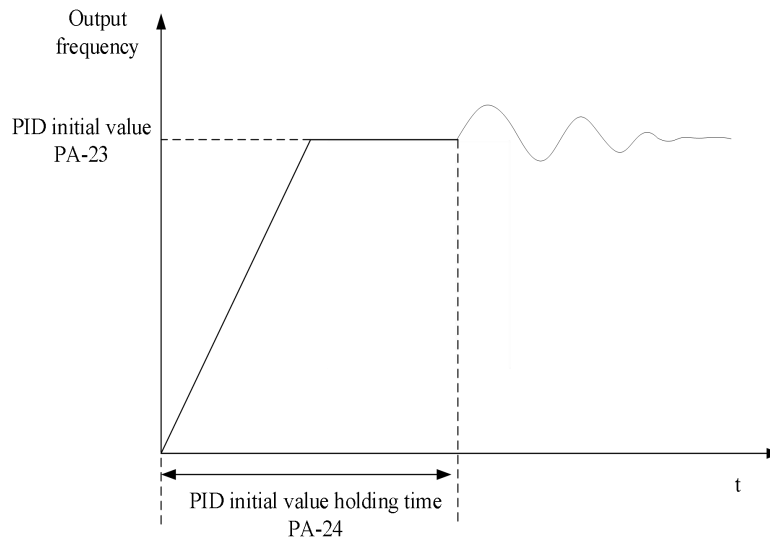
PID given feedback range is a dimensionless unit, used for PID given display U0-14 and PID feedback display

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%
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.



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

It is used to select whether the PID continues to calculate in PID shutdown state. In general application, PID should stop operation in shutdown state. When using the sleep and wake-up function, this function must be set to execute during stop.

Parameter	Name	Range
PA-26	PID integral attribute	Bit 0: integral separation 0: invalid 1: valid Bit 1: whether to stop integration after output to limit value 0: continue to integral

		1: Stop integral
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Integral separation:

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

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

6: Preset frequency P0-10

According to the different states 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.

In version 3742 and above, when P0-12 is set to 1 (digital setting frequency with stop memory), and PB-16 is set to 6 (preset frequency, with P0-10 as the given frequency), the frequency modified via the panel UP/DOWN keys will be retained after power-off.

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)
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

Parameter	Name	Range
		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.

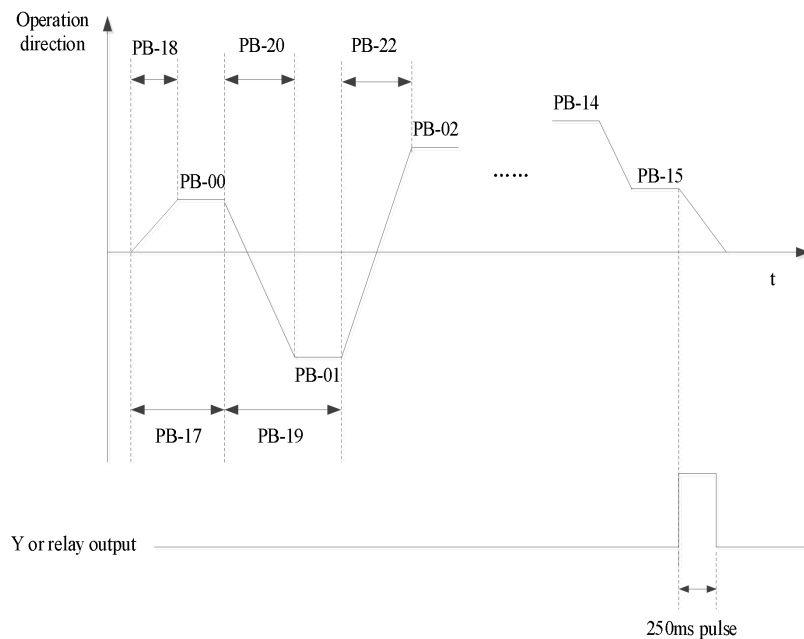
1: Keep the final value at the end of single operation

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	Bit 0: power-off memory 0: not memory 1: memory Bit 1: shutdown 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 shutdown memory is to record the previous PLC operation stage and frequency during shutdown, 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

VHL provides four groups of acceleration and deceleration times. The first group of acceleration and deceleration times is P0-18/P0-19, which is used by default. In torque control mode, the forward or reverse maximum operating frequency of the inverter is controlled by the frequency upper limit. The acceleration/deceleration time for the frequency upper limit is set by PC-07 (acceleration) and PC-08 (deceleration).

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: 100Hz

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
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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.

Example: When PC-11 is set to 10 Hz, during acceleration, if the operating frequency is lower than 10 Hz, Acceleration Time 1 (P0-18) is used; if the operating frequency is higher than 10 Hz, Acceleration Time 2 (PC-03) is used.

When PC-12 is set to 10 Hz, during deceleration, if the operating frequency is higher than 10 Hz, Deceleration Time 2 (PC-04) is used; if the operating frequency is lower than 10 Hz, Deceleration Time 1 (P0-19) is used.



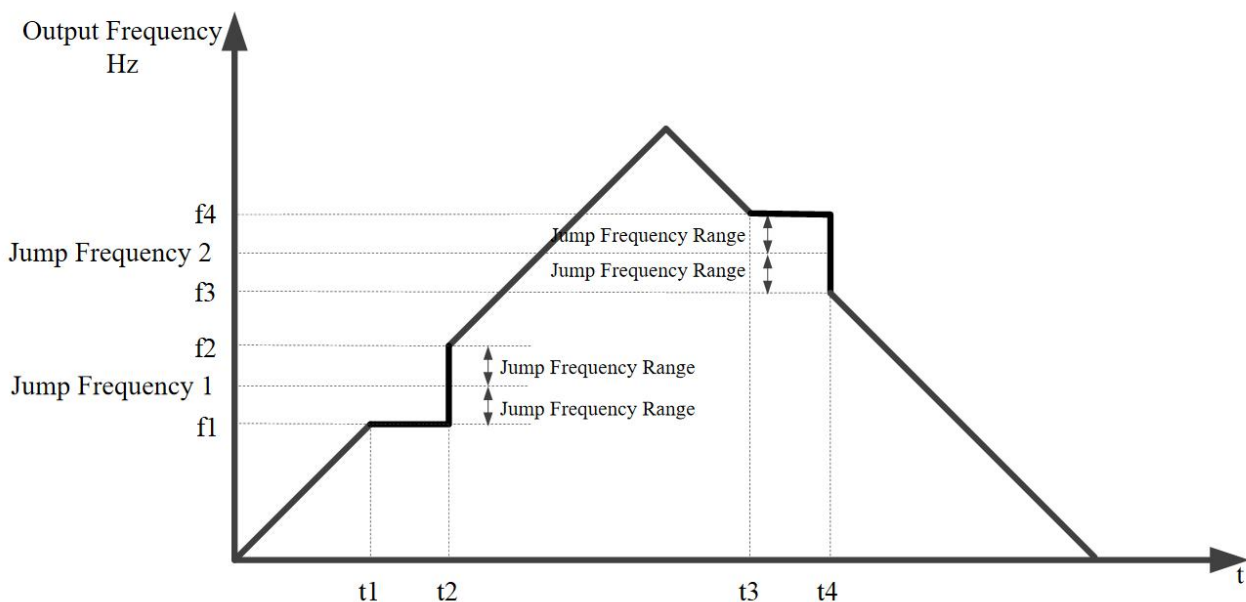
When using this function, the multi-function terminal function cannot select the acceleration and deceleration time switching.

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.

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

Please refer to the figure below for the principle of jump frequency and jump frequency amplitude.



During acceleration, when the operating frequency reaches the jump frequency range from $f1$ to $f2$, the inverter operates at the lower limit frequency $f1$ of this range. During deceleration, when the operating frequency reaches the jump frequency range from $f3$ to $f4$, the inverter operates at the upper limit frequency $f4$ of this range.

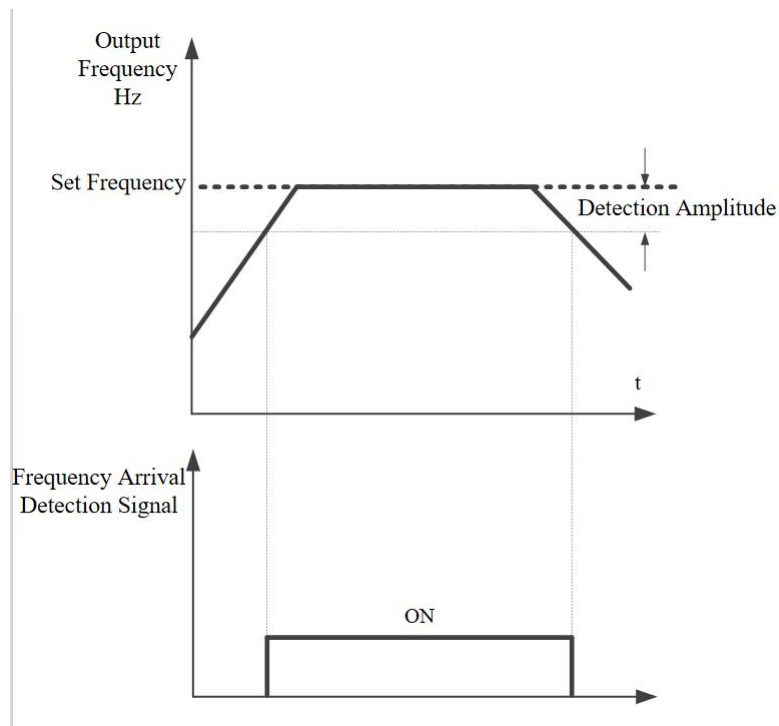
Parameter	Name	Range
PC-16	Whether the jump frequency is effective during acceleration and deceleration	0: Invalid 1: Valid

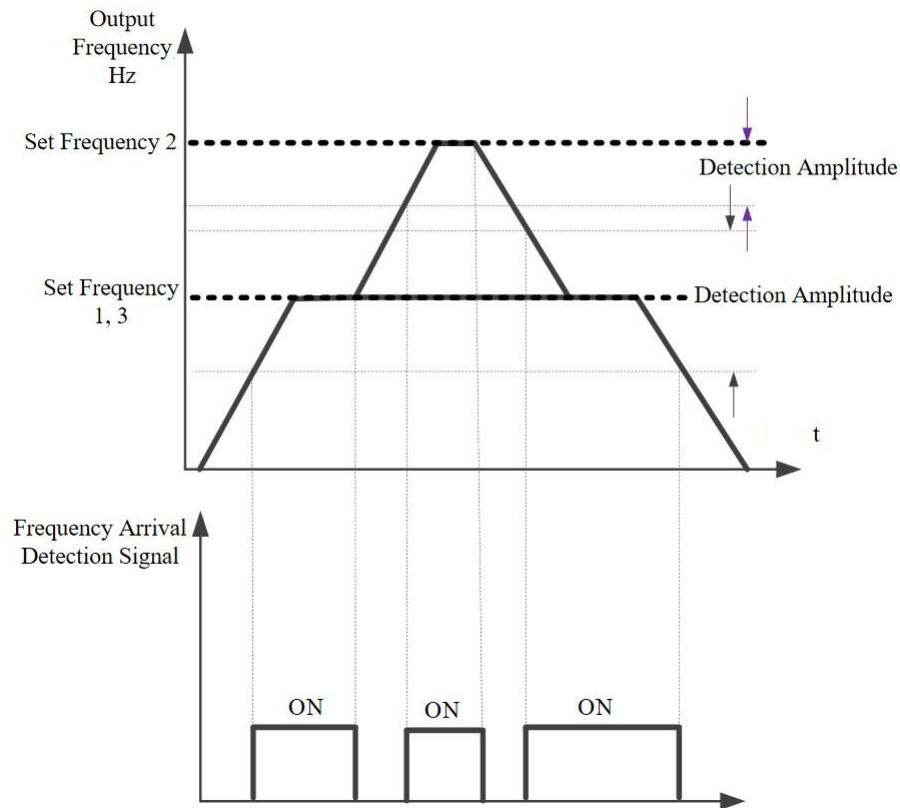
Set whether the jump frequency is effective during acceleration and deceleration.

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

When the operating frequency of the frequency converter is within a certain range of the target frequency, the multi-functional Y terminal of the frequency converter outputs an 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.

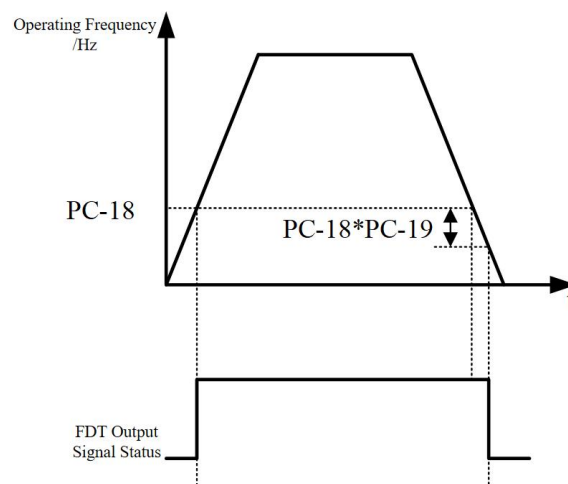




Parameter	Name	Range
PC-18	Frequency detection value (FDT1)	0.00Hz~max output frequency
PC-19	Frequency detection hysteresis value (FDT1)	0.0%~100.0% (PC-18)

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 canceled.

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. The following figure takes the FDT1 function as an example:



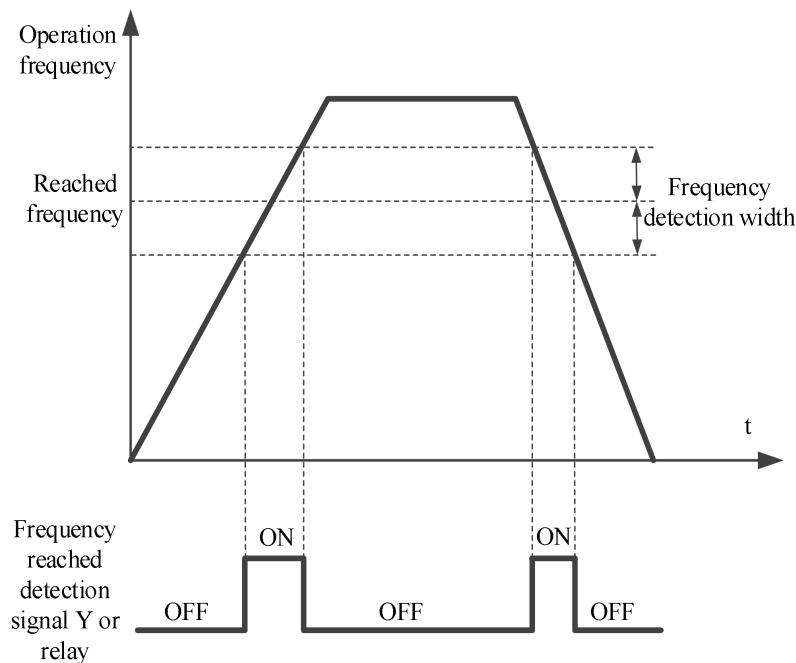
Parameter	Name	Range
PC-20	Frequency detection value (FDT2 voltage level)	0.00Hz~max output frequency
PC-21	Frequency detection hysteresis value (FDT2 voltage level)	0.0%~100.0% (PC-20)

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 reached detection value 1	0.00Hz~ max output frequency
PC-23	Frequency reached detection 1 range	0.0%~100.0% (max output frequency)
PC-24	Frequency reached detection value 2	0.00Hz~ max output frequency
PC-25	Frequency reached detection 2 range	0.0%~100.0% (max output frequency)

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

VHL provides two groups of frequency reached 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 reached 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 reached time	0~6500.0h
PC-32	Setting operation reached time	0~6500.0h

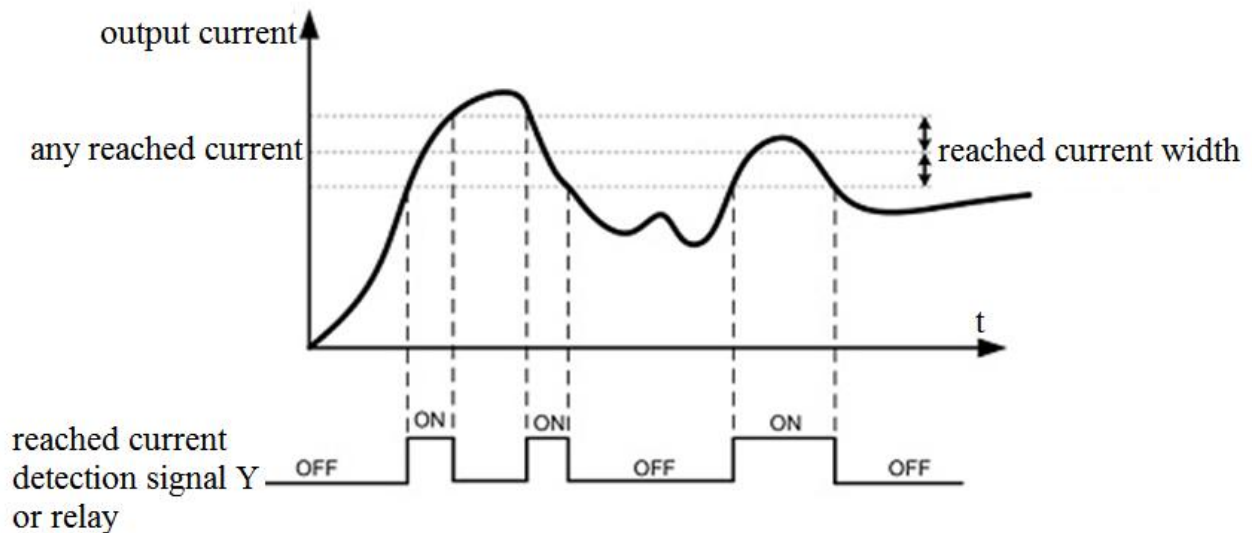
When the accumulated running time of P8-10 exceeds the running time arrival setting of PC-32, the inverter will trigger an Err46 fault and stop operation. By assigning function code 29 (Running Time Arrival) to the Y terminal, the Y terminal outputs an ON signal.

When the accumulated power-on time of P8-11 exceeds the power-on time arrival setting of PC-30, the inverter will trigger an Err47 fault and stop operation. By assigning function code 25 (Power-On Time Arrival) to the Y terminal, the Y terminal outputs an ON signal.

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

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

VHL 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 frequency converter 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 frequency converter outputs ON signal.

Parameter	Name	Range
PC-42	A11 input voltage lower limit	0.00V~PC-43
PC-43	A11 input voltage upper limit	PC-42~10.50V

When the value of analog input A11 is greater than PC-43, or A11 input is less than PC-42, Y terminal of frequency converter outputs ""A11 input overrun"" ON signal, which is used to indicate whether the input voltage of A11 is within the set range.

Parameter	Name	Range
PC-44	Over voltage point	540~810V (380V models) 200~400V (220V models)

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	Under voltage point	Versions below 3740: 200~537V (380V models) 200~400V (220V models) Version 3740 and later: 220V models: 50~400V 380Vmodels: 50~537V

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 reached	0~100°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 state 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-state 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(Supported in version 3742 and above)	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 effective, if the terminal jog command appears in the operation process, the inverter will switch to the terminal jog operation state.

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

The SVC optimization mode is only effective for asynchronous motors. In asynchronous motor SVC mode, when speed tracking startup is selected, this parameter can be set to 1 for more stable operation. In other operating conditions, adjustment of this parameter is generally not required.

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 effective 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 effective 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.

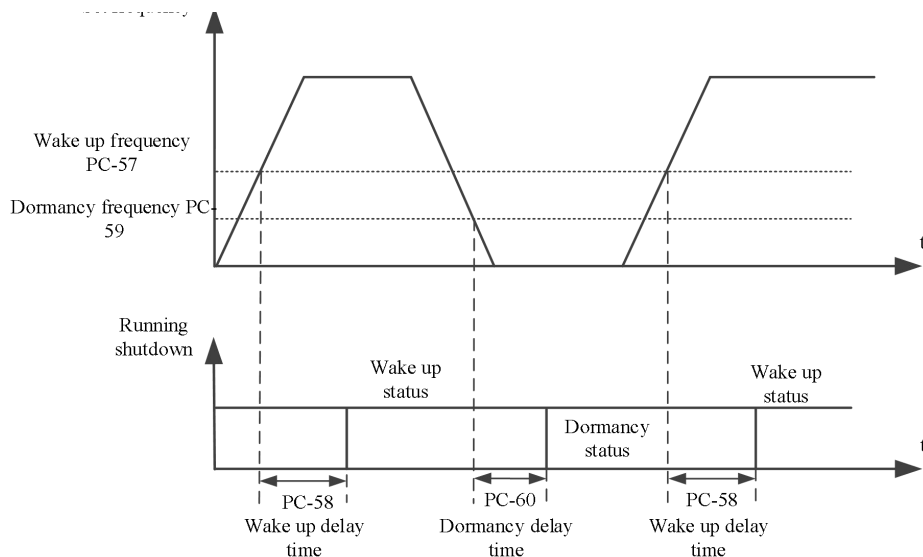
When VF control operation is unstable, please refer to parameter P5-17. For inverter loss and temperature rise, please refer to PC-67.

Parameter	Name	Range
PC-56	Random PWM	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 state and stops automatically.

If the inverter is in dormancy state 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.



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

Parameter	Name	Range
PC-62	Current detection compensation	100~110

It is used to set the current detection compensation of frequency converter. If the setting is too large, the control performance may be degraded. Generally, it does not need to be modified.

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

When the bus voltage reaches (PC-65-PC-66~PC-65+PC-66), 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	The carrier frequency is adjusted	0	No

	with temperature	1	Yes
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When PC-68 is 0, the carrier of frequency converter 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: Do not use external linear speed 1: AI1 2: AI2 4: PULSE pulse terminal X4 setting 5: Communication setting
PC-73	Maximum allowable update deviation of main frequency	0.00%~10.00%
PC-74	Allowed update 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	0.00Hz~50.00Hz

When used on wire drawing machine and winding machine, the following parameters can be set.

P0-03 set to 10 (Specific mode for wire drawing and winding), P0-04 set to 8 (PID setting), P0-05 set to 01 (Calculation results of main and auxiliary frequency sources).

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	P0.00 ~ PF.xx A0.00 ~ A2.xx A9.00 ~ Ad.xx U0.00 ~ U0.xx U4.00 ~ U5.xx
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	
PE-15	User optional parameters 15	
PE-16	User optional parameters 16	
PE-17	User optional parameters 17	
PE-18	User optional parameters 18	
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 VHL 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

Torque control can only be used in vector control mode after motor tuning is completed, i.e., when P0-01 is set to 1.

This parameter is used to select the inverter control mode: speed control or torque control. The control mode cannot be switched through this parameter while the inverter is running.

The X terminal of VHL 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 effective, 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 4: PULSE 5: Communication setting 6: min(AI1, AI2) 7: max(AI1, AI2) (the full scale of option 1-7 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. There are seven torque setting modes.

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 set to be positive, the inverter runs forward;

When the torque is set to be negative, the inverter runs reverse.

The torque setting sources are described as follows:

0: Digital setting (PF-02)

The target torque directly uses the PF-02 setting 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.

VHL 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.

4: Pulse pulse (X4)

The target torque is given by terminal X4 high speed pulse.

Given signal specification of pulse: voltage range 9V-30V, frequency range 0kHz-500kHz. Pulse setting can only be input from the multifunction input terminal X4.

The relationship between input pulse frequency and corresponding setting of terminal X4 is set through P2-66-P2-69. The corresponding relationship is the linear correspondence of 2 points. The pulse input corresponds to the percentage of PF-02.

5: Communication given

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 **H105**, and the data format is data with 2 decimal places.

6: min(AI1,AI2)

The target torque is determined by the smaller value of the signals received from terminals AI1 and AI2.

The inverter receives analog voltage/current signals through terminals AI1 and AI2, compares the two signals, and uses the lower value as the target torque.

7: max(AI1,AI2)

The target torque is determined by the larger value of the signals received from terminals AI1 and AI2.

The inverter receives analog voltage/current signals through terminals AI1 and AI2, compares the two signals, and uses the higher value as the target torque.

Parameter	Name	Range
PF-03	Torque control forward direction max frequency source	0: Digital setting 1: AI1 2: AI2 4: PULSE 5: Communication setting 6: min(AI1, AI2) 7: max(AI1, AI2) (the full scale of option 0-7 correspond to P0-13 max output frequency)
PF-04	Torque control forward direction max frequency	0.00Hz~ max output frequency

It is used to set the forward or reverse maximum operating frequency of inverter under torque control mode. The acceleration and deceleration time of 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 galloping accidents, we must limit the maximum speed of the motor in torque control.

If the maximum frequency of torque control needs to be dynamically changed continuously, it can be realized by controlling the upper limit frequency.

Parameter	Name	Range
PF-05	Torque control reverse direction max frequency source	0: Digital setting 1: AI1 2: AI2 4: PULSE 5: Communication setting 6: min(AI1, AI2) 7: max(AI1, AI2) (the full scale of option 0-7 correspond to P0-13 max output frequency)
PF-06	Torque control reverse direction max frequency	0.00Hz~max output frequency

Under torque control, the difference between the output torque of the motor and the load torque determines the speed change rate of the motor and load. The motor speed may change rapidly, causing problems such as noise or excessive mechanical stress. By setting the torque control acceleration and deceleration time, the motor speed can be smoothly changed.

Parameter PF-06 can be modified and takes effect in real time.

Parameter	Name	Range
PF-07	Torque acceleration time	0.00s~650.00s
PF-08	Torque deceleration time	0.00s~650.00s

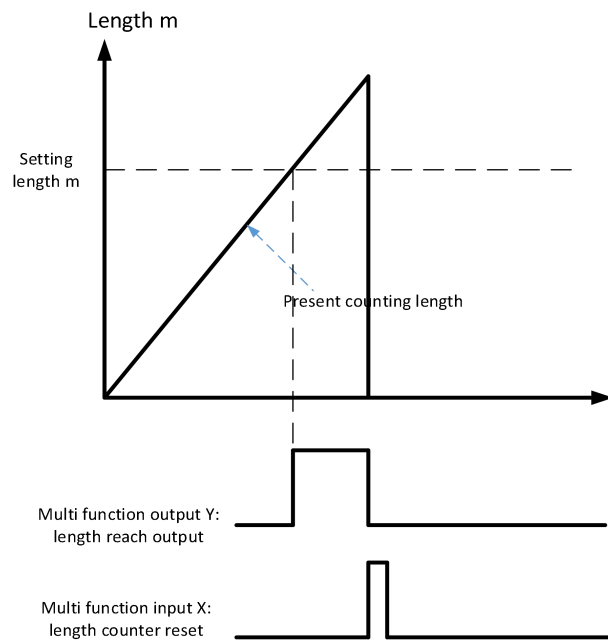
The acceleration/deceleration time is defined as the time required for the torque to change from 0 torque to the maximum output torque. When the operating torque is switched, the acceleration/deceleration time will change proportionally.

It is not recommended to set torque acceleration and deceleration time in torque control for small torque starting. If the torque acceleration and deceleration time is set, it is recommended to increase the speed filtering coefficient appropriately. In situations where fast torque response is required, set the torque control acceleration and deceleration time to 0.00s.

For example, two motors are hard connected to drive the same load. To ensure uniform load distribution, one frequency converter is set as the main unit and adopts speed control. The other frequency converter is set as the slave unit and adopts torque control. The actual output torque of the main unit is used as the torque command of the slave unit. At this time, the torque of the slave unit needs to quickly follow the main unit, so the torque control acceleration and deceleration time of the slave unit is 0.00s.

4-2-16. Group A0 fixed length, counting, swing frequency

Parameter	Name	Range
A0-00	Setting length	0m~65535m
A0-01	Actual length	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). 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 by terminals and A0-02. When the actual length is greater than the set length A0-00, the multi-function digital Y outputs the ""length reached"" 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 counting value	1~65535
A0-04	Specified counting value	1~65535

In application, the corresponding input terminal function should be set to "counter input" (function 20), and X4 port must be used when the pulse frequency is high.

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"" reached.

Counter reset operation (function 21) can be performed through multi-functional X terminal.

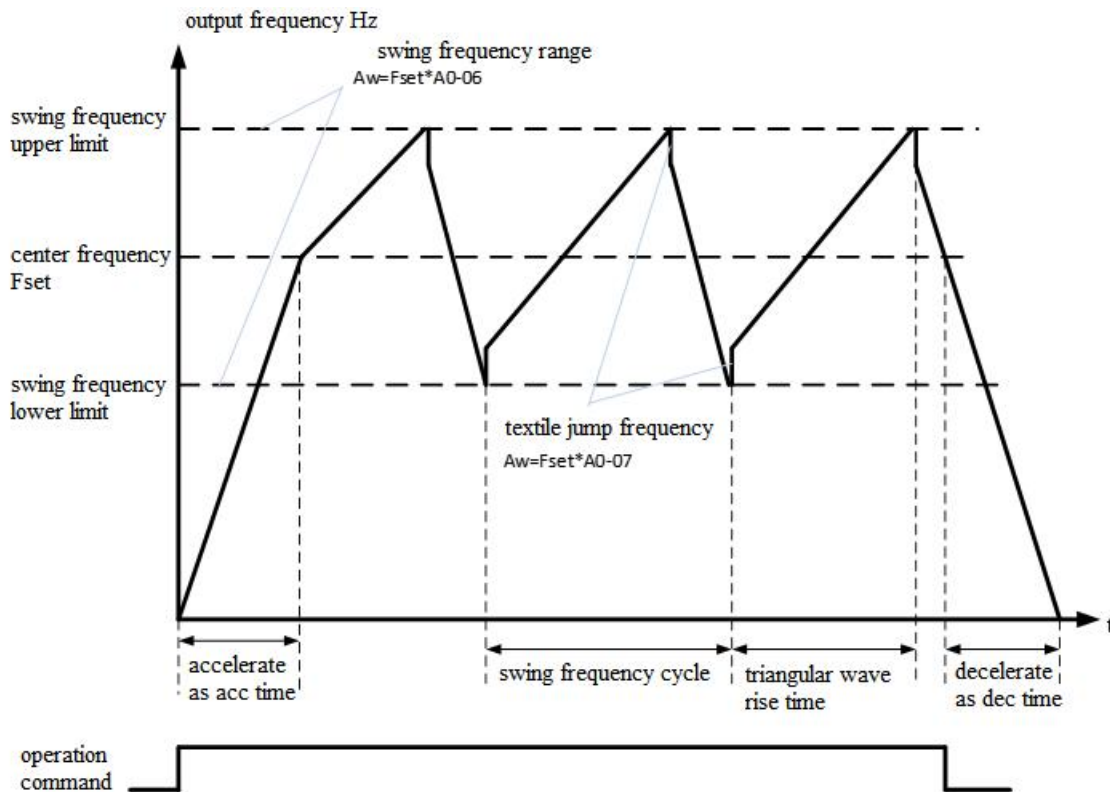
Parameter	Name	Range
A0-05	Swing frequency setting mode	0: Relative to center frequency 1: Relative to the max frequency

This parameter is used to determine the reference value of swing.

0: relative to the center frequency (P0-05 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 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%



A0-06 swing amplitude AW:

When setting swing range relative to center frequency ($A0-05 = 0$), $AW = \text{frequency source } P0-03 \times \text{amplitude } A0-06$. When setting swing range relative to maximum output frequency ($A0-05 = 1$), $AW = \text{max output frequency } P0-13 \times \text{swing range } PB-21$.

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: $\text{jump frequency} = AW \times \text{jump frequency amplitude } A0-07$.

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 $\times$ rise time coefficient of triangular wave A0-09;

Triangle wave falling time (s) = swing period A0-08 $\times$ (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 P2 Group 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 effective state source	Bit 0: virtual X1 0: the state of virtual Y1 determines whether is valid 1: Function code A1-06 sets whether virtual X1 is valid Bit 1: virtual X2 Bit 2: virtual X3 Bit 3: virtual X4 Bit 4: virtual X5
A1-06	Virtual X terminal status setting	Bit 0: virtual X1 0: invalid 1: valid Bit 1: virtual X2 Bit 2: virtual X3 Bit 3: virtual X4 Bit 4: 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 state is determined by the state 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 state is selected to determine virtual X state, to complete the following functions: when AI1 input exceeds the upper and lower limits, the frequency converter 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).

The virtual X terminal effective state mode 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 state. At this time, the virtual X1 input terminal state is valid. The virtual X1 of the frequency converter receives the user-defined fault 1, and the frequency converter will alarm Err48 and shut down.

Example 2: when the function code A1-06 is selected to set the virtual X1 state, the following functions are completed: after the inverter is powered on, it will automatically enter the operation state. The following setting method can be adopted:

Set the function of virtual X1 to ""forward running"" (A1-00=1);

Set the valid status mode 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 effective, and the terminal is forward running, which is equivalent to the frequency converter 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	Same to the function settings of X terminal
A1-08	Function selection of AI2 terminal as X terminal	
A1-10	Selection of effective mode when AI is used as X terminal	Bit 0: AI1 0: Low level valid 1: High level valid Bit 1: AI2

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: same to physical Y output
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 effective state selection	Bit 0: Virtual Y1 0: Positive logic 1: Negative logic Bit 1: virtual Y2 Bit 2: virtual Y3 Bit 3: virtual Y4 Bit 4: 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 states of virtual Y1 ~ Y5 are determined by the input states 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

VHL 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
A2-00	Motor type selection	0: Common asynchronous motor 1: Permanent magnet synchronous motor
A2-01	Motor rated power	0.1kW~650.0kW
A2-02	Motor rated voltage	1V~1200V
A2-03	Motor rated current	0.01A~655.35A
A2-04	Motor rated frequency	0.01Hz~max output frequency
A2-05	Motor rated speed	1rpm~65535rpm
A2-06	Asynchronous motor stator resistance	0.001 Ω ~65.535 Ω
A2-07	Asynchronous motor rotor resistance	0.001 Ω ~65.535 Ω
A2-08	Leakage inductance	0.01mH~655.35mH
A2-09	Asynchronous motor mutual inductance	0.01mH~655.35mH
A2-10	Asynchronous motor current without load	0.01A~A2-03
A2-15	Synchronous motor stator phase resistance	0.001 Ω ~65.535 Ω
A2-16	Synchronous motor D-axis inductance	0.01mH~655.35mH
A2-17	Synchronous motor Q-axis inductance	0.01mH~655.35mH
A2-19	Synchronous motor back EMF	0~6000.0V
A2-32	Polar logarithm of rotation	1~65535
A2-36	Motor 2 control mode	0: VF control 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: acceleration 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

Parameter	Name	Range
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	Bit 0: 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 under speed control mode	0: Parameter setting (P6-11) 1: AI1 2: AI2 4: PULSE setting 5: Communication setting 6: min(AI1,AI2) 7: max(AI1,AI2) (the full range of options 0, 1, 2, 4, and 5 corresponds to the A2-52 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	Torque regulation proportional gain	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 the verification is successful. You can view and set other parameters in the A4 group.

Set A4-01 and 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, an ERR-56 fault is reported. And the fault cannot be eliminated. After powering on again at this time, immediately report to the police. Unable to start. When entering the A4 group again, you need to enter the previously set password to access it. After setting A4-02 to 0, the fault can be eliminated by pressing the STOP button on the panel.



- Group A4 parameters cannot be written in communication;
- A4-01 cannot be read by communication;
- A4 group parameters cannot be initialized;
- 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 applicable to applications where the MODBUS address of the control system cannot be changed,

but the frequency converter must be replaced, resulting in different communication addresses. For example, the frequency communication address of the Xinje VB5N frequency converter is H2001, and the VHL communication address is H1000. Without changing the slave address in the control system, the VHL 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 VHL gives a command to write 7 to the communication address 1100H as a fault reset command. The specific instructions are as follows:

The A9-00 parameter is set to 1, and when the communication mapping function is enabled, data can only be read and written through the mapping addresses set in A9-01~A9-14. If the communication address in the data frame is inconsistent with the address values set in A9-01~A9-14, the frequency converter will report a communication address error when replying to the frame, resulting in abnormal communication control.

Example: The original control system needs to start and stop through communication with a given frequency, with a communication frequency address of 0x2000 and a communication start and stop control address of 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 (communication frequency address of this frequency converter), and A9-16 is set to 0x1100 (start stop control address of this frequency converter). At this point, it is possible to control the corresponding address of the frequency converter without changing the control system program.

Write 50.00Hz data frame: 01 06 20 00 27 10 97 36.

Start stop frequency converter 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 set of functional codes is used to calibrate the analog input AI to eliminate the influence of input port bias and gain of the analog.

This set of functional parameters has been calibrated at the factory, and when the factory values are restored, they will be restored to the factory calibrated values. Generally, calibration is not required on the application site.

The measured voltage refers to the actual voltage measured by measuring instruments such as a multimeter, and the displayed voltage refers to the displayed value of the voltage sampled by the frequency converter, as shown in the voltage (U0-26, U0-27) display before AI correction in U0 group.

During calibration, two voltage values are input at each AI input port, and the values measured by the multimeter and the values read by the U0 group are accurately input into the above function code. The frequency converter will automatically perform AI bias and gain calibration.

For situations where the user's given voltage does not match the actual sampling voltage of the frequency converter, on-site calibration can be used to ensure that the sampling value of the frequency converter is consistent with the expected given value. Taking AI1 as an example, on-site calibration 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, the actual sampling voltage viewing position is U0-27. For AI1 and AI2, it is recommended to use 2V and 8V as calibration 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

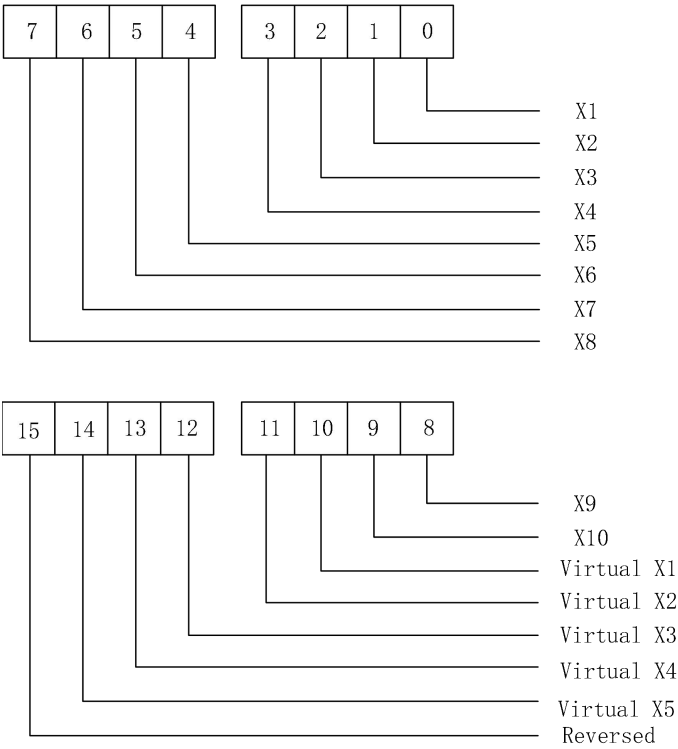
The U0 parameter group is used to monitor the operation status information of the frequency converter, and customers can view it through the panel for on-site debugging convenience. The minimum unit is shown in the function code table.

Parameter	Name	Display range
U0-00	Operation frequency (Hz)	0~600.00Hz
U0-01	Setting frequency (Hz)	0~600.00Hz
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.

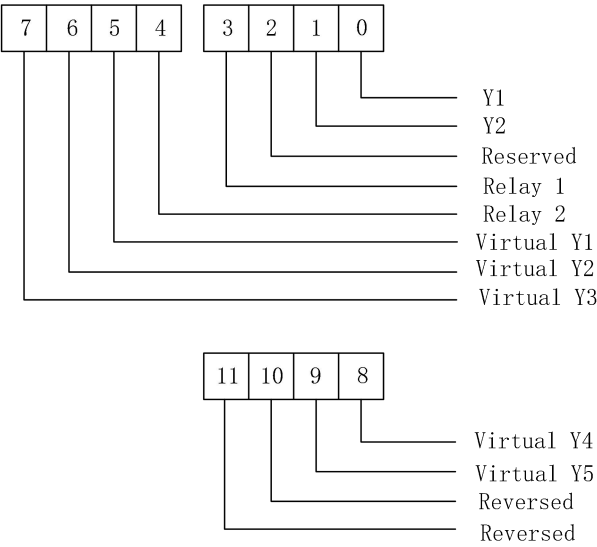
Parameter	Name	Display range
U0-07	X input state	0x0000-0x7FFF

Display the current input status value of the X terminal. After hexadecimal conversion into binary data, each bit corresponds to an X input signal. A value of 1 indicates that the input is a high-level signal, and a value of 0 indicates that the input is a low-level signal. The corresponding relationship between each bit and input terminal is as follows:



Parameter	Name	Display range
U0-08	Y output state	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	Display 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 both voltage values, and the current value is the displayed value multiplied by 2.

For example, if AI1 inputs 5V analog voltage, the displayed value of U0-09 should be 5V. If AI2 inputs 10mA analog current, the displayed value of U0-10 is 5, and the calculated analog current is 10mA.

Parameter	Name	Display range
U0-12	PULSE input frequency	0.00kHz~50.00KHz
U0-13	PULSE input frequency (Hz)	0 ~ 65535Hz

Display the high-speed pulse sampling frequency of X4 terminal.

Parameter	Name	Display 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	Display range
U0-16	Load speed display	0-65535

The set load speed is displayed during shutdown 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	Display range
U0-17	Feedback speed (Hz)	-600.00Hz~600.00Hz

Display the given frequency.

Parameter	Name	Display range
U0-19	Line speed	0~65535m/Min

Display X4 high-speed pulse sampling line speed, which is calculated from the actual number of sampling pulses per minute and A0-02 function code.

Parameter	Name	Display 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	Display 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 frequency converter. Refer to A0 group parameter description.

Parameter	Name	Display 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	Display range
U0-25	Communication setting	-100.00% ~ 100.00%

Display the value written in the H1000 through modbus communication.

Parameter	Name	Display range
U0-26	AI1 voltage(V) 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, U0-10 for the actually used correction voltage / current.

Parameter	Name	Display range
U0-29	Remaining running time	0.0Min~6500.0Min

Display the remaining running time when the timing function is running. Refer to PC group timing function parameter settings.

Parameter	Name	Display 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	Display range
U0-33	Present fault	1~56

The current fault code is displayed.

Parameter	Name	Display range
U0-35	Target torque (%)	-200%~200%

When PF-01 selects 0, U0-35 is the same value with PF-02.

Parameter	Name	Display range
U0-36	Torque upper limit	-200%~200%

Display the current torque upper limit value.

Parameter	Name	Display range
U0-41	Power factor angle	-

Display the current operating power factor angle.

Parameter	Name	Display 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	Display range
U0-44	VF separate target voltage	0~ motor rated voltage V
U0-45	VF separate output voltage	0~ motor rated voltage V

Display the target output voltage and current actual output voltage when running in VF separation state. Refer to Group P5 VF separation parameter settings.

Parameter	Name	Display range
U0-47	Motor serial number	0: motor 1 1: motor 2

Display the current motor parameter selection.

Parameter	Name	Display range
U0-65	Cumulative operation time of frequency converter	0~3600s

When U0-65 reaches 3600s, U0-65 will be cleared, and P8-10 adds 1h.

Parameter	Name	Display range
U0-66	Motor speed	0 ~ Speed corresponding to maximum output frequency/RPM
U0-67	Communication expansion card model	-

Display the current speed of the motor.

Display the communication expansion card model.

Parameter	Name	Display range
U0-70	Communication feedback motor speed 1	unit:0.1HZ

Display the motor speed fed back by communication, unit: Hz.

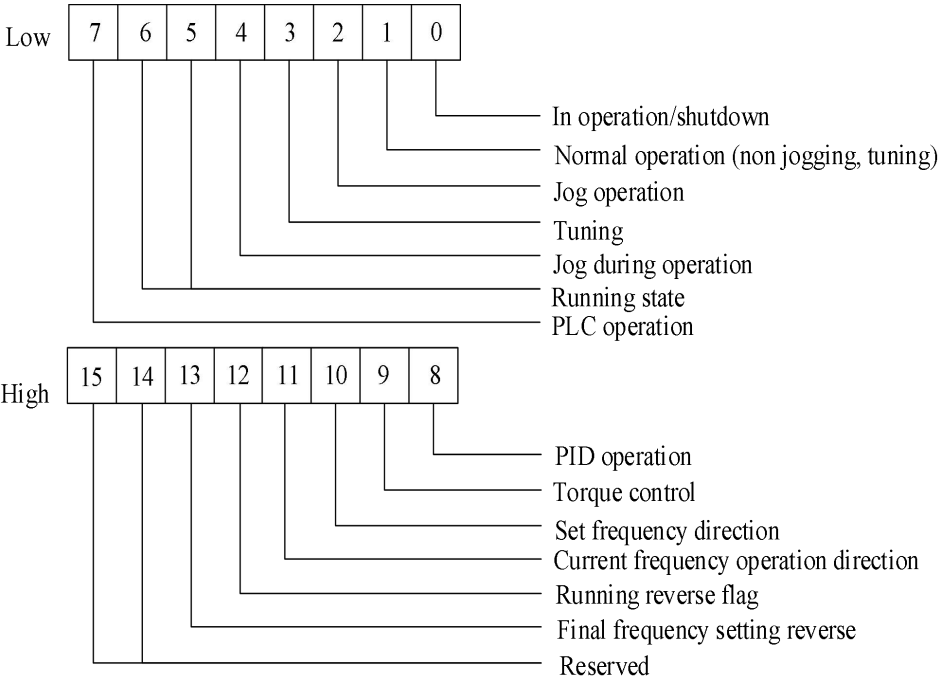
Parameter	Name	Display range
U0-71	Communication feedback motor speed 2	unit:RPM

Display the motor speed fed back by communication, unit: rpm.

Parameter	Name	Display 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	Display range
U0-75	VFD fault code	1~56
U0-76	Operation status word	0x0000~0xFFFF



5. EMC

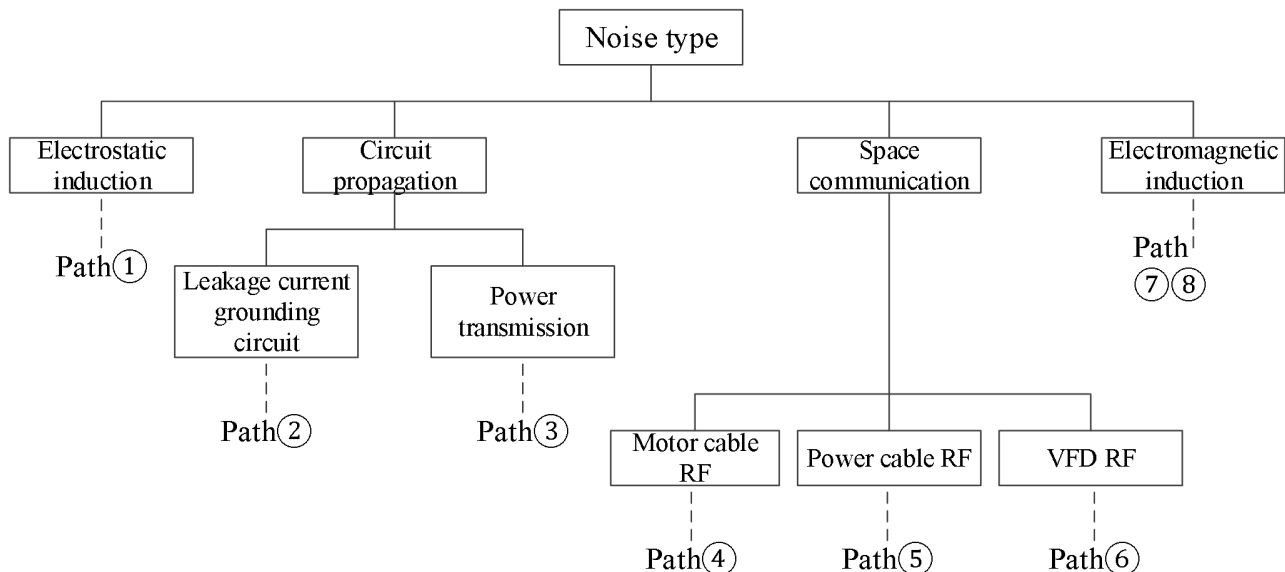
5-1. EMC compliant installation guidelines

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 frequency converter may affect the nearby instruments and equipment. The degree of influence is related to the control system of the frequency converter, 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.



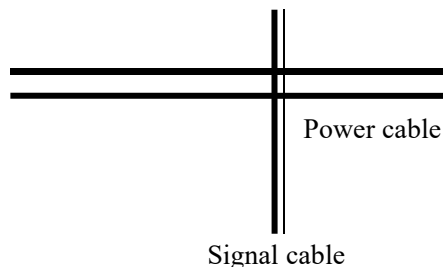
- Basic countermeasures for noise suppression

Noise propagation path	Solution
②	When the grounding wire of peripheral equipment and the wiring of frequency converter 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 frequency converter share the same system, the noise generated by the frequency converter 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 frequency converter. 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 frequency converter 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 effectively 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 frequency converter as far as possible, and its wiring should be far away from the input and output lines of frequency converter. 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 frequency converter, and keep the distance and orthogonality.

5-1-2. Field wiring and grounding

1. The cable (U, V, W terminal outgoing line) from the frequency converter to the motor should avoid parallel wiring with the power line (R, S, T or L, N 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 frequency converter, and the single end grounding near the side of the frequency converter.
4. The PE end grounding cable of frequency converter 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 (R, S, T or L, N 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.



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 (R, S, T or L, N) of frequency converter.

6. Model and dimension

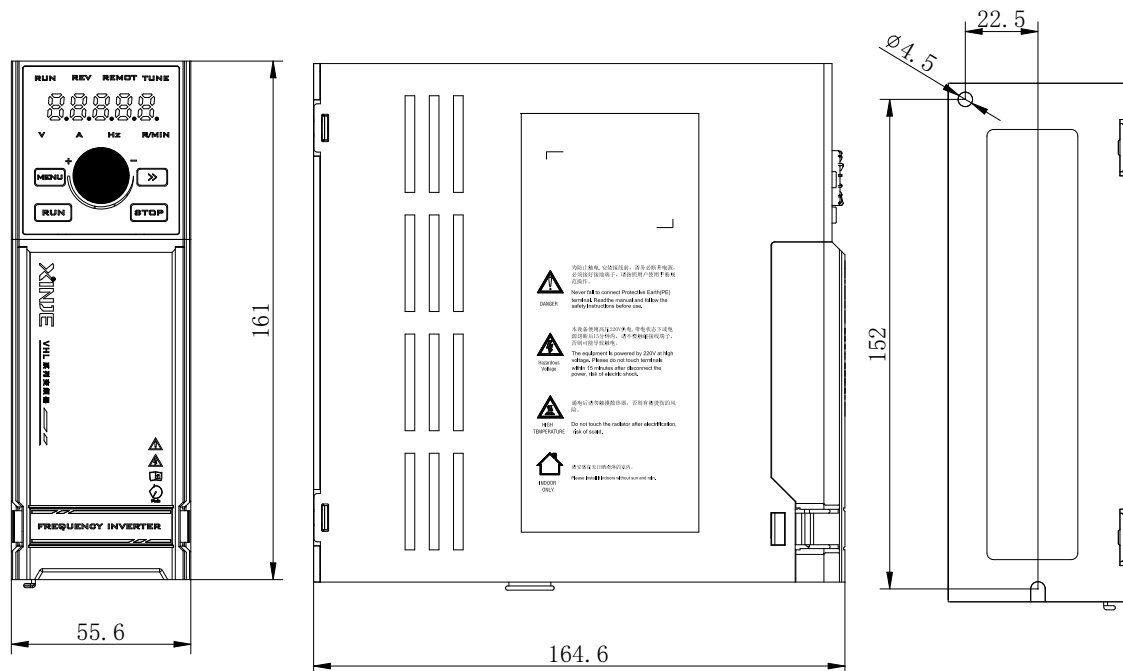
6-1. VHL series VFD electrical specification

Voltage level	Model	Input power capacity (KVA)	Input current (A)	Output current (A)	Matched motor (kW)
380V 50Hz/60Hz	VHL-40P4-B	1	1.9	1.5	0.4
	VHL-40P7-B	1.5	3.4	2.1	0.75
	VHL-41P5-B	3	5	3.8	1.5
220V 50Hz/60Hz	VHL-20P4-B	1	5.4	2.3	0.4
	VHL-20P7-B	1.5	5.6	4.0	0.75

6-2. VHL series VFD dimension

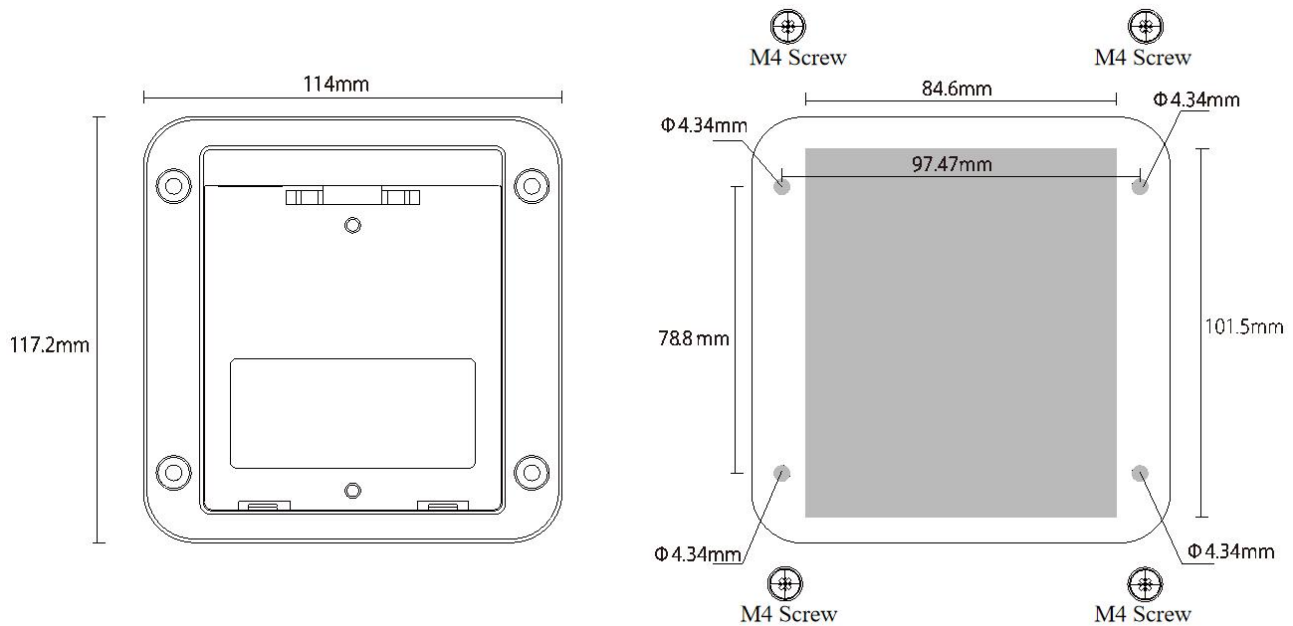
- VHL-20P4/20P7-B、VHL-40P4/40P7/41P5-B

Unit: mm



All installation screws are M4.

- Dimension drawing of operation panel mounting bracket



The gray area is the hollowed out part, and the middle hollowed out area is $84.6 \times 101.5\text{mm}$. 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

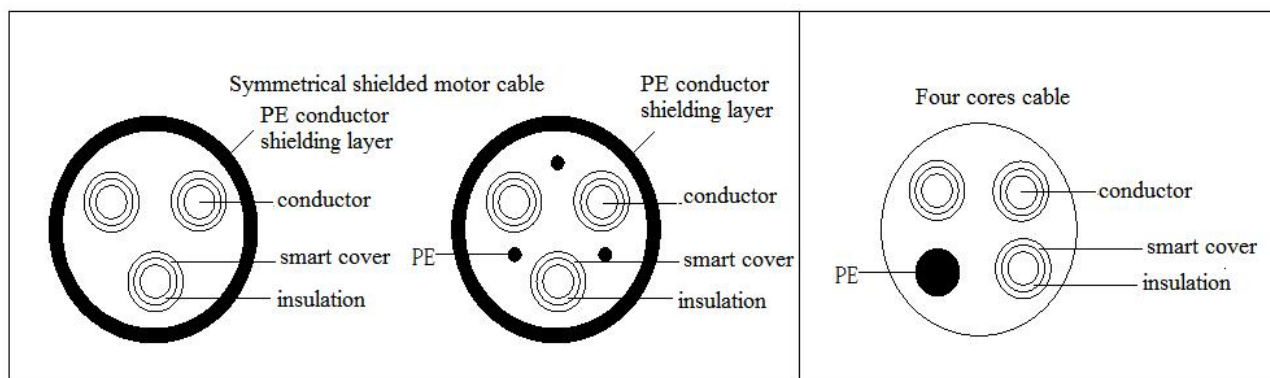
Name	Functions
Cable	A device for transmitting electrical signals
Circuit breaker	To prevent electric shock and the short circuit to ground which may cause leakage current fire (please select leakage circuit breaker for inverter device and with function of suppressing high harmonic. Rated sensitive current of circuit breaker shall be more than 30mA for one frequency converter.)
AC contactor	In order to effectively 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	It is suitable for improving the power factor of the input side of the inverter and restraining the high-order harmonic current.
DC reactor	
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 frequency converter 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 frequency converter.

Braking resistor	The regenerative energy of motor is consumed by resistor or resistor unit to shorten deceleration time and avoid over-voltage alarm of frequency converter.
Output filter	Suppress the interference generated from the output side wiring of the inverter. Please install it close to the output terminal of frequency converter.
Output choke	It is used to extend the effective transmission distance of the frequency converter and effectively suppress the instantaneous high voltage generated when the IGBT module of the frequency converter is switched.

6-3-2. Cable selection

1) Power cable

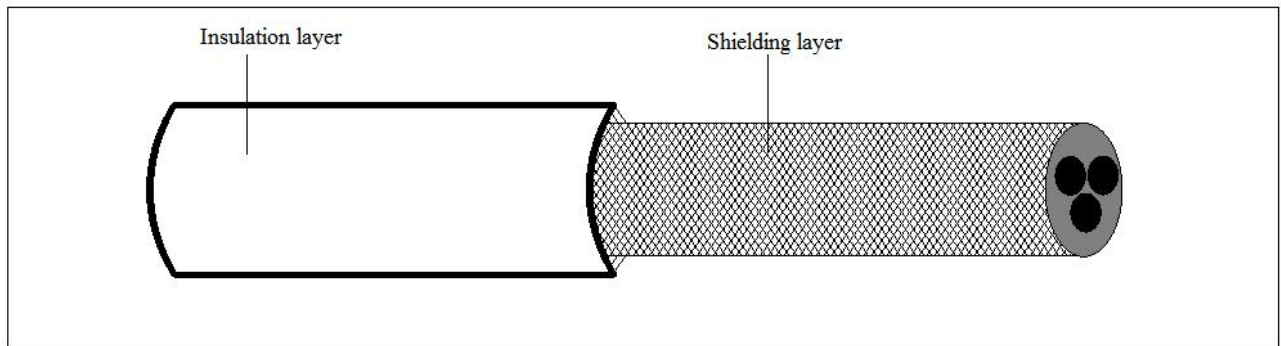
- ◆ The size of input power cable and motor cable shall comply with local regulations;
- ◆ The input power cable and motor cable must be able to withstand the corresponding load current;
- ◆ The maximum rated temperature margin of motor cable under continuous working condition should not be lower than 70°C;
- ◆ 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.



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.

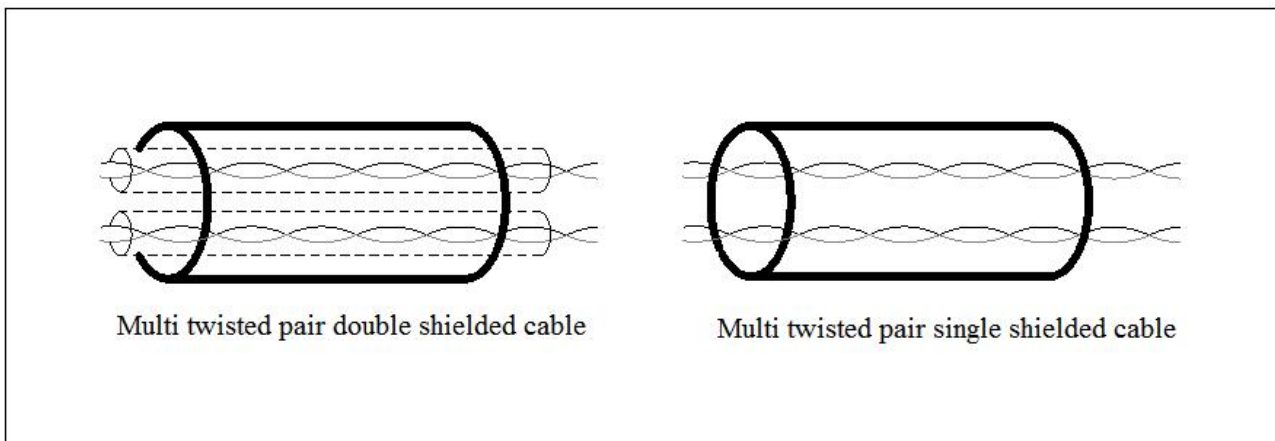
In order to effectively suppress the emission and conduction of radio frequency interference, the conductivity of the shielding wire must be at least 1/10 of that of the phase conductor. For copper or aluminum shielding, this requirement is very easy to meet. The minimum requirements of inverter motor 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 effectively it can suppress the electromagnetic interference radiation.



2) 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.



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.



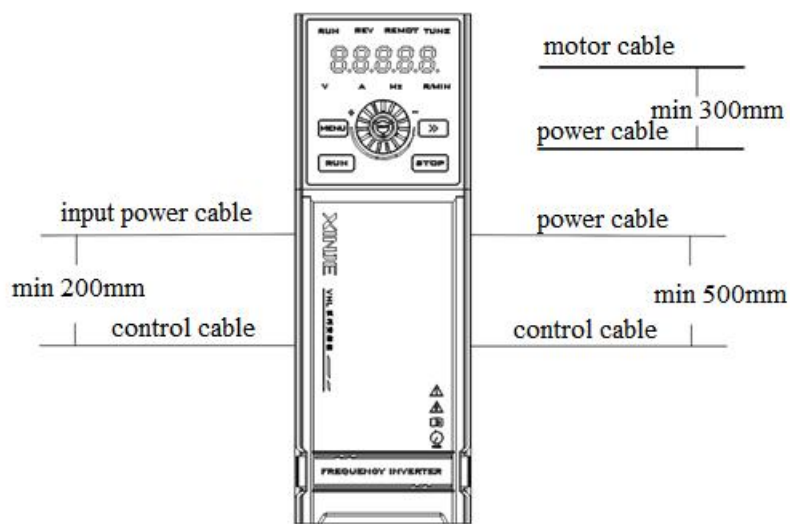
- Analog and digital signals are routed separately using different cables.
- Before connecting the input power cable of the inverter, check the insulation of the input power cable according to the local regulations.

3) 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.



4) 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 frequency converter. 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 effectively cut off the input power of frequency converter 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)
VHL-20P4-B	10	9	12
VHL-20P7-B	16	12	20
VHL-40P4-B	6	9	5
VHL-40P7-B	10	9	8
VHL-41P5-B	10	9	10



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 during high-voltage input of the power grid, it is necessary to connect an AC reactor on the input side, which can also improve the power factor on the input side.
- ◆ When the distance between the frequency converter and the motor exceeds 50 meters, due to the parasitic capacitance effect of the long cable to the ground, the leakage current is large, and the frequency converter is prone to overcurrent protection. At the same time, to avoid motor insulation damage, output reactor compensation must be added. When a frequency converter is equipped with multiple motors, the sum of the cable lengths of each motor is considered as the total motor cable length. When the total length is greater than 50 meters, an output reactor must be added on the output side of the frequency converter.

VFD model	Input reactor	Output reactor
VHL-20P4-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VHL-20P7-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VHL-40P4-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VHL-40P7-B	ACLSG-5A/4.4V	OCLSG-5A/2.2V
VHL-41P5-B	ACLSG-6A/4.4V	OCLSG-6A/2.2V



The above options are of Chint 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 state. 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 frequency converter 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 frequency converter 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. Selecting a resistor with a higher resistance value and lower power rating may result in excessive heat generation. In this case, the default discharge threshold should be reduced to minimize heat accumulation.
6. 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 frequency converter 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.

1) Brake resistor selection

When braking, the regenerative energy of the motor is almost all consumed on the braking resistance. According to the formula:

$$U \times U / R = P_b$$

U --- Braking voltage of system stable braking (different system U values are different, the default braking voltage of VHL series inverter is 690V, which can be adjusted through P7-59),

P_b ---Braking power.

2) 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:

$$A \times P_r = P_b \times D$$

A --- Generally, the value is about 50%,

P_r --- Resistor power,

D --- Braking frequency, that is, the proportion of regeneration process in the whole working process



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.

3) 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%

4) Brake resistor models

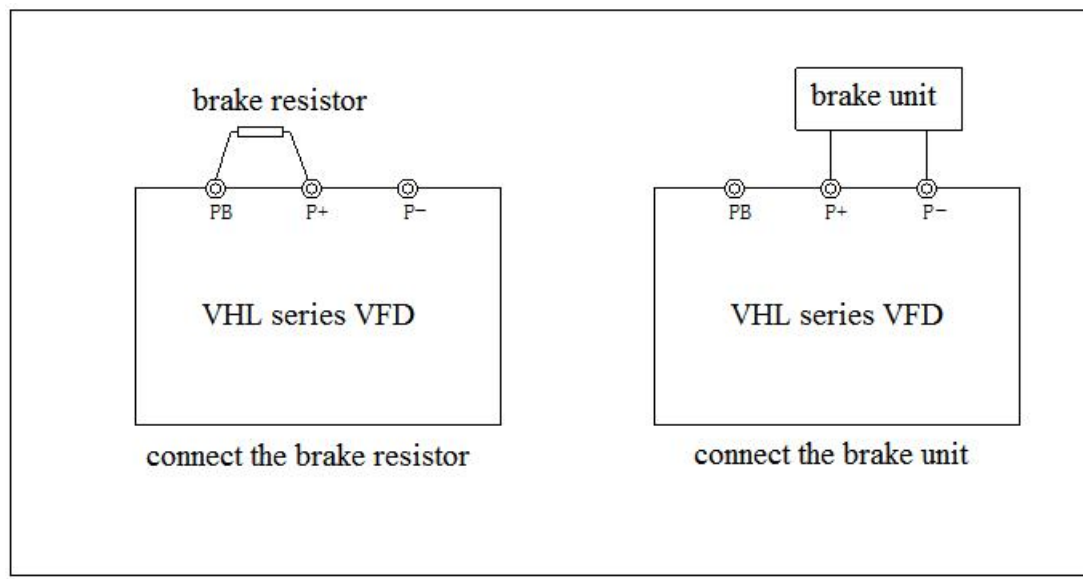
The recommended braking resistor specifications in the table below are based on a braking duty cycle of 10%.

Please confirm the applicable duty cycle requirements for the actual application.

VFD model	Braking unit	Recommended brake resistor specifications		
		Brake resistor (Ω)	Brake resistor power (W)	Brake resistor quantity
VHL-20P4-B	Built-in	≥200	≥80	1
VHL-20P7-B	Built-in	≥150	≥80	1
VHL-40P4-B	Built-in	≥300	≥150	1
VHL-40P7-B	Built-in	≥300	≥150	1
VHL-41P5-B	Built-in	≥220	≥150	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.
- The brake resistance cable shall be shielded cable.
- All resistors must be installed in a well ventilated place.
- 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.
- 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 frequency converter are shown in the table. When the frequency converter 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.

Fault Code	Name	Reason	Solution
Err01	Acceleration over current	1. There is grounding or short circuit in the output circuit of frequency converter 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 frequency converter 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 frequency converter with higher power level
Err02	Deceleration over current	1. There is grounding or short circuit in the output circuit of frequency converter 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 frequency converter 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 frequency converter 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 frequency converter with higher power level
Err04	Acceleration overvoltage	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

Fault Code	Name	Reason	Solution
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 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 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	1. Instantaneous power failure 2. The input voltage of frequency converter 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	VFD overload	1. Whether the load is too large or the motor stalls 2. The selection of frequency converter is too small	1. Reduce the load and check the motor and mechanical condition 2. Choose the frequency converter 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 frequency converter is too small	1. Set this parameter correctly 2. Reduce the load and check the motor and mechanical condition 3. Choose the frequency converter with higher power level
Err11	Input lack phase	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 lack phase	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	Overheated radiator / module	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

Fault Code	Name	Reason	Solution
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
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 frequency converter is too small	1. Reduce the load and check the motor and mechanical condition 2. Choose the frequency converter with higher power level
Err21	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 error	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

Fault Code	Name	Reason	Solution
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 lost in 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 in operation	In the process of inverter operation, change the current motor selection through the terminal	Switch the motor after the frequency converter stops
Err52	Speed offset too large	1. Encoder parameter setting incorrect 2. Motor blocked 3. Incorrect UVW wiring	1. Setting encoder parameters correctly 2. Check whether the machine is abnormal 3. Check whether the wiring between frequency converter and motor is abnormal
Err53	Motor overspeed fault	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 overheat 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 reached	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:

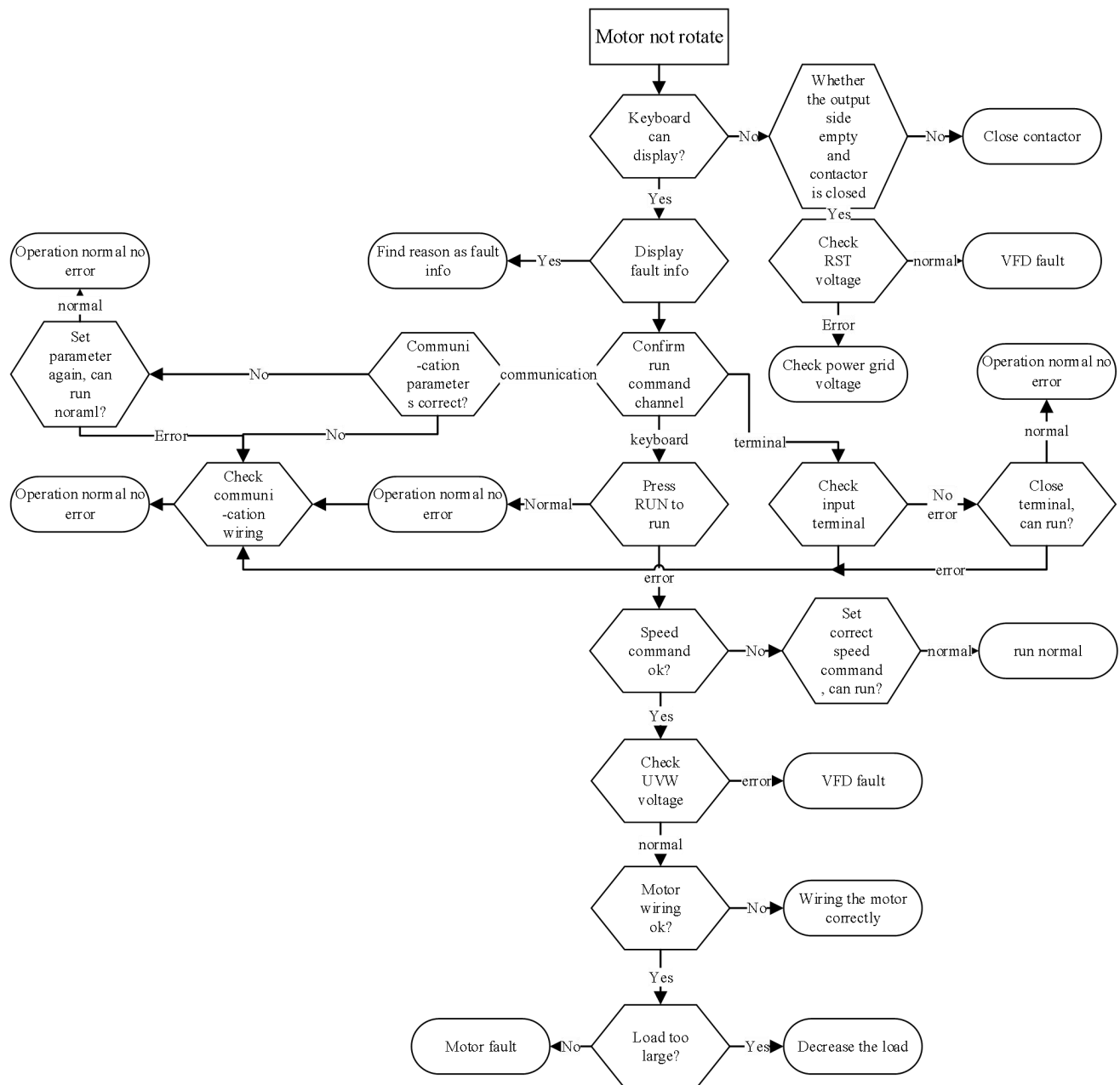
- When the fault code is displayed, press stop after confirming that it can be reset.
- Set any terminal of X1-X4 to reset stop input for external fault, and then disconnect from com terminal after closing.
- Cut off the power supply.



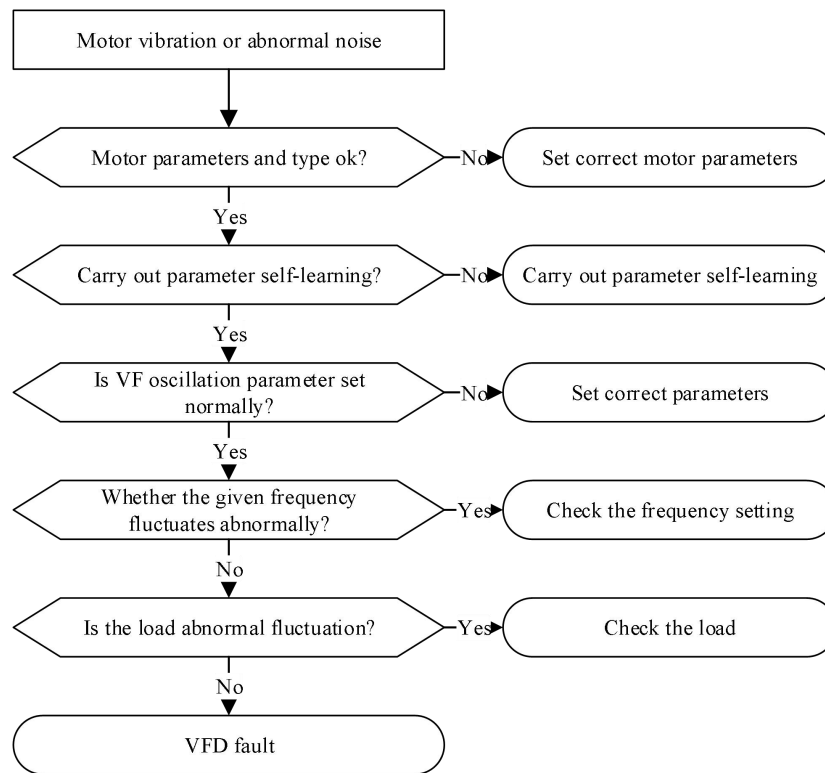
- Before reset, the reason of the fault must be thoroughly identified and eliminated, otherwise, the permanent damage of the frequency converter may be caused.
- If the fault cannot be reset, check the reason, and the continuous reset will damage the inverter.
- When overload and overheating protection acts, it shall be reset 5 minutes later.

7-4. VFD common fault analysis

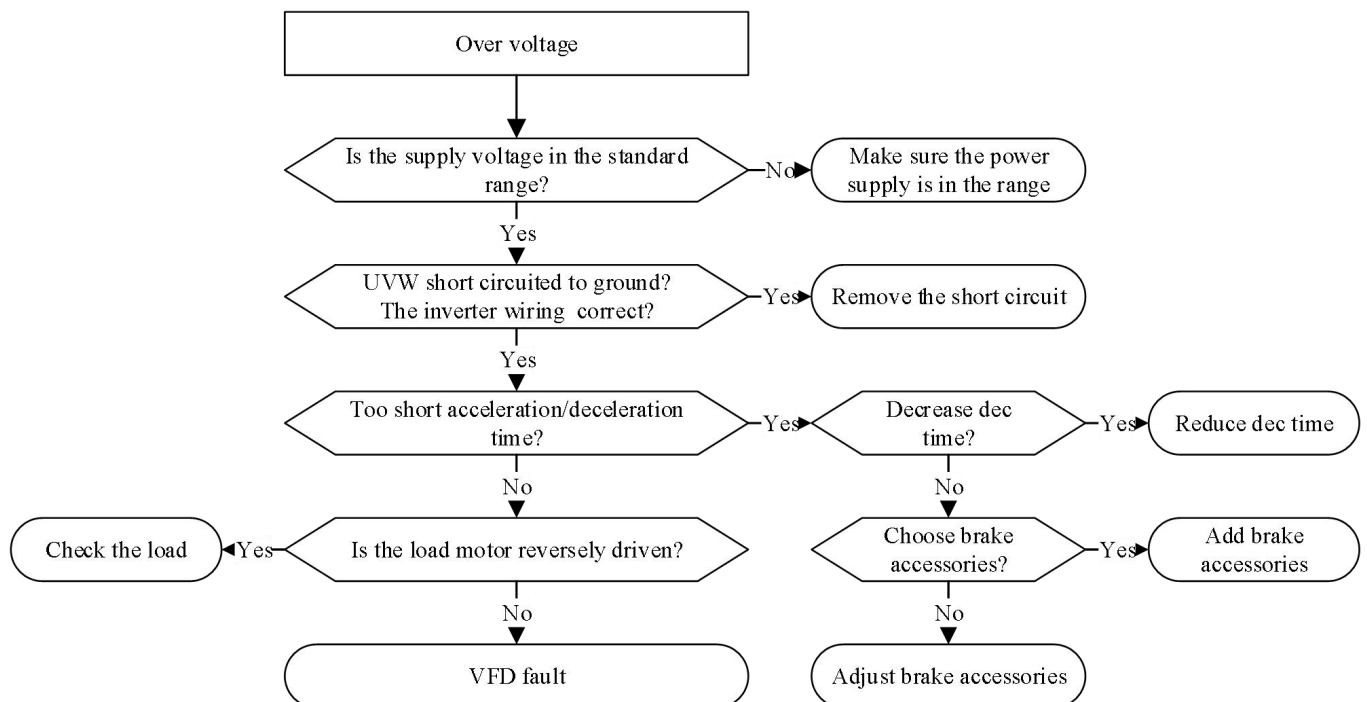
7-4-1. Motor not rotate



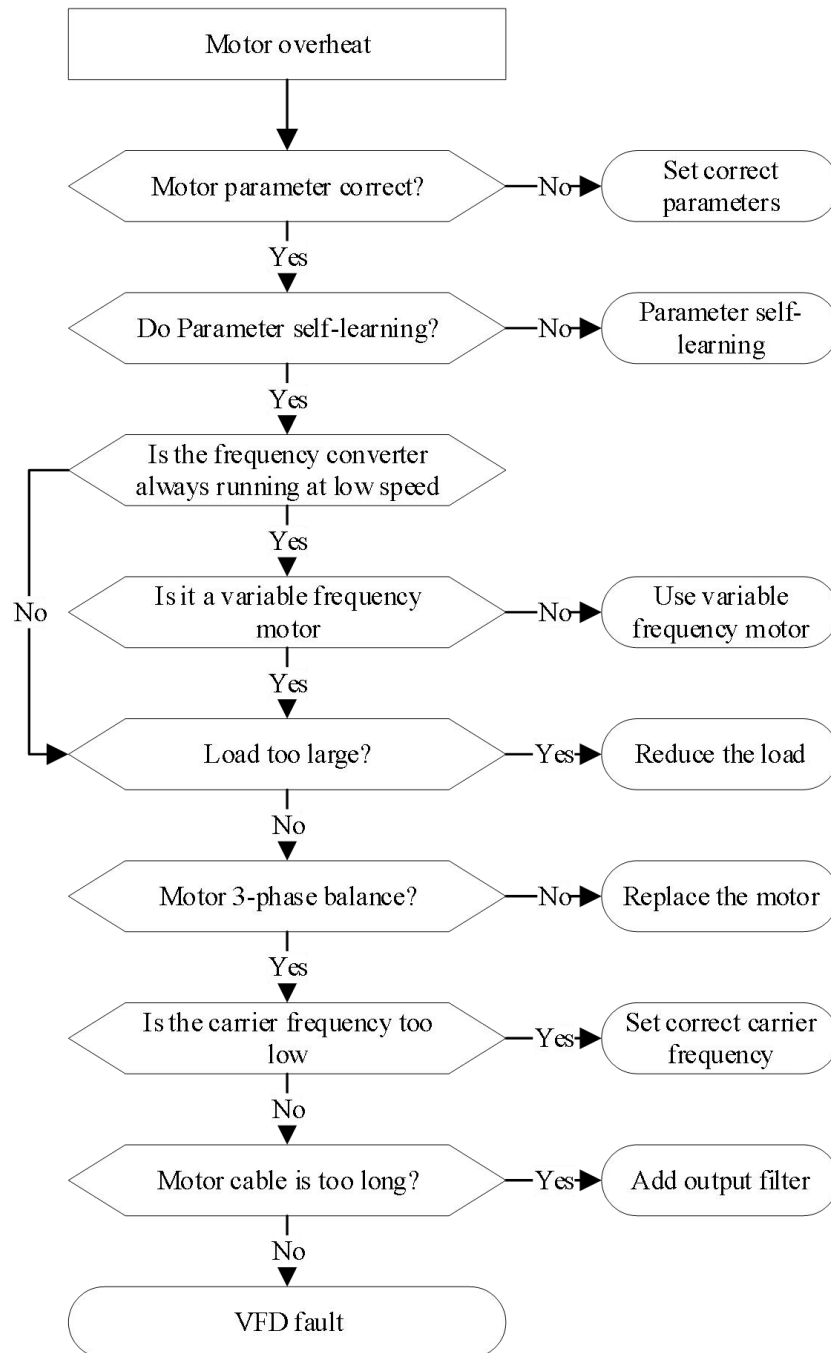
7-4-2. Motor vibration



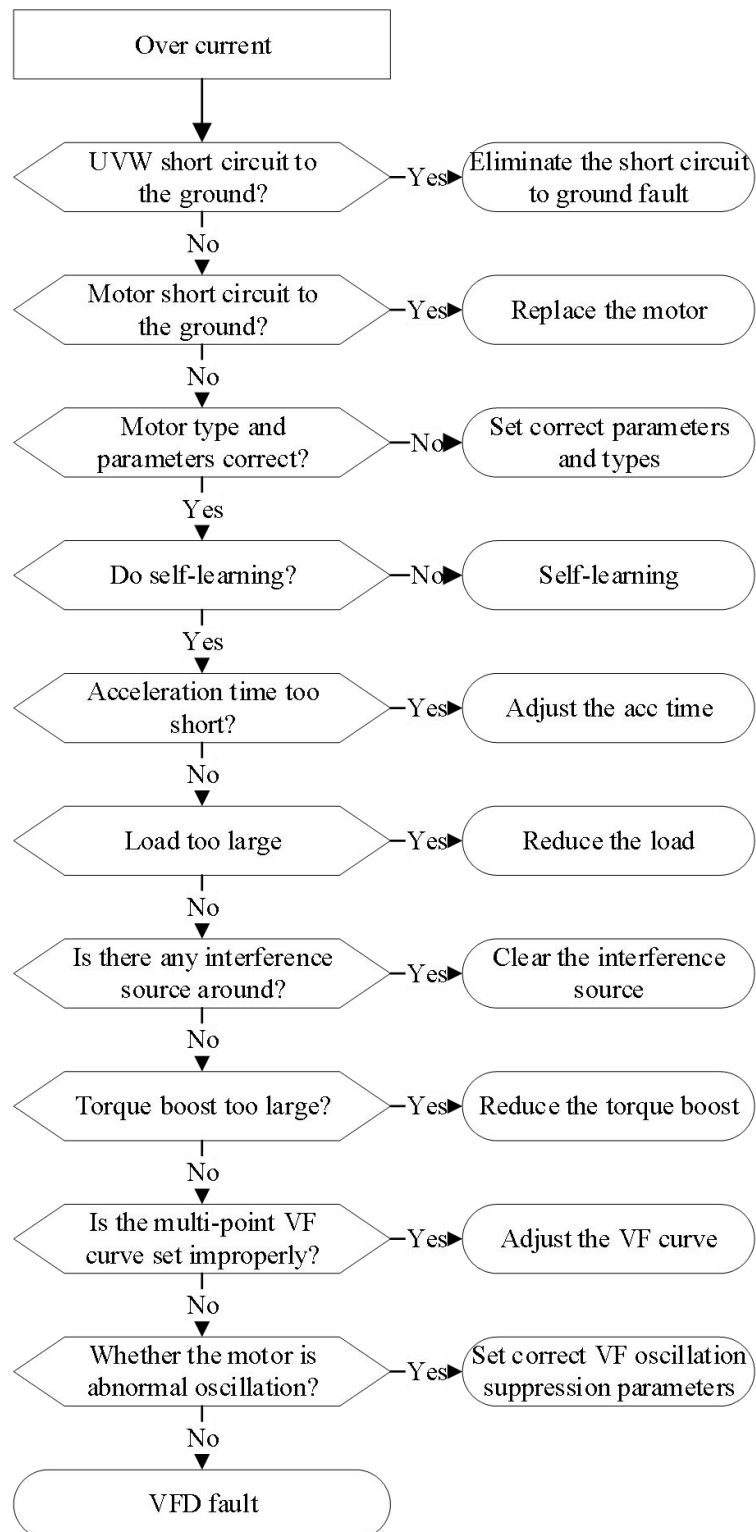
7-4-3. Over voltage

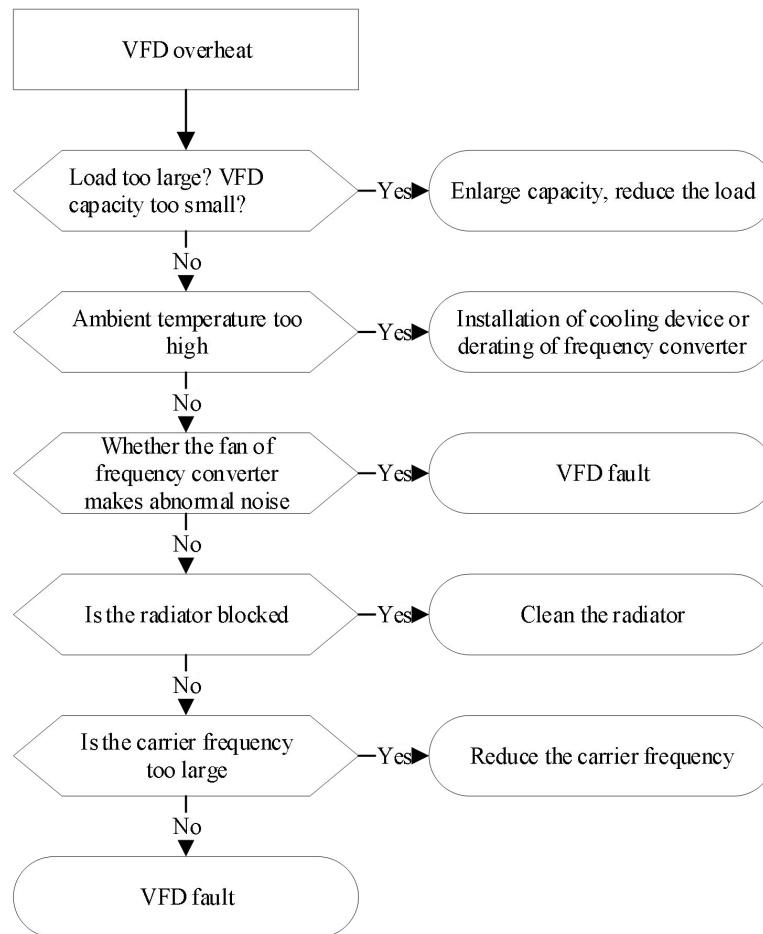


7-4-4. Motor overheating

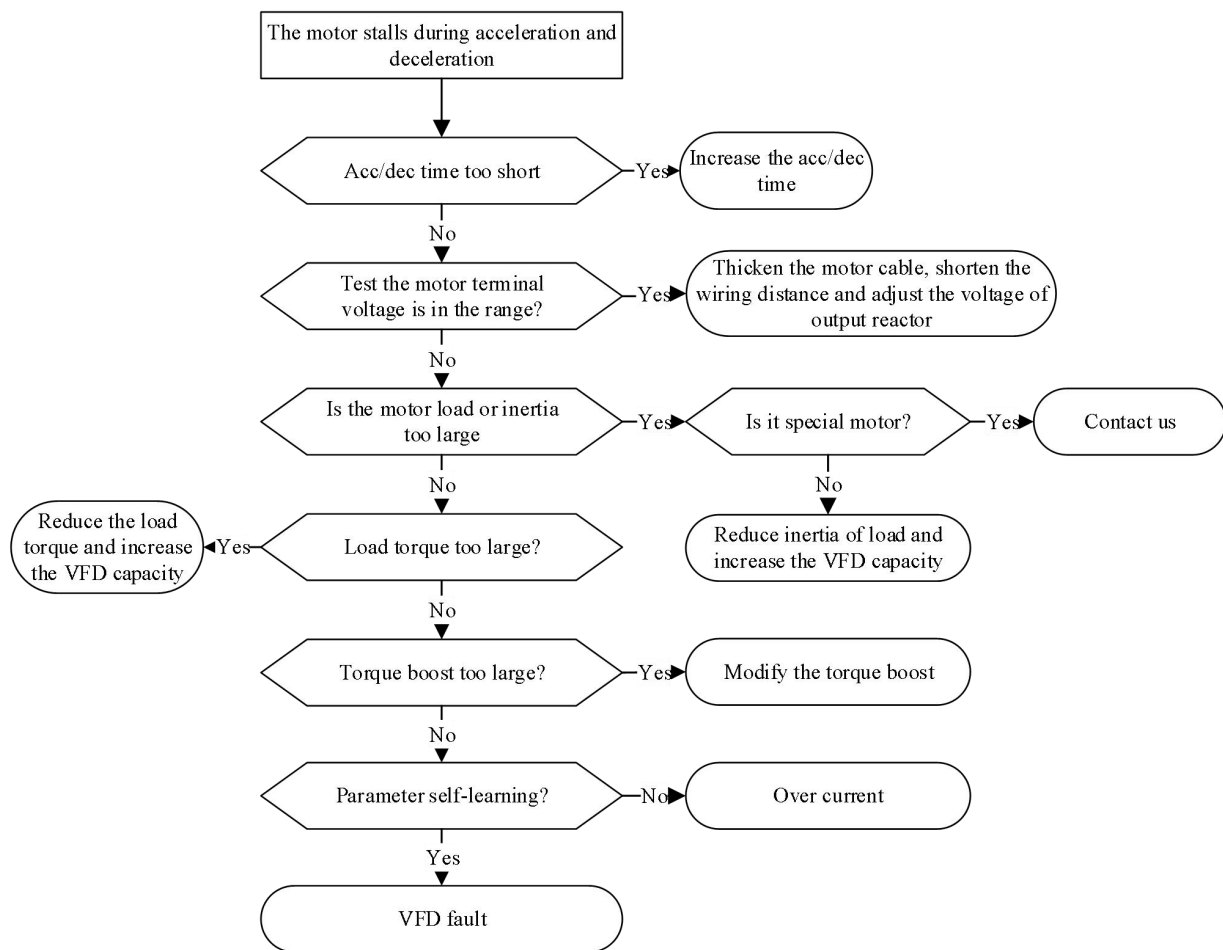


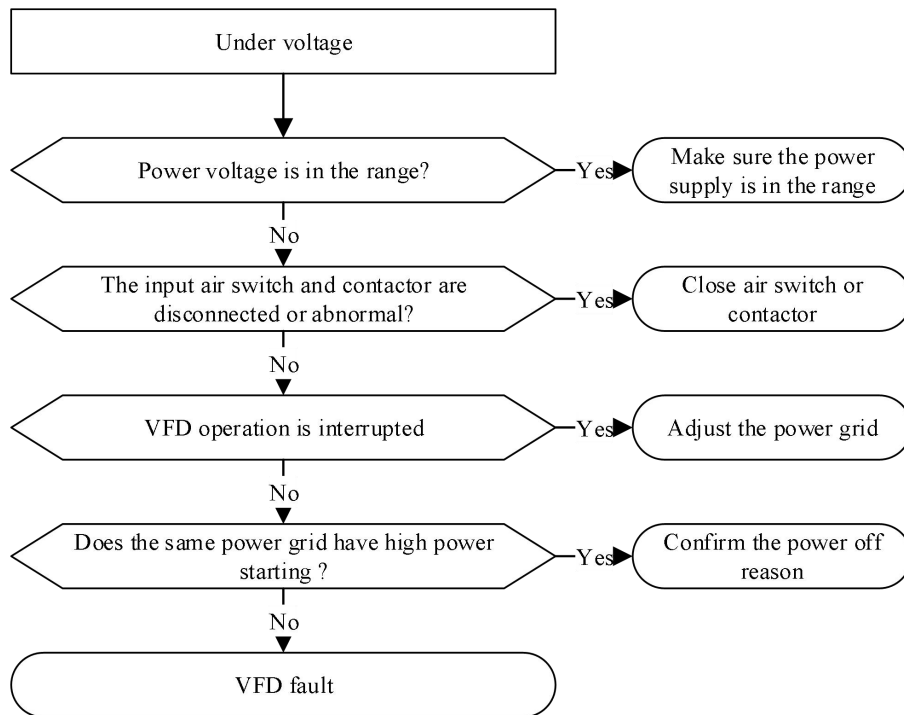
7-4-5. Over current



7-4-6. VFD overheat

7-4-7. The motor stalls during acceleration and deceleration



7-4-8. Under voltage

8. Maintenance and Upkeep

8-1. 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.

8-1-1. Routine maintenance

When the frequency converter is turned on normally, please confirm the following items:

- (1) Whether the motor has abnormal sound and vibration.
- (2) Whether the frequency converter 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 frequency converter operates normally.

8-2. Regular maintenance and upkeep

8-2-1 Regular maintenance

When the frequency converter 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	Is the screw loose	Tighten with a screwdriver
Heat sink	Is there any dust	Blow off with 4 ~ 6kgcm ² dry compressed air
PCB board	Is there any dust	Blow off with 4 ~ 6kgcm 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	Is there any dust	Blow off with 4 ~ 6kgcm ² dry compressed air
Aluminum electrolytic capacitor	Discoloration, odor and blistering	Replace the Aluminum electrolytic capacitor

8-2-2 Maintenance upkeep

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 frequency converter is different because of its different environment and conditions. As shown in the table below, the maintenance period of frequency converter 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℃.
- (2) Load factor: below 80%.
- (3) Running time: less than 12 hours per day.

8-3. Warranty of frequency converter

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; 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 frequency converter;
 - Frequency converter damage caused by flood, fire, abnormal voltage, etc;
 - Frequency converter damage caused by wrong connection cable, etc;
 - Damage caused by using frequency converter 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

VHL series frequency converter 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 frequency converter. In addition, the user can also use a frequency converter as the master, and connect several frequency converters of our company as slave through RS485, in order to realize the multi-machine linkage of the frequency converter. The remote control keyboard can also be connected through the communication port to realize the remote operation of the frequency converter by users.

The MODBUS communication protocol of this converter supports RTU 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 frequency converters 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 frequency converter 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 frequency converter 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

1) 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

2) Communication address

00H: all frequency converter 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).

3) 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.

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 multi-group data to the 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) Command code: 08H communication loop test

This command is used to test whether the communication between the master control equipment and the inverter is normal. The frequency converter will return the received data to the main control equipment.

RTU mode:

Format of inquiry information		Format of response information	
Address	01H	Address	01H
Function code	08H	Function code	08H
Contents	01H	Contents	01H
	02H		02H
	03H		03H
	04H		04H
CRC CHECK Low	41H	CRC CHECK Low	41H
CRC CHECK High	04H	CRC CHECK High	04H

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 field consists of one byte containing an 8-bit binary value. The LRC value is calculated by the transmitting device and added to the message frame. During message reception, the receiving device calculates the LRC value and compares it with the LRC value contained in the received message. If the two values do not match, an error is detected.

The LRC check is a simple error-checking method used in ASCII mode. It checks all message fields except for the start character (:) and the end-of-frame characters (CR and LF).

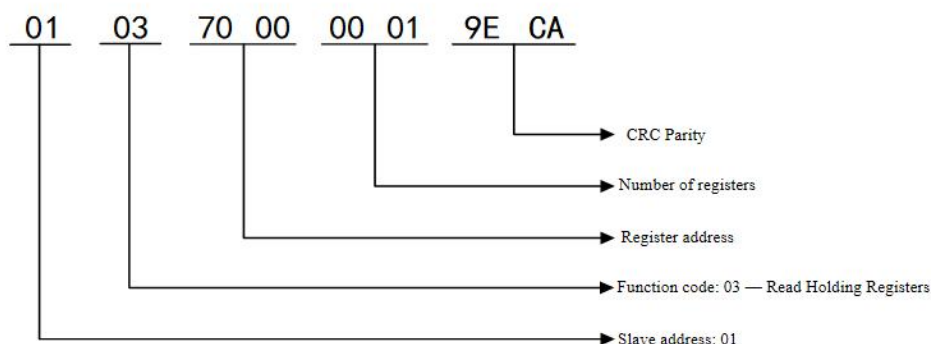
In ASCII mode, each 8-bit byte is divided into two ASCII characters for transmission. For example, the hexadecimal value 0x03 is divided into two ASCII characters, "0" and "3", corresponding to ASCII codes 0x30 and 0x33 (binary values 00110000 and 00110011). Therefore, the amount of transmitted data is twice that of RTU mode.

In RTU mode, each byte is transmitted directly as one hexadecimal byte. For example, the hexadecimal value 0x33 is transmitted directly as 0x33 (binary value 00110011). The transmission efficiency is twice that of ASCII mode.

Example: Read the contents of register address 7000H (running frequency).

Data transmitted in RTU mode:

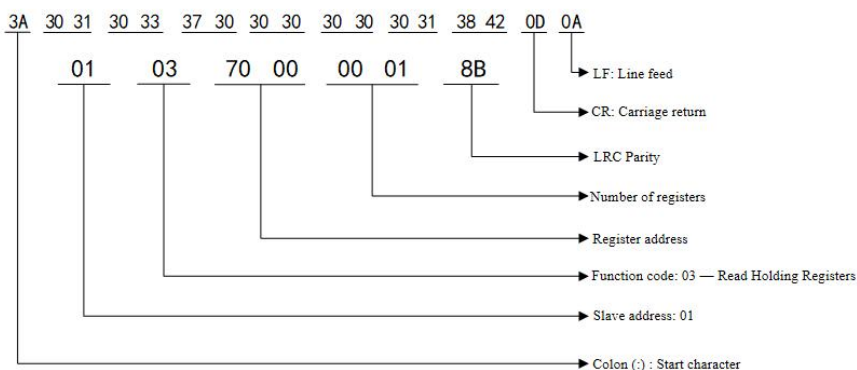
01 03 70 00 00 01 9E CA



ASCII mode transmission data:

3A 30 31 30 33 37 30 30 30 30 30 30 31 38 42 0D 0A

(Equivalent RTU frame: 01 03 70 00 00 01 8B)



5) Common ASCII Code Table

Binary	Decimal	Hexadecimal	Character	Binary	Decimal	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 frequency	Write
Control command	1100H	1: Forward running 2: Reverse operation 3: Forward jog 4: Reverse jog 5: Deceleration stop 6: Free stop	Write

Definition	Modbus address	Function	Note
		7: Fault reset	
Digital output terminal control	1101H	bit0: Y1 output control bit1: Reserved bit2: Reserved bit3: RELAY1 output control bit4: RELAY2 output control	Write
Y1 high speed pulse control	1102H	0~7FFF represents 0%~100%	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 run 2: Reverse run 3: Stop	Read
VFD fault	1210H	0000H: None 0001H: Acceleration over current 0002H: Deceleration over current 0003H: Constant speed over current 0004H: Acceleration overvoltage 0005H: Deceleration overvoltage 0006H: Constant speed over voltage 0007H: Buffer resistance overload fault 0008H: Under voltage fault 0009H: Inverter overload 000AH: Motor overload 000BH: Input phase missing 000CH: Output phase missing 000DH: Radiator overheating 000EH: Contactor fault 000FH: Current detection fault 0010H: Motor tuning fault 0011H: Code disk failure 0012H: Motor short circuit to ground fault 0014H: Wave by wave current limiting fault 0015H: Pole position detection failed 0016H: UVW signal feedback error 0017H: Brake resistance short circuit 001AH: SVC stall fault 002BH: External fault 002CH: Communication (timeout) failure 002DH: EEPROM read / write failure 002EH: Run time arrived 002FH: Power on time arrived	Read

Definition	Modbus address	Function	Note
		0030H: User defined fault 1 0031H: User defined fault 2 0032H:PID feedback lost during operation 0033H: Switch motor during operation 0034H: Large speed deviation 0035H: Motor overspeed 0036H: Motor overtemperature	

When the frequency is set by communication (P0-03=6),

$$Frequency \quad (Hz) = \frac{Data \times P0 - 13}{10000}, \text{ (Data range:0~10000)}$$

Data can be a register value or a direct numerical value. The valid range of Data is 0 – 10000. Values exceeding this range cannot be written. When users set the frequency through RS-485 communication, the corresponding Data value can be calculated according to the following formula.

For example, if the maximum output frequency of P0-13 is set to 50Hz, write 10000 to the corresponding address H1000 of the frequency, and the actual panel displays the frequency value of $100.00 \times 50\% = 50\text{Hz}$.

If there is a user password: after writing the correct password, read it within 30s, otherwise it will need to be written again.



H1000 is retained after power-off. If the power supply voltage is too low or the write operation time is insufficient, the H1000 value may not be saved after power-off.



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