VEIKONG

VFD510 High Protection Series

Inverter User Manual

Preface

First of all, thank you for purchasing the VFD510 series high-protection inverter from Veikong Industrial Co., Ltd.!

VFD510 series high protection inverter is an IP55 protection level inverter launched by our company. The product is especially suitable for application with a lot of dust, oil and water mist environments .

VFD510 can drive both asynchronous motors and permanent magnet synchronous motors. It is equipped with STO function and supports a variety of encoder types and communication interfaces. It has excellent performance, rich functions, good reliability and environmental awareness.

This manual introduces in detail the product features, installation and wiring, debugging and maintenance of the VFD510 series inverter. Please read the safety precautions in this manual carefully before use to ensure personal and equipment safety.

Data acquisition

For the electronic version of the manual, you can visit VEIKONG's official website www.veikong.com, select the corresponding file on the "Download Center" page and download it.

PRECAUTIONS
➢ Users who are using this product for the first time should read this manual carefully before operating the drive.
➢ Please strictly follow the description in Chapter 3 for installation and wiring.
➢ If you have any uncertain questions during use, please consult your local dealer or contact our company's technical service center.
➢ Due to product improvement, specification changes and further improvement of the user manual, the contents of this manual are subject to change.
➢ Please keep this manual properly for future reference.

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Contents

Chapter 1 Safety Information and Precautions

Safety Definitions: In this manual, safety precautions are divided into the following two categories:

 Indicates that failure to comply with the notice will result in serious injury or even death

 Indicates that failure to comply with the notice will result in moderate or minor injury and equipment damage

Read this manual carefully so that you have a thorough understanding. Installation, commissioning or maintenance may be performed in conjunction with this chapter. will assume no liability or responsibility for any injury or loss caused by improper operation.

1.1 Safety Precautions

Use stage	Security Level	Precautions
Before Installation	 DANGER	➢ Packing water, parts missing or damaged parts, please do not install! ➢ Packaging logo and physical name does not match, please do not install!
	 WARNING	➢ Handling should be light lift, otherwise there is the danger of damage to equipment! ➢ Do not use damaged drive or missing drive. Risk of injury! ➢ Do not touch the control system components by hand, or there is the danger of electrostatic damage!
During Installation	 DANGER	➢ Please install the flame-retardant objects such as metal, away from combustibles, or may cause a fire!
	 WARNING	➢ Do not allow lead wires or screws to fall into the drive, otherwise the drive may be damaged! ➢ Install the drive in a place where there is less vibration and direct sunlight. ➢ Drive placed in airtight cabinet or confined space, please note the installation of space to ensure the cooling effect.
Wiring	 DANGER	➢ You must follow the guidance of this manual and be used by qualified electrical engineers. Otherwise, unexpected danger may occur! ➢ There must be a circuit breaker between the drive and the power supply, otherwise a fire may occur! ➢ Make sure the power supply is in zero-energy state before wiring, otherwise there is danger of electric shock! ➢ Please follow the standard to the drive properly grounded, otherwise there is the risk of electric shock!

	 WARNING	➢ Never connect input power to the drive's output terminals (U, V, W). Note that the terminal markings, do not take the wrong line! Otherwise, it will cause damage to the drive! ➢ Never connect the braking resistor directly to the DC bus +, - terminals. Otherwise, it will cause a fire! ➢ Refer to the manual's recommendations for the wire diameter used. Otherwise, it may happen accident! ➢ Do not disassemble the connecting cable inside the driver. Otherwise, the internal of the servo driver may be damaged.
Before Power-on	 DANGER	Make sure the voltage level of the input power is the same as the rated voltage of the driver. Check if the wiring position of the power input terminals (R, S, T) and output terminals (U, V, W) is correct; Of the external circuit is short-circuited, the connection is tightened, or cause damage to the drive! No part of the drive needs to withstand voltage test, the product has been made before the test. Otherwise, it may cause accident!
	 WARNING	➢ The driver must be covered before the cover can be powered, otherwise it may cause electric shock! ➢ All peripheral accessories must be wired according to the instructions in this manual, and be properly wired in accordance with this manual. Otherwise, it may cause accident!
After Power-on	 DANGER	➢ Do not open the cover after power on, otherwise there is danger of electric shock! ➢ If the indicator light does not light after power on, the keyboard does not display the situation, immediately disconnect the power switch, do not touch any input and output terminals of the drive, otherwise there is the risk of electric shock!
	 WARNING	➢ If parameter identification is required, preclude the possibility of injury when rotating the motor! ➢ Do not arbitrarily change the drive manufacturer parameters, or it may cause damage to the device!
During Operation	 DANGER	➢ Do not touch the cooling fan, radiator and discharge resistance to test the temperature, otherwise it may cause burns! ➢ Non-professional technicians Do not detect the signal during operation, otherwise it may cause personal injury or equipment damage!
		➢ Drive operation, should avoid something falling into the device, otherwise it will cause damage to the device! ➢ Do not use the contactor on-off method to control the start and stop

	WARNING	the drive, otherwise it will cause damage to the equipment!
Maintenance	 DANGER	➢ Do not live on the equipment repair and maintenance, or there is a risk of electric shock! ➢ Turn off the input power for 10 minutes before performing maintenance and repair on the drive, otherwise the residual charge on the capacitor will cause harm to people! ➢ Do not carry out maintenance and repair on the drive without personnel who have been professionally trained, otherwise personal injury or equipment damage will occur! ➢ All pluggable plug-ins must be unplugged in the case of power failure! ➢ The parameters must be set and checked after replacing the drive.
	 WARNING	➢ Before performing maintenance work on the drive, make sure that the motor is disconnected from the drive to prevent the motor from feeding back power to the drive due to accidental rotation.

1.2 Safety label description

In order to ensure the safe operation and maintenance of the equipment, please be sure to abide by the safety signs affixed to the equipment, and do not damage, damage or peel off the safety signs. The safety signs are explained as follows:

safety signs	Description
 Risk of electric shock Don't touch the terminal until 10 minutes after the power supply off	**Danger Warning Signs** ➢ May cause injury or electric shock. ➢ Do not remove this cover plate while powered on or within 10 minutes after the power is cut off.

Note: The drive shell will temporarily remain high after a power outage. Please do not touch the drive shell immediately at this time.

1.3 Precaution

- **Contactor using**

If the contactor is installed on the power input side of the inverter, do not make the contactor frequent on-off operation. The interval between ON and OFF of the contactor should not be less than one hour. Frequent charging and

discharging will reduce the use of capacitors in the inverter life.

If a contactor is installed between the inverter output terminals (U, V, W) and the motor, make sure that the inverter is turned on and off when there is no output. Otherwise, the inverter may be damaged.

- **Lightning surge protection**

  Although this series of inverters are equipped with lightning over-current protection device, there is a certain degree of self-protection for inductive lightning, but for lightning frequent place, customers should also install lightning protection device in the front of the inverter.

- **Altitude and derating use**

  In areas where the altitude exceeds 1000m, the heat dissipation effect of the inverter becomes poor due to the thin air, so it is necessary to derate the inverter. In this case, please contact our company for technical consultation.

- **Input power**

  The input power supply of the frequency converter should not exceed the operating voltage range specified in this manual. If necessary, please use a boost or step-down device to convert the power supply to the specified voltage range.

  Do not change the three-phase inverter to two-phase input, otherwise it will cause malfunction or damage to the inverter.

- **Output filter**

  When the cable length between the inverter and the motor exceeds 100 meters, it is recommended to use an output AC reactor to prevent overcurrent caused by excessive distributed capacitance from causing inverter failure. The output filter can be selected according to site requirements.

  The output of the inverter is a PWM wave. Please do not install capacitors to improve the power factor or varistors for lightning protection on the output side. Otherwise, it may easily cause instantaneous overcurrent of the inverter or even damage the inverter.

- **About motor heating and noise**

  Because the output voltage of the inverter is a PWM wave and contains certain harmonics, the temperature rise, noise and vibration of the motor will increase slightly compared with power frequency operation.

- **Scraping**

  The electrolytic capacitors in the main circuit and the electrolytic capacitors on the printed circuit board may explode when burned, and toxic gases will be produced when plastic parts are burned. Please dispose of it as industrial waste.

- **Scope of application**

  This product is not designed and manufactured for use in life-critical situations. If you need to use this product in manned mobile vehicles, medical, aerospace, nuclear energy and other equipment or other special purposes, please contact our company. For more information.

  This product is produced under strict quality control. If it is used in equipment that may cause major accidents or losses due to inverter failure, please configure safety devices.

Chapter 2 Product Information

2.1 Nameplate and model description

Nameplate：

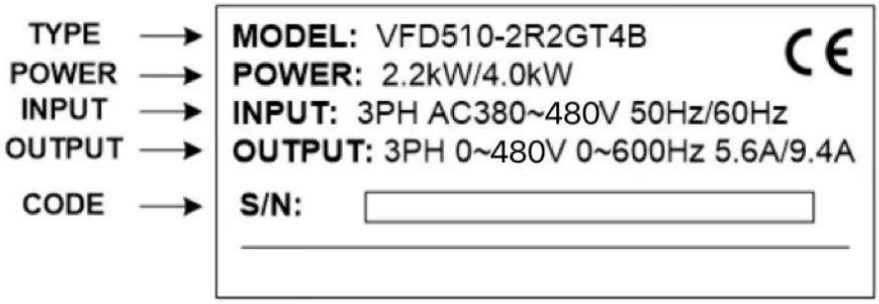


Figure 2-1 Nameplate

Model description：

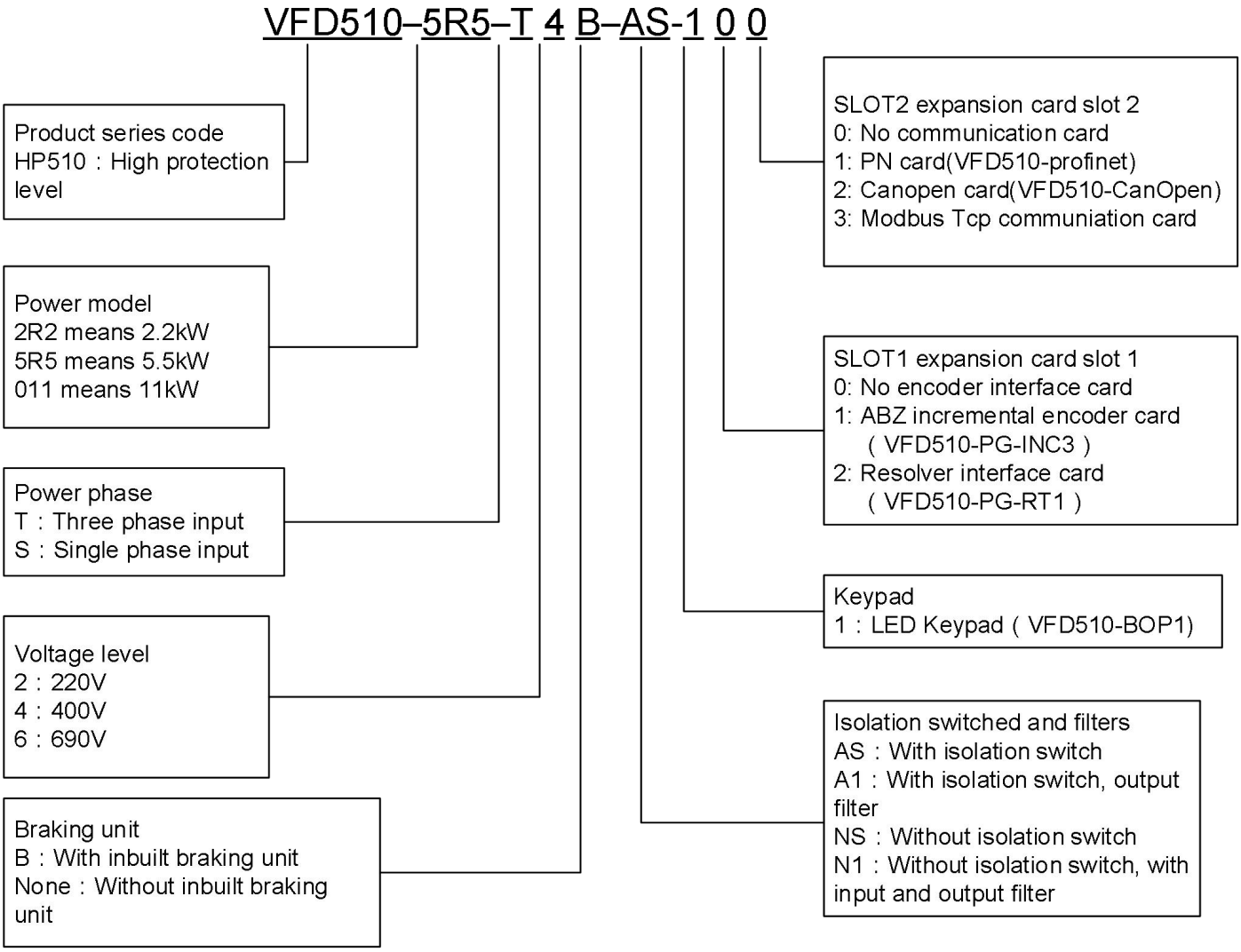


Figure 2-2 Model description

Table 2-1 Model and technical data

Model	Rated output current (A)	Structure size	Braking unit
Three phase voltage: 380V，50/60Hz			
VFD510-2R2-T4B	5.6	SIZE A	Standard built-in
VFD510-4R0-T4B	9.4		
VFD510-5R5-T4B	13.0		
VFD510-7R5-T4B	17.0	SIZE B	
VFD510-011-T4B	25.0		
VFD510-015-T4B	32.0	SIZE C	
VFD510-018-T4B	37.0		
VFD510-022-T4B	45.0		

2.3 Product technical specifications

Table 2-2 VFD510 inverter technical specifications

Item		Specification
Power supply	Input voltage	Single phase/three phase 220Vmodel：200V～240V Three phase 380V model：380V～480V
	Allowable voltage fluctuation range	-15%～10%
	Input frequency	50Hz or 60Hz，allowable fluctuation range ±5%
	Input filtering	Three phase 380V model SIZE C and above can be connected to an external DC reactor
Output	Maximum output voltage	Three phase：0～input voltage
	Overload capacity	Standard (heavy duty) application: 150% rated output current for 60 seconds Light load application: 120% rated output current for 60 seconds
Control features	Control mode	V/f control Speed sensor-less vector control（SVC） Vector control with speed sensor（VC）
	Operating mode	Speed control、torque control（SVC and VC）
	Speed range	1:100（V/f） 1:200（SVC） 1:1000（VC）
	Speed control accuracy	±0.5%（V/f） ±0.2%（SVC） ±0.02%（VC）
	Speed response	5Hz（V/f） 20Hz（SVC） 50Hz（VC）
	Frequency control	0.00～600.00Hz（V/f） 0.00～200.00Hz（SVC）

	range	0.00～400.00Hz（VC）
	Input frequency resolution	Digital input：0.01Hz Analog input：0.1% of maximum frequency
	Startup torque	150%/0.5Hz（V/f） 150%/0.25Hz（SVC） 150%/0Hz（VC）
	Torque control accuracy	SVC：10% within 5Hz, 5% above 5Hz VC：3.0%
	V/f feature	V/f curve type: straight line, multi-point, power function, V/f separation； Torque boost support: automatic torque boost (factory setting), manual torque boost
	Frequency given slope	Supports linear and S-curve acceleration and deceleration； 4 groups of acceleration and deceleration times, setting range 0.00s ~ 60000s
	DC bus voltage control	Overvoltage stall control: Limit the power generation of the motor by adjusting the output frequency to avoid overvoltage faults； Under-voltage stall control: Control the power consumption of the motor by adjusting the output frequency to avoid under-voltage faults.
	Carrier frequency	1kHz～12kHz(varies by type)
	Startup method	Direct start (DC braking can be superimposed); speed tracking start
	Stop method	Deceleration to stop (DC braking can be superimposed); free stop
	Main control function	Jogging control, droop control, up to 16-speed operation, dangerous speed avoidance, swing frequency operation, acceleration and deceleration time switching, VF separation, over-excitation braking, process PID control, sleep and wake-up functions, built-in simple PLC logic, virtual Input and output terminals, built-in delay unit, built-in comparison unit and logic unit, etc., parameter backup and recovery, complete fault records, fault retry, free switching of two sets of motor parameters, software swapping of output wiring, terminal UP/DOWN, etc.
Function	Keypad	Standard LED digital keyboard
	Communication	Standard： Modbus communication Extension card： CANopen communication card Profinet communication card ModbusTCP communication card
	Encoder interface card	Incremental encoder interface card Resolver interface card
	Input terminal	Standard： 5 digital input terminals, 1 of which supports high-speed pulse input up to 50kHz 2 analog input terminals, supporting 0~10V voltage input or 0~20mA current input
	Output terminal	Standard： 1 digital output terminal； 1 high-speed pulse output terminal (open collector type), supporting square wave signal output from 0 to 50kHz; 2 relay output terminals 2 analog output terminals, supporting 0~20mA current output or 0~10V voltage output.
Protection	Refer to Chapter 6 “Troubleshooting and Countermeasures” for the protection function	
Environment	Place of use	A place far away from sources of electromagnetic radiation; Place with no metal powder, corrosive gas, flammable gas, oil mist, or salt; Places out of direct sunlight
	Altitude	0～3000 meters. Derating is required for use above 1000 meters. For every 100 meters, the rated output current is reduced by 1%.
	Ambient	-10℃～+40℃, maximum 50℃. Starting from 40℃, the rated output current decreases by 1.5%

	temperature	for every 1℃ increase.
	Humidity	Less than 95%RH, no condensation
	Vibration	Less than 5.9m/s2 (0.6g)
	Storage temperature	-20℃～+60℃
Others	Installation method	Wall-mounted, through-the-wall
	Protection level	**IP55**
	Cooling method	Forced air cooling

2.4 Product Part Description

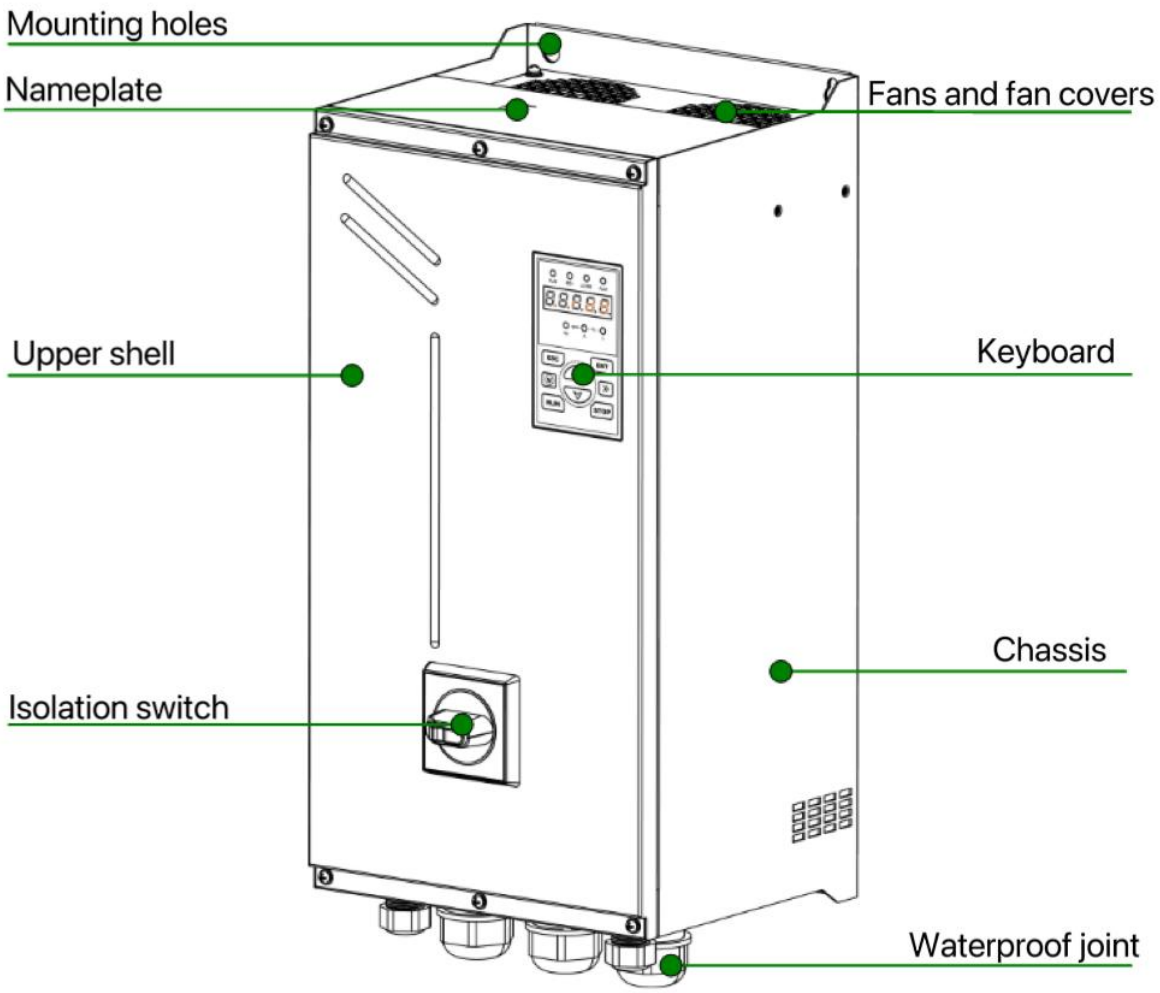


Figure 2-3 VFD510 inverter SIZE A~C (VFD510-2R2-T4B ~ VFD510-022-T4B) component description

Chapter 3 Mechanical and electrical installation

3.1 VFD appearance and installation

3.1.1 VFD overall dimensions and installation dimensions

◆VFD overall dimensions and installation dimensions

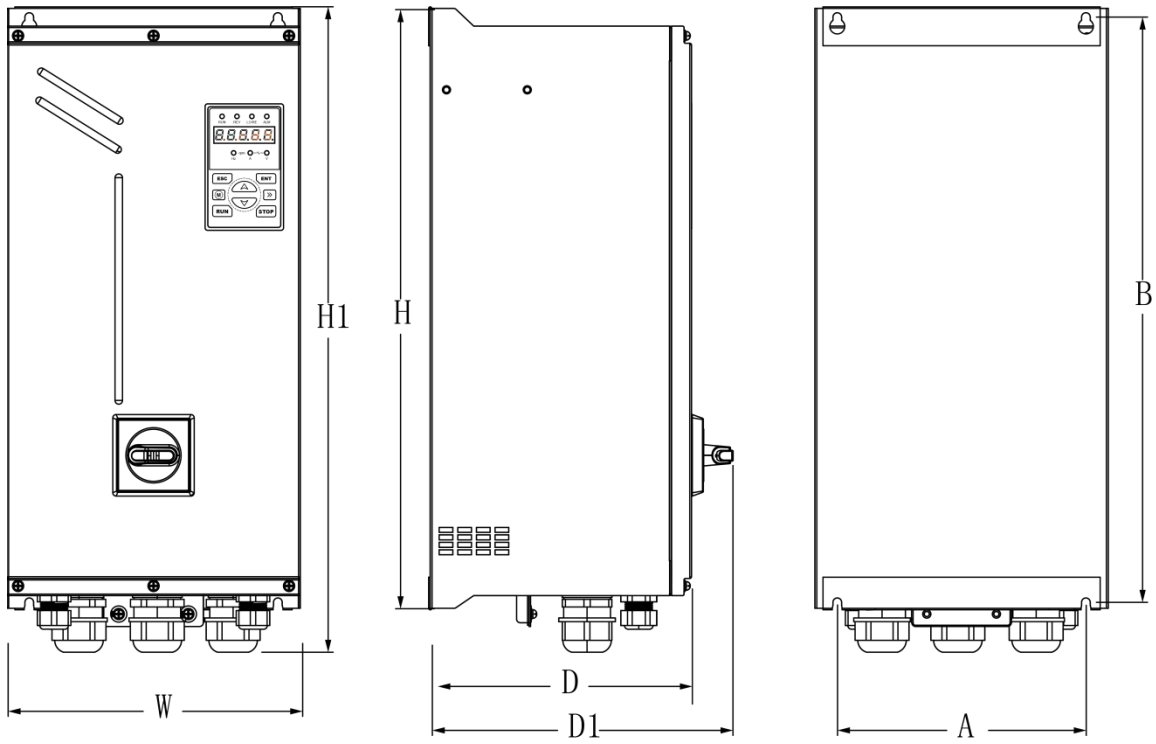


Figure 3-1 SIZE A ~ SIZE C (VFD510-2R2-T4B ~ VFD510-015-T4B) overall dimensions

Table 3-1 Overall dimensions and installation dimensions of VFD510 series

Size	Covered models	Appearance and installation dimension（mm）							
		A	B	H	H1	W	D/D1	Φd	Mounting screws
SIZEA	VFD510-2R2-T4B VFD510-4R0-T4B VFD510-5R5-T4B	128	372	385	400	160	195/230	Φ6	M5
SIZEB	VFD510-7R5-T4B VFD510-011-T4B	165	408	420	445	200	210/245	Φ6	M5
SIZEC	VFD510-015-T4B VFD510-018-T4B VFD510-022-T4B	200	470	480	515	235	210/245	Φ7	M6

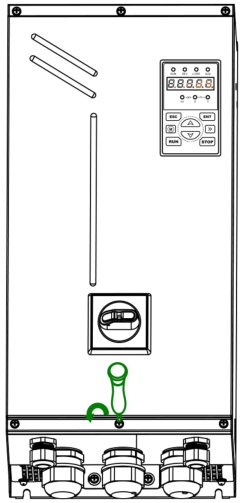
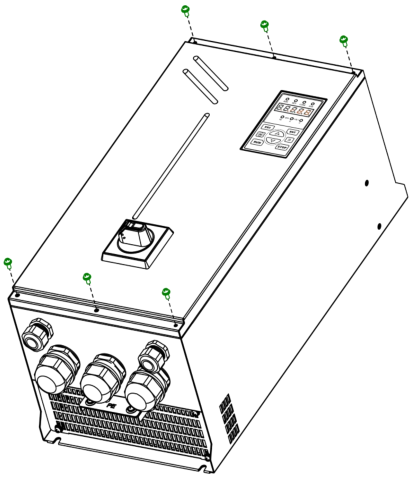
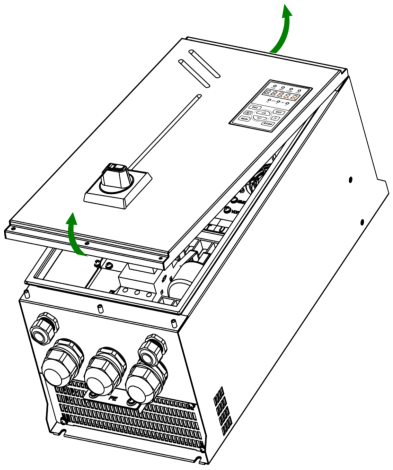
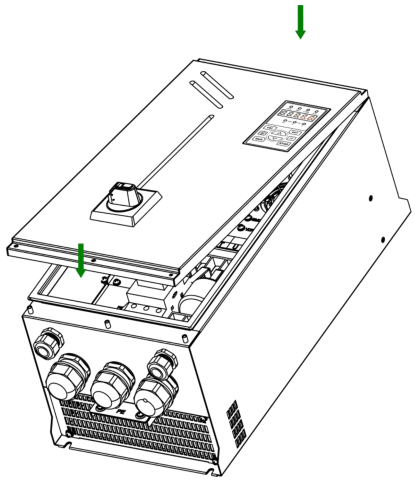
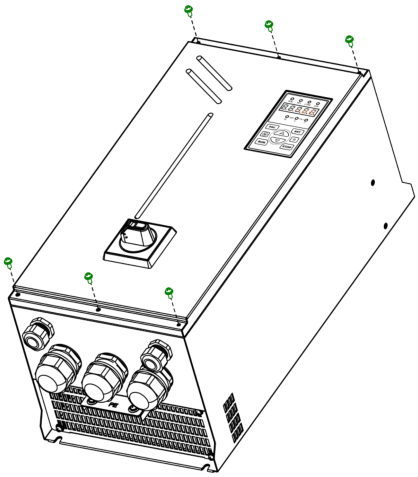
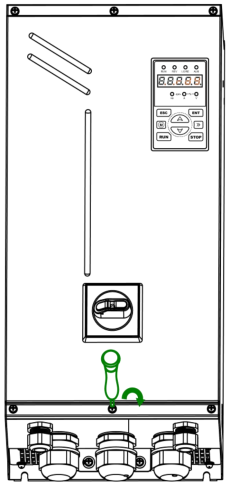
Remark：

（1）Φd is the diameter of the screw hole for mounting the whole machine.

（2）(Models above 15KW reserve external DC reactor wiring positions).

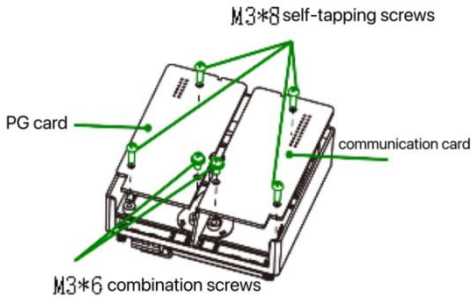
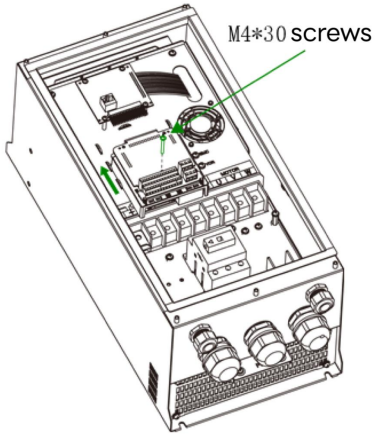
3.1.2 Removal and installation of cover and cable entry board

◆ SIZEA～C（VFD510-2R2-T4B ~ VFD510-022-T4B）Removal and installation of cover：

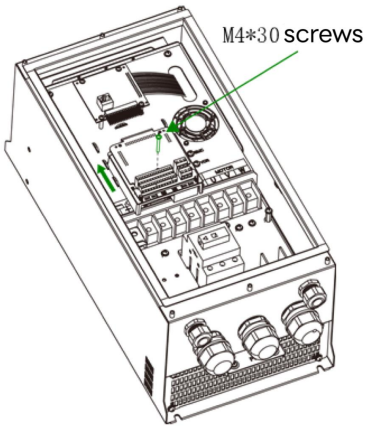
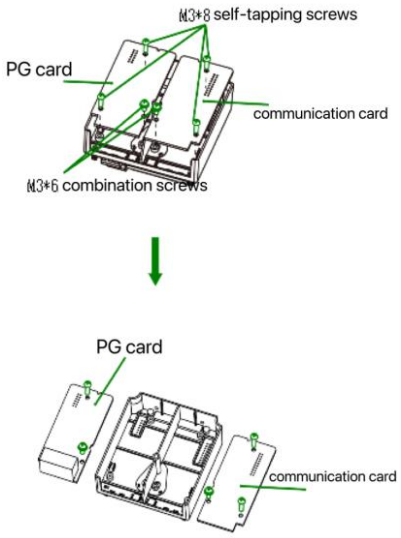
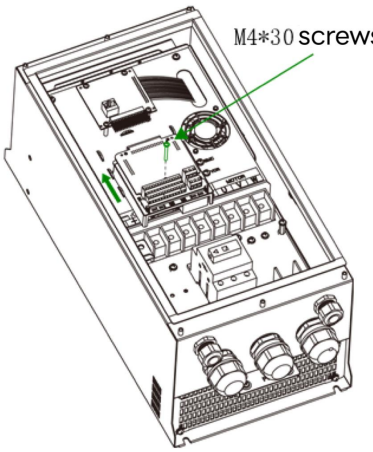
<table>
<tr><th colspan="3">Removal steps</th></tr>
<tr><td>1. Loosen the 6 M4*10 combination screws on the cover
  </td><td>2. Remove the 6 M4*10 screws on the cover
  </td><td>3. Take off the cover
  </td></tr>
<tr><th colspan="3">Installation Steps</th></tr>
<tr><td>1. Fasten the cover vertically downwards
  </td><td>2. Put the 6 screws into the corresponding positions
  </td><td>3. Tighten the screws on the over
  </td></tr>
</table>

3.2 Optional accessories installation

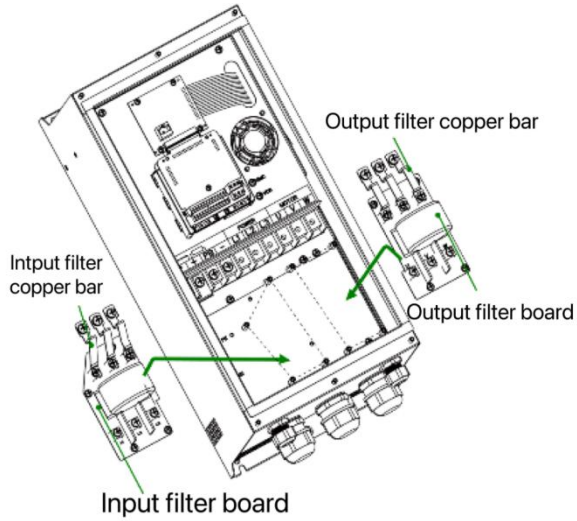
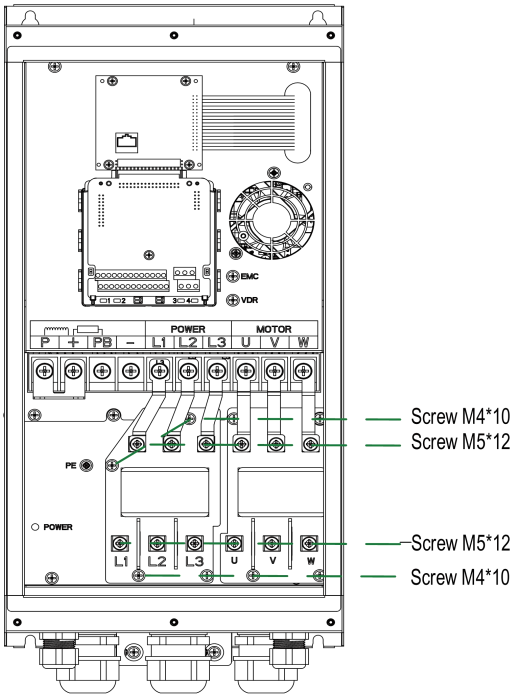
3.2.1 Installation of PG card and communication card

Installation of PG card and communication card	
1.Use screws to install the PG card or communication card on the IO bracket (note the left and right positions of different function cards) 	2. Push the IO board assembly with the PG card or communication card installed in the direction of the arrow to connect with the DSP board. After successful docking, use M4 screws to fix the IO board assembly. 

3.2.2 Disassembly of PG card and communication card

3.2.2 Disassembly of PG card and communication card		
1. Loosen the M4*30 screws on the IO board assembly and take it out, then push the IO board assembly in the direction of the arrow to disengage it from the DSP board. 	2. After the IO component is detached from the DSP board, turn over the IO component, loosen the screws of the PG card or communication card, and take out the PG card or communication card. 	3.Push the IO board assembly with the PG card or communication card out in the direction of the arrow to reconnect with the DSP board, and fix it with M4*30 screws. 

3.2.3 Installation of input/output filter board

Installation of input/output filter board	
1. Place the input filter board or output filter board assembly within the dotted area shown by the arrow in the figure below  	2. Place the input filter board or output filter board assembly in the corresponding position and fix it with screws. 

3.3 External lead wiring operation

◆External keyboard cable

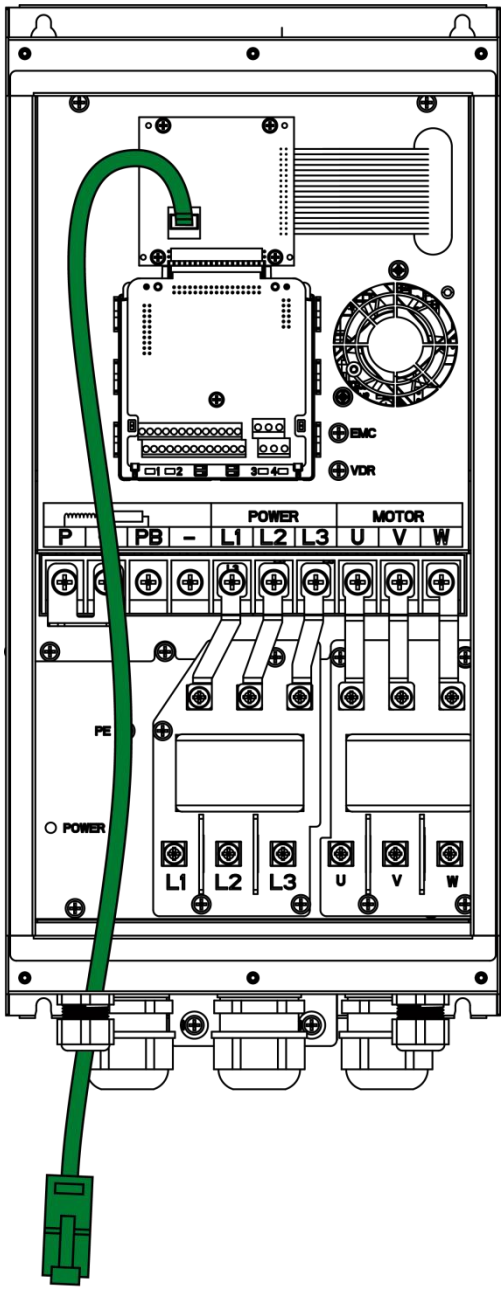


Figure 3-2 Schematic diagram of connecting the external keyboard cable

As shown in Figure 3-2, the external keyboard network cable is led out through the waterproof connector according to the path shown in the figure.

3.4 Main circuit standard wiring diagram

3.4.1 Main circuit wiring diagram

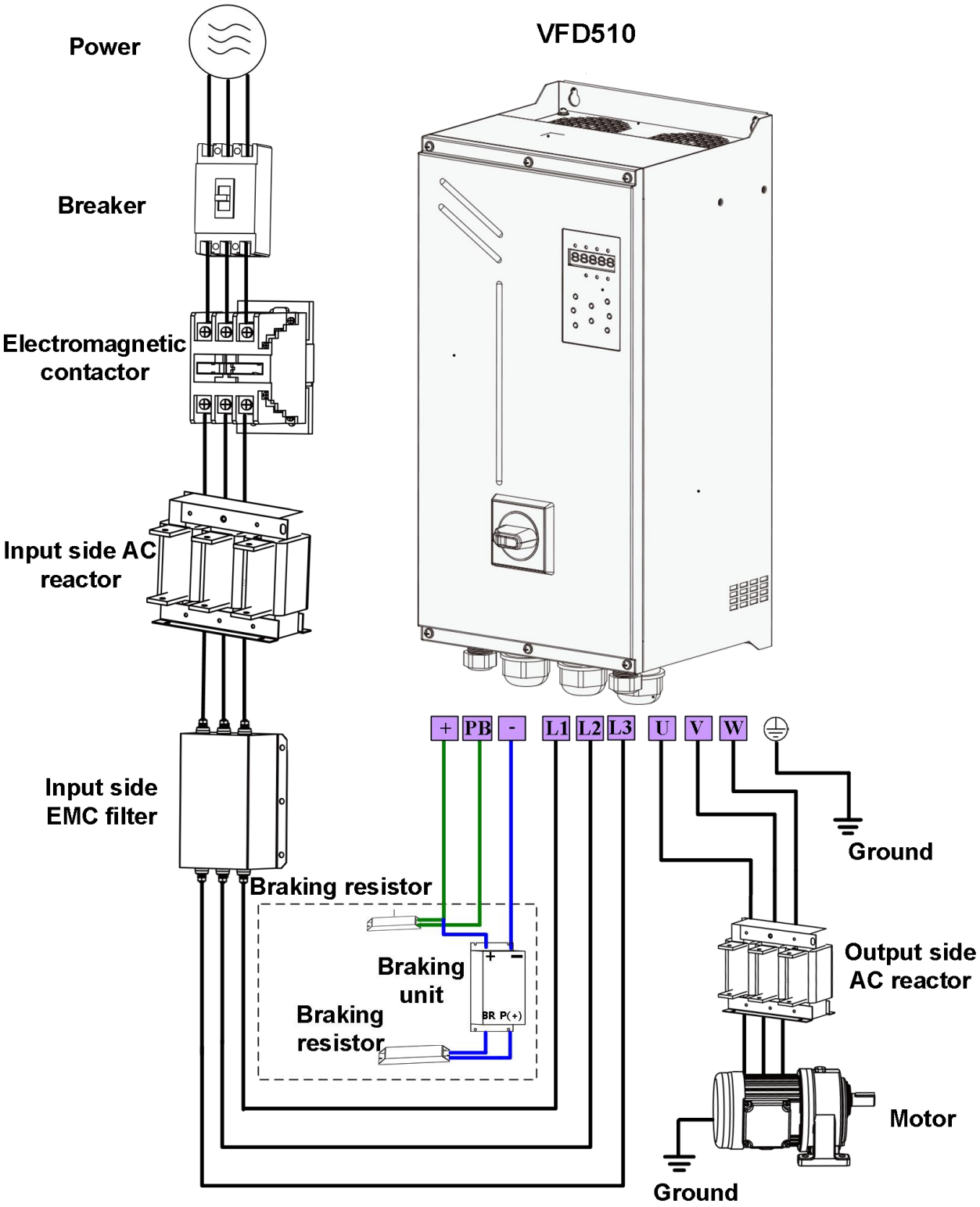


Figure 3-3 Main circuit wiring diagram

3.4.2 Peripheral device description

Device name	Function description
Power	➢ The input power supply must meet the range specified by the product
Breaker	➢ Since a large current will appear when the power is turned on, the circuit breaker capacity is 1.5 to 2 times the rated current of the driver. ➢ The time characteristics of the circuit breaker should fully consider the time characteristics of the driver overload protection. ➢ Its main function is to prevent accidents when downstream equipment overflows.
Electromagnetic contactor	➢ To ensure safety, please do not frequently close and disconnect the contactor, avoid frequent power on and off of the driver, and avoid starting the driver directly through the contactor. ➢ When using a braking resistor, in order to prevent the braking resistor from overheating and damage, please install a thermal protection relay for overheating detection of the braking resistor, and control the contactor on the power supply side to open through the contacts of the thermal protection relay.
Input side AC reactor	➢ The drive power supply capacity is greater than 600kVA or the power supply capacity is greater than 10 times the drive capacity. ➢ If there is a switched reactive power compensation capacitor or a thyristor phase-controlled load on the same power node, a large peak current will flow into the input power circuit, which will cause damage to the rectifier components. ➢ When the voltage imbalance of the driver's three-phase power supply exceeds 3%, it will cause interference to the system or damage to the rectifier components. ➢ The input power factor of the driver is required to be greater than 90%, and the input AC reactor can improve the power factor on the input side. ➢ It is required to improve the high-order harmonics on the input side to prevent voltage waveform distortion from causing damage to other equipment. ➢ Improve the impact of high-order harmonics on the input side on the driver and reduce external conduction and radiation interference.
Brake components	➢ When rapid deceleration is required or the motor is generating electricity, a braking resistor and braking unit must be installed. For the selection of driver braking resistor and braking unit, please see the section "Chapter 7 Braking Component Selection".
Thermal protection relay	➢ Although the driver has its own motor overload protection function, when one driver drives two or more motors or drives a multi-pole motor, in order to prevent the motor from overheating, please install a thermal protection relay between the driver and each motor.
Output side AC reactor	➢ When the connection from the driver to the motor exceeds 100 meters, it is recommended to install an AC output reactor that can suppress high-frequency oscillation to avoid motor insulation damage, excessive leakage current, and frequent driver protection.
Motor	➢ Choose a motor that matches the actual usage.

3.4.3 Peripheral device selection guidance

Drive model	Recommended circuit breaker (MCCB) current (A)	Recommended contactor current (A)	Recommended control loop conductor cross-sectional area (mm^2)
VFD510-2R2-T4B	16	10	0.5
VFD510-4R0-T4B	25	16	0.5
VFD510-5R5-T4B	32	25	0.75
VFD510-7R5-T4B	40	32	0.75
VFD510-011-T4B	63	32	0.75
VFD510-015-T4B	63	63	0.75
VFD510-018-T4B	100	63	1.0
VFD510-022-T4B	100	100	1.0

Table 3-2 Selection guide for some peripheral electrical components of VFD510 (three-phase 380V level)

NOTE: Select fuses according to instructions. In the event of a short circuit, the fuse will protect the input power cables from damage to the frequency converter and protect adjacent equipment from damage in the event of a short circuit within the frequency converter.

3.4.4 Main circuit terminals

Figure 3-4 SIZE A~B main circuit wiring terminal diagram

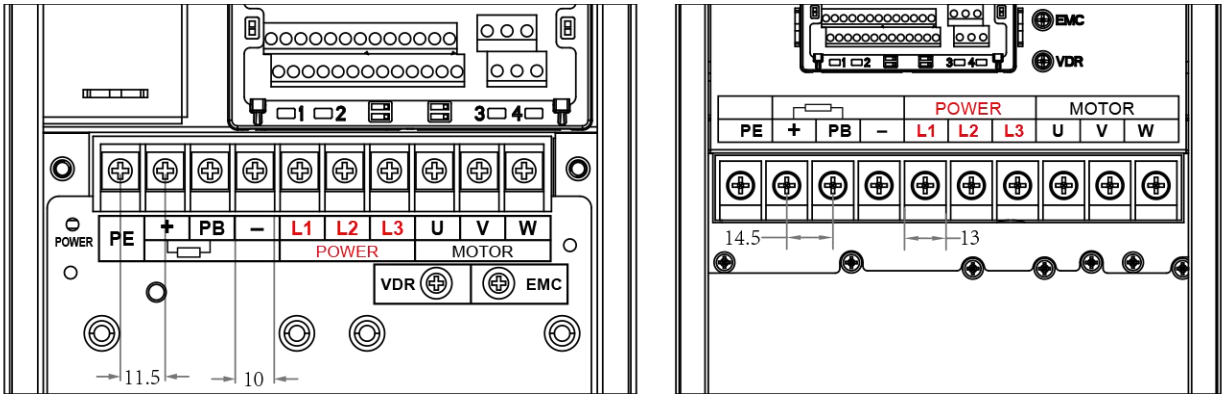


Figure 3-5 SIZE C main circuit wiring terminal diagram

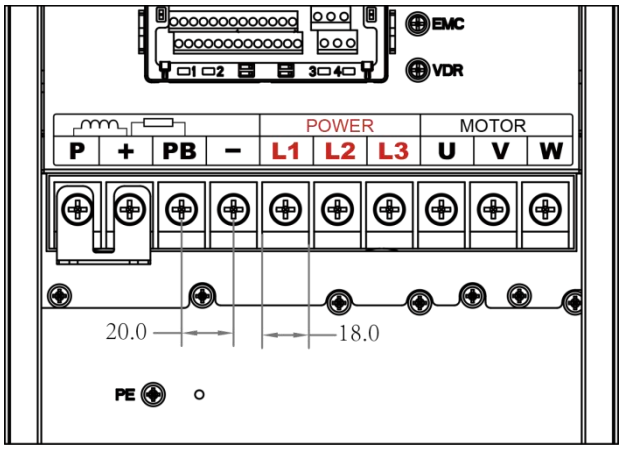


Table 3-3 Function description of the main circuit terminals of the frequency converter

Terminals	Function description
L1、L2、L3	AC power input terminal, connected to three-phase AC power
U、V、W	AC output terminal of the VFD, connected to the three-phase AC motor
+、-	They are the positive and negative terminals of the internal DC bus, which are used for the common DC bus, or for connecting to an external braking unit.
P、P+	Connect a DC reactor. When not using a DC reactor, short-circuit P1 and P2 (P2 is equivalent to the "+" of the DC bus)
+、PB	When the braking unit is built-in, the braking resistor connection terminal
PE、⏚	Ground terminal, connect to the earth
EMC、VDR	Safety capacitor and varistor ground selection screw

3.4.5 Terminal screws and wiring specifications

Table 3-4 Main circuit cable and screw specifications

Drive model	Power terminal			Ground terminal		
	screws	Tightening torque（N·m）	Cable diameter（mm^2）	screws	Tightening torque（N·m）	Cable diameter（mm^2）
VFD510-2R2-T4B	M4	2	6	M4	2	6
VFD510-4R0-T4B	M4	2	6	M4	2	6
VFD510-5R5-T4B	M4	2	6	M4	2	6
VFD510-7R5-T4B	M5	4	10	M4	2	6
VFD510-011-T4B	M5	4	10	M4	2	6
VFD510-015-T4B	M6	4	16	M4	2	6
VFD510-018-T4B	M6	4	16	M4	2	6
VFD510-022-T4B	M6	4	16	M4	2	6

3.4.6 Precautions for main circuit wiring

（1）Power cord wiring

◆It is strictly prohibited to connect the power cord to the output terminal of the inverter, otherwise the internal components of the inverter will be damaged.

◆In order to provide input side overcurrent protection and facilitate power outage maintenance, the inverter should be connected to the power supply through a circuit breaker and contactor.

◆Please confirm whether the power supply phase number and voltage are consistent with the nameplate of the product. Failure to comply may cause damage to the inverter.

（2）DC side wiring

◆Do not connect the braking resistor directly to + and -, as this may cause damage to the inverter or even fire.

◆When selecting an external braking unit, be careful not to reverse the + and - poles, otherwise it may cause damage to the inverter and the braking unit or even cause a fire.

（3）Motor wire wiring

◆It is strictly prohibited to short-circuit or ground the output terminals of the frequency converter, otherwise the internal components of the frequency converter will be damaged.

◆Avoid short circuit between the output line and the inverter shell, otherwise there is a risk of electric shock.

◆It is strictly prohibited to connect capacitors or phase-advanced LC/RC noise filters to the output end of the frequency converter, otherwise the internal components of the frequency converter will be damaged.

◆When installing a contactor between the inverter and the motor, the output contactor cannot be switched while the inverter is running, otherwise a large current will flow into the inverter, causing the inverter protection to operate.

3.5 Control loop wiring

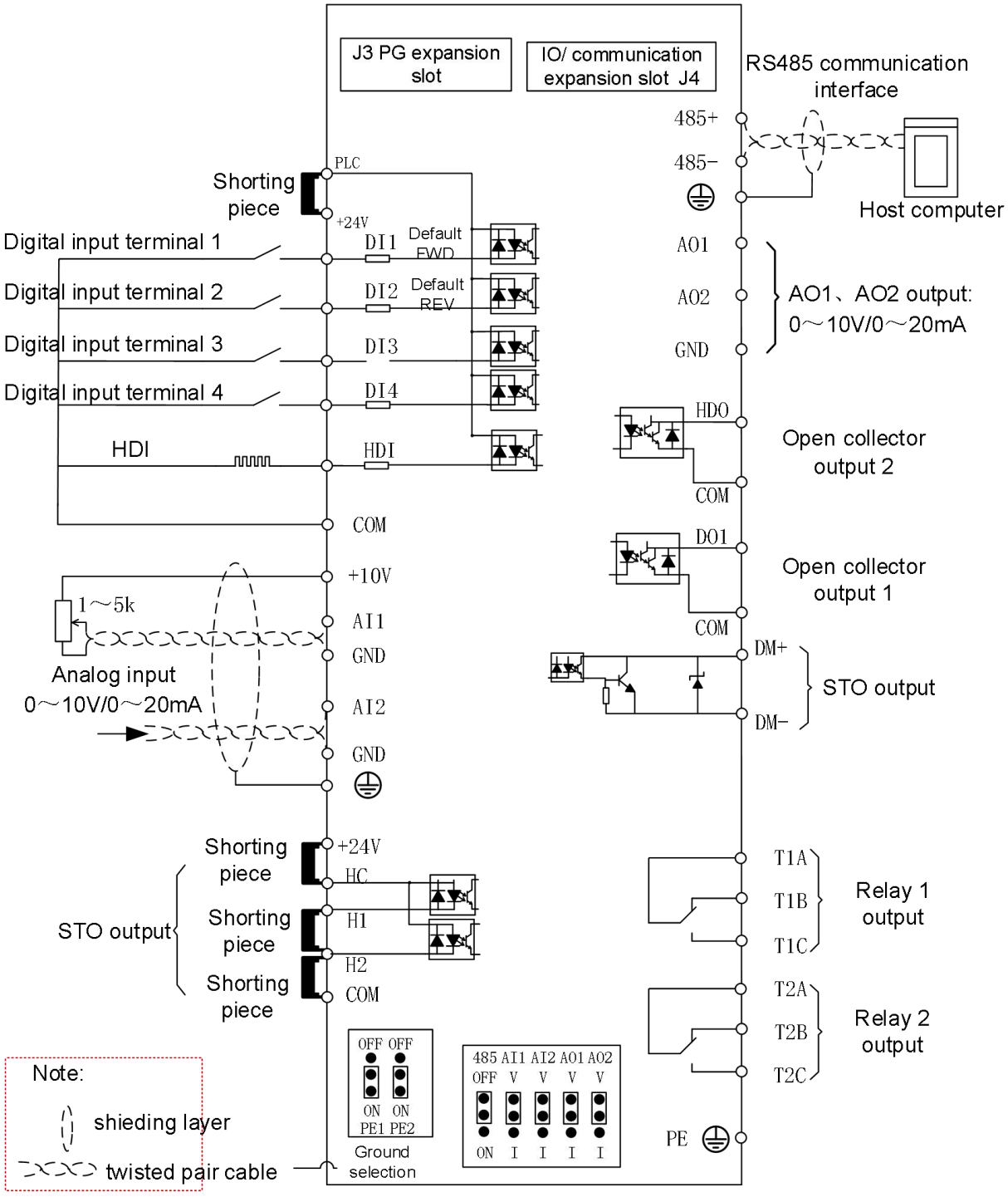


Figure 3-6 VFD510 control loop terminal diagram

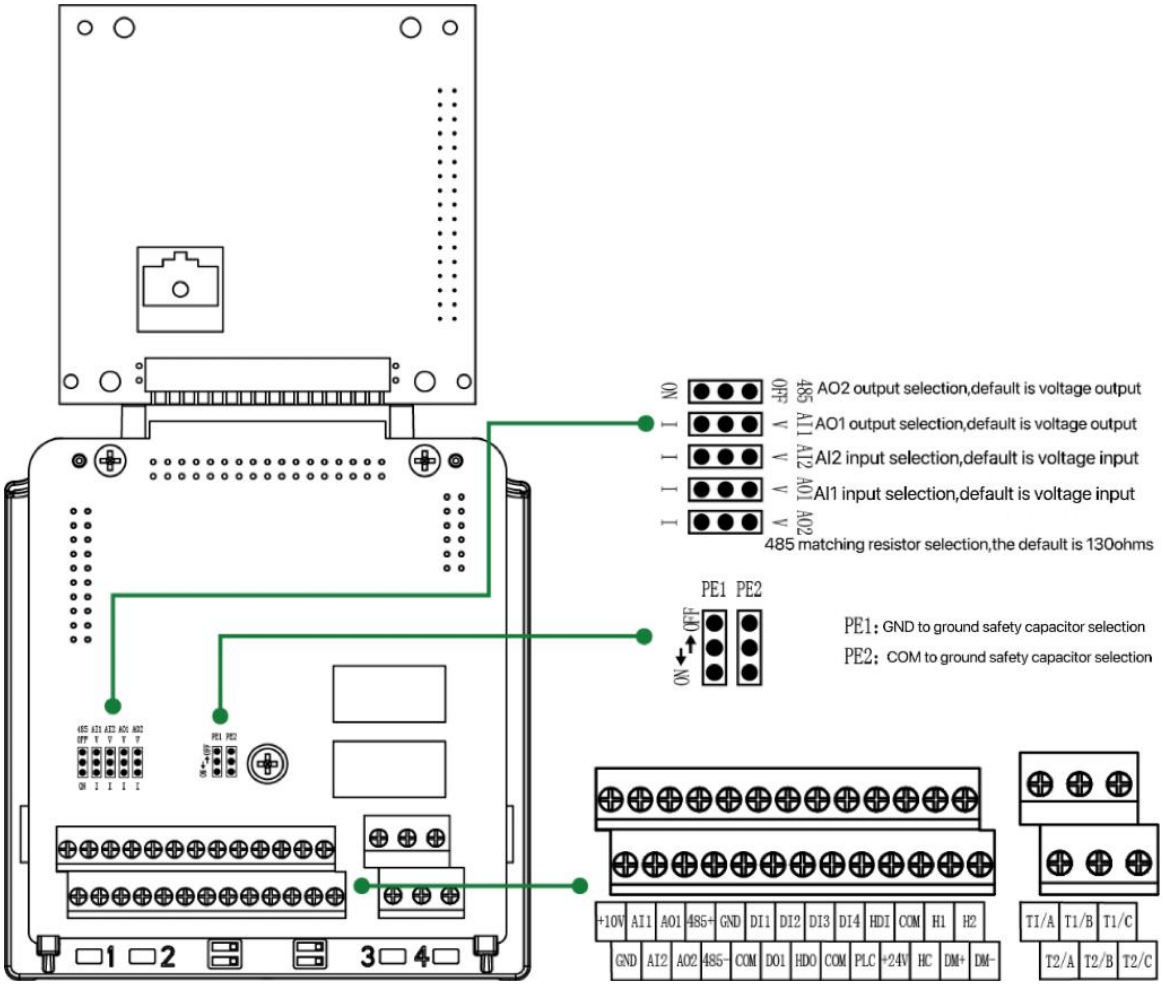


Figure 3-7 Control loop terminal distribution diagram

Table 3-5 VFD510 control loop terminal definition description

Type	Terminal symbol	Terminal name	Function description
Analog input	+10V	Analog input reference voltage	10.10V±1%
			The maximum output current is 10mA, that is, the recommended external potentiometer resistance range: 1KΩ~51KΩ
	GND	Analog ground	Internally isolated from COM
	AI1	AI 1	Input 0~10V: input impedance 22KΩ
			Input 0~20mA: input impedance 500Ω
			AI1: 0~10V and 0~20mA switching is achieved through jumpers. The factory default is voltage input.
	AI2	AI 2	Input 0~10V: input impedance 22KΩ
			Input 0~20mA: input impedance 500Ω
			AI2: 0~10V and 0~20mA switching is achieved through jumpers. The factory default is voltage input.
Analog output	AO1	AO 1	Output 0~10V: impedance requirement ≥10KΩ
			Output 0~20mA: impedance requirement 200Ω~500Ω
			AO1: 0~10V and 0~20mA switching is achieved through jumpers. The factory default is voltage output.
	AO2	AO 2	Output 0~10V: impedance requirement ≥10KΩ
			Output 0~20mA: impedance requirement 20 0Ω~500Ω

Type	Terminal symbol	Terminal name	Function description
			AO2: 0~10V and 0~20mA switching is achieved through jumpers. The factory default is voltage output.
	GND	Analog ground	Internally isolated from COM
Digital input	+24V	+24V power	24V±10%, internally isolated from GND
			Maximum output current：200mA
			Provides 24V power to the outside, generally used as working power supply for digital input and output terminals and external sensor power supply
	PLC	Digital input terminal common	It is used for high and low level switching of switch input. It is short-circuited with +24V when leaving the factory, that is, the switch input is active when low.
			When used as external power input, disconnect the PLC from +24V.
	COM	+24V ground	Internally isolated from GND
	DI1~DI4	Digital input terminals 1~4	Optocoupler isolation, compatible with bipolar input
			Frequency range：0~200Hz
			Voltage range：10V~30V
	HDI	Digital input/ High-speed pulse input	Digital input: same as DI1~DI4
			Pulse input frequency range：0~50KHz
			Voltage range：15V~30V
Digital output	DO1	Open collector output	Optocoupler isolation
			Voltage range：0V~24V
			Current range：0mA ~50mA
	HDO	Open collector output/high-speed pulse output	Open collector output: same as DO1
			High-speed pulse output：0~50KHz
Relay 1 output	T1A/T1B/T1C	Relay output	T1A-T1B：Normally closed
			T1A-T1C：Normally open
			Contact capacity：AC 250V，3A；DC 30V，1A
Relay 2 output	T2A/T2B/T2C	Relay output	T2A-T2B：Normally closed
			T2A-T2C：Normally open
			Contact capacity：AC 250V，3A；DC 30V，1A
485 communication terminal	485+	485 differential signal positive	Baud rate：1200/2400/4800/9600/19200/38400/57600/115200bps
	485-	485 differential signal negative	
STO input	HC	STO input terminal common end	Used for STO input high and low level switching. HC and +24V are short-circuited at the factory, that is, H1 or H2 input high level is active.
			When used as external power input, it is necessary to disconnect HC and +24V.
	H1	STO input 1	STO1 input, H1 and COM are short-circuited when leaving the factory, that is, STO1 is invalid
			Optocoupler isolation, bipolar input
			Voltage range: 10~30V

Type	Terminal symbol	Terminal name	Function description
	H2	STO input 2	STO2 input, H2 and COM are short-circuited at the factory, that is, STO2 is invalid.
			Optocoupler isolation, bipolar input
			Voltage range：10~30V
STO output	DM+	Security monitoring output	Monitoring loop status output (open collector output), that is, when the STO1 or STO2 input is valid, the STO output is valid
	DM-	Safety monitoring output reference	

Table 3-6 VFD510 jumper switch function description

Label	Function	Factory settings
485	485 terminal resistor selection: ON has 130 ohm terminal resistor, OFF has no terminal resistor	OFF
AI1	AI1 analog type selection: V is voltage input (0~10V), I is current input (0~20mA)	V
AI2	AI2 analog type selection: V is voltage input (0~10V), I is current input (0~20mA)	V
AO1	AO1 analog type selection: V is voltage output (0~10V), I is current output (0~20mA)	V
AO2	AO2 analog type selection: V is voltage output (0~10V), I is current output (0~20mA)	V
PE1	GND grounding selection: ON is connected to the ground through a safety capacitor, OFF is not connected	OFF
PE2	COM grounding selection: ON means connecting to the ground through a safety capacitor, OFF means not connecting	OFF

◆Instructions for use of analog input terminals

The AI1 and AI2 terminals can accept both analog voltage input and analog current input. They can be switched through the jumper switches "AI1" and "AI2" on the IO board. The wiring method and jumper switch configuration are as shown in the figure below:

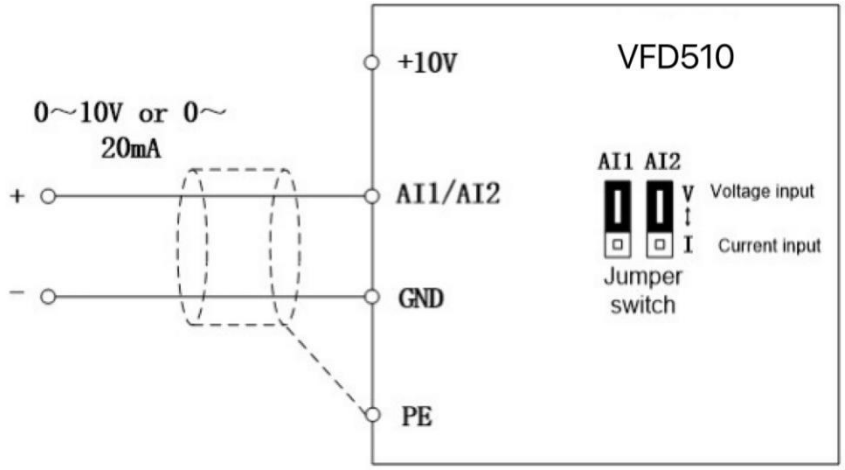


Figure 3-8 Analog input terminal wiring diagram

◆Instructions for use of analog output terminals

The AO1 and AO2 terminals support voltage output (0~10V) and current output (0~20mA), which can be selected through the jumper switches "AO1" and "AO2" on the IO board. The wiring method is as shown in the figure below:

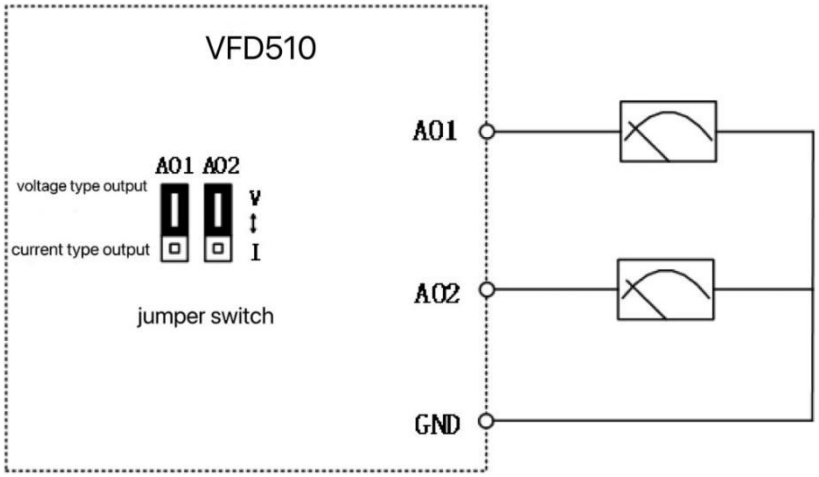
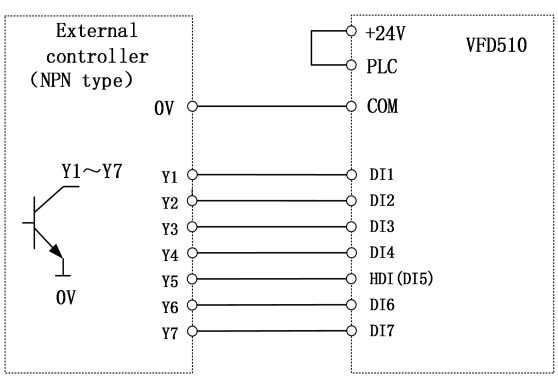
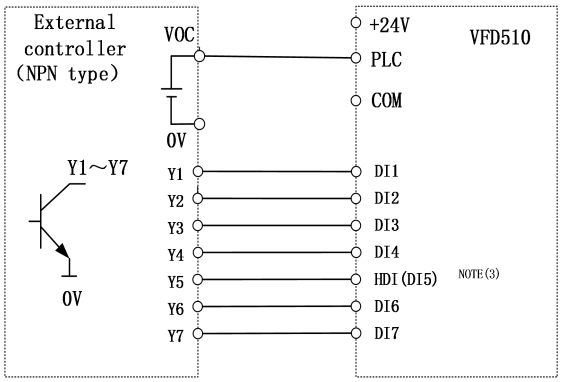


Figure 3-9 Analog output terminal wiring diagram

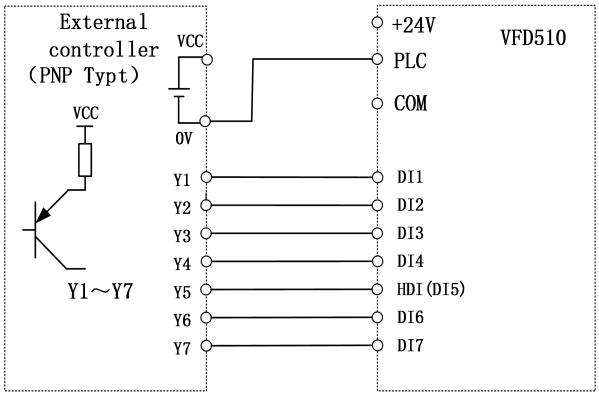
◆Instructions for use of switching input terminals



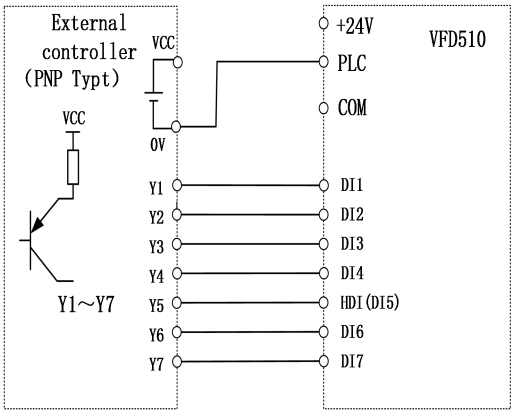
A: NPN mode uses internal +24V power supply



B: NPN mode uses external +24V power supply



C: PNP mode uses internal +24V power supply



D: PNP mode uses external +24V power supply

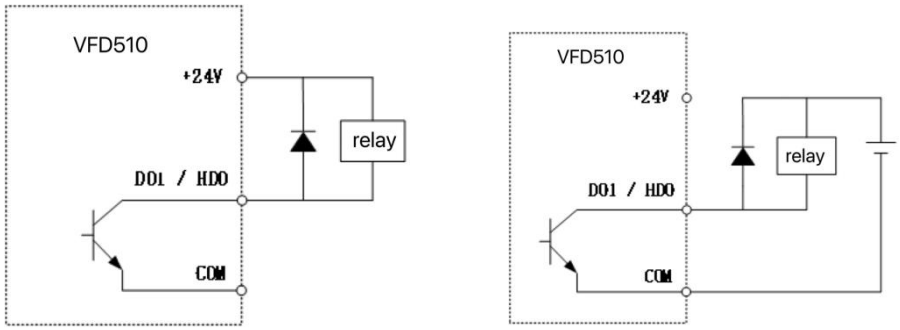
Figure 3-10 Switch input terminal wiring diagram

Notice：

1. If the external controller output is a relay contact, it can be considered an NPN type or PNP type. The "0V" or "VCC" of the external controller in the above figure can be considered as the common terminal of the relay.
2. When using an external power supply, the shorting link between +24V and PLC must be removed, otherwise the product will be damaged!
3. When using an external power supply, you need to connect the negative pole of the external power supply to COM when using HDI, otherwise HDI will be invalid!
4. VCC voltage range is 10V~30V.

◆Instructions for use of switching output terminals

The multi-function output terminals DO1 and HDO can be powered by the +24V power supply inside the inverter or an external power supply. The wiring diagram is as follows:



A. Use internal power supply B. Use external power supply

Figure 3-11 Switch output terminal wiring diagram

Notice：

The multi-function terminal output is an open-collector output, and the maximum allowed output current is 50mA. When using the internal power supply, if drive the inductive load, an absorption circuit should be installed, such as an RC absorption circuit or a freewheeling diode. When adding a freewheeling diode, be sure to confirm the polarity of the diode, otherwise the product will be damaged; when using an external power supply, please connect the negative pole of the external power supply to the COM terminal.

◆485 communication terminal usage instructions

When a host computer communicates with an inverter 485, the wiring method is as shown in the figure below. It is recommended to use twisted pair with shielding layer for the communication cable.

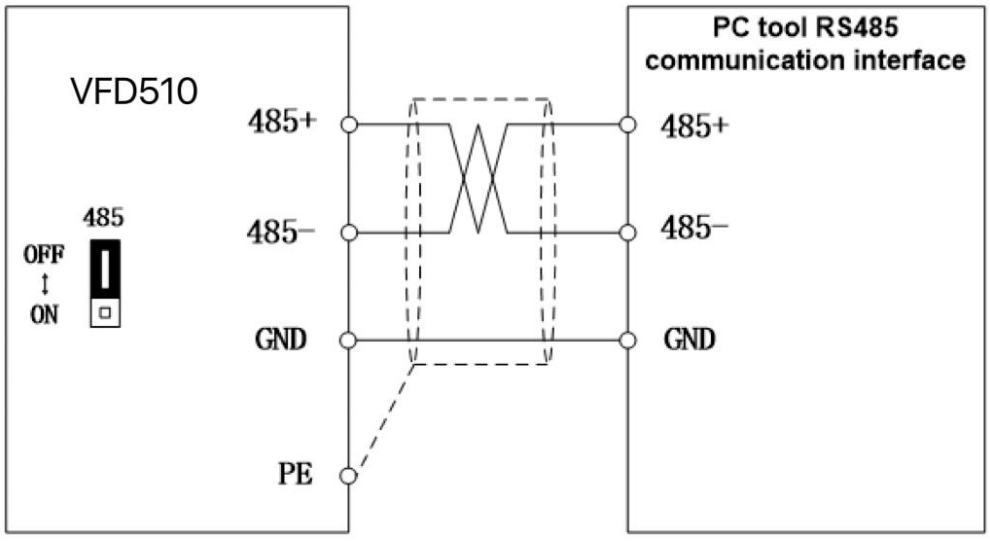


Figure 3-12 A single inverter communicates directly with the host computer through RS485 (without terminal resistor)

When multiple 485 nodes communicate, the recommended wiring method is as shown in the figure below. Only connect the terminal resistors at both ends of the bus, connect up to 128 nodes, and the distance between each node branch should be less than 3 meters.

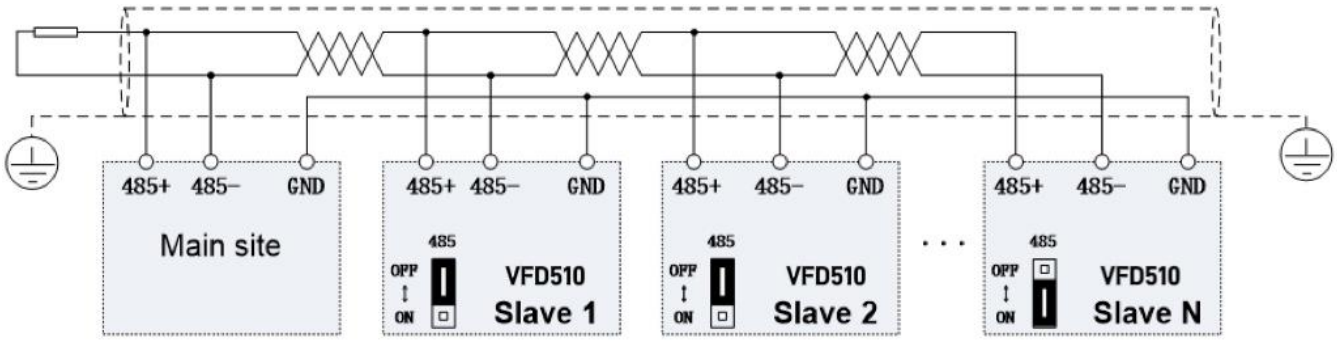


Figure 3-13 RS485 connection and communication between multiple frequency converters and the host computer

◆Instructions for use of STO safety input and output terminals

Function introduction：

STO (Safe Torque Off) function: Safe torque off, which refers to the safety function of cutting off the motor current through hardware.

The STO module (X8 terminal) has two channels of input signals, and uses an independent loop to block the PWM control signal of the power module that controls the motor current, thereby cutting off the motor current. At this time, the motor torque source is cut off. If the motor is running, it will coast to stop.

When the driver leaves the factory, the terminals have been short-circuited. Do not remove the STO short-circuit when the STO function is not used.

Things to note:

After the STO function is activated, the servo drive will no longer have control over the motor. Therefore, before using the STO function, please evaluate the risks that still exist after the STO function is enabled:

1) After the STO function is enabled, the servo will not be able to ensure that the motor moves due to the influence of external forces, such as the vertical axis;

2) The STO function cannot cut off the power supply of the servo unit, so there is still the possibility of electric shock. When performing maintenance on the servo unit, be sure to cut off the power supply of the servo unit and other devices;

3) Please use a single power supply for the STO signal input, otherwise the STO function may malfunction due to leakage current, thus unable to enter STO cut-off state.

Wiring example：

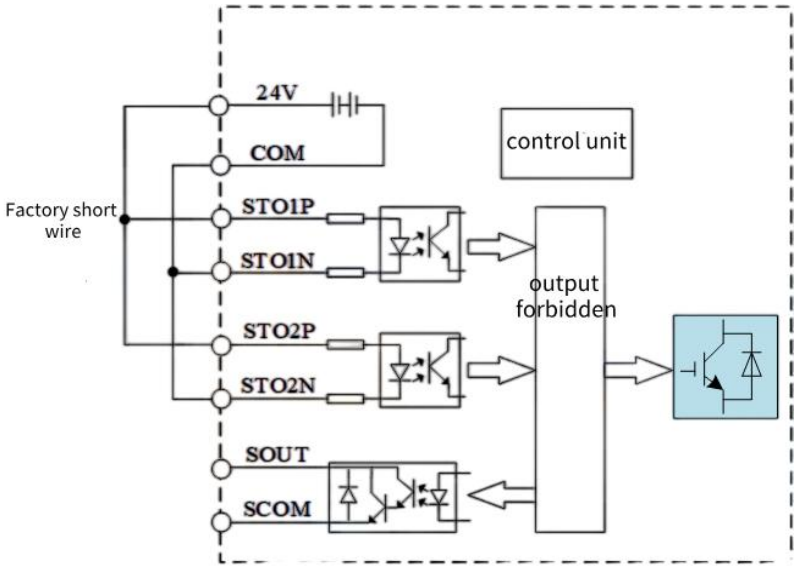


Figure 3-14 Wiring diagram without STO function

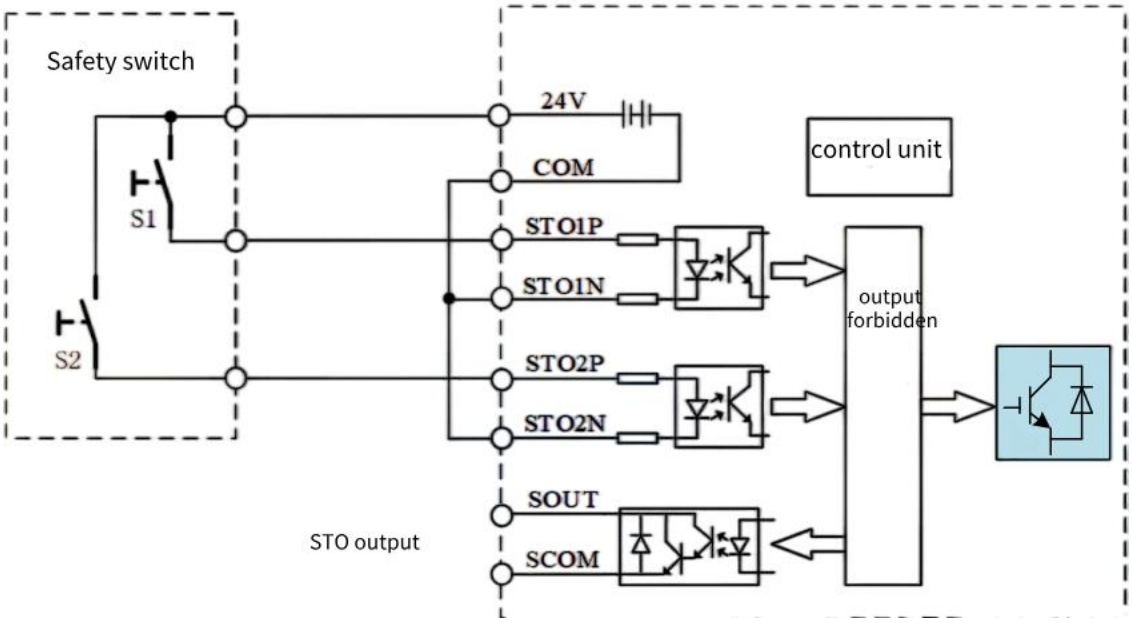


Figure 3-15 STO and safety switch wiring diagram

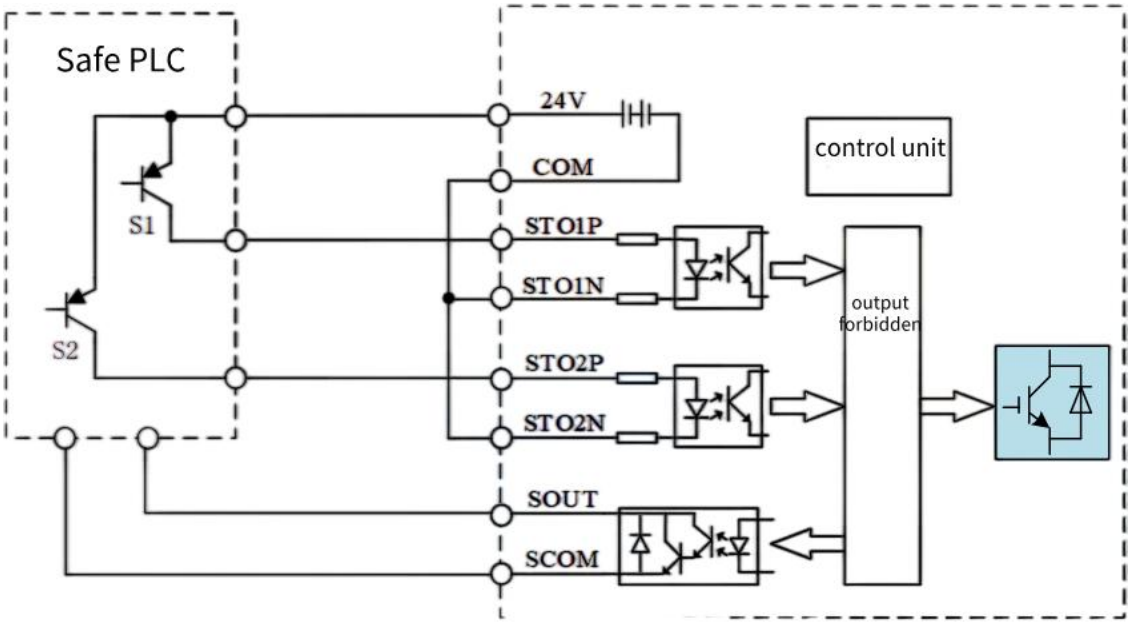


Figure 3-16 STO and safety PLC wiring diagram (internal 24V, PNP)

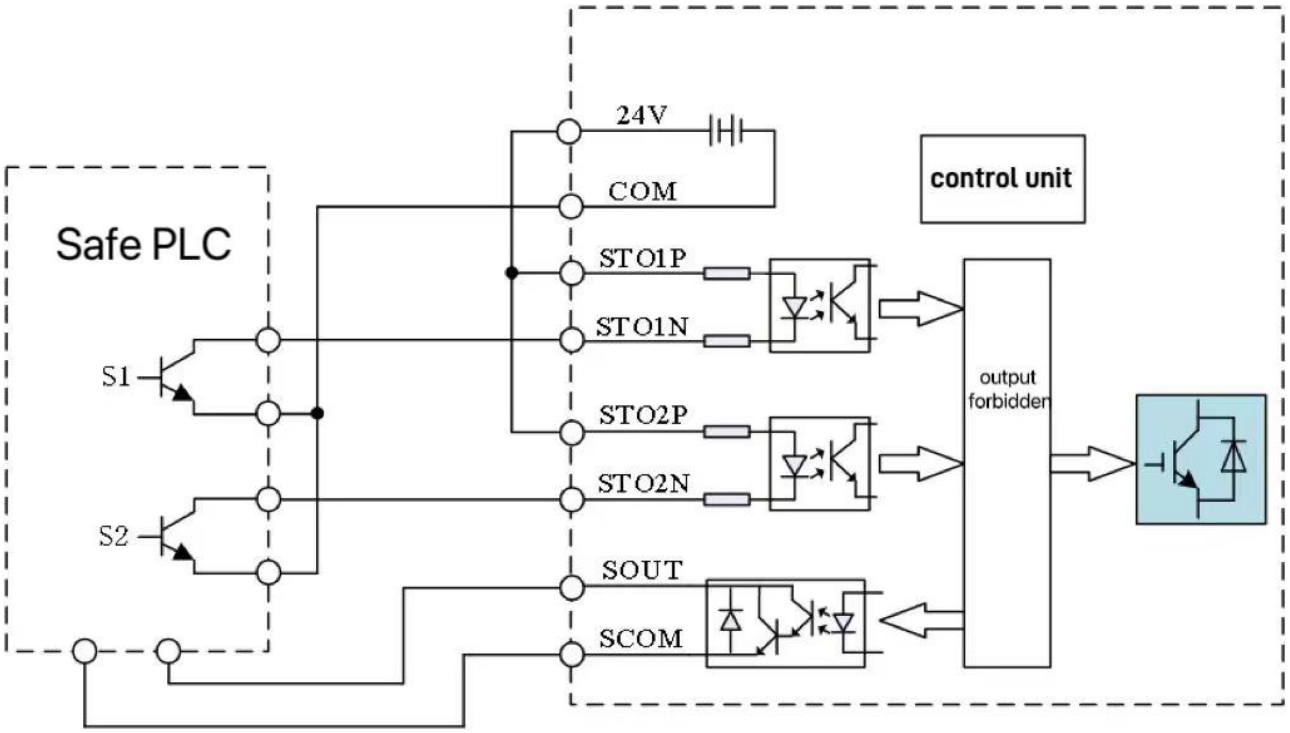


Figure 3-17 STO and safety PLC wiring diagram (internal 24V, NPN)

Action principle：

When the STO1 or STO2 input is OFF, the STO safety function is effective, the output is cut off, the SOUT output is effective (the STO input status can be monitored), and the panel displays the corresponding fault.

The fault cannot be reset automatically. It can be reset manually after confirming the fault.

The STO safety function is valid for a maximum time of 10ms.

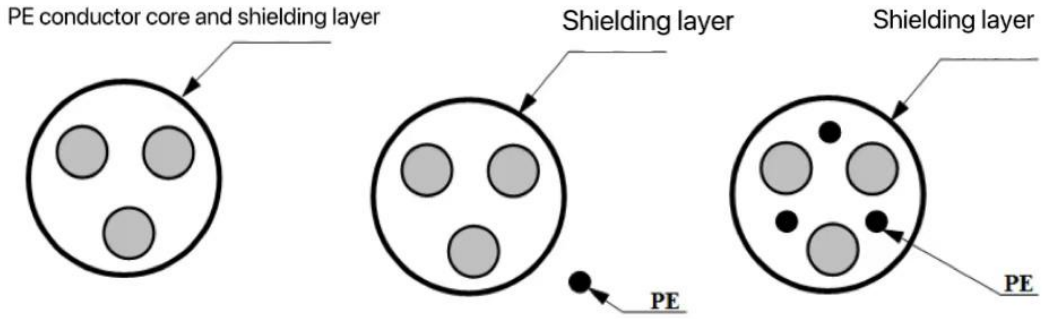
Table 3-7 STO input and output function description

STO2 input status	STO1 input status	SOUT input status	PWM control	Alarm
ON	ON	OFF	Normal	-
ON	OFF	ON	Prohibit	Er.ST1
OFF	ON	ON	Prohibit	Er.ST2
OFF	OFF	ON	Prohibit	Er.STo

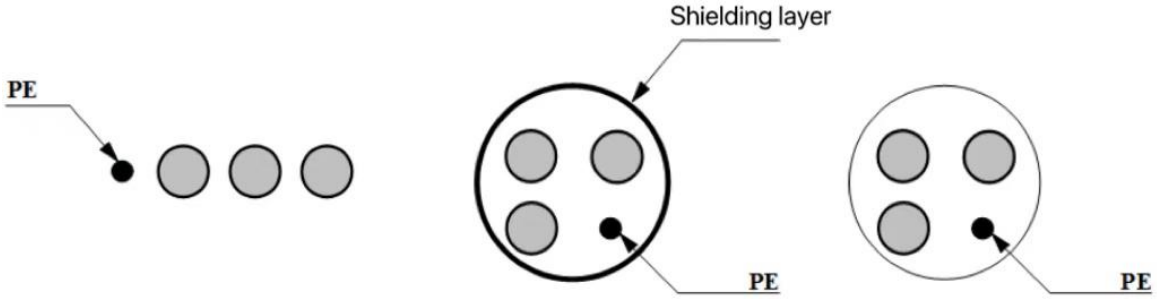
3.6 EMC Problems and solutions

The working principle of the VFD determines that it will inevitably produce electromagnetic interference, affecting and interfering with other equipment. At the same time, VFD usually work in industrial environments with strong noise, and their internal weak current signals are also susceptible to interference. For the VFD can working safely and no faulty and the normally operation of other equipment, please install the equipment according to the following rules.

- Install an input noise filter, and the wiring from the filter to the input power supply of the inverter should be as short as possible.
- The filter housing and the installation cabinet should be reliably connected over a large area to reduce the loop impedance of the noise current.
- The wiring distance between the inverter and the motor should be as short as possible. The motor cable uses a 4-core cable. One end of the ground wire is grounded on the inverter side, and the other end is connected to the motor shell. The motor cable is sheathed in a metal tube. As shown in the figure below, cable type selection：



Symmetrical shielded cable is recommended



Power cable are not recommend

- Input power wires and output motor wires should be kept as far apart as possible.
- Equipment and signal lines that are easily affected should be installed as far away from the inverter as possible.
- Key signal lines should use shielded cables. It is recommended that the shielded cable layer be grounded using the 360° grounding method and put into a metal tube. It should be kept as far away from the input power line and output motor line of the VFD as possible. If the signal cable must cross the input power line or output motor line, the two should be kept orthogonal.
- When using analog voltage and current signals for remote frequency setting, please use double-stranded glued shielded cables, and connect the shielding layer to the ground terminal PE of the inverter. The longest signal cable should not exceed 50 meters.
- The wiring of control circuit terminals T1A/T1B/T1C, T2A/T2B/T2C and other control circuit terminals should be routed separately.
- It is strictly prohibited to short-circuit the shielding layer with other signal lines and equipment.
- When the inverter is connected to an inductive load device (electromagnetic contactor, relay, solenoid valve, etc.), be sure to use a surge suppressor on the coil of the load device.
- Correct and reliable grounding is the basis for safe and reliable operation of the VFD.：

(1) The frequency converter will produce leakage current. The greater the carrier frequency, the greater the leakage current. The leakage current of the entire frequency converter is greater than 3.5mA. The size of the leakage current is determined by the usage conditions. To ensure safety, the frequency converter and motor must be grounded;

(2) Ground resistance should be less than 10 ohms. For the wire diameter requirements of the grounding cable, please refer to "3.4.5 Terminal Screw and Wiring Specifications";

(3) Never share the ground wire with welding machines and other power equipment;

(4) It is recommended that the driver be installed on a conductive mounting surface, ensuring that the entire conductive bottom of the driver overlaps well with the mounting surface;

(5) It is best to use a dedicated grounding method for drivers and other equipment. Common grounding can be used, but common grounding is not allowed;

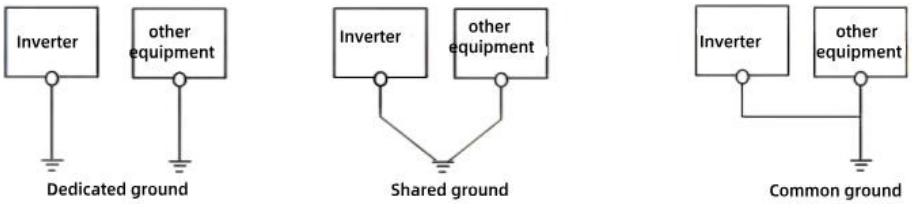


Figure 3-18 Grounding methods of drivers and other equipment

(6) When using two or more inverters, do not allow the ground wire to form a loop.

Correct wiring demonstration Incorrect wiring demonstration

Figure 3-19 Schematic diagram of ground wire connection method

- The length of the cable from the inverter to the motor must have an appropriate relationship with the carrier frequency: When the cable between the inverter and the motor is long, electrical resonance is likely to occur due to the influence of distributed capacitance, thus generating a large current and causing over-current protection of the inverter. It is recommended to install an AC output reactor when the motor cable length exceeds 100 meters. Also refer to the table below to set the carrier frequency.

Table 3-8 Inverter output cable length and carrier frequency comparison table

Cable length between frequency converter and motor	20m below	50m below	100m below	100m above
Carrier frequency（P22.00）	15kHz below	8kHz below	4kHz below	2kHz below

Chapter 4 Keyboard Operation and Trial Operation

4.1 Introduction to digital tube keyboard interface

The LED keyboard consists of 5 digital tubes, seven indicator lights, and eight buttons; it can be used for parameter setting, status monitoring, and operation control. The keyboard appearance is shown in Figure 4-1.:

Figure 4-1 LED (Digital tube) keyboard

Button and indicator light description:

Table 4-1 Names and functions of each part of the keyboard

No.	Icon	Name	Function
1	ESC	Escape	·Return to the previous menu.
2	ENT	Confirm	·Enter the next level menu. ·The parameters take effect and are stored in EEPROM.
3		Increment/UP	·Add 1 to the number indicated by the cursor. ·Next function code. ·Used to switch between left and right screens in monitoring state.
4		Decrement/Down	·Decrease the number indicated by the cursor by 1. ·The previous function code.
5	M	Multi-function	·The factory setting is the "forward jogging" function, and its function can be changed through parameter 21.02.
6		SHIFT	·Cursor shift. ·Displays the next monitored volume in monitoring status. ·Switch between left and right screens.
7	RUN	RUN	·When the command source is the keyboard, it is used to make the inverter run.

8	STOP	STOP	·In the running state, press this key to stop running (restricted by parameter 21.03). ·In fault state, press this key to reset the fault.
9	Hz	Indicator light:Hz	·The unit of parameters displayed now is Hz.
10	A	Indicator light:A	·The unit of parameters displayed now is A.
11	V	Indicator light:V	·The unit of parameters displayed now is V.
12	-rpm- Hz A	Indicator light:Hz+A （rmp/mins）	·When “Hz” and “A” light up at the same time, the unit of the currently displayed parameter is “RPM PER MINUTE”.
13	—%— A V	Indicator light:A+V（%）	·When "A" and "V" light up at the same time, it means that the unit of the currently displayed parameter is "percent".
14	RUN	Indicator light:RUN	·Off: indicates a shutdown state. ·Steady on: Indicates it is running. ·Flashing: Indicates deceleration to stop.
15	REV	Indicator light:REV	·Used to indicate the sign of the variable when the LED is displaying one of the variable listed in 27.02; ·in other cases the symbol indicating the output frequency.
16	LO/RE	Indicator light:LO/RE	·Off: The command source is the keyboard. ·Steady on: The command source is the terminal. ·Flashing: The command source is communication.
17	ALM	Indicator light:ALM	·When it lights up, it means the inverter is faulty.

4.2 Display hierarchical and menu modes

The display of the VFD510 LED keyboard is divided into four layers, from top to bottom: Monitoring status, menu mode selection status, function code selection status, parameter editing/viewing status. See Figure 4-2. In the menu mode selection state, press the【UP】or【DOWN】button to select the menu mode, and press【ENTER】to enter the selected menu mode. The following describes several menu modes:

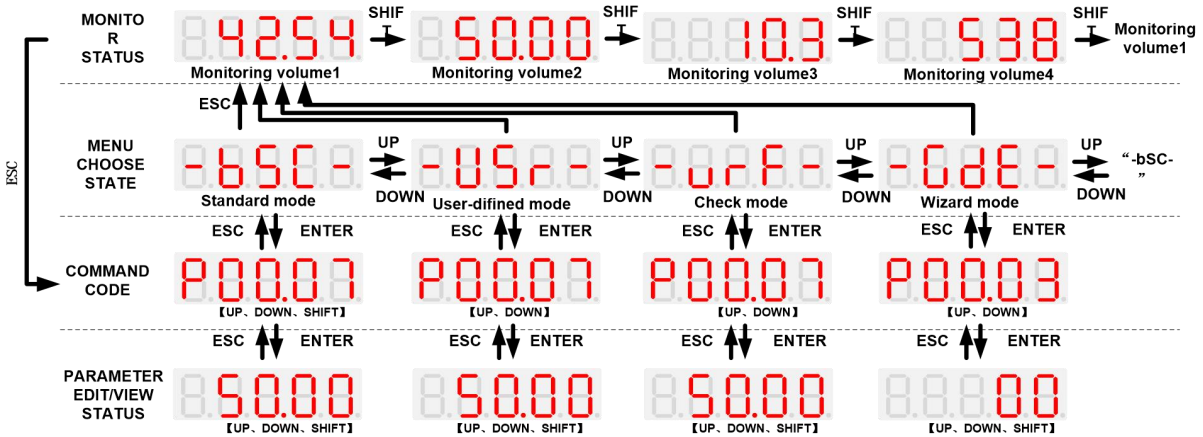


Figure 4-2 Keyboard operation diagram

◆ Standard mode (-bSC-)

If the access permission (P00.01) is standard, all function codes mentioned in this manual can be accessed.

If the access permission (P00.01) is for the end user (in the user password locked state), only individual function codes can be accessed at this time.

◆ **User-defined mode（-USr-）**

In this menu mode, only 20 groups of defined user-selected parameters are displayed.

◆ **Check mode（-vrF-）**

In this menu mode, only parameters different from the factory values are displayed.

◆ **Guide mode（-GdE-）**

When the user uses the inverter for the first time, the user can be guided to complete a simple test run.

4.3 Digital tube display

◆ **Display of decimal data**

16 digits:

The display range of unsigned numbers is 0 ~ 65535 (excluding decimal point), the display range of signed numbers is -9999 ~ 32767 (excluding decimal point), and negative numbers less than -9999 will be displayed as -9999.

32 digits:

It is displayed on the left and right screens, as shown in the figure below:

Dot1 is used to distinguish the left and right screens. If it lights up, it means the left screen (high 5 digits), and if it goes off, it means the right screen (low 5 digits). Dot5 is used to indicate the sign bit. If it lights up, it means the value is a negative number, and if it goes off, it means the value is a positive number.

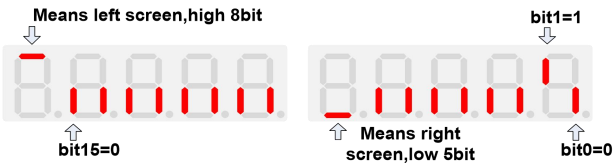
The display range of 32-bit unsigned numbers is 0 ~ 4294967295, and the display range of signed numbers is -2147483648 ~ 2147483647.

◆ **Display of binary data**

Binary numbers currently only support 16 digits and are displayed on the left and right screens.

The leftmost digital tube is used to distinguish the left and right screens: the top bit is lit to indicate the left screen, and the bottom bit is lit to indicate the right screen.

Except for the leftmost digital tube, they are Bit0 ~ Bit15 from right to left. The upper segment lights up to indicate 1, and the lower segment lights up to indicate 0.



◆ **Parameter attribute identification**

The leftmost digital tube of editable parameters displays "P"; the leftmost digital tube of read-only parameters displays "r", as shown in the figure below.

◆ **Specific symbols**

Under some conditions, the digital tube will display specific symbols. The meanings of specific symbols are shown in the table below:

Table 4-2 Digital tube display symbols and meanings

Symbol	Meaning
tUnE	·Motor parameter self-learning is in progress
bUSY	·Processing parameter read and write requests
End	·Indicates that the parameters have been changed and stored in EEPROM ·Task completed
Er.xxx	·Fault code, "XXX" is the fault type, see Chapter 6 for details

4.4 Pre-run checklist

Table 4-3 Checklist before operation

No.	Check items	Check column
1	Check whether the installed driver is consistent with the required model.	
2	Whether the installation environment, space and direction meet the installation requirements.	
3	Whether the crimped terminals are covered with heat shrink tubing to ensure the insulation effect.	
4	Check whether screws and debris have fallen into the wiring to ensure that the driver does not cause abnormalities, malfunctions, malfunctions, etc.	
5	Whether the selection of peripheral components meets the requirements.	
6	Whether the wiring position of peripheral devices meets the requirements.	
7	Whether the wire diameter of the main circuit terminal and the size of the terminal block meet the requirements.	
8	Is the main circuit wiring correct?	
9	Whether the main circuit wiring complies with the corresponding wiring precautions.	
10	Whether there is a short circuit or ground fault on the output side of the driver needs to be determined through a short circuit or ground fault test, otherwise the driver module will be damaged.	
11	Whether the wiring is carried out according to the wiring rules of EMC problems and countermeasures.	
12	Check whether the wire diameter of the control loop meets the requirements.	
13	Whether the driver control loop signal line uses shielded twisted pair wire.	
14	Whether the grounding method of motors, drivers, etc. is correct and whether the wiring is secure.	
15	Check whether the control circuit wiring is correct and whether the wiring is secure.	
16	Check whether the external keyboard network cable is separated from the main circuit and relay wiring and firmly fixed.	
17	Are the option cards and optional keyboards consistent with what was ordered?	
18	If an electromagnetic contactor is installed between the driver and motor, switch after the driver and motor stop.	

Note: This section mainly checks the wiring again. It needs to be operated by professional electricians. Please do not operate it while the power is on.

4.5 Trial run

Please follow the process below to perform the first power-on test run.

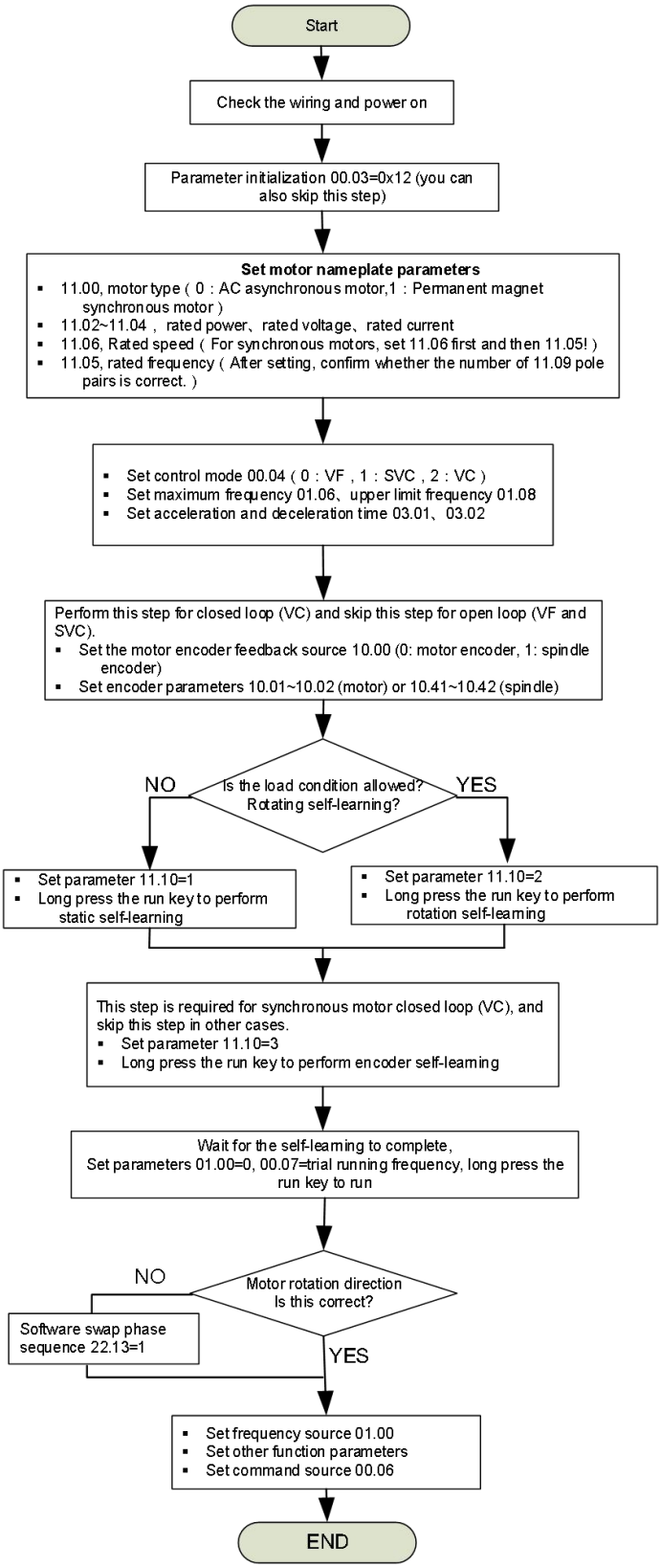


Figure 4-3 Trial operation flow chart

Chapter 5 Parameters and Descriptions

VFD510 Parameter distribution list：

Classification	Parameter group
Common parameters	00: Basic function
	01: Frequency source selection
	02: Start and stop
	03: Frequency given slope
	04: Analog and pulse input
	05: Analog and pulse output
	06: Digital input (DI)
	07: Digital output (DO)
	08: Output setting
Motor control	10: Encoder parameters
	11: Motor 1 parameter
	12: Motor 1 VF control parameter
	13: Motor 1 Vector control parameter
	14: Torque control
	16: Energy saving control
	17: Synchronous motor control
Display and protect	20: User-defined parameters
	21: Keypad and display
	22: AC drive configuration
	23: Drive protection
	24: Motor protection
	25: Fault tracking parameter
	26: Fault recording parameter
	27: Status monitoring
Communication	29: Communication special register
	30: Modbus communication parameters
	31: CANopen communication parameters
	32: ProfiNet communication
Application	40: Process PID
	41: Sleep function
	42: Simple PLC
	43: Programmable delay unit
	44: Comparator and logic unit
	45: Multifunctional counter
Motor 2	60: Motor 2 basic parameter
	61: Motor 2 parameter
	62: Motor 2 VF control parameter
	63: Motor 2 vector control parameter

Term description：

The parameter is also called function code；the operation panel is also called the keyboard.

Due to usage habits, different terms may be used in different places in this manual, but all refer to the same content.

Symbol description：

RW: Running Writable, It means that the setting value of this parameter can be changed when the inverter is in shutdown or running state.

RR: Running Read only, Indicates that the setting value of this parameter cannot be changed when the inverter is running.

RO: Read only, Indicates that the value of this parameter is the actual detection record value and cannot be changed.

Data type description:

In order to conveniently describe each bit segment, hexadecimal parameters use descriptors such as "ones digit, tens' s digit, hundred's digit, thousand's digit". The "one's digit" here is bit0~bit3 in hexadecimal, and the "tens' digit" That is, bit4~bit7 in hexadecimal, and so on. Care should be taken when reading and writing such registers through communication.

00 Group Basic Function

Function code	Parameter name	Description	Default value	Property
P00.00	User password	0～65535 ➢ No user password status（after power on P00.01=1）: Entering the same non-zero value twice in succession sets a user password and enters the locked state. ➢ Under locked status： Enter the password to unlock ➢ Unlocked status： Enter the original password to enter the locked state; enter the same value twice in a row to change the password (if you enter 0 twice in a row, the password will be cleared).	0	RW
r00.01	Access authority	0: END USER The operator panel can only access some parameters. When the user password is locked, access is for the end user. 1: Standard All function codes described in this manual can be accessed.	1	RO
P00.02	Parameter backup	0: No action 11: Save a copy of all current parameters to the EEPROM backup area 12: Restore all parameters from EEPROM backup area(Need to be powered on again to take effect).	0	RR
P00.03	Parameter initialization	0: No action 11: Restore factory settings (excluding motor parameters) 12: Restore factory settings (all non-factory parameters) 13: Clear fault record	0	RR
P00.04	Motor control mode	0: VF, VF control is suitable for general speed control occasions. 1: SVC, Encoder-less open-loop vector control. The feedback speed adopts internal estimated value and supports torque control mode. 2: VC, Closed-loop vector control with encoder, used for high-precision speed control or torque control applications. The inverter must be equipped with a PG card that matches the encoder. Please refer to Group 10 for the relevant parameters of the PG card.	0	RR

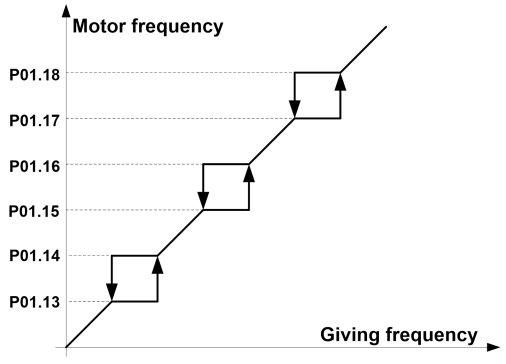
Function code	Parameter name	Description	Default value	Property
P00.05	Running mode	0: Speed control mode 1: Torque control mode ➢ If use with DI function,"19:Switch between torque and speed control" and "20: torque control disabled". Actual effective running mode is related with DI status.	0	RR
P00.06	Source of the Operation Command	0: Keypad 1: Terminal 2: Communication ➢ Command sources include: run, stop, forward rotation, reverse rotation, jog, immediate DC braking, etc. ➢ If the DI function "12: Switch command source to keyboard" or "13: Switch command source between terminal/communication" is used, the actual command source that takes effect is also related to the corresponding DI status.	0	RR
P00.07	Numeric frequency setting	00.00Hz～maximum frequency(Set P21.17=1 to change the unit to 1Rmp)	50.00Hz	RW
P00.08	Rotation direction	0: Forward 1: Reverse ➢ Only used for keyboard control to change the running direction (reverse the sign of the given frequency). If you do not want to achieve reverse operation by taking the negative sign of the frequency under the keyboard/terminal/communication control command, change the P22.13 value in the stop state (refer to the description of P22.13).	0	RW
P00.09	Reverse control	0: Reversal allowed 1: Reversal disabled	0	RR
P00.10	Motor option	0: Motor1 1: Motor2 ➢ If the DI function "16: Motor 1 and 2 switching" is used, the actual activated motor is also related to the corresponding DI status.	0	RR
P00.11	Industry application macro selection	0: Standard drive 1: Reserved	0	RR
r00.18	Driver software version	-	-	RO
r00.19	Application software version	-	-	RO
r00.20	Dedicated program software version	-	-	RO
r00.21	Product serial number 1	-	-	RO
r00.22	Product serial number 2	-	-	RO

01 Group Frequency source selection

Function code	Parameter name	Description	Default value	Property
P01.00	Main frequency source selection(A)	0: Digital setting（P00.07） 1: AI1 2: AI2 3: AI3 4: Reserved 5: HDI 6: Multi-step speed 7: Communication 8: Process PID 9: Internal PLC **Notice：** DI terminal function code 26-32 superior than this function code	0	RR
P01.01	Auxiliary frequency source selection (B)	The parameter setting range and meaning are the same as P01.00. **Notice：** DI terminal function code 33 superior than this function code	0	RR
P01.02	Auxiliary frequency source reference	0: Relative to the maximum frequency 1: Relative to main frequency	0	RR
P01.03	Auxiliary frequency gain	0.0～300.0%	100.0%	RW
P01.04	Frequency source selection	0: Main frequency source 1: Auxiliary frequency source 2: Main and auxiliary arithmetic results 3: Switch between main and auxiliary frequency. 4: Switch between main frequency and operation result 5: Switch between auxiliary frequency and operation result （*） When the terminal corresponding to the DI terminal No. 25 function is valid, the frequency source uses the latter.	0	RR
P01.05	Main and auxiliary operation formulas	0: Main+auxiliary 1: Main-auxiliary 2: The maximum value of both 3: The minimum of the two 4: Main×auxiliary	0	RR
P01.06	Maximum frequency	10.00～600.00Hz	50.00Hz	RR
P01.07	Upper limit frequency control	0: Digital setting (P01.08) 1: AI1 2: AI2 3: AI3 4:Reserved 5: HDI	0	RR

Function code	Parameter name	Description	Default value	Property
		6: Reserved 7: Communication		
P01.08	Upper limit frequency	Lower limit frequency (P01.09) ～ maximum frequency (P01.06)	50.00Hz	RW
P01.09	Lower limit frequency	0.00Hz～upper limit frequency	0.00Hz	RW
P01.10	Action when the given frequency is lower than the lower limit frequency	0: Run at low limit frequency 1: Stop after delaying P01.11 2: Run at zero speed	0	RR
P01.11	Stop delay time below lower limit frequency	0.000s～30.000s	0.000s	RR
P01.12	Hazardous speed avoidance switch	Units digit/tens digit/hundreds digit: dangerous speed 1/2/3 enable bit 0: Do not avoid 1: Avoid	000	RW
P01.13	Dangerous speed 1 lower limit	0.00Hz～Dangerous speed limit 1(P01.14)	0.00Hz	RW
P01.14	Dangerous speed limit 1	Dangerous speed 1 lower limit(P01.13) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.15	Dangerous speed 2 lower limit	0.00Hz～Dangerous speed limit 2 (P01.16)	0.00Hz	RW
P01.16	Dangerous speed limit 2	Dangerous speed 2 lower limit (P01.15) ～ maximum frequency (P01.06)	0.00Hz	RW
P01.17	Dangerous speed 3 lower limit	0.00Hz～Dangerous speed limit 3 (P01.18)	0.00Hz	RW
P01.18	Dangerous speed limit 3	Dangerous speed 3 lower limit (P01.17) ～ maximum (P01.06)	0.00Hz	RW

The hazardous speed (frequency) function can be applied to speeds and speed ranges where certain motors need to be avoided, for example, due to mechanical resonance issues. The avoidance function will be enabled only when the dangerous speed avoidance switch (P01.12) is enabled, and the dangerous speed will be avoided in both forward and reverse directions.



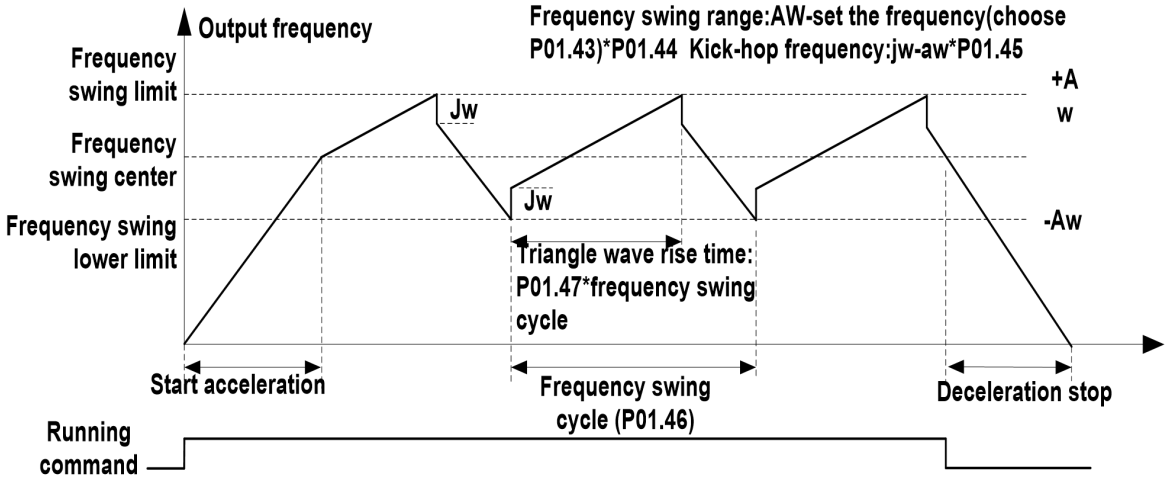
P01.19	Multi-speed mode	**Unit' digit :** Section 0 command source 0: Multi-step speed (P01.21) 1: Preset frequency given (P00.07) 2: AI1 3: AI2	00	RR

<table>
<tr><th>Function code</th><th>Parameter name</th><th>Description</th><th>Default value</th><th>Property</th></tr>
<tr><td></td><td></td><td>4: AI3
5: Reserved
6: HDI pulse frequency given
7: Communication
8: PID
Ten’s digit: Combination of multi-speed
0: Combination method
1: Priority method</td><td></td><td></td></tr>
<tr><td colspan="5">Combination method Description：
<table>
<tr><th>Multi speed terminal 4</th><th>Multi speed terminal 3</th><th>Multi speed terminal 2</th><th>Multi speed terminal 1</th><th>The speed given by the combination method</th></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Multi sped 0</td></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Effective</td><td>Multi speed 1</td></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Effective</td><td>Ineffective</td><td>Multi speed 2</td></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Effective</td><td>Effective</td><td>Multi speed 3</td></tr>
<tr><td>Ineffective</td><td>Effective</td><td>Ineffective</td><td>Ineffective</td><td>Multi speed 4</td></tr>
<tr><td>Ineffective</td><td>Effective</td><td>Ineffective</td><td>Effective</td><td>Multi speed 5</td></tr>
<tr><td>Ineffective</td><td>Effective</td><td>Effective</td><td>Ineffective</td><td>Multi speed 6</td></tr>
<tr><td>Ineffective</td><td>Effective</td><td>Effective</td><td>Effective</td><td>Multi speed 7</td></tr>
<tr><td>Effective</td><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Multi speed 8</td></tr>
<tr><td>Effective</td><td>Ineffective</td><td>Ineffective</td><td>Effective</td><td>Multi speed 9</td></tr>
<tr><td>Effective</td><td>Ineffective</td><td>Effective</td><td>Ineffective</td><td>Multi speed 10</td></tr>
<tr><td>Effective</td><td>Ineffective</td><td>Effective</td><td>Effective</td><td>Multi speed 11</td></tr>
<tr><td>Effective</td><td>Effective</td><td>Ineffective</td><td>Ineffective</td><td>Multi speed 12</td></tr>
<tr><td>Effective</td><td>Effective</td><td>Ineffective</td><td>Effective</td><td>Multi speed 13</td></tr>
<tr><td>Effective</td><td>Effective</td><td>Effective</td><td>Ineffective</td><td>Multi speed 14</td></tr>
<tr><td>Effective</td><td>Effective</td><td>Effective</td><td>Effective</td><td>Multi speed 15</td></tr>
</table>
Explanation of priority law：
<table>
<tr><th>Multi-speed terminal 4</th><th>Multi-speed terminal 3</th><th>Multi-speed terminal 2</th><th>Multi-speed terminal 1</th><th>Speed given by priority method</th></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Multi speed 0</td></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Ineffective</td><td>Effective</td><td>Multi speed 1</td></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>Effective</td><td>Random</td><td>Multi speed 2</td></tr>
<tr><td>Ineffective</td><td>Effective</td><td>Random</td><td>Random</td><td>Multi speed 3</td></tr>
<tr><td>Effective</td><td>Random</td><td>Random</td><td>Random</td><td>Multi speed 4</td></tr>
</table></td></tr>
<tr><td>P01.20</td><td>Multi-speed direction setting</td><td>Bit0~Bit15 correspond to the direction of multi-speed preset frequency 0~15.(P01.21~P01.36)
0: forward 1: reverse</td><td>0</td><td>RW</td></tr>
<tr><td>P01.21</td><td>Multi step speed 0/in-built PLC1</td><td>Lower limit frequency(P01.09) ～ maximum frequency(P01.06)
Note： When the unit’s digit of P01.19 is set to non-zero, this setting is invalid.</td><td>0.00Hz</td><td>RW</td></tr>
<tr><td>P01.22</td><td>Multi step speed 1/in-built PLC2</td><td>Lower limit frequency(P01.09) ～ maximum frequency(P01.06)</td><td>0.00Hz</td><td>RW</td></tr>
</table>

Function code	Parameter name	Description	Default value	Property
P01.23	Multi step speed 2/in-built PLC3	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.24	Multi step speed 3/in-built PLC4	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.25	Multi step speed 4/in-built PLC5	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.26	Multi step speed 5/in-built PLC6	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.27	Multi step speed 6/in-built PLC7	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.28	Multi step speed 7/in-built PLC8	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.29	Multi step speed 8/in-built PLC9	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.30	Multi step speed 9/in-built PLC10	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.31	Multi step speed 10/in-built PLC11	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.32	Multi step speed 11/in-built PLC12	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.33	Multi step speed 12/in-built PLC13	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.34	Multi step speed 13/in-built PLC14	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.35	Multi step speed 14/in-built PLC15	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.36	Multi step speed 15/in-built PLC16	Lower limit frequency(P01.09) ～ maximum frequency(P01.06)	0.00Hz	RW
P01.37	Jog frequency	0.00Hz～maximum frequency(P01.06)	5.00Hz	RW
P01.38	Whether to respond to jog commands during operation	0: Not respond 1: Respond	0	RR
P01.39	Terminal UP/DOWN rates	0.00(auto rates)～600.00Hz/s	1.00Hz/s	RW
P01.40	Terminal UP/DOWN control	**Unit's digit:** UP/DOWN Clear selection 0: Clear non-running status 1: UP/DOWN Cleared when the command is invalid 2: Not cleared (determined by power-down memory bit) **Ten's digit:** UP/DOWN memory selection 0: No memory when power off 1: Power-off memory UP/DOWN offset **Hundred's digit:** UP/DOWN Zero crossing selection	0002	RR

Function code	Parameter name	Description	Default value	Property
		0: Forbidden 1: Enable **Thousand's digit**：UP/DOWN action mode 0: Superposition 1：Gain effect		
P01.41	Droop control gain	0.00～1.00 Frequency drop: maximum frequency *P01.41*current load/rated load.	0.00	RW
P01.42	Droop control filter time	0.000s～10.000s	0.050s	RW
P01.43	Swing frequency setting method	0: Relative to center frequency 1: Relative to the maximum frequency	0	RW
P01.44	Swing frequency amplitude	0.0%～100.0% P01.43 = 0: Swing frequency amplitude Aw = P01.44 * center frequency P01.43 = 1: Swing frequency amplitude Aw = P01.44 * maximum frequency	0.0%	RW
P01.45	Kick frequency amplitude	0.0%～50.0%	0.0%	RW
P01.46	Swing frequency period	0.1s～3000.0s	10.0s	RW
P01.47	Triangular wave rise time coefficient	0.1%～100.0%	50.0%	RW

The swing frequency function is suitable for textile, chemical fiber and other industries, as well as occasions that require traversing and winding functions. The swing frequency function refers to the inverter output frequency, which swings up and down with the set frequency as the center. The trajectory of the operating frequency on the time axis is as shown in the figure below. When P01.44=0 or P01.46=0, the swing frequency does not work.



P01.48	Auxiliary frequency effective threshold	When the main frequency ≥ this setting, the auxiliary frequency is enabled.	0.00Hz	RW

02 Group Start and stop Control

Function code	Parameter name	Description	Default value	Property
P02.00	Starting mode	0：Direct start The inverter starts running from the starting frequency P02.01. After the starting frequency holding time P02.02, it runs to the given frequency according to the acceleration and deceleration curve. 1：Speed tracking enabled The inverter first searches for the speed of the rotating motor, and then accelerates and decelerates from the recognized speed to the given frequency. Related parameters:P02.16 ～ P02.19.	0	RR
P02.01	Startup frequency	0.00Hz～10.00Hz	0.00Hz	RR
P02.02	Start frequency hold time	0.000s～10.000s	0.000s	RR
P02.04	Pre-excitation current	0%～200% Motor rated current	Depend	RR
P02.05	Pre-excitation time	0.00s～10.00s Pre-excitation is used to establish a magnetic field in the asynchronous motor to increase the starting torque.	Depend	RR
P02.06	Start DC braking current	0～200%Motor rated current (maximum does not exceed the frequency converter rated current)	100%	RW
P02.07	Start DC braking time	0.00s～30.00s When set to 0s, DC braking is not started.	0.00s	RR
P02.08	Stop method	0：Ramp to stop Decrease to zero speed along the deceleration ramp and then cut off the output. Functions such as parking DC braking, over-excitation braking, and parking delay can be used. 1：Free coast to stop After receiving the stop command, the inverter immediately cuts off the output. The motor spins freely to a stop.	0	RW
P02.09	Stop DC braking starting frequency	0.00Hz～50.00Hz	1.00Hz	RR
P02.10	Parking DC braking current	0～200% Motor rated current (maximum does not exceed the frequency converter rated current)	100%	RW
P02.11	Parking DC braking time	0.00s～30.00s	0.00s	RR
P02.12	Over excitation braking coefficient	1.00～1.50 Over-excitation braking converts part of the kinetic energy into motor heat by increasing the motor excitation, speeding up the deceleration process. When 1.00 is taken, this function is invalid; the larger the value, the more obvious the effect, but	1.00	RR

Function code	Parameter name	Description	Default value	Property
		the greater the output current.		
P02.13	Stop delay frequency	0.00Hz～20.00Hz	0.50Hz	RR
P02.14	Parking delay time	0.000s～60.000s 0.000s:No parking delay function Bigger than zero: There is a parking delay function. When the output frequency drops below the parking delay frequency P02.13 during deceleration and parking, the inverter waits for the parking delay time P02.14 before blocking the pulse output. If a run command comes during the stop delay time, the inverter can restart quickly. Very useful in applications where jogging is frequently used.	0.000s	RR
P02.15	Minimum blackout time after free stop	0.010s～30.000s	Depend	RR
P02.16	Speed tracking method	**Unit's digit: tracking method** 0：Start from maximum frequency 1：Start with frequency of downtime 2：Start with grid frequency **Ten's digit:** direction selection 0 ： Search only in the command frequency direction 1：If the command frequency direction cannot be found, search from another direction.	00	RR
P02.17	Speed tracking deceleration time	0.1s～20.0s	2.0s	RR
P02.18	Speed tracking current	10%～150% Inverter rated current	40%	RR
P02.19	Speed tracking compensation coefficient	0.00～10.00	1.00	RR

03 Group Group Ramp and S curve

Function code	Parameter name	Description	Default value	Property
P03.00	Acceleration and deceleration curve type	0: Liner 1: S curve A 2: S curve B	0	RR

The acceleration and deceleration curve is also called "ramp frequency generator (RFG)" and is used to smooth the frequency command. VFD510 supports the following acceleration and deceleration curves:

0: Linear acceleration and deceleration

The output changes according to constant acceleration or deceleration. The acceleration time refers to the time for the inverter to accelerate from zero to the base frequency (selected by P03.15); the deceleration time refers to the time required to decelerate from the base frequency to zero.

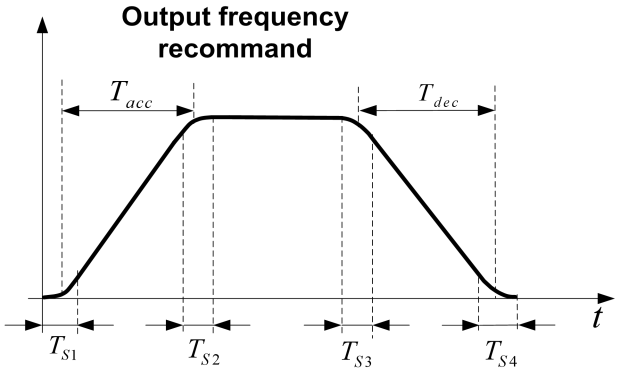
1：S curve A

The acceleration "a" of this acceleration and deceleration curve changes in a slope manner, and the start and stop are relatively gentle. The acceleration and deceleration process is shown in the figure below. Tacc and Tdec are the set acceleration and deceleration times.

The equivalent acceleration and deceleration time of this acceleration and deceleration curve is：

Acceleration time = T_{acc} + (T_{s1}+T_{s2})/2

Deceleration time = T_{dec} + (T_{s3}+T_{s4})/2



2：S curve B

The time definition of this S-curve is the same as method A. The difference is: during the acceleration and deceleration process, if the target frequency suddenly approaches or the acceleration and deceleration time changes, the S-curve will be re-planned; in addition, when the target frequency changes, this S-curve will Curves can avoid "overshoot" as much as possible.

P03.01	Acceleration time 1	The value range is determined by P03.16. P03.16 = 2, 0.00～600.00s; P03.16 = 1, 0.0s～6000.0s; P03.16 = 0, 0s～60000s	Depend	RW
P03.02	Deceleration time 1	The value range is determined by P03.16. 03.16 = 2, 0.00～600.00s; 03.16 = 1, 0.0s～6000.0s; 03.16 = 0, 0s～60000s	Depend	RW
P03.03	Acceleration time 2	The setting range is the same as P03.01	Depend	RW
P03.04	Deceleration time 2	The setting range is the same as P03.02	Depend	RW
P03.05	Acceleration time 3	The setting range is the same as P03.01	Depend	RW

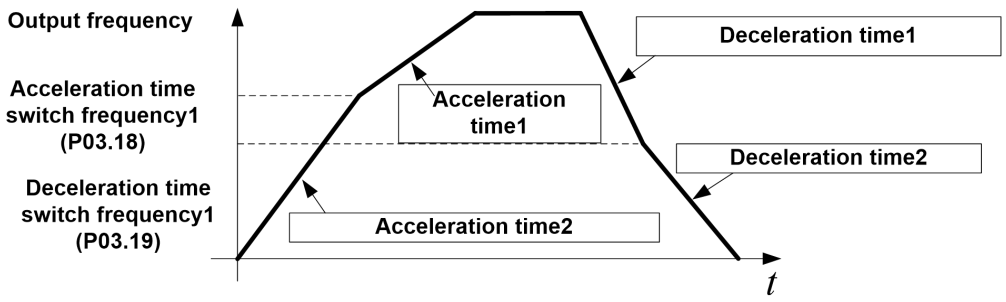
Function code	Parameter name	Description	Default value	Property
P03.06	Deceleration time 3	The setting range is the same as P03.02	Depend	RW
P03.07	Acceleration time 4	The setting range is the same as P03.01	Depend	RW
P03.08	Deceleration time 4	The setting range is the same as P03.02	Depend	RW

VFD510 provides four sets of acceleration and deceleration times. The actual acceleration and deceleration time can be selected through different methods such as DI terminal, output frequency size, and number of PLC operating segments. Several methods cannot be valid at the same time. The factory default is to use acceleration and deceleration time 1.

The mapping table for DI terminal selection of acceleration and deceleration time is as follows：

Acceleration and deceleration time terminal 2	Acceleration and deceleration time terminal 1	Selected acceleration and deceleration time
Ineffective	Ineffective	Acceleration and deceleration time 1 （P03.01,P03.02）
Ineffective	**Effective**	Acceleration and deceleration time 2 （P03.03,P03.04）
Effective	Ineffective	Acceleration and deceleration time 3 （P03.05,P03.06）
Effective	**Effective**	Acceleration and deceleration time 4 （P03.07,P03.08）

The schematic diagram of selecting acceleration and deceleration time according to the output frequency is as follows:：



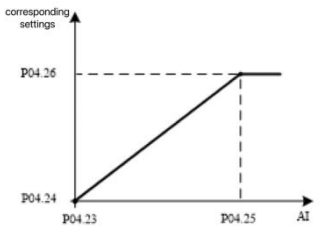
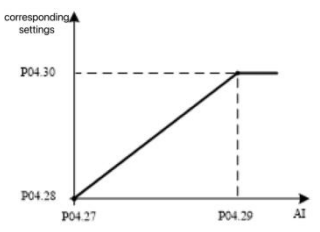
For other methods of selecting acceleration and deceleration time, please refer to the description of relevant parameters.

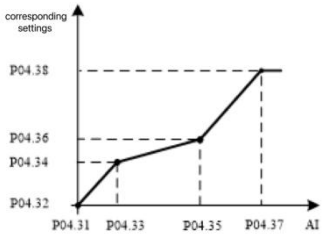
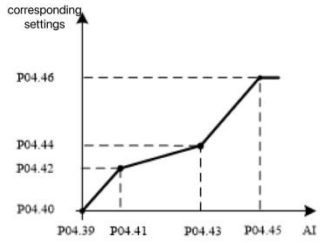
P03.09	Jog acceleration time	Acceleration time during jog, the setting range is the same as P03.01	6.00s	RW
P03.10	Jog deceleration time	Deceleration time during jog, the setting range is the same as P03.02	10.00s	RW
P03.11	S-curve acceleration begin time	The value range is determined by P03.16. P03.16 = 2, 0.01～30.00s; P03.16 = 1, 0.1s～300.0s; P03.16 = 0, 1s～3000s	0.50s	RW
P03.12	S-curve acceleration arrival time	The setting range is the same as P03.11	0.50s	RW
P03.13	S-curve deceleration begin time	The setting range is the same as P03.11	0.50s	RW
P03.14	T-curve deceleration	The setting range is the same as P03.11	0.50s	RW

Function code	Parameter name	Description	Default value	Property
	arrival time			
P03.15	Acceleration and deceleration time reference	0: Maximum frequency 1: Motor rated frequency	0	RR
P03.16	Acceleration and deceleration time unit	0: 1s 1: 0.1s 2: 0.01s	2	RR
P03.17	Deceleration time during emergency stop	The value range is determined by P03.16.	5.00s	RW
P03.18	Acceleration time switching frequency 1	0.00Hz～maximum frequency(P01.06)	0.00Hz	RW
P03.19	Deceleration time switching frequency 1	0.00Hz～maximum frequency(P01.06)	0.00Hz	RW
P03.20	Forward and reverse dead time	The zero speed waiting time inserted when the speed is switched between forward and reverse rotation,0.00s～30.00s	0.00s	RR

04 Group Analog and Pulse input

Function code	Parameter name	Description	Default value	Property
P04.00	HDI input minimum frequency	0.00kHz ～ 50.00kHz	1.00kHz	RW
P04.01	HDI input maximum frequency	0.00kHz ～ 50.00kHz	30.00kHz	RW
P04.02	HDI conversion value corresponding to the minimum frequency	-100.00% ～ 100.00%	0.00%	RW
P04.03	HDI conversion value corresponding to the maximum frequency	-100.00% ～ 100.00%	100.00%	RW
P04.04	HDI detection frequency filter time	0.000s～10.000s	0.050s	RW
r04.05	HDI input frequency	0.00kHz～50.00kHz Used to view the frequency of HDI input pulses.	-	RO
r04.06	HDI conversion value	-100.00%～100.00% Output for viewing HDI mapping curves.	-	RO
P04.07	**AI1** Mapping curve selection	**Unit's digit:** Mapping curve selection 0: Curve A 1: Curve B 2: Curve C 3: Curve D **Ten's digit:** When the input signal is below the minimum input 0: equal to minimum input 1: equal to 0.00%	00	RR
P04.08	AI1 filter time	0.000s～10.000s	0.100s	RW
r04.09	AI1 actual value	0.000V～10.000V Used to view the port voltage of AI1. When AI1 is a current type (0~20mA) input, multiply this value by 2 to get the input current (mA) of the AI1 port.	-	RO
r04.10	AI1 Conversion value	-100.00%～100.00%， Used to view the output of AI1 after mapping the curve.	-	RO
P04.11	**AI2** Mapping curve selection	**Unit's digit:** Mapping curve selection 0: Curve A 1: Curve B 2: Curve C 3: Curve D **Ten's digit:** When the input signal is below the minimum input 0: Equal to minimum input	01	RR

Function code	Parameter name	Description		Default value	Property
		1: Equal to 0.00%			
P04.12	AI2 filter time	0.000s～10.000s		0.100s	RW
r04.13	AI2 actual value	0.000V～10.000V Used to view the port voltage of AI2. When AI2 is a current type (0~20mA) input, the value multiplied by 2 is the input current (mA) of the AI2 port.		-	RO
r04.14	AI2 Conversion value	-100.00%～100.00% Used to view the output of AI2 after mapping the curve.		-	RO
P04.15	**AI3** Mapping curve selection	**Unit's digit:** Mapping curve selection 0: Curve A 1: Curve B 2: Curve C 3: Curve D **Ten's digit:** When the input signal is below the minimum input 0: Equal to minimum input 1: Equal to 0.00%		02	RR
P04.16	AI3 filter time	0.000s～10.000s		0.100s	RW
r04.17	AI3 actual value	0.000V～10.000V		-	RO
r04.18	AI3 conversion value	-100.00%～100.00%		-	RO
P04.23	Curve A horizontal axis 1	0.000V～P04.25		0.000V	RW
P04.24	Curve A vertical axis 1	-100.00% ～ 100.00%		0.00%	RW
P04.25	Curve A horizontal axis 2	P04.23～10.000V	Note： When input less than P04.23， output is decided by curve ten's digit.	10.000V	RW
P04.26	Curve A vertical axis 2	-100.00% ～ 100.00%		100.00%	RW
Method for setting AI1 to 4~20mA mode： 1、Switch the corresponding AI1 jumper on the IO board to current; 2、Set the function code：P04.07 unit's digit=0（default），P04.23=2.000.					
P04.27	**Curve B horizontal axis 1**	0.000V～P04.29		0.000V	RW
P04.28	Curve B vertical axis 1	-100.00% ～ 100.00%		0.00%	RW
P04.29	Curve B horizontal axis 2	P04.27～10.000V	Note： When input less than P04.27， output is decided by curve ten's digit.	10.000V	RW

Function code	Parameter name	Description		Default value	Property
P04.30	Curve B vertical axis 2	-100.00% ～ 100.00%		100.00%	RW
Method for setting AI2 to 4~20mA mode： 1、Switch the corresponding AI2 jumper on the IO board to current； 2、Set function code: P04.11 unit's digit = 1 (default)，P04.27=2.000。					
P04.31	**Curve C horizontal axis 1**	0.000V～P04.33	 Note：When the input is less than P04.31, the output is determined by the tens digit selected by the mapping curve.	0.000V	RW
P04.32	Curve C vertical axis 1	-100.00% ～ 100.00%		0.00%	RW
P04.33	Curve C horizontal axis 2	P04.31～P04.35		3.000V	RW
P04.34	Curve C vertical axis 2	-100.00% ～ 100.00%		30.00%	RW
P04.35	Curve C horizontal axis 3	P04.33～P04.37		6.000V	RW
P04.36	Curve C vertical axis 3	-100.00% ～ 100.00%		60.00%	RW
P04.37	Curve C horizontal axis 4	P04.35～10.000V		10.000V	RW
P04.38	Curve C vertical axis 4	-100.00% ～ 100.00%		100.00%	RW
P04.39	**Curve D horizontal axis 1**	0.000V～P04.41	 Note：When the input is less than P04.39, the output is determined by the tens digit selected by the mapping curve.	0.000V	RW
P04.40	Curve D vertical axis 1	-100.00% ～ 100.00%		0.00%	RW
P04.41	Curve D horizontal axis 2	P04.39～P04.43		3.000V	RW
P04.42	Curve D vertical axis 2	-100.00% ～ 100.00%		30.00%	RW
P04.43	Curve D horizontal axis 3	P04.41～P04.45		6.000V	RW
P04.44	Curve D vertical axis 3	-100.00% ～ 100.00%		60.00%	RW
P04.45	Curve D horizontal axis 4	P04.43～10.000V		10.000V	RW
P04.46	Curve D vertical axis 4	-100.00% ～ 100.00%		100.00%	RW
Description：HDI、AI1～AI4The range of the mapping curve： • When used for frequency reference, 100% corresponds to the maximum frequency P01.06. • When used for torque reference, 100% corresponds to the maximum torque P14.02. • When used for other purposes, see the description of the relevant function.					

05 Group Analog and Pulse output

Function code	Parameter name	Description	Default value	Property
r05.00	HDO Actual output frequency	0.00kHz～50.00kHz	-	RO
P05.01	HDO selection	0: Common DO2(P07.02 Function settings) 1: Pulse output (HDO)	0	RW
P05.02	HDO Output signal source selection	0: Operating frequency（0～maximum frequency） 1: Setting frequency（0～maximum frequency） 2: Output current （ 0 ～ 2 times inverter rated current） 3: Output torque（0～3 times motor rated torque） 4: Setting torque（0～3 times motor rated torque） 5: Output voltage（0～2 times motor rated voltage） 6: DC bus voltage（0～2 times driver standard bus voltage） 7: Output frequency （ 0 ～ 2 times motor rated power） 8: Encoder speed （ 0 ～ The rotation speed corresponding to the maximum frequency） 9: AI1（0.00～10.00V） 10: AI2（0.00～10.00V） 11: AI3（0.00～10.00V） 12: Reserved 13: Reserved 14: Acceleration and deceleration instructions (0.00～maximum frequency)	0	RW
P05.03	HDO Minimum output frequency	0.00kHz～50.00kHz When the output signal source is equal to 0, the frequency of the HDO terminal output pulse	1.00kHz	RW
P05.04	HDO Maximum output frequency	0.00kHz～50.00kHz When the output signal source is equal to the maximum value, the frequency of the HDO terminal output pulse	30.00kHz	RW
r05.05	AO1 Actual output value	0.0%～100.0%	-	RO
P05.06	AO1 Output signal selection	Same as P05.02	0	RW
P05.07	AO1 bias	-100.0%～100.0%	0.0%	RW
P05.08	AO1 Gain	-8.000～8.000	1.000	RW

The output error of AO1 can be corrected through P05.07 and P05.08, or the mapping relationship between the signal source and the actual output can be changed. The calculation formula is:

$$AO.c = P05.07 + P05.08 \times AO.p$$

AO.c：AO1 actual output；

AO.p：AO1 value before correction；

AO.c、AO.p、100.0% of P05.07 corresponds to 10V or 20mA.

eg：AO1 is set to 4~20mA output：

Function code	Parameter name	Description	Default value	Property
1. Switch the corresponding AO1 jumper on the IO board to current 2. Set the function code：P05.07=20.0%，P05.08=0.80				
r05.09	AO2 actual output value	0.0%～100.0%	-	RO
P05.10	AO2 Output signal selection	Same as P05.02	0	RW
P05.11	AO2 bias	-100.0%～100.0%	0.0%	RW
P05.12	AO2 gain	-8.000～8.000	1.000	RW

It can use P05.11 and P05.12 to correct the output error of AO2, or change the mapping relationship between the signal source and the actual output. The calculation formula is：

$$AO.c = P05.07 + P05.08 \times AO.p$$

AO.c：AO2 actual output；

AO.p：AO2 value before correction；

AO.c、AO.p、100.0% of P05.11 corresponds to 10V or 20mA.

eg：AO2 is set to 4~20mA output：

1. Switch the corresponding AO2 jumper on the IO board to current
2. Set the function code：P05.11=20.0%，P05.12=0.80

06 Group Digital input (DI)

Function code	Parameter name	Description	Default value	Property
r06.00	DI port status	Bit0～Bit8 correspond to DI1～DI9 Bit12～Bit15 correspond to VDI1～VDI4	-	RO
P06.01	DI1 function selection	0: No function 1: Operation 2: Reverse running/forward and reverse switching 3: Three-wire control 4: Forward jog command 5: Reverse jog command 6: Terminal UP 7: Terminal DOWN 8: UP/DOWN offset clear 9: Coast to stop/free stop 10: Fault reset 11: Reverse forbidden 12: Switch command source to keyboard 13: Switch command source between terminal /communication 14: Fast stop 15: External stop terminal 16: Motor 1 and 2 switch 17: Pause operation 18: DC braking 19: Speed/torque switching 20: Torque control disabled 21: Multi-speed terminal 1 22: Multi-speed terminal 2 23: Multi-speed terminal 3 24: Multi-speed terminal 4 25: Frequency source switching 26: The main frequency source switches to the digital frequency setting value 27: The main frequency source switches to AI1 28: The main frequency source switches to AI2 29: The main frequency source switches to AI3 30: Reserved 31: The main frequency source is switched to high-frequency pulse input 32: The main frequency source switches to the communication given 33: Auxiliary frequency source switches to digital	1	RR
P06.02	DI2 function selection		2	RR
P06.03	DI3 function selection		4	RR
P06.04	DI4 function selection		10	RR
P06.05	DI5(HDI) function selection		0	RR
P06.06	DI6 function selection		0	RR
P06.07	DI7 function selection		0	RR
P06.08	DI8 function selection		0	RR
P06.09	DI9 function selection		0	RR

Function code	Parameter name	Description	Default value	Property
P06.13	VDI1 function selection（virtual DI）	frequency setting 34: Acceleration and deceleration time terminal 1 35: Acceleration and deceleration time terminal 2 36: Acceleration/deceleration stop 37: User defined fault 1 38: User defined fault 2 39: Process PID Pause 40: Process PID integration paused 41: PID Parameter switching 42: PID Direct/reverse action switch 43: PID Digital setting terminal 1 44: PID Digital setting terminal 2 45: PID main and auxiliary command switch 46: PID main and auxiliary feedback switch 47: Simple PLC status reset 48: Simple PLC time stop 49: Swing frequency stop 50: Counter 1 input 51: Counter 1 reset/clear 52: Counter 2 input 53: Counter 2 reset/clear 54: Reserved 55: Motor 2 Accel and Decel time selection 56: Grid phase lock enable	0	RR
P06.14	VDI2 function selection（virtual DI）		0	RR
P06.15	VDI3 function selection（virtual DI）		0	RR
P06.16	VDI4 function selection（virtual DI）		0	RR
P06.17	VDI Terminal input source	**Unit's digit:** VDI1 input source 0~F：P06.33 specifies bit0~bit15 of the parameter **Ten's digit:** VDI2 input source 0~F：P06.34 specifies bit0~bit15 of the parameter **Hundred's digit:** VDI3 input source 0~F：P06.35 specifies bit0~bit15 of the parameter **Thousand's digit:** VDI4 input source 0~F：P06.36 specifies bit0~bit15 of the parameter	0003	RR
P06.18	DI Force function enable	Bitwise definition, 0: Disable 1: Enable Bit0 ～Bit11: DI1～DI12 Bit12～Bit15: VDI1～VDI4 When the bit is enabled, the state of the DI or VDI is set by the corresponding bit of P06.19.	H00000000 L00000000	RR
P06.19	DI Forcing data	Bitwise definition, 0:Ineffective 1: Effective Bit0 ～Bit11: DI1～DI12 Bit12～Bit15: VDI1～VDI4	0	RW
P06.20	Input terminal valid	Bitwise definition, 0: Positive logic	0	RR

Function code	Parameter name	Description	Default value	Property
	logic selection	1: Negative logic Bit0 ～Bit11: DI1～DI12 Bit12～Bit15: VDI1～VDI4 In reverse logic, the invalid level of the DI terminal changes to the valid level.		
P06.21	DI1 effective delay time	0.000s～30.000s	0.000s	RW
P06.22	DI1 Ineffective delay time	0.000s～30.000s	0.000s	RW
P06.23	DI2 effective delay time	0.000s～30.000s	0.000s	RW
P06.24	DI2 Ineffective delay time	0.000s～30.000s	0.000s	RW
P06.25	DI3 effective delay time	0.000s～30.000s	0.000s	RW
P06.26	DI3 Ineffective delay time	0.000s～30.000s	0.000s	RW
P06.27	DI4 effective delay time	0.000s～30.000s	0.000s	RW
P06.28	DI4 Ineffective delay time	0.000s～30.000s	0.000s	RW
P06.29	Terminal controlled two-wire and three-wire selection	0: 2-wire mode1 (FWD+REV) 1: 2-wire mode2 (RUN+DIRECTION) 2: 3-wire mode1 (FWD+REV+ENABLE) 3: 3-wire mode2 (RUN+DIRECTION+ENABLE) 4: 2-wire mode3 (RUN/STOP+DIRECTION)	0	RR

Function code	Parameter name	Description	Default value	Property

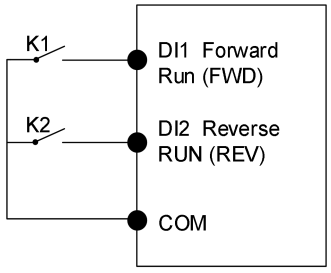


Figure 1: Two-wire mode 1

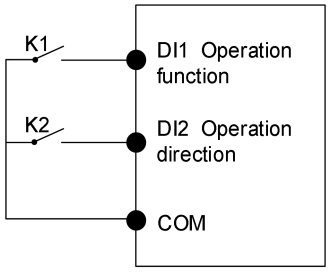


Figure 2: Two-wire mode 2

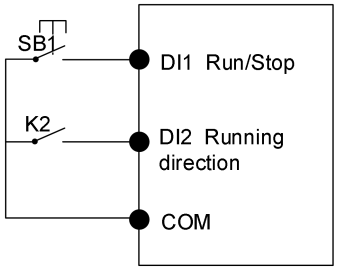


Figure 3: Two-wire mode 3

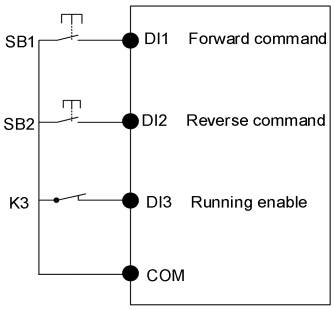


Figure 4: Three-wire mode 1

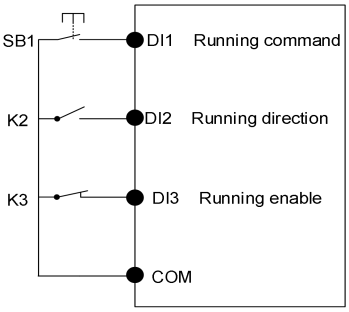


Figure 5: Three-wire mode 2

Two-wire mode 1:

When K1 is closed, the driver will run forward, and when K2 is closed, it will run reversely. If K1 and K2 are closed or disconnected at the same time, the driver will stop running.

Two-wire mode 2:

In the closed state of K1, the driver rotates forward when K2 is disconnected, and the driver rotates reversely when K2 is closed; when K1 is disconnected, the driver stops running.

Two-wire mode 3:

Press the SB1 button and the current status changes. For example, if the inverter is in the shutdown state at this time, press the SB1 button and the inverter will run. K2 will open and the drive will run forward, and K2 will close and the drive will run reverse. SB1 is an edge-type signal, and the driver internally collects the edge from invalid to valid to respond; K2 is a level-type signal.

Three-wire mode 1:

DI3 is set to a three-wire control function. When the K3 button is closed, press the SB1 button and the driver will rotate forward. Press the SB2 button and the driver will rotate reversely. When the K3 button is disconnected, the driver will stop. SB1 and SB2 are edge-type signals, and the driver internally collects the edge from invalid to valid to respond; K3 is a level-type signal.

Three-wire mode 2:

DI3 is set as a three-wire control function. When the K3 button is closed, press the SB1 button to run the driver. The running direction is determined by the K2 state. K2 is disconnected for forward rotation and K2 is closed for reverse rotation. When the K3 button is disconnected, the driver stops. SB1 is an edge-type signal. The driver internally collects the edge from invalid to valid to respond. K2 and K3 are level-type signals.

P06.30	Digital input terminal filter time	0.000～0.100s	0.010s	RW
P06.31	Terminal start protection function	0: Not protected When the command source is a terminal, if the running terminal is valid when the inverter is powered on, it can run directly. 1: Protection	0	RR

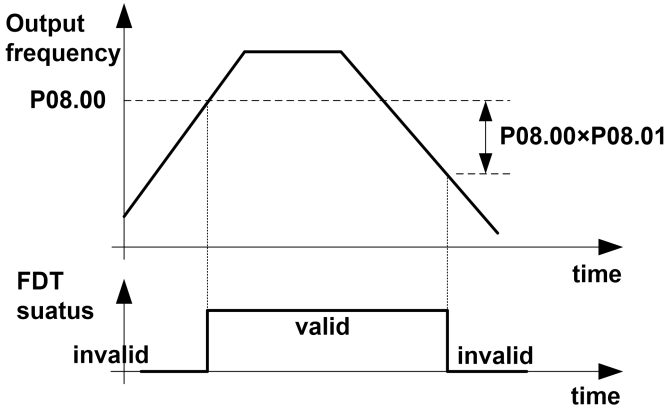
Function code	Parameter name	Description	Default value	Property
		When command is terminal, power on and terminal effective, inverter will not run, so need terminal ineffective then effective , then inverter will run.		
P06.32	DI Terminal power-on preparation time	0.000s～30.000s	2.000s	RR
P06.33	VDI1 source	To select the source of VDI1, please select the input signal of VDI1 together with the unit's digit of P06.17	06.00	RR
P06.34	VDI2 source	To select the source of VDI2, please select the input signal of VDI2 together with the ten's digit of P06.17	06.00	RR
P06.35	VDI3 source	To select the source of VDI3, please select the input signal of VDI3 together with the hundred's digit of P06.17	07.00	RR
P06.36	VDI4 source	To select the source of VDI4, please select the input signal of VDI4 together with the thousand's digit of P06.17	44.00	RR

07 Group Digital Output (DO)

Function code	Parameter name	Description	Default value	Property
r07.00	DO output port status	Bitwise definition，0: Ineffective 1:Effective Bit0: DO1; Bit1: DO2 Bit2: Relay1; Bit3: Relay2 Bit4: DO3; Bit5: DO4 Bit6: DO5; Bit7: DO6 Bit8: VDO1; Bit9: VDO2	-	RO
P07.01	DO1 function selection	0: No function 1: READY 2: RUN 3: Error1（all fault） 4: Error2（stop fault） 5: Error3 (fault but it still keeps running) 6: Swing frequency is limited 7: Torque is limited 8: Reverse running 9: Upper limit frequency reached 10: Lower limit frequency reaches 1 (stop without detection) 11: Lower limit frequency reaches 2 (stop detection) 12: FDT1 13: FDT2 14: Set frequency arrives 15: Arrival at any frequency 1 16: Arrival at any frequency 2 17: Running at zero speed (no output when stopped) 18: Running at zero speed (stop output) 19: Zero current state 20: Output current exceeds limit 21: Counter 1 set value reached 22: Counter 2 set value reaches 23: PLC cycle completed 24: Reserved 25: Frequency converter overload warning 26: Motor overload warning 27: Motor over temperature warning 28: Off loading 29: Reserved 30: Reserved 31: Reserved	0	RW
P07.02	DO2（HDO）function selection		0	RW
P07.03	Relay 1 function selection (T1A、T1B、T1C)		3	RW
P07.04	Relay 2 function selection (T2A、T2B、T2C)		0	RW
P07.05	DO3 function selection		0	RW
P07.06	DO4 function selection		0	RW
P07.07	DO5 function selection		0	RW
P07.08	DO6 function selection		0	RW

Function code	Parameter name	Description	Default value	Property
P07.09	VDO1(virtual DO1) function selection	32: Compare unit 1 output 33: Compare unit 2 output 34: Compare unit 3 output 35: Compare unit 4 output 36: Logic unit 1 output 37: Logic unit 2 output 38: Logic unit 3 output 39: Logic unit 1 output 40: Delay unit 1 output 41: Delay unit 2 output 42: Delay unit 3 output 43: Delay unit 4 output	0	RW
P07.10	VDO2(virtual DO2) function selection		0	RW
P07.11	Output logic negative	Bitwise definition，0: Off 1:On(negative) Bit0: DO1; Bit1: DO2 Bit2: relay1; Bit3: relay 2 Bit4: DO3; Bit5: DO4 Bit6: DO5; Bit7: DO6 Bit8: VDO1; Bit9: VDO2 **Note：** Positive logic equivalent to normal open point. And negative logic equivalent to normal close point.	0	RW
P07.12	DO1 effective delay time	0.000s～30.000s	0.000s	RW
P07.13	DO1 ineffective delay time	0.000s～30.000s	0.000s	RW
P07.14	DO2 effective delay time	0.000s～30.000s	0.000s	RW
P07.15	DO2 ineffective delay time	0.000s～30.000s	0.000s	RW
P07.16	Relay1 effective delay time	0.000s～30.000s	0.000s	RW
P07.17	Relay1 ineffective delay time	0.000s～30.000s	0.000s	RW
P07.18	Relay2 effective delay time	0.000s～30.000s	0.000s	RW
P07.19	Relay2 ineffective delay time	0.000s～30.000s	0.000s	RW

08 Group Digital output setting

Function code	Parameter name	Description	Default value	Property
P08.00	Frequency detection value1 (FDT1)	0.00Hz～maximum frequency(P01.06)	50.00Hz	RW
P08.01	Frequency detection hysteresis value1	0.0%～100.0%（P08.00）	5.0%	RW
P08.02	Frequency detection Value 2(FDT2)	0.00Hz～maximum frequency(P01.06)	50.00Hz	RW
P08.03	Frequency detection hysteresis value 2	0.0%～100.0%（P08.02）	5.0%	RW
FDT is used to check inverter output frequency, when output frequency is greater than frequency detection value, FDT effective, when output frequency is less than frequency detection value*(1-frequency detection hysteresis), FDT ineffective ; when output is between the above two, FDT output keep no change, following is FDT chart.  				
P08.04	Frequency arrival width	0.0%～100.0% maximum frequency(P01.06) When the output frequency is within the range of "command frequency ± frequency arrival width × P01.06", the corresponding DO outputs a valid signal.	3.0%	RW
P08.05	Arbitrary arrival frequency detection value 1	0.00Hz～maximum frequency(P01.06)	50.00Hz	RW
P08.06	Arbitrary arrival frequency detection width 1	0.0%～100.0% maximum frequency(P01.06)	3.0%	RW
P08.07	Arbitrary arrival frequency detection value 2	0.00Hz～maximum frequency(P01.06)	50.00Hz	RW
P08.08	Arbitrary arrival frequency detection width 2	0.0%～100.0% maximum frequency(P01.06)	3.0%	RW
P08.09	Zero speed detection width	0.00H～5.00Hz	0.25Hz	RW
P08.10	Zero current detection level	0.0%～100.0% motor rated current	5.0%	RW
P08.11	Zero current detection delay time	0.000～30.000s **Note:** When the output current ≤ P08.10 and lasts for P08.11 time, the corresponding DO outputs a valid signal.	0.100s	RW

Function code	Parameter name	Description	Default value	Property
P08.12	Output current exceeds limit value	0.0%～300.0% Motor rated current	200.0%	RW
P08.13	Current over-limit detection delay time	0.000～30.000s **Note:** When the output current ≥ P08.12 and lasts for P08.13 time, the corresponding DO outputs a valid signal.	0.100s	RW

10 Group Encoder parameters

Function code	Parameter name	Description	Default value	Property
P10.01	Encoder type	0: ABZ 1: ABZUVW 2: Rotary/Resolver 3: Sin Cos encoder ➢ If a PG card is required, please consult our technical support.	0	RR
P10.02	Encoder line number	1～65535 Rotary pulse number:1024*rotary pair of poles	1024	RR
P10.03	AB pulse direction	0: Forward 1: Reverse ➢ If control mode is VC(with PG card) we can get this value by auto tuning for motor ➢ We can run motor with open loop, and observe r10.12 and r27.00 if they are in the same direction, if not, then change this value.	0	RR
P10.04	UVW Phase	0: Forward， 1: Reverse This value is generally obtained through encoder self-learning(P11.10=3,13)	0	RR
P10.05	Z pulse angle	0.0 ~ 359.9 Z The electrical angle corresponding to the pulse or encoder zero position.	0.0	RR
P10.06	UVW angle	0.0 ~ 359.9 Offset angle of UVW or absolute position signal.	0.0	RR
P10.07	Rotating ratio molecule between motor and encoder	1～65535	1000	RR
P10.08	Rotating ratio denominator between motor and encoder	1～65535	1000	RR
When the encoder is not installed on the motor rotor shaft, vector control of the asynchronous motor with encoder can still be achieved by setting the motor to encoder speed ratio (P10.07 and P10.08). $\text{motor rotating speed} = \frac{P10.07}{P10.08} \times \text{encoder speed}$ Example: If the motor speed is 1500RPM and the encoder speed is 1000RPM, P10.07=1500 and P10.08=1000 should be set.				
P10.09	Encoder disconnection detection time	0.0 (no detection) ~ 10.0s If the encoder feedback signal is not detected beyond this time, an Er.PGL fault will be reported.	2.0	RR
P10.10	ABZ input signal window filter time	Unit's digit：Reserved … Thousand's digit：ABZ Pin sampling period	5501	RR
P10.11	Encoder speed filter time	0～32 Speed loop control cycle	1	RR

Function code	Parameter name	Description	Default value	Property
r10.12	Encoder feedback speed	Measured current speed of the encoder, unit:0.01Hz/1Rpm ➢ The unit is set by function code P21.17. ➢ Unsigned number, function code r27.02: Bit5 is used to indicate its direction; when viewing this parameter on the digital keyboard, the [REV] indicator light is used to indicate its direction.	-	RO
r10.13	Encoder current position	0 ～ 4*Encoder line number-1 The current position of the encoder takes the Z pulse as the reference zero point. When the motor rotates forward, the position increases, and when it rotates one circle and returns to the Z pulse, the position returns to zero.	-	RO
r10.14	Z pulse mark value	0 ～ 4*Encoder line number-1 (Can be used to monitor whether the encoder is slipping, whether AB is disturbed, etc.)	-	RO
r10.15	UVW Status	0～65535 When the encoder type is ABZUVW, it is used to monitor the current UVW level. When the encoder type is resolver, it is used to monitor the absolute position of the encoder.	-	RO

11 Group Motor 1 Parameters

Function code	Parameter name	Description	Default value	Property
r11.00	Motor type	0: AC asynchronous motor 1：Permanent magnet synchronous motor	0	RO
P11.02	Motor rated power	0.1kW～800.0kW ➢ If it is less than 1kW, it should be set according to the rounding method. For example, a 0.75kW motor should be set to 0.8kW, and a 0.55kW motor should be set to 0.6kW. ➢ When changing the rated power of the motor, the inverter will automatically set other nameplate parameters and motor model parameters. Please pay attention when using it!	Depend	RR
P11.03	Motor rated voltage	10V～2000V	Depend	RR
P11.04	Motor rated current	Unit:0.01A(P11.02＜30kW); 0.1A(P11.02≥30kW)	Depend	RR
P11.05	Motor rated frequency	1.00Hz～600.00Hz Warning: Please set parameter P11.06 for synchronous motor first! If the setting of P11.05 for the synchronous motor is incorrect, it will be automatically corrected. Right to the nearest correct value	50.00Hz	RR
P11.06	Motor rated speed	1～60000rpm	Depend	RR
P11.07	Motor rated power factor	0.500～1.000	Depend	RR
r11.08	Motor rated torque	Read only, 0.1Nm(P11.02＜30kW); 1Nm(P11.02≥30kW)	-	RO
r11.09	Number of motor pole pairs	Read only, automatically calculated based on the rated frequency and rated speed of the motor.	-	RO
P11.10	Self-learning method	Unit's digit：Self-learning method 0: No action 1:Motor static self-learning 2:Motor rotation self-learning 3:Encoder self-learning Ten's digit：Load type during self-learning 0：No load or light load 1：Heavy duty or with brake	0	RR

Asynchronous motor：

1: Motor static self-learning

The motor is stationary during self-learning. After self-learning, parameters P11.11 ~ P11.13 can be learned, but no-load current and mutual inductance cannot be learned.

2: Motor rotation self-learning

Complete self-learning can be performed. After learning is completed, the parameters P11.11~P11.18; as well as the encoder line number and direction can be obtained.

During rotation self-learning, the motor rotates forward and the speed can reach 50% ~ 100% of the rated speed.

Synchronous motor：

Function code	Parameter name	Description	Default value	Property
1 or 11: Motor static self-learning During self-learning, the motor shaft may rotate half a circle at most. After stationary self-learning, the line resistance, direct-axis inductance and quadrature-axis inductance can be learned, but the back electromotive force of the synchronous motor cannot be learned. **2 or 12：** Motor rotation self-learning In addition to the items covering the static self-learning of the motor, the rated back electromotive force of the motor can also be learned. **3 or 13：** Encoder self-learning During no-load self-learning (0x03), the motor rotates slowly for up to two turns; during load self-learning (0x13), the motor rotates at low speed for several turns. After learning, you can learn P10.02 ~ P10.06. Please perform motor self-learning before performing encoder self-learning! **Note：** Please confirm that the motor nameplate parameters (P11.00 ~ P11.06) have been correctly set before motor self-learning, and the encoder parameters (P10.01 ~ P10.02) should also be correctly set before encoder self-learning! Motor self-learning can only be performed when the command source selects the keyboard. After setting this parameter, press the "RUN" button on the keyboard to start self-learning. After the self-learning is completed, the driver will stop on its own.				
P11.11	Asynchronous machine stator resistance	Unit: 0.001Ω(P11.02＜30kW); 0.01mΩ(P11.02≥30kW)	Depend	RR
P11.12	Asynchronous machine rotor resistance	Unit: 0.001Ω(P11.02＜30kW); 0.01mΩ(P11.02≥30kW)	Depend	RR
P11.13	Asynchronous machine stator leakage inductance	Unit: 0.01mH(P11.02＜30kW); 0.001mH(P11.02≥30kW)	Depend	RR
P11.14	Asynchronous machine mutual inductance	Unit: 0.1mH(P11.02＜30kW); 0.01mH(P11.02≥30kW)	Depend	RR
P11.15	Asynchronous machine no-load excitation current	Unit: 0.01A(P11.02＜30kW); 0.1A(P11.02≥30kW)	Depend	RR
P11.16	Asynchronous machine magnetic saturation coefficient 1	Magnetic saturation coefficient of asynchronous motor in non-rated excitation state.	1.100	RR
P11.17	Asynchronous machine magnetic saturation coefficient 2	Magnetic saturation coefficient of asynchronous motor in non-rated excitation state.	0.900	RR
P11.18	Asynchronous machine magnetic saturation coefficient 3	Magnetic saturation coefficient of asynchronous motor in non-rated excitation state.	0.800	RR
P11.19	Synchronous machine stator resistance	Unit:0.001Ω(P11.02＜30kW); 0.01mΩ(P11.02≥30kW)	Depend	RR
P11.20	Synchronous machine d-axis inductor	Unit:0.01mH(P11.02＜30kW); 0.001mH(P11.02≥30kW)	Depend	RR
P11.21	Synchronous machine q-axis inductor	Unit:0.01mH(P11.02＜30kW); 0.001mH(P11.02≥30kW)	Depend	RR
P11.22	Synchronous machine back electromotive force	0.0V ~ 2000.0V Induced electromotive force at rated speed	Depend	RR

12 Group Motor 1 VF control parameters

Function code	Parameter name	Description	Default value	Property
P12.00	VF curve type	0: Linear VF 1: Multi-point VF 2: 1.3 Power 3: 1.7 Power 4: 2.0 Power 5: VF Complete separation 6: VF Half separation	0	RR

- When the VF curve is a straight line and a power curve, the frequency-voltage curve is as shown in the figure below：

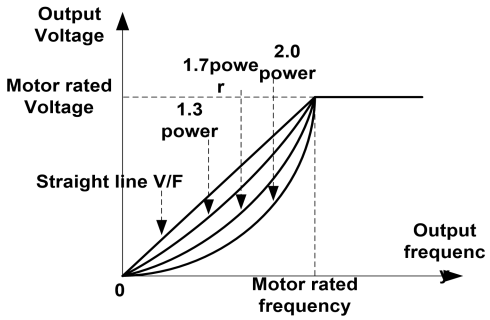


Figure 1: Straight line VF and 1.3, 1.7, 2.0 power VF

- Multi-segment polyline VF curve：

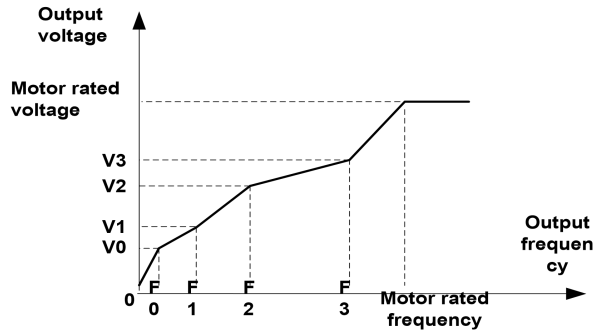


Figure 2: Multi-segment polyline VF curve

- VF complete separation

  The output voltage and output frequency are completely independent. The output frequency is determined by the frequency source and the output voltage is determined by P12.20. Suitable for applications such as variable frequency power supply or torque motor.

- VF semi-detached

  At this point, the ratio of the output voltage to the output frequency is determined by the voltage source, and the calculation formula is as follows：

$$\text{output voltage}=2 \times \text{Voltage source given} \times \text{output frequency} \times \frac{\text{motor rated voltage}}{\text{motor rated frequency}}$$

P12.01	Multi point VF curve F0	0.00Hz～Multi point VF curve F1(P12.03)	0.00Hz	RW
P12.02	Multi point VF curve V0	0.0%～100.0%	0.0%	RW
P12.03	Multi point VF curve F1	Multi point VF curve F0(P12.01)～ Multi point VF	50.00Hz	RW

Function code	Parameter name	Description	Default value	Property
		curve F2(P12.05)		
P12.04	Multi point VF curve V1	0.0%～100.0%	100.0%	RW
P12.05	Multi point VF curve F2	Multi point VF curve F1(P12.03)～ Multi point VF curve F3(P12.07)	50.00Hz	RW
P12.06	Multi point VF curve V2	0.0%～100.0%	100.0%	RW
P12.07	Multi point VF curve F3	Multi point VF curve F2(P12.05)～600.00Hz	50.00Hz	RW
P12.08	Multi point VF curve V3	0.0%～100.0%	100.0%	RW
P12.09	Torque boost	0%~200%, 0% is automatic torque boost.	0%	RW
➢ Automatic torque boost When P12.09 is set to 0, it is automatic torque promotion. The inverter automatically compensates the output voltage according to the load condition to improve low-frequency torque. Automatic torque boost is only effective on straight V/F curves. ➢ Manual torque boost When P12.09 is set to non-0, it is manual torque boost. The amount of improvement when the output frequency is 0 is equal to: P12.09 × motor stator resistance × rated excitation current. The amount of improvement gradually decreases as the frequency increases. When the output frequency is higher than 50% of the rated frequency of the motor, the amount of improvement is 0. **Note: Manual torque boost is effective for straight line VF and power curve VF.**				
P12.11	Slip compensation gain	0～200% It is used to compensate for the speed drop after the asynchronous motor VF control is loaded and improve the speed control accuracy. Please adjust according to the following principles.： • If the motor speed is lower than the target value after loading, increase this setting. • If the motor speed is higher than the target value after loading, reduce this setting.	100%	RW
P12.12	Slip compensation filter time	0.01s～10.00s Used to adjust the speed and stability of VF control's response to the load. • When the load response is slow, reduce this setting. • When the speed is unstable, increase this setting.	1.00s	RW
P12.13	Oscillation suppression gain	0～2000	300	RW
P12.14	Oscillation suppression range	Set the scope of the oscillation suppression function, 100% corresponds to the rated frequency of the motor.	110%	RW
P12.15	Current limiting function selection	0: Invalid 1: Adjust the output voltage (generally used for current limiting during VF separation) 2: Adjust output frequency	2	RR
P12.16	Current limit level	20%～180% Inverter rated current	150%	RW

Function code	Parameter name	Description	Default value	Property
P12.17	Current limiting coefficient in the weak magnetic region	0.50 ～ 2.00， Used to optimize the dynamic performance of the weak magnetic zone.	0.60	RW
P12.19	VF Maximum output voltage	100%~130%， Increasing this parameter can improve the load capacity of VF control in the field weakening zone.	110%	RW
P12.20	VF Separate voltage source selection	0: Digital setting 1: AI1 2: AI2 3: AI3 4: Reserved 5: HDI 6: Reserved 7: Communication 8: Process PID	0	RR
P12.21	VF Separate voltage digital setting	0.0%～100.0%	0.0%	RW
P12.22	VF Separation voltage acceleration and deceleration time	0.00s～60.00s	1.00s	RW
P12.23	VF Separation voltage change rate with time	The amount of change in the given voltage of VF separation per hour Setting range: -100.0%～100.0%	0.0%	RW
P12.36	Synchronous machine no-load current 0	1.0% ~ 100.0%	30.0%	RW
P12.37	Synchronous machine no-load current 1	1.0% ~ 100.0%	15.0%	RW
P12.38	Synchronous machine no-load current 2	1.0% ~ 100.0%	10.0%	RW
P12.39	High efficiency control time constant	It is used to reduce the input current of the synchronous motor under load to improve its operating efficiency. Generally speaking, the larger the load inertia, the larger the setting value. You can also adjust the setting value according to the following rules: When the motor speed fluctuates greatly, the setting value can be appropriately increased; When the torque response is slow, the setting value can be appropriately reduced.	1.00s	RW
P12.40	Highly efficient control of filter time	0.001s~1.000s	0.040s	RW
P12.41	Back EMF compensation amount	0% ~ 100% When the low-frequency torque is insufficient, this setting value can be increased appropriately.	0%	RW

Function code	Parameter name	Description	Default value	Property
P12.42	Back EMF compensation cutoff frequency	1.0% ~ 100.0% After it is higher than this set value, back electromotive force compensation is canceled.	50.0%	RW
P12.43	Voltage drop compensation gain	0% ~ 100%	100%	RW
P12.44	Pressure drop compensation action time	0.001s ~ 1.000s	0.010s	RW

13 Group Motor 1 Vector control

Function code	Parameter name	Description	Default value	Property
P13.00	ASR Proportional gain 1	0.1～100.0	12.0	RW
P13.01	ASR Integration time 1	0.001s～30.000s	0.200s	RW
P13.02	ASR Proportional gain 2	0.1～100.0	10.0	RW
P13.03	ASR Integration time 2	0.001s～30.000s	0.500s	RW
P13.04	ASR Parameter switching frequency 1	0.00Hz ～ ASR Parameter switching frequency 2(P13.05)	5.00Hz	RW
P13.05	ASR Parameter switching frequency 2	ASR Parameter switching frequency 1(P13.04)～600.00Hz	10.00Hz	RW
P13.00 and P13.01 are the speed regulator parameter used at low speed, and its range is from zero speed to P13.04； P13.02 and P13.03 are the speed regulator parameter used at high speed, and its range is from P13.05 to the maximum frequency. Between P13.04 and P13.05, the two sets of parameters transition linearly.				
P13.06	Torque limit source selection	**Unit's digit:** Electric torque limiting source 0: Digital given 1: AI1 2: AI2 3: AI3 4: Reserved 5: HDI 6: Communication **Ten's digit:** Braking torque limit source Same as the unit's digit	00	RR
P13.07	Electric torque limit	0.0%～300.0%	160.0%	RW
P13.08	Braking torque limit	0.0%～300.0%	160.0%	RW
P13.12	Torque current command filter time	0～100 Current loop control cycle	2	RW
P13.13	ACR proportional gain 1	1～1000	300	RW
P13.14	ACR Integration time 1	0.01～300.00ms	10.00ms	RW
P13.15	ACR proportional gain 2	1～1000	300	RW
P13.16	ACR Integration time 2	0.01～300.00ms	10.00ms	RW
P13.17	Output voltage feedforward gain	0～100	0	RR
P13.19	Voltage margin	0.0%～50.0%	3.0%	RW
P13.20	Field weakening regulator integration time	0.001s～5.000s	0.010s	RW
P13.21	Field weakening regulator proportional gain	0.000~2.000	0.100	RW

14 Group Torque control

Function code	Parameter name	Description	Default value	Property
P14.00	Torque control torque input source	0: Digital setting（P14.01） 1: AI1 2: AI2 3: AI3 4: Reserved 5: HDI 6: Communication	0	RR
P14.01	Torque given digital setting	-200.0～200.0% A torque given greater than 0 means that the direction of the torque is the same as the forward direction of the motor; less than 0 means that the direction of the torque is the same as the reverse direction of the motor.	0	RW
P14.02	Maximum torque	10.0%～300.0% This is the torque reference when analog input and high-frequency pulse input are used as torque reference, and it is also the limit output torque during torque control.	200.0%	RR
P14.03	Torque given ramp rise time	0.000s～60.000s The time for the torque reference to increase from 0 to the rated torque of the motor.	0.100s	RW
P14.04	Torque given ramp down time	0.000s～60.000s The time for the torque reference to decrease from the rated torque of the motor to 0.	0.100s	RW
P14.05	Rate limiting source	**Unit's digit：rate limiting source** 0: Digital setting（P14.06 and P14.07） 1: AI1 2: AI2 3: AI3 4: Reserved 5: HDI 6: Communication **Ten's digit：speed limit source symbol** 0：Unsigned 1：Signed	0	RR
P14.06	Digital setting of forward speed limit value	Relative to the maximum frequency: 0.00% ～ 100.00%	100.00%	RW
P14.07	Digital setting of reverse speed limit value	Relative to the maximum frequency: 0.00% ～ 100.00%	100.00%	RW
P14.08	Torque reference after exceeding the limited speed	0: Symmetrical torque command After the motor speed exceeds the speed limit value, the torque input source is set to the absolute value of the torque given, and the direction of the torque is always the braking force.	0	RR

Function code	Parameter name	Description	Default value	Property
		1: Enter speed mode After the motor speed exceeds the speed limit value, it enters the speed mode, and the inverter will limit the speed within the speed limit value as much as possible.		
P14.10	Static friction torque	0.0%～100.0% It is used to overcome the static friction at startup. The static friction torque compensation is canceled after the speed is higher than P14.11.	10.0%	RW
P14.11	Static friction range	0.00Hz～50.00Hz	2.00Hz	RR
P14.12	Dynamic friction coefficient	0.0%～50.0% The sliding friction torque when the motor is running at rated speed.	0.0%	RW
P14.13	Dynamic friction starting value	0.0%～50.0%	0.0%	RW

16 Group Energy saving control parameters

Function code	Parameter name	Description	Default value	Property
r16.00	Electricity meter count (32 bits)	Unit: KW/H	-	RO
r16.02	Output frequency	Unit: 0.1kw, The output power is negative in the power generation state.	-	RO
r16.03	Power factor	-1.000～1.000	-	RO
P16.04	Electricity meter zero clearing	0: No function; 1111: Clear to zero	0	RW
P16.05	Energy saving control options	0: Invalid; 1: Valid	0	RR
P16.06	Energy saving adjustment voltage limit	0%～50%	0%	RW
P16.07	Energy saving control filter time constant	0.00～10.00s	0.50s	RW

17 Group Synchronous motor control

Function code	Parameter name	Description	Default value	Property
14 Group torque control				
P17.00	Initial angle identification method	**Unit's digit：** Initial angle identification method 0：Pulse test method It is suitable for surface-mounted permanent magnet synchronous motors, and the identification time is shorter than the "high frequency injection method". 1：High frequency injection method Suitable for embedded permanent magnet synchronous motors or surface-mounted permanent magnet motors with obvious salient pole effect. 2：Unrecognized **Ten's digit ：** Initial angle identification timing 0：Identify before each run 1: Only identify before powering on and running for the first time	0x00	★
P17.01	Initial position identification current	20% ～ 180%	100%	RR
P17.03	Low speed zone definition	0.0% ～ 100.0%	10.0%	RR
P17.05	Electrical angle correction properties	0：Do not use Z pulse to correct the electrical angle (the motor may run away when the interference is large, so use with caution). 1：Use Z pulses to correct the electrical angle of the synchronous motor, and ignore abnormal Z pulses.	1	RR
P17.07	High frequency injection amplitude	5% ～ 50% For the amplitude of high-frequency signal injection, the larger the set value, the higher the position recognition accuracy, but the greater the motor noise. When the accuracy meets the requirements, the set value should be as small as possible.	20%	RW
P17.11	SVC Control The operation mode of low speed zone	0: Conventional way 1: High frequency injection operation	0	RR

Function code	Parameter name	Description	Default value	Property
P17.12	SVC No load current in low speed zone	0.0% ～ 100.0% When the speed is lower than P17.03, use this setting value.	25.0%	RW
P17.13	SVC No load current in high speed zone	0.0% ～ 50.0%	3.0%	RW
P17.18	MTPA Control enable	0：Prohibit 1：Enable MTPA That is, maximum torque to current ratio control, enabling MTPA can reduce Motor current during low load operation.	1	RW
P17.19	MTPA control adjustment time	The smaller the setting value, the faster the MTPA effect, but if the setting value is too small, it will causes current oscillation.	0.500	RW

20 Group User-defined function code

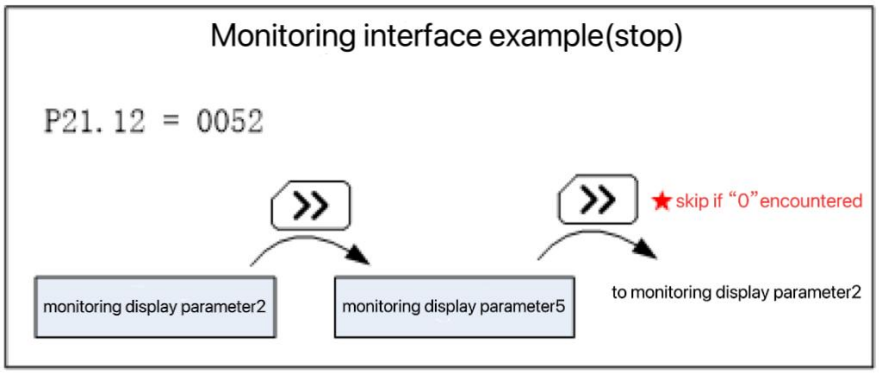
Function code	Parameter name	Description	Default value	Property
P20.00	User function code 0	This group of parameters can have two purposes: **Purpose 1: Customized menu display** When using the numeric keyboard, specify the function code displayed in the user-defined menu mode (-USr-). **Example**：If you want to display P03.01 and P13.00 in "-USr-" mode, set P20.00=03.01, P20.01=13.00 **Purpose 2: Communication address mapping** In order to improve communication efficiency, when it is necessary to read and write function codes of different parameter groups in one frame, the address pointer function of this group of parameters can be used. Usage method 1: Set P30.16 to 1, then when communicating to read or write P20.xx (address 0x14xx), the parameter pointed to by P20.xx will be automatically operated internally. Usage method 2: Communication read and write register 0x6F.xx, equivalent to the parameter pointed to by operation P20.xx. **Things to note:** 1. When mapped to register 00.00, the return value of read data is 0, and the write data is invalid. 2. Up to 16 function codes can be read and written in one frame.	00.00	RW
P20.01	User function code 1		00.00	RW
P20.02	User function code 2		00.00	RW
P20.03	User function code 3		00.00	RW
P20.04	User function code 4		00.00	RW
P20.05	User function code 5		00.00	RW
P20.06	User function code 6		00.00	RW
P20.07	User function code 7		00.00	RW
P20.08	User function code 8		00.00	RW
P20.09	User function code 9		00.00	RW
P20.10	User function code 10		00.00	RW
P20.11	User function code 11		00.00	RW
P20.12	User function code 12		00.00	RW
P20.13	User function code 13		00.00	RW
P20.14	User function code 14		00.00	RW
P20.15	User function code 15		00.00	RW
P20.16	User function code 16		00.00	RW
P20.17	User function code 17		00.00	RW
P20.18	User function code 18		00.00	RW
P20.19	User function code 19		00.00	RW
P20.20	User function code 20		00.00	RW
…	…		…	…
P20.39	User function code 39		00.00	RW

21 Group Keyboard and display

Function code	Parameter name	Description	Default value	Property
P21.00	Keyboard UP/DOWN function selection	Unit digit：UP/DOWN enable selection 0：Disable 1：Enable Ten's digit：Clear selection 0：Cleared in non operation status 1：Not cleared Hundred's digit：Power-off memory selection 0：No memory 1：Memory Thousand's digit：Rate selection 0：Automatic rate 1：P01.39 Rate	0111	RR
P21.02	MK function option	0: No function 1: Forward jog 2: Reverse jog 3:Forward/reverse switch 4: Fast stop 5: Coast to stop 6: Curse left shift(LCD keyboard)	1	RR
P21.03	STOP function selection	0: Only valid in keyboard operation mode 1: Any operation method is valid	1	RW
P21.04	Monitor display 1	00.00～99.99(function code index)	27.00	RW
P21.05	Monitor display 2	00.00～99.99(function code index)	27.01	RW
P21.06	Monitor display 3	00.00～99.99(function code index)	27.06	RW
P21.07	Monitor display 4	00.00～99.99(function code index)	27.05	RW
P21.08	Monitor display 5	00.00～99.99(function code index)	27.03	RW
P21.09	Monitor display 6	00.00～99.99(function code index)	27.08	RW
P21.10	Monitor display 7	00.00～99.99(function code index)	06.00	RW
P21.11	Operation status monitoring quantity selection	Unit's digit to Thousand's digit set 1-4 monitor parameter 0 means no display, 1 to 7 correspond to monitoring display parameters 1 to 7 Units place: Select the first monitoring quantity, 0~7 Tens digit: Select the second monitoring quantity, 0~7 Hundreds digit: Select the third monitoring quantity, 0~7 Thousands digit: Select the 4th monitoring quantity, 0~7	5321	RW
P21.12	Stop state monitoring quantity selection	Same as P21.11	0052	RW

The monitoring interface of the VFD510 digital keyboard supports up to 4 monitoring quantities. The monitoring variables in the running state and the monitoring variables in the stopping state are set by P21.11 and P21.12 respectively. Press the [>>] key on the keyboard to switch the monitoring variable from the low position of P21.11 or P21.12 to the high position. , skip when encountering "0", and monitor in a loop.

Taking the shutdown monitoring interface as an example, P21.12=0052, there are two monitoring quantities,

Function code	Parameter name	Description	Default value	Property
namely r27.01 (monitoring display parameter 2, P21.05=27.01) and r27.03 (monitoring display parameter 5, P21.08 =27.03), press the [>>] key on the keyboard to switch between the two monitoring quantities, as shown in the figure below.  The rules for running the monitoring interface are the same as those for the shutdown monitoring interface and will not be repeated.				
P21.13	Digital keypad personalized setting	**Unit's digit: Quick editing function selection** 0: Invalid 1: Numeric frequency setting 2: Numeric torque setting 3: PID digital setting 0 4: Forward speed limit value setting in torque control **Note**：The quick editing function means that in the monitoring state, if the current monitoring quantity is the output frequency or command frequency, then pressing the 【ENTER】 key can directly enter the parameter editing interface, and the edited parameters are set by the units digit of this function code. **Ten's digit: Monitoring pointer reset selection** 0:When the display state enters the monitoring state from other states, or switches between the running monitoring state and the shutdown monitoring state, the previously memorized monitoring pointer position is restored. 1: When the display state enters the monitoring state from other states, or switches between the running monitoring state and the shutdown monitoring state, the monitoring pointer is reset to the ones digit of P21.11 or P21.12. Note ： When powering on, the shutdown monitoring pointer points to the ones digit of P21.12, and the running monitoring pointer points to the ones digit of P21.11.	0x01	RR
P21.14	Load speed display	0.01～65.00	30.00	RW

Function code	Parameter name	Description	Default value	Property
	coefficient			
P21.15	Number of decimal points for load speed	0～2	0	RW
r21.16	Load speed display	Load speed = r27.00*P21.14, the number of decimal points is specified by P21.15.	-	RO
P21.17	Speed display unit	0: 0.01Hz； 1: 1Rpm Used to select the display unit of P00.07, r27.00, r27.01, r10.12.	0	RR

22 Group Drive configuration

Function code	Parameter name	Description	Default value	Property
P22.00	Carrier frequency	The setting range is determined by the inverter model.: ≤7.5kW: 1kHz～12.0kHz 11kW ～ 1kHz～8kHz 45kW: ≥55kw: 1kHz～4kHz When the following phenomena occur, the carrier frequency can be reduced: •The leakage current generated by the frequency converter is large • The interference generated by the frequency converter has an impact on peripheral equipment •The wiring distance between the inverter and the motor is long When the following phenomena occur, the carrier frequency can be increased: • The electromagnetic noise generated by the motor is relatively large	Depend	RW
P22.01	Carrier frequency adjustment selection	**Unit's digit:** Adjust the carrier frequency according to the output frequency 0: Yes; 1: No **Ten's digit:** Limit the carrier frequency according to the inverter temperature 0: Yes; 1: No	00	RR
P22.02	Carrier frequency at low speed	1.0kHz～15.0kHz	Depend	RW
P22.03	Carrier frequency at high speed	1.0kHz～15.0kHz	Depend	RW
P22.04	Carrier frequency switching point 1	0.00Hz～600.00Hz When the carrier frequency is adjusted according to the output frequency, the carrier frequency set by P22.02 is used when the output frequency is lower than this set value.	10.00Hz	RW
P22.05	Carrier frequency switching point 2	0.00Hz～600.00Hz When the carrier frequency is adjusted according to the output frequency, the carrier frequency set by P22.03 is used when the output frequency is higher than this set value.	50.00Hz	RW
P22.06	PWM Modulation method	0: SVPWM It is normally used 1: SVPWM+DPWM Using this modulation method can reduce the switching loss of the inverter and reduce the	0	RR

Function code	Parameter name	Description	Default value	Property
		probability of overheating alarm of the inverter; however, the electromagnetic noise of the motor in the medium speed section will be too large. 2: Random PWM The electromagnetic noise produced by the motor is white noise, not a high-pitched whine. 3: SPWM Use only on special occasions.		
P22.07	DPWM switching point	10%～100%（Modulation ratio） When P22.06 is set to 1, increasing this setting can reduce the electromagnetic noise in the mid-speed section.	30%	RR
P22.08	Modulation limit	1.00～1.10 Used to limit the duty cycle of the inverter side IGBT. When the setting is above 100%, over-modulation is allowed. When the setting value increases from 101 to 110, the allowable degree of over-modulation becomes deeper.	1.05	RR
P22.10	AVR function selection	0: Disable 1: Enable When the AVR function is effective, it can eliminate the impact of DC bus voltage changes on the output voltage.	1	RR
P22.11	Energy consumption braking enable selection	0: Disable 1: Enable 2: Only enabled during deceleration and stop ➢ This parameter is only used to control the built-in braking unit. For models without built-in braking units, this setting can be ignored.	1	RW
P22.12	Energy consumption braking voltage	220V level: 320V～400V 380V level: 600V～800V 480V level: 690V～900V 690V level: 950V～1250V	Depend	RW
P22.13	Output phase switch	0: No operation 1:Phase switch(equivalent to exchanging motor wiring V and W. For closed-loop control, rotation self-learning needs to be performed again to confirm the encoder direction)	0	RR
P22.14	Cooling method (fan control)	0: Valid at runtime 1: Always valid after power on 2: Automatically controlled according to temperature	0	RW
P22.15	GP Model selection	0: G type（standard type） 1: P type（Light load type）	0	RR
r22.16	Inverter rated power	Read only Unit:0.1kw	-	RO

Function code	Parameter name	Description	Default value	Property
r22.17	Drive rated Voltage	Read only Unit:V	-	RO
r22.18	Drive rated current	Read only Unit:0.1A	-	RO
P22.20	Trial time setting	After this time, the inverter will stop and report Er.TTA fault; if set to 0, it will be canceled. Note: This parameter needs agency authority to be able to see	0	RW

23 Group Drive protection

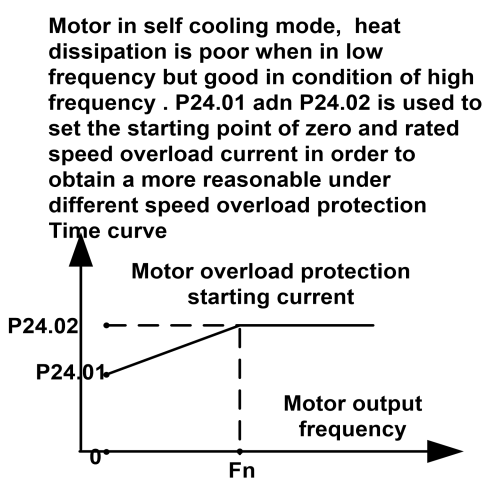
Function code	Parameter name	Description	Default value	Property
P23.00	Bus voltage control	**Unit's digit: Overvoltage stall control** 0: Overvoltage stall is invalid 1: Overvoltage stall is valid 2: Overvoltage stall is valid （Adaptive pressure limiting, suitable for cam loads） ➢ The overvoltage stall function limits the power generation of the motor by extending the deceleration time or even increasing the speed to avoid overvoltage faults caused by excessive DC side voltage. **Ten's digit: Under voltage stall control** 0: Undervoltage stall is invalid 1: Undervoltage stall is valid (Standby after decelerating to zero frequency, and automatically restarting after voltage recovery) 2: Undervoltage stall is valid (stop after decelerating to zero frequency) ➢ The undervoltage stall function reduces the motor speed, reduces the motor's power consumption or switches to power generation operation to avoid undervoltage faults caused by too low DC side voltage. ➢ The undervoltage stall function is used when the input power quality is poor (the power supply voltage fluctuates greatly or there are occasional short-term power outages) and the inverter needs to be kept running as much as possible.	01	RR
P23.01	Overvoltage stall point	220V level: 320V～400V 380V level: 540V～800V 480V level: 650V～950V 690V level: 950V～1250V	Depend	RR
P23.02	Undervoltage stall point	220V level: 160V～300V 380V level: 350V～520V 480V level: 400V～650V 690V level: 650V～900V	Depend	RR
P23.03	Overvoltage stall ratio	0～10.0	1.0	RW
P23.04	Undervoltage stall ratio	0～20.0	4.0	RW
P23.05	Undervoltage fault point	220V level: 160V～300V 380V level: 350V～520V 480V level: 400V～650V	Depend	RR

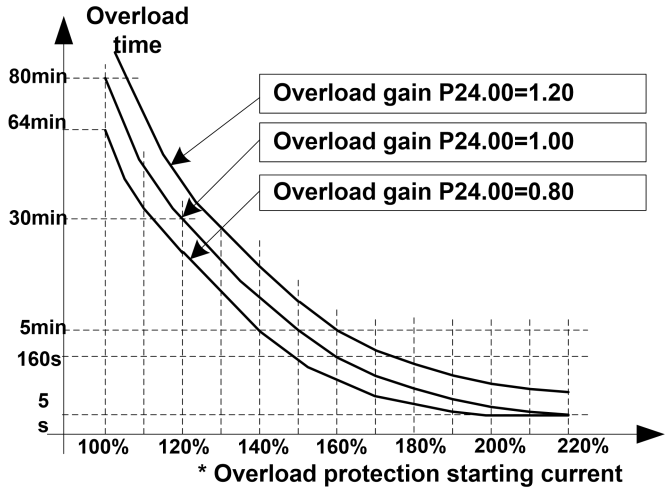
Function code	Parameter name	Description	Default value	Property
		690V level: 650V～900V		
P23.06	Undervoltage fault detection time	0.0s～30.0s	1.0s	RW
P23.07	Hardware protection configuration	**Units digit:** Wave-by-wave current limit enable bit 0:Ineffective; 1:Effective **Ten's digit:** Short circuit to ground enable bit 0: Ineffective 1: Power-on detection 2：Test before running 3：Tested before power-on and operation	11	RR
P23.10	Over-speed detection value	0.0%～120.0% Maximum frequency	120.0%	RW
P23.11	Over-speed detection time	0.0s(not detect)～30.0s	1.0s	RW
P23.12	Excessive speed deviation detection value	0.0%～100.0%(Motor rated frequency)	20.0%	RW
P23.13	Excessive speed deviation detection time	0.0s(not detect)～30.0s	0.0s	RW
P23.14	Enter the phase loss detection time	0.0s(not detect)～30.0s	8.0s	RW
P23.15	Output phase loss detection imbalance	0%(not detect)～100%	25%	RW
P23.18	Fault protection action selection 1	Unit’s digit: Input phase loss 0: Coast to stop 1: Emergent stop 2: Stop as per stop mode 3: Continue to Run Ten’s unit: user self-defined fault 1 Hundred’s unit: user self-defined fault 2 Thousand’s unit: communication fault Ten’s/hundred’s/Thousand’s are same as unit’s digit.	0000	RW
P23.19	Fault protection action selection 2	Unit’s digit: Motor overload 0: Coast to stop 1: Emergent stop 2: Stop as per stop mode 3: Continue to Run **Ten’s digit:** Motor overheat **Hundred’s digit:** Too large speed deviation **Thousand’s digit:** Motor over speed Ten’s/hundred’s/Thousand’s are same as unit’s digit.	0000	RW
P23.20	Fault protection action selection 3	**Unit’s digit:** PID feedback lost 0: Coast to stop 1: Emergent stop	0000	RW

Function code	Parameter name	Description	Default value	Property
		2: Stop as per stop mode 3: Continue to Run Ten's /Hundred's/Thousand's digit: Reserved		
P23.21	Fault protection action selection 4	**Unit's digit:** Output phase loss 0: Coast to stop 1: Emergent stop 2: Stop as per stop mode **Ten's digit:** EEPROM fault 0: Coast to stop 1: Emergent stop 2: Stop as per stop mode 3: Continue to Run **Hundred's digit:** Reserved **Thousand's digit:** Load loss fault 0: Coast to stop 1: Emergent stop 2: Stop as per stop mode 3: Continue to Run	0000	RW
P23.24	Fault automatic reset source selection	Bitwise definition: Bit0-Undervoltage fault; Bit1-Inverter overload Bit2-Inverter overheat; Bit3-Motor overload Bit4-Motor overheat; Bit5-User Failure1 Bit6-User failure2; Bit7～15 Reserved	0	RW
P23.25	Fault retry source selection	Bitwise definition: Bit0-Output overcurrent; Bit1-Reserved Bit2-Reserved; Bit3-DC bus overvoltage Bit4-Reserved; Bit5-Reserved Bit6-Inverter undervoltage; Bit7-Input phase loss Bit8-Inverter overload; Bit9-Inverter overheat Bit10-Motor overload; Bit11-Motor overheat Bit12-User failure1; Bit13-User failure2 Bit14-Reserved; Bit15-Reserved	0	RW
P23.26	Fault retry times	0～99	0	RW
P23.27	Fault D0 status during fault retry	0:No action; 1:Action	0	RW
P23.28	Failure retry interval	0.1s～300.0s	0.5s	RW
P23.29	Fault retry count clearing time	0.1s～3600.0s	10.0s	RW
P23.30	Frequency selection to continue operation in case of failure	0: Run at set frequency 1: Operating at abnormal backup frequency	0	RW
P23.31	Abnormal backup frequency	0.00Hz～Maximum frequency	2.00Hz	RW

24 Group Motor protection

Function code	Parameter name	Description	Default value	Property
P24.00	Motor overload protection gain	0.20～10.00 The larger the value, the longer the overload operation time is allowed and the higher the risk of overheating damage to the motor.	1.00	RW
P24.01	Zero speed motor overload starting current	50.0%～150.0%	100.0%	RW
P24.02	Rated speed motor overload starting current	50.0%～150.0%	115.0%	RW





Left picture: Motor overload protection starting current Right: Motor overload protection curves under different overload protection gains

Motor overload only protects the motor from overload when P24.04 is enabled. P24.00 is used to adjust the overload inverse time curve time. As shown in the figure on the right above, the minimum motor overload time limit is 5.0s.

Note： The user needs to correctly set the three parameter values of P24.00, P24.01 and P24.02 according to the actual overload capacity of the motor. If the settings are unreasonable, the motor may be damaged due to overheating and the inverter may not provide timely alarm protection.

P24.03	Motor overload warning coefficient	50%~100%， When the accumulated overload degree is greater than this value, the DO terminal with function "26: Motor overload warning" selected will output a valid signal.	80%	RW
P24.04	Motor overload protection selection	**Unit's digit: Motor 1 overload protection selection** 0: Turn off software overload protection 1: Enable software overload protection **Ten's digit: Motor 2 overload protection selection** 0: Turn off software overload protection 1: Enable software overload protection	0x11	RW

Function code	Parameter name	Description	Default value	Property
P24.08	Motor temperature sensor type	0: None 1: PT100 2: PT1000 3: KTY84-130	0	RW
P24.09	Motor overheating fault threshold	0.0℃～200.0℃	120.0℃	RW
P24.10	Motor overheating warning threshold	0.0℃～200.0℃ When the motor temperature detected by the temperature sensor is greater than this value, the DO terminal with function "27: Motor over-temperature warning" selected will output a valid signal.	90.0℃	RW
r24.11	Motor temperature reading	Unit:0.1℃ Displays the motor temperature detected by the temperature sensor.	-	RO
P24.12	Load loss protection options	0: Effective; 1: Ineffective	0	RW
P24.13	Load shedding detection level	0.0～100.0%	10.0%	RW
P24.14	Load drop detection time	0.000s～60.000s	1.000s	RW

25 Group Fault Tracking

Function code	Parameter name	Description	Default value	Property
r25.00	Most recent failure type	Please refer to the "Fault Diagnosis and Treatment" chapter for details of fault types.	-	RO
r25.01	Output frequency at fault	Unit: 0.01Hz	-	RO
r25.02	Output current during fault	Unit: 0.1A	-	RO
r25.03	Bus voltage at fault	Unit: V	-	RO
r25.04	Status word 1 in case of fault	See r27.10 description for details	-	RO
r25.05	Input terminal status during fault	Bit0～Bit6 Correspond to DI1～DI7 Bit12～Bit15 Correspond to VDI1～VDI4	-	RO
r25.06	Current running time at the time of failure	Unit: 0.01s	-	RO
r25.07	Cumulative operating time at the time of failure	Unit: Hour	-	RO
r25.08	Frequency command at fault	Unit: 0.01Hz	-	RO
r25.09	Torque command at fault	Unit: 0.1%Relative to motor rated torque	-	RO
r25.10	Encoder speed at fault	Unit: RPM	-	RO
r25.11	Electrical angle at fault	Unit: 0.1°	-	RO
r25.12	Status word 2 in case of fault	See r27.11 description for details	-	RO
r25.13	Output terminal status during fault	Bitwise definition，0: Effective ， 1: Ineffective. Bit0: DO1; Bit1: DO2 Bit2: Relay1; Bit3: Relay2 Bit4: DO3; Bit5: DO4 Bit6: DO5; Bit7: DO6 Bit8: VDO1; Bit9: VDO2	-	RO
r25.14	Radiator temperature at fault	Unit: 0.1℃	-	RO
r25.15	Covered low-level faults	Please refer to the "Fault Diagnosis and Treatment" chapter for details of fault types.	-	RO
r25.16	Warning type	For details on warning types, please refer to the "Fault Diagnosis and Handling" chapter; when equal to 0, it means there is no warning currently.	-	RO

26 Group Fault record

Function code	Parameter name	Description	Default value	Property
r26.00	Type of previous fault	Please refer to the "Fault Diagnosis and Treatment" chapter for details of fault types.	-	RO
r26.01	Output frequency at the time of the previous fault	Unit: 0.01Hz	-	RO
r26.02	Output current during the previous fault	Unit: 0.1A	-	RO
r26.03	Bus voltage at the time of the previous fault	Unit: V	-	RO
r26.04	Status word 1 during the previous fault	See r27.10 description for details	-	RO
r26.05	Input terminal status at the time of the previous fault	Bit0～Bit6 Correspond to DI1～DI7 Bit12～Bit15 Correspond to VDI1～VDI4	-	RO
r26.06	Running time of the previous fault	Unit: 0.01s	-	RO
r26.07	Cumulative running time of the previous fault	Unit: Hour	-	RO
r26.08	Type of previous 2 failures	Same as the previous fault description	-	RO
r26.09	Output frequency during the first 2 faults		-	RO
r26.10	Output current during the first 2 faults		-	RO
r26.11	Bus voltage during the first 2 faults		-	RO
r26.12	Status word 1 for the first 2 faults		-	RO
r26.13	Input terminal status during the first 2 faults		-	RO
r26.14	Running time of the first 2 faults		-	RO
r26.15	Cumulative running time of the first 2 faults		-	RO
r26.16	Types of the first 3 failures	Same as the previous fault description	-	RO
r26.17	Output frequency during the first 3 faults		-	RO
r26.18	Output current during the first 3 faults		-	RO
r26.19	Bus voltage during the first three faults		-	RO
r26.20	Status word 1 for the first 3 faults		-	RO
r26.21	Input terminal status		-	RO

Function code	Parameter name	Description	Default value	Property
	during the first 3 faults			
r26.22	Running time of the first 3 faults		-	RO
r26.23	Cumulative running time of the first 3 failures		-	RO

27 Group Status Monitoring

Function code	Parameter name	Description	Default value	Property
r27.00	Operating frequency	The unit can be set through P21.17	-	RO
r27.01	Set frequency	The unit can be set through P21.17	-	RO
r27.02	Direction flag	Bit0: Direction of operating frequency (0-Positive direction; 1-Negative direction, the same below) Bit1: Set frequency direction Bit2: Direction of dominant frequency Bit3: The direction of the auxiliary frequency Bit4: UpDown direction of offset Bit5: Direction of encoder feedback frequency Bit6: The above are reserved	-	RO
r27.03	Bus voltage	Unit: 1V	-	RO
r27.04	VF Separate set voltage	Unit: 0.1%	-	RO
r27.05	Output voltage	Unit: 0.1V	-	RO
r27.06	Output current	Unit: 0.1A	-	RO
r27.07	Output current percentage	Unit: 0.1%(Percentage relative to the rated current of the inverter)	-	RO
r27.08	Output torque	0.1%	-	RO
r27.09	Target torque	0.1%	-	RO
r27.10	Drive status word 1	Bit0-Running status: 0-Stop;1-Run; Bit1-Motor steering: 0-Forward;1-Reverse Bit2-VFD Ready signal: 0-Not ready; 1-Ready Bit3-Fault status: 0-No faulty; 1-Faulty Bit4～5-Fault type: 0-Coast to stop; 1-Emergency stop; 2-Stop according to stop mode; 3-continue running Bit6-Jog status: 0-No jog; 1-Jog status Bit7-Tuning status: 0-Non-tuned state; 1-Tuning status Bit8-DC braking: 0-Non-DC braking; 1-DC braking Bit9-Reserved Bit10～11-Acceleration and deceleration status: 0:Stop/zero output; 1:Accelerate; 2:Decelerate; 3:Constant speed Bit12-Reserved Bit13-Current limit state: 0-Unrestricted; 1-Restricted Bit14-Overvoltage stall: 0-No stall regulation; 1-Stall adjustment in progress Bit15-Under voltage stall: 0-No stall regulation;	-	RO

Function code	Parameter name	Description	Default value	Property
		1-Stall adjustment in progress		
r27.11	Drive status word 2	Bit0 ～ 1-Current command source: 0-Keypad; 1-Terminal ; 2-Communication Bit2 ～ 3-Currently selected motor: 0-Motor1; 1-Motor 2 Bit4 ～ 5-Current control method: 0-VF; 1-SVC; 2-VC Bit6 ～ 7-Current operating mode: 0-Speed; 1-Torque; 2-Position	-	RO
r27.12	Drive status word 3	Reserved	-	RO
r27.13	Drive status word 4	Reserved	-	RO
r27.14	Cumulative power-on time	Unit:Hour	-	RO
r27.15	Cumulative running time	Unit: Hour	-	RO
r27.16	This running time	Unit: Min	-	RO
r27.18	Radiator temperature	Unit: 0.1℃	-	RO
r27.19	Main frequency	Unit: 0.01Hz	-	RO
r27.20	Auxiliary frequency	Unit: 0.01Hz	-	RO
r27.21	Up Down offset	Unit: 0.01Hz	-	RO

29 Group Communication special register

Function code	Parameter name	Description	Default value	Property
This set of registers is equivalent to 0x70xx registers： Example：P29.00（address 0x1D00）equal to 0x7000； P29.04（address 0x1D04）equal to 0x7004； This set of registers can display the current value on the panel to facilitate communication data diagnosis.				
P29.00	Communication command	Communication command. The values and functions are as follows： 0x0000：The run command is invalid, which is equivalent to all keys under keyboard control being invalid.； 0x0001：Forward running； 0x0002：Reverse run； 0x0003：Forward jog； 0x0004：Reverse jog； 0x0005：Coast to stop； 0x0006：Slow down and stop； 0x0007：Quick stop； 0x0008：Fault reset.	-	RW
P29.01	Communication speed given	Communication speed is given. The unit of this register can be set by 30.14. 0.01% (-100.00% ~100.00%) 0.01Hz (0 ~ 600.00Hz) 1Rpm (0 ~ 65535Rpm)	-	RW
P29.02	Communication torque given	Communication torque given.0.01%（-300.00% ~ 300.00%）	-	RW
P29.03	Communication upper limit frequency	Communication upper limit frequency. The unit of this register can be set by 30.14. The range under different units is the same as 0x7001.	-	RW
P29.04	Torque mode speed limit value	Torque mode speed limit value. The unit of this register can be set by 30.14. The range under different units is the same as 0x7001.	-	RW
P29.05	Electric torque limit	Electric torque limit. 0.1%（0~300.0%）	-	RW
P29.06	Generator torque limit	Generator torque limit. 0.1%（0~300.0%）	-	RW
P29.07	Process PID given	Process PID given. 0.01%（-100.00% ~100.00%）	-	RW
P29.08	Process PID given	Process PID given. 0.01%（-100.00% ~100.00%）	-	RW
P29.09	VF separation voltage given	VF separation voltage given. 0.1%（0~100.0%）	-	RW
P29.10	External fault setting	External fault setting	-	RW

<table>
<tr><th>Function code</th><th>Parameter name</th><th>Description</th><th>Default value</th><th>Property</th></tr>
<tr><td>P29.11</td><td>DO Status settings</td><td>DO Status settings When the DO function (please refer to P07.01~P07.10) is set to 0 (no function), its status comes from the setting of the communication special register, and the corresponding bit is 1, which means it is valid. The bit definitions of this register are as follows：
<table>
<tr><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>reserved</td><td>reserved</td><td>reserved</td><td>reserved</td><td>RL2</td><td>RL1</td><td>DO2</td><td>DO1</td></tr>
<tr><td>Bit15</td><td>Bit14</td><td>Bit13</td><td>Bit12</td><td>Bit11</td><td>Bit10</td><td>Bit9</td><td>Bit8</td></tr>
<tr><td>reserved</td><td>reserved</td><td>reserved</td><td>reserved</td><td>reserved</td><td>reserved</td><td>VDO2</td><td>VDO1</td></tr>
</table></td><td>-</td><td>RW</td></tr>
</table>

30 Group Modbus Communication parameters

Function code	Parameter name	Description	Default value	Property
P30.00	Communication type	0：Modbus; 1：CANopen	0	RR
P30.01	Local address	1～247 Different slave machines on the same network should set different local addresses; 0 is the broadcast address, which can be recognized by all slave inverters.	1	RR
P30.02	Modbus Communication baud rate	0: 1200 bps; 1: 2400 bps 2: 4800 bps; 3: 9600 bps 4: 19200 bps; 5: 38400 bps 6: 57600 bps; 7: 115200 bps	3	RR
P30.03	Modbus Data format	0: 1-8-N-1 (1 start bit+8 data bits+1 Stop bit) 1: 1-8-E-1 (1start bit+8 data bits+1 even parity+1Stop bit) 2: 1-8-0-1 (1start bit+8 data bits+1 odd parity+1Stop bit) 3: 1-8-N-2 (1start bit+8 data bits+2 Stop bit) 4: 1-8-E-2 (1start bit+8 data bits+1 even parity+2Stop bit) 5: 1-8-0-2 (1start bit+8 data bits+1 odd parity+2Stop bit)	0	RR
P30.04	Modbus response delay	Delay time for local machine to answer host，1～20ms	2ms	RR
P30.05	Modbus Communication timeout	0.0s(invalid)～ 60.0s When this function code is valid, if the slave does not receive data from the host within this time, it will report Er.485 fault.	0.0s	RR
r30.06	Modbus Number of frames received	Each time a frame is received, this value is incremented by 1, and the cycle count is from 0 - 65535.	-	RO
r30.07	Modbus Number of frames sent	Each time a frame is sent, this value increases by 1, and the cycle count ranges from 0 - 65536.	-	RO
r30.08	Modbus Number of error frames received	Each time an error frame is received, this value is incremented by 1, 0~65535 cycle counts; it can be used to determine the degree of communication interference.	-	RO
P30.09	Modbus Master-slave selection	0: Slave machine 1: Host (broadcast transmission)	0	RW
P30.10	Slave registers operated when this machine is the	1～9 correspond to 0x7001～0x7009	1	RW

Function code	Parameter name	Description	Default value	Property
	master			
P30.11	Host sends content	0: Output frequency 1: Set frequency 2: Output torque 3: Target torque 4: PID given 5: PID feedback 6: Output current	0	RW
P30.12	Host sending interval	When acting as a host, after sending one frame of data, the next frame of data will be sent after this delay. 0.010～10.000s	0.100s	RW
P30.13	Slave receiving proportion coefficient	-10.00～10.00 The values of slave registers 0x7001 and 0x7002 will take effect after passing this proportional coefficient.	1.00	RW
P30.14	Communication special register speed unit	The units of some communication-specific registers can be set by this parameter. See Appendix A for details. 0: 0.01% 1: 0.01Hz 2: 1Rpm	0	RW
P30.15	Modbus response characteristics	When the format of the received frame is write register, this parameter can set whether to reply to the host. 0: Reply to host (standard Modbus protocol) 1: No reply to host (non-standard Modbus protocol)	0	RW
P30.16	20 Group communication mapping enabled	0：Disable When reading and writing P20.xx through communication, the value of P20.xx is operated. 1：Enable communication mapping When reading and writing P20.xx through communication, the value of the parameter mapped by P20.xx is operated. It can be used to read and write multiple parameters of different parameter groups in one frame to improve communication efficiency. Note: The 0x6Fxx communication address is also a parameter mapped by operation P20.xx.	0	RW

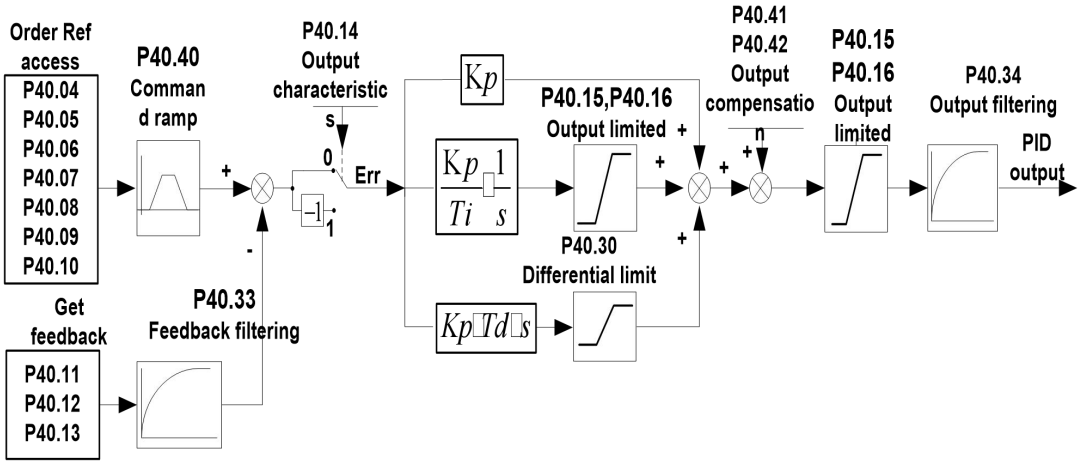
31 Group CANopen communication parameter

Function code	Parameter name	Description	Default value	Property
P31.00	CANopen communication address	1~127	1	RW
P31.01	CANopen baud rate	0：100k 1：125k 2：250k 3：500k 4：1M	3	RW
P31.02	CANopen overtime	1ms ~ 20ms	4ms	RW
r31.07	CANopen version number	Display the version number of the CANopen card	-	RO
r31.08	CANopen working status	0：Initialization status 1: Disconnected 2: Connecting/Preparing 3: Stopped 4: Operational 5: Pre_operational	-	RO
r31.10	CANopen receive error count	CANopen The cumulative number of error frames received will not be saved after power off.	-	RO
r31.11	CANopen send error count	CANopen The cumulative number of error frames sent will not be saved when the power is off.	-	RO
r31.12	CANopen receive frame number	CANopen The accumulated number of frames received will not be saved when the power is off.	-	RO
r31.14	CANopen send frame number	CANopen The accumulated number of frames received and sent will not be saved when the power is off.	-	RO

32 Group ProfiNet Communication

Function code	Parameter name	Description	Default value	Property
P32.00	PN site index	For manufacturer debugging	-	RW
P32.01	PN IP1	Display the IP address of the local PN card. The IP address of the local PN card is usually set by the PLC host software.	-	RW
P32.02	PN IP2		-	RW
P32.03	PN IP3		-	RW
P32.04	PN IP4		-	RW
P32.05	PN MAC1	Display the MAC address of the local PN card. The MAC address of the local PN card is usually set by the PLC upper software.	-	RW
P32.06	PN MAC2		-	RW
P32.07	PN MAC3		-	RW
P32.08	PN Card software version	Displays the communication card software version.	-	RW

40 Group Process PID

Function code	Parameter name	Description	Default value	Property
r40.00	PID Final output actual value	Read only, unit: 0.1%	-	RO
r40.01	PID final actual set value	Read only, physical measurement, the same unit P40.05	-	RO
r40.02	PID final actual feedback value	Read only, physical measurement, the same unit P40.05	-	RO
r40.03	PID Regulator input deviation value	Read only, unit: 0.01%	-	RO
PID implements a closed-loop system by performing proportional (P), integral (I) and differential (D) operations on the difference between the target signal (command) and the controlled quantity feedback signal, adjusting the output frequency of the inverter, etc., so that the controlled quantity Stable at the target value. VFD510 built-in process PID structure is shown below, which is suitable for flow control, pressure control, temperature control, tension control and other applications. 				
P40.04	PID given source	Bit 0～3 ： PID main given source(ref1) 0: Digital given 1: AI1 2: AI2 3: AI3 4: Reserved 5: HDI 6: Communication given（add:0x1D07） Bit 4～7 ： PID Auxiliary given source(ref2) Same Bit 0～3	0x00	RW
P40.05	PID Given and feedback range	0.01～655.35 The units of r40.01 and r40.02 are the same as this setting value. The factory value of 100.00 can be regarded as having no unit. The units of P40.06~P40.09 are the same as this setting value.	100.00	RW
P40.06	PID digital given 0	0.00～P40.05	0.00	RW
P40.07	PID digital given 1	0.00～P40.05	0.00	RW

<table>
<tr><th>Function code</th><th>Parameter name</th><th>Description</th><th>Default value</th><th>Property</th></tr>
<tr><td>P40.08</td><td>PID digital given 2</td><td>0.00～P40.05</td><td>0.00</td><td>RW</td></tr>
<tr><td>P40.09</td><td>PID digital given 3</td><td>0.00～P40.05</td><td>0.00</td><td>RW</td></tr>
<tr><td colspan="5">When the PID given source is digital given, the PID given depends on the status of the DI terminal functions "43: PID digital given terminal 1" and "44: PID digital given terminal 2"：
<table>
<tr><th>PID Digital given terminal 2</th><th>PID Digital given terminal 1</th><th>PID Digital setting value(0.1%)</th></tr>
<tr><td>Ineffective</td><td>Ineffective</td><td>P40.06</td></tr>
<tr><td>Ineffective</td><td>Effective</td><td>P40.07</td></tr>
<tr><td>Effective</td><td>Ineffective</td><td>P40.08</td></tr>
<tr><td>Effective</td><td>Effective</td><td>P40.09</td></tr>
</table>
For example: If the PID feedback source is AI1 and the PID given source is digital given, if the full scale range of the sensor connected to AI1 corresponds to 16.0kg pressure and the PID is required to be controlled at 8.0kg, then set P40.05 to 16.00 and P40 .06 (PID number given is 0) can be set to 8.00.</td></tr>
<tr><td>P40.10</td><td>PID Given source selection</td><td>0: Ref1
1: Ref1+ref2
2: Ref1-ref2
3: Ref1*ref2
4: Ref1/ref2
5: Min(ref1,ref2)
6: Max(ref1,ref2)
7: (Ref1+ref2)/2
8: Ref1 and ref2 switchover</td><td>0</td><td>RW</td></tr>
<tr><td>P40.11</td><td>PID Feedback source</td><td>Bite 0～3: PID feedback source1(fdb1)
0: AI1
1: AI2
2: AI3
3: Reserved
4: HDI
5: Communication given
6: Motor output current
7: Motor output frequency
8: Motor output torque
9: Motor output power
Bit 4～7: PID feedback source 2(fdb2)
Same bit 0～3</td><td>0x00</td><td>RW</td></tr>
<tr><td>P40.13</td><td>PID Feedback function selection</td><td>0: Fdb1
1: Fdb1+fdb2
2: Fdb1-fdb2
3: Fdb1*fdb2
4: Fdb1/fdb2
5: Min(fdb1,fdb2)
6: Max(fdb1,fdb2)
7: (Fdb1+fdb2)/2
8: Fdb1 and fdb2 switchover</td><td>0</td><td>RW</td></tr>
</table>

Function code	Parameter name	Description	Default value	Property
P40.14	PID Output characteristic selection	0: Positive effect; 1: Reaction	0	RW
PID Is the deviation reversed?，Determined by P40.14 and DI terminal No. 42 function "PID forward/reverse action switching"： P40.14 = 0 and “42：PID positive/negative switching" terminal is invalid: : PID output characteristic is positive P40.14 = 0 and “42：PID positive/negative switching" terminal is valid: : PID output characteristic is negative P40.14 = 1 and “42：Positive/negative switching" terminal is invalid: : PID output characteristic is negative P40.14 = 1 and “42：Positive/negative switching" terminal is valid: : PID output characteristic is positive				
P40.15	PID Output upper limit	-100.0%～100.0%	100.0%	RW
P40.16	PID Output lower limit	-100.0%～100.0%	0.0%	RW
P40.17	Proportional gain KP1	0.0～200.0%	5.0%	RW
P40.18	Integration time TI1	0.00s(No integral effect)～20.00s	1.000s	RW
P40.19	Differential time TD1	0.000s～0.100s	0.000s	RW
P40.20	Proportional gain KP2	0.0～200.0%	5.0%	RW
P40.21	Integration time TI2	0.00s(No integral effect)～20.00s	1.000s	RW
P40.22	Differential time TD2	0.000s～0.100s	0.000s	RW
P40.23	PID Switch condition	0: Not switch,use KP1、TI1、TD1 1: Switching via DI terminal When the DI terminal No. 41 function is invalid, use KP1, TI1, and TD1; when it is valid, use KP2, TI2, and TD2. 2: Automatic switching based on deviation If the absolute value of the PID command and feedback deviation is less than P40.24, use KP1, TI1, and TD1; if the absolute value of the deviation is greater than P40.25, use the KP2, TI2, and TD2 parameters; if the absolute value of the deviation is between P40.24~P40.25, Linear transition of two sets of parameters.	0	RW
P40.24	PID Parameter switching deviation 1	0.00%～P40.25	20.00%	RW
P40.25	PID Parameter switching deviation 2	P40.24～100.00%	80.00%	RW
P40.26	PID Integral separation threshold	0.0%～100.00% When the deviation is greater than this set value, the integral term stops calculating.	100.00%	RW
P40.27	PID initial value	0.0%～100.0%	0.0%	RW
P40.28	PID Initial value retention time	0.00～65.00s	0.000s	RW
This function is only valid when P40.39 = 0 and the calculation is stopped. The PID output is reset after the inverter is stopped. If P40.28 ≠ 0, after the inverter is running, the PID output is equal to the PID initial value and remains for the time of P40.28. .				

Function code	Parameter name	Description	Default value	Property
P40.29	PID Deviation dead zone	0.0%～100.00%，When the absolute value of the deviation is less than this set value, the PID stops operation and the output freezes.	0.00%	RW
P40.30	PID Differential term limiting	0.00%～100.00%	5.00%	RW
P40.31	PID Differential filter time	0.000～5.000s Perform low-pass filtering on the differential term to reduce differential noise.	0.005s	
P40.33	PID Feedback filter time	0.000～10.000s Reduces the impact of interference on the feedback amount, but the response will be slower.	0.000s	RW
P40.34	PID Feedback loss start delay	PID feedback loss Er.FbL detection is only performed after this time has passed from shutdown to operation.	0.00s	RW
P40.35	PID Feedback loss detection threshold (lower limit)	PID If the feedback is lower than this value and lasts for the time of P40.36, Er.FbL will be reported.	0.00%	RW
P40.36	PID Feedback loss lower limit detection time	0.000s(not detect)～30.000s	0.000s	RW
P40.37	PID Feedback loss detection threshold (upper limit)	PID If the feedback is higher than this value and lasts for the time of P40.38, Er.FbL will be reported.	100.00%	RW
P40.38	PID Feedback loss upper limit detection time	0.000s(not detect)～30.000s	0.000s	RW
P40.39	PID Halt operation	0: Stopped and does not operate 1: Halt operation	0	RW
P40.40	PID Command acceleration time	0.000s～60.000s	0.100s	RW
P40.41	PID Command deceleration time	0.000s～60.000s	0.100s	RW
P40.42	PID Feed forward selection	0：No feedforward 1：Digital frequency given P00.07 2：AI1 3：AI2 4：AI3 5：HDI 6：Communication given（0x1D01，or 0x7001）	0	RW

41 Group Sleeping function

Function code	Parameter name	Description	Default value	Property
P41.00	Sleep/wake source selection	**Unit's digit：Sleep source selection** 0: No sleep function 1: Output frequency sleep 2: AI1 sleep 3: AI2 sleep 4: AI3 sleep **Ten's digit: Wake-up source selection** 0: Frequency command wake-up 1: AI1 wake up 2: AI2 wake up 3: AI3 wake up **Hundred's digit: Sleep and wake-up direction selection** 0: Forward Sleep source（AI1～AI3）>P41.03, Inverter sleep Wake up source（AI1～AI3）<P41.04, inverter wake up 1: Reverse Sleep source（AI1～AI3）<P41.03, Inverter sleep Wake up source（AI1～AI3）>P41.04,inverter wake up ➢ Usually, when the frequency source is PID given, the sleep wake-up direction is the same as the PID action direction P40.14. ➢ When the sleep source and wake-up source are the same, please pay attention to the size relationship between P41.03 and P41.04. If the parameter settings are unreasonable, when the selected wake-up conditions are met, even if the sleep conditions are met, it will not be able to enter the sleep state. Special attention needs to be paid when using it.	010	RW
P41.01	Frequency sleep setting value	0.00Hz～600.00Hz,If the output frequency is less than this value, it will enter sleep mode.	0.00Hz	RW
P41.02	Frequency sleep wake-up value	0.00Hz～600.00Hz, The frequency command is greater than this value, sleep and wake up	0.00Hz	RW
When selecting frequency sleep or frequency wake-up, you must set: P41.01 < P41.02. When the frequency source is PID given, if frequency wake-up is used, PID shutdown operation must be set: P40.39 = 1.				

Function code	Parameter name	Description	Default value	Property
P41.03	Analog sleep setting value	0～100.0%	0.0%	RW
P41.04	Analog sleep wake-up value	0～100.0%	0.0%	RW
P41.05	Enter sleep delay	0.0s～6000.0s	0.0s	RW
P41.06	Sleep wake-up delay	0.0s～6000.0s	0.0s	RW
P41.07	Sleep deceleration time	The value range is determined by P03.16. When P03.16 = 2, 0.00～600.00s; When P03.16 = 1, 0.0s～6000.0s; When P03.16 = 0, 0s～60000s ➢ When P41.07 is set to 0, the sleep stop mode is free stop.	0.00s	RW

42 Group Simple PLC

Function code	Parameter name	Description	Default value	Property
r42.00	PLC Current running stage	Read only	-	RO
r42.01	PLC Remaining time in current segment	Read only	-	RO
r42.02	PLC Number of times it has been looped	Read only	-	RO
P42.03	PLC operation mode	**Unit's digit:** Operation mode 0: Stop after running the set number of times 1: Keep the final value after running the set number of times 2: Keep looping 3: PLC resets after a single shutdown **Ten's digit:** Power-off memory selection 0: No memory when power off 1: Power-off memory **Hundred's digit:** Stop memory selection 0: No memory when shutdown 1: shutdown memory	0x003	RW
P42.04	PLC Number of runs	1～60000	1	RW
P42.05	PLC step 1 running time	0.0~6553.5, the unit is determined by P42.21 Note: Running time does not include acceleration and deceleration time, the same below	0.0	RW
P42.06	PLC step 2 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.07	PLC step 3 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.08	PLC step 4 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.09	PLC step 5 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.10	PLC step 6 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.11	PLC step 7 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.12	PLC step 8 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.13	PLC step 9 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.14	PLC step 10 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.15	PLC step 11 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.16	PLC step 12 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.17	PLC step 13 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.18	PLC step 14 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.19	PLC step 15 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW
P42.20	PLC step 16 running time	0.0～6553.5, the unit is determined by P42.21	0.0	RW

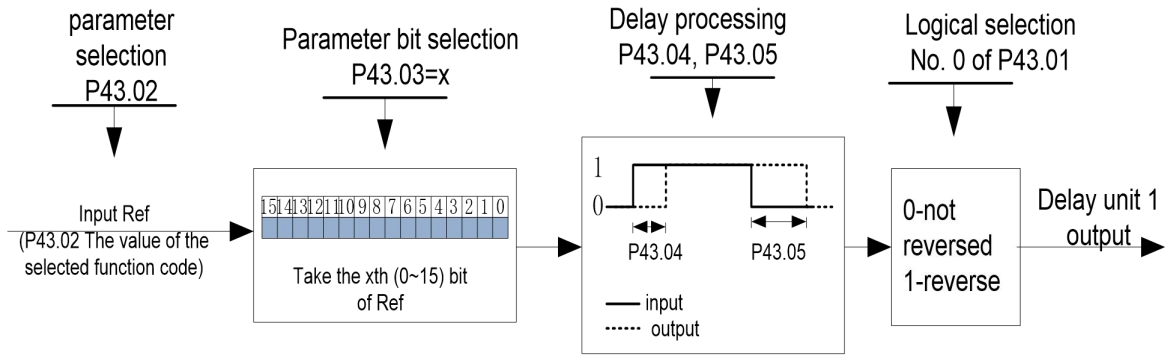
Function code	Parameter name	Description	Default value	Property
P42.21	PLC running time unit	0:Second; 1:Minute; 2:Hour	0	RW
P42.22	The step1-4 PLC acceleration and deceleration time	Unit's digit: Step1 acceleration and deceleration time selection. Ten's digit: Step 2 acceleration and deceleration time selection. Hundred's digit: Step 3 acceleration and decel eration time selection. Thousand's digit: Step 4 acceleration and dece leration time selection. Value and meaning: 0: Acceleration and deceleration time 1 1: Acceleration and deceleration time 2 2: Acceleration and deceleration time 3 3: Acceleration and deceleration time 4 ➢ Acceleration and deceleration time refers to: the acceleration time or deceleration time used when accelerating or decelerating to the PLC target frequency of this section.	0x0000	RW
P42.23	The step 5-8 PLC acceleration and deceleration time	Unit's digit: Step 5 acceleration and deceleration selection Ten's digit: Step 6 acceleration and deceleration selection Hundred's digit: Step 7 acceleration and deceleration selection Thousand's digit: Step 8 acceleration and deceleration selection ➢ The value and meaning are the same as P42.22.	0x0000	RW
P42.24	The step 9-12 PLC acceleration and deceleration time	Unit's digit: Step 9 acceleration and deceleration selection Ten's digit: Step 10 acceleration and deceleration selection Hundred's digit: Step 11 acceleration and deceleration selection Thousand's digit: Step 12 acceleration and deceleration selection ➢ The value and meaning are the same as P42.22.	0x0000	RW
P42.25	The step 13-16 PLC acceleration and deceleration time	Unit's digit: Step 13 acceleration and deceleration selection Ten's digit: Step 14 acceleration and deceleration selection Hundred's digit: Step 15 acceleration and deceleration selection	0x0000	RW

Function code	Parameter name	Description	Default value	Property
		Thousand's digit: Step 16 acceleration and deceleration selection ➢ The value and meaning are the same as P42.22.		
P42.26	PLC Stop deceleration time	The value range is determined by P03.16. When P03.16 = 2, 0.00～600.00s; When P03.16 = 1, 0.0s～6000.0s; When P03.16 = 0, 0s～60000s	20.00s	RW

43 Group Delay unit

Function code	Parameter name	Description	Default value	Property
r43.00	Delay unit output status	Used to view the current output status of the delay unit. Using bit definition, Bit0~Bit3 respectively represent the output status of delay units 1~4, 0 means invalid, 1 means valid.	-	RO

VFD510 frequency converter has 4 built-in delay units. The delay unit can collect the status of bits 0 to 15 of all accessible parameters of the function code table, and after delay processing and logic selection, it will be used as the output of this delay unit. The flow chart of delay unit 1 is as follows, and the same applies to delay units 2 to 4.



Delay unit 1 block diagram

The delay unit can be used for DI/DO delay processing, and can also be used with comparators and logic units to achieve more flexible timing functions.

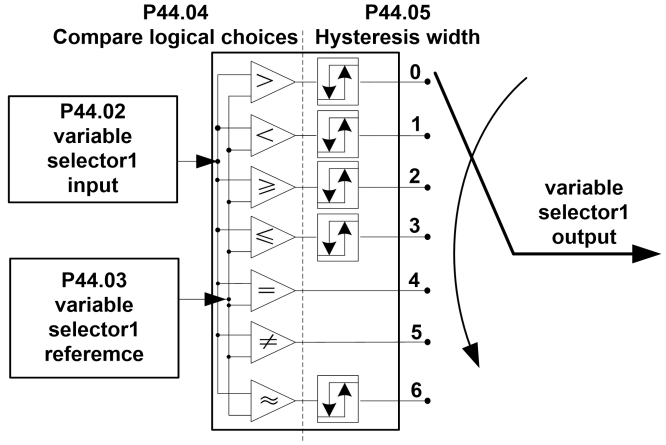
P43.01	Delay unit 1~4 logic selection	0000B～1111B Bit0~Bit3Corresponds to delay units 1~4, used to specify whether the output of the delay unit is inverted.	0	RW
P43.02	Delay unit 1 Input parameter selection	00.00～98.99（Function code index）	00.00	RW
P43.03	Delay unit 1 input bit selection	0～15	0	RW
P43.04	Delay unit 1 rising edge delay	0.0～3000.0s	0.0s	RW
P43.05	Delay unit 1 falling edge delay	0.0～3000.0s	0.0s	RW
P43.06	Delay unit 2 Input parameter selection	00.00～98.99（Function code index）	00.00	RW
P43.07	Delay unit 2 input bit selection	0～15	0	RW
P43.08	Delay unit 2 rising edge delay	0.0～3000.0s	0.0s	RW
P43.09	Delay unit 2 falling edge delay	0.0～3000.0s	0.0s	RW
P43.10	Delay unit **3** Input parameter selection	00.00～98.99（Function code index）	00.00	RW

Function code	Parameter name	Description	Default value	Property
P43.11	Delay unit 3 input bit selection	0～15	0	RW
P43.12	Delay unit 3 rising edge delay	0.0～3000.0s	0.0s	RW
P43.13	Delay unit 3 falling edge delay	0.0～3000.0s	0.0s	RW
P43.14	Delay unit 4 Input parameter selection	00.00～98.99（Function code index）	00.00	RW
P43.15	Delay unit 4 input bit selection	0～15	0	RW
P43.16	Delay unit 4 rising edge delay	0.0～3000.0s	0.0s	RW
P43.17	Delay unit 4 falling edge delay	0.0～3000.0s	0.0s	RW

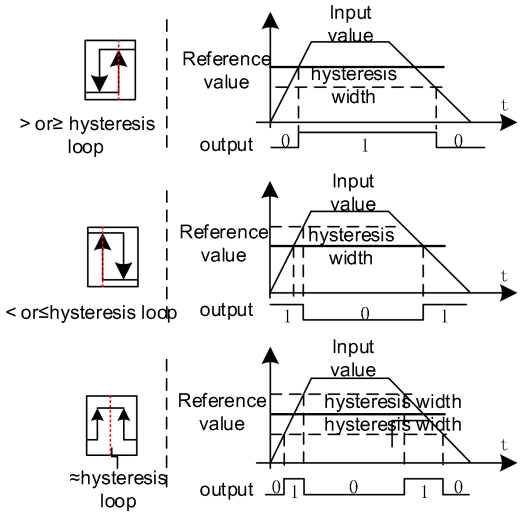
44 Group Comparators and Logic Units

Function code	Parameter name	Description	Default value	Property
r44.00	Comparator output status	Defined by bits, Bit0~Bit3 represent the output of comparators 1~4. 0 means invalid, 1 means valid.	-	RO
r44.01	Logic unit output status	Defined by bits, Bit0~Bit3 represent the output of comparators 1~4. 0 means invalid, 1 means valid.	-	RO
P44.02	**Comparator 1 input value selection**	00.00～98.99（Function code index）	00.00	RW
P44.03	Comparator 1 reference value selection	00.00～98.99（Function code index）	00.00	RW
P44.04	Comparator 1 Logic selection	0:＞; 1:＜; 2:≥; 3:≤; 4:＝; 5:≠; 6:≈	0	RW
P44.05	Comparator 1 hysteresis width	0～65535	0	RW

VFD510 has 4 built-in comparator units. The comparator function can compare two arbitrary function code parameters by selecting a comparison relationship. If the conditions are met, it will output 1, otherwise it will output 0. The comparator output result can be used as input such as DI, VDI, delay unit, etc., or as output such as DO, relay, etc. This enables users to obtain the required logic functions more flexibly. The schematic block diagram of comparator 1 is as follows (left), in which the hysteresis width method is shown in the right figure. Comparators 2 to 4 are not given examples one by one.



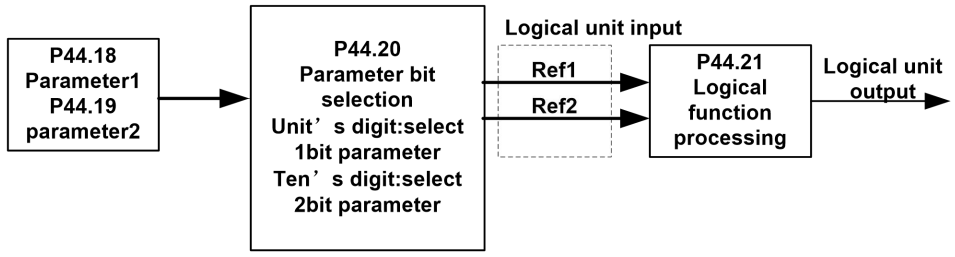
Left:Variable selector graph



Right: Hysteresis width graph

P44.06	**Comparator 2 input value selection**	00.00～98.99（Function code index）	00.00	RW
P44.07	Comparator 2 reference value selection	00.00～98.99（Function code index）	00.00	RW
P44.08	Comparator 2 Logic selection	0:＞; 1:＜; 2:≥; 3:≤; 4:＝; 5:≠; 6:≈	0	RW
P44.09	Comparator 2 hysteresis width	0～65535	0	RW

Function code	Parameter name	Description	Default value	Property
P44.10	**Comparator 3 input value selection**	00.00～98.99（Function code index）	00.00	RW
P44.11	Comparator 3 reference value selection	00.00～98.99（Function code index）	00.00	RW
P44.12	Comparator 3 Logic selection	0:＞; 1:＜; 2:≥; 3:≤; 4:＝; 5:≠; 6:≈	0	RW
P44.13	Comparator 3 hysteresis width	0～65535	0	RW
P44.14	**Comparator 4 input value selection**	00.00～98.99（Function code index）	00.00	RW
P44.15	Comparator 4 reference value selection	00.00～98.99（Function code index）	00.00	RW
P44.16	Comparator 4 Logic selection	0:＞; 1:＜; 2:≥; 3:≤; 4:＝; 5:≠; 6:≈	0	RW
P44.17	Comparator 4 hysteresis width	0～65535	0	RW
P44.18	**Logic unit 1 parameter 1 selection**	00.00～98.99（Function code index）	00.00	RW
P44.19	Logic unit 1 parameter 2 selection	00.00～98.99（Function code index）	00.00	RW
P44.20	Logic unit 1 input bit selection	**Unit's digit:** Parameter 1 bit selection 0 ～ F(Represents 0~15, the 0~15th digit of the parameter selected by P44.18) **Ten's digit:** Parameter 2 bit selection 0～F(Represents 0 to 15, the 0th to 15th position of the parameter selected by P44.19)	0	RW
P44.21	Logic unit 1 function selection	0: No function 1: And 2: Or 3: And not 4: Or not 5: Exclusive OR 6: Ref1＝1 effective；Ref2＝1 ineffective 7: Ref1 Rising edge valid；Ref2 Rising edge invalid 8: Ref1 Rising edge, signal inversion 9: Ref1 Rising edge, output 200ms pulse width	0	RW
VFD510 has 4 built-in logic units. The logic unit can process the logical relationship between any bit of data from 0 to 15 bits of parameter 1 and any bit of data from 0 to 15 bits of parameter 2. If the condition is true, it will output 1, otherwise it will output 0. The output result of the logic unit can be used as input such as DI, VDI, delay relay, etc., and output such as DO, relay, etc., so that users can obtain the required logic functions more flexibly. The schematic block diagram of logic unit 1 is as follows.				

Function code	Parameter name	Description	Default value	Property
				
P44.22	**Logic unit 2 parameter 1 selection**	00.00～98.99（Function code index）	00.00	RW
P44.23	**Logic unit 2 parameter 2 selection**	00.00～98.99（Function code index）	00.00	RW
P44.24	Logic Unit 2 Input Bit selection	**Unit's digit:** Parameter 1 bit selection 0～F(Represents 0 to 15, P44.22 corresponds to the 0th to 15th position of the parameter) **Ten's digit:** Parameter 2 bit selection 0～F(Represents 0 to 15, P44.23 corresponds to the 0th to 15th position of the parameter)	0	RW
P44.25	Logic unit 2 function selection	0: No function 1: And 2: Or 3: And not 4: Or not 5: Exclusive OR 6: Ref1＝1effective；Ref 2＝1 ineffective 7: Ref1 Rising edge valid； Ref 2 Rising edge invalid 8: Ref1 Rising edge, signal inversion 9: Ref1 Rising edge, output 200ms pulse width	0	RW
P44.26	**Logic unit 3 parameter 1 selection**	00.00～98.99（Function code index）	00.00	RW
P44.27	Logic unit 3 parameter 2 selection	00.00～98.99（Function code index）	00.00	RW
P44.28	Logic Unit 3 Input Bit selection	**Unit's digit:** Parameter 1 bit selection 0～F(Represents 0 to 15, P44.26 corresponds to the 0th to 15th position of the parameter) **Ten's digit:** Parameter 2 bit selection 0～F(Represents 0 to 15, P44.27 corresponds to the 0th to 15th position of the parameter)	0	RW
P44.29	Logic unit 3 function selection	0: No function 1: And 2: Or 3: And not 4: Or not 5: Exclusive OR 6: Ref1＝1 effective；Ref2＝1 ineffective	0	RW

Function code	Parameter name	Description	Default value	Property
		7: Ref1 Rising edge valid；Ref2 Rising edge invalid 8: Ref1 Rising edge, signal inversion 9: Ref1 Rising edge valid, output 200ms pulse width		
P44.30	**Logic Unit 4 Parameter 1 Selection**	00.00～98.99（Function code index）	00.00	RW
P44.31	Logic Unit 4 Parameter 2 Selection	00.00～98.99（Function code index）	00.00	RW
P44.32	Logic Unit 4 Input Bit selection	**Unit's digit:** Parameter 1 bit selection 0～F(Represents 0 to 15, P44.30 corresponds to the 0th to 15th position of the parameter) **Ten's digit:** Parameter 2 bit selection 0～F(Represents 0 to 15, P44.31 corresponds to the 0th to 15th position of the parameter)	0	RW
P44.33	Logic Unit 4 Function Selection	0: No function 1: And 2: Or 3: And not 4: Or not 5: Exclusive OR 6: Ref1＝1 effective；Ref2＝1 ineffective 7: Ref1 Rising edge valid；Ref2 Rising edge invalid 8: Ref1 Rising edge, signal inversion 9: Ref1 Rising edge, output 200ms pulse width	0	RW
P44.34	Constant setting 1	0～65535	0	RW
P44.35	Constant setting 2	0～65535	0	RW
P44.36	Constant setting 3	0～65535	0	RW
P44.37	Constant setting 4	-9999～9999	0	RW
P44.38	Bit definition constant setting 1	0～65535(Bitwise definition)	0	RW
P44.39	Bit definition constant setting 2	0～65535(Bitwise definition)	0	RW
P44.40	Bit definition constant setting 3	0～65535(Bitwise definition)	0	RW
P44.41	Bit definition constant setting 4	0～65535(Bitwise definition)	0	RW
➢ Constant settings are generally used for reference inputs of comparison units or logic units.				

45 Group Multifunctional counter

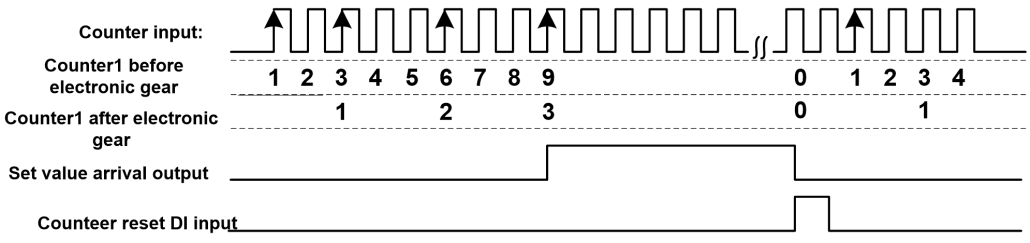
Function code	Parameter name	Description	Default value	Property
r45.00	Counter 1 input value	The count value before conversion, that is, the number of pulses received by the counter 1 hardware, 32-bit read-only data	-	RO
r45.02	Counter 1 count value	Converted count value, 32-bit read-only data	-	RO
P45.04	Counter 1 setting value	1 ～ 4294967295, When the count value of counter 1 (after conversion) reaches this setting, the DO function "Counter 1 setting value arrival" is effective.	1000	RW
P45.06	Counter 1 maximum value	1～4294967295， Set the maximum value of counter 1 (after conversion).	4294967295	RW
P45.08	Counter 1 conversion ratio denominator	1～65535 counter 1 counter value = counter 1 input value × conversion ratio number / conversion ratio denominator	1	RW
P45.09	Counter 1 Conversion Ratio Numerator	1～65535	1	RW

VFD510 has two built-in counters: Counter 1 is a 32-bit multi-function counter with conversion ratio; Counter 2 is a 16-bit ordinary counter without conversion ratio function. Now take counter 1 as an example to briefly explain its function and use. Counter 2 will not be explained in detail.

Counter 1 receives the pulse signal through the terminal corresponding to the DI function "Counter 1 Input". The pulse signal is used for counting in Counter 1 after a conversion ratio. When the count value reaches the set value (P45.04), the DO function "Counter 1 set value arrival" is effective; when the count value reaches the maximum value (P45.06), select whether to stop counting or reset counting according to P45.13 value.

The counter can also be reset through the DI terminal. When the DI terminal has the "Counter 1 Reset" function and the terminal is valid, Counter 1 is reset.

Example: P45.04＝3, P45.08＝3, P45.09＝1, the function of counter 1 is as shown in the figure below.



By setting a reasonable conversion ratio, in addition to the counting function, counter 1 can also implement functions such as fixed length, which can be used flexibly by users in specific applications.

r45.10	Counter 2 actual value	Read only	-	RO
P45.11	Timer 2 setting value	When the count value of counter 2 reaches this setting, the DO function "Counter 2 set value arrival" is effective. Setting range: 1～65535	1000	RW

Function code	Parameter name	Description	Default value	Property
P45.12	Counter 2 maximum value	1～65535，Set the maximum value of counter 2. Setting range：1～65535	65535	RW
P45.13	Counter 1 control	**Unit's digit：**Counting method 0：Stop counting after reaching the maximum value. 1：Reset after reaching the maximum value and count again from 0. **Ten's digit：**Action after the counter reaches the set value. 0：Continue running 1：Coast to stop 2：Slow down and stop 3：Emergency stop **Hundred's digit：**Power-off save option 0：The count value is not saved when the power is off. 1：Save count value when power off	0x001	RW
P45.14	Counter 2 control	**Unit's digit：**Counting method 0：Stop counting after reaching the maximum value. 1：Reset after reaching the maximum value and count again from 0 **Ten's digit：**Action after the counter reaches the set value 0：Continue running 1：Coast to stop 2：Slow down and stop 3：Emergency stop **Hundred's digit：**Power-off save option 0：The count value is not saved when the power is off. 1：Save count value when power off	0x100	RW
P45.15	Material break detection input source	0: Counter 1 count value 1: Counter 2 count value	1	RW
P45.16	Material break detection starting frequency	0～50.00Hz When the operating frequency is greater than the set value, material outage detection starts.	10.00	RW
P45.17	Material break detection time	0～60.000s When the counter value does not change within the set value time, a material outage fault occurs.	0	RW

60 Group Motor 2 basic parameters

Function code	Parameter name	Description	Default value	Property
P60.00	Control method	Same as P00.04	0	RR
P60.01	Upper limit frequency selection	Same as P01.07	0	RR
P60.02	Upper limit frequency digital setting	Lower limit frequency (P01.09) ~ maximum frequency (P01.06)	50.00Hz	RW
P60.04	Acceleration and deceleration time selection	0: Same motor 1 1: Acceleration and deceleration time 3 When 1 is selected, motor 2 acceleration and deceleration can be switched between acceleration and deceleration time 3/4 through DI terminal No. 55 function "Motor 2 acceleration and deceleration time selection" or by comparing the output frequency with P60.05 and P60.06 before accelerating and decelerating. Switch between 3/4.	0	RR
P60.05	Acceleration time switching frequency 2	0.00Hz～maximum frequency(P01.06)	0.00Hz	RW
P60.06	Deceleration time switching frequency 2	0.00Hz～maximum frequency(P01.06)	0.00Hz	RW

61 Group Motor 2 parameters

Same as group 11 "Motor 1 Parameters"

62 Group Motor 2VF control parameters

Same as group 12 "Motor 1 VF control parameters"

63 Group Motor 2 vector control parameters

Same as group 13 "Motor 1 Vector Control Parameters"

Chapter 6 Fault Diagnosis and Countermeasures

6.1 Trouble and diagnosis

VFD510 frequency converter has complete protection functions. If a fault occurs, the inverter will act according to the fault attributes. For more serious faults, the inverter will directly block the output; for general faults, it can be configured to stop or continue running according to a predetermined shutdown method. After a fault occurs in the frequency converter, the fault relay contact will act and the fault code will be displayed on the display panel. Before seeking service, users can perform self-examination according to the tips in this section, analyze the cause of the fault, and find out the solution.

Fault name	Fault code	Operation panel display	Cause of failure	Troubleshooting Countermeasures
Output short circuit	1	Er. SC	1. Motor insulation aging. 2. Contact or short circuit occurs due to damaged cables. 3. The wiring between the motor and the inverter is too long. 4. Output transistor breakdown. 5. The internal wiring of the inverter is loose or the hardware is defective. 6. Brake transistor short circuit.	1. Check the insulation resistance of the motor and replace the motor if there is continuity. 2. Check the motor power cables. 3. Install a reactor or output filter. 4. Seek technical support. 5. Seek technical support. 6. Check whether the braking resistor is damaged and whether the wiring is correct.
Acceleration overcurrent	2	Er.oC1	1. Acceleration time is too short. 2. The motor insulation is aging, the cable is damaged, or other reasons lead to short circuit between phases or to ground. 3. There is a contactor on the output side of the inverter that is opening or closing. 4. Torque boost or V/F curve is inap propriate. 5. The control mode is vector and n o parameter identification is perfor med. 6. Start a rotating motor. 7. Excessive load or sudden impact load.	1. Increase acceleration time. 2. Troubleshoot peripheral problems. 3. Please ensure that the contactor does not open or close when the inverter has output. 4. Adjust the torque boost or V/F curve. 5. Motor parameter identification in cold state. 6. Speed tracking starts or waits for the motor to stop before starting again. 7. Reduce the impact load, increase the inverter capacity, and if it is VF control, try SVC or VC control.
Deceleration overcurrent	3	Er.oC2	1. Deceleration time too short. 2. Phase-to-phase short circuit or short circuit to ground caused by aging of motor insulation, damaged cables, or other reasons. 3. There is a contactor on the output side of the inverter that is opening or closing. 4. The control mode is vector and no parameter identification is performed. 5. Excessive load or sudden impact load. 6. No braking unit and braking resistor installed.	1. Increase deceleration time. 2. Troubleshoot peripheral problems. 3. Please ensure that the contactor does not open or close when the inverter has output. 4. Motor parameter identification in cold state. 5. Reduce impact load or increase inverter capacity. 6. Install braking unit and braking resistor.

Fault name	Fault code	Operation panel display	Cause of failure	Troubleshooting Countermeasures
Constant speed overcurrent	4	Er.oC3	1. Phase-to-phase short circuit or short circuit to ground caused by aging of motor insulation, damaged cables, or other reasons. 2. There is a contactor on the output side of the inverter that is opening or closing. 3. Torque boost or V/F curve is inap propriate. 4. The control mode is vector and no parameter identification is performed. 5. Excessive load or sudden impact.	1. Troubleshoot peripheral problem. 2. Please ensure that the contactor does not open or close when the inverter has output. 3. Adjust the torque boost or V/F curve. 4. Motor parameter identification in cold state. 5. Reduce the impact load, increase the inverter capacity, and if it is VF control, try SVC or VC control.
Acceleration overvoltage	5	Er.oU1	1. Input voltage is too high. 2. There is a surge voltage mixed in the input power supply. 3. There is an external force driving the motor to run, or the braking load is too heavy. 4. Acceleration time is too short. 5. Motor short circuit to ground.	1. Reduce the power supply voltage to normal range. 2. Install DC reactor. 3. Cancel the external force that can drag the motor to run, or install a braking unit. 4. Increase acceleration time. 5. Eliminate the location of the ground short circuit.
Deceleration overvoltage	6	Er.oU2	1. Input voltage is too high. 2. There is a surge voltage mixed in the input power supply. 3. There is an external force driving the motor to run, or the braking load is too heavy. 4. Deceleration time too short. 5. Motor short circuit to ground.	1. Reduce the power supply voltage to normal range. 2. Install DC reactor. 3. Cancel the external force that can drag the motor to run, or install a braking unit. 4. Increase deceleration time. 5. Eliminate the location of the ground short circuit.
Constant speed overvoltage	7	Er.oU3	1. Input voltage is too high. 2. There is a surge voltage mixed in the input power supply. 3. There is an external force driving the motor to run, or the braking load is too heavy. 4. Acceleration or deceleration time is too short. 5. Motor short circuit to ground.	1. Reduce the power supply voltage to normal range. 2. Install DC reactor. 3. Cancel the external force that can drag the motor to run, or install a braking unit. 4. Increase acceleration time or deceleration time. 5. Eliminate the location of the ground short circuit.
Undervoltage fault	8	Er.Lv1	1.Input phase loss or instantaneous power failure. 2.The voltage at the input terminal of the frequency converter is not within the range required by the specification. 3.Cut off power during operation. 4.The internal wiring of the frequency converter is loose or the hardware is defective.	1. Check whether there is any abnormality in the input power supply, whether the input power terminal is loose, whether there is any abnormality in the input contactor or air switch. 2. Adjust voltage to normal range. 3. The inverter is shut down and then powered off. 4. Seek technical support. 5. In the case of unstable power supply, if the performance requirements are low, you can try to enable the undervoltage stall function (P23.00).

Fault name	Fault code	Operation panel display	Cause of failure	Troubleshooting Countermeasures
The soft start switch is not closed	9	Er.Lv2	1. Instantaneous power failure occurs. 2. The frequency inverter's input voltage is not within the allowable range. 3. Cut off the power during operation. 4. The internal wiring of the inverter is loose, or the hardware is bad.	1. Check if the input power supply is abnormal, whether the input power terminal is loose, whether the input contactor or the air switch is abnormal. 2. Adjust the voltage to the normal range. 3. Power off after the inverter stops. 4. Seeking technical support. 5. For the unstable power supply, if the performance requirements are low, try to enable the undervoltage stall function (P23.00).
Frequency converter overload	10	Er. oL	1. The load is too large or the motor is blocked. 2. The acceleration and deceleration time of large inertia load is too short. 3. VF When controlling, the torque boost or V/F curve is inappropriate. 4. Inverter selection is too small. 5. Overload when running at low speed.	1. Reduce load and check motor and mechanical conditions. 2. Increase acceleration and deceleration time. 3. Adjust the torque boost or V/F curve. 4. Choose an inverter with a larger power level. 5. Carry out motor self-learning when cold and reduce the carrier frequency at low speed.
Motor overload	11	Er.oL1	1. The load is too large or the motor is blocked. 2. The acceleration and deceleration time of large inertia load is too short. 3. During VF control, the torque boost or V/F curve is inappropriate. 4. Motor selection is too small. 5. Overload when running at low speed 6. Improper setting of motor parameters and motor protection parameters.	1. Reduce the load and check the condition of the motor and machinery. Correctly set the motor parameters and motor protection parameters. 2. Increase acceleration and deceleration time. 3. Adjust the torque boost or V/F curve. 4. Choose a motor with a higher power level. 5. Carry out motor self-learning when cold and reduce the carrier frequency at low speed. 6. Check the settings of relevant parameters.
Input phase loss	12	Er.iLP	1. The three-phase input power supply is abnormal. 2. Bad hardware.	1. Check and eliminate problems in peripheral lines. 2. Seek technical support.
Output phase loss	13	Er.oLP	1. The wiring from the inverter to the motor is loose and the motor is burned out. 2. The three-phase output of the inverter is unbalanced when the motor is running. 3. Bad hardware.	1. Troubleshoot peripheral problems 2. Check whether the three-phase windings of the motor are balanced; check whether the rated current of the motor is too much smaller than the rated current of the inverter. 3. Ask for technical support. 4. Ask for technical support.

Fault name	Fault code	Operation panel display	Cause of failure	Troubleshooting Countermeasures
Module overheated	14	Er. oH	1. Ambient temperature is too high 2. Air duct blocked 3. Fan damaged 4. Bad hardware	1. Lower ambient temperature 2. Clean the air duct 3. Change fan 4. Ask for technical support.
Motor overheated	16	Er. oH3	1. Temperature sensor wiring is loose. 2. Motor overheated. 3. The motor temperature sensor detects that the temperature is greater than the set threshold.	1. Check temperature sensor wiring. 2. Increase the carrier frequency, enhance motor heat dissipation, reduce the load, and choose a higher power motor. 3. Check whether the set threshold is reasonable.
Wave-by-wave current limiting fault	17	Er.CbC	1. Refer to the fault causes of Er.SC, Er.oC1, Er.oC2, and Er.oC3.	1. Refer to the troubleshooting strategies of Er.SC, Er.oC1, Er.oC2, and Er.oC3.
Short circuit to ground	18	Er.GF	1. The motor is burned out or the insulation is aged. 2. Contact or short circuit occurs due to damaged cables. 3. The distributed capacitance of the ⏚ terminal and motor cable is larger than motor cable. 4. Hardware is damaged.	1. Check the insulation resistance of the motor and replace the motor if there is continuity. 2. Check the power cable of the motor and eliminate the fault point. 3. Reduce the carrier frequency and install an output reactor. 4. Seek technical support.
Energy consumption brake pipe short circuit	19	Er.Pb	1. The braking resistor is short-circuited 2. Hardware is damaged.	1. Disconnect the external braking resistor and check whether its resistance is within the recommended range. 2. Ask for technical support.
Module temperature Detect anomalies	20	Er.tCK	1. Inverter's hardware is damaged. 2. Ambient temperature is too low.	1. Ask for technical support. 2. Manual intervention increases drive temperature.
Current detection failure	21	Er.Cur	1. Abnormal current detection element. 2. Abnormal driver board. 3. Main control board abnormality.	1. Ask for technical support. 2. Ask for technical support. 3. Ask for technical support.
Encoder disconnection	22	Er.PGL	1. Motor stall occurs. 2. Encoder line number setting error. 3. Encoder disconnection.	1. Check the condition of motor and machinery. 2. Correctly set encoder parameters. 3. Check encoder wiring.
Encoder interference	23	Er.PGt	1. Encoder cable shield is not grounded. 2. The motor and driver are not grounded.	1. Add shielding measures to the encoder line. 2. Reliably ground the motor and inverter.
Motor overspeed fault	25	Er. oS	1. Encoder parameter setting is incorrect. 2. No parameter identification was performed. 3. Motor overspeed detection parameter setting is unreasonable.	1. Correctly set encoder parameters. 4. Perform motor parameter identification. 5. Reasonably set detection parameters according to actual conditions.

Fault name	Fault code	Operation panel display	Cause of failure	Troubleshooting Countermeasures
Speed deviation is too large	26	Er.dEv	1. Encoder parameter setting is incorrect. 2. No parameter identification was performed. 3. The speed deviation is too large and the detection parameter settings are unreasonable. 4. Load too heavy.	1. Correctly set encoder parameters. 2. Perform motor parameter identification. 3. Reasonably set detection parameters according to actual conditions. 4. Increase the current limit or reduce the load.
Motor auto-tuning fault 1	27	Er.tU1	1. Motor parameters are not set according to the nameplate. 2. Motor resistance identification abnormality.	1. Correctly set the motor parameters according to the nameplate. 2. Please ensure that the motor wire is connected correctly; if there is a contactor between the inverter output and the motor, please ensure that the contactor is closed.
Motor auto-tuning fault 3	29	Er.tU3	1. The motor carries a heavier load during rotation self-learning. 2. The rated output current of the inverter is too different from the rated current of the motor.	1. Perform rotating self-learning without load, or perform static self-learning. 2. Replace matching inverter or motor.
Abnormal initial angle of synchronous motor	30	Er.iAt	1. The initial position of the synchronous motor is not correctly recognized.	1. Check whether the motor winding is normal.
Load loss fault	31	Er. LL	1. Motor load lost. 2. The load-shedding protection parameters (P24.12~P24.14) are set unreasonably.	1. Check whether the load is detached. 2. Adjust parameter settings to match actual operating condition.
EEPROM Read and write failure	32	Er.EEP	1. EEPROM Operating too frequently. 2. EEPROM Chip damaged.	1. The host computer should avoid frequent operations EEPROM. 2. Replace the main control board.
Running time arrives	33	Er.TTA	1. The inverter trial time has arrived.	1. Contact dealer.
485 Communication failure	34	Er.485	1. The host computer is not working properly. 2. The communication cable is not wired correctly, or there is a short circuit or disconnection. 3. No data received within the specified time.	1. Check the host computer wiring. 2. Check whether there is any abnormality in the communication cable. 3. Correctly set P30.01~P30.05; ensure that the communication configuration of the host computer is consistent with that of the inverter.
Runtime PID feedback lost	36	Er.FbL	1. PID feedback is less than P40.35 and lasts for the time set by P40.36. 2. PID feedback is greater than P40.37 and lasts for the time set by P40.38.	1. Check whether there is any abnormality in the PID feedback signal. 2. Check whether the settings of P40.35~P40.38 are reasonable.

Fault name	Fault code	Operation panel display	Cause of failure	Troubleshooting Countermeasures
User-defined fault 1	37	Er.Ud1	The DI/VDI terminal function is set to "User-defined fault 1" and the terminal is valid.	1. Check the source of the fault. 2. Reset operation.
User-defined fault 2	38	Er.Ud2	The DI/VDI terminal function is set to "User-defined fault 2" and the terminal is valid.	1. Check the source of the fault. 2. Reset operation.
CAN disconnection fault	41	Er.CA1	The slave station detects whether it is offline, and reports a fault if it is offline. At the same time, in the master-slave synchronization mode, if the slave station fails and goes offline, the master station will also report a fault.	1. Is the baud rate of the master station consistent with that of the slave station? 2. Check termination resistor configuration. 3. Check whether there is any abnormality in the communication cable. 4. Troubleshooting a drive failure. 5. Power cycle.
CAN Send timeout Fault	42	Er.CA2	The slave station starts timing from sending the message. If it has not successfully sent the message after the time set by P31.02, a fault will be reported.	1.The timeout time is set too short, reset the value of P31.02. 2.Check whether there is any abnormality in the communication cable.
Not executed Motor self-learning	44	Er.nt	Running without executing motor self-learning or encoder self-learning.	After executing motor self-learning or encoder self-learning,run.
CPU overload	49	Er.CPU	CPU overload.	1.Reduce carrier frequency P22.00; 2.Cancel double refresh P22.09: bit12~15 = 0

The fault code is used for communication reading fault type: when communication reads registers r25.00, r26.00, r26.08, r26.16, the content of the returned register is the fault code.

6.2 Warning type

Warnings are used to remind and inform users of the current status of the inverter. When a warning occurs, the keyboard will display a warning message. When the warning is eliminated, the warning will automatically reset. Some warnings require the user to troubleshoot the cause before running the inverter, while others do not need to be ignored. Warning is used as an immediate reminder, and the inverter will not store the corresponding information.

Bit12 of r27.10 indicates whether there is currently a warning message.

Warning name	Warning code	Display	Reason	Measure
Insufficient power	1	PoFF 	1: The DC link voltage is insufficient and cannot be started normally.	1.Check if the inverter power supply is normal.
About to self-study	2	tUnE 	Motor self-learning is set up	Press the "RUN" button on the operation panel key to perform self-learning.
Wrong parameter	4	A.PARA 	1: The parameter settings are wrong, such as: The torque mode is set in the VF control mode.	1. Modify and check the parameter compatibility problem
Sleeping status	5	SLEEP 	1. The system is in a sleep state, and the system will automatically start when hibernation is over.	1.Generally no need to pay attention to it.

The warning code is used for the communication read warning type: when the communication reads register r25.16, the contents of the returned register are the warning code.

Chapter 7 Spare parts selection

7.1 Brake component selection

The braking resistor is used to consume the energy feed back to the inverter by the motor during braking or power generation operation to achieve rapid braking or avoid the inverter from reporting a main circuit over-voltage fault. There are two parameters for selecting a braking resistor: resistance and power. Generally, the greater the inertia of the system, the shorter the deceleration time required, and the more frequent braking, the larger the power of the braking resistor should be. , the smaller the resistance.

1. Braking resistor power calculation

The power of the braking resistor can be calculated according to the following formula：

$$P_R = P_B \times D$$

In the formula，

P_B：Maximum braking power during braking process

D：The braking rate (the proportion of the braking process to the entire working process) is determined by the working condition characteristics of the load. Typical values for common situations are as shown in the table below：

Table 7-1 Braking rates in common situations

Application	D value
Elevator	20%～40%
Unwinding and lifting	40%～60%
General application	10%

2. Selection of braking resistor resistance

The resistance value of the braking resistor can be calculated according to the following formula：

$$R = \frac{U^2}{P_B}$$

In the formula：

U：DC bus voltage during braking (different models have different values. Models with built-in braking units can be set by P22.12)

3. Brake component selection table

Table 7-2 VFD510 frequency converter braking component selection table

Three-phase 380V level			
Model	Recommended power of braking resistor（$P_B \le P_N$，10% braking rate）	Recommended resistance value of braking resistor	Braking unit
VFD510-2R2-T4B	300W	≥ 180Ω	Standard inbuilt
VFD510-4R0-T4B	500W	≥ 90Ω	
VFD510-5R5-T4B	800W	≥ 60Ω	

VFD510-7R5-T4B	1000W	≥ 60Ω	
VFD510-011-T4B	1.2KW	≥ 25Ω	
VFD510-015-T4B	1.5KW	≥ 25Ω	
VFD510-018-T4B	2.0KW	≥ 18Ω	
VFD510-022-T4B	2.5KW	≥ 18Ω	

7.2 PG Card selection

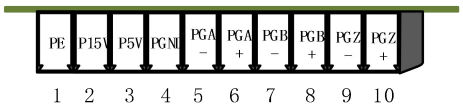
The optional PG cards and supported encoders of VFD510 are shown in the table below.

Table 7-3 List of PG card models

Model	Name	Usage
VFD510-PG-INC3	Incremental encoder PG card	Suitable for open collector type, push-pull output type and differential output type encoders.
VFD510-PG-RT1	Resolver PG card	Suitable for resolver.

（1）Incremental encoder PG card

Table 7-4 Incremental encoder PG card (MT500-PG-INC3) port definition

Pin number diagram	Pin number	Name	Usage
	1	PE	Shield terminal
	2	P15V	Power output, used to power the encoder P15V±2%, maximum 200mA
	3	P5V	Power output, used to power the encoder P5V±2%, maximum 200mA
	4	PGND	Power and signal common terminal
	5	PGA-	Encoder PGA-Signal
	6	PGA+	Encoder PGA+ signal
	7	PGB-	Encoder PGB-signal
	8	PGB-	Encoder PGB-signal
	9	PGZ-	Encoder PGZ-signal
	10	PGZ+	Encoder PGZ+signal

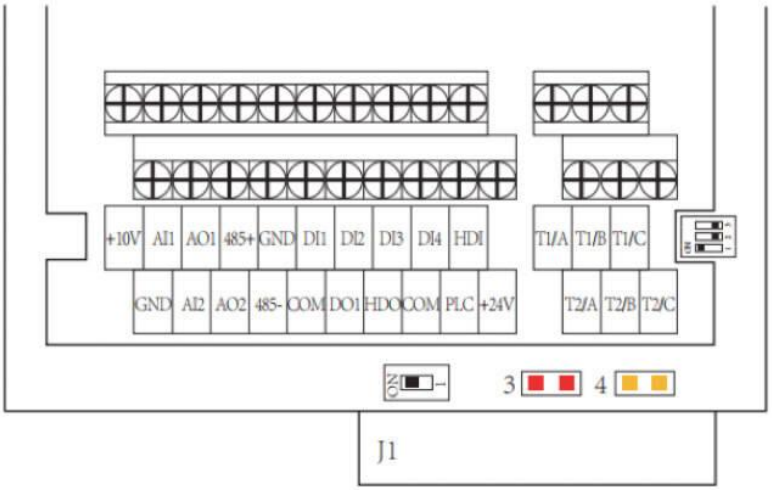
◆ Open collector type, push-pull output type encoder wiring：

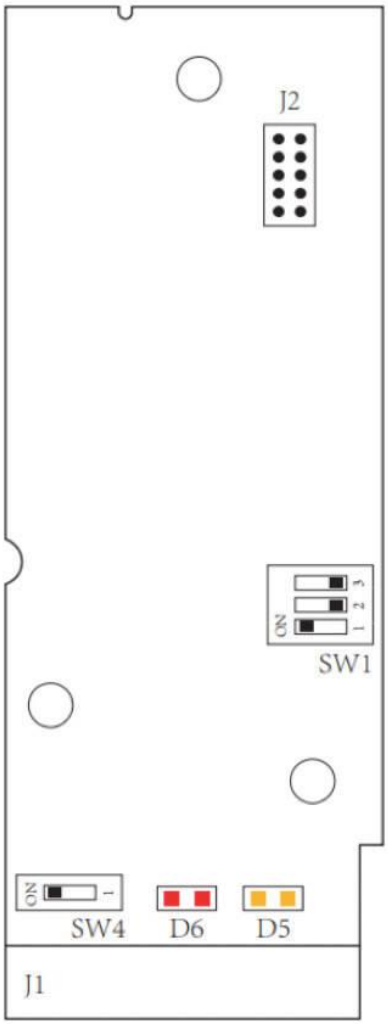
There is no need to wire the PGA+, PGB+, and PGZ+ terminals of the PG card. The signal output of the encoder is connected to the PGA-, PGB-, and PGZ- terminals of the PG card respectively.

◆ Differential output encoder wiring：

The wiring of the PG card and the encoder are connected one-to-one according to the silk screen.

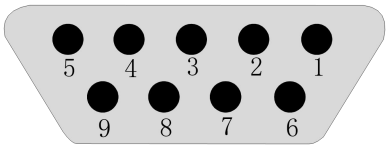
Icon name	Name	Function illustration
J1	Terminals	Terminals, see description in table 7-4
Indicator light red: (3) yellow:(4)	Status Indicator light	Working status indication: red(3) light on means do orthogonal processing on pulse signals(PGA+, PGA-, PGB+, PGB-) yellow light on means normal working
SW1	Dial switch	Dial switch 1. dial switch. 2. For filter level selection; 1,2 dial to the digital end: 1st level filtering 1 dial to ON, 2 dial to the digital end: 2nd level filtering 1 dial to the digital end, 2 dial to ON: 3rd level filtering 1,2 dial to ON: 4th level filtering Dip switch 3 is used to turn on pulse signal orthogonal processing: 3 dial to digital end: turn off pulse signal orthogonal processing, red light off. 3 dial to ON: turn on pulse signal orthogonal processing, red light on.
SW4	Dial switch	Ground selection: Dial to ON: connect to the ground PE through the internal Y capacitor. Dial to 1 : disconnect the internal Y capacitor from the ground PE.





（2）Resolver PG card

Table 7-5 Resolver PG card (MT500-PG-RT1) interface definition

Pin number diagram	Pin number	Name	Usage
 （Interface type：DB9）	1	EXC	Resolver excitation positive
	2	EXCLO	Resolver excitation negative
	3	SIN	Resolver feedback SIN positive
	4	SINLO	Resolver feedback SIN negative
	5	COS	Resolver feedback COS positive
	9	COSLO	Resolver feedback COS negative
	6，7，8	NC	Hanging in the air

7.3 CANopen Communication card

VFD510-CAN1 communication card is a CANopen slave communication card, used to connect VFD510 series frequency converters to the CANopen network. Please note that CANopen communication and Modbus communication cannot be used at the same time.

Product feature：

Supports Node Guard protocol, the master station can use this function to query device status；

Supports Heartbeat protocol, the slave station reports the current status to the master station regularly；

Support NMT network management protocol；

SDO only supports accelerated transmission mechanism, which can transmit up to 4 bytes and can be used to read and write inverter parameters.；

Supports 4 groups of PDO.

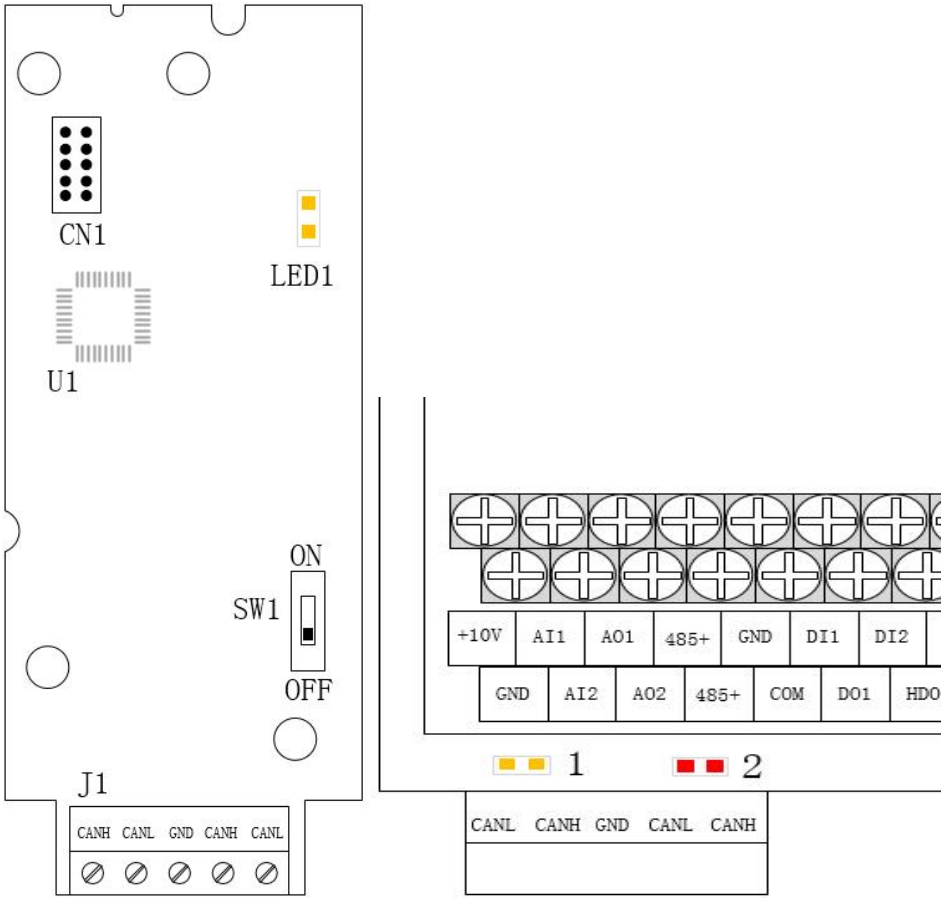


Figure 7-4 CANopen communication card and installation diagram

Table 7-6 CANopen communication card hardware description

Icon name	Name	Function description
J1	Terminal block	CANopen Bus terminals, see description in Table 7-7
LED1	Power indicator light	Lights up to indicate normal power supply
Indicator light: yellow light(1) red light(2)	Status indicator light	Working status and fault indication： Yellow light (1) is on: indicating normal operation Yellow light (1) flashes: indicating communication initialization Red light (2) on: Indicates internal communication failure Flashing red light (2): indicates CANopen communication failure or bus shutdown
SW1	DIP switch	Used to set the termination resistor of the CANopen bus

Table 7-7 J1 terminal function description

Terminal number	Terminal name	Function description
1，4	CANH	Signal line positive
2，5	CANL	Negative pole of signal line
3	GND	Signal ground

7.4 Profinet communication

7.4.1 Installation method

Figure 7-5 Schematic diagram of screw fixing holes

As shown in Figure 7-5, after inserting the PN card into the card slot, you need to use M3 self-tapping screws to fix it, and it cannot be operated while the power is on.

7.4.2 Indicator lights and selector switches

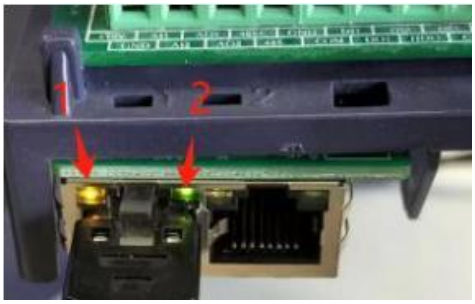


Figure 7-6 Network port indicator light

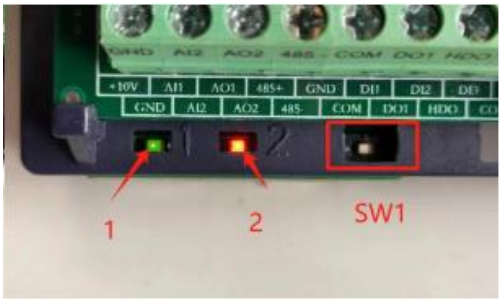


Figure 7-7 PN card indicator light and selection switch

Figure 7-6 shows the network port status indicator, with the yellow light on the left and the green light on the right. Figure 7-7 shows the PN card status indicator, with the green light on the left and the red light on the right, and SW1 is the selection switch.

Table 7-8 Description of status indicators and selector switches

<table>
<tr><th>Name</th><th>Description</th></tr>
<tr><td>Network port status indicator light</td><td>Profinet The bus terminal indicator light is on the front of the port.
<table>
<tr><th>Yellow light</th><th>Green light</th><th>Description</th></tr>
<tr><td>Off</td><td>Off</td><td>Network cable is not connected</td></tr>
<tr><td>Flashing</td><td>On</td><td>The PN card is exchanging data</td></tr>
<tr><td>On</td><td>On</td><td>The PN card is successfully connected to the PLC</td></tr>
</table>
Please use a shielded Category 5e network cable or a higher specification network cable to connect.</td></tr>
<tr><td>SW1</td><td>The GND reference ground is optional to the ground through the Y capacitor: ON means the connection to the ground, OFF means the connection to the ground is disconnected. The factory default setting is ON.</td></tr>
<tr><td>PN card working status indicator light</td><td>
<table>
<tr><th>Green light</th><th>Red light</th><th>Description</th></tr>
<tr><td>Off</td><td>Off</td><td>Working normally</td></tr>
<tr><td>Off</td><td>On</td><td>Communication failure between PN card and inverter CPU</td></tr>
<tr><td>Off</td><td>Flashing</td><td>Frequency converter failure</td></tr>
<tr><td>On</td><td>On</td><td>Communication failure between PN card and PLC</td></tr>
<tr><td>On</td><td>Flashing</td><td>PZD Channel configuration error</td></tr>
<tr><td>Flashing</td><td>Flashing</td><td>PLC Flashing state during debugging</td></tr>
</table>
</td></tr>
</table>

7.5 Modbus-TCP communication card

7.5.1 Installation method

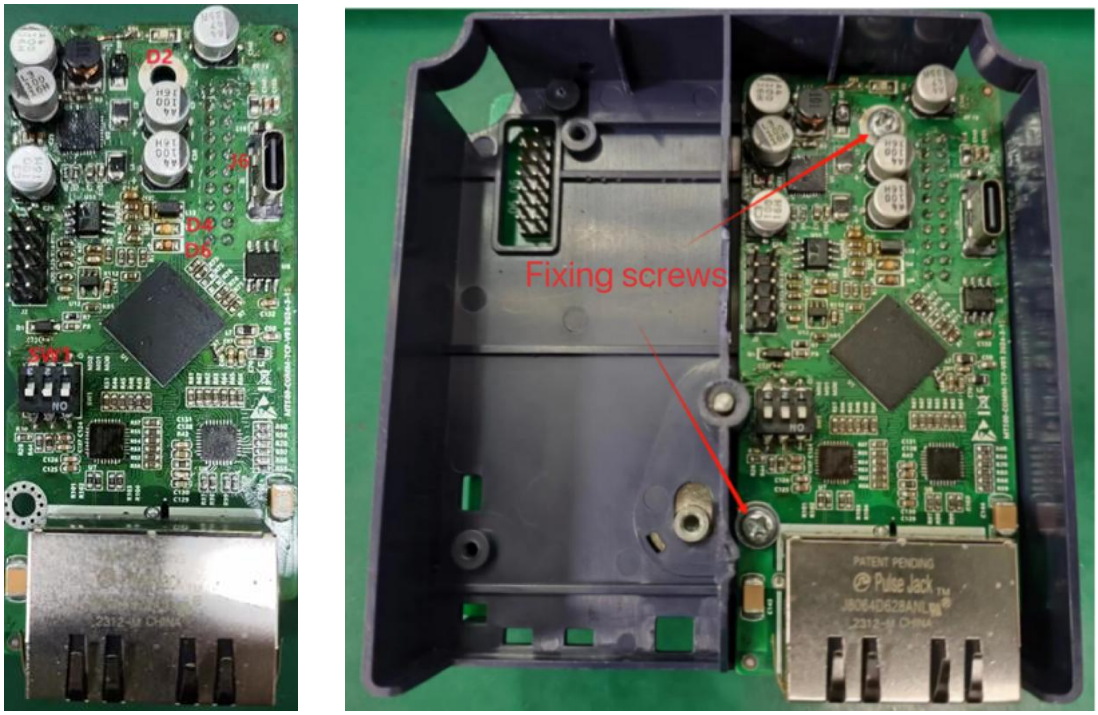


Figure 7-8 Modbus-TCP communication card appearance and installation diagram

Note: Please turn off the power of the inverter before installation, insert the Modbus-TCP communication card into the card slot and secure the corresponding screws.

7.5.2 Indicator lights and selector switches

Table 7-9 Interface description

Label	Effect	Illustrate
J6	USB terminal	For USB burning program
SW1	Boot mode dial switch	Used for operating mode selection, the three switches are turned to ON by default.
SW2	EMC dial switch	Used for EMC grounding selection, turn it to ON to connect to PE, turn it to OFF to disconnect from PE, and turn it to ON by default.
D2	Power indicator light (green)	On: normal power on; off: abnormal power on
D6	Reserved (green)	
D4	Program heartbeat indicator light (red)	When it is always on, it means that the system is not working properly or has not been initialized. When flickering at 1Hz, it lights up for 500ms and turns off for 500ms, indicating that the system is operating normally.
D5	TCP connection indicator light (red) with the master station	When it is always on, it means that the system has not been initialized and no TCP connection has been established. When off, it means a normal TCP connection is generated. When flashing at 2.5Hz, it lights up for 200ms, and when it goes

		out for 200ms, it means that the TCP connection has been disconnected for more than 5 seconds. P32.10 records the number of disconnections.
D3	Bridge status indicator light (green) with the frequency converter	When it is always on, it means that the system is not working properly or has not been initialized. When flashing at 0.25Hz, it lights up for 2s. When it goes out for 2s, it means that the bridge communication is not successful. Please check whether P30.02 is equal to 7. When flickering at 1Hz, it lights up for 500ms and turns off for 500ms, indicating that the system is operating normally. When 5Hz flashes, it lights up for 100ms. When it goes out for 100ms, it indicates an error occurs in communication with the inverter. When an error occurs, this state lasts for 5s. If no new communication error occurs within 5s, it automatically switches to the 1Hz flashing state.
Port1	RJ45 Ethernet Communication port 1	When powered on, the green indicator light and yellow indicator light light up and then turn off normally. After connecting the network cable (the other end is connected to a standard network device), the green indicator light lights up When the connection rate is 100M, the yellow indicator light lights up and flashes when data is sent and received.
Port2	RJ45 Ethernet Communication port 2	

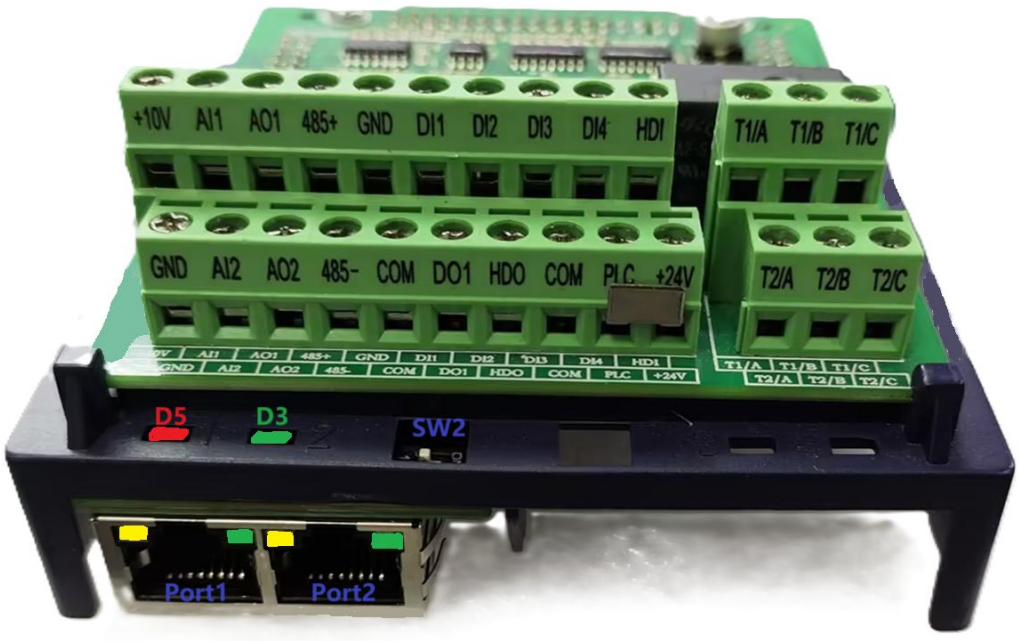


Figure 7-9 Status indicator light

Table 7-10 Description of working status indicators

Red light (D5)	Green light (D3)	Status
Off	Flashing(1HZ)	Work normally
On	Flashing(1HZ)	Waiting for master connection
Flashing	Flashing(1HZ)	The master station is

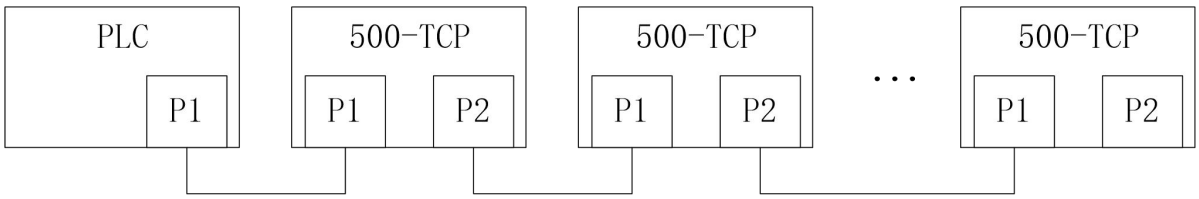
		disconnected, and P32.10 records the number of disconnections.
On	Flashing(0.25HZ)	Communication with the frequency converter failed, please check P30.02=7
Off	Flashing(5HZ)	There is an error frame in communication with the frequency converter.
Off	Off	Not powered on
On	On	Not working properly

Table 7-11 Description of network port status indicators

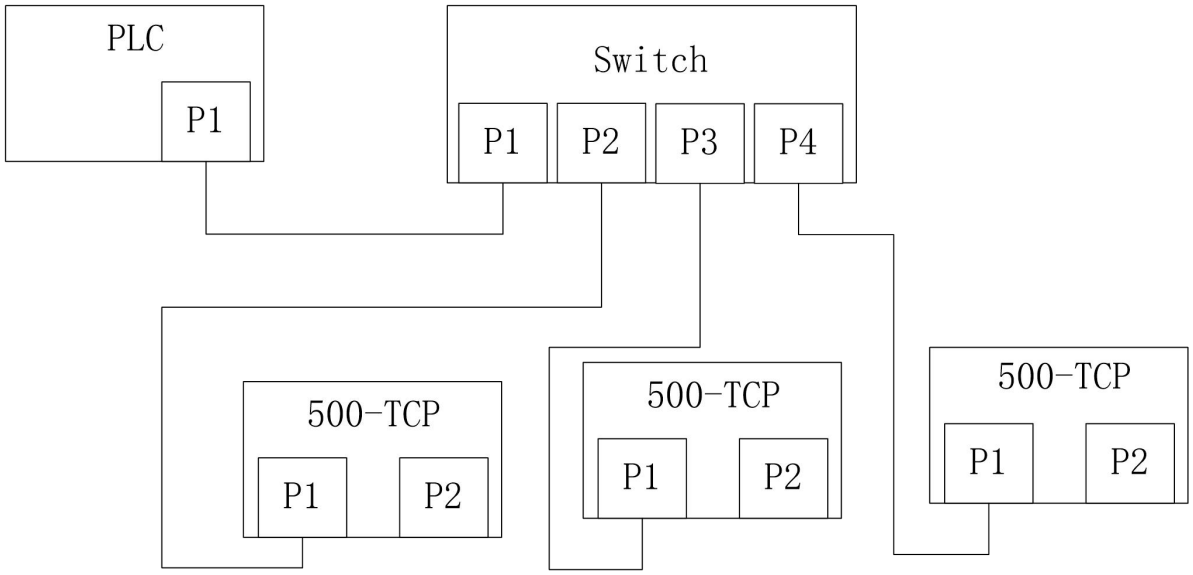
Yellow light (Port1/2)	Green light (Port1/2)	Status
Off	Off	Network cable is not connected
On	On	Successfully connected
Flashing	On	Successfully connected and data is sent and received

7.5.3 Network topology

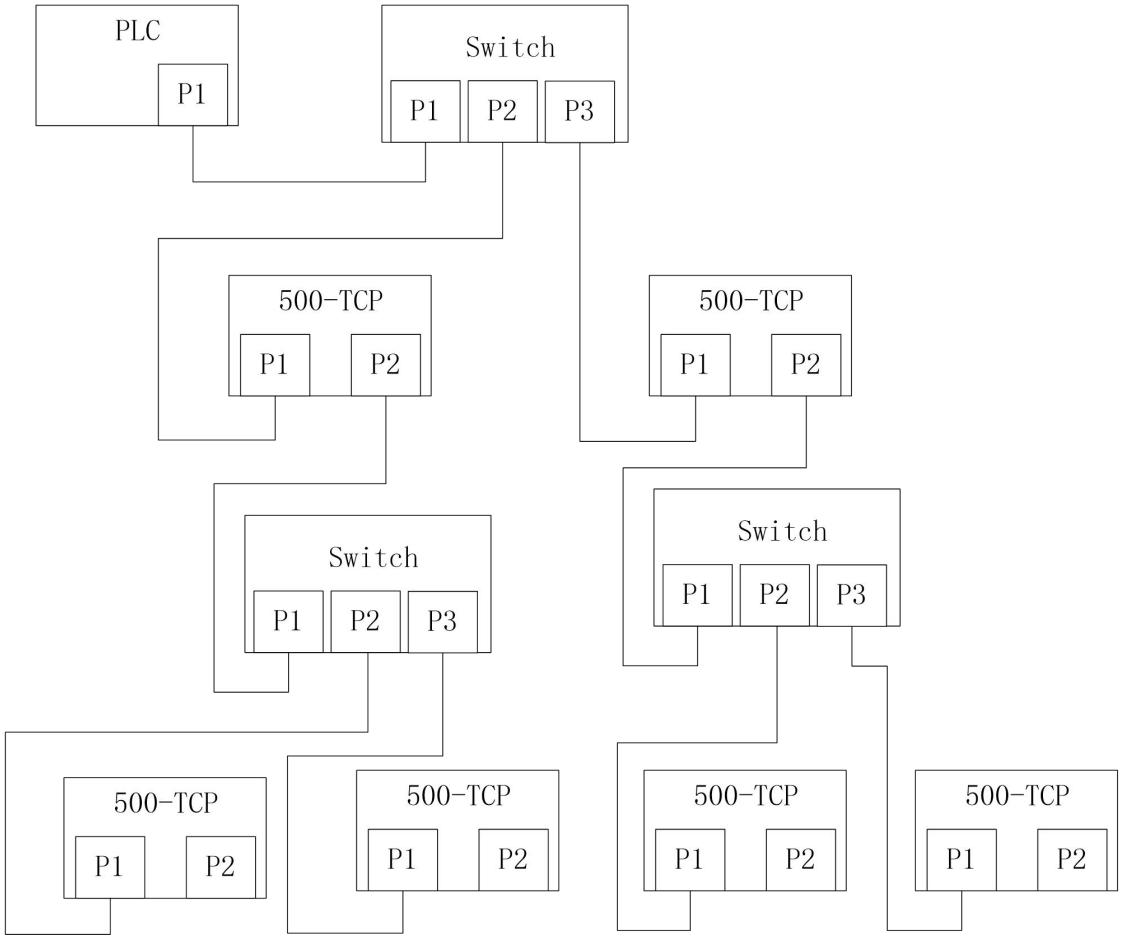
The 500-TCP communication card uses a standard Ethernet RJ45 socket to connect to the Modbus-Tcp master station. Its pin signal definition is consistent with the standard Ethernet pins, and both crossover cables and direct connections are available. After the communication card is connected to the inverter, face the status indicator light. The network port on the left is P1 and the network port on the right is P2. Modbus-Tcp supports a variety of topologies, including bus, star, and tree. By rationally utilizing switches, a variety of networking can be achieved.



(a) Bus type



(b) Star type



(c) tree type

Figure 7-10 Network topology diagram

Note: To ensure stable operation, it is recommended to use a minimum category 5e shielded twisted pair network cable.

Chapter 8 Care and Maintenance

8.1 Regular inspection

Temperature, humidity, smoke, dust, vibration, etc. in the operating environment, as well as many factors such as the aging of the inverter's own components, may affect the normal operation of the inverter or even cause failure. Therefore, preventive maintenance such as daily inspection, periodic inspection, and component replacement must be performed on the frequency converter.

8.1.1 Daily inspection

To avoid deterioration of inverter function and product damage, please copy this checklist and confirm the following items every day.

Table 8-1 Daily inspection items

Check item	Check content	Countermeasures in case of failure	Check bar
Motor	Is there any abnormal vibration or sound.	➢ Check the mechanical connections of the motor. ➢ Check peripheral components near the motor.	
	Is the motor abnormally hot or discolored.	➢ Check whether it is overloaded. ➢ Confirm the ambient temperature. ➢ Check if the wiring is loose.	
Inverter	Is there any deformation or discoloration of the inverter.	➢ Check whether it is overloaded. ➢ Confirm the ambient temperature. ➢ Seek customer service support.	
	Is there any abnormal vibration in the frequency converter.	➢ Tighten the set screws.	
	Is there a lot of dust or oil attached to the inverter.	➢ Clean it up (when the power is off)	
	Is the cooling fan damaged or blocked.	➢ Check the running time of the frequency converter to determine whether it needs to be replaced. ➢ Clean the clogged area.	
	Whether the output current of the frequency converter is higher than the rated value and lasts for a certain period of time.	➢ Check whether it is overloaded. ➢ Confirm the motor parameter settings.	
Power	Is the main circuit voltage normal.	➢ Confirm whether the main circuit power supply voltage of each phase is within the allowable range. ➢ Check power input.	

8.1.2 Regular inspection

Under normal circumstances, it is recommended to conduct regular inspections every 3 to 6 months to eliminate potential faults and safety hazards. However, please determine the actual inspection frequency based on actual usage and working environment.

Please cut off the power supply of the equipment before inspection and wait for more than 10 minutes to avoid danger caused by residual voltage inside the inverter!

Table 8-2 Periodic inspection contents

Check items	Unusual measures
Are the inverter mounting screws loose?	Tighten with a screwdriver or socket
Are the main circuit terminal and ground terminal screws loose?	Tighten with a screwdriver or socket
Check whether the control circuit terminal screws and plug-in parts are loose?	Tighten with a screwdriver and secure firmly
Whether the circuit board is dusty?	Clean with dry air
Is the air duct blocked?	Clean with dry air
Whether the power cables and control cables are damaged?	Replace damaged cables
Are there any abnormalities in peripheral circuits, contactors, motors, etc.	Replace parts or eliminate hidden dangers.
Is the keyboard display incomplete or unclear?	Contact the manufacturer to replace the keyboard
Is there any abnormal increase in vibration and operating noise?	Stop the device and contact the manufacturer

8.2 Replacement of wearing parts

The vulnerable parts of the frequency converter mainly include cooling fans, electrolytic capacitors, relays, etc., and their service life is closely related to the environment in which they are used and the maintenance status. Table 8-3 lists the replacement time and causes of damage of main components for reference. In addition, if any abnormality is found during maintenance, please replace it in time.

Table 8-3 Replacement time of wearing parts

Wearable parts	Standard replacement time	Reasons for damage	Judgement method
Fan	30000～60000h	Bearing wear, blade aging	1. The blade has cracks. 2. Abnormal vibration, excessive noise.
Electrolytic capacitor	40000～50000h	Poor input power quality, high ambient temperature, low air pressure, frequent load changes, electrolyte aging	1. There is liquid leakage. 2. The safety valve protrudes. 3. The capacitance value is beyond the allowable range. 4. Insulation resistance is abnormal. 5. DC bus voltage fluctuations are too large.
Relay	50000～100000 times	Corrosion, dust affect contact contact effect, contact action is too frequent	Contact ineffective

The user can refer to the accumulated power-on time and accumulated running time recorded by the inverter, and combine the actual operating conditions and the external environment to determine the replacement period.

8.3 Inverter warranty instructions

1) Warranty only refers to frequency inverter.

2) Under normal use, if there is any failure or damage, our company is responsible for the warranty within 18 months. (Leave factory date is subjected to the S/N on the frequency inverter nameplate or according to the contract). When over 18 months, reasonable fee will be charged for maintenance;

3) During the period of 18 months, if the following situation happens, certain maintenance fee will be charged;

a. The users don't follow the rules in the manual lead to the frequency inverter damaged;

b. The damage caused by fire, flood and abnormal voltage;

c. The damage caused by using the frequency inverter for abnormal functions;

d. The relevant service fee is calculated according to the manufacturer's standard, if there is an contract, then it is subject to the contract items.

 For detailed warranty instructions, please refer to the Product Warranty Card.

Appendix A Modbus communication protocol

VFD510 provides RS485 communication interface, supports Modbus-RTU protocol format, and is suitable for "single master multiple slaves" communication network with RS485 bus. Users can set the inverter operating commands, modify or read function code parameters through the Modbus communication protocol; in addition, the VFD510 inverter can also be used as a host to communicate with other VFD510 inverters in a broadcast manner.

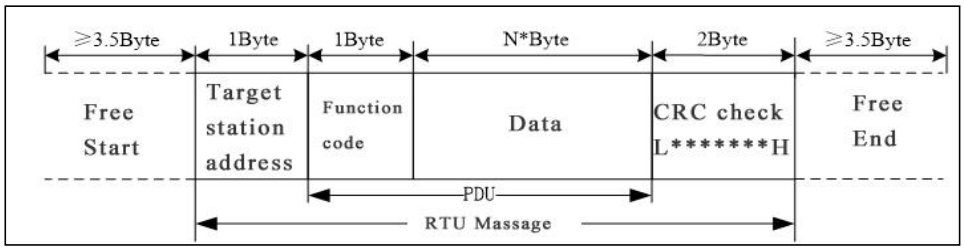
A.1 Protocol format

RS485 asynchronous half-duplex.

RS485 terminal default data format: 1-8-N-1 (1 start bit, 8 data bits, no parity, 1 stop bit), the default baud rate: 9600bps. See parameter group set 30.

A.2 Message format

The Modbus message of the VFD510 series inverter includes a start flag, an RTU message and an end flag.



The RTU message includes the address code, the PDU (Protocol Data Uint, the protocol data unit), and the CRC check. PDU includes the function code and the data section.

Data frame field description:

Frame start (START)	More than 3.5 byte transmission time.	
Target site address (ADDR)	Communication address range: 1~247 slave address, 0 is broadcast address.	
Command code(CMD)	Command code	Description
	0x03	Read multiple registers of the AC drive.
	0x06	Write a single register to the AC drive.
	0x10	Write Multiple registers to the AC drive.
	0x08	Diagnostic command code.
Data	It mainly includes register address, register number and register content, etc. For the specific format, see Chapter A.3.	
CRCL	CRC16 check value. When transmitting, the low byte comes first and the high byte comes last. For details on calculation methods, see Chapter A.5.	
CRCH		
FRAME END	More than 3.5 byte transmission time.	

A.3 Command code instruction

A.3.1 Command code 0x03 reads multiple registers

- **Request PDU**

Command code	1 byte	0x03
Initial address	2 bytes	0x0000～0xFFFF（High 8 bits first）
Number of registers	2 bytes	0x0001～0x0010（1～16,high 8 bit first）

- **Response PDU**

Command code	1 byte	0x03
Number of bytes	1 byte	2*N（N is the number of registers）
Number of registers	2*N bytes	Register value high 8 bits first； The register value of the starting address is sent first.

- **Error PDU**

Command code	1 byte	0x83
Exception code	1 byte	See Chapter A.4 Exception Response Information

Warning: The current Modbus protocol 0x03 command code does not support reading multiple function codes across groups. If the number of function codes in the current group is exceeded, an error frame will be returned!

A.3.2 Command code 0x06 writes a single register

- **Request PDU**

Command code	1 byte	0x06
Initial address	2 bytes	0x0000～0xFFFF（High 8 bits first）
Register value	2 bytes	0x0000～0xFFFF（Register value high 8 bits first）

- **Response PDU**

Command code	1 byte	0x06
Register address	2 bytes	0x0000～0xFFFF（High 8 bits first）
Register value	2 bytes	0x0000～0xFFFF（Register value high 8 bits first）

- **Error PDU**

Command code	1 byte	0x86
Exception code	1 byte	See Chapter A.4 Exception Response Information

A.3.3 Command code 0x10 writes multiple registers

- **Request PDU**

Command code	1 byte	0x10
Initial address	2 bytes	0x0000～0xFFFF（High 8 bits first）
Number of registers	2 bytes	0x0001～0x0010（1~16，High 8 bits first）
Number of bytes	1 byte	2*N（N is the number of registers）
Register value	2*N bytes	The high 8 bits of the register value come first; The register value of the starting address is sent first.

- **Response PDU**

Command code	1 byte	0x10
Initial address	2 bytes	0x0000～0xFFFF（High 8 bits first）
Number of registers	2 bytes	0x0001～0x0010（1~16，High 8 bits first）

- **Error PDU**

Command code	1 byte	0x90

Exception code	1 byte	See Chapter A.4 Exception Response Information

A.3.4 Command code 0x08 line diagnosis

The Modbus command code 0x08 of VFD510 is used to check whether the line is connected.

- **Request PDU**

Command code	1 byte	0x08
Sub-command code	2 bytes	0x0000
Data	2 bytes	0x0000～0xFFFF

- **Response PDU**

Command code	1 byte	0x08
Sub-command code	2 bytes	0x0000
Data	2 bytes	Same as request PDU

- **Error PDU**

Command code	1 byte	0x88
Exception code	1 byte	See Chapter A.4 Exception Response Information

A.4 Exception response information

Exception response command code = normal response command code + 0x80. The value and meaning of the exception code are as shown in the table below：

Exception code	Name	Description
0x01	Invalid command code	The command code received from the slave station is invalid
0x02	Illegal register address	The register address received by the slave does not exist； The number of registers read and written exceeds the range； When writing multiple registers, the number of bytes in the PDU is not equal to the number of registers.
0x03	Frame format error	CRC check failed； Frame length is incorrect；
0x04	Data out of range	The data received by the slave station exceeds the range of the minimum value to the maximum value of the corresponding register.
0x05	Read and write requests denied	Write operations to read-only registers; Write operations to run read-only registers in running state.

A.5 CRC check

CRC (Cyclical Redundancy Check) refers to operating the message content other than the CRC check code according to the check algorithm to generate a two-byte check code and attach it to the sent message. The receiving device recalculates the CRC of the received message and compares it with the value in the received CRC field. If the two CRC values are not equal, there is an error in the transmission.

There is a lot of information about CRC check on the Internet. Regarding the CRC check code generation algorithm, I will not go into details here.

A.6 Register address distribution

The register address of the VFD510 frequency converter is 16-bit data. The high 8 bits represent the function code group number, and the low 8 bits represent the serial number within the group. The high 8 bits are sent first.

 The 32-bit register occupies two adjacent addresses, the even address stores the lower 16 bits, and the address next to the even address (odd address) stores the upper 16 bits.

When performing a register write operation, in order to avoid memory damage caused by frequent writing to EEPROM, the highest bit of the register address is used to indicate whether EEPROM is stored. A highest bit of 1 indicates that EEPROM is stored, and a 0 indicates that only RAM is stored. In other words, if you want the written register value to be saved after power off, you should add 0x8000 to the original register address.

The 0x70xx address in the table below is equivalent to 0x1Dxx, which is parameter 29.xx.

The register address table of VFD510 is as follows：

Address space		Description
0x0000 ~ 0x6363 （Function code address space）		**Rule：** The high 8 bits of hexadecimal represent the group number (0 ~ 99), and the low 8 bits represent the group number (0 ~ 99). **Example1：** Function code 27.10 (drive status word 1), which The hexadecimal address is: 0x1B0A (0x1B=27, 0x0A=10), Decimal address: 27×256+10 = 6922. **Example 2：** Function code 14.01 (torque given digital setting), when there is no EEPROM, its The hexadecimal address is: 0x0E01 (0x0E=14, 0x01=1), The decimal address is: 14×256+1 = 3585. If you want the content written by communication to be saved to EEPROM after power off, then The hexadecimal address is 0x8E01 (0x0E01 plus 0x8000), The decimal address is 36353 (3585 plus 32768). **Note:** The address calculated using hexadecimal or decimal is the same. Users can choose the familiar calculation method.
Communication dedicated address	0x7000	Communication command.The values and functions are as follows： 0x0000：The run command is invalid, which is equivalent to all keys under keyboard control being invalid.； 0x0001：Forward running； 0x0002：Reverse run； 0x0003：Forward jog； 0x0004：Reverse jog； 0x0005：Coast to stop； 0x0006：Slow down and stop； 0x0007：Quick stop； 0x0008：Fault reset.
	0x7001	Communication speed is given. The unit of this register can be set by 30.14. 0.01%（-100.00% ~100.00%） 0.01Hz（0 ~ 600.00Hz） 1Rpm（0 ~ 65535Rpm）
	0x7002	Communication torque given. 0.01%（-300.00% ~ 300.00%）
	0x7003	Communication upper limit frequency. The unit of this register can be set by 30.14.不 The range under the same unit is the same as 0x7001.
	0x7004	Torque mode speed limit value. The unit of this register can be set by 30.14. The range under different units is the same 0x7001.
	0x7005	Electric torque limit. 0.1%（0~300.0%）
	0x7006	Generator torque limit. 0.1%（0~300.0%）
	0x7007	The process PID is given. 0.01%（-100.00% ~100.00%）
	0x7008	Process PID feedback. 0.01%（-100.00% ~100.00%）
	0x7009	VF separation voltage is given. 0.1%（0~100.0%）
	0x700A	External fault setting.
	0x700B	DO status setting. When the DO function (please refer to P07.01~P07.10) is set to 0 (no function), its status comes from the setting of the communication special register, and the corresponding bit is 1, which means it is valid. The bit definitions of this register are as follows:

		Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
		Reserved	Reserved	Reserved	Reserved	RL2	RL1	DO2	DO1
		Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
		Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	VDO2	VDO1

A.7 Register data type

There are several types of register data, and each type of communication setting method is shown in the following table：

Register data type	Communication setting method
16-bit unsigned number	0~65535 corresponds to 0xFFFF; the decimal point does not need to be processed. Example：Set P00.07 to 40.00Hz: Write 0x0FA0 to address 0x0007.
16-bit signed number	-32768~32767 corresponds to 0x8000~0x7FFF. Example：Set P14.01 to -50.0%： Write 0xFE0C to address 0x0E01.
Binary number	Represents a 16-bit value. Example：The content of the read address 0x0600 is 0x0012, which means: Bit1=1, bit4=1 of r06.00; that is, DI1 and DI5 (HDI) are valid.
"Ten, hundreds, thousands" type	"Ones digit" ~ "thousands digit" correspond to 0~3bit, 4~7bit, 8~11bit, 12~15bit respectively. Example: Set the "ones digit" of P40.04 to AI1 and the "tens digit" to AI2： Write 0x0021 to address 0x2804.
32-bit unsigned number	The contents of the two registers need to be combined into a 32-bit number. For example, read the electricity meter r16.00： Step 1: Read 2 registers from starting address 0x1000 Step 2: Electricity meter reading = ((Uint32)0x1001 value<<16) + 0x1000 value
32-bit signed number	Similar to 32-bit unsigned numbers. The value of the even address still represents the lower 16 bits, and the value of the next address (odd number) after the even address represents the high 16 bits.

A.8 Frequency converter as Modbus master station

VFD510 can be used as a Modbus master station and currently only supports broadcast networking. Setting P30.09 to 1 enables the master station mode. When acting as the master station, the sending frame is as follows:

0x00	0x06	0x70	**N**	**ValH**	**ValL**	CRCL	CRCH

Instruction：

1. N indicates the slave register of the operation which is set by P30.10.

2. Val means the data sent, Val = (ValH << 8) + ValL, the function code P30.11 is to select the contents of the data sent.

3. The idle time between frame and frame is set by function code P30.

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