Goodrive350C Series

High-performance Closed-loop VFD

User Manual

SHENZHEN INVT ELECTRIC CO., LTD.

Preface

Overview

Thank you for purchasing INVT Goodrive350C series variable-frequency drive (VFD). If not otherwise specified, the VFD mentioned in this manual refers to Goodrive350C series high-performance closed-loop VFD. This product is primarily used to drive asynchronous motors, permanent magnet synchronous motors, and synchronous reluctance motors. It is widely applied in automated production equipment across various industries, including textiles, wire drawing, lifting, papermaking, petroleum, chemicals, building materials, plastics, machine tools, printing and packaging, food, municipal services, HVAC, fans, and pumps.

This manual mainly describes the methods of mechanical installation, electrical installation, operation methods, commissioning, maintenance and troubleshooting of the VFD. Read the manual carefully before installing and using the VFD.

Readers

Personnel with electrical professional knowledge (such as qualified electrical engineers or personnel with equivalent knowledge).

Change history

Due to product version upgrade or other reasons, this document will be updated from time to time without notice.

No.	Change description	Version	Release date
1	First release.	V1.0	March 2025

Contents

1 Safety precautions

1.1 Safety declaration

Read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the product. Otherwise, equipment damage or physical injury or death may be caused.

We shall not be liable or responsible for any equipment damage or physical injury or death caused due to failure to follow the safety precautions.

1.2 Safety level definition

To ensure personal safety and avoid property damage, you must pay attention to the warning symbols and tips in the manual.

Warning symbols	Name	Description
	Danger	Severe personal injury or even death can result if related requirements are not followed.
	Electric shock	Severe personal injury or even death can result if related requirements are not followed. As high voltage still presents in the bus capacitor after power off, wait for at least 5 minutes (or 15 minutes, 25 minutes, depending on the warning symbols on the machine) after power off to prevent electric shock.
	Warning	Personal injury or equipment damage can result if related requirements are not followed.
	Electrostatic discharge	The PCBA may be damaged if related requirements are not followed.
	Hot sides	You may get burnt if related requirements are not followed.
Note	Note	Slight personal injury or equipment damage can result if related requirements are not followed.

1.3 Personnel requirements

Trained and qualified professionals: People operating the equipment must have received professional electrical and safety training and obtained the certificates, and must be familiar with all steps and requirements of equipment installing, commissioning, running and maintaining and capable to prevent any emergencies according to experiences.

1.4 Safety guidelines

<table>
<tr><th colspan="2">General principles</th></tr>
<tr><td></td><td>
● Only trained and qualified professionals are allowed to carry out related operations.
● Do not perform wiring, inspection or component replacement when power supply is applied. Before performing these operations, ensure all the input power supplies have been disconnected, and wait for at least the time designated on the VFD or until the DC bus voltage is less than 36V. The minimum waiting time is listed in the following.
<table>
<tr><th>Model</th><th>Minimum waiting time</th></tr>
<tr><td>380V 1R5G–110G</td><td>5 minutes</td></tr>
<tr><td>380V 132G–315G</td><td>15 minutes</td></tr>
<tr><td>380V 355G and higher</td><td>25 minutes</td></tr>
</table>
</td></tr>
<tr><td></td><td>
● Do not modify the VFD unless authorized; otherwise fire, electric shock or other injury may result.
● The VFD cannot be used as an "Emergency-stop device".
● The VFD cannot act as an emergency brake for the motor; it is a must to install a mechanical braking device.
● Prevent the screws, cables and other conductive parts from falling into the VFD.
</td></tr>
<tr><td></td><td>
● The base may become hot when the VFD is running. Do not touch. Otherwise, you may get burnt.
</td></tr>
<tr><td></td><td>
● The electrical parts and components inside the VFD are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.
</td></tr>
</table>

<table>
<tr><th colspan="2">Delivery</th></tr>
<tr><td></td><td>
● Select appropriate tools for VFD delivery to avoid damage to the VFD, and take protective measures like wearing safety shoes and working uniforms to avoid physical injury or death.
● Protect the VFD against physical shock or vibration.
● Do not carry the VFD only by its front cover as the cover may fall off.
</td></tr>
</table>

<table>
<tr><th colspan="2">Installation</th></tr>
<tr><td></td><td>
● Do not install the VFD on inflammables. In addition, prevent the VFD from contacting or adhering to inflammables.
● Do not install the damaged or incomplete VFD.
● Do not contact the VFD with damp objects or body parts. Otherwise, electric shock may result.
</td></tr>
</table>

Installation

- The installation site must be away from children and other public places. For details, see section 3.2.1 Installation environment and site.
- Connect the optional braking parts (such as braking resistors, braking units or feedback units) according to the wiring diagrams.
- As VFD leakage current caused during running may exceed 3.5mA, apply reliable grounding and ensure the ground resistance is less than 10Ω. The PE ground conductor and phase conductor have equal conductivity capability. For the models of 30kW and higher, the cross sectional area of the PE ground conductor can be slightly less than the recommended area.
- R, S, and T are the power input terminals, while U, V, and W are the output motor-connection terminals. Connect the input power cables and motor cables properly; otherwise, the VFD may be damaged.
- When the VFD is installed in a confined space (such as cabinet), it is necessary to provide protective devices (such as fireproof housing, electrical protective housing, mechanical protective housing, etc.) that meet the IP rating, and the IP rating shall comply with the relevant IEC standards and local regulations.

Commissioning

- The VFD may start up by itself when power-off restart is enabled (P01.21=1). Do not get close to the VFD and motor.

- Do not switch on or switch off the input power supplies of the VFD frequently.
- If the VFD has been stored without use for a long time, perform capacitor reforming (described in section 9.3 Reforming), inspection and pilot run for the VFD before the reuse.

Run

- Close the VFD front cover before running; otherwise, electric shock may occur.
- High voltage presents inside the VFD during running. Do not carry out any operation on the VFD during running except for keypad setup. The control terminals of the product form extra-low voltage (ELV) circuits. Therefore, you need to prevent the control terminals from connecting to accessible terminals of other devices.
- During driving a synchronous motor, besides above-mentioned items, the following work must be done:
  - ✓ All input power supplies have been disconnected, including the main power and control power.
  - ✓ The synchronous motor has been stopped, and the voltage on output

Run	
	end of the VFD is lower than 36V. ✓ After the synchronous motor has stopped, wait for at least the time designated on the VFD, and ensure the voltage between (+) and (-) is lower than 36V. ✓ During operation, it is a must to ensure the synchronous motor cannot run again by the action of external load; it is recommended to install an effective external braking device or cut off the direct electrical connection between the synchronous motor and the VFD.

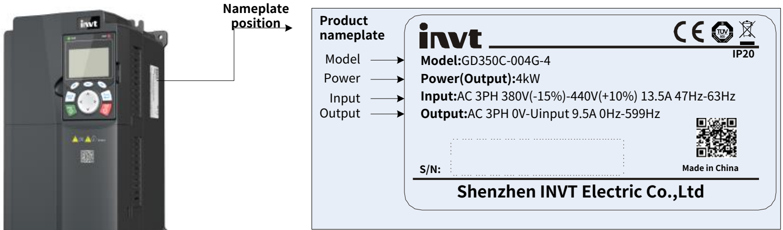
Maintenance	
	● Do not perform VFD maintenance or component replacement when the power is on. Otherwise, electric shock may result. ● Keep the VFD and its parts and components away from combustible materials and ensure they have no combustible materials adhered.
	● During maintenance and component replacement, take proper anti-static measures on the VFD and its internal parts.
	● Do not carry out insulation voltage-endurance test on the VFD, or measure the control circuits of the VFD with a megohmmeter.
Note	● Use proper torque to tighten screws.

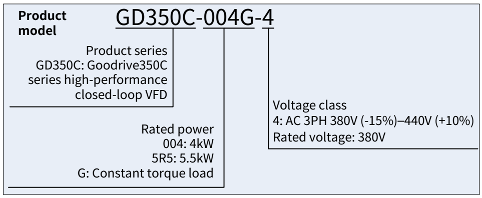
Disposal	
	● The VFD contains heavy metals. Dispose of a scrap VFD as industrial waste.

2 Product overview

2.1 Product nameplate and model

Each VFD is affixed with a nameplate containing the basic product information and, depending on the actual certification, certification marks such as the CE mark.





2.2 Product specifications

Item		Specifications
Input	Input voltage (V)	AC 3PH 380V (-15%) – 440V (+10%); rated voltage: 380V
	Input current (A)	See section 2.3 Product ratings.
	Input frequency (Hz)	50Hz or 60Hz; Allowed range: 47–63Hz, with a maximum change rate of 20%/s
	Short-circuit capacity	According to the definition in IEC 61439-1, the maximum allowable short-circuit current at the incoming end is 100 kA. Therefore, the VFD is applicable to scenarios where the transmitted current in the circuit is no larger than 100kA when the VFD runs at the maximum rated voltage.
Output	Output voltage (V)	0–Input voltage
	Output current (A)	See section 2.3 Product ratings.
	Output power (kW)	See section 2.3 Product ratings.
	Output frequency (Hz)	0–599Hz

Item		Specifications
Control Performance	Control mode	Space voltage vector control, sensorless vector control (SVC), and feedback vector control (FVC) mode
	Motor	Motor type: Asynchronous motor (AM) and synchronous motor (SM) Voltage: 0–U1 (motor rated voltage), 3PH symmetrical, U_{max} (VFD rated voltage) at the field-weakening point Circuit protection: The motor output short-circuit protection meets the requirements of IEC 61800-5-1. Frequency: 0–599Hz, frequency resolution: 0.01Hz Carrier frequency: 1kHz–15kHz. Please refer to the function code P00.14 for the default carrier frequency. Maximum motor cable length: 50m
	Speed ratio	For AMs: 1: 200 (SVC) For PMSMs: 1: 200 (SVC); 1: 1000 (FVC)
	Speed control accuracy	±0.2% (SVC); ±0.02% (FVC)
	Speed fluctuation	±0.3% (SVC)
	Torque response	≤5ms
	Torque control accuracy	≤5%
	Starting torque	0.25Hz/150% (SVC); 0Hz/200% (FVC)
	Overload capacity	150% of the rated current for 60s 180% of the rated current for 10s 200% of the rated current for 1s
Peripheral interface	Terminal analog input resolution	No more than 20mV
	Terminal digital input resolution	No more than 2ms
	Analog input	2 channels AI1: 10–10V/0–20mA; AI2: -10–10V
	Analog output	2 channels AO1: 0–10V/0–20mA; AO2: 0–10V/0–20mA
	Digital input	Four regular inputs. Max. frequency: 1kHz; internal impedance: 3.3kΩ Two high-speed inputs. Max. frequency: 50kHz; supporting quadrature encoder input; with speed measurement function
	Digital output	One high-speed pulse output; max. frequency: 50kHz One DO terminal open collector output

Item		Specifications
	Relay output	Two programmable relay outputs RO1A: NO; RO1B: NC; RO1C: common RO2A: NO; RO2B: NC; RO2C: common Contact capacity: 3A/AC250V, 1A/DC30V
	Extended interfaces	Three extended interfaces: SLOT1, SLOT2, and SLOT3; Supporting PG cards, programmable cards, communication cards, and I/O cards. You should not insert two cards of the same type simultaneously. **Note:** Models of 7R5G and above support simultaneous use of three expansion cards.
Environment requirements and standards	Mounting method	Three methods: Wall mounting, floor mounting, and flange mounting.
	Temperature of running environment	-10–50°C **Note:** Derating is required when the ambient temperature exceeds 40°C.
	Ingress protection (IP) rating	IP20
	Pollution degree	Degree 2
	Cooling method	Forced air cooling
	Certification	CE

2.3 Product ratings

Product model	Constant torque		
	Output power (kW)	Input current (A)	Output current (A)
Single unit			
GD350C-1R5G-4	1.5	5	3.7
GD350C-2R2G-4	2.2	5.8	5
GD350C-004G-4	4	13.5	9.5
GD350C-5R5G-4	5.5	19.5	14
GD350C-7R5G-4	7.5	25	18.5
GD350C-011G-4	11	32	25
GD350C-015G-4	15	40	32
GD350C-018G-4	18.5	45	38
GD350C-022G-4	22	51	45
GD350C-030G-4	30	64	60
GD350C-037G-4	37	80	75
GD350C-045G-4	45	98	92

Product model	Constant torque		
	Output power (kW)	Input current (A)	Output current (A)
GD350C-055G-4	55	128	115
GD350C-075G-4	75	139	150
GD350C-090G-4	90	168	180
GD350C-110G-4	110	201	215
GD350C-132G-4	132	265	260
GD350C-160G-4	160	310	305
GD350C-185G-4	185	345	340
GD350C-200G-4	200	385	380
GD350C-220G-4	220	430	425
GD350C-250G-4	250	460	480
GD350C-280G-4	280	500	530
GD350C-315G-4	315	580	600
GD350C-355G-4	355	625	650
GD350C-400G-4	400	715	720
GD350C-450G-4	450	840	820
GD350C-500G-4	500	890	860
Parallel connection			
GD350C-560G-4	560	1090	1060
GD350C-630G-4	630	1220	1200
GD350C-710G-4	710	1250	1300
GD350C-800G-4	800	1430	1440
GD350C-1000G-4	1000	1780	1720
GD350C-1200G-4	1200	2145	2160
GD350C-1500G-4	1500	2670	2580
GD350C-2000G-4	2000	3560	3440
GD350C-2500G-4	2500	4450	4300
GD350C-3000G-4	3000	5340	5160

2.4 Parallel VFD model

Power (kW)	380V parallel VFD model	
	Power (kW)	Qty
560	280	2
630	315	2
710	355	2
800	400	2
1000	500	2

Power (kW)	380V parallel VFD model	
	Power (kW)	Qty
1200	400	3
1500	500	3
2000	500	4
2500	500	5
3000	500	6

2.5 Product dimensions and weight

Product model	Outline dimensions W×H×D (mm)	Packaging outline dimensions W×H×D (mm)	Standard weight (kg)	Gross weight (kg)
Single unit				
GD350C-1R5G-4	126×186×185	290×210×265	2	3
GD350C-2R2G-4				
GD350C-004G-4	126×186×201		2.5	3.5
GD350C-5R5G-4				
GD350C-7R5G-4	146×256×192	343×230×270	3	4
GD350C-011G-4	170×320×220	430×275×325	6	7
GD350C-015G-4				
GD350C-018G-4	200×340.6×208	490×315×315	8.5	10.5
GD350C-022G-4				
GD350C-030G-4	250×400×223	580×395×360	16	17
GD350C-037G-4				
GD350C-045G-4	282×560×258	680×425×380	24	27
GD350C-055G-4				
GD350C-075G-4				
GD350C-090G-4	338×554×330	675×470×575	41	52
GD350C-110G-4				
GD350C-132G-4	500×872×360	971×631×565	85	110
GD350C-160G-4				
GD350C-185G-4				
GD350C-200G-4				
GD350C-220G-4	680×960×380	1086×826×595	135	165
GD350C-250G-4				
GD350C-280G-4				
GD350C-315G-4				
GD350C-355G-4	620×1700×560	1850×840×820	350	407
GD350C-400G-4				

Product model	Outline dimensions W×H×D (mm)	Packaging outline dimensions W×H×D (mm)	Standard weight (kg)	Gross weight (kg)
GD350C-450G-4				
GD350C-500G-4				
Parallel connection				
GD350C-560G-4	1447×1419.9×442.5	845×605×1625	432	492
GD350C-630G-4			462	522
GD350C-710G-4	1323×1900×636.3	855×795×2130	814	928
GD350C-800G-4				
GD350C-1000G-4			820	934
GD350C-1200G-4	1956×1900×636.3		1221	1392
GD350C-1500G-4			1230	1401
GD350C-2000G-4	2589×1900×636.3		1640	1868
GD350C-2500G-4	3222×1900×636.3	855×795×2130	2050	2335
GD350C-3000G-4	3855×1900×636.3		2460	2802

2.6 Product heat dissipation

Product model	Entire machine full load power dissipation (W)	Entire machine standby power dissipation (W)	Heat dissipation (BTU/hr)	Air rate (m^3/h)	Air rate (CFM) (ft^3/min)
Single unit					
GD350C-1R5G-4	77	12	262.7	10.8	6.3
GD350C-2R2G-4	95		324.1		
GD350C-004G-4	164.9		562.6	53.3	31.4
GD350C-5R5G-4	263.3		898.4		
GD350C-7R5G-4	337.4		1151.2	90.2	53.1
GD350C-011G-4	384.3	14	1311.2	100.8	59.3
GD350C-015G-4	436		1487.6	105.5	62.1
GD350C-018G-4	525		1791.3	131.5	77.4
GD350C-022G-4	544		1856.1	176.2	103.7
GD350C-030G-4	848		2893.4		
GD350C-037G-4	968	25.0	3302.8	251.0	147.7
GD350C-045G-4	1220.4	53.5	4163.9	272.94	160.66
GD350C-055G-4	1592.6		5434.1		
GD350C-075G-4	1674.4		5713.1		
GD350C-090G-4	1849	48	6308.8	383.5	225.7
GD350C-110G-4	2181		7441.6		

Product model	Entire machine full load power dissipation (W)	Entire machine standby power dissipation (W)	Heat dissipation (BTU/hr)	Air rate (m^3/h)	Air rate (CFM) (ft^3/min)
GD350C-132G-4	2465	68	8410.6	606.3	356.9
GD350C-160G-4	2681	73	9147.6		
GD350C-185G-4	2884	100	9840.2		
GD350C-200G-4	3371	115	11501.9		
GD350C-220G-4	4171	140	14231.5	662.5	389.9
GD350C-250G-4	4591	139	15664.5		
GD350C-280G-4	4385	173	14961.6		
GD350C-315G-4	5201	203	17745.8		
GD350C-355G-4	6298	224	21488.8	1180.0	694.5
GD350C-400G-4	6679	257	22788.7		
GD350C-450G-4	7453	254	25429.6		
GD350C-500G-4	7914	264	27002.6		
Parallel connection					
GD350C-560G-4	10665	346	36390	1325	779
GD350C-630G-4	12281	406	41903		
GD350C-710G-4	14734	448	50272	2360	1388
GD350C-800G-4	15456	514	52735		
GD350C-1000G-4	18589	528	63426		
GD350C-1200G-4	23183	771	79102	3540	2082
GD350C-1500G-4	27884	792	95139		
GD350C-2000G-4	37178	1056	126852	4720	2776
GD350C-2500G-4	46473	1320	158565	5900	3471
GD350C-3000G-4	55767	1584	190278	7080	4165

2.7 Structure diagram

Figure 2-1 Product components (taking 380V 030G as an example)

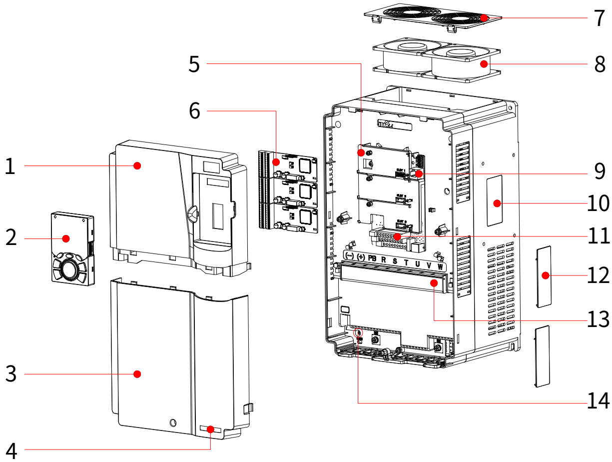


Table 2-1 Component description

No.	Component	Description
1	Upper cover	Used to protect internal components.
2	Keypad	See section 5.3 Operation procedure.
3	Lower cover	Used to protect internal components.
4	Product label	See section 2.1 Product nameplate and model.
5	Baffle of control board	Protects the control board and install extension card.
6	Expansion card	Optional. See Appendix E Expansion card.
7	Fan cover	See section 9.2.1 Cooling fan.
8	Cooling fan	See section 9.2.1 Cooling fan.
9	Keypad interface	Connects the keypad.
10	Nameplate	See section 2.1 Product nameplate and model.
11	Control terminals	See section 4.4.2 Control circuit terminals.
12	Heat dissipation hole cover	Optional. Cover plate can upgrade protection level, however, as it will also increase internal temperature, derated use is required.
13	Main circuit terminals	See section 4.3.2 Main circuit terminals.
14	POWER indicator	Power supply indicator

2.8 System configuration

When using the VFD to drive a motor to form a control system, various electrical devices need to be installed on the input and output sides of the VFD to ensure stable system running.

Figure 2-2 System composition

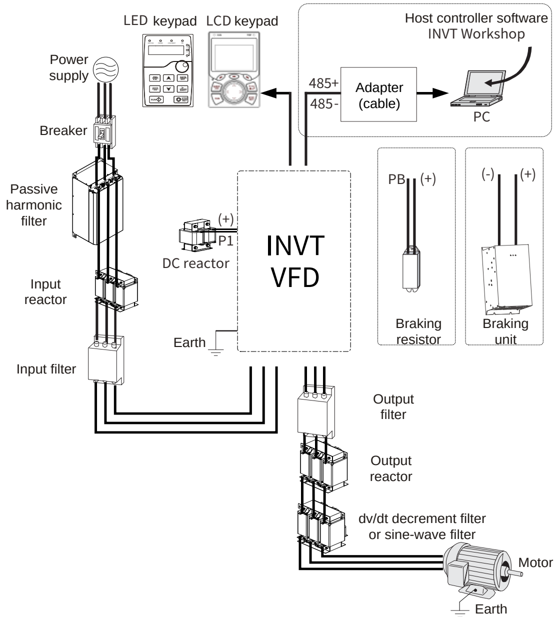
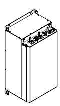
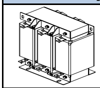
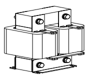
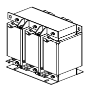
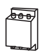
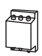
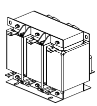
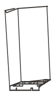
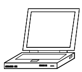


Table 2-2 System configuration

Component		Position value	Description
	Breaker	Between the power supply and the VFD input side	Device for electric shock prevention and protection against short-to-ground that may cause current leakage and fire. Select residual-current circuit breakers (RCCBs) that are applicable to VFDs and can restrict high-order harmonics, and of which the rated sensitive current for one VFD is larger than 30mA.
	Passive harmonic filters	On the VFD input side	Device used to reduce the current distortion rate and harmonic content, thereby improving the power factor.

<table>
<tr><th colspan="2">Component</th><th>Position value</th><th>Description</th></tr>
<tr><td></td><td>Input Reactor</td><td>On the VFD input side</td><td rowspan="2">Accessories used to improve the power factor on the input side of the VFD, and thus restrict high-order harmonic currents.
● DC reactor: Built-in part for 380V 018G–110G VFD models; optional part for 380V 132G and higher models. P1 and (+) have been short connected by default for the 380V 132kW and higher VFD models. If you need to connect to an external DC reactor, take off the short-contact tag of P1 and (+).
● AC input reactor: Built-in part for 380V 355G and higher models.</td></tr>
<tr><td></td><td>DC reactor</td><td>Between VFD terminals P1 and (+)</td></tr>
<tr><td></td><td>Output reactor</td><td>Between the VFD output side and the motor, and installed near the VFD.</td><td>(Optional) Accessory used to lengthen the valid transmission distance of the VFD, which effectively restricts the transient high voltage generated during the switch-on and switch-off of the IGBT module of the VFD.</td></tr>
<tr><td></td><td>Input filter</td><td>On the VFD input side</td><td rowspan="2">(Optional) Input filter: Accessory that restricts the electromagnetic interference generated by the VFD and transmitted to the public grid through the power cable. Try to install the input filter near the input terminal side of the VFD.
(Optional) Output filter: Accessory used to restrict interference generated in the wiring area on the output side of the VFD.
All 380V VFD models can meet the conductive emission requirements of IEC/EN 61800-3 C3 electrical drive systems.
Optional external filters can be used to meet the conductive emission requirements of IEC/EN 61800-3 C2 electrical drive systems.
Note: For the assembly of motors, motor cables and filters, observe the technical requirements specified in the appendix of the manual.</td></tr>
<tr><td></td><td>Output filter</td><td>Try to install the output filter near the output terminal side of the VFD.</td></tr>
<tr><td></td><td>dv/dt decrement filters</td><td>Between the VFD output side and the motor, adjacent to the</td><td>Device used to suppress voltage spikes, reduce traveling waves in long cables, and reflect dv/dt transient voltages, thereby reducing motor eddy current losses and noise, and providing motor</td></tr>
</table>

Component		Position value	Description
		motor	insulation protection.
	Sine filters	Between the VFD output side and the motor, adjacent to the motor	Device used to suppress and absorb high-order harmonic currents derived from switching frequency ripple currents, correcting the waveform to approximate a sine wave, significantly extending the length of the output cable, reducing motor eddy current losses and noise, and protecting motor insulation.
	Braking unit	Between the VFD main circuit terminals (+) and (-)	Accessories used to consume the regenerative energy of the motor to reduce the DEC time. ● Models of 380V 037G and lower include a built-in braking unit. Models from 380V 045G to 110G can optionally include a built-in braking unit. Models of 380V 132G and above can optionally include an external braking unit. ● Braking resistor: Externally-connected option for all models
	Braking resistor	Between the VFD main circuit terminals (+) and PB	
	Upper computer Software	Installed in the host controller which controls the VFD	INVT Workshop software is used to configure and monitor the VFD. Its main functions include: ● Monitor multiple VFDs ● Set and monitor function code parameters, and upload and download parameters in batch ● View the modified function codes, compare the default values, follow function codes, and search function coeds ● View and follow state parameters ● View the real-time faults and historical faults ● Display function codes in configuration mode ● Control the start/stop and forward/reverse running of the device ● View oscilloscope curve, save and playback waveform data, operate the waveform by cursor, and simulate waveform data. You can visit our official website at www.invt.com to download the software for free.

For details about optional part model selection, see Appendix D Peripheral accessories.

2.9 Quick startup

Task	Reference
1. Unpacking inspection	See section 3.1 Unpacking inspection.
2. Check that the load and power supply connected to the inverter are proper.	See section 2.1 Product nameplate and model.
3. Check the installation environment.	See section 3.2 Preparing.
4. Install the VFD on the wall/in the cabinet.	See section 3.3 Mounting method.
5. Wiring	See section 4 Electrical installation.
6. Commission the VFD.	See section 6 Commissioning.

3 Mechanical installation

3.1 Unpacking inspection

After receiving the product, perform the following steps to ensure the product use safety.

- **Check the package**

  Before unpacking, check whether the product package is intact–whether the package is damaged, dampened, soaked, or deformed. After unpacking, check whether the interior surface of the packing box is abnormal, for example, in wet condition.

- **Check the machine and parts**

  After unpacking, check whether the equipment enclosure is damaged or cracked, whether the parts (including the VFD, keypad, and manual) inside the packing box are complete, and whether the nameplate and label on the product body are consistent with the model ordered.

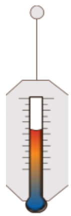
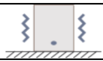
3.2 Preparing

Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Read the following installation preparation carefully before installation to ensure smooth installation and avoid personal injury or equipment damage.

Warning	
	● Carry out operations according to instructions presented in section 1.4 Safety guidelines. Ensure the VFD power has been disconnected before installation. If the VFD has been powered on, disconnect the VFD and wait for at least the time designated on the VFD, and ensure the POWER indicator is off. You are recommended to use a multimeter to check and ensure the VFD DC bus voltage is below 36V. ● The VFD installation must be designed and done according to applicable local laws and regulations. INVT does not assume any liability whatsoever for any VFD installation which breaches local laws or regulations.

3.2.1 Installation environment and site

■ **Environment requirements**

Environment	Requirement	
Temperature		● -10–+50°C ● Do not use the VFD when the ambient temperature exceeds 50°C. When the ambient temperature exceeds 40°C, derate 1% for every increase of 1°C. ● The temperature does not change rapidly. ● When the VFD is installed in a closed space, such as control cabinet, use a cooling fan or air conditioner for temperature adjustment if necessary. ● When the temperature is too low, if you want to use the VFD that has been idled for a long time, install an external heating device before the use to eliminate the freeze inside the VFD. Otherwise, the VFD may be damaged.
Relative humidity (RH)		● RH: less than 90%, no condensation ● The max. RH cannot exceed 60% in the environment with corrosive gases.
Altitude		● Lower than 1000m ● When the altitude exceeds 1000m, derate by 1% for every increase of 100m. ● When the altitude exceeds 3000m, consult our local dealer or office for details.
Vibration		Max. vibration ACC: 5.8m/s² (0.6g)

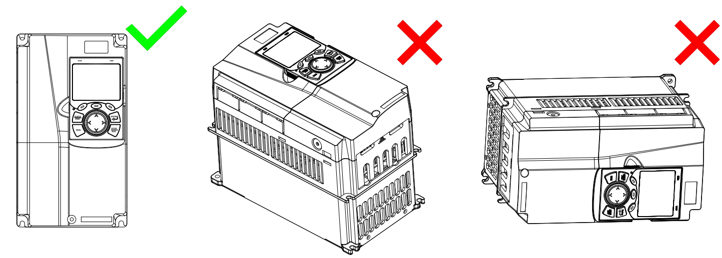
■ **Site requirement**

Site	Requirement	
Indoor		Without electromagnetic radiation sources and direct sunlight. **Note:** The VFD must be installed in a clean and well-ventilated environment based on the housing IP rating.
		Without foreign objects such as oil mist, metal powder, conductive dust, and water.
		Without radioactive, corrosive, hazard, and combustible and explosive substances. **Note:** Do not install the VFD onto combustible objects.
		With low salt content.

3.2.2 Installation direction

The VFD can be installed on the wall or in a cabinet. Vertical installation is a must. Do not install the VFD in other directions such as horizontal, transverse or upside-down.

Figure 3-1 Mounting direction



Vertical installation   Horizontal installation   Transverse installation

3.2.3 Installation space

3.2.3.1 Single VFD

Figure 3-2 Installation space diagram of single VFD

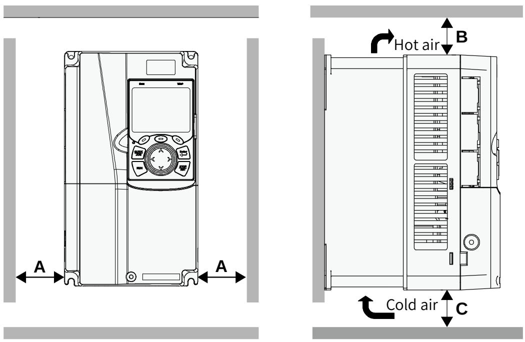


Table 3-1 Installation space dimensions of single inverter

VFD model	Dimensions (mm)		
	A	B	C
1R5G–200G	⩾100	⩾100	⩾100
220G–500G	⩾100	⩾100	0

3.2.3.2 Multiple VFDs

- **Parallel installation**

When installing multiple VFDs, it is recommended to install them in parallel. When you install VFDs in different sizes, align the top of each VFD before installation for the convenience of future maintenance.

Figure 3-3 Installation space diagram of multiple VFDs

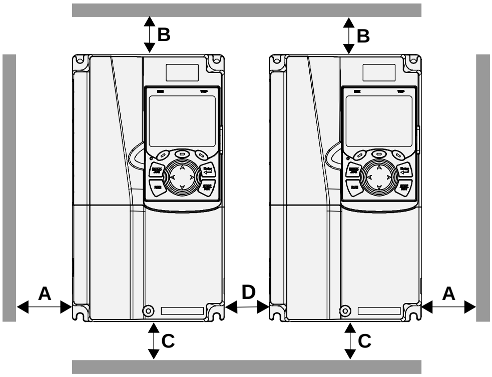
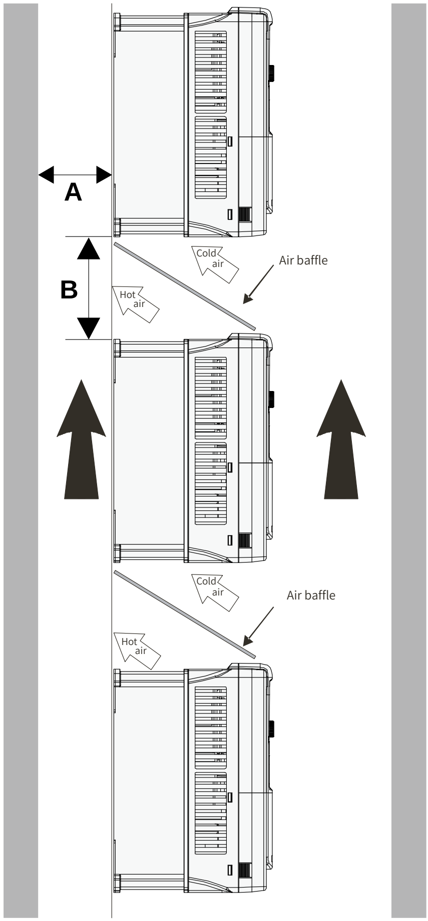


Table 3-2 Installation space dimensions of multiple VFDs

VFD model	Dimensions (mm)			
	A	B	C	D
1R5G–200G	⩾100	⩾100	⩾100	⩾100
220G–500G	⩾100	⩾100	0	⩾100

■ **Vertical installation**

Figure 3-4 Vertical installation space

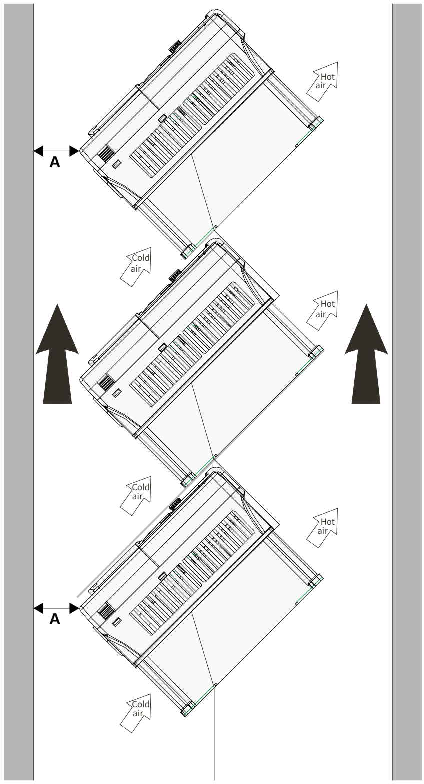


Note:

- During vertical installation, you must install windshield, otherwise, the VFD will experience mutual interference, and the heat dissipation effect will be degraded.
- The minimum spaces of A and B are ⩾*50n*. n is the number of machines, and n must be greater than 1.
- Vertical installation is applicable to 1R5G–315G VFD models.

■ **Tilted installation**

Figure 3-5 Tilted installation space



Note:

- During tilted installation, it is a must to ensure the air inlet duct and air outlet duct are separated from each other to avoid mutual interference.
- The minimum space of A is *⩾50n*. n is the number of machines, and n must be greater than 1.
- Tilted installation is applicable to 1R5G–315G VFD models.

3.3 Mounting method

The installation method of the VFD varies with the outline dimensions. Based on the specific model and application environment, select the appropriate installation method according to the following table. (√ means you can choose this installation method.)

Table 3-3 Installation method selection

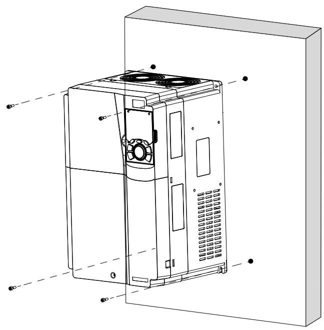
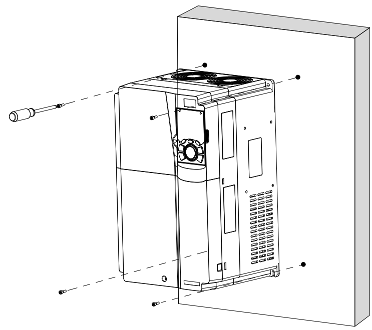
Rated voltage (V)	Model	Mounting method		
		Wall mounting	Flange mounting	Floor mounting
380V	1R5G–075G	√	√	-
	090G–110G	√	√	-
	132G–200G	√	√	-
	220G–315G	√	-	√
	355G–500G	-	-	√

Note:

- When the flange mounting method is used, the (optional part) flange mounting plate is required for the 380V 1R5G–110G VFD models but not required for the 132G–200G VFD models.
- The 380V 220G–315G VFD models support the (optional part) installation base, which can house an input AC reactor (or DC reactor) and an output AC reactor.

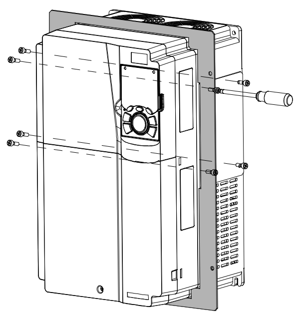
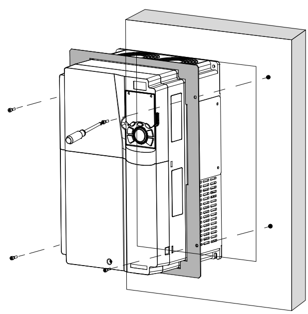
3.3.1 Wall mounting

The mounting procedures are as follows:

Step 1 Mark the installation hole positions. Mount the screws or bolts onto the designated positions. For details about the installation hole positions, see section C.2 VFD overall dimensions.	Step 2 Fix the VFD on the wall or mounting plate, and tighten the screws on the wall or mounting plate.
	

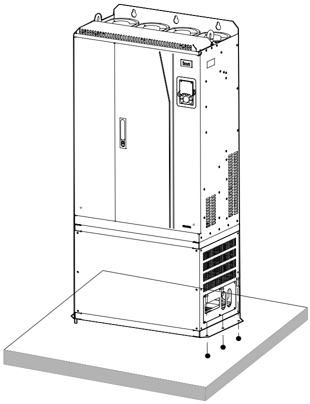
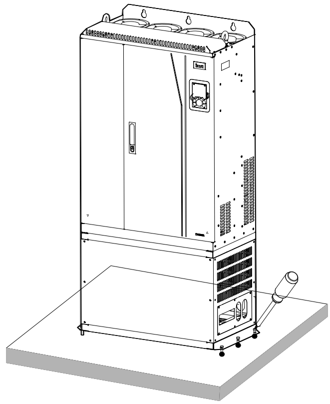
3.3.2 Flange mounting

The mounting procedures are as follows:

Step 1 Fix the bracket on both sides of the VFD body, and tighten the screws on both sides of the bracket.	Step 2 Fix the VFD with bracket on the control cabinet, and tighten the screws on the front of the bracket.
	

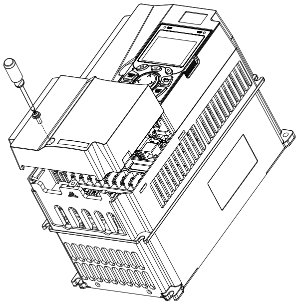
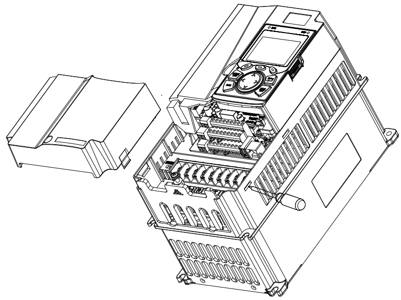
3.3.3 Floor mounting

The mounting procedures are as follows:

Step 1 Mark the installation hole positions. Mount the screws or bolts onto the designated positions. For details about the installation hole positions, see section C.2 VFD overall dimensions. 	Step 2 Fix the VFD on the floor or mounting plate, and tighten the screws on the floor or mounting plate. 

3.4 Remove the lower cover

Remove the lower cover of the VFD to perform the wiring of main circuit and control circuit. The removal steps are as follows.

Step 1 Use a tool to loosen the screw on the lower cover and take it out. 	Step 2 Use a tool to pry up the snaps on both sides of the lower cover. Lift up the bottom of the lower cover gently and take out the lower cover. 

4 Electrical installation

4.1 Insulation inspection

Do not perform any voltage endurance or insulation resistance tests, such as high-voltage insulation tests or using a megameter to measure the insulation resistance, on the VFD or its components. Insulation and voltage endurance tests have been performed between the main circuit and chassis of each VFD before delivery. In addition, voltage limiting circuits that can automatically cut off the test voltage are configured inside the VFDs. If you need to conduct insulation resistance testing on the VFD, please contact us.

Note: Remove the cable connection terminals from the VFD, then perform the insulation resistance test on the input and output power cables.

- **Input power cable**

Check the insulation conditions of the input power cable of a VFD according to the local regulations before connecting it.

- **Motor cable**

Ensure that the motor cable is connected to the motor, and then remove the motor cable from the U, V, and W output terminals of the VFD. Use a megohmmeter of 500V DC to measure the insulation resistance between each phase conductor and the protection grounding conductor. For details about the insulation resistance of the motor, see the description provided by the manufacturer.

Note: If the motor interior is damp, the insulation resistance will decrease. If you suspect the inside of motor is moist, dry and re-measure the motor.

4.2 Cable selection and routing

4.2.1 Cable selection

- **Power cable**

Power cables mainly include input power cables and motor cables. To meet the EMC requirements stipulated in the CE standards, it is recommended to use symmetrical shielded cables as motor cables and input power cables. See section D.1.1 Power cable.

Note: If the electrical conductivity of the motor cable shield layer does not meet the requirements, a separate PE conductor must be used.

- **Control cable**

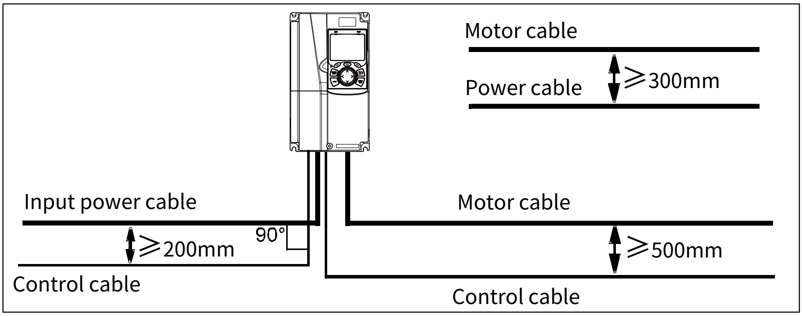
Control cables mainly include analog signal control cables and digital signal control cables. Analog signal control cables use twisted double shielded cables with a separate shielded twisted pair for each signal and different ground wires for different analog signals. For digital signal control cables, a double-shielded cable is preferred, but single-shielded or unshielded twisted pairs can also be used. See section D.1.2 Control cable.

4.2.2 Cable arrangement

Motor cables must be arranged away from other cables. The dU/dt of the VFD output may increase electromagnetic interference on other cables. The motor cables of several VFDs can be arranged in parallel. It is recommended that you arrange the motor cables, input power cables, and control cables separately in different trays.

If a control cable and power cable must cross each other, ensure that the angle between them is 90°. The cable trays must be connected properly and well grounded. The cable trays must be connected properly and well grounded. Cable routing and routing distance are shown in Figure 4-1.

Figure 4-1 Cable routing distance



4.3 Main circuit wiring

4.3.1 Main circuit wiring diagrams

Figure 4-2 Main circuit wiring diagram

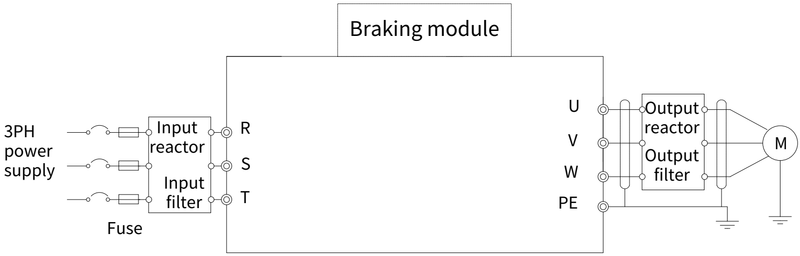
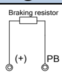
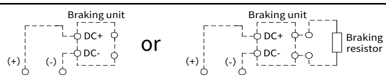
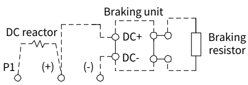


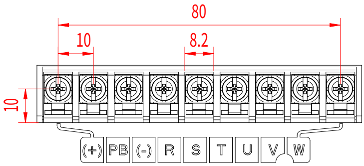
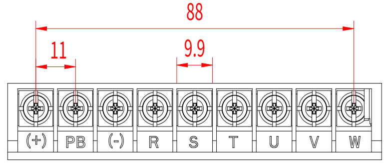
Table 4-1 Braking module power range

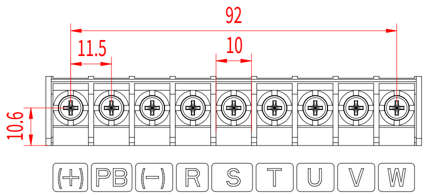
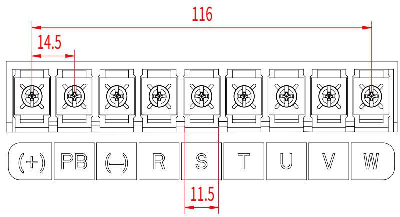
Braking module	Applicable power range
	380V 037G and below
	380V 045G–110G (inclusive)
	380V 132G and above

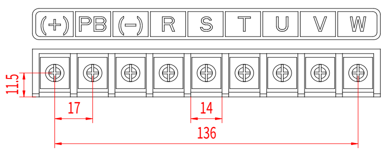
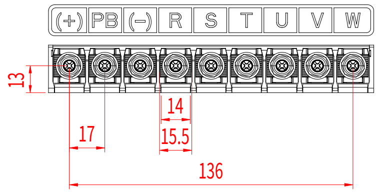
Note:

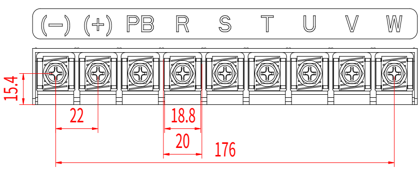
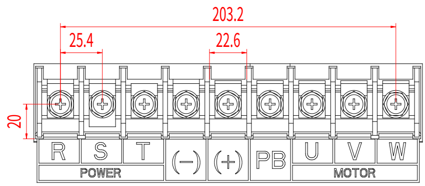
- The fuse, DC reactor, braking unit, braking resistor, input reactor, input filter, output reactor and output filter are optional parts. For details, see Appendix D Peripheral accessories.
- P1 and (+) have been short connected by default for the 380V 132G and above VFD models. If you need to connect to an external DC reactor, take off the short-contact tag of P1 and (+).
- Before connecting the braking resistor, remove the yellow warning labels marked with PB, (+), or (-) from the terminal block; otherwise, poor contact may occur.
- Built-in braking unit is optional for the 380V 045G–110G (inclusive) VFD models.
- For main circuit wiring diagram of parallel VFDs, see the manual for Goodrive series VFDs in parallel connection.

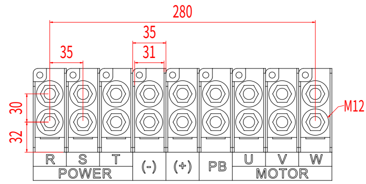
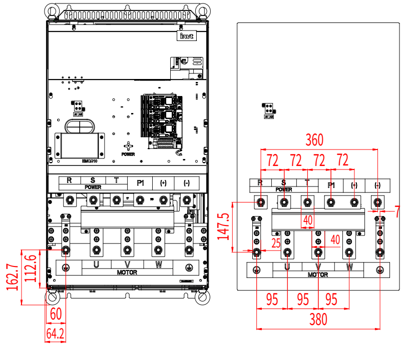
4.3.2 Main circuit terminals

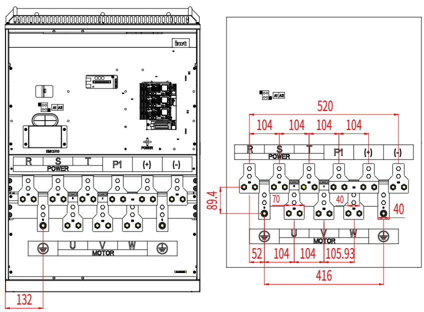
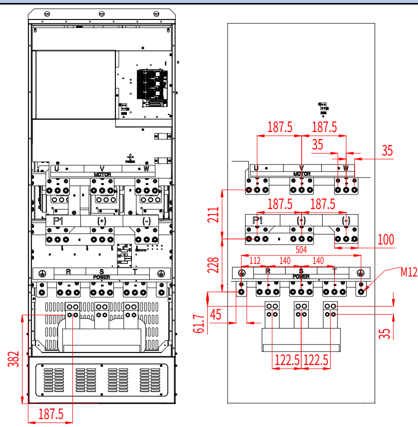
<table>
<tr><th>Main circuit terminals for the 380V 1R5G–2R2G models</th><th>Main circuit terminals for the 380V 004G–5R5G models</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

<table>
<tr><th>Main circuit terminals for the 380V 7R5G model</th><th>Main circuit terminals for the 380V 011G–015G models</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

<table>
<tr><th>Main circuit terminals for the 380V 018G model</th><th>Main circuit terminals for the 380V 022G model</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

<table>
<tr><th>Main circuit terminals for the 380V 030G–037G models</th><th>Main circuit terminals for the 380V 045G–075G models
(PB is valid when a braking unit is embedded)</th></tr>
<tr><td>
</td><td>
</td></tr>
</table>

Main circuit terminals for the 380V 090G–110G models (PB is valid when a braking unit is embedded)	Main circuit terminals for the 380V 132G–200G models (A1, A2)
	

Main circuit terminals for the 380V 220G–315G models (A1, A2)	Main circuit terminals for the 380V 355G–500G models (A1, A2)
	

Terminal symbol	Terminal name			Function description
	037G and below	045G–110G (inclusive)	132G and above	
R, S, T	Main circuit power input			3PH AC input terminals, connected to the grid
U, V, W	VFD outputs			3PH AC output terminals, connected to the motor usually
P1	Not available	Not available	DC reactor terminal 1	P1 and (+) connect to the external DC reactor. (+) and (-) connect to the external braking unit. PB and (+) connect to external braking resistor terminal
(+)	Braking resistor terminal 1	Braking unit terminal 1, brake resistor terminal 1	DC reactor terminal 2, Braking unit terminal 1	
(-)	Not available	Braking unit terminal 2		
PB	Braking resistor terminal 2	Braking resistor terminal 2	Not available	
PE	Grounding terminal for safe protection			Grounding terminal for safe protection; each machine must carry two PE terminals and proper grounding is required
A1, A2	Not available		220V control power supply terminal	External 220V control power terminals

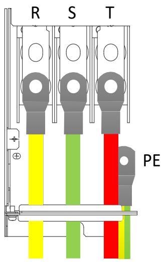
Note:

- It is not recommended to use asymmetrical motor cables. If there is a symmetrical grounding conductor in the motor cable besides the conductive shielded layer, ground the grounding conductor on the inverter end and motor end.
- Braking resistor, braking unit and DC reactor are optional parts.
- "Not available" means this terminal is not for external connection.
- GD series VFDs cannot share the DC bus with other series VFDs.
- When sharing the DC bus, the VFDs must be the same in power and must be simultaneously powered on or off.
- In shared DC bus running mode, current balance on the VFD input side must be considered during wiring, and equalizing reactors are recommended to be configured.

4.3.3 Wiring procedure

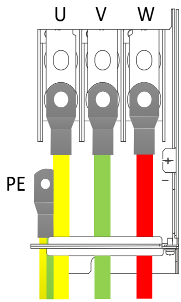
Step 1 Connect the grounding line of the input power cable to the grounding terminal (PE) of the VFD, and connect the 3PH input cable to R, S and T terminals and tighten up.

Figure 4-3 Wiring diagram of input power cables



Step 2 Connect the ground wire of the motor cable to the PE terminal of the VFD, connect the motor 3PH cable to the U, V and W terminals, and tighten up.

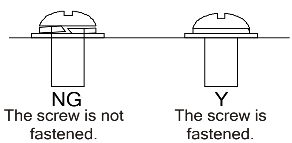
Figure 4-4 Wiring diagram of motor cables



Step 3 Connect optional parts such as the braking resistor that carries cables to designated positions. For details, see section 4.3.1 Main circuit wiring diagrams.

Step 4 Fasten all the cables outside the VFD mechanically if allowed.

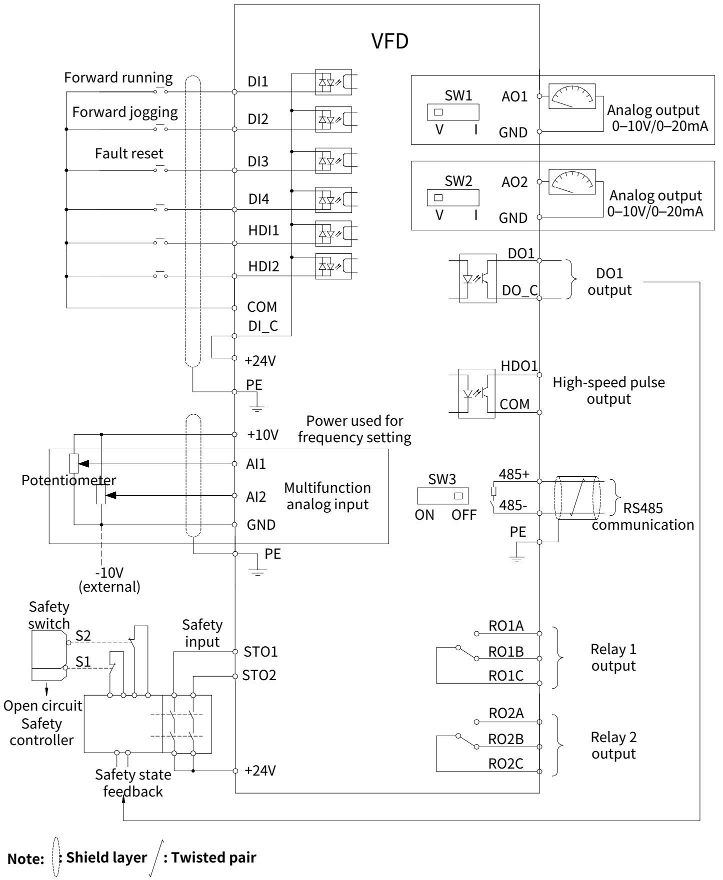
Figure 4-5 Screw installation diagram



4.4 Control circuit wiring

4.4.1 Control circuit wiring diagram

Figure 4-6 Control circuit wiring



Note:

- The sampling line of the potentiometer (the wire in the middle of the resistor) must not be connected to 10V or GND. It must be wired exactly as shown in Figure 4-6. Otherwise, adjusting the potentiometer may cause a short circuit to 10V, and a long time of short circuit could damage the control board.
- If wire-passing board outlet space is insufficient when all terminals on the control

board are wired, cut the knock-out hole on the lower cover for wire outlet. If a dangerous situation occurs when the knock-out hole is cut for a purpose but not wire outlet, we will not bear any responsibility.

- For details about the control circuit wiring diagram of parallel VFDs, see the manual for Goodrive series VFDs in parallel connection.

4.4.2 Control circuit terminals

Figure 4-7 Control circuit terminals for the 5R5G and below VFD models

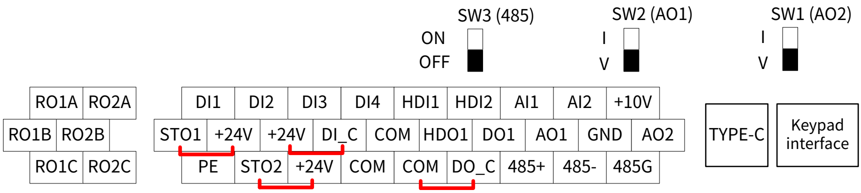
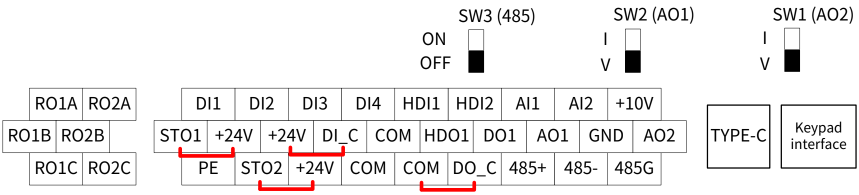


Figure 4-8 Control circuit terminals for the 7R5G and above VFD models



<table>
<tr><th>Terminal name</th><th>Specifications</th></tr>
<tr><td>+10V</td><td>Used to externally provide 10.5V±3% reference power supply, max. output current: 50mA.
Typically used as an external potentiometer to adjust the power supply, with a potentiometer resistance of 5kΩ or above.</td></tr>
<tr><td>AI1</td><td rowspan="2">Input range: AI1: 0–10V/0–20mA; AI2: -10V–+10V
Whether voltage or current is used for input of AI1 is set through P05.50.
Input impedance: 20kΩ for voltage input or 250Ω for current input
Resolution: 5mV when 10V corresponds to 50Hz
Deviation: ±0.5% at 25°C, when input is above 5V/10mA</td></tr>
<tr><td>AI2</td></tr>
<tr><td>GND</td><td>+10V reference ground</td></tr>
<tr><td>AO1</td><td rowspan="2">Output range: 0–10V, 0–20mA
Whether voltage or current is used for output is set through the DIP switch SW2
Deviation: ±0.5% when output exceeds 5V or 10mA at 25°C</td></tr>
<tr><td>AO2</td></tr>
</table>

<table>
<tr><th>Terminal name</th><th colspan="2">Specifications</th></tr>
<tr><td>RO1A</td><td colspan="2" rowspan="3">RO1 output; RO1A: NO; RO1B: NC; RO1C: common
Contact capacity: 3A/AC250V, 1A/DC30V</td></tr>
<tr><td>RO1B</td></tr>
<tr><td>RO1C</td></tr>
<tr><td>RO2A</td><td colspan="2" rowspan="3">RO2 output; RO2A: NO; RO2B: NC; RO2C: common
Contact capacity: 3A/AC 250V, 1A/DC 30V</td></tr>
<tr><td>RO2B</td></tr>
<tr><td>RO2C</td></tr>
<tr><td>HDO1</td><td colspan="2">Switch capacity: 50mA/30V
Output frequency range: 0–50kHz
Duty ratio: 50%</td></tr>
<tr><td>COM</td><td colspan="2">+24V reference ground</td></tr>
<tr><td>DO_C</td><td colspan="2">Common terminal of open collector output; short connected to COM by default</td></tr>
<tr><td>DO1</td><td colspan="2">Switch capacity: 50mA/30V
Output frequency range: 0–1kHz</td></tr>
<tr><td>485+</td><td colspan="2" rowspan="2">RS485 differential signal communication port. The standard 485 communication interface should use shielded twisted pair; 120Ω terminal matching resistor of 485 communication is connected by the switch SW3.</td></tr>
<tr><td>485-</td></tr>
<tr><td>PE</td><td colspan="2">Grounding terminal</td></tr>
<tr><td>DI_C</td><td colspan="2">External input terminal for digital input circuits
Voltage range: 12–30V</td></tr>
<tr><td>+24V</td><td colspan="2">User power supply provided by the VFD. Max. output current: 200mA</td></tr>
<tr><td>DI1</td><td colspan="2" rowspan="4">Digital input terminals 1–4
Internal impedance: 3.3kΩ
12–30V voltage input is acceptable
Bi-direction input terminals, supporting both NPN and PNP
Max. input frequency: 1kHz
All are programmable digital input terminals, the functions of which can be set through function codes</td></tr>
<tr><td>DI2</td></tr>
<tr><td>DI3</td></tr>
<tr><td>DI4</td></tr>
<tr><td>HDIA</td><td colspan="2" rowspan="2">Channels for both high frequency pulse input and digital input
Max. input frequency: 50kHz
Duty ratio: 30%–70%
Supports the input of a quadrature encoder with 24V power supply; equipped with speed-measurement function</td></tr>
<tr><td>HDIB</td></tr>
<tr><td>+24V—STO1</td><td>STO input 1</td><td rowspan="2">Safe torque off (STO) redundant input, connected to the external NC contact. When the contact opens, STO acts and the VFD stops output.
● Safety input signal wires use shielded wires whose length</td></tr>
<tr><td>+24V—STO 2</td><td>STO input 2</td></tr>
</table>

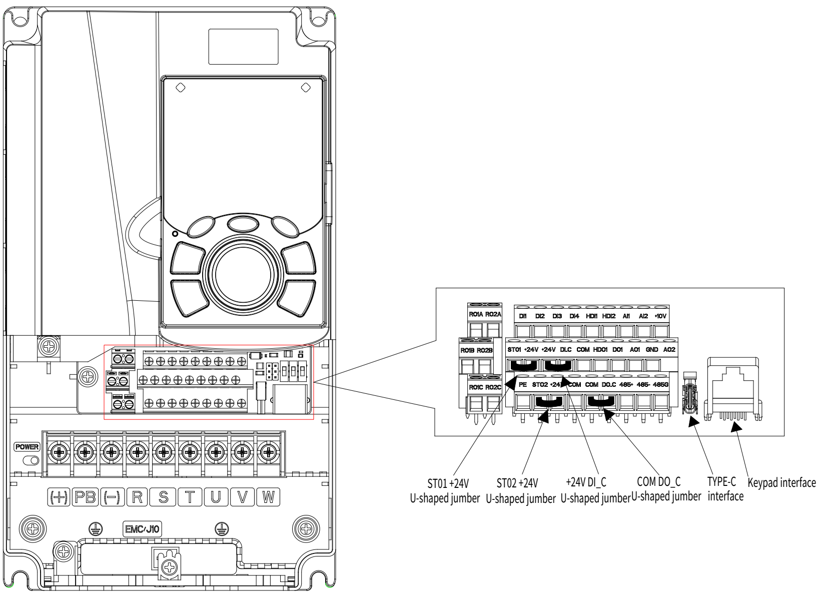
Terminal name	Specifications	
		is within 25m. ● The STO1 and STO2 terminals are short connected to +24V by default. Remove the short connectors from the terminals before using STO function.

4.4.3 Input/output signal connection diagram

4.4.3.1 Input signal connection diagram

You can select the NPN/PNP mode and the internal/external power through the U-shaped jumper. The NPN internal mode is adopted by default. There are two ways to set the U-shaped jumper based on the input signal:

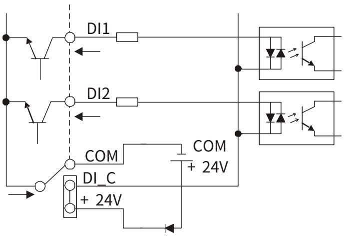
Figure 4-9 U-shaped jumper positions



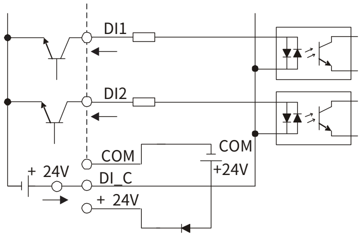
Note: As shown in the figure above, the USB port can be used to upgrade the software, and the keypad port can be used to connect an external keypad. The external keypad cannot be used when the local VFD keypad is used.

Method 1: If the input signal comes from the NPN transistor, set the U-shaped jumper between +24V and DI_C based on the power used according to the following figure.

Figure 4-10 NPN mode



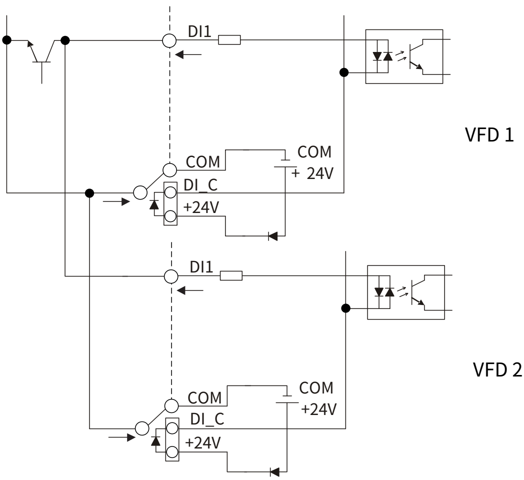
Internal power (NPN mode)



External power (NPN mode)

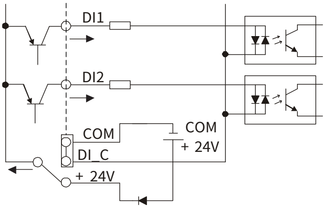
Note: When using internal power supply in Method 1, the DI terminals of different VFDs must not be connected in parallel; otherwise, it may cause erroneous operation of the DI terminals. If DI terminals need to be connected in parallel (between different VFDs), a diode must be connected in series between 24V and DI_C (anode connected to 24V). The diode must meet the following specifications: IF > 40mA, VR > 40V, as shown in Figure 4-11.

Figure 4-11 Wiring method for parallel connection of DI terminals of multiple VFDs (internal power supply NPN mode)

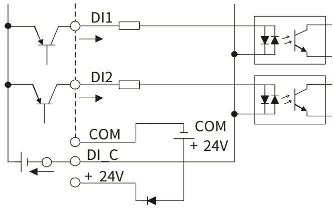


Method 2: If the input signal comes from the PNP transistor, set the U-shaped jumper between COM and DI_C based on the power used according to the following figure.

Figure 4-12 PNP mode



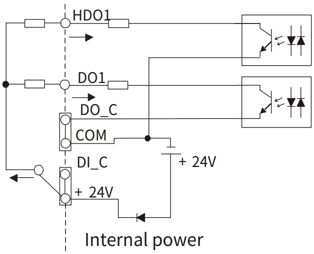
Internal power (PNP mode)



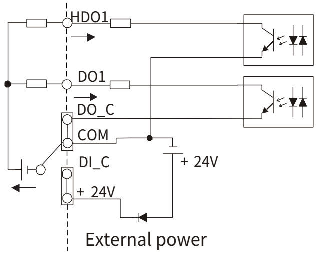
External power (PNP mode)

4.4.3.2 Output signal connection diagram

Figure 4-13 Wiring for DI1 and HDO1 terminals



Internal power



External power

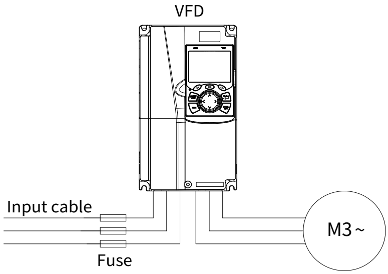
4.5 Power distribution protection

⚠	Do not connect any power source to the VFD output terminals U, V and W. The voltage applied to the motor cable may cause permanent damage to the VFD.

■ **Power cable and inverter protection**

In case of short circuit, the fuse protects input power cables to avoid damage to the VFD; if internal short circuit occurs to the VFD, it can protect neighboring equipment from being damaged. The wiring diagram is as follows.

Figure 4-14 Fuse configuration



Note: Select the fuse according to section D.2 Breaker and electromagnetic contactor.

- **Motor and motor cable short-circuit protection**

If the motor cable is selected based on VFD rated current, the VFD is able to protect the motor cable and motor without other protective devices during short circuit.

Note: If the VFD is connected to multiple motors, use a separated thermal overload switch or breaker to protect the cable and motor, which may require the fuse to cut off the short circuit current.

- **Motor thermal overload protection**

Once overload is detected, the power supply must be cut off. The inverter is equipped with the motor thermal overload protection function, which can block output and cut off the current (if necessary) to protect the motor.

- **Bypass connection protection**

In some critical scenarios, the power/variable frequency conversion circuit needs to be configured to ensure proper operation of the system when a fault occurs to the VFD.

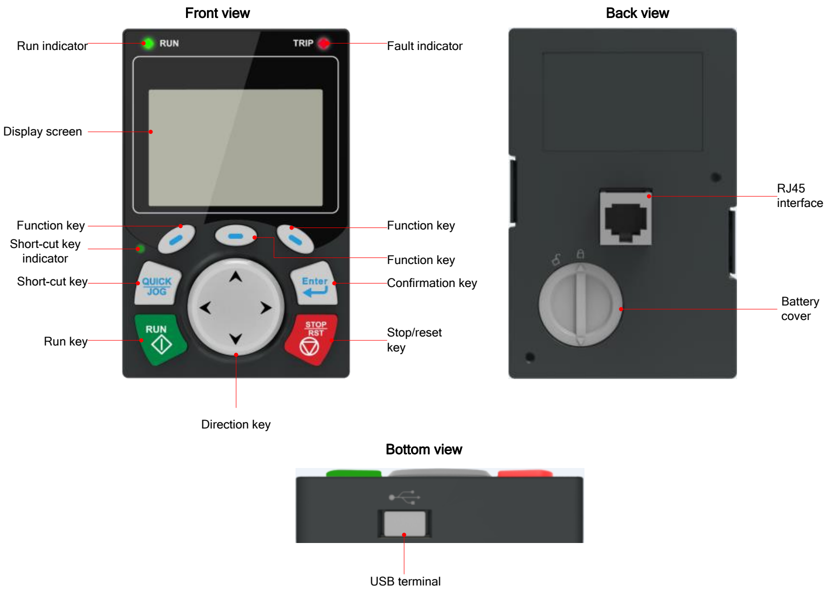
In some special scenarios, such as in soft startup, power-frequency running is directly performed after the startup, which requires bypass connection.

If VFD status needs to be switched frequently, you can use the switch which carries mechanical interlock or a contactor to ensure motor terminals are not connected to input power cables and VFD output ends simultaneously.

5 Keypad operation guidelines

5.1 Keypad panel display

The VFD has been equipped with a LCD keypad as a standard configuration part, through which various functions can be realized, such as: controlling the start and stop, reading status data, setting parameters, and copying parameters of the VFD.



Note:

- The keypad is equipped with a real-time clock, which can run properly after being installed with batteries even if the power line is disconnected. The clock battery (model number: CR2032) is user purchased.
- If the keypad needs to be extended, use a standard RJ45 crystal head network cable as the keypad extension cable, and mount the keypad on the front door panel of the cabinet using M3 screws or the optional keypad bracket.

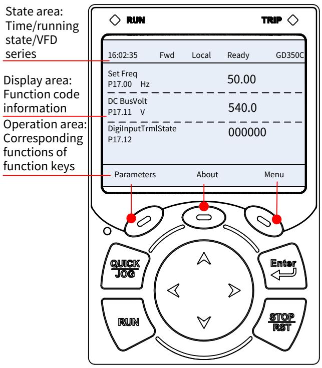
5.1.1 Indicator

Indicator	State	Meaning
RUN	◆ ON	The VFD is running.
	◆◇ Blink	The VFD is in parameter autotuning.
	◇ Off	The VFD is stopped

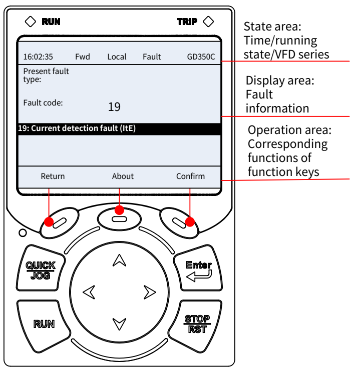
Indicator	State	Meaning
TRIP	ON	The VFD is in fault state.
	Blink	The VFD is in pre-alarm state.
	Off	The VFD is in normal state.
QUICK/JOG	ON	The displayed state varies depending on the short-cut key function. For details, see the definition of QUICK/JOG.
	Blink	
	Off	

5.1.2 Display screen

The display shows different content depending on the operating scenario.

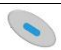


Example of parameters displayed in stopped state



Example of parameters displayed in fault state

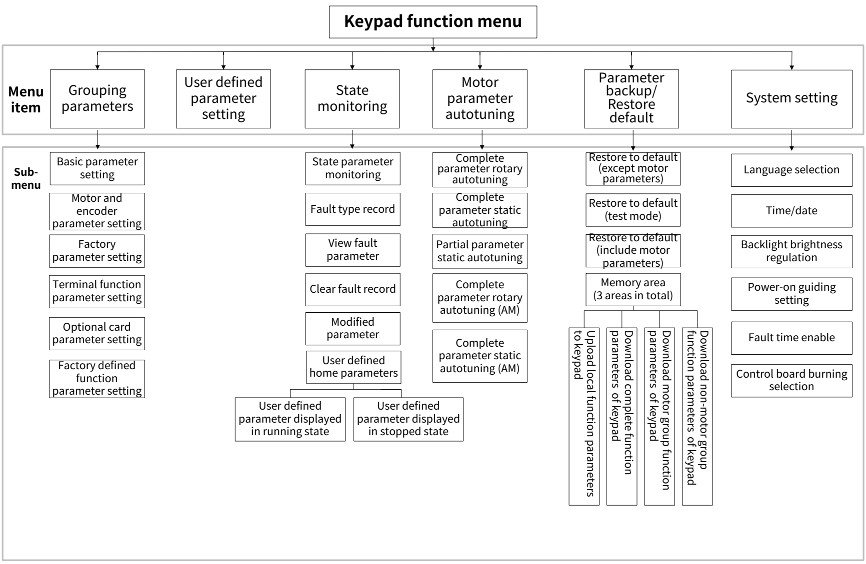
5.1.3 Key

Key		Function
	Function key	Press it to display the function on the corresponding page position.
		
		
	Short-cut key	The ones place of P07.02 defines the key function, which is jogging by default and can be redefined. For details, see the description of P07.02.
	Confirmation key	The function of this key varies depending on the menu, such as confirming parameter settings, selecting parameters, or entering a sub-menu.
	Run key	Under keypad operation mode, the running key is used for running or autotuning.

Key		Function
	Stop/Reset key	The function code P07.04 specifies the validity of the key function. Press it to stop running or autotuning in running state. Press it to reset in fault alarm state.
	Direction key	The function of the direction key varies with interfaces. Up key : Press it to move the item up or increase the value. Down key : Press it to move the item down or decrease the value. Left key : Press it to switch the page, move the cursor to the left, or return to the previous menu. Right key : Press it to switch the page, move the cursor to the right, or enter the next menu.

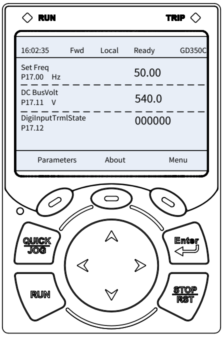
Note: In general, you can press or or to enter the current cursor-lighted menu; you can press or to return to the previous menu. In the following, take or as an example to enter the current menu or return to the previous menu.

5.2 Keypad functions

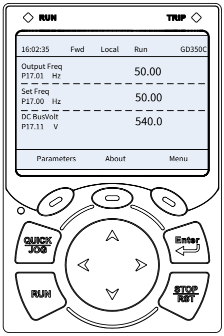


5.3 Operation procedure

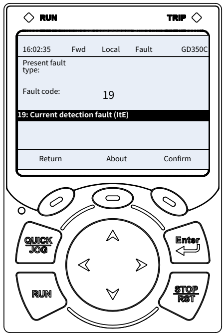
You can operate the VFD through the keypad homepage **Menu** regardless of whether the VFD is stopped or running.



Stopped state homepage



Running state homepage



Fault state homepage

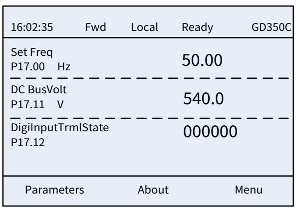
Once a fault is detected, the keypad displays the fault code and fault information with the indicator on the keypad turning on. You can perform fault reset by using the STOP/RST key, control terminals, or communication commands.

5.3.1 Entering/Exiting menus

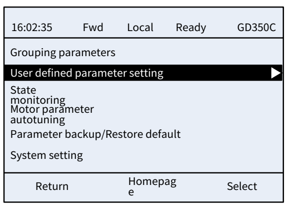
The following figures show how to enter/exit menu in the stopped state.

Note: Limited by the keypad display area, items can be displayed by multiple pages. You can press the down key to display full items.

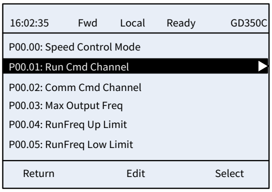
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



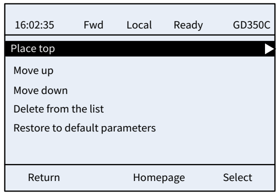
Step 2 Press the down key to select **User defined parameter setting** and press to confirm.



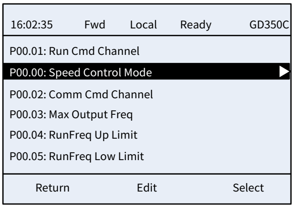
Step 3 Press or key to select the function code.



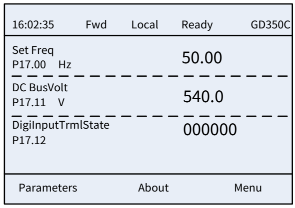
Step 4 After pressing the key corresponding to **Edit**, press the key corresponding to **Place top** to confirm.



Step 5 Press the key corresponding to **Return** to return to the previous menu.



Step 6 Press the key corresponding to **Return** or press the key corresponding to **Homepage** to return to the homepage.

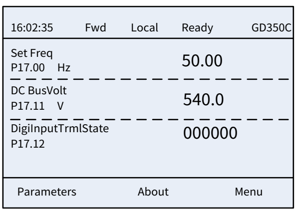


5.3.2 Editing the parameter list

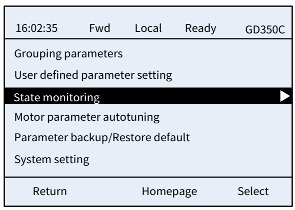
You can edit the user defined parameter list (in the stopped state and running state), and the editing operations include **Place top**, **Move up**, **Move down**, **Delete from the list** and **Restore to default parameters**.

The operation example is as follows:

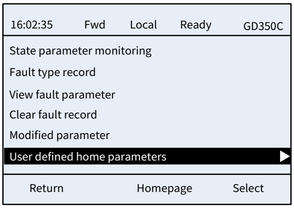
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



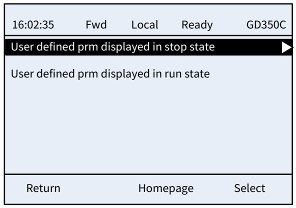
Step 2 Press to select **State monitoring** and press to confirm.



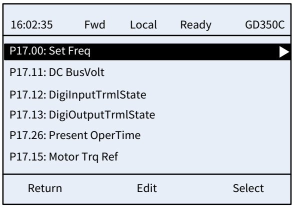
Step 3 Press to select **User defined home parameters** and press to confirm.



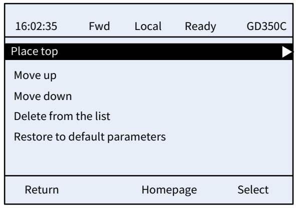
Step 4 Press to select **User defined prm displayed in stop state**.



Step 5 Press to select the function code P17.00.



Step 6 Press to select **Place top**.

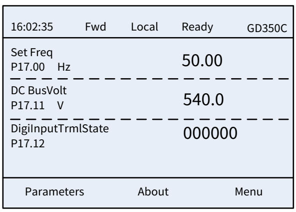


5.3.3 Adding parameters

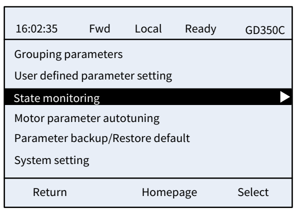
Parameter list displayed in the stopped/running state

The operation example is as follows:

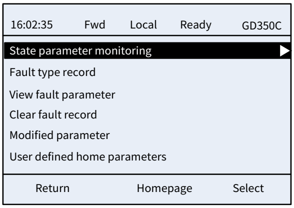
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



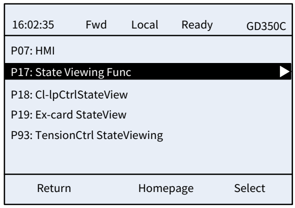
Step 2 Press to select **State monitoring** and press to confirm.



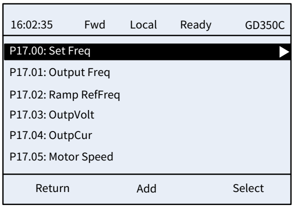
Step 3 Select **State parameter monitoring** and press to confirm.



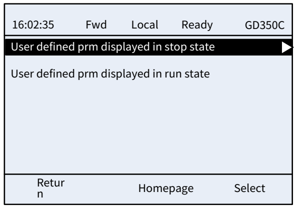
Step 4 Press to select P17 function code group, and press to confirm.



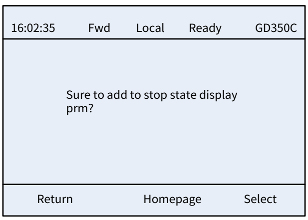
Step 5 Press the key corresponding to **Add**.



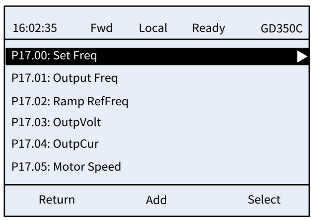
Step 6 Press to select **User defined prm displayed in stop state**.



Step 7 Press the key corresponding to "Confirm".



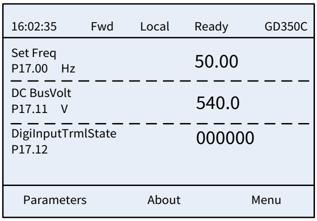
Step 8 After the page returns to the current function code group, continue adding function codes or return to the previous menu.



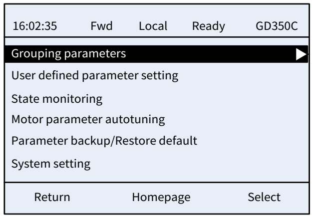
User defined parameter list

The operation example is as follows:

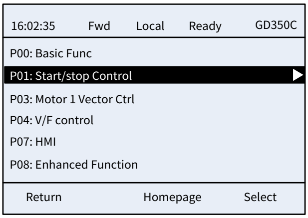
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



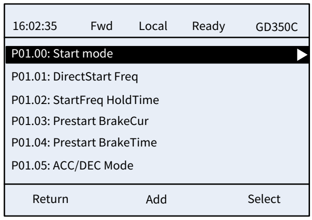
Step 2 Select **Grouping parameters** and press to confirm.



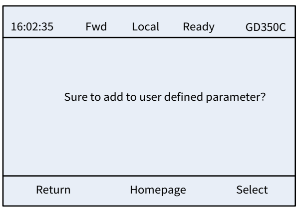
Step 3 Press to select P01, and press to confirm.



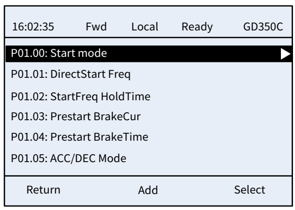
Step 4 Press **the** key corresponding to **Add**.



Step 5 Press the key **corresponding** to **Confirm**.



Step 6 After the page returns to the current function code group, continue adding function codes or return to the previous menu.



5.3.4 Modifying parameters

You can quickly modify the parameter value through **Parameters** on the homepage in the stopped/running state, or through **Menu** > **Grouping Parameters** or **User defined parameter setting**.

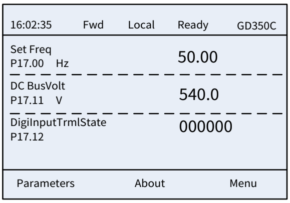
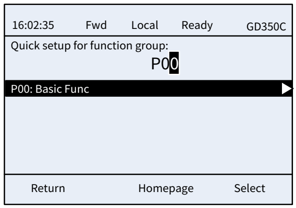
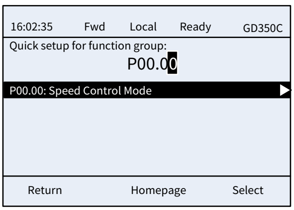
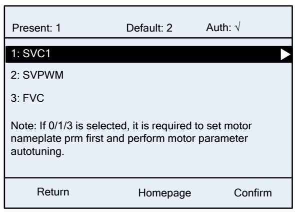
In parameter value modification interface, the **authority** on the top right indicates whether the parameter can be modified.

"✓": It indicates that the value of the parameter can be modified under current VFD state.

"×": It indicates that the value of the parameter cannot be modified under current VFD state.

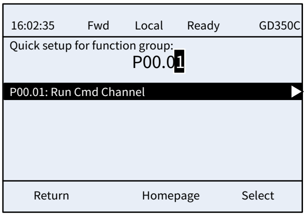
Quick parameter modification

The operation example is as follows:

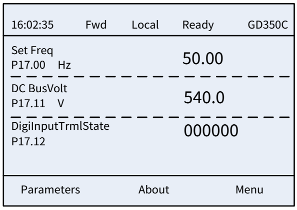
<table>
<tr>
<td>Step 1 In the stopped state homepage, press the key corresponding to Parameters to select the menu item.

</td>
<td>Step 2 Press or to select a function code group; press the key corresponding to Select to keep the current selection.

</td>
</tr>
<tr>
<td>Step 3 Press or to select a function code; press the key corresponding to Select to keep the current selection.

</td>
<td>Step 4 Press or to change the value.


Press the key corresponding to Confirm. The page returns to the current group function code list. You can continue with the modification or to return to the previous menu.</td>
</tr>
</table>

Step 5 Press the key corresponding to **Confirm**. The page goes to the next function code.



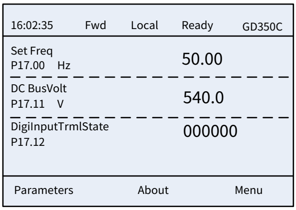
Step 6 Repeating the preceding steps to modify other parameters, or press the key corresponding to **Return** to return to previous menu, or press the key corresponding to **Homepage** to go to the homepage.



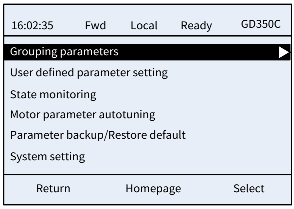
Grouping parameters

The operation example is as follows:

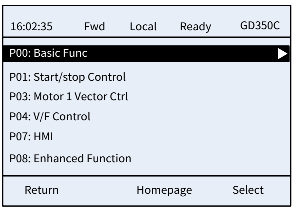
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



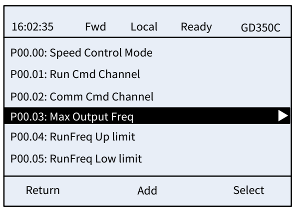
Step 2 Select **Grouping parameters** and press to confirm.



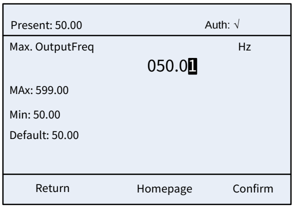
Step 3 Select **Basic parameters**, and press to select function code group P00.



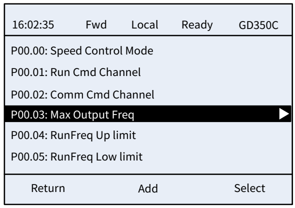
Step 4 Press to select a function code, and press to confirm.



Step 5 Press or to increase or decrease the value.

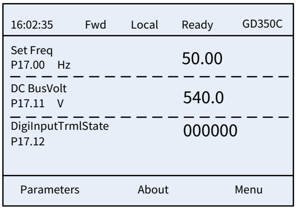


Step 6 Press the key corresponding to **Confirm**. The page returns to the current group function code list. You can continue with the modification or to return to the previous menu.

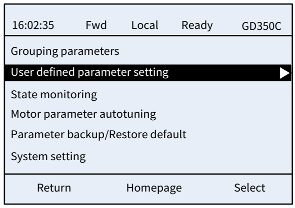


User defined parameter setting

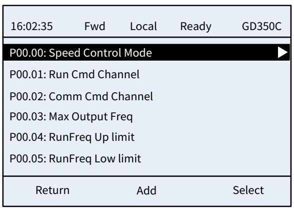
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



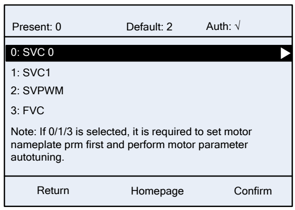
Step 2 Press to select **User defined parameter setting**, and press to confirm.



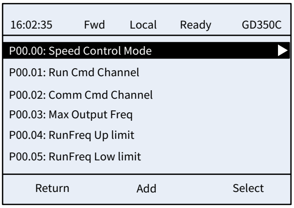
Step 3 Press the key corresponding to **Select**.



Step 4 Press or to change the value.



Step 5 Press the key corresponding to **Confirm**. The page returns to the user defined parameter list, and you can continue to modify parameters or return to the previous menu.

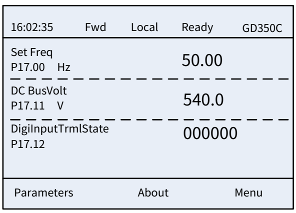


5.3.5 View parameters

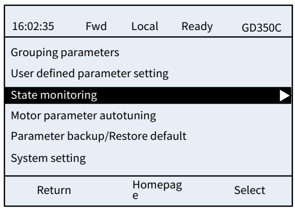
Users can know the VFD state through viewing related parameters.

The operation example is as follows:

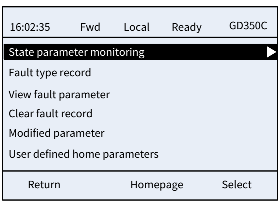
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



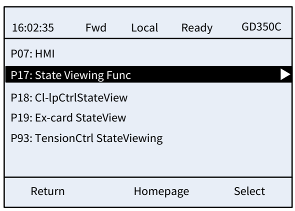
Step 2 Press to select **State monitoring** and press to confirm.



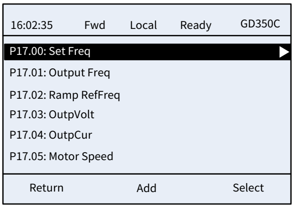
Step 3 Press to select **State parameter monitoring**, and press to confirm.



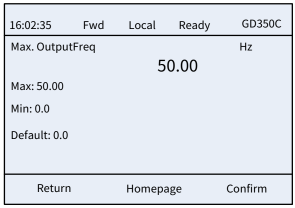
Step 4 Press to select function code group P17, and press to confirm.



Step 5 Press the key corresponding to **Select**.



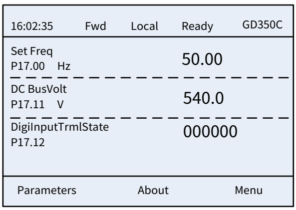
Step 6 Press the key corresponding to **Confirm** to display the next function code, or press the key corresponding to **Return** to return to the current function code group.



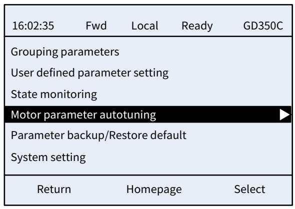
5.3.6 Motor parameter autotuning

The operation example is as follows:

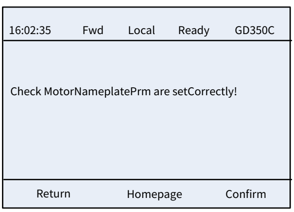
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



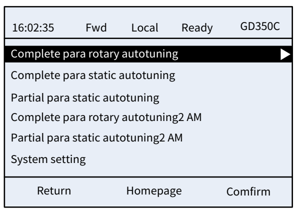
Step 2 Press to select **Motor parameter autotuning**, and press to confirm.



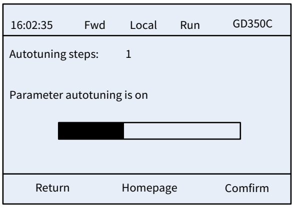
Step 3 (Assume that the motor nameplate parameters have been set.) Press the key corresponding to **Confirm**.



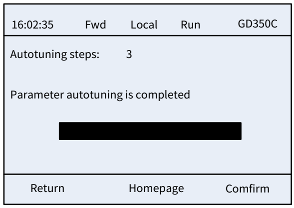
Step 4 Press to select **Complete para rotary autotuning**.



Step 5 The page shows the autotuning progress, and you can press the key corresponding to **Stop** to end the autotuning.



Step 6 Press the key corresponding to **Confirm**.

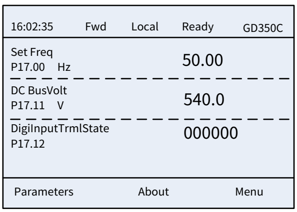


5.3.7 Back up parameters

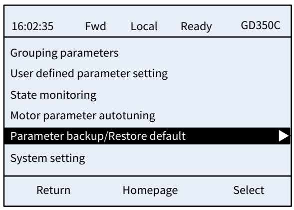
The keypad provides three different storage areas for parameter backup, and each storage area can save the parameters of one VFD, namely it can save parameters of three VFDs in total.

The operation example is as follows:

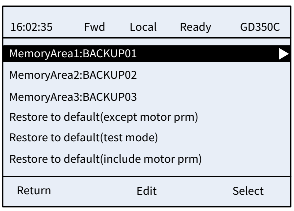
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



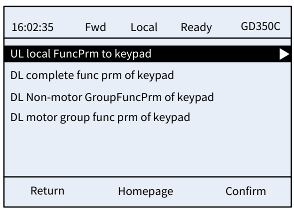
Step 2 Press to select **Parameter backup/Restore default**, and press to confirm.



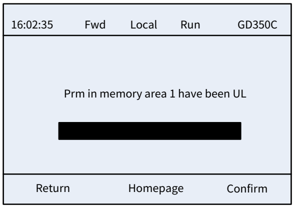
Step 3 Press to select **MemoryArea1: BACKUP01**.



Step 4 Press to select **UL local FuncPrm to keypad**.



Step 5 After parameter uploading is completed, press **Confirm** or **Return** to return to the previous menu.



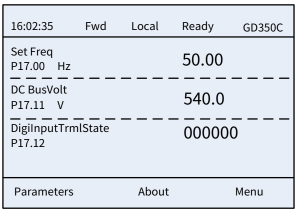
5.3.8 System setup

Users can set keypad language, time/date, backlight brightness, backlight time and restore parameters.

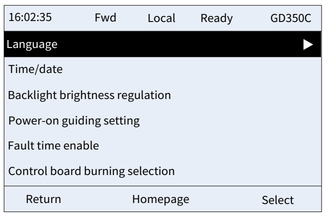
Note: The keypad time/date needs to be reset after power off.

The operation example is as follows:

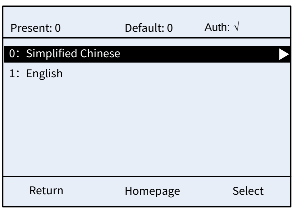
Step 1 In the stopped state homepage, press the key corresponding to **Menu** to select the menu item.



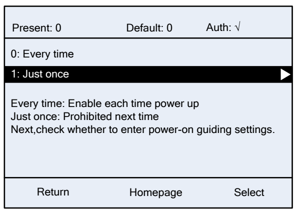
Step 2 Press to select **Language**.



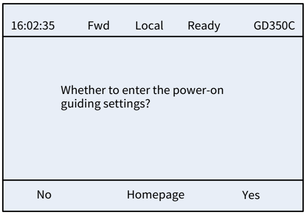
Step 3 Press to select **0: Simplified Chinese**.



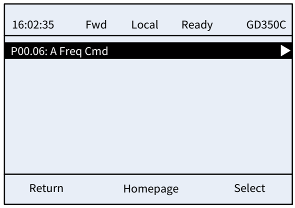
Step 4 Press to select **1: Just once**, and press the key corresponding to **Confirm**.



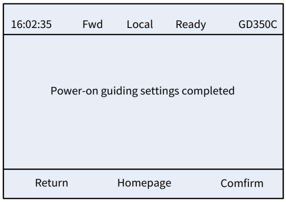
Step 5 Press the key corresponding to **Yes**.



Step 6 Complete all parameter settings according to the on-screen instructions.



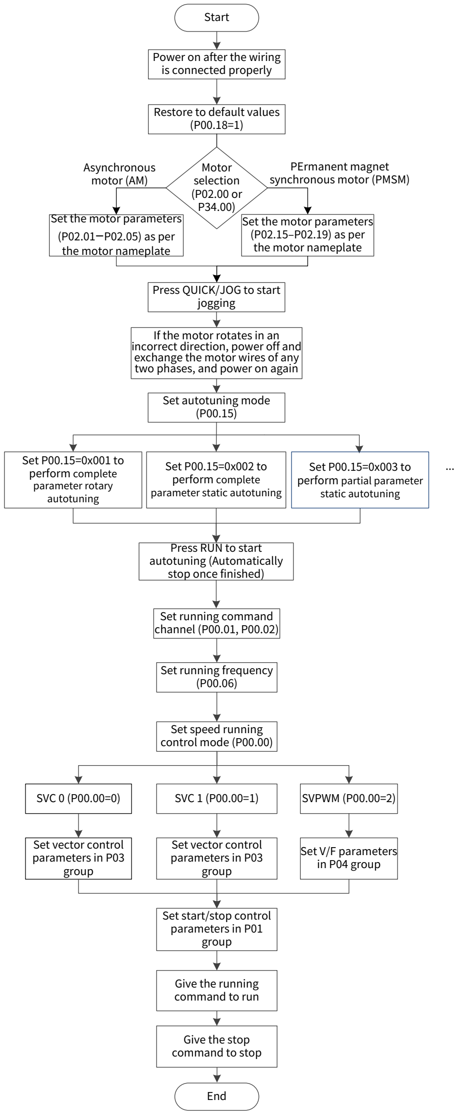
Step 7 When finished, press the key corresponding to **Confirm** to go to the home page.



If you want to change the guiding settings, you can select **Menu** > **System-setting** > **Power-on guiding enable** or **Power-on guiding settings** to modify.

6 Commissioning

The simplified commissioning flowchart is as follows.



6.1 Motor parameter setting

The product supports the control of three-phase AC asynchronous motors and permanent magnet synchronous motors. The VFD supports the setting of two groups of motor parameters. Motor 1 corresponds to parameter group P02, and motor 2 corresponds to parameter group P34. Switching between the two sets of motor parameters can be achieved through multifunctional digital input terminals or communication methods.

6.1.1 Motor type selection

Set P02.00 or P34.00 to select the motor type.

Function code	Name	Default	Setting range	Description
P02.00	Type of motor 1	0	0–2	0: Asynchronous motor (AM) 1: Permanent magnet synchronous motor 2: Synchronous reluctance motor
P34.00	Type of motor 2	0	0–2	0: Asynchronous motor (AM) 1: Permanent magnet synchronous motor 2: Synchronous reluctance motor

Note: The types of motors that are driven at the same type must be the same.

6.1.2 Rated motor parameter setting

■ **Set the rated parameters for the three-phase AC asynchronous motor based on the motor nameplate.**

Parameters P02.01–P02.05 are the parameters of AM 1. Parameters P34.01–P34.05 are the parameters of AM 2.

Function code	Name	Default	Setting range	Description
P02.01	Rated power of AM 1	Model depended	0.1–3000.0kW	-
P02.02	Rated frequency of AM 1	Model depended	0.01Hz–P00.03	P00.03 specifies the max. output frequency.
P02.03	Rated speed of AM 1	Model depended	1–60000RPM	-
P02.04	Rated voltage of AM 1	Model depended	0–1200V	-
P02.05	Rated current of AM 1	Model depended	0.8–6000.0A	-
P34.01	Rated power of AM 2	Model depended	0.1–3000.0kW	-
P34.02	Rated frequency of AM 2	Model depended	0.01Hz–P00.03	P00.03 specifies the max. output frequency.
P34.03	Rated speed of AM 2	Model depended	1–60000RPM	-
P34.04	Rated voltage of AM 2	Model depended	0–1200V	-

Function code	Name	Default	Setting range	Description
P34.05	Rated current of AM 2	Model depended	0.8–6000.0A	-

■ **Set the rated parameters for the three-phase permanent-magnet synchronous motor based on the motor nameplate.**

Parameters P02.15–P02.19 are the parameters of SM 1. Parameters P34.15–P34.19 are the parameters of SM 2.

Function code	Name	Default	Setting range	Description
P02.15	Rated power of SM 1	Model depended	0.1–3000.0kW	-
P02.16	Rated frequency of SM 1	Model depended	0.01Hz–P00.03	P00.03 specifies the max. output frequency.
P02.17	Number of pole pairs of SM 1	2	1–128	-
P02.18	Rated voltage of SM 1	Model depended	0–1200V	-
P02.19	Rated current of SM 1	Model depended	0.8–6000.0A	-
P34.15	Rated power of SM 2	Model depended	0.1–3000.0kW	-
P34.16	Rated frequency of SM 2	Model depended	0.01Hz–P00.03	P00.03 specifies the max. output frequency.
P34.17	Number of pole pairs of SM 2	2	1–128	-
P34.18	Rated voltage of SM 2	Model depended	0–1200V	-
P34.19	Rated current of SM 2	Model depended	0.8–6000.0A	-

6.1.3 Motor switchover

Set P05.01–P05.04, P05.11–P05.12, or P08.31 to switch between the two sets of motor parameters. There are two switching methods.

Method 1 Switching through multifunction digital input terminal function setting

Set the terminal function of P05.01–P05.04 or P05.11–P05.12 (whichever you choose) to 32.

<table>
<tr><th>Function code</th><th>Name</th><th>Default</th><th>Setting range</th><th>Description</th></tr>
<tr><td rowspan="4">P05.01–P05.04</td><td rowspan="4">Function selection of multifunction digital input terminals (DI1–DI4)</td><td>1</td><td rowspan="6">0–95</td><td rowspan="6">32: Motor switchover terminal 1</td></tr>
<tr><td>4</td></tr>
<tr><td>7</td></tr>
<tr><td>0</td></tr>
<tr><td rowspan="2">P05.11–P05.12</td><td rowspan="2">Function selection of multifunction digital input</td><td>0</td></tr>
<tr><td>0</td></tr>
</table>

Function code	Name	Default	Setting range	Description
	terminals (HDI1, HDI2)			

Note: The two groups of motor parameters cannot be switched directly during running. You can switch motors only after the VFD has stopped.

Method 2 Switching through communication mode setting

Set the ones place of P08.31 to select any channel to switch between Motor 1 and Motor 2.

Function code	Name	Default	Setting range	Description
P08.31	Motor switchover channel selection	0x00	0x00–0x15	Ones place: Switchover channel 0: Terminal 1: Modbus/Modbus TCP communication 2: PROFIBUS/CANopen/DeviceNet communication 3: Ethernet communication 4: EtherCAT/PROFINET/ EtherNet IP communication 5: Reserved Tens place: indicates whether to enable switchover during running 0: Disable 1: Enable

6.2 Parameter autotuning setting

To improve the motor control effect, it is recommended to set the motor rated parameters based on the motor nameplate at first power-on, and then perform parameter autotuning. The VFD supports three parameter autotuning modes, which are motor parameter autotuning, motor inertia autotuning, and SM initial magnetic pole angle autotuning. You can select an autotuning mode based on actual conditions.

6.2.1 Motor parameter autotuning

The motor parameters have a significant impact on the calculation of the control model, especially in the case of vector control. The motor parameter autotuning is required first.

After setting the motor parameters, set P00.15 to select the autotuning mode to perform motor parameter autotuning. The setting procedure is as follows.

Step 1 Set P00.01 to 0 to select the keypad as the command running channel.

Step 2 Set P00.15 to select a motor parameter autotuning method.

Step 3 Press the RUN key to give the start command. The motor enters parameter autotuning.

Function code	Name	Default	Setting range	Description
P00.15	Motor parameter autotuning	0x000	0x000–0x234	Ones place: Motor basic parameter autotuning 0: No operation 1: Complete parameter rotary autotuning 2: Complete parameter static autotuning 3: Partial parameter static autotuning 4: VFD parameter autotuning Tens place: Initial pole angle autotuning 0: No operation 1: Rotary autotuning 2: Static autotuning 3: Rotary autotuning 2 Hundreds place: System inertia autotuning 0: No operation 1: Mode 1 2: Mode 2

Note:

- When P00.15 is set to 0x001, disconnect the motor from the load to put the motor in static and no-load state.
- When P00.15 is set to 0x002 or 0x003, there is no need to disconnect the motor from the load.
- Motor autotuning can be carried out on the present motor only. If you need to perform autotuning on the other motor, switch the motor first.

Table 6-1 Obtained motor parameters in different autotuning methods

Setting of P00.15	Autotuning parameters			
	AM 1	AM 2	SM 1	SM 2
0x001	P02.06–P02.14	P34.06–P34.14	P02.20–P02.23	P34.20–P34.23
0x002	P02.06–P02.10	P34.06–P34.10	P02.20–P02.22	P34.20–P34.22
0x003	P02.06–P02.08	P34.06–P34.08		
-	P02.06–P02.14	P34.06–P34.14	-	-
-	P02.06–P02.08	P34.06–P34.08	-	-

Note: If the autotuned parameters have deviation, SM back-EMF constant P02.23 and P34.23 can be calculated.

Back-EMF constants can also be calculated based on the parameters on the motor nameplate, and there are three calculation methods.

Method 1: If the back-EMF coefficient K_e is marked on the nameplate, the calculation is as follows:

$$E = (K_e * n_N * 2\pi) / 60$$

Method 2: If the back-EMF E' (unit: V/1000r/min) is marked on the nameplate, the calculation is as follows:

$$E = E' * n_N / 1000$$

Method 3: If none of the two preceding parameters is marked on the nameplate, the calculation is as follows:

$$E = P / (\sqrt{3} * I)$$

In the formula, "n_N" indicates the rated speed, "P" indicates the rated power, and "I" indicates the rated current.

6.2.2 Motor inertia autotuning

Inertia autotuning is applicable to the scenarios where large inertia exists and speed dynamic response follows up well in the closed-loop vector control mode. Inertia autotuning is required before inertia compensation enabling. During the autotuning process, the VFD controls the automatic start and stop of the motor and prompts for autotuning completion. Set P03.44 to perform the motor inertia autotuning. The setting procedure is as follows:

Step 1 Set P00.01 to 0 to select the keypad as the command running channel.

Step 2 Set P03.44 to select the identification mode.

Step 3 After the RUN key is pressed to give the VFD start command, the VFD starts inertia identifying and automatically controls the motor start and stop.

Function code	Name	Default	Setting range	Description
P03.43	Motor 1 inertia identification torque	10.0%	0.0–100.0% (of motor rated torque)	Due to friction force, it is required to set certain identification torque for the inertia identification to be performed properly.
P03.44	Motor 1 inertia identification enabling	0	0–2	0: No operation 1: Mode 1 2: Mode 2

Note: If the motor is running at low speed for a long time, which indicates that P03.43 (Inertia identification torque) is set too low, perform manual stop, increase the value of P03.43, and execute inertia identification again.

6.2.3 SM initial pole angle autotuning

SM initial pole angle autotuning is applicable to the scenarios where an absolute position encoder is installed in the closed-loop vector control mode. Set P20.11 to perform the SM initial pole angle autotuning. The procedure is as follows:

Step 1 Set P00.01 to 0 to select the keypad as the command running channel.

Step 2 Set P02.00/P34.00 to 1 (permanent magnet synchronous motor).

Step 3 Set P02.11 to select a autotuning method.

Step 4 Press the RUN key to give the VFD a start command. It enters parameter autotuning.

Function code	Name	Default	Setting range	Description
P20.11	Initial pole position autotuning	0	0–3	0: No operation 1: Rotary autotuning 1 (DC braking first, applicable to encoders with Z signals) 2: Static autotuning (applicable to resolver-type encoders or sin/cos encoders with CD signal feedback) 3: Rotary autotuning 2 (initial angle static autotuning first, applicable to encoders with Z signals) **Note:** The pole initial angle obtained through option **1: Rotary autotuning** is accurate. Option **1: Rotary autotuning** is recommended in most cases, in which the motor needs to be decoupled from the load or the motor load is light.

6.3 Running command selection

The running commands are used to control the start, stop, forward running reverse running, and jogging of the inverter. The channels of running commands include keypad, terminal, and communication. Set P00.01 to select a channel of running commands.

Function code	Name	Default	Setting range	Description
P00.01	Channel of running commands	0	0–3	0: Keypad 1: Terminal 2: Communication

Running commands set through the keypad

When P00.01 is set to 0, you can control the VFD start or stop through key and key on the keypad. After pressing the key, the VFD starts running, and the RUN indicator turns on. In running state, if you press the key, the VFD stops running, and the RUN indicator turns off. For details about the keypad operations, see chapter 5 Keypad operation guidelines.

Running commands set through the terminal

When P00.01 is set to 1, you can control the inverter start or stop through external terminals. The setting procedure is as follows:

Step 1 Set the terminal function of P05.01–P05.04 or P05.11–P05.12 (whichever you choose) to 1–6.

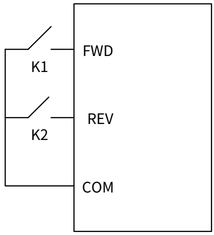
Function code	Name	Default	Setting range	Description
P05.01–P05.04	Function selection of multifunction digital input terminals (DI1–DI4)	1 4 7 0	0–95	0: No function 1: Run forward (FWD) 2: Run reversely (REV) 3: Three-wire running control (DI_{in}) 4: Jog forward 5: Jog reversely 6: Coast to stop
P05.11–P05.12	Function selection of multifunction digital input terminals (HDI1, HDI2)	0 0		

Step 2 Set P05.17 to select the terminal control mode.

Function code	Name	Default	Setting range	Description
P05.17	Terminal control mode	0	0–3	0: Two-wire control mode 1 1: Two-wire control mode 2 2: Three-wire control mode 1 3: Three-wire control mode 2

Two-wire control mode 1: P05.17= 0

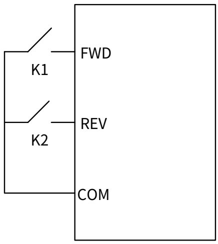
The enabling is combined with the direction. This mode is widely used. The defined FWD/REV terminal command determines the motor rotation direction.



FWD	REV	Running command
OFF	OFF	Stop
ON	OFF	Forward running
OFF	ON	Reverse running
ON	ON	Hold

Two-wire control mode 2: P05.17= 1

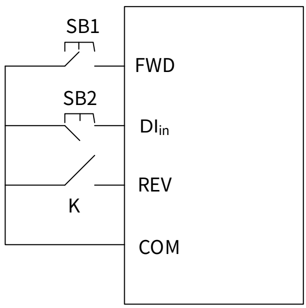
The enabling separated from the direction. In this mode, FWD is the enabling terminal. The direction depends on the defined REV state.



FWD	REV	Running command
OFF	OFF	Stop
ON	OFF	Forward running
OFF	ON	Stop
ON	ON	Reverse running

Three-wire control mode 1: P05.17= 2

This mode defines DI_{in} as the enabling terminal, and the running command is generated by FWD, while the direction is controlled by REV. During running, the DI_{in} terminal needs to be closed, and when terminal FWD generates a rising edge signal, the VFD starts to run in the direction set by the state of terminal REV; the VFD needs to be stopped by disconnecting terminal DI_{in}.

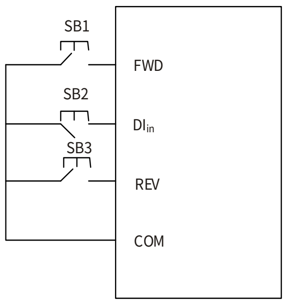


The direction control is as follows during running:

DI_{in}	REV	Previous direction	Present direction
ON	OFF→ON	FWD run	REV run
		REV run	FWD run
ON	ON→OFF	REV run	FWD run
		FWD run	REV run
ON→OFF	ON	Decelerate to stop	
	OFF		

Three-wire control mode 2: P05.17= 3

This mode defines DI_{in} as the enabling terminal, and the running command is generated by FWD or REV, but the direction is controlled by both FWD and REV. During running, the DI_{in} terminal needs to be closed, and terminal FWD or REV generates a rising edge signal to control the running and direction of the VFD; the VFD needs to be stopped by disconnecting terminal DI_{in}.



The direction control is as follows during running:

DI_{in}	FWD	REV	Running direction
ON	OFF→ON	ON	FWD run
		OFF	FWD run
ON	ON	OFF→ON	REV run
	OFF		REV run
ON→OFF	-	-	Decelerate to stop

Note: For two-wire controlled running mode, when the FWD/REV terminal is valid, if the VFD stops due to a stop command given by another source, the VFD does not run again after the stop command disappears even if the control terminal FWD/REV is still valid. To make the VFD run, you need to trigger FWD/REV again, for example, PLC single-cycle stop, fixed-length stop, and valid STOP/RST stop during terminal control. (See P07.04.)

Running commands set through communication

When P00.01 is set to 2, you can control the VFD run or stop by giving commands through communication. For details, see chapter 7 Communication.

Function code	Name	Default	Setting range	Description
P00.02	Communication mode of running commands	0	0–6	0: Modbus/Modbus TCP communication 1: PROFIBUS/CANopen/DeviceNet communication 2: Ethernet communication 3: EtherCAT/PROFINET/EtherNet IP communication 4: Programmable expansion card 5: Wireless communication card 6: USB (reserved) **Note:** The Modbus TCP communication mode of option 0 and options 1, 2, 3, 4 and 5 are extended functions which are applicable with corresponding cards.

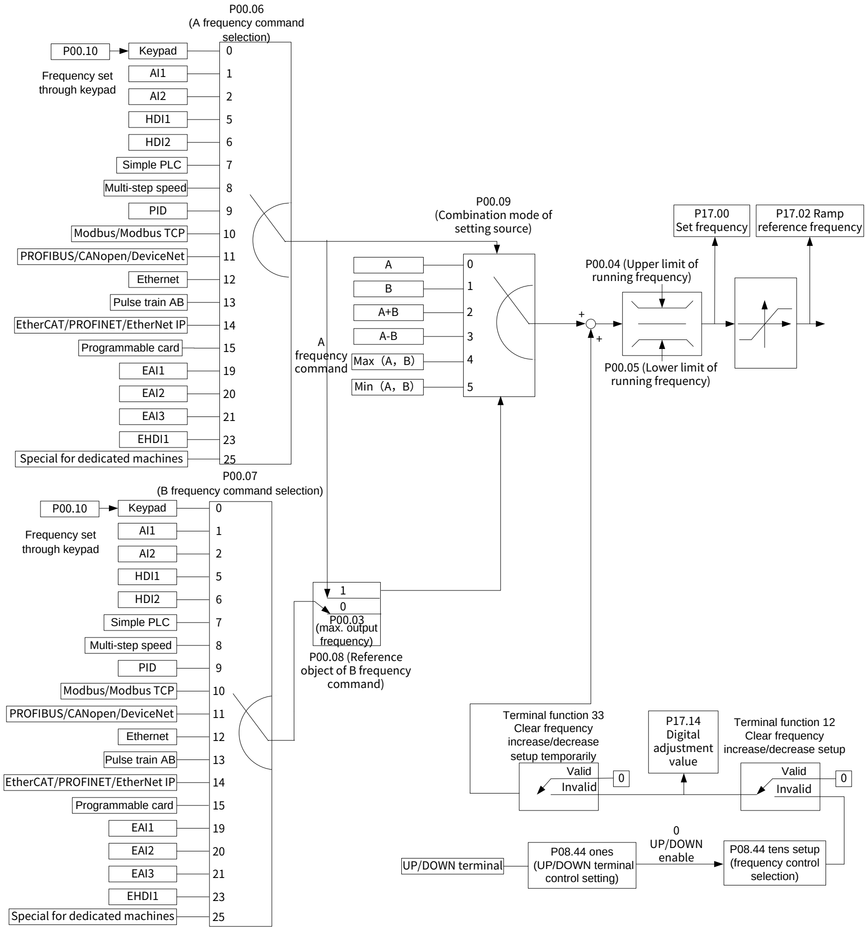
6.4 Frequency setting

The VFD supports multiple kinds of frequency reference modes, which can be categorized into two types: main reference channel and auxiliary reference channel.

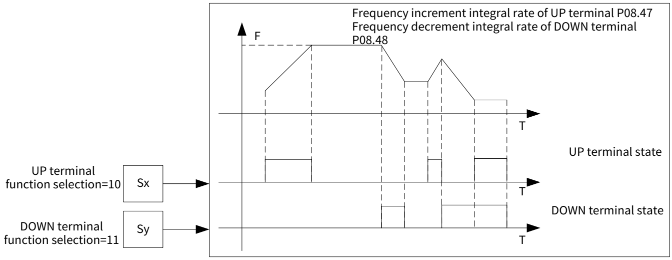
There are two main reference channels, namely frequency reference channel A and frequency reference channel B. These two channels support simple arithmetical operation between each other, and they can be switched dynamically.

There is one auxiliary reference channel, namely terminal UP/DOWN switch input, equivalent to the UP/DOWN adjustment made by the VFD internal auxiliary reference input. By setting P08.44, you can enable the corresponding reference mode and the impact on the VFD frequency reference made by this reference mode.

The actual VFD reference is comprised of the main reference channel and auxiliary reference channel. See the following figure.



When selecting P05.01 to P05.04 or P05.11 to P05.12 (whichever terminal function is set to 10 and 11) to configure the auxiliary frequency inside the VFD, you can increase/decrease the set frequency quickly through P08.47 (Frequency integral rate of the UP terminal) and P08.48 (Frequency integral rate of the DOWN terminal). The schematic diagram is as follows:



6.4.1 Combination of frequency setting source

6.4.1.1 Combination mode of setting source

Set P00.09 to select the combination mode of setting source.

Function code	Name	Default	Setting range	Description
P00.09	Combination mode of setting source	0	0–5	0: A 1: B 2: (A+B) 3: (A-B) 4: Max(A, B) 5: Min(A, B)

6.4.1.2 Frequency channel switchover

You can set the terminal function of P05.01–P05.04 or P05.11–P05.12 (whichever you choose) to 13 to 15 to switch frequency channels. The setting procedure is as follows:

Step 1 Select any of multifunction digital input terminals DI1–DI4, HDI1, HDI2 as an external input terminal.

Step 2 Set P05.01–P05.04 or P05.11–P05.12 to select one of the functions 13 to 15.

Function code	Name	Default	Setting range	Description
P05.01–P05.04	Function selection of multifunction digital input terminals (DI1–DI4)	1 4 7 0	0–95	13: Switch between A setting and B setting 14: Switch between combination setting and A setting 15: Switch between combination setting and B setting
P05.11–P05.12	Function selection of multifunction digital input terminals (HDI1, HDI2)	0 0		

Details of the combinations can be found in the table below:

Present reference channel P00.09	Multifunction digital input terminal function 13 (Switch from channel A to channel B)	Multifunction digital input terminal function 14 (Switch from combined setting to channel A)	Multifunction digital input terminal function 15 (Switch from combined setting to channel B)
A	B	-	-
B	A	-	-
A+B	-	A	B
A-B	-	A	B
Max(A, B)	-	A	B
Min(A, B)	-	A	B

6.4.2 Frequency setting method

The VFD supports multiple frequency setting methods. Set P00.06 to select A frequency command reference and P00.07 to select B frequency command reference.

Function code	Name	Default	Setting range	Description
P00.06	Setting channel of A frequency command	0	0–25	0: P00.10 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Simple PLC program 8: Multi-step speed running 9: PID control 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Pulse train 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable card 16–18: Reserved 19: EAI1 20: EAI2
P00.07	Setting channel of B frequency command	24		

Function code	Name	Default	Setting range	Description
				21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated frequency channel for specialized equipment

6.4.2.1 Setting frequency through keypad

Set P00.06 or P00.07 to 0 to select keypad for setting, and P00.10 is the initial value of the VFD frequency digital setting.

Function code	Name	Default	Setting range	Description
P00.10	Setting frequency through keypad	50.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency. When A and B frequency commands select the keypad for setting, P10.00 is the original setting one of the frequency data of the VFD.

6.4.2.2 Frequency set through analog

Set P00.06 or P00.07 to 1 or 2 to select the analog signal set frequency. For details, see section 6.10.2 Analog input and output terminal functions.

6.4.2.3 Frequency set through high-speed pulse

Set P00.06 or P00.07 to 5 or 6 to select the high-speed pulse set frequency. For details, see section 6.10.3 High-speed pulse input and output terminal functions.

6.4.2.4 Setting frequency through pulse train

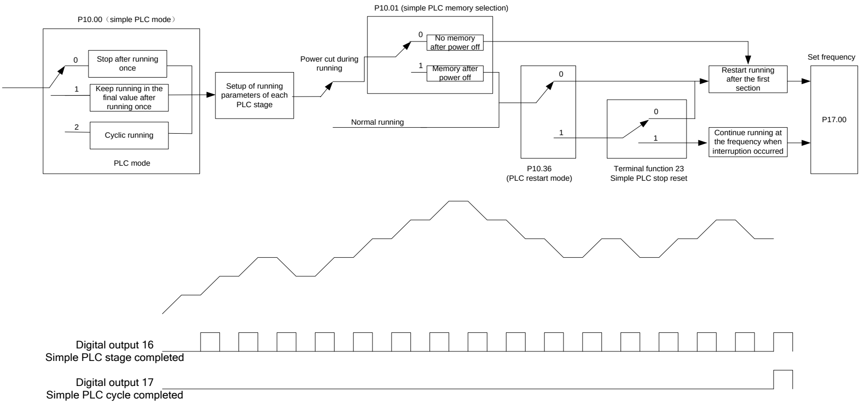
Set P00.06 or P00.07 to 13 to select pulse train AB command for frequency setting. It is applicable to the scenarios where PG cards with pulse reference signals are installed.

Function code	Name	Default	Setting range	Description
P20.20	Pulse number of pulse reference channel F	1024	0–16000	-

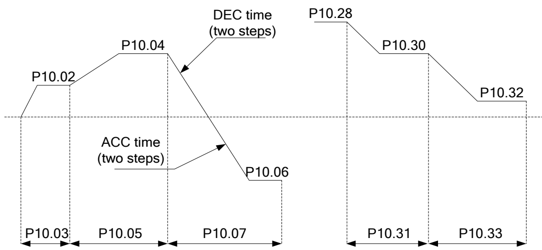
6.4.2.5 Frequency set through simple PLC

Set P00.06 or P00.07 to 7, which implements frequency setting through simple PLC commands.

Simple PLC is a multi-step speed generator, and the VFD can change the running frequency and direction automatically based on the running time to fulfill process requirements. The VFD can realize 16-step speeds control, and provide four groups of acceleration/deceleration time for choose. After the set PLC completes one cycle (or one step), an ON signal can be output by the multifunction relay. See the following figure.



When using the simple PLC as the set frequency, it is required to set P10.02–P10.33 to determine the running frequency and running time of each step. Parameters are detailed in the diagram below.



Note: The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running. ACC time means the time needed if the VFD speeds up from 0Hz to the max. output frequency (P00.03). DEC time means the time needed if the VFD speeds down from the max. output frequency (P00.03) to 0Hz. Select corresponding acceleration/deceleration time, and then convert 16-bit binary number into hexadecimal number, finally, and then set corresponding function codes.

Function code	Name	Default	Setting range	Description
P00.11	ACC time 1	Model depended	0.0–3600.0s	The VFD has four groups of ACC/DEC time, which can be selected by multifunction digital input terminal functions 21 and 22 (specified by P05). The factory default ACC/DEC time of the VFD is the first group.
P00.12	DEC time 1	Model depended		
P08.00	ACC time 2	Model depended		
P08.01	DEC time 2	Model depended		
P08.02	ACC time 3	Model depended		
P08.03	DEC time 3	Model depended		
P08.04	ACC time 4	Model depended		
P08.05	DEC time 4	Model depended		
P10.34	ACC/DEC time of steps 0–7 of simple PLC	0x0000	0x0000–0xFFFF	Select corresponding acceleration/deceleration time, convert a 16-bit binary number into a hexadecimal number, and then set corresponding function codes. For details, see the following table.
P10.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000		

The description is as follows:

Function code	Binary		Step	ACC/DEC time 1	ACC/DEC time 2	ACC/DEC time 3	ACC/DEC time 4
P10.34	Bit1	Bit0	0	00	01	10	11
	Bit3	Bit2	1	00	01	10	11
	Bit5	Bit4	2	00	01	10	11
	Bit7	Bit6	3	00	01	10	11
	Bit9	Bit8	4	00	01	10	11
	Bit11	Bit10	5	00	01	10	11
	Bit13	Bit12	6	00	01	10	11
	Bit15	Bit14	7	00	01	10	11
P10.35	Bit1	Bit0	8	00	01	10	11
	Bit3	Bit2	9	00	01	10	11
	Bit5	Bit4	10	00	01	10	11
	Bit7	Bit6	11	00	01	10	11
	Bit9	Bit8	12	00	01	10	11
	Bit11	Bit10	13	00	01	10	11
	Bit13	Bit12	14	00	01	10	11
	Bit15	Bit14	15	00	01	10	11

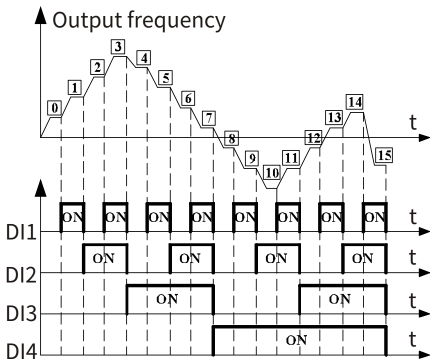
6.4.2.6 Frequency set through multi-step speed

You can set P00.06 or P00.07 to 8 (setting frequency through multi-step speed commands). It is applicable to scenarios where the VFD running frequency does not need to be adjusted continuously and only a number of frequency values are needed.

The VFD supports the setting of 16-step speed, which are set by combined codes of multi-step terminals 1–4 set by DI terminals, corresponding to function code P05.01–P05.14, P05.11–P05.12) and correspond to multi-step speed 0 to multi-step speed 15.

When terminal 1, terminal 2, terminal 3 and terminal 4 are OFF, the frequency input mode is set by P00.06 or P00.07. When terminal 1, terminal 2, terminal 3 and terminal 4 are not all OFF, the frequency set by multi-step speed will prevail, and the priority of multi-step setting is higher than that of the keypad, analog, high-speed pulse, PID, and communication settings.

Note: The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running. For details, see chapter 6.4.2.5Frequency set through simple PLC.



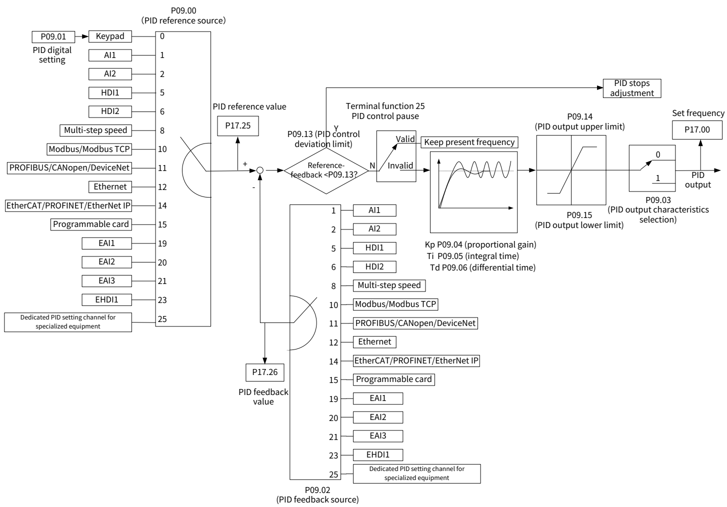
Terminal 1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
Terminal 2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
Terminal 3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Terminal 4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Step	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Terminal 1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
Terminal 2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
Terminal 3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Terminal 4	ON	ON	ON	ON	ON	ON	ON	ON
Step	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**

Function code	Name	Default	Setting range	Description
P05.01–P05.04	Function selection of multifunction digital input terminals (DI1–DI4)	1	0–95	16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Pause multi-step speed running
		4		
		7		
		0		
P05.11–P05.12	Function selection of multifunction digital input terminals (HDI1, HDI2)	0		
		0		
P10.02–P10.32	Multi-step speed 0–15 and running time	0.0%	Frequency: -300.0%–300.0%	The setting 100.0% corresponds to the max. output frequency (P00.03).
		0.0s (min)	Time: 0.0–6553.5s (min)	The time unit is specified by P10.37.

6.4.2.7 Frequency set through PID control

Set P00.06 or P00.07 to 9, which implements frequency setting through PID commands.

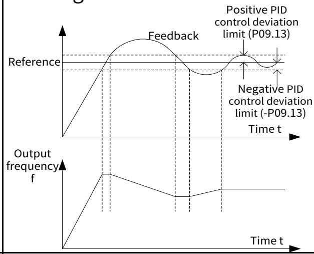
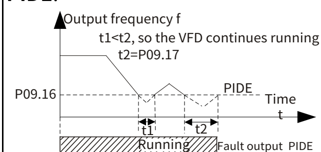
PID control, a common mode for process control, is mainly used to adjust the VFD output frequency or output voltage , thus forming a negative feedback system to keep the controlled variables above the target. It is applicable to flow control, pressure control, temperature control, and so on. The following is the basic schematic block diagram for output frequency regulation.



Function code	Name	Default	Setting range	Description
P09.00	PID reference source	0	0–25	When the frequency command selection (P00.06, P00.07) is 7 or the voltage setting channel selection (P04.27) is 6, the VFD is process PID controlled. The function code determines the target given channel during the PID process. 0: Set by P09.01 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated PID setting channel for specialized equipment The set target of process PID is a relative value, for which 100% equals 100% of the feedback signal of the controlled system. The system always performs calculation by using a relative value (0.0–100.0%).
P09.01	PID digital	0.0%	-100.0–	The function code is mandatory when

Function code	Name	Default	Setting range	Description
	setting		100.0%	P09.00=0. The base value of P09.01 is the feedback of the system.
P09.02	PID feedback source	0	0–25	0: Reserved 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated PID feedback channel for specialized equipment **Note:** The reference channel and feedback channel cannot be duplicated. Otherwise, effective PID control cannot be achieved.
P09.03	PID output characteristics selection	0	0–1	0: PID output is positive. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will decrease to balance the PID. Example: PID control on strain during winding. 1: PID output is negative. When the feedback signal is greater than the PID

Function code	Name	Default	Setting range	Description
				reference value, the output frequency of the VFD will increase to balance the PID. Example: PID control on strain during unwinding.
P09.04	Low frequency proportional gain (Kp)	1.00	0.00–100.00	-
P09.05	Low frequency integral time (Ti)	0.90s	0.00–10.00s	-
P09.06	Low frequency differential time (Td)	0.00s	0.00–10.00s	-
P09.07	Low frequency point for PID parameter switching	5.00Hz	0.00Hz–P09.11	-
P09.08	High-frequency proportional gain (Kp)	1.80	0.00–100.00	-
P09.09	High-frequency integral time (Ti)	0.90s	0.00–10.00s	-
P09.10	High-frequency differential time (Td)	0.00s	0.00–10.00s	-
P09.11	High frequency point for PID parameter switching	10.00Hz	P09.07–P00.03	-
P09.12	Sampling cycle (T)	0.001s	0.000–1.000s	Used to indicate the sampling cycle of feedback. The regulator calculates in each sampling cycle. A longer sampling cycle indicates slower response.
P09.13	PID control deviation limit	0.0%	0.0–100.0%	Used to adjust the accuracy and stability of the PID system. The output value of the PID system is relative to the max. deviation of the closed loop reference. As shown in the following

Function code	Name	Default	Setting range	Description
				figure, the PID regulator stops regulating in the range of deviation limit. 
P09.14	PID output upper limit	100.0%	P09.15–100.0 (Max. frequency or voltage)	Used to set the upper limit of PID regulator output values.
P09.15	PID output lower limit	0.0%	-100.0–P09.14 (Max. frequency or voltage)	Used to set the lower limit of PID regulator output values.
P09.16	Feedback offline detection value	0.0%	0.0–100.0%	When the feedback value is smaller than or equal to the feedback offline detection value, and the duration exceeds the value specified by P09.12, the VFD reports "PID feedback offline fault" the keypad displays **PIDE**. 
P09.17	Feedback offline detection time	1.0s	0.0–3600.0s	
P09.18	PID control selection	0x0001	0x0000–0x1111	Ones place: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens place: 0: Same as the main reference direction 1: Contrary to the main reference direction

Function code	Name	Default	Setting range	Description
				Hundreds place: 0: Limit as per the max. frequency 1: Limit as per A frequency Thousands place: 0: A+B frequency. ACC/DEC of main reference A frequency source precharging is invalid. 1: A+B frequency. Acceleration/ deceleration of main reference A frequency source precharging is valid. The acceleration/deceleration is determined by P08.04 (acceleration time 4).
P09.19	ACC/DEC time of PID command	0.0s	0.0–1000.0s	-
P09.20	PID output filter time	0.000s	0.000–10.000s	-
P17.00	Set frequency	0.00Hz	0.00Hz–P00.03 (Max. output frequency)	-
P17.25	PID reference value	0.0%	-100.0–100.0%	-
P17.26	PID feedback value	0.0%	-100.0–100.0%	-

■ **Introduction to the working principles and control methods for PID control**

Proportional control (Kp)

Proportional control can respond to feedback changes rapidly, however, it cannot eliminate the static difference by itself. A larger proportional gain indicates a faster regulating speed, but a too large gain will result in oscillation. To solve this problem, set the integral time to a large value and the differential time to 0 to run the system, and then change the reference to observe the difference (that is, static difference) between the feedback signal and reference. If the static difference occurs in the direction of reference change (such as reference increase, where the feedback is always less than the reference after system stabilizes), continue increasing the proportional gain; otherwise, decrease the proportional gain. Repeat this process until the static difference becomes small.

Function code	Name	Default	Setting range	Description
P09.04	Low frequency proportional gain (Kp)	1.00	0.00–100.00	The function is applied to the proportional gain P of PID input. P determines the strength of the whole PID regulator. The larger the value of P, the stronger the adjustment intensity. The value 100 indicates that when the difference between the PID feedback value and given value is 100%, the range within which the PID regulator can regulate the output frequency command is the max. frequency (ignoring integral function and differential function).

Integral time (Ti)

The integral adjuster can be used to eliminate static difference. Too large regulation may lead to system oscillation. The integral time parameter is generally regulated gradually from large to small until the stabilized system speed fulfills the requirement.

Function code	Name	Default	Setting range	Description
P09.05	Low frequency integral time (Ti)	0.90s	0.01–10.00s	Used to determine the speed of the integral adjustment on the deviation of PID feedback and reference from the PID regulator. When the deviation of PID feedback and reference is 100%, the integral adjuster works continuously during the time to achieve the max. output frequency (P00.03) or the max. voltage (P04.31). Shorter integral time indicates stronger adjustment.

Differential time (Td)

Differential control is used to control the feedback signal variation based on the change trend. Exercise caution before using the differential regulator since it may enlarge the system interferences, especially those with high change frequency.

When frequency command selection (P00.06, P00.07) is 9, or voltage setting channel (P04.27) is 9, the running mode of VFD is process PID control.

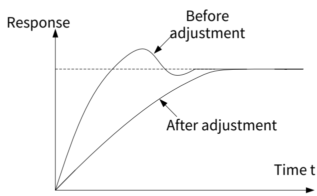
Function code	Name	Default	Setting range	Description
P09.06	Low frequency differential time (Td)	0.00s	0.00–10.00s	Used to determine the strength of the change ratio adjustment on the deviation of PID feedback and reference from the PID regulator. If the PID feedback changes 100% during the time, the adjustment of the differential regulator is the max. output frequency (P00.03) or the max. voltage (P04.31). Longer differential time indicates stronger adjustment.

- **How to fine-tune PID**

After setting the parameters controlled by PID, you can adjust these parameters by the following means.

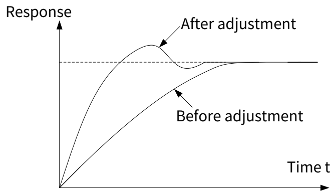
Control overshoot

When overshoot occurred, shorten the derivative time (Td) and prolong integral time (Ti).



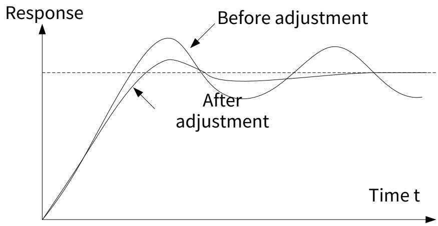
Stabilize the feedback value as fast as possible

When overshoot occurred, shorten integral time (Ti) and prolong derivative time (Td) to stabilize control as fast as possible.



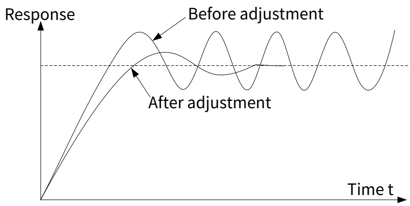
Control long-term oscillation

If the cycle of periodic oscillation is longer than the set value of integral time (Ti), it indicates the integral action is too strong, prolong the integral time (Ti) to control oscillation.



Control short-term oscillation

If the oscillation cycle is as short almost the same as the set value of differential time (Td), it indicates the differential action is too strong. Shorten the differential time (Td) to control oscillation. When the differential time (Td) is set to 0.00 (namely no differential control), and there is no way to control oscillation, decrease the proportional gain.



6.4.2.8 Frequency set through communication

You can set P00.06 or P00.07 to 10, 11, 12, 14, 15 to enable setting frequency through communication. For details, see chapter 7 Communication.

6.4.3 Frequency fine-tuning

The VFD supports frequency fine-tuning based on the set frequency. In some special scenarios, the channel frequency can be set to 0, and the frequency fine-tuning function can be used for frequency setting during the whole process.

Step 1 Select any of terminals DI1–DI4, HDI1, HDI2 as an external input terminal.

Step 2 Set P05.01–P05.04, P05.11–P05.12to select functions 10 or 11.

Function code	Name	Default	Setting range	Description
P05.01–P05.04	Function selection of multifunction digital input terminals (DI1–DI4)	1 4 7 0	0–95	10: Increase frequency setting (UP) 11: Decrease frequency setting (DOWN)
P05.11–P05.12	Function selection of multifunction digital input terminals (HDI1, HDI2)	0 0		
P08.46	UP/DOWN terminal control setting	0x000	0x000–0x221	Ones place: Whether the setting made through UP/DOWN is valid. 0: The setting made through UP/DOWN is valid. 1: The setting made through UP/DOWN is invalid. Tens place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority Hundreds place: Action selection for stop 0: Setting is valid.

Function code	Name	Default	Setting range	Description
				1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received
P08.47	Frequency integral rate of the UP terminal	0.50Hz/s	0.01Hz/s–P00.03/s	**Note:** The value is also used as the frequency increment or decrement that is made by pressing the UP/DOWN key on the LCD keypad.
P08.48	Frequency integral rate of the DOWN terminal	0.50Hz/s	0.01Hz/s–P00.03/s	

6.5 Speed control mode selection

The VFD supports four speed control modes. You can set P00.00 to select the speed control mode based on actual conditions. Before using a vector control mode (0, 1, or 3), set the motor nameplate parameters and perform motor parameter autotuning first. For details, See section 6.1.2 Rated motor parameter setting and section 6.2.1 Motor parameter autotuning.

Function code	Name	Default	Setting range	Description
P00.00	Speed control mode	2	0–3	0: SVC mode 0 1: SVC mode 1 2: Space voltage vector control mode 3: Closed-loop vector control mode

SVC mode 0: P00.00=0

In this case, there is no need to install encoders. It is applicable to scenarios with requirements for low frequency, great torque, and high speed control accuracy. It implements precise control of speed and torque. Relative to SVC mode 1, this mode is more applicable to the scenarios requiring medium and small power. For details, see Group P03 Vector control of motor 1.

Note: The SM in this mode is applicable to large-power low frequency running rather than ultra-high speed running.

SVC mode 1: P00.00=1

In this case, there is no need to install encoders. It is applicable to scenarios that require high speed control accuracy. It can be used across all power ranges, enabling precise control of speed and torque. For details, see Group P03 Vector control of motor 1.

Space voltage vector control mod: P00.00= 2

In this case, there is no need to install encoders. It can improve the control accuracy with the advantages of stable operation, valid low-frequency torque boost and current vibration suppression and the functions of slip compensation and voltage adjustment. For details, see Group P04 Motor 1 V/F control

Closed-loop vector control mode: P00.00=3

In this case, an encoder needs to be installed. It is applicable to the scenarios where great speed control and high current control accuracy are required. For details, see Group P20 Encoder of motor 1.

Note: The mode requires that the motor must be equipped with an encoder whose type is the same as the type of PG expansion card supported by the VFD.

6.6 Torque setting method selection

The VFD supports torque control and speed control. Speed control aims to stabilize the speed to keep the set speed consistent with the actual running speed, meanwhile, the max. load-carrying capacity is restricted by the torque limit. Torque control aims to stabilize the torque to keep the set torque consistent with the actual output torque, meanwhile, the output frequency is restricted by the upper and lower limits.

6.6.1 Torque setting method

Set P03.11 to select a torque setting method. The torque setting adopts a relative value, 100% corresponds to the motor rated current, and the setting range is -300.0%–300.0%. After giving the start command to the VFD, the VFD runs in the forward direction when the torque reference value is positive and in the reverse direction when the torque reference value is negative.

Function code	Name	Default	Setting range	Description
P03.11	Torque setting method selection of motor 1	0	0–25	0: P03.12 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved

Function code	Name	Default	Setting range	Description
				8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated torque setting channel for specialized equipment **Note:** For these settings, 100% corresponds to the motor rated current.
P03.12	Motor 1 torque set through keypad	20.0%	-300.0%–300.0%	The torque setting adopts a relative value, 100% corresponds to the motor rated current.
P03.13	Motor 1 torque reference filter time	0.010s	0.000–10.000s	-

6.6.2 Switching between speed control and torque control

There are two switching methods for speed control and torque control.

Method 1 Enable control switching

Set P03.32 to 0 for speed control or 1 for torque control.

Method 2 Switching through the multifunction digital input terminal signal selection and torque control enable selection

The steps for switching the multifunction digital input terminal signals are as follows.

Step 1 Select any of terminals DI1–DI4, HDI1, HDI2 as an external input terminal.

Step 2 Set P05.01–P05.04, P05.11–P05.12to select functions 29.

When the function 29 is valid, set P03.32 to 0 for torque control or 1 for speed control.

Note: When the speed and torque control switching terminals are valid, the control mode is the opposite of that selected in P03.32.

Function code	Name	Default	Setting range	Description
P03.32	Enabling torque control	0	0–1	0: Disable 1: Enable
P05.01–P05.04	Function selection of multifunction digital input terminals (DI1–DI4)	1 4 7 0	0–95	29: Switch between speed control and torque control
P05.11–P05.12	Function selection of multifunction digital input terminals (HDI1, HDI2)	0 0		

6.7 Start/stop settings

6.7.1 Start settings

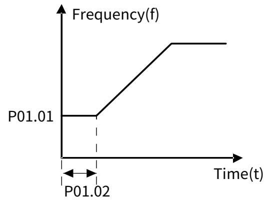
For a specific motor type and application scenario, you can select a starting mode by setting P01.00.

Function code	Name	Default	Setting range	Description
P01.00	Start mode	0	0–4	0: Direct start 1: Start after DC braking 2: Start after speed tracking (with exciting) 3: Start after speed tracking (without excitation) 4: Start after speed tracking (software) **Note:** This function is available for the 004G and above models.

Direct start: P01.00=0

If the braking time before start is 0, the VFD runs at the starting frequency of direct start (P01.01). This is often applicable to start from a still state. See the following figure.

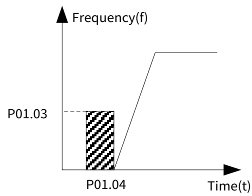
Direct start



Start after DC braking: P01.00=1

If the DC braking time is not 0, enable the motor to keep at a position by means of DC braking, and then perform ACC start. This is applicable to the scenarios with the motor in slight rotation before start. See the following figure.

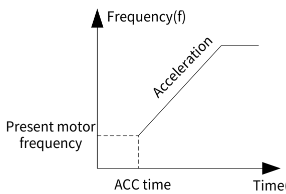
Start after DC brake



Start after speed tracking: P01.00=2, 3, or 4

The VFD searches for the current running frequency and direction of the motor and then controls the motor to run from the current frequency to the set frequency, implementing smooth running without impact. This is applicable to the scenarios with the motor in high-speed rotation or with transient grid voltage drop. See the following figure.

Start after speed tracking



Function code	Name	Default	Setting range	Description
P01.01	Starting frequency of direct start	0.50Hz	0.00Hz–P00.03	The function code indicates the initial frequency during VFD start. See P01.02 (Starting frequency hold time) for detailed information.
P01.02	Starting	0.0s	0.0–50.0s	Setting a proper starting frequency can

Function code	Name	Default	Setting range	Description
	frequency hold time			increase the torque during VFD start. During the hold time of the starting frequency, the output frequency of the VFD is the starting frequency. And then, the VFD runs from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the VFD stops running and keeps in the standby state. The starting frequency is not limited in the lower limit frequency.
P01.03	Braking current before start	0.0%	0.0–100.0%	The VFD performs DC braking with the braking current before start and it speeds up after the DC braking time. If the set DC braking time is 0, DC braking is invalid. Stronger braking current indicates larger braking power. The DC braking current before start is a percentage of the VFD rated output current.
P01.04	Braking time before start	0.00s	0.00–50.00s	
P01.23	Start delay	0.0s	0.0–600.0s	After a VFD running command is given, the VFD is in standby state and restarts with the start delay to implement brake release.
P01.30	Hold time of short-circuit braking for start	0.00s	0.00–50.00s	When the VFD starts in direct start mode (P01.00=0), set P01.30 to a non-zero value to enter short-circuit braking.

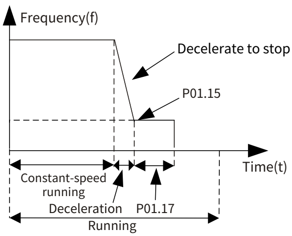
6.7.2 Stop settings

You can select a stop mode by setting P01.08.

Function code	Name	Default	Setting range	Description
P01.08	Stop mode	0	0–1	0: Decelerate to stop 1: Coast to stop

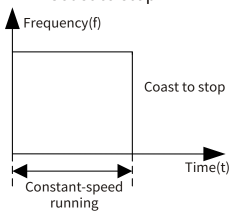
Decelerate to stop: P01.08=0

After a stop command takes effect, the VFD lowers output frequency based on the DEC mode and the defined DEC time; after the frequency drops to the stop speed (P01.15), the VFD stops.



Coast to stop: P01.08=1

After a stop command takes effect, the VFD stops output immediately. And the load coasts to stop according to mechanical inertia.



Note: If the set frequency is changed from higher than the frequency lower limit to lower than the frequency lower limit, the VFD takes the action specified by P01.19.

Function code	Name	Default	Setting range	Description
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	0x00	0x00–0x12	Ones place: Action selection 0: Run at the frequency lower limit 1: Stop 2: Sleep Tens place: Stop mode 0: Coast to stop 1: Decelerate to stop

If you need to achieve a fast and stable stop of the motor, the motor can be stopped by short circuit braking or DC braking after reaching the low speed frequency specified by P01.09.

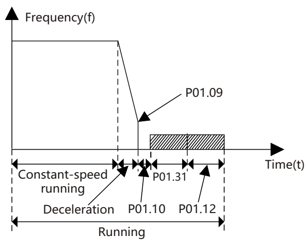
Function code	Name	Default	Setting range	Description
P01.09	Starting	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output

Function code	Name	Default	Setting range	Description
	frequency of DC braking for stop			frequency. During the deceleration to stop, the VFD starts DC braking for stop when the running frequency reaches the frequency specified by P01.09.

P01.09 = Non-zero value

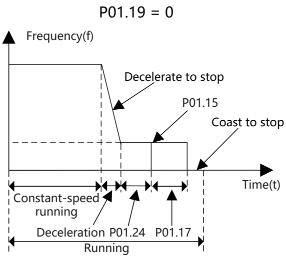
Short-circuit braking for stop and DC braking can be valid only with this setting. During decelerating to stop, if the running frequency of VFD is lower than the starting frequency of brake for stop (P01.09), the VFD waits for the demagnetization time P01.10 and checks the value of P01.31. If the value is a non-zero value, the VFD enters short-circuit braking for stop. Then the VFD checks the value of P01.12. If the value is a non-zero value, the VFD performs DC braking with the time specified by P01.12. When the DC braking time is reached, the VFD coasts to stop. If the value of P01.31 is zero, short-circuit braking for stop is invalid. Similarly, if the value of P01.12 is zero, DC braking for stop is invalid.

P01.09 = Non-zero value



P01.09 = Zero

The VFD decelerates to stop according to the normal process. When the ramp frequency is less than P01.15, the VFD performs stop determination with a delay specified by P01.24 according to the mode specified by P01.16. If P01.16=0, the VFD coasts to stop. If P01.16=1, the VFD needs to check whether the motor output frequency is less than P01.15. If yes, the VFD coasts to stop. If no, the VFD coasts to stop with a delay specified by P01.17.



The methods for fast decelerating to stop are as follows:

Method 1 Increase the VFD power to improve the VFD max. braking capability.

Method 2 Decelerate to the lower speed specified by P01.09 to enable short-circuit braking or DC braking.

Method 3 Set P08.50 to enable magnetic flux braking to accelerate the motor's deceleration tracking process.

Method 4 Add braking resistors.

Method 5 Set the S-curve deceleration method.

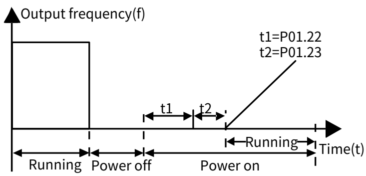
Function code	Name	Default	Setting range	Description
P01.10	Demagnetization time	0.00s	0.00–30.00s	The VFD blocks the output before starting DC braking for stop. The VFD starts DC braking after this time so as to prevent overcurrent caused by DC braking at high speed.
P01.11	DC braking current for stop	0.0%	0.0–100.0%	Percentage of the VFD rated output current. Stronger current indicates greater DC braking effect.
P01.12	DC braking time for stop	0.00s	0.0–50.0s	DC braking duration. If the time is 0, DC braking is invalid, and the VFD decelerates to stop within the specified time.
P01.15	Stop speed	0.50Hz	0.00Hz–P00.03	Specifies the stop speed (frequency).
P01.16	Stop speed detection mode	0	0–1	0: Detect by the set speed (unique in space voltage vector control mode) 1: Detect by the feedback speed
P01.17	Stop speed detection time	0.50s	0.00–100.00s	-

Function code	Name	Default	Setting range	Description
P01.24	Stop speed delay	0.0s	0.0–600.0s	-
P01.29	Short-circuit braking current	0.0%	0.0–150.0%	(of the VFD rated current)
P01.31	Hold time of short-circuit braking for stop	0.00s	0.00–50.00s	-

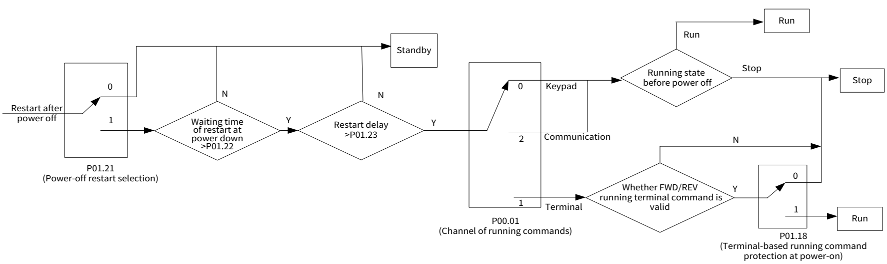
6.7.3 Power-off restart

For all command running channels, if P01.21=1, the VFD memorizes the running status at power off. If the VFD is running before power-off, the VFD automatically runs with a wait time specified by P01.22 at the next power-on when start conditions are met.

When terminals are uses as the command running channel, you need to set P01.18 to 1. The following figure shows the wait time for restart after power-off.



The following figure shows the logic flow:



Function code	Name	Default	Setting range	Description
P01.21	Power-off restart selection	0	0–1	0: Disable 1: Enable

Function code	Name	Default	Setting range	Description
P01.22	Wait time for restart after power-off	1.0s	0.0–3600.0s	Valid when P01.21 is 1. The function code indicates the wait time before the automatic running of the VFD that is re-powered on.
P01.23	Start delay	0.0s	0.0–600.0s	After a VFD running command is given, the VFD is in standby state and restarts with the delay defined by P01.23 to implement brake release.
P01.18	Terminal-based running command protection at power-on	0	0–1	0: The terminal running command is invalid at power-on 1: The terminal running command is valid at power-on **Note:** ● Valid only when P01.21 is set 0. ● Exercise caution before using this function. Otherwise, serious result may follow.

Terminal-based running command is invalid at power-on: P01.18= 0

Though the command running terminal is considered as valid during power-on, the VFD does not run and it keeps the protection state until the terminal is disabled and then enabled.

Terminal-based running command is valid at power-on: P01.18=1

If the command running terminal is considered as valid during power-on, the VFD is started automatically after the initialization.

6.8 Position settings

You can select a positioning mode by setting P21.00. The ones place of P21.00 specifies the control mode (1: position control), while the tens place specifies the position setting source. Different position setting sources correspond to different position giving methods, as listed in the following table.

Function code	Name	Default	Setting range	Description
P21.00	Positioning mode	0x0000	0x0000–0x3031	Ones place: Control mode selection (only for closed-loop vector control)

Function code	Name	Default	Setting range	Description
				0: Speed control 1: Position control Tens place: Position command source 0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop 3: Position JOG Hundreds place: Reserved Thousands place: Servo mode (Reserved) 0: Disable servo, without position deviation 1: Disable servo, with position deviation 2: Enable servo, without position deviation 3: Enable servo, with position deviation **Note:** In the pulse train or spindle positioning mode, the VFD enters the servo operation mode if there is a valid servo enabling signal. If there is no servo enabling signal, the VFD enter the servo operation mode only after it receives a forward running or reverse running command.

Pulse train position giving: P21.00=0x0001

Before using the pulse train to give the position, you need to set P21.01 to adjust the AB pulse form and direction.

Digital position giving: P21.00=0x0011

Before selecting digital position giving, you need to set P21.16 and P21.17 to set the position.

Function code	Name	Default	Setting range	Description
P21.01	Pulse command mode	0x0000	0x0000–0x3133	Ones place: Pulse mode 0: A/B quadrature pulse; A leads B 1: A is PULSE and B is SIGN If channel B is of low electric level, the edge counts up; if channel B is of high electric level, the edge counts down. 2: A is positive pulse Channel A is positive pulse; channel B needs no wiring 3: A/B dual-channel pulse; channel A pulse edge counts up, channel B pulse edge counts down Tens place: Pulse direction 0: Pulse direction setting: forward 1: Pulse direction setting: reverse 2: Pulse direction set by running direction 3: Pulse direction set by running direction Hundreds place: Frequency multiplication selection for pulse +direction (reserved) 0: No frequency multiplication 1: Frequency multiplication Thousands place: Pulse control selection 0: Inertia filter, without overspeed control 1: Average moving filter, without overspeed control 2: Inertia filter, with overspeed control 3: Average moving filter, with overspeed control **Note:** The numerator and denominator of the position command ratio are used to adjust the position relationship between the spindle and the motor shaft. When the

Function code	Name	Default	Setting range	Description
				spindle is not the motor shaft, set P21.11 (or P21.30) and P21.12 to match the position setting of the spindle. In position control mode, you can view P18.03, P18.04, P18.24, and P18.25 in P18 to check whether the position setting is correct.
P21.11	Numerator of position command ratio	1000	1–65535	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement.
P21.12	Denominator of position command ratio	1000	1–65535	-
P21.16	Digital positioning mode	0	0x0000–0xFFFF	Bit 0: Positioning mode 0: Relative position (Incremental command) 1: Absolute position (Positional command) Bit 1: Cyclic positioning setting. You can enable positioning through a terminal (function 55) or choose automatic cyclic positioning. Terminals support only the enabling of continuous positioning, and automatic cyclic positioning can be set to cyclic positioning or reciprocating positioning through bit 2 of P21.16. 0: Terminal-based cyclic positioning (function 55) 1: Automatic cyclic positioning Bit2: Cyclic mode 0: Continuous 1: Reciprocating (support the automatic cyclic positioning) Bit 3: P46.03+P21.17 digital setting mode. You can select incremental or position type. The incremental type

Function code	Name	Default	Setting range	Description
				indicates that P46.03+P21.17 needs to be conducted again after each positioning is enabled. When the position reference bit command is enabled, the displacement is set through P46.03+P21.17. When P46.03+P21.17 is changed, new position is be positioned automatically. 0: Incremental 1: Position type (do not support the continuous mode) Bit4: Origin searching mode. This function is reserved. 0: Search for the origin only for once 1: Search for the origin in every time of running Bit5: Origin calibration mode. This function is reserved. 0: Calibration in real time 1: One-time calibration Bit 6: Positioning completion signal setting. You can set the positioning completion signal in the pulse or electrical level form. The positioning completion signal is valid in the positioning completion signal holding time set in P21.25. 0: Valid in the positioning completion signal holding time (P21.25) 1: Always valid Bit 7: First positioning setting. You can set whether the first positioning is performed when a running command is received. If no, the first positioning is performed only after the positioning enabling terminal or automatic cyclic positioning is enabled. 0: Invalid 1: Valid

Function code	Name	Default	Setting range	Description
				Bit 8: Positioning enabling signal setting (for terminal-based cyclic positioning). In the pulse form, after positioning is completed or in the first positioning, the jump edge of the positioning enabling terminal needs to be detected for performing positioning. In the electrical level mode, after positioning is completed or in the first positioning, positioning is performed after it is detected that the positioning enabling terminal is switched on. 0: Pulse signal 1: Electrical level signal Bit 9: Position source 0: Set by P21.17+P46.03 1: Dp/CANopen/PROFINET/ Ethernet IP communication Bit 10: Indicates whether to save encoder pulse count value at power-off 0: No 1: Yes Bit11: Reserved Bit 12: Positioning curve setting (Reserved) 0: Straight line 1: S curve Bit13–bit15: Reserved
P21.17	Position set in digital mode (LSB)	0	0–65535	Used to set the position for digital positioning.
P21.30	Numerator of the 2nd command ratio	1000	1–65535	-
P18.03	Position reference value MSB	0	0–30000	It is cleared after stop.

Function code	Name	Default	Setting range	Description
P18.04	Position reference value LSB	0	0–65535	It is cleared after stop.
P18.24	High-order bit of PG card pulse reference count value	0	0–65535	Indicates the pulse command (A2, B2) count value. The count value is accumulated only if the VFD is powered on.
P18.25	Low-order bit of PG card pulse reference count value	0	0–65535	Indicates the pulse command (A2, B2) count value. The count value is accumulated only if the VFD is powered on.

6.9 Control performance regulation

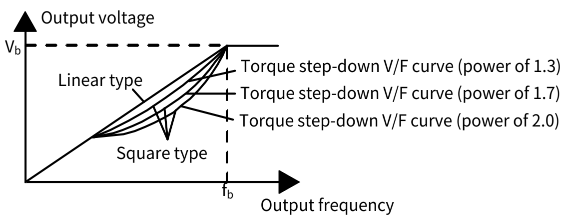
6.9.1 Space vector control performance optimization

6.9.1.1 V/F curve setting

The inverter provides multiple V/F curve modes to meet different requirements. You can select V/F curves or set V/F curves as required.

For the load featuring constant torque, such as conveyor belt which runs in straight line, as the whole running process requires constant torque, it is recommended to adopt the straight line V/F curve.

For the load featuring decreasing torque, such as fan and water pumps, as there is a power (square or cube) relationship between its actual torque and speed, it is recommended to adopt the V/F curve corresponding to the power of 1.3, 1.7 or 2.0.

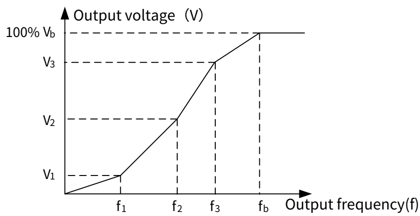


Note: In the figure, V_b indicates the motor rated voltage, and f_b indicates the motor rated frequency.

Function code	Name	Default	Setting range	Description

Function code	Name	Default	Setting range	Description
P04.00	V/F curve setting of motor 1	0	0–5	0: Straight-line V/F curve, applicable to constant torque loads 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) 5: Customized V/F (V/F separation); in this mode, V can be separated from F and F can be adjusted through the frequency setting channel set by P00.06 or the voltage setting channel set by P04.27 to change the characteristics of the curve.

The VFD also provides multi-point V/F curves. You can change the VFD output V/F curves by setting the voltage and frequency of the three points in the middle. A whole curve consists of five points starting from (0Hz, 0V) and ending at (motor fundamental frequency, motor rated voltage). During setting, follow the rule: 0 ⩽ f1 ⩽ f2 ⩽ f3 ⩽ Motor fundamental frequency, and 0 ⩽ V1 ⩽ V2 ⩽ V3 ⩽ Motor rated voltage Too high voltage for low frequency will cause motor overheat or damage and cause VFD overcurrent stall or overcurrent protection. When P04.00 is set to 1 (multi-dot V/F curve), you can set the V/F curve through P04.03–P04.08.



Function code	Name	Default	Setting range	Description
P04.03	V/F frequency point 1 of motor 1	0.00Hz	0.00Hz–P04.05	-
P04.04	V/F voltage point 1 of motor 1	0.0%	0.0%–110.0%	Rated voltage of motor 1
P04.05	V/F frequency point 2 of motor 1	0.00Hz	P04.03–P04.07	-
P04.06	V/F voltage point 2 of motor 1	0.0%	0.0%–110.0%	Rated voltage of motor 1

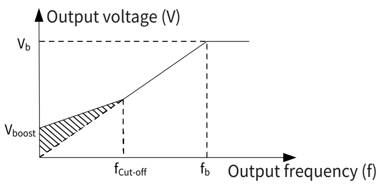
Function code	Name	Default	Setting range	Description
P04.07	V/F frequency point 3 of motor 1	0.00Hz	P04.05–P02.02 (rated frequency of AM 1) or P04.05–P02.16 (rated frequency of SM1)	-
P04.08	V/F voltage point 3 of motor 1	0.0%	0.0%–110.0%	Rated voltage of motor 1

6.9.1.2 Torque boost

Boost compensation to output voltage can effectively improve the low-speed torque performance in the V/F control. The cut-off frequency of manual torque boost is a percentage of the rated motor frequency f_b. Torque boost can improve the low-frequency torque characteristics in the V/F control.

You need to select torque boost based on the load. The load is proportional to the boost, but the boost cannot be too large. If the torque boost is too large, the motor will run at over-excitation, which may cause increased output current and motor overheating, thus decreasing the efficiency. The default torque boost is 0.0%, which indicates automatic torque boost so that the inverter can regulate the torque boost based on the actual load.

Set P04.01 to determine the torque boost of motor 1. Set P04.02 to determine the torque boost cut-off frequency of motor 1. Below this frequency threshold, torque boost is valid; exceeding this threshold will invalidate torque boost. See the following figure.



Function code	Name	Default	Setting range	Description
P04.01	Torque boost of motor 1	0.0%	0.0%–10.0%	0.0% (automatic torque boost); 0.1%–10.0% (manual torque boost) **Note:** V_b indicates the max. output voltage.
P04.02	Torque boost cut-off of motor 1	20.0%	0.0%–50.0%	The cut-off frequency of manual torque boost is a percentage of the rated motor frequency f_b. Torque

Function code	Name	Default	Setting range	Description
				boost can improve the low-frequency torque characteristics in the V/F control.

6.9.1.3 Energy-saving run

During actual running, the VFD can search for the max. efficiency point to keep running in the most efficient state to save energy. This function is generally used in light load or no-load cases. Set P04.32 to specify whether to act in energy-saving run.

Function code	Name	Default	Setting range	Description
P04.32	V/F control energy-saving mode selection for AM 1	0	0–3	0: Disable (Energy-saving is ineffective) 1: Max. efficiency 2:Optimal power factor 3: Max. torque per ampere (MTPA) In light-load state, the motor can adjust the output voltage automatically to achieve energy saving. This function is no applicable to the cases where sudden load changes often occur.

6.9.1.4 V/F slip compensation gain

The V/F control is an open-loop mode, while a sudden motor load change will cause motor rotation speed fluctuation. In cases where strict speed requirements must be met, you can set the slip compensation gain through P04.09 to change the inverter internal output adjustment method and therefore compensate for the speed change caused by load fluctuation, improving the motor mechanical rigidity.

The formula used to calculate the motor rated slip frequency is as follows: $\triangle f=f_b-n*p/60$

Of which, "f_b" is the rated frequency of the motor 1, corresponding to the parameter P02.02. "n" is the rated rotating speed of the motor 1, corresponding to the parameter P02.03. "p" is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency $\triangle f$ of motor 1.

Function code	Name	Default	Setting range	Description
P04.09	V/F slip compensation gain of motor 1	100.0%	0.0–200.0%	100% corresponds to the rated slip frequency.

Note: Rated slip frequency = (Rated synchronous rotation speed of motor – Rated rotation speed of motor) x (Number of motor pole pairs)/60.

6.9.1.5 Oscillation control

In large-power driving scenarios, using the space voltage vector control mode will cause motor oscillation, which can be eliminated by setting P04.10 and P04.11, while the oscillation control threshold of motor 1 is specified by P04.12.

Function code	Name	Default	Setting range	Description
P04.10	Low-frequency oscillation control factor of motor 1	10	0–100	Setting a greater value indicates better control effect. However, if the value is too large, the VFD output current may be too large.
P04.11	High-frequency oscillation control factor of motor 1	10	0–100	
P04.12	Oscillation control threshold of motor 1	30.00Hz	0.00Hz–P00.03	

6.9.1.6 AM IF control

The following uses AM 1 for example, which is similar to AM 2.

Generally, the IF control mode is valid for AMs. It can be used for SMs only when the frequency is extremely low. IF control is implemented by performing closed-loop control on the total output current of the VFD. The output voltage adapts to the current reference, and open-loop control is separately performed over the frequency of the voltage and current. Set P04.26 to 1 to enable the IF mode for AM 1. You can set related parameters when the IF mode is enabled.

Function code	Name	Default	Setting range	Description
P04.26	Enabling IF mode for AM 1	0	0–1	0: Invalid 1: Enable
P04.27	Current setting in IF mode for AM 1	120.0%	0.0–200.0%	When IF control is adopted for AM 1, the function code is used to set the output current. The value is a percentage of the motor rated current.
P04.28	Proportional coefficient in IF	350	0–5000	When IF control is adopted for AM 1, the function code is used to set the

Function code	Name	Default	Setting range	Description
	mode for AM 1			proportional coefficient of the output current closed-loop control.
P04.29	Integral coefficient in IF mode for AM 1	150	0–5000	When IF control is adopted for AM 1, the function code is used to set the integral coefficient of the output current closed-loop control.
P04.30	IF switch-out frequency point for AM 1	10.00Hz	0.00–P04.31	-
P04.31	End frequency point for switching off IF mode for motor 1	25.00Hz	P04.30–P00.03	-

6.9.1.7 Reactive current regulation in SM V/F control

When the SM V/F control mode is enabled, you can set P04.34 to specify the frequency threshold for the switching between pull-in current 1 and pull-in current 2. When the output frequency is less than or equal to P04.36, the motor reactive current is specified by P04.34; when the output frequency is greater than P04.36, the motor reactive current is specified by P04.35.

Function code	Name	Default	Setting range	Description
P04.20	Pull-in current 1 in SM 1 V/F control	30.0%	100.0%–100.0%	
P04.21	Pull-in current 2 in SM 1 V/F control	10.0%	100.0%–100.0%	-
P04.22	V/F control pull-in current frequency switching point for SM 1	20.0%	0.0%–200.0%	-
P04.23	Reactive current closed-loop proportional coefficient in SM 1 V/F control	50	0–500	When the SM VF control mode is enabled, the function code is used to set the proportional coefficient of reactive current closed-loop control.
P04.24	V/F control reactive current	30	0–300	When the SM VF control mode is enabled, the function code is used

Function code	Name	Default	Setting range	Description
	closed-loop integral time for SM 1			to set the integral coefficient of reactive current closed-loop control.

6.9.1.8 V/F flux weakening performance optimization

When the AM needs to run with flux weakened, set P04.19 in the V/F control mode to increase the output voltage and maximize the bus voltage utilization, improving the motor acceleration time.

Function code	Name	Default	Setting range	Description
P04.19	Weakening coefficient in constant power zone (V/F)	1.00	1.00–1.30	-

6.9.2 Vector control performance optimization

6.9.2.1 Torque upper limit setting

Speed control and torque control in the vector control mode are restricted by torque upper limits. When you set P03.18 (Setting source of electromotive torque upper limit) to keypad, the torque upper limit is specified by P03.20. When you set P03.19 (Setting source of braking torque upper limit) to keypad, the torque upper limit is specified by P03.21.

Function code	Name	Default	Setting range	Description
P03.18	Setting source of motor 1 electromotive torque upper limit	0	0–25	0: P03.20 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication

Function code	Name	Default	Setting range	Description
				12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated electromotive torque upper limit for specialized equipment **Note:** For these settings, 100% corresponds to the motor rated current.
P03.19	Setting source of motor 1 braking torque upper limit	0	0–25	0: P03.21 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved

Function code	Name	Default	Setting range	Description
				23: EHDI1 24: Reserved 25: Dedicated braking torque upper limit for specialized equipment **Note:** For these settings, 100% corresponds to the motor rated current.
P03.20	Motor 1 electromotive torque upper limit set through keypad	180.0%	0.0–300.0% (of the motor rated current)	Used to set torque limits.
P03.21	Motor 1 braking torque upper limit set through keypad	180.0%	0.0–300.0% (of the motor rated current)	

6.9.2.2 Frequency upper limit settings in torque control

In torque control, the VFD outputs torque according to the set torque command. When the set torque is greater than the load torque, the VFD output frequency increases to the frequency upper limit; when the set torque is less than the load torque, the VFD output frequency decreases to the frequency lower limit; when the VFD output frequency is restricted, the output torque will no longer be the same as the set torque. When you set P03.14 to set the setting source of forward rotation upper-limit frequency in torque control, the torque limit is specified by P03.16. When you set P03.15 to set the setting source of reverse rotation upper-limit frequency in torque control, the torque limit is specified by P03.17.

Function code	Name	Default	Setting range	Description
P03.14	Setting source of motor 1 forward rotation frequency upper limit in torque control	0	0–25	0: P03.16 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved

Function code	Name	Default	Setting range	Description
				8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated forward rotation frequency upper limit in torque control for specialized equipment **Note: For setting sources 1–25, 100% corresponds to the max. frequency.**
P03.15	Setting source of motor 1 reverse rotation frequency upper limit in torque control	0	0–25	0: P03.17 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved

Function code	Name	Default	Setting range	Description
				14: EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated reverse rotation frequency upper limit in torque control for specialized equipment **Note: For setting sources 1–25, 100% corresponds to the max. frequency.**
P03.16	Motor 1 forward rotation frequency upper limit set through keypad in torque control	50.00Hz	0.00Hz–P00.03	Used to set the frequency upper limit. P03.16 sets the value when P03.14=0; P03.17 sets the value when P03.15=0.
P03.17	Motor 1 reverse rotation frequency upper limit set through keypad in torque control			

6.9.2.3 Speed loop

The following uses motor 1 for example, which is similar to motor 2.

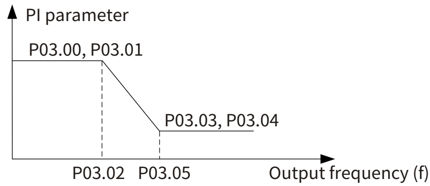
The speed loop dynamic response characteristics in vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator.

The dynamic response of speed regulator can be accelerated by increasing the proportional gain or decreasing the integral time. However, too quick dynamic response of speed regulator can cause oscillations.

Recommended adjustment method: If the default settings can not meet the requirements, adjust the settings slightly. First, increase the proportional gain to ensure that the system does not oscillate; and then reduce the integration time, so that the system responds fast with small overshoot.

Improper PI parameter settings will cause large speed overshoot.

The switchover between the low-point frequency for switching and the high-point frequency for switching indicates the linear switchover between two groups of PI parameters. See the following figure.



Function code	Name	Default	Setting range	Description
P03.00	Speed-loop proportional gain 1 of motor 1	20.0	0.0–200.0	Speed loop PI parameters are divided into the low-speed group and high-speed group. When the running frequency is less than P03.02 (Low-point frequency for speed-loop switching of motor 1), the speed loop PI parameters are P03.00 and P03.01. When the output frequency P17.01 is greater than P03.05 (High-point frequency for speed-loop switching of motor 1), the speed loop PI parameters are P03.03 and P03.04.
P03.01	Speed-loop integral time 1 of motor 1	0.200s	0.000–10.000s	
P03.02	Low-point frequency for speed-loop switching of motor 1	5.00Hz	0.00Hz–P03.05	
P03.03	Speed-loop proportional gain 2 of motor 1	20.0	0.0–200.0	
P03.04	Speed-loop integral time 2 of motor 1	0.200s	0.000–10.000s	-
P03.05	High-point frequency for speed-loop switching of motor 1	10.00Hz	P03.02–P00.03	-
P03.06	Speed-loop output filter of motor 1	0	0–8	-
P03.36	Speed-loop differential gain of	0.00s	0.00–10.00s	-

Function code	Name	Default	Setting range	Description
	motor 1			

6.9.2.4 Current loop

The following uses motor 1 for example, which is similar to motor 2.

In vector control mode, the current loop bandwidth is set by P03.54.

Function code	Name	Default	Setting range	Description
P03.54	Current-loop band width of motor 1	400	0–2000	Smaller current-loop band width indicates slower response but better current waveform.

6.9.2.5 Position loop

Set P21.04 to select the mode for switching between position-loop gains.

Function code	Name	Default	Setting range	Description
P21.04	APR gain switchover mode	0	0: No switchover 1: Torque command 2: Speed command 3–5: Reserved	-

No switchover: P21.04=0

Position-loop gain 1 is used by default.

Torque command: P21.04=1

When the output torque is greater than P21.05, the VFD automatically switches to position-loop gain 2; when the output torque is equal to or less than P21.05, the VFD automatically switches to position-loop gain 1.

Speed command: P21.04=2

When the running rotation speed is greater than P21.06, the VFD automatically switches to position-loop gain 2; when the running rotation speed is equal to or less than P21.06, the VFD automatically switches to position-loop gain 1.

Function code	Name	Default	Setting range	Description
P21.02	APR gain 1	20.0	0.0–400.0	The two automatic position regulator (APR) gains are switched based on the switching mode set through P21.04. When
P21.03	APR gain 2	30.0		

Function code	Name	Default	Setting range	Description
				the spindle orientation function is used, the gains are switched automatically, regardless of the setting of P21.04. P21.03 is used for dynamic running, and P21.02 is used for maintaining the locked state.
P21.05	Position gain switchover threshold in torque command	10.0%	0.0–100.0% (of motor rated torque)	-
P21.06	Position gain switchover threshold in speed command	10.0%	0.0–100.0% (Motor rated speed)	-
P21.07	Smooth filter coefficient for gain switchover	5	0–15	Smooth filter coefficient for APR gain switchover.

Note: Increasing the position-loop gain can improve the response, but too great position-loop gain will lead to system oscillation. Reasonable switchover between the two position-loop gains can improve the stability in high-low frequency or heavy-light load running.

6.9.2.6 Position control performance optimization

When P21.00=0x0001 (pulse train giving the position), you can set P21.02–P21.07 and P21.13 to increase the position feedforward gain to increase the response.

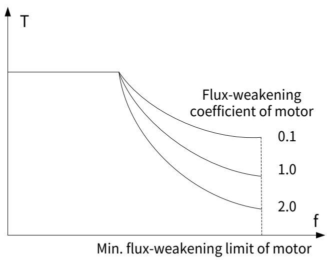
Function code	Name	Default	Setting range	Description
P21.13	Position feedforward gain	100.00	0.00–120.00%	For pulse train giving only (in position control); the position feedforward gain cannot be too great.
P21.14	Position feedforward filter time	3.0ms	0.0–3200.0ms	For pulse train giving only (in position control)

Function code	Name	Default	Setting range	Description
	constant			
P21.15	Position command filter time constant	0.0ms	0.0–3200.0ms	Position feedforward filter time constant during the pulse train positioning.

6.9.2.7 Vector control flux weakening performance optimization

When running at a speed higher than the rated speed, the AM enters the flux weakening state. You can set P03.22 to change the flux-weakening curvature. A great flux-weakening control coefficient indicates a steep curve. The weakening coefficient in constant power zone is used in AM flux-weakening control, while the flux-weakening proportional gain and flux-weakening integral gain are specified by P03.26 and P03.33. The max. VFD output voltage is specified by P03.24.

If pre-exciting is performed for the motor when the VFD starts up, a magnetic field is built up inside the motor to improve the torque performance during the start process. The pre-exciting time is specified by P03.25.



Function code	Name	Default	Setting range	Description
P03.22	Weakening coefficient in constant power zone	1.0	0.1–2.0	Used when the AM is in flux-weakening control; the lowest weakening point in constant power zone is specified by P03.23.
P03.23	Lowest weakening point of AM in constant power zone	10%	5%–100%	
P03.24	Max. voltage limit	100.0%	0.0–120.0%	Used to set the max. VFD output voltage, which is a percentage of

Function code	Name	Default	Setting range	Description
				the motor rated voltage. Set the value according to onsite conditions.
P03.25	Pre-exciting time	0.300s	0.000–10.000s	Pre-exciting is performed for the motor when the VFD starts up. A magnetic field is built up inside the motor to improve the torque performance during the start process.
P03.26	Flux-weakening proportional gain	1000	0–8000	-
P03.33	Flux-weakening integral gain	100.0%	0.0–300.0%	-

6.9.2.8 SM start control optimization

In closed-loop vector control mode, the autotuned initial magnetic pole angle is saved to P20.10, which can be directly used on the next startup without repeated autotuning. In a scenario with an incremental encoder stalled, each time after power-on, the static autotuning of initial magnetic pole angle is performed for the first startup, but the autotuned angle can be directly used for the next startup.

Function code	Name	Default	Setting range	Description
P20.10	Pole initial angle	0.00	0.00–359.99	Relative electric angle between the encoder position and the motor pole position.

In the open-loop control mode, you can select a start control method by setting P13.01.

Function code	Name	Default	Setting range	Description
P13.01	Detection mode of initial pole	2	0: No detection 1: High frequency superposition 2: Pulse superposition	-

No detection: P13.01=0

The VFD startup command given is a direct startup command. In this mode, set P13.02 to a great value to increase the starting torque, which causes a start reversal phenomenon with an average load carrying capacity.

High frequency superimposition: P13.01=1

If a VFD startup command is given, the VFD autotunes the initial pole angle by means of high-frequency current injection and then automatically starts up after the autotuning. When P13.02 is valid and the initial pole angle based direction setting is accurate, the reverse rotation problem can be weakened or eliminated, but also the load carrying capacity can be improved. This time you can adjust the high-frequency injection current by setting P13.13.

Pulse superimposition: P13.01=2

This method is similar to that when P13.01=1. The difference is that the initial pole angle autotuning method is different. This method has higher identification accuracy with shorter time but sharper noise, but you can adjust the pulse current value by setting P13.06.

Function code	Name	Default	Setting range	Description
P13.02	Pull-in current 1	30.0%	-100.0%–100.0% (of the motor rated current)	Pull-in current is the pole position orientation current; pull-in current 1 is valid within the lower limit of pull-in current switch-over frequency threshold. If you need to increase the start torque, increase the value of this function parameter properly.
P13.06	Pulse current setting	80.0%	0.0–300.0% (of the motor rated current)	Used to set the pulse current threshold when the initial magnetic pole position is detected in the pulse mode.
P13.13	High-frequency pull-in current	20.0%	0.0–300.0% (of the VFD rated current)	Used to set the pulse current threshold when the initial magnetic pole position is detected in the high-frequency current injection mode.

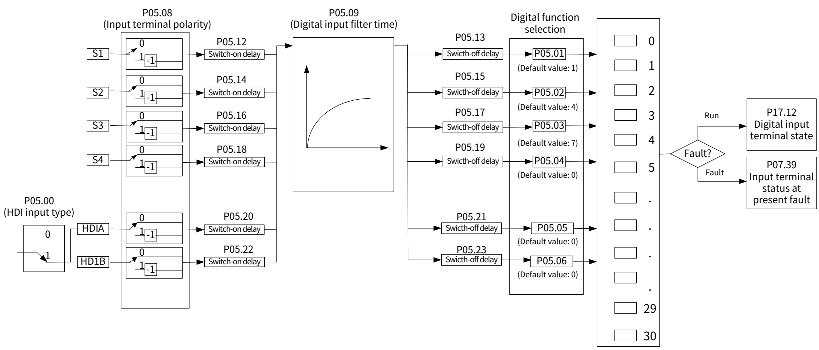
6.10 Input and output

6.10.1 Digital input and output

6.10.1.1 Digital input

The VFD carries four programmable digital input terminals and two HDI input terminals. The function of all the digital input terminals can be programmed through function codes. HDI input terminal can be set to act as high-speed pulse input terminal or common digital input terminal; if it is set to act as high-speed pulse input terminal, you can also set HDI1 or HDI2 high-speed pulse input to serve as the frequency reference and encoder signal input.

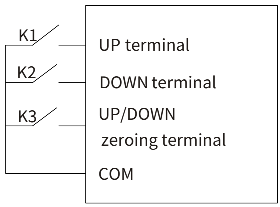
Note: For the wiring method, see section 4.4.3 Input/output signal connection diagram.



Note: Two different multifunction input terminals cannot be configured with a same function.

P05.01–P05.04, P05.11–P05.12 are used to set the functions of digital multifunction input terminals. Terminal functions are set as follows.

Setting	Function	Description
0	No function	The VFD does not act even if there is signal input. Set unused terminals to "no function" to avoid misaction.
1	Run forward	External terminals are used to control the forward/reverse running of the inverter.
2	Run reversely	
3	Three-wire running control (DI_{in})	Used to determine the three-wire system running control of the VFD. For details, see the description for P05.13.
4	Jog forward	For details about frequency of jogging running and ACC/DEC time of jogging running, see the description for P08.06, P08.07, and P08.08.
5	Jog reversely	
6	Coast to stop	The inverter blocks output, and the stop process of motor is

Setting	Function	Description
		uncontrolled by the inverter. This mode is applied in the scenarios with large-inertia loads and without stop time requirements. Its definition is the same as P01.08, and it is mainly used in remote control.
7	Fault reset	External fault reset function, same as the reset function of the STOP/RST key on the keypad. You can use this function to reset faults remotely.
8	Pause running	The inverter decelerates to stop, however, all the run parameters are in memory state, such as PLC parameter, wobbling frequency, and PID parameter. After this signal disappears, the inverter will revert to the state before stop.
9	External fault input	When external fault signal is transmitted to the inverter, the inverter releases fault alarm and stops.
10	Increase frequency setting (UP)	Used to change the frequency increase/decrease command when the frequency is given by external terminals.
12	Decrease frequency setting (DOWN)	
12	Clear the frequency increase/decrease setting	 The terminal used to clear frequency-increase/decrease setting can clear the frequency value of auxiliary channel set by UP/DOWN, thus restoring the reference frequency to the frequency given by main reference frequency command channel.
13	Switch between A setting and B setting	The function is used to switch between the frequency setting channels. A frequency reference channel and B frequency reference channel can be switched by function 13; the combination channel set by P00.09 and the A frequency reference channel can be switched by function 14; the combination channel set by P00.09 and the B frequency reference channel can be switched by function 15.
14	Switch between combination setting and A setting	
15	Switch between combination setting and B setting	
16	Multi-step speed terminal 1	A total of 16-step speeds can be set by combining digital states of these four terminals. **Note:** Multi-step speed 1 is the LSB, and multi-step speed
17	Multi-step speed	

<table>
<tr><th>Setting</th><th>Function</th><th>Description</th></tr>
<tr><td></td><td>terminal 2</td><td rowspan="3">4 is the MSB.<table><tr><th>Multi-step speed 4</th><th>Multi-step speed 3</th><th>Multi-step speed 2</th><th>Multi-step speed 1</th></tr><tr><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr></table></td></tr>
<tr><td>18</td><td>Multi-step speed terminal 3</td></tr>
<tr><td>19</td><td>Multi-step speed terminal 4</td></tr>
<tr><td>20</td><td>Pause multi-step speed running</td><td>The multi-step speed selection function can be screened to keep the set value in the present state.</td></tr>
<tr><td>21</td><td>ACC/DEC time selection 1</td><td rowspan="2">The status of the two terminals can be combined to select four groups of ACC/DEC time.<table><tr><th>Terminal 1</th><th>Terminal 2</th><th>ACC/DEC time</th><th>Parameter</th></tr><tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 1</td><td>P00.11/P00.12</td></tr><tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2</td><td>P08.00/P08.01</td></tr><tr><td>OFF</td><td>ON</td><td>ACC/DEC time 3</td><td>P08.02/P08.03</td></tr><tr><td>ON</td><td>ON</td><td>ACC/DEC time 4</td><td>P08.04/P08.05</td></tr></table></td></tr>
<tr><td>22</td><td>ACC/DEC time selection 2</td></tr>
<tr><td>23</td><td>Simple PLC stop reset</td><td>Used to clear the previous PLC state memory information and restart the simple PLC process.</td></tr>
<tr><td>24</td><td>Pause simple PLC</td><td>Used to pause the simple PLC. When the function is revoked, the simple PLC resumes the running.</td></tr>
<tr><td>25</td><td>Pause PID control</td><td>PID is ineffective temporarily, and the VFD maintains current frequency output.</td></tr>
<tr><td>26</td><td>Pause wobbling frequency (stopped at the present frequency)</td><td>The VFD pauses at current output. After this function is canceled, it continues wobbling-frequency operation at current frequency.</td></tr>
<tr><td>27</td><td>Reset wobbling frequency (returned to the center frequency)</td><td>The set frequency of VFD reverts to center frequency.</td></tr>
<tr><td>28</td><td>Reset the counter</td><td>The counter is cleared.</td></tr>
<tr><td>29</td><td>Switch between speed control and torque control</td><td>The VFD switches from torque control mode to speed control mode, or vice versa.</td></tr>
<tr><td>30</td><td>Disable ACC/DEC</td><td>Used to ensure the VFD is not impacted by external signals (except for stop command), and maintains the present output frequency.</td></tr>
<tr><td>31</td><td>Trigger the counter</td><td>Used to enable the counter to count pulses.</td></tr>
<tr><td>32</td><td>Motor switchover</td><td>When the function is enabled, you can realize switchover</td></tr>
</table>

Setting	Function	Description
	terminal 1	control of two motors.
34	DC braking	The VFD starts DC brake immediately after the command becomes valid.
35	Clear the frequency increase/decrease setting temporarily	When the terminal is closed, the frequency value set by the UP/DOWN key can be cleared and restored to the frequency given by frequency command channel; when the terminal is opened, it is changed to the frequency value after frequency increase/decrease setting.
36	Switch the running command channel to keypad	When the function is enabled, the running command channel is switched to keypad. When the function is disabled, the running command channel is restored to the previous setting.
37	Switch the running command channel to terminal	When the function is enabled, the running command channel is switched to terminal. When the function is disabled, the running command channel is restored to the previous setting.
38	Switch the running command channel to communication	When the function is enabled, the running command channel is switched to communication. When the function is disabled, the running command channel is restored to the previous setting.
39	Pre-exciting command	When the function is enabled, motor pre-exciting is started until the function becomes invalid.
40	Clear power consumption quantity	After this command becomes valid, the power consumption quantity of the VFD will be zeroed out.
41	Keep power consumption quantity	When the function is enabled, the present operation of the VFD does not impact the power consumption quantity.
42	Switch the setting source of braking torque upper limit to keypad	The torque upper limit is set through the keypad when the command is valid.
43	Position reference point input	Only valid for DI2, DI3, and DI4.
44	Disable spindle orientation	Spindle positioning is disabled.
45	Spindle zeroing / Local positioning zeroing	Trigger the spindle positioning function.

Setting	Function	Description
46	Spindle zeroing position selection 1	Spindle zeroing position 1 selected through terminal.
47	Spindle zeroing position selection 2	Spindle zeroing position 2 selected through terminal.
48	Spindle indexing selection 1	Spindle indexing value 1 selected through terminal.
49	Spindle indexing selection 2	Spindle indexing value 2 selected through terminal.
50	Spindle indexing selection 3	Spindle indexing value 3 selected through terminal.
51	Terminal for switching between position control and speed control	Switch between position control and speed control.
52	Disable pulse input	When the terminal is active, the pulse input is invalid.
53	Clear position deviation	Clear the input deviation of the position loop.
54	Switch position proportional gains	Switch the position proportional gains.
55	Enable cyclic digital positioning	Enabling cyclic positioning function in digital position positioning mode.
56	Emergency stop	When the function is enabled, the motor decelerates to stop in emergency manner according to the time specified by P01.26.
57	Motor overtemperature fault input	When there is motor overtemperature fault input, the motor stops due to the fault.
58	Enable rigid tapping	
59	Switch FVC to V/F control	When the function is enabled in stopped state, space voltage vector control is used.
60	Switch to VC control	When the function is enabled in stopped state, VC is used.
61	Switch PID polarities	Switching the output polarity of PID, this terminal should be used in conjunction with P09.03.
63	Enable servo	When the thousands place of P21.00 is set to enable servo, the servo enabling terminal is valid, which controls the VFD to enter zero servo control. At this time, the start command is not needed.
64	FWD max. limit	Max frequency limit on forward rotation.

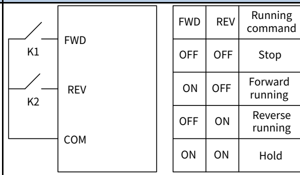
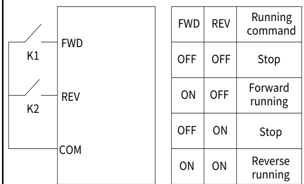
Setting	Function	Description
65	REV max limit	Max frequency limit on reverse rotation.
66	Zero out the counter	Zero out the position counting value.
67	Pulse increase	If the terminal is valid when the function is selected, the pulse input is increased according to P21.27 (Pulse superposition speed).
68	Enable pulse superposition	When the pulse superimposition is enabled, pulse⊠ increase and pulse decrease are effective.
69	Pulse decrease	If the terminal is valid when the function is selected, the pulse input is decreased according to P21.27 (Pulse superposition speed).
70	Electronic gear selection	When the terminal is valid, the proportional numerator is switched to the P21.30 numerator of the 2nd command ratio.
71	Switch to the master	When the function is enabled in stopped state, the unit switches to the master mode.
72	Switch to the slave	When the function is enabled in stopped state, the unit switches to the slave mode.
73	Rolling diameter reset in tension control	If the terminal is valid when the tension-specific function is used, the terminal resets the roll diameter.
74	Winding/unwinding switchover in tension control	If the terminal is valid when the tension-specific function is used, the terminal switches between the winding mode and unwinding mode.
75	Tension control pre-driving	If the terminal is valid when the tension-specific function is used, the VFD performs tension control pre-driving.
76	Disabling roll diameter calculation in tension control	If the terminal is valid when the tension-specific function is used and the terminal is valid, the VFD does not calculate the roll diameter.
77	Clearing alarm display in tension control	If the terminal is valid when the tension-specific function is used, tension alarm display is cleared.
78	Manual braking in tension control	If the terminal is valid when the tension-specific function is used, manual braking is allowed.
79	Triggering a forcible material feeding interrupt signal in tension control	If the terminal is valid when the tension-specific function is used, the VFD triggers a forcible material feeding interrupt signal.
80	Initial roll diameter	If the terminal is valid when the tension-specific function is

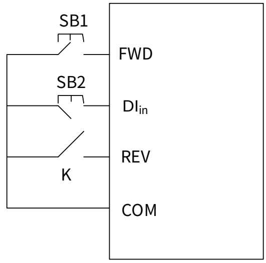
Setting	Function	Description
	selection 1 in tension control	used, initial roll diameter 1 and initial roll diameter 2 are combined for different initial roll diameter selection. For detailed descriptions, see function codes P41.15–P41.19.
81	Initial roll diameter selection 2 in tension control	
82	Triggering fire control	If the terminal is valid when the fire mode is enabled, the VFD triggers a fire control signal.
83	PID switchover in tension control	If the terminal is valid when the tension-specific function is used, the terminal switches from the first group of PID parameter to the second group. The first group is the default PID parameter group.
84	PID pause in tension control	If the terminal is valid when the tension-specific function is used, PID is ineffective temporarily, and the VFD maintains current frequency output.
85	Tension control thickness switchover selection 1	If the terminal is valid when the tension-specific function is used, selections 1 and 2 can be combined to switch between four groups of thickness parameters P41.34–P41.37.
86	Tension control thickness switchover selection 2	
87	Clearing length in tension control	If the terminal is valid when the tension-specific function is used, the terminal is used to clear the calculated material length.
89	Switching between open-loop torque mode and closed-loop speed mode	If the terminal is valid when the tension-specific function is used, the terminal is used to switch between open-loop torque mode and closed-loop speed mode.
90	Clearing residual pulses	

Related parameters are listed in the following.

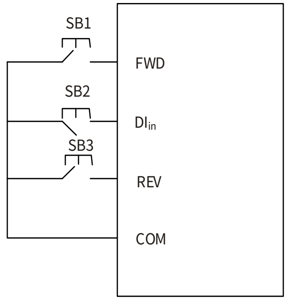
Function code	Name	Default	Setting range	Description
P05.00	HDI input type	0x00	0x00–0x22	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2

Function code	Name	Default	Setting range	Description
				Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1
P05.01	Function of DI1	1	0–95	For details, see the preceding table.
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		
P05.14	Input terminal polarity selection	0x000	0x000–0xFFF	Used to set the input terminal polarity. When a bit is 0, the input terminal is positive; when a bit is 1, the input terminal is negative.
P05.15	Digital input filter time	0.010s	0.000–1.000s	Used to specify the sampling filter time of the DI1–DI4, HDI1, and HDI2 terminals. In strong interference cases, increase the value to avoid maloperation.
P05.16	Virtual terminal setting	0x00	0x000–0xFFF	Bit0: DI1 virtual terminal Bit1: DI2 virtual terminal Bit2: DI3 virtual terminal Bit3: DI4 virtual terminal Bit10: HDI1 virtual terminal Bit11: HDI2 virtual terminal
P05.17	Terminal control mode	0	0.000–50.000s	Used to set the terminal control mode. 0: Two-wire control 1, the enabling consistent with the direction. This mode is widely used. The defined FWD/REV terminal command determines the motor rotation direction.
P05.18	DI1 switch-on delay	0.000s		
P05.19	DI1 switch-off delay	0.000s		
P05.20	DI2 switch-on delay	0.000s		
P05.21	DI2 switch-off delay	0.000s		
P05.22	DI3 switch-on delay	0.000s		
P05.23	DI3 switch-off delay	0.000s		
P05.24	DI4 switch-on delay	0.000s		

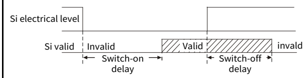
Function code	Name	Default	Setting range	Description
P05.25	DI4 switch-off delay	0.000s		 1: Two-wire control 2, the enabling separated from the direction. In this mode, FWD is the enabling terminal. The direction depends on the defined REV state.  2: Three-wire control 1. This mode defines DI_{in} as the enabling terminal, and the running command is generated by FWD, while the direction is controlled by REV. During running, the DI_{in} terminal needs to be closed, and when terminal FWD generates a rising edge signal, the VFD starts to run in the direction set by the state of terminal REV; the VFD needs to be stopped by disconnecting terminal DI_{in}.
P05.38	HDI1 switch-on delay	0.000s		
P05.39	HDI1 switch-off delay	0.000s		
P05.40	HDI2 switch-on delay	0.000s		
P05.41	HDI2 switch-off delay	0.000s		

<table>
<tr><th>Function code</th><th>Name</th><th>Default</th><th>Setting range</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td></td><td>


The direction control is as follows during running:
<table>
<tr><th>DIin</th><th>REV</th><th>Previous direction</th><th>Present direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF →ON</td><td>FWD run</td><td>REV run</td></tr>
<tr><td>REV run</td><td>FWD run</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">ON→ OFF</td><td>REV run</td><td>FWD run</td></tr>
<tr><td>FWD run</td><td>REV run</td></tr>
<tr><td rowspan="2">ON→ OFF</td><td>ON</td><td colspan="2" rowspan="2">Decelerate to stop</td></tr>
<tr><td>OFF</td></tr>
</table>
DIin: Three-wire control; FWD: Forward running; REV: Reverse running
3: Three-wire control 2. This mode defines DIin as the enabling terminal, and the running command is generated by FWD or REV, but the direction is controlled by both FWD and REV. During running, the DIin terminal needs to be closed, and terminal FWD or REV generates a rising edge signal to control the running and direction of the VFD; the VFD needs to be stopped by disconnecting terminal DIin.
</td></tr>
</table>

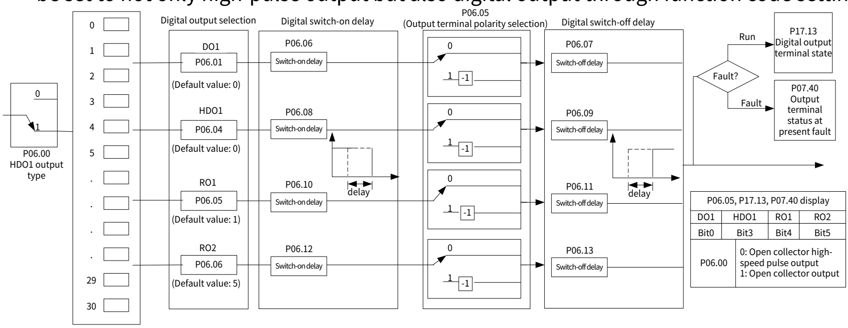
<table>
<tr><th>Function code</th><th>Name</th><th>Default</th><th>Setting range</th><th>Description</th></tr>
<tr><td></td><td></td><td></td><td></td><td>


<table>
<tr><th>DIin</th><th>FWD</th><th>REV</th><th>Running direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>ON</td><td>FWD run</td></tr>
<tr><td>OFF</td><td>FWD run</td></tr>
<tr><td rowspan="2">ON</td><td>ON</td><td rowspan="2">OFF→ON</td><td>REV run</td></tr>
<tr><td>OFF</td><td>REV run</td></tr>
<tr><td>ON→OFF</td><td>-</td><td>-</td><td>Decelerate to stop</td></tr>
</table>
DIin: Three-wire control; FWD: Forward running; REV: Reverse running
Note: For two-wire controlled running mode, when the FWD/REV terminal is valid, if the VFD stops due to a stop command given by another source, the VFD does not run again after the stop command disappears even if the control terminal FWD/REV is still valid. To make the VFD run, you need to trigger FWD/REV again, for example, PLC single-cycle stop, fixed-length stop, and STOP/RST stop during terminal control. (See P07.04.)
The function codes specify the
</td></tr>
</table>

Function code	Name	Default	Setting range	Description
				delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off.  **Note:** When the terminal status is changed by means of RS485 communication, the communication address is 0x200A.
P07.39	Input terminal status at present fault	0x0000	0x0000–0xFFFF	-
P17.12	Digital input terminal status	0x000	0x000–0xFFF	-

6.10.1.2 Digital output

The VFD carries two groups of relay output terminals, one open collector DO1 output terminal, and one high-speed pulse output (HDO) terminal. All the digital output terminal functions can be specified through function code setting. of which the HDO terminal can be set to not only high-pulse output but also digital output through function code setting.



The following table lists the options of function parameters P06.01–P06.04. A same output terminal function can be repeatedly selected.

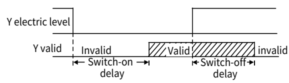
Setting	Function	Description

Setting	Function	Description
0	Invalid	The output terminal does not have any function.
1	Running	The ON signal is output when there is frequency output during running.
2	Running forward	The ON signal is output when there is frequency output during forward running.
3	Running reversely	The ON signal is output when there is frequency output during reverse running.
4	Jogging	The ON signal is output when there is frequency output during jogging.
5	Inverter fault	The ON signal is output when a VFD fault occurred.
6	Frequency level detection FDT1	Refer to the description for P08.32 and P08.33.
7	Frequency level detection FDT2	Refer to the description for P08.34 and P08.35.
8	Frequency reached	Refer to the description for P08.36.
9	Running in zero speed	The ON signal is output when the VFD output frequency and reference frequency are both zero.
10	Upper limit frequency reached	The ON signal is output when the running frequency reaches the upper limit.
11	Lower limit frequency reached	The ON signal is output when the running frequency reaches the lower limit frequency.
12	Ready to run	The ON signal is output when main circuit and control circuit powers are established, the protection functions do not act, and the VFD is ready to run.
13	Pre-exciting	The ON signal is output when the VFD is in pre-exciting.
14	Overload pre-alarm	The ON signal is output after the pre-alarm time elapsed based on the pre-alarm threshold; see P11.08–P11.10 for details.
15	Underload pre-alarm	Output ON signal after the pre-alarm time elapsed based on the pre-alarm threshold. For details, see the descriptions for P11.11–P11.12.
16	Simple PLC stage completed	When the present state of the simple PLC is completed, it outputs a signal.
17	Simple PLC cycle completed	When a single cycle of the simple PLC is completed, it outputs a signal.
18	Set counting value reached	-
19	Designated counting	-

Setting	Function	Description
	value reached	
20	External fault is valid	-
22	Running time reached	-
23	Modbus/ Modbus TCP communication virtual terminal output	A signal is output based on the value set through Modbus/Modbus TCP communication. When the value is 1, the ON signal is output; when the value is 0, the OFF signal is output.
24	PROFIBUS/CANopen/DeviceNet communication virtual terminal output	A signal is output based on the value set through PROFIBUS/CANopen communication. When the value is 1, the ON signal is output; when the value is 0, the OFF signal is output.
25	Ethernet communication virtual terminal output	A signal is output based on the value set through Ethernet communication. When the value is 1, the ON signal is output; when the value is 0, the OFF signal is output.
26	DC bus voltage established	When the bus voltage is higher than the inverter undervoltage, the output is valid.
27	Z pulse output	When the encoder Z pulse is reached, the output is valid, which becomes invalid 10 seconds later.
28	Superposing pulses	When the pulse superposition terminal input function is valid, the output is valid.
29	STO action	When an STO fault occurs, the output is valid.
30	Positioning completed	When positioning is completed, the output is valid.
31	Spindle zeroing completed	When spindle zeroing is completed, the output is valid.
32	Spindle indexing completed	When spindle indexing is completed, the output is valid.
34	EtherCAT/ PROFINET/ EtherNet IP communication virtual terminal output	A signal is output based on the value set through PROFINET communication. When the value is 1, the ON signal is output; when the value is 0, the OFF signal is output.
36	Speed/position control switchover completed	When the mode switchover is completed, the output is valid.
37	Any frequency reached	The frequency reaching signal is output when the ramp reference frequency is greater than the detected value of frequency reaching.
41	DO1	DO1 from the programmable card (P27.00 must be set to 1).

Setting	Function	Description
42	DO2	DO2 from the programmable card (P27.00 must be set to 1).
43	HDO1	HDO1 from the programmable card (P27.00 must be set to 1).
44	RO1	RO1 from the programmable card (P27.00 must be set to 1).
45	RO2	RO2 from the programmable card (P27.00 must be set to 1).
46	RO3	RO3 from the programmable card (P27.00 must be set to 1).
47	RO4	RO4 from the programmable card (P27.00 must be set to 1).
48	EAI1 detected OH pre-alarm	Overheating detected by EAI1 temperature measurement
49	EAI2 detected OH pre-alarm	Overheating detected by EAI2 temperature measurement
50	AIAO detected OH pre-alarm	Overheating detected by the temperature detection AI or AO terminal.
51	Stopped or running in zero speed	The VFD is stopped or running at zero speed.
52	Tension control disconnection	Disconnection is detected when the tension-specific function disconnection detection is enabled.
53	Tension control specified roll diameter reached	The specified roll diameter (P41.74) is reached when the tension-specific function is enabled.
54	Tension control stop roll diameter reached	The stop roll diameter (P41.75) is reached when the tension-specific function is enabled.
55	Tension control length reached	The specified length (P43.03) is reached when the tension-specific function is enabled.
56	Fire mode enabled	The fire mode is enabled.
57	DI1 terminal state	-
58	DI2 terminal state	-
59	DI3 terminal state	-
60	DI4 terminal state	-
61	HDI1 terminal state	-
62	HDI2 terminal state	-
63	Brake output	-

Related parameters are listed in the following.

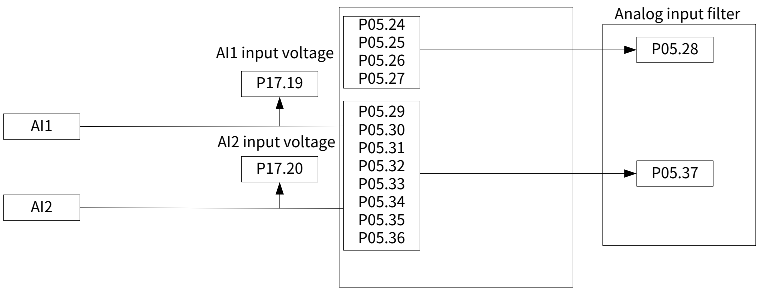
<table>
<tr><th>Function code</th><th>Name</th><th>Default</th><th>Setting range</th><th>Description</th></tr>
<tr><td>P06.00</td><td>HDO1 output type</td><td>0</td><td>0–1</td><td>0: Open collector high-speed pulse output
1: Open collector output</td></tr>
<tr><td>P06.01</td><td>DO1 output</td><td>0</td><td rowspan="4">0–63</td><td rowspan="4">For details, see the preceding table.</td></tr>
<tr><td>P06.04</td><td>HDO1 output</td><td>0</td></tr>
<tr><td>P06.05</td><td>RO1 output</td><td>1</td></tr>
<tr><td>P06.06</td><td>RO2 output</td><td>5</td></tr>
<tr><td>P06.09</td><td>Output terminal polarity selection</td><td>0x00</td><td>0x00–0xFF</td><td>Used to set the output terminal polarity.
When the current bit is set to 0, the output terminal is positive.
When a bit is 1, the output terminal is negative.
<table><tr><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit0</td></tr><tr><td>RO2</td><td>RO1</td><td>HDO1</td><td>DO1</td></tr></table></td></tr>
<tr><td>P06.10</td><td>DO1 switch-on delay</td><td rowspan="8">0.000s</td><td rowspan="8">0.000–50.000s</td><td rowspan="8">Used to specify the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off.

Note: P06.16 and P06.17 are valid only when P06.00=1.</td></tr>
<tr><td>P06.11</td><td>DO1 switch-off delay</td></tr>
<tr><td>P06.16</td><td>HDO1 switch-on delay</td></tr>
<tr><td>P06.17</td><td>HDO1 switch-off delay</td></tr>
<tr><td>P06.18</td><td>RO1 switch-on delay</td></tr>
<tr><td>P06.19</td><td>RO1 switch-off delay</td></tr>
<tr><td>P06.20</td><td>RO2 switch-on delay</td></tr>
<tr><td>P06.21</td><td>RO2 switch-off delay</td></tr>
<tr><td>P08.37</td><td>Detection value for any frequency being reached</td><td>1.00Hz</td><td>0.00Hz–P00.03</td><td>-</td></tr>
<tr><td>P08.38</td><td>Detection time for any frequency being reached</td><td>0.5s</td><td>0–3600.0s</td><td>-</td></tr>
</table>

Function code	Name	Default	Setting range	Description
P07.40	Output terminal status at present fault	0x0000	0x0000–0xFFFF	-
P17.13	Digital output terminal state	0x00	0x00–0xFF	Displays the present digital output terminal state of the VFD. Corresponds to RO2, RO1, HDO1, and DO1 respectively

6.10.2 Analog input and output terminal functions

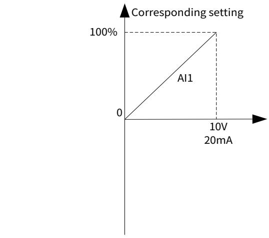
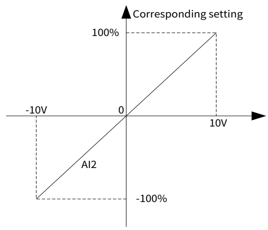
6.10.2.1 Analog input

The VFD carries two analog input terminals AI1 and AI2. The input range of AI1 is 0–10V/0–20mA, and whether AI1 uses voltage input or current input can be specified by P05.76. The input range of AI2 is -10–+10V. Each input can be filtered separately, and the corresponding reference curve can be set by adjusting the reference values correspond to the max. value and min. values.



Function code	Name	Default	Setting range	Description
P00.06	Setting channel of A frequency command	0	0–25	1: AI1 2: AI2
P00.07	Setting channel of B frequency command	24		
P03.11	Torque setting method selection of motor 1	0	0–25	2: AI1 3: AI2

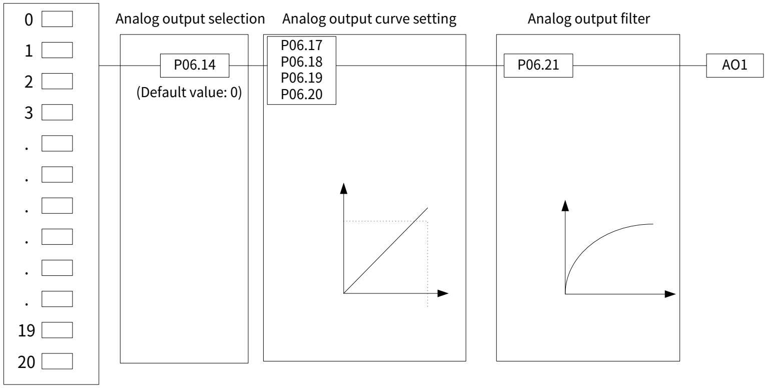
Function code	Name	Default	Setting range	Description
P03.14	Setting source of motor 1 forward rotation frequency upper limit in torque control	0	0–25	1: AI1 2: AI2
P03.15	Setting source of motor 1 reverse rotation frequency upper limit in torque control	0	0–25	1: AI1 2: AI2
P03.18	Setting source of motor 1 electromotive torque upper limit	0	0–25	1: AI1 2: AI2
P03.19	Setting source of motor 1 braking torque upper limit	0	0–25	1: AI1 2: AI2
P04.13	Motor 1 voltage setting channel selection	0	0–25	1: AI1 2: AI2
P05.42	AI1 lower limit	0.00V	0.00V–P05.44	Used to define the relationship between the analog input voltage and its corresponding setting. When the analog input voltage exceeds the range from the upper limit to the lower limit, the upper limit or lower limit is used. When the analog input is current input, 0mA–20mA current corresponds to 0V–10V voltage. In different applications, 100.0% of the analog setting corresponds
P05.43	Corresponding setting of AI1 lower limit	0.0%	-300.0%–300.0%	
P05.44	AI1 upper limit	10.00V	P05.42–10.00V	
P05.45	Corresponding setting of AI1 upper limit	100.0%	-300.0%–300.0%	
P05.46	AI1 input filter time	0.100s	0.000s–10.000s	
P05.47	AI2 lower limit	-10.00V	-10.00V–P05.49	
P05.48	Corresponding	-100.0%	-300.0%–	

Function code	Name	Default	Setting range	Description
	setting of AI2 lower limit		300.0%	to different nominal values. See the descriptions of each application section for details.
P05.49	AI2 middle value 1	0.00V	P05.47–P05.51	The following figure illustrates the cases of several settings:
P05.50	Corresponding setting of AI2 middle value 1	0.0%	-300.0%–300.0%	
P05.51	AI2 middle value 2	0.00V	P05.49–P05.53	
P05.52	Corresponding setting of AI2 middle value 2	0.0%	-300.0%–300.0%	
P05.53	AI2 upper limit	10.00V	P05.51–10.00V	
P05.54	Corresponding setting of AI2 upper limit	100.0%	-300.0%–300.0%	
P05.55	AI2 input filter time	0.030s	0.000s–10.000s	Input filter time: to adjust the sensitivity of analog input. Increasing the value properly can enhance analog input anti-interference but may reduce the sensitivity of analog input. **Note:** AI1 supports the 0–10V/0–20mA input. When AI1 selects the 0–20mA input, the corresponding voltage of 20mA is 10V. AI2 supports the -10–+10V input.
P05.76	AI1 input signal type	0	0–1	0: Voltage 1: Current
P09.00	PID reference source	0	0–25	1: AI1 2: AI2
P09.02	PID feedback source	0	0–25	1: AI1 2: AI2

Function code	Name	Default	Setting range	Description
P21.18	Positioning speed setting selection	0	0–6	1: AI1 2: AI2
P41.04	Upper limit frequency channel selection	0	0–7	1: AI1 2: AI2
P41.13	Linear speed input method	0	0–15	1: AI1 2: AI2
P41.55	Tension giving method selection	0	0–23	1: AI1 2: AI2
P41.59	Tension taper input method	0	0–23	1: AI1 (relative to digital tension taper value) 2: AI2
P42.00	PID giving method	0	0–23	1: AI1 2: AI2
P42.05	Pendulum/tension feedback selection	1	0–23	1: AI1 2: AI2

6.10.2.2 Analog output

The VFD carriers one analog output terminal (supporting the output of 0–10V/0–20mA). Analog output signal can be filtered separately, and the proportional relationship can be adjusted by setting the max. value, min. value, and the percentage of their corresponding output. Analog output signal can output motor speed, output frequency, output current, motor torque and motor power at a certain proportion.



AO output relationship description:

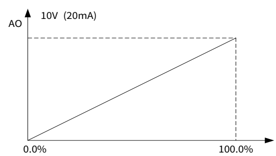
(The min. value and max. value of the output correspond to 0.% and 100.00% of the analog default output. The actual output voltage corresponds to the actual percentage, which can be set through function codes.) Output functions are as follows.

Setting	Function	Description
0	Running frequency	0–Max. output frequency
1	Set frequency	0–Max. output frequency
2	Ramp reference frequency	0–Max. output frequency
3	Rotational speed	0–Synchronous speed corresponding to max. output frequency
4	Output current (relative to the VFD)	0–Twice the VFD rated current
5	Output current (relative to motor)	0–Twice the motor rated current
6	Output voltage	0–1.5 times the VFD rated voltage
7	Output power	0–Twice the motor rated power
8	Set torque value (bipolar)	0–Twice the motor rated current. A negative value corresponds to 0.0% by default.
9	Output torque (absolute value)	0–Twice the motor rated torque (electromotive/braking)
10	AI1 input	0–10V/0–20mA
11	AI2 input	0V–10V. A negative value corresponds to 0.0% by default.
12	AI3 input	0–10V/0–20mA
14	HDI1 input	0.00–50.00kHz
15	HDI2 input	0.00–50.00kHz

Setting	Function	Description
16	Value 1 set through Modbus/Modbus TCP communication	0–1000
17	Value 2 set through Modbus/Modbus TCP communication	0–1000
18	Value 1 set through PROFIBUS/CANopen/DeviceNet communication	0–1000
19	Value 2 set through PROFIBUS/CANopen/DeviceNet communication	0–1000
20	Value 1 set through Ethernet communication	0–1000
21	Value 2 set through Ethernet communication	0–1000
22	Value 1 set through EtherCAT/ PROFINET/EtherNet IP communication	0–1000. A negative value corresponds to 0.0% by default.
23	Value 2 set through EtherCAT/ PROFINET/EtherNet IP communication	0–1000
24	Torque current (bipolar)	0–Three times the motor rated current. A negative value corresponds to 0.0% by default.
25	Exciting current	0–Three times the motor rated current. A negative value corresponds to 0.0% by default.
26	Set frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
27	Ramp reference frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
28	Rotational speed (bipolar)	0–Synchronous rotation speed corresponding to max. output frequency. A negative value corresponds to 0.0% by default.
29	AO1 from the programmable card	0–1000
30	AO2 from the programmable card	0–1000
31	Rotational speed	0–Twice the motor rated synchronous rotation

Setting	Function	Description
		speed
32	Output torque (bipolar)	0–Twice the motor rated torque. A negative value corresponds to 0.0% by default.
33	AIAO detected temperature output	AO output temperature in the AIAO temperature detection.
34	Set tension output	-
35	EAI1 input	-
36	EAI2 input	-
37	EAI3 input	-
39	EHDI1 input	-

Related parameters are listed in the following.

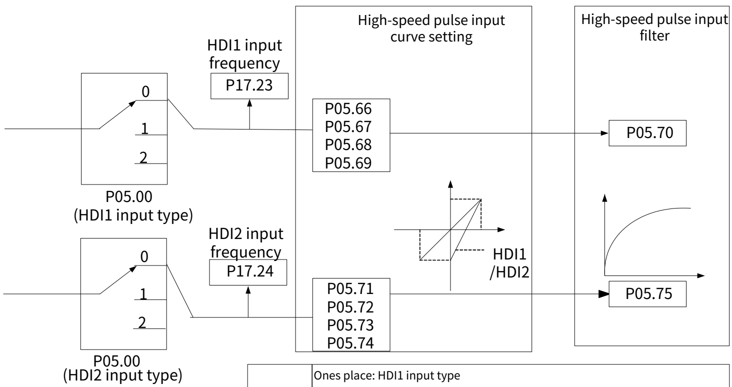
Function code	Name	Default	Setting range	Description
P06.26	AO1 output	0	0–63	0–39: For details, see the preceding table. 40–63: Reserved
P06.27	AO2 output	0		
P06.29	AO1 output lower limit	0.0%	-300.0%–P06.19	Used to define the relationship between the output value and analog output. When the output value exceeds the allowed range, the output uses the lower limit or upper limit. When the analog output is current output, 1mA equals 0.5V. In different cases, the corresponding analog output of 100% of the output value is different.
P06.30	AO1 output corresponding to lower limit	0.00V	0.00–10.00V	
P06.31	AO1 output upper limit	100.0%	P06.17–300.0%	
P06.32	AO1 output corresponding to upper limit	10.00V	0.00–10.00V	
P06.33	AO1 output filter time	0.000s	0.000–10.000s	
P06.34	AO2 output lower limit	0.0%	-300.0%–P06.36	Same as above
P06.35	AO2 output correspondin	0.00V	0.00–10.00V	

Function code	Name	Default	Setting range	Description
	g to lower limit			
P06.36	AO2 output upper limit	100.0%	P06.34–300.0%	
P06.37	AO2 output correspondin g to upper limit	10.00V	0.00–10.00V	
P06.38	AO2 output filter time	0.000s	0.000–10.000s	

6.10.3 High-speed pulse input and output terminal functions

6.10.3.1 High-speed pulse input

The VFD supports two high-speed pulse input terminals HDI1 and HDI2. Each input can be filtered separately, and the corresponding reference curve can be set by adjusting the reference values correspond to the max. value and min. values. In addition, the joint use of HDI1 and HDI2 can provide the 24V encoder quadrature signal speed detection to achieve simplified closed-loop control.



P05.00	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1

Related parameters are listed in the following.

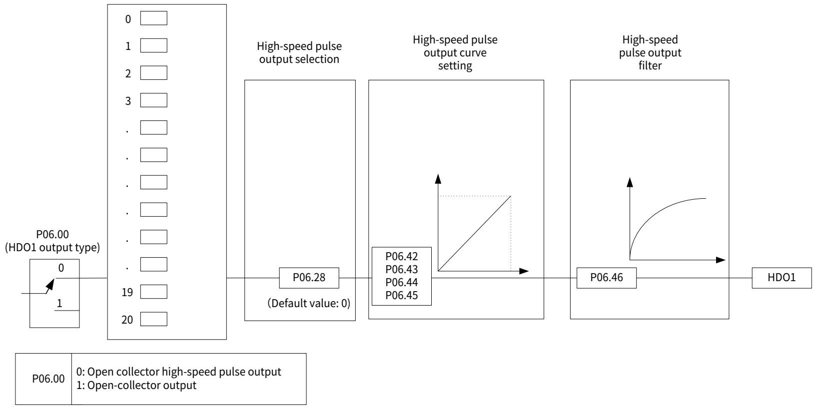
Function code	Name	Default	Setting range	Description
P00.06	Setting channel of A frequency command	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P00.07	Setting channel of B frequency command	24		
P03.11	Torque setting method selection of motor 1	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P03.14	Setting source of motor 1 forward rotation frequency upper limit in torque control	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P03.15	Setting source of motor 1 reverse rotation frequency upper limit in torque control	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P03.18	Setting source of motor 1 electromotive torque upper limit	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P03.19	Setting source of motor 1 braking torque upper limit	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P04.13	Motor 1 voltage setting channel selection	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P05.00	HDI input type	0x00	0x00–0x11	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital

Function code	Name	Default	Setting range	Description
				2: Speed measurement pulse input, used together with HDI1
P05.66	HDI1 lower limit frequency	0.000	0.000kHz–P05.68	-
P05.67	Corresponding setting of HDI1 lower limit frequency	0.0	-300.0–300.0%	-
P05.68	HDI1 upper limit frequency	50.000	P05.66–50.000kHz	-
P05.69	Corresponding setting of HDI1 upper limit frequency	100.0	-300.0–300.0%	-
P05.70	HDI1 frequency input filter time	0.030	0.000–10.000s	-
P05.71	HDI2 lower limit frequency	0.000	0.000kHz–P05.73	-
P05.72	Corresponding setting of HDI2 lower limit frequency	0.0	-300.0–300.0%	-
P05.73	HDI2 upper limit frequency	50.000	P05.71–50.000kHz	-
P05.74	Corresponding setting of HDI2 upper limit frequency	100.0	-300.0–300.0%	-
P05.75	HDI2 frequency input filter time	0.030	0.000–10.000s	-
P18.00	Actual frequency of encoder	0.0Hz	-999.9–3276.7Hz	-
P20.15	Speed measurement mode	0	0–1	0: PG card 1: Locally measured through HDI1 and HDI2. Only the 24V incremental encoders are supported.

Function code	Name	Default	Setting range	Description
P06.26	AO1 output	0	0–63	14: HDI1 input 15: HDI2 input
P06.27	AO2 output	0		
P06.28	HDO high-speed pulse output	0		
P09.00	PID reference source	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P09.02	PID feedback source	0	0–25	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P21.18	Positioning speed setting	0	0–6	4: High-speed pulse HDI1 5: High-speed pulse HDI2
P40.15	Speed measurement mode	0	0–1	0: PG card 1: Locally measured through HDI1 and HDI2. Only the 24V incremental encoders are supported.
P41.04	Upper limit frequency channel selection	0	0–6	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P41.13	Linear speed input method	0	0–8	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P41.16	Roll diameter calculation method	0	0–10	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P41.55	Tension giving method selection	0	0–7	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P41.59	Tension taper input method	0	0–6	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P42.00	PID giving method	0	0–7	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P42.05	Pendulum/tension feedback selection	1	0–6	5: High-speed pulse HDI1 6: High-speed pulse HDI2
P42.47	Deviation integral action channel selection	0	0–4	5: High-speed pulse HDI1 6: High-speed pulse HDI2

6.10.3.2 High-speed pulse output

The VFD carries one high-speed pulse output terminal. High-speed pulse output signals can be filtered separately, and the proportional relationship can be adjusted by setting the max. value, min. value, and the percentage of their corresponding output. High-speed pulse output signals can output the motor speed, output frequency, output current, motor torque and motor power at a certain proportion.



HDO output relationship description:

(The min. value and max. value of the output correspond to 0.% and 100.00% of the analog default output. The actual output pulse frequency corresponds to the actual percentage, which can be set through function codes.) Output functions are as follows.

Setting	Function	Description
0	Running frequency	0–Max. output frequency
1	Set frequency	0–Max. output frequency
2	Ramp reference frequency	0–Max. output frequency
3	Rotational speed	0–Synchronous speed corresponding to max. output frequency
4	Output current (relative to the VFD)	0–Twice the VFD rated current
5	Output current (relative to motor)	0–Twice the motor rated current
6	Output voltage	0–1.5 times the VFD rated voltage
7	Output power	0–Twice the motor rated power
8	Set torque value (bipolar)	0–Twice the motor rated current. A negative value corresponds to 0.0% by default.
9	Output torque (absolute	0–Twice the motor rated torque

Setting	Function	Description
	value)	(electromotive/braking)
10	AI1 input	0–10V/0–20mA
11	AI2 input	0V–10V. A negative value corresponds to 0.0% by default.
12	AI3 input	0–10V/0–20mA
14	HDI1 input	0.00–50.00kHz
15	HDI2 input	0.00–50.00kHz
16	Value 1 set through Modbus/Modbus TCP communication	0–1000
17	Value 2 set through Modbus/Modbus TCP communication	0–1000
18	Value 1 set through PROFIBUS/CANopen/DeviceNet communication	0–1000
19	Value 2 set through PROFIBUS/CANopen/DeviceNet communication	0–1000
20	Value 1 set through Ethernet communication	0–1000
21	Value 2 set through Ethernet communication	0–1000
22	Value 1 set through EtherCAT/ PROFINET/EtherNet IP communication	0–1000. A negative value corresponds to 0.0% by default.
23	Value 2 set through EtherCAT/ PROFINET/EtherNet IP communication	0–1000
24	Torque current (bipolar)	0–Three times the motor rated current. A negative value corresponds to 0.0% by default.
25	Exciting current	0–Three times the motor rated current. A negative value corresponds to 0.0% by default.
26	Set frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
27	Ramp reference frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
28	Rotational speed (bipolar)	0–Synchronous rotation speed corresponding to

Setting	Function	Description
		max. output frequency. A negative value corresponds to 0.0% by default.
29	AO1 from the programmable card	0–1000
30	AO2 from the programmable card	0–1000
31	Rotational speed	0–Twice the motor rated synchronous rotation speed
32	Output torque (bipolar)	0–Twice the motor rated torque. A negative value corresponds to 0.0% by default.
33	AIAO detected temperature output	AO output temperature in the AIAO temperature detection.
34	Set tension output	
35	EAI1 input	
36	EAI2 input	
37	EAI3 input	
39	EHDI1 input	

Related parameters are listed in the following.

Function code	Name	Default	Setting range	Description
P06.00	HDO1 output type	0	0–1	0: Open collector high-speed pulse output 1: Open collector output
P06.28	HDO1 high-speed pulse output	0	0–63	0–34. For details, see the preceding table. 35–63: Reserved
P06.42	HDO1 output lower limit	0.0	-300.0%–P06.44	-
P06.43	HDO1 output corresponding to lower limit	0.00	0.00–50.00kHz	-
P06.44	HDO1 output upper limit	100.0	P06.42–300.0%	-
P06.45	HDO1 output corresponding to upper limit	50.00	0.00–50.00kHz	-
P06.46	HDO1 output	0.000	0.000–10.000s	-

Function code	Name	Default	Setting range	Description
	filter time			

6.11 RS485 communication

The communication addresses on the communication network are unique, which is the basis of the point-to-point communication between the host controller and VFD. When the master writes the slave communication address to 0 indicating a broadcast address in a frame, all the salves on the Modbus bus receive the frame but do not respond to it. The local communication address is specified by P14.00. The communication response delay is specified by P14.03, and the RS485 communication timeout time is specified by P14.04.

There are four transmission error processing methods, which can be selected through P14.05. Option 2 (Stop in enabled stop mode without reporting an alarm) is applicable only to the communication mode.

Function code	Name	Default	Setting range	Description
P14.00	Local communication address	1	1–247	**Note:** The communication address of a slave cannot be set to 0.
P14.01	Communication baud rate setting	4	0–7	Used to set the rate of data transmission between the host controller and the VFD. 0: 1200bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 115200 bps **Note:** The baud rate set on the VFD must be consistent with that on the host controller. Otherwise, the communication fails. A greater baud rate indicates faster communication.
P14.02	Data bit check setting	1	0–5	The data format set on the VFD must be consistent with that on

Function code	Name	Default	Setting range	Description
				the host controller. Otherwise, the communication fails. 0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU
P14.03	Communication response delay	5ms	0–200ms	Indicates the communication response delay, that is, the interval from when the VFD completes receiving data to when it sends response data to the host controller. If the response delay is shorter than the system processing time, the system sends response data to the upper computer after processing data. If the delay is longer than the system processing time, the system does not send response data to the upper computer until the delay is reached although data has been processed.
P14.04	485 communication timeout period	0.0s	0.0 (invalid)–60.0s	When P14.04 is set to 0.0, the communication timeout time is invalid. When P14.04 is set to a non-zero value, the system reports the "RS485 communication fault" (CE) if the communication interval exceeds the value. In general, the function code is set to 0.0. When continuous communication is required, you can set the function code to monitor communication status.

Function code	Name	Default	Setting range	Description
P14.05	Transmission fault processing	0	0–3	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)
P14.06	Modbus communication processing action selection	0x000	0x000–0x111	Ones place: Response upon the write operation 0: Respond to write operations 1: Not respond to write operations Tens place: Communication password protection 0: Communication password protection is invalid. 1: Communication password protection is valid. Hundreds place: User-defined address (valid only for RS485 communication) 0: User-defined addresses specified by P16 are invalid. 1: User-defined addresses specified by P16 are valid.
P16.00–P16.63	User-defined running command address	0xFFFF	0x0000–0xFFFF	-

6.12 Monitoring parameters

Monitoring parameters mainly fall in groups P07, P17, P18, and P29, which are used to view and analyze the VFD control and use status. The monitored content is listed in the following.

Category	Type	Monitored content
P07 group	HMI	VFD information, module temperature, run time, power usage, fault history, and software version.
P17 group	Basic status viewing	● Frequency information ● Current information ● Voltage information ● Torque and power information ● Input terminal information ● Output terminal information ● PID regulator information ● Control word and status word information
P18 group	Viewing of status in closed-loop control	● Encoder-based speed detecting information ● Pulse reference based speed detecting information ● Encoder position information ● Pulse reference position information ● Position control information
P29 group	Expansion card status viewing	● Expansion card information ● IO card input terminal information ● IO card output terminal information ● Communication card control words and status words

Group P07 Human-machine interface (HMI)

Function code	Name	Default	Setting range	Description
P07.11	Rectifier bridge temperature	0.0°C	-20.0–120.0°C	-
P07.12	Inverter module temperature	0.0°C	-20.0–120.0°C	-
P07.13	Control board software version	Version depended	1.00–655.35	-
P07.18	VFD rated power	Model depended	0.4–3000.0kW	-
P07.19	VFD rated voltage	Model	50–1200V	-

Function code	Name	Default	Setting range	Description
		depended		
P07.20	VFD rated current	Model depended	0.1–6000.0A	-
P07.27	Present fault type	0	0–100	0: No fault 1: Inverter unit U-phase protection (E1) 2: Inverter unit V-phase protection (E2) 3: Inverter unit W-phase protection (E3) 4: Overcurrent during acceleration (E4) 5: Overcurrent during deceleration (E5) 6: Overcurrent during constant speed running (E6) 7: Overvoltage during acceleration (E7) 8: Overvoltage during deceleration (E8) 9: Overvoltage during constant speed running (E9) 10: DC bus undervoltage (E10) 11: Motor overload (E11) 12: VFD overload (E12) 13: Phase loss on input side (E13) 14: Phase loss on output side (E14) 15: Rectifier module overheat (E15) 16: Inverter module overheat (E16) 17: External fault (E17) 18: Modbus/Modbus TCP communication fault (E18) 19: Current detection fault (E19) 20: Motor autotuning fault (E20) 21: EEPROM operation error (E21) 22: PID feedback offline (E22) 23: Reserved 24: Running time reached (E24) 25: Electronic overload (E25) 26: Keypad communication error (E26) 27: Parameter upload error (E27) 28: Parameter download error (E28) 29: PROFIBUS communication fault (E29) 30: Reserved
P07.28	Last fault type	0		
P07.29	2nd-last fault type	0		
P07.30	3rd-last fault type	0		
P07.31	4th-last fault type	0		
P07.32	5th-last fault type	0		

Function code	Name	Default	Setting range	Description
				31: CANopen communication fault (E31) 32: To-ground short-circuit fault 1 (E32) 33: To-ground short-circuit fault 2 (E33) 34: Speed deviation fault (E34) 35: Mal-adjustment fault (E35) 36: Underload fault (E36) 37: Encoder disconnection (E37) 38: Encoder reversal (E38) 39: Encoder Z-pulse disconnection (E39) 40: Safe torque off (E40) 41: Exception occurred to safety circuit of channel 1 (E41) 42: Exception occurred to safety circuit of channel 2 (E42) 43: Exception occurred to channel 1 and channel 2 (E43) 44: Safety code FLASH CRC fault (E44) 45: Programmable card customized fault 1 (E45) 46: Programmable card customized fault 2 (E46) 47: Programmable card customized fault 3 (E47) 48: Programmable card customized fault 4 (E48) 49: Programmable card customized fault 5 (E49) 50: Programmable card customized fault 6 (E50) 51: Programmable card customized fault 7 (E51) 52: Programmable card customized fault 8 (E52) 53: Programmable card customized fault 9 (E53) 54: Programmable card customized fault 10 (E54)

Function code	Name	Default	Setting range	Description
				55: Repetitive expansion card type (E55) 56: Encoder UVW loss fault (E56) 57: PROFINET communication fault (E57) 58: CAN communication fault (E58) 59: Motor overtemperature fault (E59) 60: Failure to identify the card at slot 1 (E60) 61: Failure to identify the card at slot 2 (E61) 62: Failure to identify the card at slot 3 (E62) 63: Communication timeout of the card in slot 1 (E63) 64: Communication timeout of the card in slot 2 (E64) 65: Communication timeout of the card in slot 3 (E65) 66: EtherCAT communication fault (E66) 67–68: Reserved 69:aster/slave synchronous CAN slave fault (E69) 70–81: Reserved 82: EAI1 detected overtemperature fault (E82) 83: EAI2 detected overtemperature fault (E83) 84–91: Reserved 92: AI1 disconnection (E92) 93: AI2 disconnection (E93) 94: Reserved 95: EtherNet IP communication timeout (E95) 96: No upgrade bootload (E96) 97: Low battery (E209) 98: Position overtravel (E630) 99. DEC time setting error (E631) 100: Position tracking deviation

Function code	Name	Default	Setting range	Description
				exceeds limit (E632) For details about fault information, see section 8.2 Faults and solutions.
P07.33	Running frequency at present fault	0.00Hz	0.00Hz–P00.03	-
P07.34	Ramp reference frequency at present fault	0.00Hz	0.00Hz–P00.03	-
P07.35	Output voltage at present fault	0V	0–1200V	-
P07.36	Output current at present fault	0.0A	0.0–6300.0A	-
P07.37	Bus voltage at present fault	0.0V	0.0–2000.0V	-
P07.38	Max. temperature at present fault	0.0°C	-20.0–120.0°C	-
P07.39	Input terminal status at present fault	0x0000	0x0000–0xFFFF	-
P07.40	Output terminal status at present fault	0x0000	0x0000–0xFFFF	-
P07.44	Running frequency at last fault	0.00Hz	0.00Hz–P00.03	-
P07.45	Ramp reference frequency at last fault Reference frequency	0.00Hz	0.00Hz–P00.03	-
P07.46	Output voltage at last fault	0V	0–1200V	-
P07.47	Output current at last fault	0.0A	0.0–6300.0A	-
P07.48	Bus voltage at last fault	0.0V	0.0–2000.0V	-

Function code	Name	Default	Setting range	Description
P07.49	Temperature at last fault	0.0°C	-20.0–120.0°C	-
P07.50	Input terminal status at last fault	0x0000	0x0000–0xFFFF	-
P07.51	Output terminal status at last fault	0x0000	0x0000–0xFFFF	-
P07.55	Running frequency at 2nd-last fault	0.00Hz	0.00Hz–P00.03	-
P07.56	Ramp reference frequency at 2nd-last fault	0.00Hz	0.00Hz–P00.03	-
P07.57	Output voltage at 2nd-last fault	0V	0–1200V	-
P07.58	Output current at 2nd-last fault	0.0A	0.0–6300.0A	-
P07.59	Bus voltage at 2nd-last fault	0.0V	0.0–2000.0V	-
P07.60	Temperature at 2nd-last fault	0.0°C	-20.0–120.0°C	-
P07.61	Input terminal status at 2nd-last fault	0x0000	0x0000–0xFFFF	-
P07.62	Output terminal status at 2nd-last fault	0x0000	0x0000–0xFFFF	-
P07.75	Local accumulative running time	0h	0–65535h	
P07.76	VFD electricity consumption MSB	0kkWh	0–65535kkWh	Used to display the electricity consumption of the VFD. VFD electricity consumption = P07.76 × 1000 + P07.77
P07.77	VFD electricity consumption LSB	0.0kWh	0.0–999.9kWh	

Group P17 Basic status viewing

Basic status viewing

Function code	Name	Default	Setting range	Description
P17.42	Motor control mode	0x000	0x000–0x123	Ones place: Control mode 0: Vector 0 1: Vector 1 2: VF control 3: Closed-loop vector control Tens place: Control status 0: Speed control 1: Torque control 2: Position control Hundreds place: Motor number 0: Motor 1 1: Motor 2
P17.12	Digital input terminal status	0x000	0x00–0xFFF	Displays the present digital input terminal state of the VFD.
P17.13	Digital output terminal status	0x00	0x00–0xFF	Displays the present digital output terminal state of the VFD.

Frequency related information

Function code	Name	Default	Setting range	Description
P17.00	Set frequency	0.00Hz	0.00Hz–P00.03	Displays the present set frequency of the VFD.
P17.01	Output frequency	0.00Hz	0.00Hz–P00.03	Displays the present output frequency of the VFD.
P17.02	Ramp reference frequency	0.00Hz	0.00Hz–P00.03	Displays the present ramp reference frequency of the VFD.
P17.05	Motor rotation speed	0RPM	0–65535RPM	Displays the present motor rotation speed.
P17.10	Estimated motor frequency	0.00Hz	0.00Hz–P00.03	Displays the estimated motor rotor frequency under the open-loop vector condition.
P17.14	Digital adjustment value	0.00Hz	0.00Hz–P00.03	Displays the adjustment on the VFD through the UP/DOWN terminal.

Function code	Name	Default	Setting range	Description
P17.16	Linear speed	0	0–65535	-
P17.23	HDI1 input frequency	0.000kHz	0.000–50.000kHz	Display HDI1 input frequency.
P17.24	HDI2 input frequency	0.000kHz	0.000–50.000kHz	Display HDI2 input frequency.
P17.45	Forward rotation upper-limit frequency in torque control	0.00Hz	0.00Hz–P00.03	-
P17.46	Reverse rotation upper-limit frequency in torque control	0.00Hz	0.00Hz–P00.03	-
P17.51	Frequency set by A source	0.00Hz	0.00Hz–P00.03	-
P17.52	Frequency set by B source	0.00Hz	0.00Hz–P00.03	-

Voltage related information

Function code	Name	Default	Setting range	Description
P17.03	Output voltage	0V	0–1200V	Displays the present output voltage of the VFD.
P17.11	DC bus voltage	0.0V	0.0–2000.0V	Displays the present DC bus voltage of the VFD.
P17.19	AI1 input voltage	0.00V	0.00–10.00V	Displays the AI1 input signal.
P17.20	AI2 input voltage	0.00V	-10.00V–10.00V	Displays the AI2 input signal.

Current related information

Function code	Name	Default	Setting range	Description
P17.04	Output current	0.0A	0.0–5000.0A	Displays the valid value of present output current of the VFD.
P17.06	Torque current	0.0A	-3000.0–3000.0A	Displays the present torque current of the VFD.

Function code	Name	Default	Setting range	Description
P17.07	Exciting current	0.0A	-3000.0–3000.0A	Displays the present exciting current of the VFD.
P17.35	Exciting current reference	0.0A	-3000.0–3000.0A	Displays the exciting current reference value under the vector control mode.
P17.36	Torque current reference	0.0A	-3000.0–3000.0A	Displays the torque current reference value under the vector control mode.
P17.37	AC incoming current	0.0A	0.0–5000.0A	Displays the valid value of incoming current on AC side.

Torque and power related information

Function code	Name	Default	Setting range	Description
P17.08	Motor power	0.0%	-300.0%–300.0%	Displays the present motor power. 100% corresponds to the rated motor power. The positive value is the motoring state while the negative value is the generating state.
P17.09	Motor output torque	0.0%	-250.0%–250.0%	Displays the present output torque of the VFD; 100% relative to the rated motor torque. During forward running, the positive value is the motoring state while the negative value is generating state. During reverse running, the positive value is the generating state while the negative value is the motoring state.
P17.15	Torque reference value	0.0%	-300.0%–300.0%	100% corresponds to the rated torque of the present motor, displaying the torque reference.
P17.27	Motor power factor	1.00	-1.00–1.00	Displays the power factor of the current motor.
P17.38	Output torque	0.0Nm	-3000.0–3000.0Nm	Displays the output torque value. During forward running, the

Function code	Name	Default	Setting range	Description
				positive value is the motoring state while the negative value is generating state. During reverse running, the positive value is the generating state while the negative value is the motoring state.
P17.43	Electromotive torque upper limit	0.0%	0.0%–300.0%	100% corresponds to the rated current of the present motor.
P17.44	Braking torque upper limit	0.0%	0.0%–300.0%	100% corresponds to the rated current of the present motor.
P17.47	Inertia compensation torque	0.0%	-100.0%–100.0%	-
P17.48	Friction compensation torque	0.0%	-100.0%–100.0%	-

PID regulator information

Function code	Name	Default	Setting range	Description
P17.25	PID reference value	0.0%	-100.0–100.0%	Displays the PID reference value.
P17.26	PID feedback value	0.0%	-100.0–100.0%	Displays the PID feedback value.
P17.53	PID proportional output	0.00%	-100.0–100.0%	-
P17.54	PID integral output	0.00%	-100.0–100.0%	-
P17.55	PID differential output	0.00%	-100.0–100.0%	-
P17.56	PID present proportional gain	0.00%	0.00–100.00%	-
P17.57	PID present integral gain	0.00s	0.00–10.00s	-

Function code	Name	Default	Setting range	Description
P17.58	PID present differential time	0.00s	0.00–10.00s	-
P17.40	Process PID output	0.00%	-100.0–100.0%	-

Group P18 Status viewing in closed-loop control

Function code	Name	Default	Setting range	Description
P18.00	Actual frequency of encoder	0.0Hz	-999.9–3276.7Hz	Used to indicate the actual-measured encoder frequency. The value of forward running is positive; the value of reverse running is negative.
P18.01	Encoder position count value	0	0–65535	Encoder count value, quadruple frequency.
P18.02	Encoder Z pulse count value	0	0–65535	Corresponding count value of encoder Z pulse.
P18.14	High-order bit of count value of PG card pulse feedback	0	0–65535	Encoder pulse count value. The count value is accumulated only if the VFD is powered on.
P18.15	Low-order bit of PG card pulse feedback count value	0	0–65535	Encoder pulse count value. The count value is accumulated only if the VFD is powered on.

Pulse reference and position control information

Function code	Name	Default	Setting range	Description
P18.17	Pulse command frequency	0.0Hz	-3276.8–3276.7Hz	Pulse command (A2/B2 terminal) is converted to the set frequency, and it is valid under the pulse position mode and pulse speed mode.
P18.24	High-order bit of	0	0–65535	Pulse command (A2,B2) count

Function code	Name	Default	Setting range	Description
	PG card pulse reference count value			value. The count value is accumulated only if the VFD is powered on.
P18.25	Low-order bit of PG card pulse reference count value	0	0–65535	Pulse command (A2,B2) count value. The count value is accumulated only if the VFD is powered on.
P18.18	Pulse command feedforward	0.0Hz	-3276.8–3276.7Hz	Pulse command (A2/B2 terminal) is converted to the set frequency, and it is valid under the pulse position mode and pulse speed mode.
P18.03	Position reference value MSB	0	0–30000	It is cleared after stop.
P18.04	Position reference value LSB	0	0–65535	It is cleared after stop.
P18.05	Position feedback value MSB	0	0–30000	It is cleared after stop.
P18.06	Position feedback value LSB	0	0–65535	It is cleared after stop.
P18.07	Position deviation	0	-32768–32767	Deviation between the reference position and actual running position.
P18.19	Position regulator output	0.00Hz	-327.68–327.67Hz	-

Spindle positioning information

Function code	Name	Default	Setting range	Description
P18.08	Position of position reference point	0	0–65535	Z-pulse reference point position of spindle accurate stop.
P18.09	Present position	0.00	0.00–359.99	Present position setting of

Function code	Name	Default	Setting range	Description
	setting of spindle			spindle accurate stop.
P18.10	Present position of spindle accurate stop	0	0–65535	Present position setting when the spindle stops accurately.

Group P29 Expansion card status viewing

Function code	Name	Default	Setting range	Description
P29.00	Expansion card type of card slot 1	0	0–50	0: No card 1: PLC card 2: I/O card 3: Incremental PG card 4: Incremental PG card with UVW 5: Ethernet communication card 6: PROFIBUS communication card 7: Bluetooth card 8: Resolver PG card 9: CANopen communication card 10: WIFI card 11: PROFINET communication card 12: Sine-cosine PG card without CD signals 13: Sine-cosine PG card with CD signals 14: Absolute encoder PG card 15: CAN master/slave communication card 16: Modbus TCP communication card 17: EtherCAT communication card 18: BACnet communication card (reserved) 19: DeviceNet communication card (reserved) 20: PT100/PT1000 temperature detection card
P29.01	Expansion card type of card slot 2			
P29.02	Expansion card type of card slot 3			

Function code	Name	Default	Setting range	Description
				21: EtherNet IP card 22: MECHATROLINK card (reserved) 23: Bluetooth card 2 24–26: Reserved 27: Endat card 28–31: Reserved 32: SSI card 33: Reserved 34: TFORMAT card 35–50: Reserved
P29.03	Software version of expansion card in slot 1	0.00	0.00–655.35	-
P29.04	Software version of expansion card at slot 2	0.00	0.00–655.35	-
P29.05	Software version of expansion card at slot 3	0.00	0.00–655.35	-
P29.06	Terminal input status of I/O card	0x0000	0x0000–0xFFFF	-
P29.07	Terminal output status of I/O card	0x0000	0x0000–0xFFFF	-
P19.09	EAI1 input voltage of I/O card	0.00V	0.00–10.00V	-

6.13 Encoder-based speed detecting

The VFD supports the speed detecting by the local encoder or by encoder expansion card. The speed detecting method is specified by P20.15.

Method 1 Local encoder based speed detecting

The VFD supports high-speed pulse input, using HDIA and HDIB to input encoder signals (non-differential). You can check the value of P18.00 to obtain the actually detected frequency of encoder.

Function code	Name	Default	Setting range	Description

Function code	Name	Default	Setting range	Description
P05.00	HDI input type	0x00	0x00–0x22	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1
P18.00	Actual frequency of encoder	0.0Hz	-999.9–3276.7Hz	-
P20.01	Encoder pulse count	1024	0–16000	Number of pulses generated when the encoder revolves for one circle.
P20.02	Encoder direction	0x000	0x000–0x111	Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds place: CD/UVW pole signal direction 0: Forward 1: Reverse
P20.15	Speed measurement mode	0	0–1	0: PG card 1: Locally measured through HDI1 and HDI2. Only the 24V incremental encoders are supported.

Method 2 Encoder expansion card based speed detecting

To check whether the detected speed is normal, do as follows:

Step 1 Restore to default values through the keypad.

Step 2 Set P00.03, P00.04 and motor nameplate parameters in group P02.

Step 3 Perform motor parameter autotuning. The autotuned parameters are automatically saved to related motor parameters in group P02.

Step 4 Check whether the detected speed is normal. Set P20.01 (Encoder pulse number) and set P00.00 to 2 (space voltage vector control mode). When P00.10 is 20.00Hz, run the VFD. Then the motor frequency is about 20Hz. Check the value of P18.00 (Actually detected frequency of encoder). If the speed is negative, the encoder is in the reverse direction, and you need to set P20.02 to 1. If the speed deviation is great, the value of P20.01 (Encoder pulse count) is set improperly.

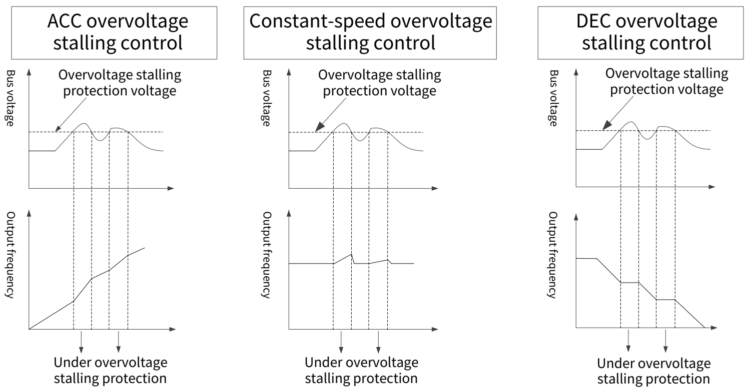
Function code	Name	Default	Setting range	Description
P18.00	Actual frequency of encoder	0.0Hz	-999.9–3276.7Hz	Used to indicate the actual-measured encoder frequency. The value of forward running is positive; the value of reverse running is negative.
P20.00	Encoder type display	0	0–6	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder 4: SSI 5: TFORMAT 6: Reserved
P20.01	Encoder pulse count	1024	0–16000	Number of pulses generated when the encoder revolves for one circle.
P20.02	Encoder direction	0x000	0x000–0x111	Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds place: CD/UVW pole signal direction 0: Forward 1: Reverse
P20.26	Single-turn resolution of absolute encoder	13	0–31	-
P20.27	Multi-turn resolution of absolute encoder	12	0–31	-

6.14 Protection parameter setting

6.14.1 Overvoltage stalling protection

When the motor is in power generation state (the motor speed is greater than the output frequency), the VFD bus voltage will increase continuously. When the detected bus voltage exceeds the value of P11.04 (Overvoltage stalling protection voltage), the overvoltage stalling protection function adjusts the output frequency based on the VFD ACC/DEC status (to be specific, if the VFD is in the ACC or constant speed state, the VFD will increase the output frequency; if the VFD is in the DEC state, the VFD will run at a constant speed and it can decelerate the speed only when the bus voltage is lower than the overvoltage stalling voltage). In this way, the regenerative energy on the bus can be consumed, preventing against VFD overvoltage. If the function does not meet requirements in the actual application, you can adjust parameters related to the current loop and voltage loop.

Figure 6-1 Actions taken for protection against overvoltage stall



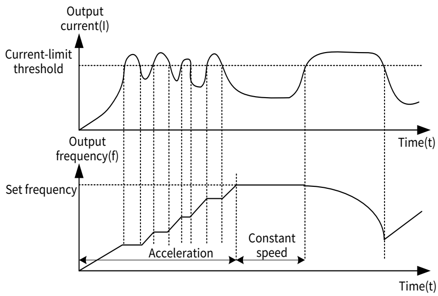
Function code	Name	Default	Setting range	Description
P11.03	Overvoltage stalling protection	1	0–1	0: Disable 1: Enable **Note:** If the braking resistor or dynamic braking unit is used, disable the overvoltage stall control function, that is , set P11.03 to 0.
P11.04	Overvoltage stalling protection	Model depended	120–150% (of the	For 380V, 136% by default For 220V, 120% by default

Function code	Name	Default	Setting range	Description
	voltage		standard bus voltage)	
P11.21	Proportional coefficient of voltage regulator during overvoltage stall	60	0–127	Specifies the proportional coefficient of the bus voltage regulator during overvoltage stalling.
P11.22	Integral coefficient of voltage regulator during overvoltage stall	5	0–1000	Specifies the integral coefficient of the bus voltage regulator during overvoltage stalling.
P11.23	Proportional coefficient of current regulator during overvoltage stall	60	0–1000	Specifies the proportional coefficient of the active current regulator during overvoltage stalling.
P11.24	Integral coefficient of current regulator during overvoltage stall	250	0–2000	Specifies the integral coefficient of the active current regulator during overvoltage stalling.

6.14.2 Current-limit protection

During accelerated running, as the load is too large, the actual acceleration rate of motor is lower than that of output frequency, if no measures are taken, the VFD may trip due to overcurrent during acceleration.

Current-limit protection function detects output current during running, and compares it with the current-limit level defined by P11.06, if it exceeds the current-limit level, the VFD will run at stable frequency during accelerated running, or run in decreased frequency during constant-speed running; if it exceeds the current-limit level continuously, the VFD output frequency will drop continuously until reaching lower limit frequency. When the output current is detected to be lower than the current-limit level again, it will continue accelerated running. In some heavy load scenarios, you can increase the value of P11.06 to improve the VFD output torque.

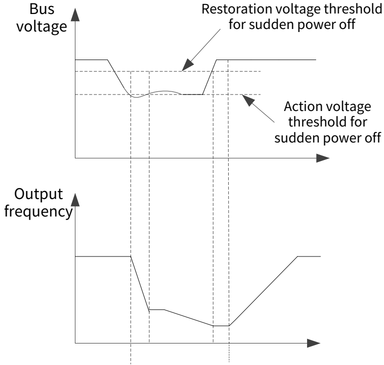


Function code	Name	Default	Setting range	Description
P11.05	Current limit mode	0x001	0x000–0x111	Ones place: Current limit action selection 0: Invalid 1: Always valid Tens place: Action selection upon hardware current limit overload 0:The VFD stops upon a hardware current limit overload fault 1: Keep running Hundreds place: SM hardware current limit action enabling 0: Disable 1: Enable
P11.06	Automatic current limit threshold	Model depended	50.0–200.0%	For the G type: 160.0% For the P type: 120.0% Percentage of the VFD rated output current.
P11.07	Frequency drop rate during current limit	10.00Hz/s	0.00Hz/s–P00.03/s	-

6.14.3 Frequency decrease at sudden power failure

This function enables the system to keep running at sudden short-period power failure. When power failure occurs, the motor is in the power generation state, the bus voltage is kept at the action determination voltage for frequency decrease at sudden power failure, preventing the VFD from stop due to undervoltage.

If this function does not meet actual requirements, you can set parameters P11.17–P11.20. The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral coefficient of speed regulator. Increasing proportional gain or reducing integral time can accelerate dynamic response of speed loop; however, if the proportional gain is too large or integral time is too small, system oscillation and overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur.



Function code	Name	Default	Setting range	Description
P11.01	Frequency drop at transient power-off	0	0–1	0: Disable 1: Enable
P11.17	Proportional coefficient of voltage regulator during undervoltage stall	30	0–127	Specifies the integral coefficient of the bus voltage regulator during undervoltage stalling.
P11.18	Integral coefficient of voltage regulator during undervoltage stall	40	0–1000	Specifies the integral coefficient of the bus voltage regulator during undervoltage stalling.
P11.19	Proportional coefficient of current regulator during undervoltage stall	25	0–1000	Specifies the proportional coefficient of the active current regulator during undervoltage stalling.
P11.20	Integral coefficient	150	0–2000	Specifies the integral coefficient

Function code	Name	Default	Setting range	Description
	of current regulator during undervoltage stall			of the active current regulator during undervoltage stalling.

6.14.4 Cooling fan control

There are three cooling fan control modes, which can be specified by P08.41.

Function code	Name	Default	Setting range	Description
P08.41	Cooling-fan running mode	0	0–2	0: Normal mode 1: Permanent running after power-on 2: Run mode 2

Note: The fan automatically runs in any mode if the VFD detects that the rectifier bridge or inverter module temperature reaches 50°C.

Normal mode: P08.41 = 0

The cooling fan runs when the VFD runs. The cooling fan stops 30s after the VFD stops.

Permanent running after power-on: P08.41 = 1

The cooling fan runs as long as the VFD is powered on.

Run mode 2: P08.41 = 2

The cooling fan runs only when the VFD runs and the ramp frequency is greater than 0. The cooling fan stops 30s after the VFD stops.

6.14.5 Dynamic braking

When the VFD driving a high-inertia load decelerates or needs to decelerate abruptly, the motor runs in the power generation state and transmits the load-carrying energy to the DC circuit of the VFD, causing the bus voltage of the VFD to rise. If the bus voltage exceeds a specific value, the VFD reports an overvoltage fault. To prevent this from happening, you need to configure braking components.

You can set the following parameters for the VFD with a built-in dynamic braking unit:

When P08.39 = 1 and P11.02 = 1, and the bus voltage exceeds the dynamic braking voltage threshold, the braking pipe is opened regardless of whether the VFD is running or stopped. If the bus voltage is less than dynamic braking voltage threshold minus 10V, the braking pipe is closed.

When P08.39 = 1 and P11.02 = 0, and the bus voltage exceeds the dynamic braking voltage threshold, the braking pipe is opened only when the VFD is running. If the bus voltage is less than dynamic braking voltage threshold minus 10V, the braking pipe is closed.

Function code	Name	Default	Setting range	Description
P08.39	Enabling dynamic braking	1	0–1	0: Disable 1: Enable
P08.40	Dynamic braking threshold voltage	700.0V	200.0–2000.0V	The function code is used to set the starting bus voltage of dynamic braking. Adjust this value properly to achieve effective braking for the load. The default value varies depending on the voltage class.
P11.02	Enabling dynamic braking in standby mode	0	0–1	0: Disable 1: Enable

6.14.6 Safe torque cut-off

You can enable the safe torque off (STO) function to prevent unexpected startups when the main power supply of the drive is not switched off. The STO function switches off the drive output by turning off the drive signals to prevent unexpected startups of the motor. See section Appendix F STO function.

Function code	Name	Default	Setting range	Description
P08.55	STO lock selection	0	0–1	0: Lock upon STO alarm Lock upon STO alarm indicates resetting is required after state restoration if STO occurs. 1: No lock upon STO alarm "No lock upon STO alarm" indicates the STO alarm disappears automatically after state restoration if STO occurs.

6.15 Typical applications

6.15.1 Counting

When photoelectric switch pulse signals need to be collected, you can collect signals through the multifunctional digital input terminal by setting P05.11 and P05.12 to 31 (Trigger the counter).

When P17.18 (Accumulative counting value) reaches P08.25 (Set counting value), counting restarts. Once the value of P17.18 equals that of P08.25, set the digital output function to 18 to output the ON signal. Similarly, Once the value of P17.18 equals that of P08.26, set the digital output function to 19 to output the ON signal.

Function code	Name	Default	Setting range	Description
P05.00	HDI input type	0x00	0x00–0x22	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1
P05.11	Function of HDI1	0	0–95	18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 28: Reset the counter (the counting value is cleared) 31: Trigger the counter (the counting value is accumulated)
P05.12	Function of HDI2	0		
P06.00	HDO1 output type	0	0–1	0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, see P06.42–P06.46. 1: Open collector output. For details about the related functions, see P06.02.
P06.01	DO1 output	0	0–63	0: Invalid 18: Set counting value reached
P06.04	HDO1 output	0		

Function code	Name	Default	Setting range	Description
P06.05	RO1 output	1		19: Designated counting value reached
P06.06	RO2 output	5		
P08.25	Set counting value	0	P08.26–65535	-
P08.26	Designated counting value	0	0–P08.25	-
P17.18	Accumulative counting value	0	0–65535	-

6.15.2 Motor temperature detecting

The motor temperature can be detected by connecting the VFD carried terminals AO1 and AI1 to a temperature sensor (PT100, PT1000, or KTY84). This function helps to output an overheating alarm and stop the machine. The wiring procedure is as follows:

Step 1 Set the AO1 output signal type to current, and then connect one end of the sensor resistor to AI1 and AO1 and the other end to GND.

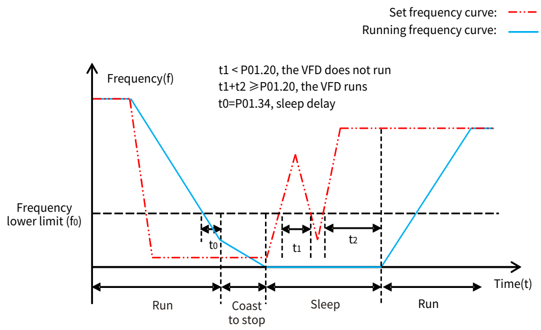
Step 2 Check the value of P06.51 to obtain the actual temperature. When the detected temperature exceeds P06.49 (Motor OT pre-alarm threshold) and digital output terminal function 50 is used, the VFD outputs the ON signal. When the detected temperature exceeds P06.48 (Motor OT protection threshold), the VFD reports the OT fault.

Function code	Name	Default	Setting range	Description
P06.47	Type of sensor for AI/AO card to detect motor temperature	0	0x000–0x014	Ones place: Temperature sensor type 0: None 1: PT100 2: PT1000 3: KTY84 4: PTC Tens place: AI input source 0: AI1 1: AI2 (Reserved) Hundreds place: Reserved **Note:** Motor temperature is displayed through P06.51. To measure temperature, switch the output of AO1 to current, and

Function code	Name	Default	Setting range	Description
				connect one end of the temperature resistor to AI1 and AO1, and the other end to GND.
P06.48	AIAO detected motor OT protection threshold	110.0°C	0.0–200.0°C	When the motor temperature exceeds the value, the VFD reports the OT fault.
P06.49	AIAO detected motor OT pre-alarm threshold	90.0°C	0.0–200.0°C	When the motor temperature exceeds the value, the DO terminal with function 48 (AI detected motor OT pre-alarm) outputs a valid signal.
P06.51	AIAO detected temperature	0.0°C	-20.0–200.0°C	-
P06.00	HDO output type	0	0–1	0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, see P06.42–P06.46. 1: Open collector output. For details about the related functions, see P06.02.
P06.01	DO1 output	0	0–95	0: Invalid 50: AIAO detected OT pre-alarm
P06.04	HDO1 output	0		
P06.05	RO1 output	1		
P06.06	RO2 output	5		

6.15.3 Sleep and wakeup

According to energy saving requirements, the sleep function can be used in water supply scenarios. When the motor needs to run effectively, you can adjust the set frequency to wake up it. The timing diagram is as follows.

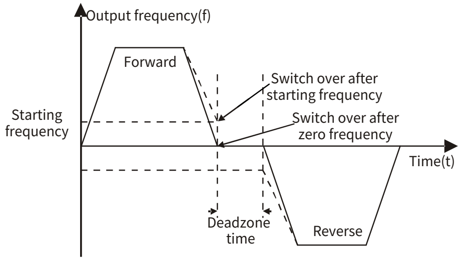


When the set frequency is lower than the frequency lower limit, and the ones place of P01.19 is set to sleep, the VFD stops according to the tens place of P01.19 and sleeps once running at the lower limit for the time specified by P01.34. If the set frequency exceeds the lower limit again and it lasts for the time specified by P01.20, the VFD restores to the running state automatically and increases to the set frequency.

Function code	Name	Default	Setting range	Description
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	0x00	0x00–0x12	The function code determines the running state of the VFD when the set frequency is lower than the lower-limit one. Ones place: Action selection 0: Run at the frequency lower limit 1: Stop 2: Sleep Tens place: Stop mode 0: Coast to stop 1: Decelerate to stop
P01.20	Wake-up-from-sleep delay	0.0s	0.0–3600.0s	Valid when P01.19 is 2.
P01.34	Sleep delay	0.0s	0–3600.0s	-

6.15.4 Switchover between FWD run and REV run

In scenarios with the needs of frequent switchover between FWD run and REV run, you can set P01.14 to increase the force and stability in the process to decrease the current impact. When P01.14=0, the switching frequency point is zero (P01.15). When P01.14=1, the switching frequency point is starting frequency (P01.01). See the following figure.



Function code	Name	Default	Setting range	Description
P01.14	FWD/REV running switching mode	1	0–2	0: Switch at zero frequency 1: Switch at the starting frequency 2: Switch after the speed reaches the stop speed with a delay

Switch at the zero or starting frequency: P01.14=0 or 1

When P01.14=0 or 1, and the switchover between FWD run and REV run is valid, the VFD decelerates to the switching frequency point. If P01.16=1, check whether the motor output frequency is less than the switching frequency point. If yes, wait the time specified by P01.13, and then control the motor to run in the reverse direction. If no, wait the time specified by P01.17 and then the time specified by P01.13, and then control the motor to run in the reverse direction.

Switch after the speed reaches the stop speed with a delay: P01.14=2

When P01.14=2, the DEC process for the switchover between FWD run and REV run is similar to the process of deceleration to stop. In the DEC process for the switchover, you can set related parameters to determine whether to enable short-circuit braking for stop and DC braking based on the work conditions. The difference between the two processes is as follows: When the running frequency reaches the stop speed specified by P01.15 or DC braking ends, the deadzone time specified by P01.13 needs to be waited, and then the motor can be controlled to run in the reverse direction.

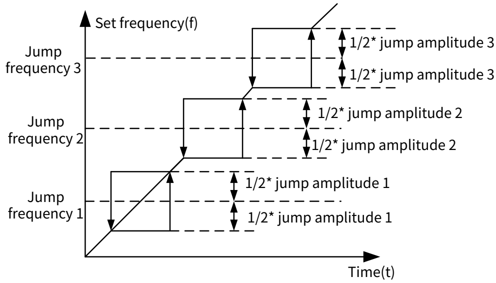
Function code	Name	Default	Setting range	Description
P01.01	Starting frequency of direct start	0.50Hz	0.00Hz–P00.03	The function code indicates the initial frequency during VFD start. For details, see P01.02 (Starting frequency hold time).

Function code	Name	Default	Setting range	Description
P01.02	Starting frequency hold time	0.0s	0.0–50.0s	Setting a proper starting frequency can increase the torque during VFD start. During the hold time of the starting frequency, the output frequency of the VFD is the starting frequency. And then, the VFD runs from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the VFD stops running and keeps in the standby state. The starting frequency is not limited in the lower limit frequency.
P01.13	FWD/REV running deadzone time	0.0s	0.0–3600.0s	This function code indicates the transition time specified in P01.14 during FWD/REV rotation switching.
P01.15	Stop speed	0.50Hz	0.00Hz–P00.03	Specifies the stop speed (frequency).
P01.16	Stop speed detection mode	0	0–1	0: Detect by the set speed (unique in V/F mode) 1: Detect by the feedback speed
P01.17	Stop speed detection time	0.50s	0.00–100.00s	-

6.15.5 Jump frequency

The VFD can avoid mechanical resonance points by setting jump frequencies. The VFD has three jump frequency parameters P08.11, P08.13, and P08.15. If all jump frequencies are set to 0, this function is invalid. When the set frequency is within the jump frequency range (Jump frequency ± 1/2 * Jump amplitude), if the VFD is in the ACC phase, the VFD runs at the lower bound (Jump frequency – 1/2 * Jump amplitude); if the VFD is in the DEC phase, the VFD runs at the upper bound (Jump frequency + 1/2 * Jump amplitude).

See the following figure.

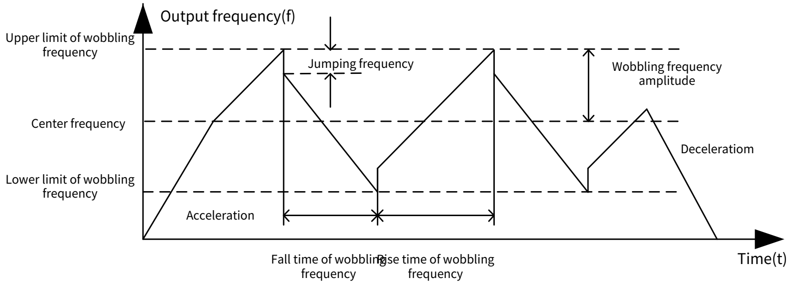


Function code	Name	Default	Setting range	Description
P08.11	Jump frequency 1	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency.
P08.12	Jump frequency amplitude 1	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency. Refer to P08.11 to set it.
P08.13	Jump frequency 2	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency.
P08.14	Jump frequency amplitude 2	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency. Refer to P08.13 to set it.
P08.15	Jump frequency 3	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency.
P08.16	Jump frequency amplitude 3	0.00Hz	0.00Hz–P00.03	P00.03 specifies the max. output frequency. Refer to P08.15 to set it.

6.15.6 Wobbling frequency

Wobbling frequency is mainly applied in the scenarios where transverse movement and winding functions are needed such as textile and chemical fiber industries. The wobbling frequency function indicates that the VFD output frequency wobbles up or down with the set frequency as the center, and the output frequency with the wobbling frequency is impacted by the frequency upper and lower limits.

The time axis tracking is as shown in the following figure.



Wobbling frequency = Central frequency (Set frequency) x P08.17 (Amplitude of wobbling frequency)

Sudden jump frequency = Wobbling frequency x P08.18 (Amplitude of sudden jump frequency)

Function code	Name	Default	Setting range	Description
P08.17	Wobbling frequency amplitude percentage	0.0%	0.0–100.0%	Relative to the set frequency
P08.18	Amplitude of sudden jump frequency	0.0%	0.0–50.0%	Relative to the wobbling frequency
P08.19	Rise time of wobbling frequency	5.0s	0.1–3600.0s	Time taken to run from the lowest point of wobbling frequency to the highest point.
P08.20	Fall time of wobbling frequency	5.0s	0.1–3600.0s	Time taken to run from the highest point of wobbling frequency to the lowest point.
P05.00	HDI input type	0x00	0x00–0x22	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1

Function code	Name	Default	Setting range	Description
P05.01	Function of DI1	1	0–95	0: No function 26: Pause wobbling frequency, stopped at the present frequency 27: Reset wobbling frequency, returned to the center frequency (set frequency)
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		

6.15.7 CAN master/slave control

This function is applicable to the scenarios that require power balancing for multiple motors driving the same load. The CAN master/slave cards need to be configured for the VFDs. The master needs to run in the speed control mode, while the slave follows the master speed or torque and it can run at the speed or torque control mode.

When the motors driven by the master and slave are connected rigidly through gears or chains, the slave needs to use the torque control mode. When the motors driven by the master and slave are connected softly, the slave needs to use the speed control mode. If the mechanical drive ratios of the master driven and slave driven motors are not the same, recalculate the running frequency of the slave running at the max. linear speed of the master, and set the max. output frequency P00.03 of the slave to this running frequency.

When connecting the CAN master and slave cards, check whether the terminal resistor between the master card and the final slave card.

Table 6-2 Master/slave control parameter settings in rigid or soft connection

Master/slave control in rigid connection		Master/slave control in soft connection	
Master VFD parameter settings	Slave VFD parameter settings	Master VFD parameter settings	Slave VFD parameter settings
P08.63	P08.63	P08.62	P08.62
P28.00–P28.02	P03.68	P08.63	P08.63
P28.06	P28.00–P28.04	P28.00–P28.02	P28.00–P28.03
-	P28.17	P28.06	-

Function code	Name	Default	Setting range	Description
P08.62	Frequency threshold of the start of drop control	2.00Hz	0.00Hz–P00.03	If unbalanced low-speed current occurs at start, increase this value properly to enable the droop control in advance.

Function code	Name	Default	Setting range	Description
P08.63	Frequency decrease ratio in drop control	0.00Hz	0.00Hz–P00.03	The output frequency of the VFD changes as the load changes. The function code is mainly used to balance the power when several motors drive a same load. **Note:** In rigid connection, set it to 0 since the master and slave VFDs do not need the droop function. In soft connection, set it to a proper value (below 5.00Hz) for the master VFD. A small mechanical transmission ratio requires a small value of this parameter.
P03.68	Upper limit frequency bias value in torque control	0.00Hz	0.00Hz–P00.03	It is valid only for torque control. A great slave mechanical transmission ratio requires a great value of this parameter.
P28.00	Master/slave mode	0	0–2	0: Master/slave control is invalid. 1: The local device is the master. 2: The local device is the slave.
P28.01	Master/slave communication data selection	0	0–1	0: CAN 1: Reserved
P28.02	Master/slave control mode	0x001	0x000–0x112	Ones place: Master/slave running mode selection 0: Master/slave mode 0 The master and slave use speed control, with power balanced through droop control. 1: Master/slave mode 1 The master and slave must be in the same type of vector control. When the master is in speed control, the slave is forced into torque control. 2: Master/slave mode 2

Function code	Name	Default	Setting range	Description
				The slave switches from speed mode (master/slave mode 0) to torque mode (master/slave mode 1) at a frequency point. Tens place: Slave start command source 0: Master 1: Determined by P00.01 Hundreds place: Whether to enable master/slave to send/receive data 0: Enable 1: Disable
P28.03	Slave speed gain	100.0%	0.0–500.0%	Used to adjust the upper frequency in slave torque control. 100.0% is relative to the linear speed same as the master. When the slave mechanical transmission ratio is great, you can set this parameter to a value greater than 100.0%
P28.04	Slave torque gain	100.0%	0.0–500.0%	Used to adjust the slave torque reference. 100.0% is relative to the percentage of the torque current same as the master.
P28.05	Frequency point for switching between speed mode and torque mode in master/slave mode 2	5.00Hz	0.00Hz–P00.03	-
P28.06	Number of slaves	1	0–15	-
P28.17	Slave torque offset	0.0%	-100.0–100.0%	Used to adjust the slave torque reference, imposing an offset value. 100.0% is relative to the motor rated current of the slave.
P28.18	CAN	1	0–127	-

Function code	Name	Default	Setting range	Description
	communication address			
P28.19	CAN communication baud rate	2	0–5	0: 50kbps 1: 100kbps 2: 125kbps 3: 250kbps 4: 500kbps 5: 1Mbps
P28.20	CAN communication timeout time	0.0s	0.0–60.0s	0.0: Invalid

6.15.8 Pulse train positioning control

Pulse train positioning control is based on closed-loop vector control . Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. For details about speed measurement, see section 6.13 Encoder-based speed detecting. The commissioning description is as follows:

1. Set P21.00=0x0001 set positioning mode to position control, namely pulse train control. There are four types of pulse command mode, which can be set through P21.01.

In position control mode, you can view parameters P18.00, P18.02, P18.03–P18.06, P18.17 and P18.19 in group P18 and find the relationship between P18.08, P18.02, and between P18.17, P18.18 and P18.19.

2. The position regulator has two gains, namely P21.02 and P21.03, and they can be switched by speed command, torque command and terminals.

3. When P21.08 (Position controller output limit) is set to 0, the position control will be invalid, and at this point, the pulse train acts as frequency source, P21.13 (Position feedforward gain) should be set to 100%, the speed ACC/DEC time is determined by the pulse train ACC/DEC time, and the pulse train ACC/DEC time of the system can be adjusted.

If the pulse train acts as the frequency source in speed control, you can also set P21.00 to 0x0000, and set the frequency source reference P00.06 or P00.07 to 13 (set by pulse train AB). At this point, the ACC/DEC time is determined by the VFD ACC/DEC time, meanwhile, the parameters of pulse train AB is still specified by group P21. In speed mode, the filter time of pulse train AB is determined by P21.29.

4. Pulse train input frequency is consistent with encoder pulse feedback frequency. You can change the relationship by setting P21.11 and P21.12. In addition, you can set any parameters among P05.01–P05.04, P05.11–P05.12 to 70 (Electric gear selection) to switch the numerator of the 2nd command ratio.

Function code	Name	Default	Setting range	Description
P21.00	Positioning mode	0x0000	0x0000–0x3031	Ones place: Control mode selection (only for closed-loop vector control) 0: Speed control 1: Position control Tens place: Position command source 0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop 3: Position JOG Hundreds place: Reserved Thousands place: Servo mode (Reserved) 0: Disable servo, without position deviation 1: Disable servo, with position deviation 2: Enable servo, without position deviation 3: Enable servo, with position deviation **Note:** In the pulse train or spindle positioning mode, the VFD enters the servo operation mode if there is a valid servo enabling signal. If there is no servo enabling signal, the VFD enter the servo operation mode only after it receives a forward running or reverse running command.
P21.01	Pulse command mode	0x0000	0x0000–0x3133	Ones place: Pulse mode 0: A/B quadrature pulse; A leads B 1: A is PULSE and B is SIGN **Note:** If channel B is of low electric level, the edge counts up; if channel B

Function code	Name	Default	Setting range	Description
				is of high electric level, the edge counts down. 2: A is positive pulse **Note:** Channel A is positive pulse; channel B needs no wiring. 3: A/B dual-channel pulse; channel A pulse edge counts up, channel B pulse edge counts down Tens place: Pulse direction 0: Pulse direction setting: forward 1: Pulse direction setting: reverse 2: Pulse direction set by running direction 3: Pulse direction set by running direction Hundreds place: Frequency multiplication selection for pulse +direction (reserved) 0: No frequency multiplication 1: Frequency multiplication Thousands place: Pulse control selection 0: Inertia filter, without overspeed control 1: Average moving filter, without overspeed control 2: Inertia filter, with overspeed control 3: Average moving filter, with overspeed control
P21.02	APR gain 1	20.0	0.0–400.0	The switchover between the two position loop gains is specified by P21.04.
P21.03	APR gain 2	30.0		
P21.04	APR gain switchover mode	0	0–5	Used to select the mode for switching between position loop gains. To use torque command-based switching, you need to set P21.05; and to use speed command-based switching, you need to set P21.06.

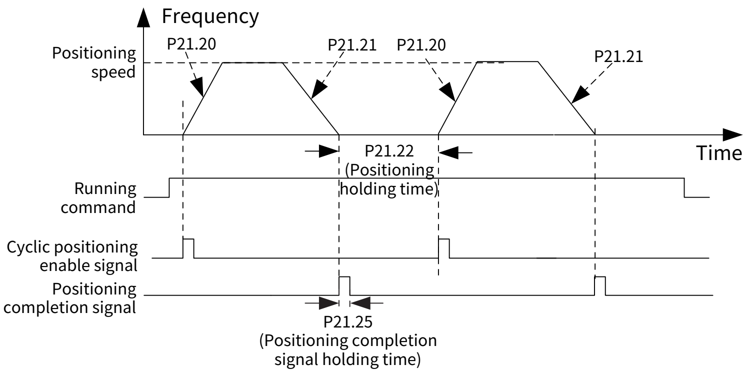
Function code	Name	Default	Setting range	Description
				0: No switchover 1: Torque command 2: Speed command 3–5: Reserved
P21.05	Position gain switchover threshold in torque command	10.0%	0.0–100.0%	Motor rated torque
P21.06	Position gain switchover threshold in speed command	10.0%	0.0–100.0%	Motor rated speed
P21.07	Smooth filter coefficient for gain switchover	5	0–15	Smooth filter coefficient for APR gain switchover.
P21.08	APR output limit	20.0%	0.0–100.0%	The max. output frequency is P00.03. Position regulator output Value. When the APR output limit is 0, the APR is invalid, and no position control can be performed, however, speed control is valid.
P21.09	Positioning completion zone	10	0–1000	When the position deviation is less than P21.09, and the duration is greater than P21.10, positioning completion signal will be outputted.
P21.10	Detection time for positioning completion	10.0ms	0.0–1000.0ms	-
P21.11	Numerator of position command ratio	1000	1–65535	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement.
P21.12	Denominator of position command ratio	1000	1–65535	-
P21.13	Position feedforward gain	100.00%	0.00–120.00	For pulse train giving only (in position control)

Function code	Name	Default	Setting range	Description
			%	
P21.14	Position feedforward filter time constant	3.0ms	0.0–3200.0 ms	
P21.15	Position command filter time constant	0.0ms	0.0–3200.0ms	Position feedforward filter time constant during the pulse train positioning.
P21.29	Speed feedforward filtering time constant (pulse train-based speed mode)	10.0ms	0.0–3200.0ms	Filter time constant detected by the pulse train when the speed reference source is set to the pulse train (P00.06=12 or P00.07=12).
P21.30	Numerator of the 2nd command ratio	1000	1–65535	You can select terminal function 70 to switch to the numerator of the 2nd command ratio.
P20.17	Pulse filter handling selection	0x0033	0x0000–0xFFFF	Bit0: Encoder channel P input filter enabling 0: Disable 1: Enable Bit 1: Encoder P-channel input filter method 0: Self-adaptive filter 1: Use P20.18 filter parameter Bit2: Encoder channel P frequency-division output filter enabling 0: Disable 1: Enable Bit3: Pulse reference channel F frequency-division output filter enabling 0: No filter 1: Filter Bit4: Pulse reference channel F filter enabling 0: Disable 1: Enable

Function code	Name	Default	Setting range	Description
				Bit5: Pulse reference channel F filter mode 0: Self-adaptive filter 1: Use P20.19 filter parameter Bit6: Frequency-divided output source setting 0: Encoder signals 1: Pulse reference signals Bit7–bit15: Reserved
P20.19	Pulse reference channel F filter width	2	0–63	The filter time is P20.19*0.25μs. The value 0 or 1 indicates 0.25μs.
P20.20	Pulse number of pulse reference channel F	1024	0–16000	It is the same as the value of P20.01 in most cases, which indicates the number of pulses per turn.

6.15.9 Digital positioning control

Digital positioning control is based on closed-loop vector control . Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. For details about speed measurement, see section 6.13 Encoder-based speed detecting. Digital positioning control is shown in the following figure.



The commissioning description is as follows:

1. Set P21.00=0x0011 to enable digital positioning. According to the actual situation, set the positioning offset through P21.17, P21.11, and P21.12, set the positioning speed through P21.18 and P21.19, and set the positioning ACC/DEC time through P21.20 and P21.21.

2. Set bit 1 of P21.16 to select a positioning operation. Setting it to 0 enables one-time positioning. Then the motor executes a single positioning action and keeps at the positioning position according to the setup at step 1. Setting it to 1 enables the cyclic positioning, which is divided into continuous mode and repetitive mode. Or you can set any of P05.01–P05.04, P05.11–P05.12 to 55 to perform cyclic positioning.

Function code	Name	Default	Setting range	Description
P21.00	Positioning mode	0x0000	0x0000–0x3031	Ones place: Control mode selection (only for closed-loop vector control) 0: Speed control 1: Position control Tens place: Position command source 0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop 3: Position JOG Hundreds place: Reserved Thousands place: Servo mode (reserved) 0: Disable servo, without position deviation 1: Disable servo, with position deviation 2: Enable servo, without position deviation 3: Enable servo, with position deviation
P21.02	APR gain 1 (static)	20.0	0.0–400.0	The switchover between the two position loop gains is specified by P21.04.
P21.03	APR gain 2 (dynamic)	30.0		
P21.04	Position loop gain switchover	0	0–2	Used to select the mode for switching between position loop

Function code	Name	Default	Setting range	Description
	mode			gains. To use torque command-based switching, you need to set P21.05; and to use speed command-based switching, you need to set P21.06. 0: No switchover 1: Torque command 2: Speed command
P21.05	Position gain switchover threshold in torque command	10.0%	0.0–100.0%	Relative to the motor rated torque.
P21.06	Position gain switchover threshold in speed command	10.0%	0.0–100.0%	Relative to the motor rated speed.
P21.07	Smooth filter coefficient for gain switchover	5	0–15	Smooth filter coefficient for APR gain switchover.
P21.08	APR output limit	20.0%	0.0–100.0%	Relative to max. output frequency P00.03. When the position regulator output limit is 0, the position regulator is invalid, and no position control can be performed, however, speed control is valid.
P21.09	Positioning completion zone	10	0–1000	When the position deviation is less than P21.09, and the duration is greater than P21.10, positioning completion signal will be outputted.
P21.10	Detection time for positioning completion	10.0ms	0.0–1000.0ms	-
P21.11	Numerator of position command ratio	1000	1–65535	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement.
P21.12	Denominator of position	1000	1–65535	

Function code	Name	Default	Setting range	Description
	command ratio			
P21.16	Digital positioning mode	0x0000	0x0000–0xFFFF	Bit 0: Positioning mode 0: Relative position 1: Absolute position (Origin mode. This function is reserved.) Bit 1: Cyclic positioning setting. You can enable positioning through a terminal (function 55) or choose automatic cyclic positioning. Terminals support only the enabling of continuous positioning, and automatic cyclic positioning can be set to cyclic positioning or reciprocating positioning through bit 2 of P21.16. 0: Terminal-based cyclic positioning (terminal No. 55) 1: Automatic cyclic positioning Bit2: Cyclic mode 0: Continuous 1: Reciprocating (Only supported during automatic cyclic positioning) Bit 3: P21.17 digital setting mode. You can select incremental or position type. The incremental type indicates that P21.17 needs to be conducted again after each positioning is enabled. When the position reference bit command is enabled, the displacement is set through P21.17. When P21.17 is changed, new position is be positioned automatically. 0: Incremental 1: Position type (do not support the continuous mode)

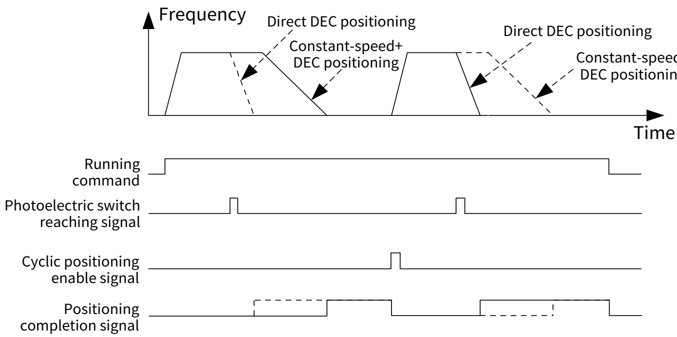
Function code	Name	Default	Setting range	Description
				Bit4: Origin searching mode (reserved) 0: Search for the origin only for once 1: Search for the origin in every time of running Bit5: Origin calibration mode (reserved) 0: Calibration in real time 1: One-time calibration Bit 6: Positioning completion signal setting. You can set the positioning completion signal in the pulse or electrical level form. The positioning completion signal is valid in the positioning completion signal holding time set in P21.25. 0: Valid in the positioning completion signal holding time (P21.25) 1: Always valid Bit 7: First positioning setting. You can set whether the first positioning is performed when a running command is received. If no, the first positioning is performed only after the positioning enabling terminal or automatic cyclic positioning is enabled. 0: Invalid 1: Valid Bit 8: Positioning enabling signal setting (for terminal-based cyclic positioning). In the pulse form, after positioning is completed or in the first positioning, the jump

Function code	Name	Default	Setting range	Description
				edge of the positioning enabling terminal needs to be detected for performing positioning. In the electrical level mode, after positioning is completed or in the first positioning, positioning is performed after it is detected that the positioning enabling terminal is switched on. 0: Pulse signal 1: Electrical level signal Bit 9: Position source 0: Set by P21.17 1: Dp/CANopen/PROFINET/ Ethernet IP communication Bit 10: Indicates whether to save encoder pulse count value at power-off 0: No 1: Yes Bit11: Reserved Bit 12: Positioning curve setting (Reserved) 0: Straight line 1: S curve Bit13–bit15: Reserved
P21.17	Position set in digital mode (LSB)	0	0–65535	Used to set the position LSB for digital positioning. The position MSB for digital positioning is set in P46.03.
P21.18	Positioning speed setting	0	0–6	0: Set by P21.19 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDI1 5: High-speed pulse HDI2 6: Dp/CANopen/PROFINET/ Ethernet IP communication

Function code	Name	Default	Setting range	Description
P21.19	Positioning speed set in digital mode	20.0%	0–100.0%	Relative to the max. frequency.
P21.20	Positioning ACC time	3.00s	0.01–300.00s	Used to set the ACC/DEC time in the positioning process. Positioning ACC time means the time needed if the VFD speeds up from 0Hz to the max. output frequency (P00.03).
P21.21	Positioning DEC time	3.00s	0.01–300.00s	Positioning DEC time means the time needed if the VFD speeds down from the max. output frequency (P00.03) to 0Hz.
P21.22	Positioning holding time	0.100s	0.000–60.000s	Used to set the holding time after the destination position is reached.
P21.25	Positioning completion signal holding time	0.200s	0.000–60.000s	Time for holding the positioning completion signal. This parameter is also valid for the positioning completion signal of spindle accurate stop.

6.15.10 Photoelectric switch stop positioning

Photoelectric switch stop positioning is based on closed-loop vector control. Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. For details about speed measurement, see section 6.13 Encoder-based speed detecting. The photoelectric switch stop positioning is shown in the following figure.



The commissioning description is as follows:

1. Set P21.00=0x0021 to enable positioning of photoelectric switch stop.

The photoelectric switch signal must connect to S8, and P05.08 is set to 43. Based on the actual situation, position the displacement through P21.17, P21.11, and P21.12, and determine the DEC time through P21.21.

Note: If the running speed is too high or the set positioning displacement is too small, the positioning DEC time will fail, and the direct DEC positioning mode is entered.

2. Cyclic positioning operation

After positioning is completed, the motor will keep at the current position. You can set cyclic positioning through input terminal function selection (55: enable cyclic digital positioning) in group P05; when the terminal receives cyclic positioning enable signal (that is pulse signal), the motor will continue running in the set speed as per the speed mode and re-enter the positioning state after encountering the photoelectric switch.

3. Hold positioning.

The position loop gain during positioning is P21.03; while the position loop gain in positioning-completion-hold state is P21.02. In order to keep sufficient position-hold force and ensure no system oscillation occurred, adjust P03.00, P03.01, P20.05 and P21.02.

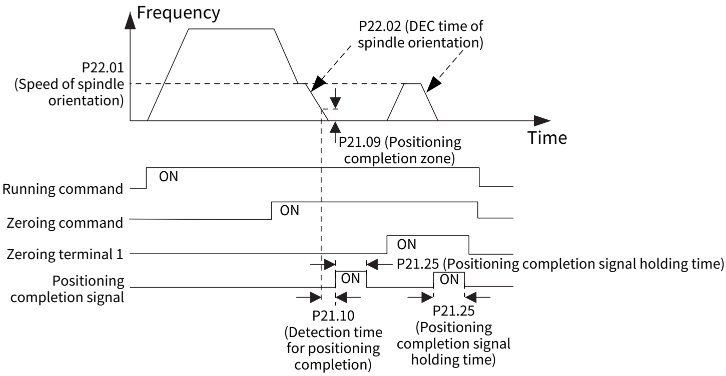
Function code	Name	Default	Setting range	Description
P21.00	Positioning mode	0x0000	0x0000–0x3031	Ones place: Control mode selection (only for closed-loop vector control) 0: Speed control 1: Position control Tens place: Position command source

Function code	Name	Default	Setting range	Description
				0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop 3: Position JOG Hundreds place: Reserved Thousands place: Servo mode (Reserved) 0: Disable servo, without position deviation 1: Disable servo, with position deviation 2: Enable servo, without position deviation 3: Enable servo, with position deviation
P21.02	APR gain 1	20.0	0.0–400.0	The switchover between the two position loop gains is specified by P21.04.
P21.03	APR gain 2	30.0		
P21.04	APR gain switchover mode	0	0–2	Used to select the mode for switching between position loop gains. To use torque command-based switching, you need to set P21.05; and to use speed command-based switching, you need to set P21.06. 0: No switchover 1: Torque command 2: Speed command
P21.05	Position gain switchover threshold in torque command	10.0%	0.0–100.0%	Relative to the motor rated torque
P21.06	Position gain switchover threshold in speed command	10.0%	0.0–100.0%	Relative to the motor rated speed
P21.07	Smooth filter	5	0–15	Smooth filter coefficient for APR

Function code	Name	Default	Setting range	Description
	coefficient for gain switchover			gain switchover.
P21.08	APR output limit	20.0%	0.0–100.0%	When the position regulator output limit is 0, the position regulator is invalid, and no position control can be performed, however, speed control is valid.
P21.09	Positioning completion zone	10	0–1000	When the position deviation is less than P21.09, and the duration is greater than P21.10, positioning completion signal will be outputted.
P21.10	Detection time for positioning completion	10.0ms	0.0–1000.0ms	-
P21.11	Numerator of position command ratio	1000	1–65535	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement.
P21.12	Denominator of position command ratio	1000	1–65535	
P21.17	Position set in digital mode	0	0–65535	Used for digital positioning. Actual position = P21.17×P21.11/P21.12
P21.21	Positioning DEC time	3.00s	0.01–300.00s	Positioning DEC time means the time needed if the VFD speeds down from the max. output frequency (P00.03) to 0Hz.
P21.22	Positioning holding time	0.100s	0.000–60.000s	Used to set the holding time after the destination position is reached.
P21.25	Positioning completion signal holding time	0.200s	0.000–60.000s	Time for holding the positioning completion signal. This parameter is also valid for the positioning completion signal of spindle accurate stop.

6.15.11 Spindle zeroing

Spindle zeroing control is based on closed-loop vector control . Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. For details about speed measurement, see section 6.13 Encoder-based speed detecting. Spindle zeroing is shown in the following figure.



The commissioning description is as follows:

Set bit 0 of P22.00 to 1 to enable spindle positioning, and set bit 1 of P22.00 to select spindle zero-point input. Set bit 2 of P22.00 to select a zero-point search mode, set bit 3 of P22.00 to enable or disable zero-point calibration, and set bit 7 of P22.00 to select a zero-point calibration mode.

Function code	Name	Default	Setting range	Description
P22.00	Spindle positioning mode selection	0x0000	0x0000–0xFFFF	Bit0: Enable spindle positioning 0: Disable 1: Enable Bit1: Spindle positioning reference point selection. Select the encoder Z pulse or the photoelectric switch (set to function 43) as the spindle accurate stop reference point. 0: Z pulse input 1: DI2/DI3/DI4 terminal input Bit2: Search for reference point 0: Search only once 1: Search each time Bit3: Enable reference point calibration 0: Disable 1: Enable

Function code	Name	Default	Setting range	Description
				Bit4: Positioning mode selection 1 0: Set direction positioning 1: Near-by direction positioning Bit5: Positioning mode selection 2. It is valid when bit4 is set to 0. 0: Forward positioning 1: Reverse positioning Bit6: Zeroing command selection 0: Electric level mode 1: Pulse mode. Executing the positioning (zeroing and indexing) command does not need a running command. If there is a run command, it will automatically switch back to the speed mode. Bit7: Reference point calibration mode 0: Calibrate at the first time 1: Calibration in real time Bit8: Action selection after zeroing signal cancellation (electric level type) 0: Switch to speed mode 1: Position lock mode Bit9: Positioning completion signal selection 0: Electrical level signal 1: Pulse signal Bit10: Z pulse signal source 0: Motor 1: Spindle Bit11–15: Reserved
P22.01	Speed of spindle orientation	10.00Hz	0.00Hz–P00.03	Used to indicate the speed of searching for the accurate-stop start position during spindle accurate stop. After finding the accurate-stop start position, switch to position control mode for an accurate stop.

Function code	Name	Default	Setting range	Description
P22.02	DEC time of spindle accurate stop	3.0s	0.1–100.0s	DEC time of spindle accurate stop. Spindle orientation deceleration time means the time needed for the VFD to decelerate from the max. output frequency (P00.03) to 0Hz.

6.15.11.1 Spindle zeroing

The spindle zeroing procedure is as follows:

Step 1 Select a positioning direction through bit 4 of P22.00.

Step 2 Set multifunction input terminals to 46 and 47 through group P05, and select one zeroing position (there are four zero points in group P22). When performing the zeroing function, the motor stops the corresponding zeroing position according to the set positioning direction. You can check the value of P18.10 to view the information.

Function code	Name	Default	Setting range	Description
P05.01	Function of DI1	1	0–95	43: Position reference point input 44: Disable spindle orientation 45: Spindle zeroing / Local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zeroing position selection 2
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		
P18.10	Present position of spindle accurate stop	0	0–65535	Present position of spindle accurate stop
P22.03	Spindle zeroing position 0	0	0–65535	-
P22.04	Spindle zeroing position 1	0	0–65535	-
P22.05	Spindle zeroing position 2	0	0–65535	-
P22.06	Spindle zeroing position 3	0	0–65535	-

Note: The positioning length of spindle zeroing is determined by the deceleration time and the speed of accurate stop.

6.15.11.2 Spindle indexing operation

Set multifunction input terminals to 48, 49, and 50 through group P05, and select one indexing position (there are seven indexing positions in group P22). After the motor completes accurate-stop, if the corresponding indexing terminal is enabled, the motor will query the indexing position status table and turn to the corresponding position in an incremental manner. You can check the value of P18.09 to view the information.

Indexing operation is only valid when P22.00 bit6 = 1, and after activation, neither the spindle logic nor the indexing logic can be started via the keyboard 'run' command; it can only be started via terminals.

Spindle operation is valid when P22.00 bit6 = 1 or P22.00 bit6 = 0. When P22.00 bit6 = 1, spindle operation cannot be started via the keyboard 'run' command and must be initiated via terminals. When P22.00 bit6=0, spindle operation can be performed using the 'run' command to execute the spindle precise stop logic.

Note: Speed mode has higher priority than indexing, and indexing mode is only active at P22.00=0x41.

Function code	Name	Default	Setting range	Description
P05.01	Function of DI1	1	0–95	48: Spindle indexing selection 1 49: Spindle indexing selection 2 50: Spindle indexing selection 3
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		
P18.09	Present position setting of spindle	0.00	0.00–359.99	Present position setting when the spindle stops accurately.
P22.07	Spindle indexing angle 1	15.00	0.00–359.99	-
P22.08	Spindle indexing angle 2	30.00	0.00–359.99	-
P22.09	Spindle indexing angle 3	45.00	0.00–359.99	-
P22.10	Spindle indexing angle 4	60.00	0.00–359.99	-
P22.11	Spindle indexing angle 5	90.00	0.00–359.99	-

Function code	Name	Default	Setting range	Description
P22.12	Spindle indexing angle 6	120.00	0.00–359.99	-
P22.13	Spindle indexing angle 7	180.00	0.00–359.99	-

6.15.11.3 Priority of speed control, position control, zeroing, and indexing

Speed control takes priority over indexing. When the system runs in indexing mode, only if spindle positioning is disabled, the motor uses the speed mode or position mode.

Zeroing takes priority over indexing. The indexing command is valid when the indexing terminal changes from the 000 state to a non-000 state. For example, for the change from 000 to 011, the spindle executes indexing 3. The transition time during terminal switchover needs to be less than 10ms; otherwise, an incorrect indexing command may be executed.

6.15.11.4 Hold positioning.

The position loop gain during positioning is P21.03; while the position loop gain in positioning-completion-hold state is P21.02. In order to keep sufficient position-hold force and ensure no system oscillation occurred, adjust P03.00, P03.01, P20.05 and P21.02.

Function code	Name	Default	Setting range	Description
P03.00	Speed-loop proportional gain 1 of motor 1	20.0	0.0–200.0	-
P03.01	Speed-loop integral time 1 of motor 1	0.200s	0.000–10.000s	-
P20.05	Filter times of encoder detection	0x33	0x00–0x99	Ones place: Low-speed filter count, corresponding to 2^(0–9)×125µs Tens place: High-speed filter times, corresponding to 2^(0–9)×125µs.
P21.02	APR gain 1	20.0	0.0–400.0	The two automatic position regulator (APR) gains are switched based on the switching mode set through P21.04. When
P21.03	APR gain 2	30.0	0.0–400.0	

Function code	Name	Default	Setting range	Description
				the spindle orientation function is used, the gains are switched automatically, regardless of the setting of P21.04. P21.03 is used for dynamic running, and P21.02 is used for maintaining the locked state.

6.15.11.5 Positioning command selection

Set bit 6 of P22.00 to select a positioning command.

Note: When bit 6 is 0, the positioning command can be executed only after the running or servo enabling command is given under the level signal.

6.15.11.6 Spindle reference point selection

Set bit0 of P22.00 to select the spindle reference point. Encoder Z-pulse positioning supports the following spindle positioning methods:

Method 1 When the encoder is installed on the motor shaft, and the transmission ratio is 1:1, the motor shaft and spindle is in rigid connection.

Method 2 When the encoder is installed on the motor shaft, and the transmission ratio is 1:1, the motor shaft and spindle is in belt connection. The belt may slip during high-speed running and cause inaccurate positioning, it is recommended to install a proximity switch on the spindle.

Method 3 When the encoder is installed on the motor shaft, but the transmission ratio is not 1:1, you need to set P20.06 (the DEC ratio between the motor and encoder), and P22.14 (Spindle transmission ratio) to 1.

Note: As the encoder is not installed on the motor, using method 3 affects closed-loop vector control performance.

Method 4 When the encoder is installed on the motor shaft, but the transmission ratio is not 1:1, you need to set P22.14 (Spindle transmission ratio).

Function code	Name	Default	Setting range	Description
P22.06	Spindle zeroing position 3	0	0–65535	-
P22.14	Spindle drive ratio	1.000	0.001–30.000	Used to set the reduction ratio of the spindle to the encoder mounting shaft

6.15.12 Rigid tapping

The rigid tapping function is applicable to pulse train position control or speed control mode, which is often used for machine workpiece processing. It is not applicable to position control. When using analog to give frequency for speed control, you can switch to the rigid tapping mode by setting P22.18, and improve the analog signal identifying speed by setting P22.19 to quickly respond to frequency changes and improve processing effects.

Function code	Name	Default	Setting range	Description
P22.18	Rigid tapping selection	0x00	0x00–0x71	Ones place: Enabling selection 0: Disable (This function can be enabled through a terminal (configured with function 58) 1: Enable (internally) Tens place: Analog input port selection 0: Invalid 1: AI1 2: AI2 3–4: Reserved 5: EAI1 6: EAI2 7: EAI3
P22.19	Analog filter time of rigid tapping	1.0ms	0.0ms–1000.0ms	-
P22.20	Rigid tapping maximum frequency	50.00Hz	0.00Hz–P00.03	-
P22.21	Corresponding frequency of analog zero drift of rigid tapping	0.00Hz	0.00Hz–P00.03	-

6.15.13 Zero servo running

The zero servo function is valid only in position control or spindle positioning. The VFD enters the zero servo running mode by setting P21.00 to 0x2001. If there is no servo enabling signal, the VFD enter the servo running mode only after it receives a forward or reverse running command.

Function code	Name	Default	Setting range	Description
P21.00	Positioning mode	0x2001	0x0000–0x3031	Ones place: Control mode selection (only for closed-loop vector control) 0: Speed control 1: Position control Tens place: Position command source 0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop 3: Position JOG Hundreds place: Reserved Thousands place: Servo mode (Reserved) 0: Disable servo, without position deviation 1: Disable servo, with position deviation 2: Enable servo, without position deviation 3: Enable servo, with position deviation **Note:** In the pulse train or spindle positioning mode, the VFD enters the servo operation mode if there is a valid servo enabling signal. If there is no servo enabling signal, the VFD enter the servo operation mode only after it receives a forward running or reverse running command.
P05.00	HDI input type	0x00	0x00–0x22	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital

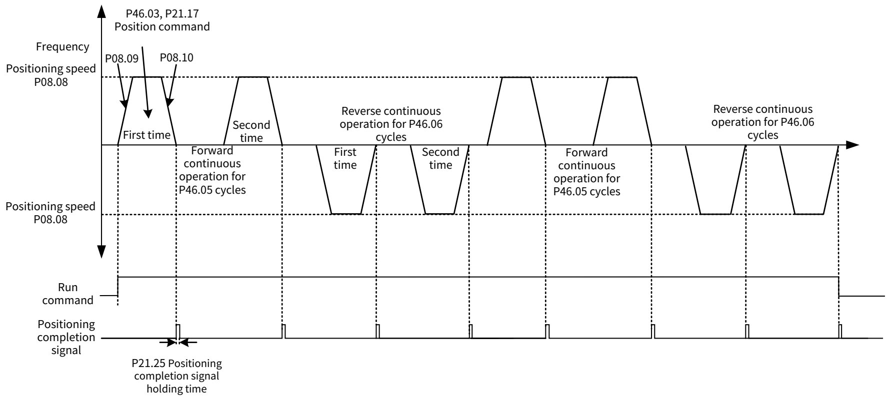
Function code	Name	Default	Setting range	Description
				2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1
P05.01	Function of DI1	1	0–95	1: Run forward 2: Run reversely 3: Three-wire running control 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Fault reset
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		

Note: You can set the thousands place of P21.00 to 2 or set the digital input terminal function to 63 to implement servo enabling.

6.15.14 Position JOG cycle mode

The position JOG cycle mode is a quick setup mode designed for initial debugging and certain simple position cycle operations. It allows for cyclic positioning and forward/reverse positioning operations to determine whether the system's position closed-loop is functioning correctly. The control diagram for the position JOG mode is as follows.

The functional combination logic is as follows: move in the set forward direction for the number of times specified by P46.05, then move in the reverse direction for the number of times specified by P46.06. P46.05 and P46.06 together constitute one cycle. By setting P46.07, the device can be controlled to perform actions according to the specified combination logic.



1. Follow the steps for closed-loop vector speed debugging.
2. Set P21.00=0x0031 to enable the position JOG mode.
3. Set P21.16=0x0000 to select the relative position coordinate system and running mode.

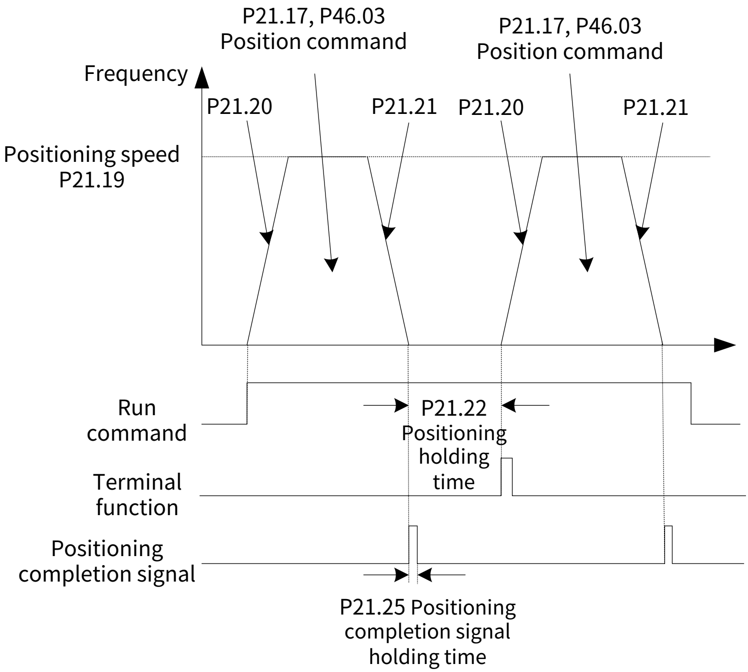
Relative position coordinate system: All position commands refer to the current feedback position, and the commands are added as incremental instructions.

4. Set P21.18 and P21.19 as the speed command sources.
5. Set P46.03=0x0000 and P21.17=0xC350 to specify the target position as 50000 pulses forward from the current stop position.
6. Set P08.08 to 5.00 to set the maximum frequency in position mode to 5.00% of the motor's rated frequency. If the distance is too short, the set speed may not be reached, which is related to the system's path planning.
7. Set P08.08 and P08.09 for acceleration and deceleration times in position mode.
8. Set P46.04 to define the initial direction of the device.
9. Set P46.05 and P46.06 for the number of forward and reverse rotations.
10. Set P46.07 for the number of combined motion cycles.
11. Set P21.09 for the position positioning range, P21.10 for the positioning completion detection time, and P21.22 for the positioning reached hold time.
12. Press RUN on the keypad, and the device will start moving according to the set acceleration/deceleration times and distance.
13. If the target position needs to be changed, wait until the device reaches the target position, then modify P21.17 and P46.03 to update the parameters. Changing the target position during motion is not supported.

Note: Assuming the encoder has 2500 lines and the electronic gear ratio P21.11/P21.12 is equal, setting 50000 pulses forward will result in the motor shaft rotating 5 times.

6.15.15 Position point-to-point (PTP) control

PTP control is based on closed-loop vector control. Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. The PTP control positioning is shown as follows.



1. Follow the steps for closed-loop vector speed debugging.
2. Set P21.00=0x0011 to enable the PTP position mode.
3. Set P21.16=0x0000 to select the position coordinate system and running mode.

   Relative position coordinate system: All position commands refer to the current feedback position, and the commands are added as incremental instructions.

   Absolute position coordinate system: All position commands refer to the moment of power-on (i.e., the moment when the pulse count is zero).
4. Set P21.18 and P21.19 as the speed command sources.

5. Set P21.17=0x0000 and P46.03=0xC350 to specify the target position as 50000 pulses forward from the current stop position.
6. Set 21.19=20.0 to set the maximum frequency in position mode to 20.0% of the motor's rated frequency. If the distance is too short, the set speed may not be reached, which is related to the system's path planning.
7. Set P21.20 and P21.21 for the acceleration and deceleration time in position mode.
8. Set P21.09 for the position positioning range, P21.10 for the positioning completion detection time, and P21.22 for the positioning reached hold time.
9. Press RUN on the keypad, and the device will start moving according to the set acceleration/deceleration times and distance.
10. If the target position needs to be changed, wait until the device reaches the target position, then modify P21.17 and P46.03 to update the parameters.

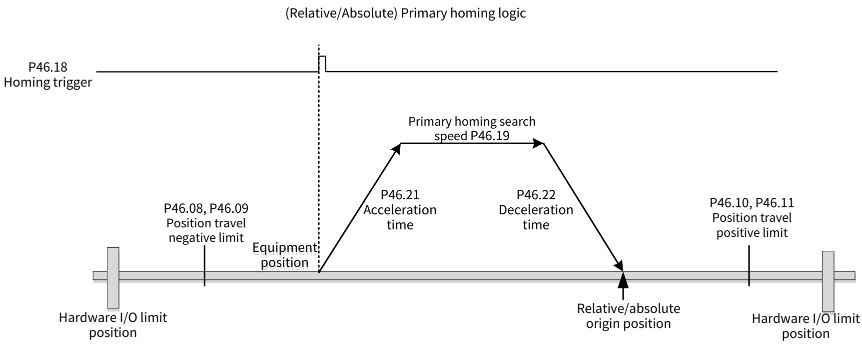
Note: Assuming the encoder has 2500 lines and the electronic gear ratio P21.11 and P21.12 are equal, setting 50000 pulses forward will result in the motor shaft rotating 5 times.

6.15.16 Homing control

Homing control operates based on closed-loop vector control, aiming to provide two homing logics. Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. The homing mode is divided into primary homing and secondary homing. Primary homing is used when the origin position has already been obtained. It plans the position path and performs system positioning, offering high precision and speed. Secondary homing is suitable when the origin position is unknown. It involves a high-speed search process. Once the origin is detected, a secondary low-speed homing is performed, ensuring high efficiency and precise positioning.

6.15.16.1 Primary homing (return to relative origin / return to absolute origin)

The primary homing control positioning is shown as follows.

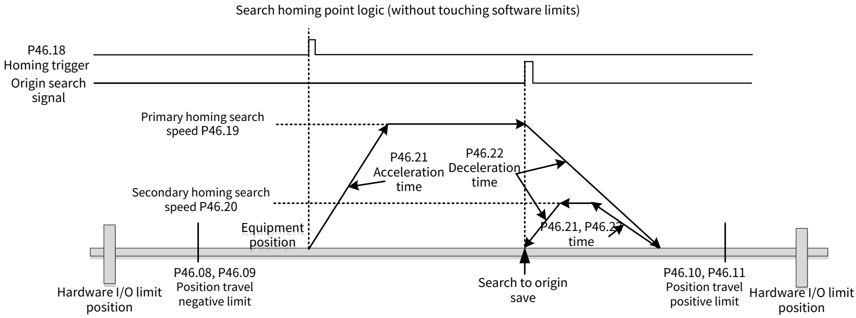


1. Follow the steps for closed-loop vector speed debugging.
2. In the stopped state, enable P46.18 (bit0=1) to activate the homing enable switch.
3. Set P46.14 and P46.15 as the offset values for the origin (both absolute zero and relative zero will be offset).
4. Set P46.19 for the primary homing frequency, P46.20 for the secondary homing frequency, P46.21 for the homing acceleration, and P46.22 for the homing deceleration.
5. After completing the above settings, you can activate P46.18 (bit0=1) to initiate the homing operation, whether the system is in motion or at rest.

   Select thousands place of P46.24 to 1 to return to the absolute origin (the point at power-on). During the origin setting process, verify whether the origin drift setting contains data, as its absence may cause positional errors in the system.
6. During system motion, once positioning is complete, press the STOP button on the keypad.
7. In the stopped state, enable P46.18 (bit0=0) to exit the homing mode, putting the system into standby.

6.15.16.2 Secondary homing

Secondary homing is performed within the software-defined limit positions (P46.08–P46.11) and does not touch the physical limit of the travel range, thus requiring no reversal.



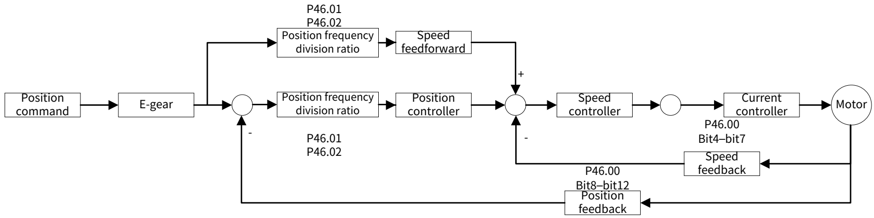
1. Follow the steps for closed-loop vector speed debugging.
2. Set P46.14=0 and P46.15=0 to clear the origin offset values.
3. Set P46.19 for the primary homing frequency, P46.20 for the secondary homing frequency, P46.21 for the homing acceleration, and P46.22 for the homing deceleration.
4. Set the thousands place of P46.24 to 2 to enable the search homing mode. When the device touches the origin within the set limit range, the encoder count value at the trigger state is recorded and stored as the origin. The device then decelerates and stops according to P46.22, with a slight error in the distance from the origin due to braking delay.
5. After coming to a complete stop, the device automatically moves in reverse at an ultra-low speed to the recorded origin position, locks in place, and completes the homing process.

6.15.17 Fully-closed loop

6.15.17.1 Control diagram

A control system using two PG cards to form a full closed-loop circuit. The control diagram is as follows.

The PG card located near the I/O port of the control board is named PG1, while the PG card located farther from the I/O port of the control board is named PG2.



Function code	Name	Default	Setting range	Description
P46.00	Feedback source selection	0x0000	0x0000–0x0321	Ones place: Enable bit for full closed-loop mode 0: Disable 1: Enable Tens place: Speed feedback source 0: PG1-P 1: PG2-P 2: Open loop (reserved) Hundred place: Position feedback source 0: PG1-P 1: PG1-F 2: PG2-P 3: PG2-F Thousands place: Reserved
P46.01	Numerator of position frequency division ratio (speed source)	1000	1–65535	The full closed-loop transmission ratio is used to adjust the correspondence between the load and the motor.
P46.02	Denominator of position frequency division ratio (position source)	1000	1–65535	The full closed-loop transmission ratio is used to adjust the correspondence between the load and the motor.

6.15.17.2 Commissioning procedures for full closed-loop control

Full closed-loop control is based on closed-loop vector control. Before using this function, verify the encoder installation and the accuracy of the closed-loop vector speed control speed measurement. When the ones place of P46.00 is set to 1, the full closed-loop control is enabled, allowing two PG cards to be installed as feedback sources. The tens place of P46.00 switches the speed feedback source, and the hundreds place of P46.00 switches the position feedback source. The group P20 configures the parameters for PG1 card, and the group P40 configures the parameters for PG2 card (PG1 is the PG card close to the I/O port of the control board, and PG2 is the PG card far from the I/O port of the control board). P20.02/P40.02 is used to select the direction of the load encoder. If the direction is incorrect, the position control will deviate, and the value needs to be toggled.

Step 1 Confirm wiring.

Step 2 Enable the full closed-loop mode by setting the ones place of P46.00 to 1.

Step 3 Select the speed feedback source and operate in semi closed-loop mode.

Step 4 Verify the direction of the position encoder via P20.02/P40.02.

Step 5 Select the encoder feedback source using the ones place and hundreds place of P46.00.

Step 6 Set the electronic gear ratio via P46.01/P46.02.

- **Position encoder direction setting**

When using full closed-loop control, it is necessary to first verify whether the position encoder feedback pulse direction matches the speed encoder feedback pulse direction. If the directions are opposite, the position encoder direction can be reversed using P20.02/P40.02. The selection of P20.02/P40.02 depends on the encoder source configured in P46.00. If PG2 is selected as the position feedback source, use P40.02 to reverse the direction. If PG1 is selected as the position feedback source, use P20.02 to reverse the direction. (This procedure is only used in full closed-loop mode. If you do not use full closed-loop mode and use the same encoder for position and speed encoder, modify the encoder direction via P20.02.)

Verification steps are as follows:

Step 1 Run in open-loop vector or closed-loop vector mode forward (speed loop forward direction).

Step 2 P18.39=1 (position loop direction is also forward). If not, change P20.02/P40.02 so that P18.39 is 1.

- **Electronic gear ratio setting**

There are two methods to calculate the ratio of encoder pulse counts between the speed loop and the position loop. The first method is based on theoretical values, using physical parameters for calculation. The second method involves practical measurement. If the electronic gear ratio of the full closed-loop position encoder is set incorrectly, it can lead to increased error between the speed encoder and the position encoder, affecting control performance and triggering alarms.

The procedure of practical measurement of the electronic gear ratio is as follows:

Step 1 Perform a PTP motion (relative movement) using a single encoder in semi closed-loop mode (speed feedback source). Set P21.17 to move a distance "**a**".

Step 2 Observe the actual displacement "**b**" measured by the other encoder (full closed-loop position feedback source).

Step 3 Calculate the electronic gear ratio as **a/b** and configure P46.01/P46.02 accordingly.

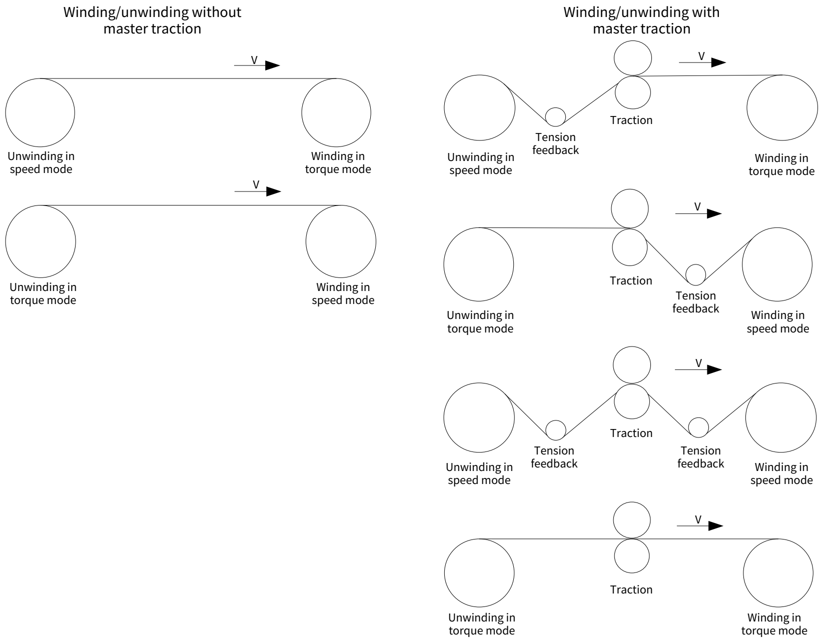
6.15.18 Tension control

To improve product quality, constant tension is required in the winding/unwinding processes in industrial production fields such as paper making, paper processing, printing, dyeing, packaging, wire and cable, fiber optic cable, tape manufacturing, textile, leather, metal foil material processing and other industries.

The VFD controls the tension by regulating the motor output torque or speed. There are six control modes: closed-loop tension speed control mode, open-loop tension torque control mode, closed-loop tension torque control mode, master drive traction mode, standard winding/unwinding mode, and torque debugging mode.

Tension control are mainly specified by groups P41–P43, in which P41 group is the basic tension control function group, P42 group is the closed-loop tension control function group, and P43 group is the auxiliary tension control function group.

Figure 6-2 Typical winding/unwinding diagrams



6.15.18.1 Control mode selection

Set P41.00 to select different tension control modes.

Function code	Name	Default	Setting range	Description
P41.00	Tension control mode selection	0	0–8	0: Standard model 1: Open-loop torque mode 2: Closed-loop speed mode 3: Closed-loop torque mode 4: Constant linear speed mode (reserved) 5: Traction mode 6: Standard winding/unwinding mode (feedforward speed mode) 7: Direct speed torque mode (torque debugging mode) 8: Wire alignment mode (reserved) **Note:** The value 0 indicates the

Function code	Name	Default	Setting range	Description
				VFD enables general-purpose functions. A non-zero value indicates the VFD enables the tension control function.

Standard model: P41.00=0

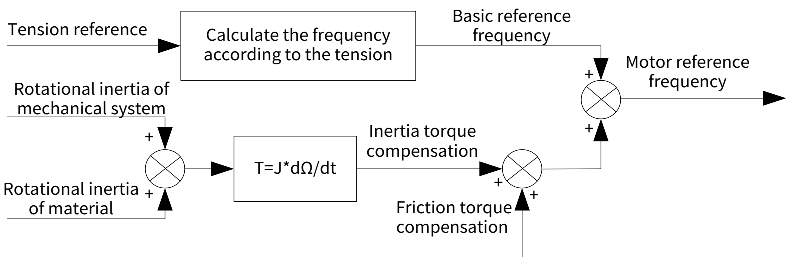
The tension control function is not used, and the system operates as a closed-loop VFD.

Open-loop torque mode: P41.00=1

There is no tension feedback signal in the open-loop tension torque control mode, but stable tension control can be achieved by directly adjusting the motor torque magnitude, and its speed follows the linear speed of the material automatically. The control feasibility is based on: for the winding/unwinding control system, the relationship between the reel material-feeding tension (F), the current roll diameter (D) and the output reel shaft output torque (T) is as follows:

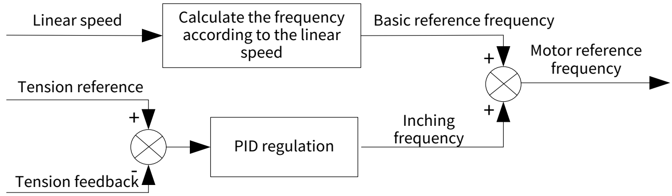
$T = F \times D/2$

Adjusting the output torque of winding shaft according to the roll diameter change can control the tension on the material. To ensure constant tension during the acceleration and deceleration processes, the VFD is equipped with built-in friction compensation and inertia compensation modules. It calculates the present drum's rotation inertia in real time and applies inertia compensation to the torque based on the present rate of speed change. To ensure tension control accuracy, the system must run in the closed-loop vector control mode with an installed encoder. The control schematic diagram is shown as follows.



Closed-loop speed mode: P41.00=2

Closed-loop tension speed control is implemented through tension detection feedback signal (such as tension sensor or tension pendulum). In this mode, PID calculation is executed according to feedback signal, so as to adjust the motor rotation speed directly to control linear speed synchronization and tension stability. When using a tension pendulum or floating roller as feedback, changing the set value (PID given) can change the actual tension, or changing the mechanical configuration such as the counterweight of the tension pendulum or floating roller can also change the tension. The control schematic diagram is shown as follows.

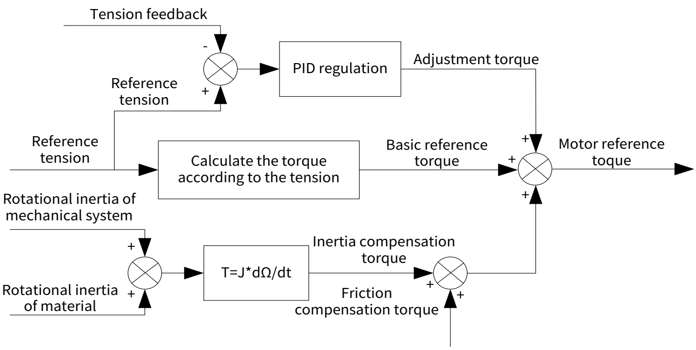


Note: This tension control mode is applicable to space voltage, SVC, and closed-loop vector control modes. When accurate tension control is required, the closed-loop vector control mode must be used.

Closed-loop torque mode: P41.00=3

No tension detection feedback signal is required. The VFD keeps the tension on the material constant by controlling the motor output torque and needs to operate in the closed-loop vector control mode with an encoder installed. It is applicable to scenarios with tension detection sensors, which obtains higher tension control accuracy.

Similar to the open-loop tension torque control mode, it supports all the functional modules of open-loop tension torque control, the difference is that the closed-loop mode has a tension detection sensor installed on the winding and unwinding side and the closed-loop mode has an additional tension feedback PID closed-loop adjustment module. The control schematic diagram is shown as follows.



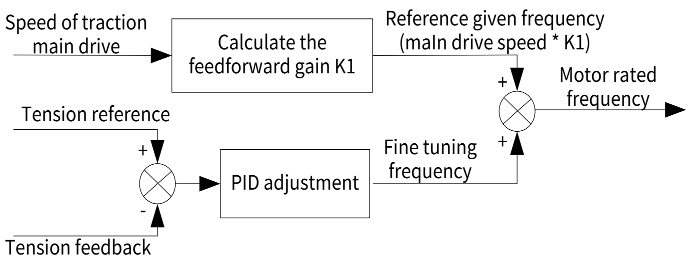
Traction mode: P41.00=5

In applications with a dual VFD wire drawing machine featuring a pendulum and a traction main drive, the traction VFD is set to this mode during the winding/unwinding process. If the system needs to run in constant speed mode, it is generally set to the standard winding/unwinding mode (P90.00=6) in coordination with the rewinding VFD.

Standard winding/unwinding mode (feedforward speed mode): P41.00=6

The standard winding/unwinding mode is a type of closed-loop speed control mode, also implemented through tension feedback signals (such as from a tension sensor or pendulum). It is suitable for simple tension applications, such as dual-VFD wire drawing machines with a pendulum and a traction main drive.

The difference from closed-loop tension speed control is that there is no roll diameter calculation frequency (using line speed calculation or thickness accumulation method). Instead, the PID tuning frequency is superimposed by the feedforward gain K1 * Traction main drive speed. The feedforward gain K1 is calculated by dividing the feedback pendulum position into multiple zones, with integration performed based on the integration time set for each zone. At the same time, the real-time speed of the traction main drive needs to be transmitted to the rewinding VFD through the analog output port to respond to the acceleration and deceleration processes of the traction main drive in real time. In this mode, PID calculation is also performed based on feedback signal, and the motor speed is directly adjusted to achieve synchronized line speed and stable tension control. The control schematic diagram is shown as follows.



Direct speed torque mode (torque debugging mode): P41.00=7

During equipment debugging, the torque debugging mode can be selected, and torque setting can be directly adjusted through P90.07, facilitating the debugging process.

6.15.18.2 Winding/unwinding mode

By simultaneously setting function code P41.01 and configuring terminal functions P05.11–P05.12 to 74, the winding/unwinding mode can be selected.

Function code	Name	Default	Setting range	Description
P41.01	Winding/unwinding mode	0	0–1	0: Winding 1: Unwinding

P41.01 (0: Winding, 1: Unwinding)	DI terminal No. 74 (0: Ineffective; 1: Effective)	Mode
0	0	Winding
1	0	Unwinding
0	1	Unwinding
1	1	Winding

6.15.18.3 Frequency upper limit of winding/unwinding

Set P41.04 to select the frequency upper limit channel during torque control.

Function code	Name	Default	Setting range	Description
P41.01	Winding/unwinding mode	0	0–1	0: Winding 1: Unwinding
P41.02	Winding upper limit frequency	50.00Hz	0.00Hz–P00.03	-
P41.03	Unwinding upper limit frequency	1.00Hz	0.00Hz–P00.03	-
P41.04	Upper limit frequency channel selection	0	0–7	0: Set by P41.05 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Automatic upper limit (winding operates at the present frequency)
P41.05	Actual upper limit frequency	20.0Hz	0.01Hz–P00.03	Displays the actual frequency upper limit.

Speed limit in torque mode for winding/unwinding:

Setting through the keypad: P41.04=0

Winding upper limit frequency is set by P41.02, unwinding upper limit frequency is set by P41.03.

Setting through analog: P41.04=1, 2, or 3

It is determined by analog input voltage or current. 10V, 20mA corresponds to the upper limit frequency set by P41.02, P41.03.

Setting through the high-speed pulse: P41.04=4 or 5

It is determined by external input pulse frequency, HDI upper limit frequency corresponds to the upper limit frequency set by P41.02, P41.03.

Automatic upper limit: P41.04=6

The frequency is calculated based on the linear speed. The following formula shows how to calculate the frequency based on the linear speed and present roll diameter:

F=××/(60××)

Where v is the line speed, "**i**" is the gear ratio, "**p**" is the motor pole pairs, and "**D**" is the current roll diameter.

6.15.18.4 Linear speed setting

Set P41.13 to select the line speed input source.

Function code	Name	Default	Setting range	Description
P41.13	Linear speed input method	0	0–15	0: Linear speed is 0 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Max. linear speed 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Pulse train 14:

Function code	Name	Default	Setting range	Description
				EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card
P41.14	Max. linear speed	300.0m/min	0.0–3000.0 m/min	Specifies the max. linear speed.
P41.15	Real-time linear speed	0.0m/min	0.0m/min–P41.14	Displays the real-time linear speed.
P41.78	Main traction wheel roll diameter	500mm	1–10000mm	Specifies the main traction wheel roll diameter.
P41.79	Main traction wheel transmission ratio	1.00	0.01–300.00	Master traction drive ratio = Motor rotation speed/Master traction roller rotation speed = Master traction roller diameter/Motor shaft diameter

Linear speed is 0: P41.13=0

The linear speed input is invalid.

Setting through analog: P41.13=1 or 2

It is determined by analog input voltage or current. 10V or 20mA corresponds to the max. linear speed P41.14.

Setting through the high-speed pulse: P41.13=5 or 6

It is determined by external input pulse frequency. The upper limit frequency of HDI corresponds to the maximum line speed P41.14.

Setting through communication: P41.13=10, 11, 12, or 14

It is written via communication. The communication address is hexadecimal 200F, and the value range is 0.0 to P41.14.

Setting through max. linear speed: P41.13=8

The linear speed is set to the maximum linear speed P41.14.

Note: When the VFD using the tension control function works as the master, setting P41.48 and P41.49 can control the linear speed ACC/DEC time; when it works as a slave, set P41.48 and P41.49 to 0.

Function code	Name	Default	Setting range	Description
P41.48	Traction machine ACC time	15.00s	0.00–300.00s	-
P41.49	Traction machine DEC time	15.00s	0.00–300.00s	-

6.15.18.5 Roll diameter calculation

- **Initial roll diameter selection**

Set the terminal function of P05.01–P05.04 or P05.11–P05.12 (whichever you choose) to 80 and 81.

The following table lists the initial roll diameter selection methods (DI1=80, DI2=81).

DI2	DI1	Initial roll diameter	
OFF	OFF	P41.18 (Winding)	P41.22 (Unwinding)
OFF	ON	P41.19 (Winding)	P41.23 (Unwinding)
ON	OFF	P41.20 (Winding)	P41.24 (Unwinding)
ON	ON	P41.21 (Winding)	P41.25 (Unwinding)

Function code	Name	Default	Setting range	Description
P05.01	Function of DI1	1	0–95	80: Initial roll diameter selection 1 81: Initial roll diameter selection 2
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		
P41.17	Max. roll diameter	1200mm	1–10000mm	-
P41.18	Winding initial roll diameter 0	80mm	0mm–P41.17	-
P41.19	Winding initial roll diameter 1	100mm		
P41.20	Winding initial roll diameter 2	120mm		
P41.21	Winding initial roll diameter 3	150mm		
P41.22	Unwinding initial roll diameter 0	800mm		
P41.23	Unwinding initial	900mm		

Function code	Name	Default	Setting range	Description
	roll diameter 1			
P41.24	Unwinding initial roll diameter 2	1000mm		
P41.25	Unwinding initial roll diameter 3	1200		
P41.27	Roll diameter reset selection	0	0–2	0: Terminal reset 1: Stop reset 2: Communication reset (When this option is selected, it automatically changes to 0 after resetting once.)

■ **Roll diameter calculation**

Set P41.16 to select the roll diameter calculation method.

Function code	Name	Default	Setting range	Description
P41.16	Roll diameter calculation method	0	0–22	0: Not calculated 1: AI1 calibration method 2: AI2 calibration method 3–4: Reserved 5: HDI1 calibration method 6: HDI2 calibration method 7: Linear speed 8: PG thickness accumulation method 9: SVC estimation method 10: Automatic recognition switching 11–18: Reserved 19: EAI1 calibration method 20: EAI2 calibration method 21: EAI3 calibration method 22: Reserved

No roll diameter calculation: P41.16 = 0

Control applications without winding do not need roll diameter calculation.

Calculation method based on linear speed: P41.16=7

This operation is independent of the material thickness and applies to wires, in which case it is necessary to set P41.32 = 0. The calculation method is based on the linear speed and running frequency in real time, and errors are not cumulative. When the linear speed is lower than P41.28, keep the current roll diameter value without calculation. When the linear speed is higher than P41.28, the roll diameter calculation needs to be performed again. When selecting the method, certain conditions must be met for Linear speed setting, and P41.06 must be set correctly.

PG thickness accumulation method: P41.16=8

This operation applies to strips, in which case it is necessary to set P41.32 = 1. This method does not require a linear speed, and the calculation is cumulative based on the material thickness and the circle count signal, and the calculation result is smooth, but it will accumulate errors.

Note: The material thickness is determined by digital input terminals 85 (material thickness terminal 1) and 86 (material thickness terminal 2).

Material thickness terminal 2 (0: Invalid; 1: Valid)	Material thickness terminal 1 (0: Invalid; 1: Valid)	Material thickness
0	0	P41.34
0	1	P41.35
1	0	P41.36
1	1	P41.37

Note: For every **i**×**k** turns of the motor, the roll diameter increases by 2 times the material thickness ("**i**" is the transmission ratio P41.06, "**k**" is the number of turns per layer).

Setting through the high-speed pulse: P41.16=5 or 6

This is suitable for detecting the roll diameter with the roll diameter detection sensor, in which case the value of P41.17 (maximum roll diameter) must be set correctly.

Setting through analog: P41.16=1, 2, 19, 20, or 21

This is suitable for detecting the roll diameter with the roll diameter detection sensor, in which case the value of P41.17 (maximum roll diameter) must be set correctly. For example, if you set P41.16 to 1 (AI1), 100.0% of AI1 input corresponds to the roll diameter specified by P41.17.

SVC estimation method: P41.16=9

When the motor driving mode is SVC, the roll diameter is calculated based on the evaluation of motor rotation speed.

Function code	Name	Default	Setting range	Description
P41.06	Reel mechanical transmission rate	1.00	0.01–300.00	When the roll diameter is calculated based on the linear speed, a great reel mechanical transmission rate indicates a great roll diameter. Refer to this rule, and calibrate the parameter according to the deviation of the calculated value of the roll diameter from the actual value. Reel mechanical transmission rate = Motor rotation speed/Reel rotation speed = Reel diameter/Motor shaft diameter
P41.28	Min. linear speed for roll diameter calculation	15.0m/min	0.1–300.0m/min	-
P41.29	Roll diameter calculation interval	1.000s (P41.16=1) 0.000s (P41.16=Other)	0.000–30.000s	-
P41.30	Monotonicity selection for roll diameter calculation	1	0–1	0: No requirement 1: Winding can only increase, unwinding can only decrease.
P41.31	Roll diameter change rate 1	0.10mm/T (P41.16=1) 0.00mm/T (P41.16=Other)	0.00mm/T–P41.16	0.00mm/T unlimited
P41.41	Roll diameter calculation filter time	3.000s	0.000–10.000s	A great setting value indicates a smoother roll diameter calculation value, while the delay of the roll diameter change increases.

6.15.18.6 Tension PID control

Set P42.09 to select the tension PID parameter source.

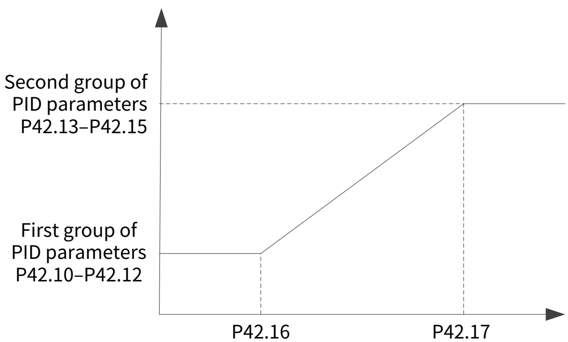
Function code	Name	Default	Setting range	Description
P42.09	Tension PID parameter source	0	0–5	Setting range: 0–5 0: Use the first set of parameters 1: Adjust based on roll diameter (linear change between initial winding diameter and initial unwinding diameter) 2: Adjust based on frequency 3: Adjust based on linear speed 4: Adjust based on deviation 5: Terminal **Note:** P41.00=6, 4(Winding); 2(Unwinding).

Fixed to the first group of PID parameter in P42: P42.09=0

Parameters P42.10–P42.12 are used (the first group of PID parameter).

Ratio of present value to max. value: P42.09=1, 2, 3, or 4

If the ratio of the present value to the max. value is less than the value of P90.36, parameters P42.10–P42.12 (first group of PID parameter) are used; if the ratio is greater than the value of P42.17, parameters P42.13–P42.15 (second group of PID parameter) are used; if the ratio is between P42.16 and P42.17, the linear change values are taken between the first group and second group. See the following figure for the linear change.



Terminal based switchover: P42.09 = 5

Select function 83 for any of parameters P05.01–P05.04, P05.11–P05.12 to select different PIDs. By default, if the terminal is not on, the first group (P42.10–P42.12) is selected; if the terminal is on, the second group (P42.13–P42.15) is selected.

Function code	Name	Default	Setting range	Description
P05.01	Function of DI1	1	0–95	83: Tension PID switchover
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		
P42.10	Proportional gain 1	0.200	0.000–30.000	**Note:** P41.00=6, 0.060(Winding); 0.300(Unwinding).
P42.11	Integral time 1	0.00s	0.00–30.00s	-
P42.12	Differential time 1	0.000s	0.000–30.000s	-
P42.13	Proportional gain 2	0.200	0.000–30.000	**Note:** P41.00=6, 0.100(Winding); 0.400(Unwinding).
P42.14	Integral time 2	0.00s	0.00–30.00s	-
P42.15	Differential time 2	0.000s	0.000–30.000s	-
P42.16	PID1 switch point	4.00%	0.00–100.00%	-
P42.17	PID2 switch point	45.00%	0.00–100.00%	**Note:** P1.00=6, 45(Winding); 90(Unwinding).

6.15.18.7 Tension setting

When P41.00 is set to 1 or 3 and torque control is used, tension setting must be made. The set torque can be calculated based on the roll diameter and the set tension.

Function code	Name	Default	Setting range	Description
P41.00	Tension control mode selection	0	0–8	Setting range: 0–8 0: Standard model 1: Open-loop torque mode 2: Closed-loop speed mode 3: Closed-loop torque mode 4: Constant linear speed mode (reserved)

Function code	Name	Default	Setting range	Description
				5: Traction mode 6: Standard winding/unwinding mode 7: Direct speed torque mode (torque or speed execution, requires inertia compensation and friction compensation) 8: Wire alignment mode (reserved) **Note:** The value 0 indicates the VFD enables general-purpose functions. A non-zero value indicates the VFD enables the tension control function.
P41.55	Tension giving method selection	0	0–23	0: Set by P41.56 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Direct torque setting 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3

Function code	Name	Default	Setting range	Description
				22: Reserved 23: EHDI1
P41.56	Digital setting of given tension	0N	0N–P41.57	-
P41.57	Max. tension	10000N	0–60000N	-
P41.58	Tension giving change time	0.00s	0–60.00s	-

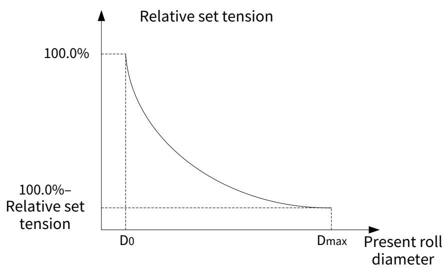
6.15.18.8 Tension taper

Tension taper is generally used for winding, which can control the tension to decrease accordingly as the roll diameter increases, in order to prevent damage to the roll and improve the product curl effect. The VFD provides four tension taper calculation methods.

Method 1 Set P41.61 to 0 to select the inverse proportional curve calculation method. The algorithm is as follows.

$$F = F_0 \times [1 - k(1 - \frac{D_0 + D_1}{D + D_1})]$$

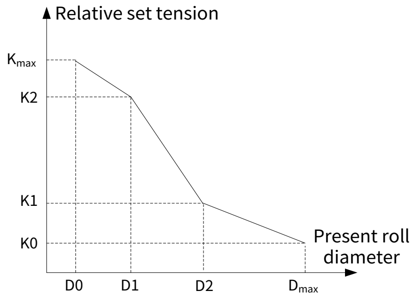
In the algorithm, F_0 is the tension setting, k is the tension taper coefficient, D_0 is the empty-roll diameter, D is the present roll diameter, D_1 is the tension taper compensation used to compensate for the difference between the calculated roll diameter value and the actual roll diameter. See the following figure.



Method 2 Set P41.61 to 1 to select the single-segment linear method for calculation.

Method 3 Set P41.61 to 2 to select the two-segment linear method for calculation.

Method 4 Set P41.61 to 3 to select the multi-segment linear method for calculation (20 segments), which needs to be used in conjunction with P43.08–P43.47. See the following figure.



Function code	Name	Default	Setting range	Description
P41.59	Tension taper input method	0	0–23	0: Set by P41.60 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1
P41.60	Digital tension taper	0.00%	0.00–100.00%	-
P41.61	Tension taper method	1	0–3	0: Curve taper 1: Single-segment linear taper

Function code	Name	Default	Setting range	Description
				(denominator 1000) 2: Two-segment linear taper (interpolation) 3: Twenty-segment linear taper (interpolation)
P41.62	Tension taper compensation	1mm	0–10000mm	-
P41.63	Intermediate roll diameter	500	P41.18–41.22	-
P41.64	Intermediate tension	80.00%	0.00–100.00%	-
P41.65	Max. roll diameter	50.00%	0.00–100.00%	-

6.15.18.9 Multi-segment integration

Multi-segment integration is used to calculate the feedforward gain K1 in the standard winding/unwinding mode, which is also implemented through tension feedback signals (such as from a tension sensor or pendulum). It is suitable for simple tension applications, such as dual-VFD wire drawing machines with a pendulum and a traction main drive. The feedforward gain K1 is calculated by dividing the feedback pendulum position into multiple zones, with integration performed based on the integration time set for each zone. At the same time, the real-time speed of the traction main drive needs to be transmitted to the rewinding VFD through the analog output port to respond to the acceleration and deceleration processes of the traction main drive in real time.

Function code	Name	Default	Setting range	Description
P42.33	Deviation 0	4.00%	0.00–P42.34(%)	-
P42.34	Deviation 1	12.00%	P42.33–P42.35(%)	-
P42.35	Deviation 2	22.00%	P42.34–P42.36(%)	-
P42.36	Deviation 3	37.00%	P42.35–P42.37(%)	-
P42.37	Deviation 4	52.00%	P42.36–P42.38(%)	-
P42.38	Deviation 5	72.00%	P42.37–100.00(%)	-
P42.39	Soft startup integral time	167.0s	0.0–1000.0s	167.0s(winding); 143.0s(Unwinding)
P42.40	Integral time 1	909.0s	0.0–1000.0s	909.0s(winding); 555.0s(Unwinding)
P42.41	Integral time 2	333.0s	0.0–1000.0s	333.0s(winding);

Function code	Name	Default	Setting range	Description
				200.0s(Unwinding)
P42.42	Integral time 3	133.0s	0.0–1000.0s	133.0s(winding); 77.0s(Unwinding)
P42.43	Integral time 4	67.0s	0.0–1000.0s	67.0s(winding); 36.0s(Unwinding)
P42.44	Integral time 5	25.0s	0.0–1000.0s	25.0s(winding); 13.5s(Unwinding)
P42.45	Integral time 6	9.0s	0.0–1000.0s	9.0s(winding); 5.0s(Unwinding)
P42.46	Deviation integral actual value	0.00%	0.00–500.00%	-
P42.47	Deviation integral action channel selection	1 or 2 (Winding) 7 (Unwinding)	0–23	0: Reserved 1: Feedforward gain*AI1 2: Feedforward gain*AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Feedforward gain*10V 8–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1
P42.48	Deviation integral range selection	1 (Winding) 2 (Unwinding)	0–2	0: Feedforward gain unchanged 1: 0–feedforward gain upper limit 2: -feedforward gain upper limit – +feedforward gain upper limit
P42.49	Deviation integral upper limit	500.00% (Winding) 100.00% (Unwinding)	0.00–500.00%	-
P42.50	Deviation integral gain	50.00% (Winding)	0.00–500.00%	-

Function code	Name	Default	Setting range	Description
		0.00% (Unwinding)		
P42.51	Deviation integral power-off memorizing selection	0x10	0x00–0x11	Ones place: 0: Automatic reset 1: Terminal reset (shared roll diameter reset terminal) Tens place: 0: Save at power off 1: Do not save at power off

6.15.18.10 Friction compensation

Friction compensation is valid when P41.00 is set to 1 or 3. In the process of material winding or unwinding, there is frictional resistance on the machinery. In the case of winding, for example, the frictional resistance will make the material tension smaller. By appropriately setting the friction compensation value, the friction resistance can be reduced to some extent, and the tension control effect can be improved. The system has inconsistent resistance values at high speed and low speed, and constant tension cannot be obtained throughout the entire process only by using constant friction compensation torque. Proper setting of P41.08–P41.12 can compensate for the effect caused by system resistance.

Function code	Name	Default	Setting range	Description
P41.08	Static friction torque compensation	0.0%	0.0–100.0%	-
P41.09	Dynamic friction torque compensation	0.0%	0.0–100.0%	-
P41.10	Torque compensation for max. linear speed	0.0%	0.0–100.0%	-
P41.11	Static friction frequency threshold	1.00Hz	0.01Hz–P00.03	-
P41.12	Dynamic friction frequency threshold	5.00Hz	0.01Hz–P00.03	-

6.15.18.11 Inertia compensation

Inertia compensation is valid when P41.00 is set to 1 or 3. In the case of fast ACC/DEC control, at the winding side, materials are apt to loose in the ACC process and materials are apt to tighten in the DEC process; at the unwinding side, materials are apt to tighten in the ACC process and materials are apt to loose in the DEC process. Inertia compensation is required in these cases.

When the keypad is used as the control channel and there are empty axes, setting P03.44 to 1 allows inertia recognition of the mechanical system and give the VFD the start command. If the motor runs for a long period of time, stop the VFD and increase the value of P03.43, and then restart the VFD. During inertia identification, the motor starts the ACC/DEC process twice. When the inertia identification is completed, the VFD stops automatically, and P03.44 is updated to 0 automatically.

Function code	Name	Default	Setting range	Description
P03.40	Enabling inertia compensation	0	0–1	0: Disable 1: Enable
P03.41	Upper limit of inertia compensation torque	10.0%	0.0–150.0%	The max. inertia compensation torque is limited to prevent inertia compensation torque from being too large. Relative to the motor rated torque.
P03.42	Inertia compensation filter times	7	0–10	Filter times of inertia compensation torque, used to smooth inertia compensation torque.
P03.43	Inertia identification torque	10.0%	0.0–100.0%	Due to friction force, certain identification torque needs to be set for the inertia identification to be performed properly. Relative to the motor rated torque.
P03.44	Motor 1 inertia identification enabling	0	0–2	0: No operation 1: Mode 1 2: Mode 2
P41.45	Material density	0kg/m^3	0–60000kg/m^3	-
P41.46	Material inertia	0.00kg・m^2	0.00–300.00 kg・m^2	-
P41.47	Mechanical	0.00kg・m^2	0.00–300.00	-

Function code	Name	Default	Setting range	Description
	inertia		kg・m^2	
P41.50	Inertia compensation torque	0.0%	0.0–300.0%	Display
P41.51	Linear acceleration	0.00m/s^2	-99.00–99.00m/s^2	Display
P41.52	Inertia compensation ACC/DEC time	0.100s	0.000–10.000s	-

6.15.18.12 Related I/O parameters

Function code	Name	Default	Setting range	Description
P05.00	HDI input type	0x00	0x00–0x22	Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1
P05.01	Function of DI1	1	0–95	0: No function 73: Rolling diameter reset in tension control 74: Winding/unwinding switchover in tension control 75: Tension control pre-driving 76: Disabling roll diameter calculation in tension control 77: Clearing alarm display in tension control 78: Manual braking in tension control 79: Triggering a forcible material feeding interrupt signal in tension
P05.02	Function of DI2	4		
P05.03	Function of DI3	7		
P05.04	Function of DI4	0		
P05.11	Function of HDI1	0		
P05.12	Function of HDI2	0		

Function code	Name	Default	Setting range	Description
				control 80: Initial roll diameter selection 1 in tension control 81: Initial roll diameter selection 2 in tension control 82: Trigger fire mode control 83: Tension PID switchover in tension control 84: PID pause in tension control 85: Tension control thickness switchover selection 1 86: Tension control thickness switchover selection 2 87: Clearing length in tension control
P06.00	HDO1 output type	0	0–1	0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, see P06.42–P06.46. 1: Open collector output. For details about the related functions, see P06.04.
P06.01	DO1 output	0	0–63	0: Invalid 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 53: Tension control specified roll diameter reached 54: Tension control stop roll diameter reached 55: Tension control length reached

6.15.19 Sin/Cos encoder subdivision function

P20.32=1 enables the encoder subdivision function, and P20.31 sets the angle subdivision bits for the sine/cosine encoder. The higher the number of bits, the finer the subdivision.

7 Communication

7.1 Standard communication interface

The VFD provides RS485 communication as a standard function. The following table lists the communication interfaces and terminals.

Table 7-1 RJ45 interface definition

Interface	Network signal	Signal description	Description
RJ45 interface	RS485+ RS485-	RS485 communication	Internal RS485 communication terminal, used to connect to the external keypad or PC. The interface type is RJ45.
	CANH CANL	CAN communication	Internal CAN communication terminal. The interface type is RJ45. The CAN communication supports CANopen.
	15V GND	External keypad power supply	Voltage is accurate to 10% and current to 100mA.

Table 7-2 Standard communication terminal

Interface	Network signal	Signal description	Description
IO terminal	485+ 485-	RS485 communication	Terminal for external RS485 communication, supporting the Modbus communication protocol

7.2 Communication data address

The communication data includes VFD-related function parameter data, VFD status parameter data, and VFD control parameter data.

7.2.1 Function parameter address

The address of a function code consists of two bytes, with the MSB on the left and LSB on the right. Both the MSB and LSB also range from 00–FFH. The MSB is the hexadecimal form of the group number on the left of the dot mark, and LSB is that of the number on the right of the dot mark. Take P05.06 as an example: The group number is 05, that is, the MSB of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 06, that is, the LSB is the hexadecimal form of 05. Therefore, the function code address is 0506H in the hexadecimal form. For P10.01, the parameter address is 0A01H.

Note:

- The parameters in the P99 group are set by the manufacturer and cannot be read or modified. Some parameters cannot be modified when the VFD is running; some cannot be modified regardless of the VFD status. Pay attention to the setting range, unit, and description of a parameter when modifying it.
- Frequently writing to EEPROM will reduce its life time. Some function codes do not need to be stored during communication. The application requirements can be met by modifying the value of the on-chip RAM, that is, modifying the highest-order bit of the corresponding function code address from 0 to 1. For example, the function code P00.07 does not need to be stored into EEPROM. Only by changing the value in RAM can set the address to 8007H. The address can be used only for writing data to the on-chip RAM, and it is invalid when used for reading data.

7.2.2 Non-function parameter address

In addition to modifying the parameters of the VFD, the master can also control the VFD, such as starting and stopping it, and monitoring the operation status of the VFD. The following describes status parameter data addresses and control parameter data addresses.

1. Status parameters

Note: Status parameters are read only.

Parameter	Address	Description
VFD status word 1	2100H	0001H: Forward running
		0002H: Reverse running
		0003H: Stopped
		0004H: Faulty
		0005H: POFF
		0006H: Pre-exciting
VFD status word 2	2101H	Bit0: Ready for running (0: Bus voltage not established; 1: Bus voltage established) Bit1–bit2: Motor number (00b: Motor 1; 01b: Motor 2; 10–11b: Reserved) Bit3: Motor type (0: Asynchronous motor; 1: Synchronous motor) Bit4: Overload pre-alarm (0: No overload pre-alarm; 1: Overload pre-alarm present)

Parameter	Address	Description
		Bit5–bit6: Command channel (00b: Keypad channel; 01b: Terminal channel; 10b: Communication channel; 11b: Reserved) Bit 7: Reserved Bit8–bit9: Operation mode (00b: Speed mode; 01b: Torque mode; 10–11b: Position mode) Bit10–bit11: Control mode (00: SVC0; 01: SVC1; 10: VF; 11: FVC) Bit12–bit15: Reserved
VFD fault code	2102H	See the description of fault types.
VFD identification code	2103H	GD350C--0x01A8
Running frequency	3000H	0–Fmax (Unit: 0.01Hz)
Set frequency	3001H	0–Fmax (Unit: 0.01Hz)
Bus voltage	3002H	0.0–2000.0V (Unit: 0.1V)
Output voltage	3003H	0–1200V (Unit: 1V)
Output current	3004H	0.0–3000.0A (Unit: 0.1A)
Rotational speed	3005H	0–65535 (Unit: 1RPM)
Output power	3006H	-300.0–300.0% (Unit: 0.1%)
Output torque	3007H	-250.0–250.0% (Unit: 0.1%)
Closed-loop setting	3008H	-100.0–100.0% (Unit: 0.1%)
Closed-loop feedback	3009H	-100.0–100.0% (Unit: 0.1%)
Input IO state	300AH	0x000–0xFFF Corresponding to the local: HDI2/HDI1/DI4/DI3/DI2/DI1
Output IO state	300BH	0x00–0xFF (corresponding to local RO2/RO1/HDO1/DO1)
Analog input 1	300CH	0.00–10.00V (Unit: 0.01V)
Analog input 2	300DH	0.00–10.00V (Unit: 0.01V)
Reserved	300EH	-
Reserved	300FH	-
Read input of HDI1 high-speed pulse	3010H	0.00–50.00kHz (Unit: 0.01Hz)
Read input of HDI2 high-speed pulse	3011H	-
Present step of simple PLC	3012H	0–15

Parameter	Address	Description
External length value	3013H	0–65535
External counting value	3014H	0–65535
Torque set value	3015H	-300.0–300.0% (Unit: 0.1%)
VFD identification code	3016H	-
Fault code	5000H	-

2. Control parameter

Note: VFD control parameters can be read and written.

Parameter	Address	Description
Communication-based control command	2000H	0001H: Run forward
		0002H: Run reversely
		0003H: Jog forward
		0004H: Jog reversely
		0005H: Stop
		0006H: Coast to stop
		0007H: Fault reset
		0008H: Jogging stop
		0009H: Decelerate to stop in emergency manner
Communication-based setting address	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01Hz)
	2002H	PID reference (0–1000, in which 1000 corresponds to 100.0%)
	2003H	PID feedback (0–1000, in which 1000 corresponds to 100.0%)
	2004H	Torque setting (-3000–3000, in which 1000 corresponds to 100.0% of the motor rated current)
	2005H	Upper limit setting of forward running frequency (0–Fmax; unit: 0.01Hz)
	2006H	Upper limit setting of reverse running frequency (0–Fmax; unit: 0.01Hz)
	2007H	Electromotive torque upper limit (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)
	2008H	Braking torque upper limit (0–3000, in which 1000

Parameter	Address	Description
		corresponds to 100.0% of the motor rated current)
	2009H	Special control command word Bit1–bit0: =00: Motor 1 =01: Motor 2 Bit2: =1: Speed/torque control switchover =0: No switchover Bit3: =1 Clear electricity consumption data =0: Keep electricity consumption data Bit4=1: Enable pre-excitation =0: Disable pre-excitation Bit5=1: Enable DC braking =0: Disable DC braking
	200AH	Virtual input terminal command (0x000–0xFFF)
	200BH	Virtual output terminal command, range: 0x00–0xFF
	200CH	Voltage setting (used when V/F separation is implemented) (0–1000, in which 1000 corresponds to 100.0% of the motor rated voltage)
	200DH	AO setting 1 (-1000–+1000, in which 1000 corresponding to 100.0%)
	200EH	AO setting 2 (-1000–+1000, in which 1000 corresponding to 100.0%)
	2013H	IO card virtual input terminal command. Range: 0x000–0x1FF
	2014H	IO card virtual output terminal command, range: 0x00–0x1F

Note: Some parameters in the preceding table are valid only after they are enabled. For example, for the running or stop operation, you must set "Channel of running commands" (P00.01) to "Communication", and set "Communication channel of running commands" (P00.02) to "Modbus".

The following table describes the encoding rules of device codes (corresponding to the identification code 2103H of the VFD).

8 MSBs	Meaning	8 LSBs	Meaning
0x01	Goodrive	0xA8	GD350C vector VFD

7.3 Modbus networking

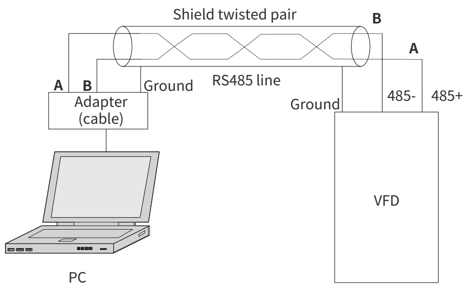
A Modbus network is a control network with one master and multiple slaves, that is, on one Modbus network, there is only one device serving as the master, and other devices are the slaves. The master can communicate with any single slave or with all slaves. For separate access commands, a slave needs to return a response. For broadcasted information, slaves do not need to return responses.

Generally, the PC, industry control device, or programmable logic controller (PLC) functions as the master, while VFDs function as slaves.

7.3.1 Network topology

Application to one VFD

Figure 7-1 Application to one VFD



Application to multiple VFDs

In practical application to multiple VFDs, the daisy chain connection and star connection are commonly used.

Figure 7-2 Practical daisy chain connection application

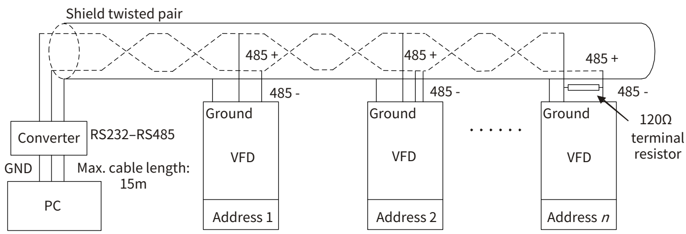
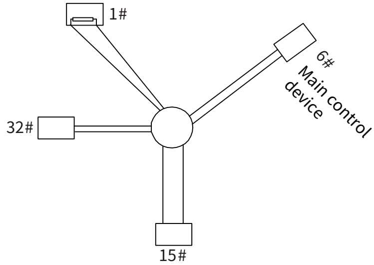


Figure 7-3 shows the star connection. When this connection mode is adopted, the two devices that are farthest away from each other on the line must be connected with a terminal resistor (the two devices are devices #1 and #15).

Figure 7-3 Star connection



Use shielded cables, if possible, in multi-device connection. The baud rates, data bit check settings, and other basic parameters of all the devices on the RS485 line must be set consistently, and addresses cannot be duplicated.

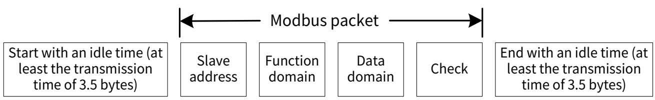
7.3.2 RTU mode

7.3.2.1 RTU communication frame structure

When a controller is set to use the RTU communication mode on a Modbus network, every byte (including 8 bits) in the message includes 2 hexadecimal characters (each includes 4 bits). Compared with the ASCII mode, the RTU mode achieves transmission of more data at the same baud rate.

In RTU mode, the transmission of a new frame always starts from an idle time (the transmission time of 3.5 bytes). On a network where the transmission rate is calculated based on the baud rate, the transmission time of 3.5 bytes can be easily obtained. After the idle time ends, the data domains are transmitted in the following sequence: slave address, command code, data, and CRC check character. Each byte transmitted in each domain includes 2 hexadecimal characters (0–9, A–F). The network devices always monitor the communication bus. After receiving the first domain (address information), each network device identifies the byte. After the last byte is sent, a similar transmission interval (with a minimum transmission time of 3.5 bytes) is used to indicate that the frame transmission ends. Then, the transmission of a new frame starts.

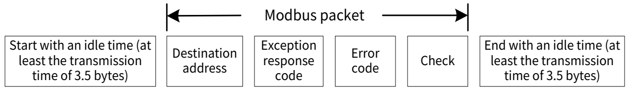
RTU data frame format



The information of a frame must be transmitted in a continuous data flow. If there is an interval greater than the transmission time of 1.5 bytes before the transmission of the entire frame is complete, the receiving device deletes the incomplete information, and mistakes the subsequent byte for the address domain of a new frame. Similarly, if the transmission interval between two frames is shorter than the transmission time of 3.5 bytes, the receiving device mistakes it for the data of the last frame. The CRC check value is incorrect due to the disorder of the frames, and thus a communication fault occurs.

If the slave detects a communication fault or read/write failure due to another cause, an error frame is replied.

RTU data frame format



The following table describes the standard structure of an RTU frame.

START (frame header)	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (decimal system; 0 is the broadcast address)
CMD (function domain)	03H: Read slave parameter; 06H: Write slave parameter
Data domain DATA (N-1)...DATA (0)	Data of 2*N bytes Main content of the communication as well as the core of data exchanging
CRC CHK LSB	Detection value: CRC verification value (16 bits)
CRC CHK MSB	
END (frame tail)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

7.3.2.2 RTU communication frame error check methods

During the transmission of data, errors may occur due to various factors. Without error check, the data receiving device cannot identify data errors and may make an incorrect response. The incorrect response may cause severe problems. Therefore, the data must be checked.

The error check of a frame includes two parts, namely, bit check on individual bytes (that is, odd/even check using the check bit in the character frame), and whole data check (CRC check).

7.3.2.3 Bit check on individual bytes (odd/even check)

You can select the bit check mode as required, or you can choose not to perform the check, which will affect the check bit setting of each byte.

Definition of even check: Before the data is transmitted, an even check bit is added to indicate whether the number of "1" in the to-be-transmitted data is odd or even. If it is even, the check bit is set to "0"; and if it is odd, the check bit is set to "1".

Definition of odd check: Before the data is transmitted, an odd check bit is added to indicate whether the number of "1" in the to-be-transmitted data is odd or even. If it is odd, the check bit is set to "0"; and if it is even, the check bit is set to "1".

For example, the data bits to be sent are "11001110", including five "1". If the even check is applied, the even check bit is set to "1"; and if the odd check is applied, the odd check bit is set to "0". During the transmission of the data, the odd/even check bit is calculated and placed in the check bit of the frame. The receiving device performs the odd/even check after receiving the data. If it finds that the odd/even parity of the data is inconsistent with the preset information, it determines that a communication error occurs.

7.3.2.4 Cyclic redundancy check (CRC)

A frame in the RTU format includes an error detection domain based on the CRC calculation. The CRC domain checks all the content of the frame. The CRC domain consists of two bytes, including 16 binary bits. It is calculated by the transmitter and added to the frame. The receiver calculates the CRC of the received frame, and compares the result with the value in the received CRC domain. If the two CRC values are not equal to each other, errors occur in the transmission.

During CRC, 0xFFFF is stored first, and then a process is invoked to process a minimum of 6 contiguous bytes in the frame based on the content in the current register. CRC is valid only for the 8-bit data in each character. It is invalid for the start, stop, and parity bits.

During the generation of the CRC values, the "exclusive or" (XOR) operation is performed on the each 8-bit character and the content in the register. The result is placed in the bits from the least significant bit (LSB) to the most significant bit (MSB), and 0 is placed in the MSB. Then, LSB is detected. If LSB is 1, the XOR operation is performed on the current value in the register and the preset value. If LSB is 0, no operation is performed. This process is repeated for 8 times. After the last bit (8th bit) is detected and processed, the XOR operation is performed on the next 8-bit byte and the current content in the register. The final values in the register are the CRC values obtained after operations are performed on all the bytes in the frame.

The calculation adopts the international standard CRC check rule. You can refer to the related standard CRC algorithm to compile the CRC calculation program as required.

The following example is a simple CRC calculation function for your reference (using the C programming language):

```
unsigned int crc_cal_value (unsigned char*data_value,unsigned char
data_length)
{
    int i;
    unsigned int crc_value=0xFFFF;
```

```
        while (data_length--)
        {
            crc_value^=*data_value++;
            for (i=0;i<8;i++)
            {
                if (crc_value&0x0001)
                    crc_value= (crc_value>>1) ^0xa001;
                else
                    crc_value=crc_value>>1;
            }
        }
        return (crc_value) ;
    }
```

In the ladder logic, CKSM uses the table look-up method to calculate the CRC value according to the content in the frame. The program of this method is simple, and the calculation is fast, but the ROM space occupied is large. Use this program with caution in scenarios where there are space occupation requirements on programs.

7.3.3 RTU command code

7.3.3.1 Command code 03H, reading *N* words (continuously up to 16 words)

The command code 03H is used by the master to read data from the VFD. The count of data to be read depends on the "data count" in the command. A maximum of 16 pieces of data can be read. The addresses of the read parameters must be contiguous. Each piece of data occupies 2 bytes, that is, one word. The command format is presented using the hexadecimal system (a number followed by "H" indicates a hexadecimal value). One hexadecimal value occupies one byte.

The 03H command is used to read information including the parameters and running status of the VFD.

For example, if the master reads two contiguous pieces of data (that is, to read content from the data addresses 0004 H and 0005 H) from the VFD whose address is 01H, the command frame structure is described in the following.

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR (address)	01H
CMD (command code)	03H
Start address MSB	00H
Start address LSB	04H

Data count MSB	00H
Data count LSB	02H
CRC LSB	85H
CRC MSB	CAH
End	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

"T1-T2-T3-T4 (transmission time of 3.5 bytes)" in "START" and "END" indicates that

the RS485 communication needs to be idle for at least the transmission time of 3.5

bytes. An idle time is required to distinguish on message from another to ensure that the two messages are not regarded as one.

"ADDR" is "01H", indicating that the command is sent to the VFD whose address is 01H. "ADDR" occupies one byte.

"CMD" is "03H", indicating that the command is used to read data from the VFD. "CMD" occupies one byte.

"Start address" indicates the address from which data is read. "Start address" occupies two bytes, with the MSB on the left and LSB on the right.

"Data count" indicates the count of data to be read (unit: word). "Start address" is "0004H" and "Data count" is "0002H", which indicates reading data from the addresses 0004H and 0005H.

CRC check occupies two bytes, with the LSB on the left, and MSB on the right.

RTU slave response (from the VFD to the master)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	01H
CMD	03H
Number of bytes	04H
MSB of data in 0004H	13H
LSB of data in 0004H	88H
MSB of data in 0005H	00H
LSB of data in 0005H	00H
CRC LSB	7EH
CRC MSB	9DH
End	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

The definition of the response information is described as follows:

"ADDR" is "01H", indicating that the command is sent from the VFD whose address is 01H. "ADDR" occupies one byte.

"CMD" is "03H", indicating that the message is a VFD response to the 03H command from the master for reading data. "CMD" occupies one byte.

"Number of bytes" indicates the number of bytes between the byte (not included) and the CRC byte (not included). The value "04" indicates that there are four bytes of data between "Number of bytes" and "CRC LSB", that is, "MSB of data in 0004H", "LSB of data in 0004H", "MSB of data in 0005H", and "LSB of data in 0005H".

A record of data contains two bytes, with the MSB on the left and LSB on the right. From the response, the data in 0004H is 1388H, and that in 0005H is 0000H.

CRC check occupies two bytes, with the LSB on the left, and MSB on the right.

7.3.3.2 Command code 06H, writing a word

This command is used by the master to write data to the VFD. One command can be used to write only one piece of data. It is used to modify the parameters and running mode of the VFD.

For example, if the master writes 5000 (1388H) to 0004H of the VFD whose address is 02H,

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	06H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of data content	13H
LSB of data content	88H
CRC LSB	C5H
CRC MSB	6EH
End	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

RTU slave response (from the VFD to the master)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	06H

MSB of data writing address	00H
LSB of data writing address	04H
MSB of data content	13H
LSB of data content	88H
CRC LSB	C5H
CRC MSB	6EH
End	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

7.3.3.3 Command code 10H, continuous writing

The command code 10H is used by the master to write data to the VFD. The quantity of data to be written is determined by "Data quantity", and a maximum of 16 pieces of data can be written.

For example: Writing 5000 (1388H) and 50 (0032H) to 0004H and 0005H of the VFD (as the slave) whose address is 02H.

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	10H
MSB of data writing address	00H
LSB of data writing address	04H
Data count MSB	00H
Data count LSB	02H
Number of bytes	04H
MSB of data to be written to 0004H	13H
LSB of data to be written to 0004H	88H
MSB of data to be written to 0005H	00H
LSB of data to be written to 0005H	32H
CRC LSB	C5H
CRC MSB	6EH
End	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

RTU slave response (from the VFD to the master)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

ADDR	02H
CMD	10H
MSB of data writing address	00H
LSB of data writing address	04H
Data count MSB	00H
Data count LSB	02H
CRC LSB	C5H
CRC MSB	6EH
End	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

7.3.4 Fieldbus scale

In practical applications, communication data is represented in the hexadecimal form, but hexadecimal values cannot represent decimals. You can multiply a non-integer by a multiple to obtain an integer, in which the multiple is considered as a fieldbus scale.

The fieldbus scale depends on the number of decimal places in the value specified in "Setting range" or "Default". If there are n (for example, 1) decimal places in the value, the fieldbus scale m (then m=10) is the result of 10 to the power of n. For example:

Function code	Name	Description	Setting range	Default
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19 ones place is 2)	0.0–3600.0	0.0s

The value specified in "Setting range" or "Default" contains one decimal place, and therefore the fieldbus scale is 10. If the value received by the master is 50, "Delay of auto fault reset" of the VFD is 5.0 (5.0=50/10).

To set "Wake-up-from-sleep delay" to 5.0s through Modbus communication, you need first to multiply 5.0 by 10 according to the scale to obtain an integer 50, that is, 32H in the hexadecimal form, and then send the following write command:

01	**06**	**01 14**	**00 32**	**49 E7**
VFD address	Write command	Parameter address	Parameter data	CRC

After receiving the command, the VFD converts 50 into 5.0 based on the fieldbus scale, and then sets "Wake-up-from-sleep delay" to 5.0s.

For another example, after sending the "Wake-up-from-sleep delay" parameter read command, the master receives the following response from the VFD:

<u>**01**</u>	<u>**03**</u>	<u>**02**</u>	<u>**00 32**</u>	<u>**39 91**</u>
VFD address	Read command	2-byte data	Parameter data	CRC

The parameter data is 0032H, that is, 50, and therefore 5.0 is obtained based on the fieldbus scale (50/10=5.0). Then, the master confirms that the wake-up-from-sleep delay is 5.0s.

7.3.5 Error message response

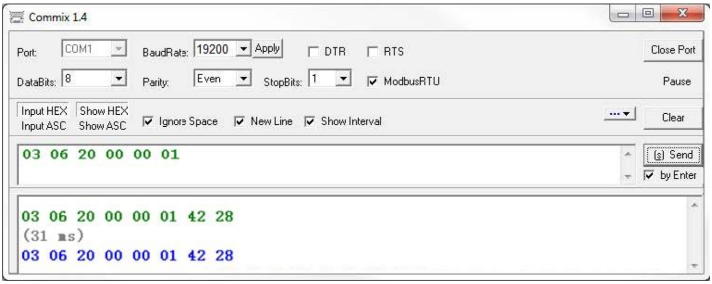
Error message responses are sent from the VFD to the master. The following table lists the codes and definitions of the error message responses.

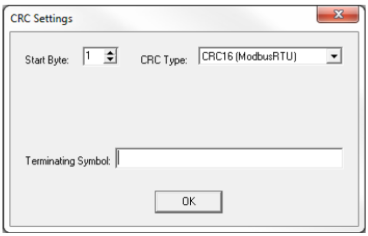
Code	Name	Meaning
01H	Invalid command	The command code received by the upper computer is not allowed to be executed. The possible causes are as follows: ● The function code is applicable only on new devices and is not implemented on this device. ● The slave is in the faulty state when processing this request.
02H	Invalid data Address	For the VFD, the data address in the request of the host controller is not allowed. In particular, the combination of the register address and the number of the to-be-sent bytes is invalid.
03H	Invalid data value	The received data domain contains a value that is not allowed. The value indicates the error of the remaining structure in the combined request. **Note:** It does not mean that the data item submitted for storage in the register includes a value unexpected by the program.
04H	Operation failure	The parameter setting is invalid in the write operation. For example, a function input terminal cannot be set repeatedly.
05H	Incorrect password	The password entered in the password verification address is different from that set in P7.00.
06H	Incorrect data frame	The data frame sent from the host controller is incorrect in the length, or in the RTU format, the value of the CRC check bit is inconsistent with the CRC value calculated by the lower computer.
07H	Parameter read-only	The parameter to be modified in the write operation of the upper computer is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the upper computer cannot be modified during the running of the VFD.

Code	Name	Meaning
09H	Password protection	If the host controller does not provide the correct password to unlock the system to perform a read or write operation, the error of "system being locked" is reported.

7.3.6 Communication commissioning

In the following example, a PC is used as the master, an RS232-RS485 converter is used for signal conversion, and the PC serial port used by the converter is COM1 (an RS232 port). The host controller commissioning software is the serial port commissioning assistant Commix1.4, which can be downloaded from the Internet. Download a version that can automatically execute the CRC check function. The following figure shows the interface of Commix.





Set **Port** to **COM1**. Set **BaudRate** consistently with P14.01. **DataBits**, **Parity**, and **StopBits** must be set consistently with P14.02. If the RTU mode is selected, choose **Input HEX** and **Show HEX**. To implement automatic CRC, you need to choose **ModbusRTU**, and set **Start Byte** to **1** and **CRC Type** to **CRC16 (MODBU SRTU)** in the **CRC Settings** window. After the automatic CRC is enabled, do not enter CRC in commands. Otherwise, command errors may occur due to repeated CRC.

The commissioning command for setting the VFD whose address is 03H to run forward is as follows:

03	06	20 00	00 01	42 28
VFD address	Write command	Parameter address	Forward running	CRC

Note:

- The VFD address (P14.00) must be set to 03.
- **"Channel of running commands" (P00.01) must be set to "Communication", and "Communication channel of running commands" (P00.02) to the Modbus channel.**
- Click **Send**. If the line configuration and settings are correct, a response from the VFD is received.

03	06	20 00	00 01	42 28
VFD address	Write command	Parameter address	Forward running	CRC

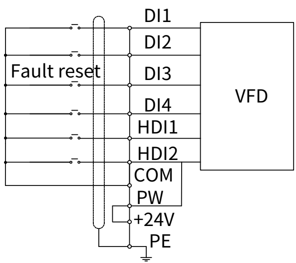
8 Fault handling

8.1 Fault indication and reset

When the TRIP indicator is on, the VFD is in abnormal state, with the keypad showing the fault code. For details about fault causes and solutions, see section 8.2 Faults and solutions. If the fault cause cannot be located, contact our local office for technical support. There are three methods to reset VFD faults:

Method 1 Press the  key on the keypad.

Method 2 Set the corresponding parameter in P05.01–P05.04, P05.11–P05.12 to 7.



Method 3 Cut off the VFD power supply.

8.2 Faults and solutions

When a fault occurred, handle the fault as follows:

Step 1 Check whether the keypad display is improper. If yes, contact the local INVT office.

Step 2 If no, check the function codes in P07 group to determine the real state when the fault occurred.

Step 3 Check the following table to see whether the exception state exists by solution.

Step 4 Rule out the faults or ask for help from professionals.

Step 5 After confirming the fault is removed, perform fault reset, and start running.

8.2.1 Common faults and solutions

<table>
<tr><th>Fault code display</th><th>Fault type</th><th>Possible cause</th><th>Solution</th></tr>
<tr><td>E1</td><td>[1] Inverter unit U-phase protection</td><td rowspan="3">● ACC/DEC is too fast.
● IGBT module damaged.
● Misoperation caused by interference.
● Drive wires are poorly connected.
● To-ground short circuit occurred.
● Sparks occurred inside due to poor use environment conditions.</td><td rowspan="3">● Increase ACC/DEC time.
● Change the inverter unit.
● The device and system has been grounded reliably.
● Check for loose drive wires.
● Check for abnormal motor wiring and motor-to-ground short connection.
● Remove the dust or oil stain inside the VFD regularly.</td></tr>
<tr><td>E2</td><td>[2] Inverter unit V-phase protection</td></tr>
<tr><td>E3</td><td>[3] Inverter unit W-phase protection</td></tr>
<tr><td>E4</td><td>[4] Overcurrent during ACC</td><td rowspan="3">● ACC/DEC is too fast.
● Grid voltage is too low.
● VFD power is too small.
● Load transient or exception occurred.
● 3PH output current imbalance.
● Strong external interference sources (contactor switchover or improper grounding)</td><td rowspan="3">● Increase ACC/DEC time.
● Increase grid input voltage.
● Select a VFD with larger power.
● Check for motor stalling, short connection, and load device exceptions.
● Check for abnormal VFD 3PH output voltage and motor 3PH resistance imbalance.
● Check for strong interference (whether motor cable far away from contactor and system grounded reliably).</td></tr>
<tr><td>E5</td><td>[5] Overcurrent during DEC</td></tr>
<tr><td>E6</td><td>[6] Overcurrent during constant speed running</td></tr>
<tr><td>E7</td><td>[7] Overvoltage during ACC</td><td rowspan="2">● ACC/DEC time is too short.
● Abnormal input voltage.
● Start during motor</td><td rowspan="2">● Increase ACC/DEC time.
● Check the input voltage.
● Use the speed-tracking start function.</td></tr>
<tr><td>E8</td><td>[8] Overvoltage during DEC</td></tr>
</table>

Fault code display	Fault type	Possible cause	Solution
E9	[9] Overvoltage during constant speed running	rotating. ● Load energy regeneration is too large. ● Dynamic brake is not enabled.	● Add dynamic braking devices or regenerative units. ● Set dynamic braking function parameters.
E10	[10] Bus undervoltage	● Grid voltage is too low. ● Abnormal bus voltage display. ● Abnormal precharge contactor closing.	● Increase grid input voltage. ● Contact us.
E11	[11] Motor overload	● Grid voltage is too low. ● Motor rated current is set incorrectly. ● Motor stall or load jumps violently	● Increase grid input voltage. ● Reset the motor rated current in the motor parameter group. ● Check the load and adjust torque boost.
E12	[12] VFD overload	● Acceleration is too fast. ● The motor in rotating is restarted ● The grid voltage is too low ● Load is too heavy. ● VFD power is too small.	● Increase acceleration time. ● Avoid restart after stop or conduct speed-tracking start. ● Increase grid input voltage ● Select a VFD with larger power.
E13	[13] Phase loss on input side	● Phase loss or violent fluctuation occurred on inputs RST. ● Input-side screws are loose.	● Check for abnormal input power and loose input cables. ● Set P11.00 to screen out the fault.
E14	[14] Phase loss on output side	● Output cables broken or short connected to the ground. ● UVW phase loss (or the three phases of load are	● Check for loose or broken output cables. ● Check for sharp load fluctuation and motor 3PH resistance

Fault code display	Fault type	Possible cause	Solution
		seriously asymmetrical).	imbalance.
E15	[15] Rectifier module overheating	● Air duct is blocked or fan is damaged. ● Ambient temperature is too high. ● Long-time overload running.	● Ventilate the air duct or replace the fan. ● Keep good ventilation to lower ambient temperature. ● Select a VFD with larger power.
E16	[16] Inverter module overheating		
E17	[17] External fault	● S terminal external fault input signal action.	● Check whether external device input is normal.
E18	[18] RS485 communication fault	● Incorrect baud rate ● Communication line fault. ● Incorrect communication address. ● Communication suffers from strong interference.	● Set a proper baud rate. ● Check the communication port wiring. ● Set the communication address correctly. ● You are recommended to use shielded cables to improve anti-interference.
E19	[19] Current detection fault	● Abnormal motor cable or motor insulation. ● Hall cable in poor contact. ● Hall component or current sampling optocoupler damaged.	● Remove motor cables to check. ● Check the Hall cable connector. ● Contact the manufacturer.
E20	[20] Motor autotuning fault	● Motor capacity does not match with the VFD capacity. This fault may occur if the capacity difference exceeds five power classes. ● Incorrect motor parameter setting. ● The parameters gained	● Change the VFD model, or adopt V/F mode for control ● Check motor wiring, motor type, and parameter settings. ● Empty the motor load and re-perform autotuning.

Fault code display	Fault type	Possible cause	Solution
		from autotuning deviate sharply from the standard parameters. ● Autotuning timeout. ● Pulse current setting is too large.	● Check whether the upper limit frequency is larger than 2/3 of the rated frequency. ● Decrease the pulse current setting properly.
E21	[21] EEPROM operation fault	● Error in reading or writing control parameters ● EEPROM is damaged.	● Press STOP/RST to reset. ● Replace the main control board.
E22	[22] PID feedback offline fault	● PID feedback is disconnected. ● PID feedback source disappears.	● Check PID feedback signal wires. ● Check PID feedback source.
E23	[23] Braking unit fault	● Fault occurred to the braking circuit or the braking pipe is damaged. ● External braking resistor with small resistance.	● Check the braking unit, and replace with new braking pipe ● Increase the braking resistance.
E24	[24] Running time reached	● Actual VFD running time longer than internally set running time.	● Contact us.
E25	[25] Electronic overload fault	● The VFD reports overload pre-alarm according to the setting.	● Check whether the overload pre-alarm point is set properly.
E26	[26] Keypad communication fault	● Keypad cable connected improperly or disconnected. ● Keypad cable too long, causing strong interference. ● Keypad or mainboard communication circuit error	● Check the keypad cable and re-plug to determine whether a fault occurs. ● Check the surroundings to rule out interference source ● Replace the hardware and seek maintenance services.

Fault code display	Fault type	Possible cause	Solution
E27	[27] Parameter upload error	● Keypad cable connected improperly or disconnected. ● Keypad cable too long, causing strong interference. ● Keypad or mainboard communication circuit error	● Check the keypad cable and re-plug to determine whether a fault occurs. ● Check the surroundings to rule out interference source ● Replace the hardware and seek maintenance services.
E28	[28] Parameter download error	● Keypad cable connected improperly or disconnected. ● Keypad cable too long, causing strong interference. ● Keypad data storage error	● Check the surroundings to rule out interference source ● Replace the hardware and seek maintenance services. ● Back up the data in the keyboard again, and check whether the version of the original control board software of parameter copy is the same as the version of the control board software to be downloaded.
E32	[32] To-ground short-circuit fault 1	● The output of the VFD is short circuited to the ground. ● Current detection circuit is faulty. ● Actual motor power setup deviates sharply from the VFD power.	● Check and ensure that the motor is not short circuited to the ground and the wiring is normal. ● Check whether the motor wiring is normal. ● Replace the hall component. ● Replace the main control board. ● Reset the motor parameters properly.
E33	[33] To-ground short-circuit fault 2		

Fault code display	Fault type	Possible cause	Solution
E34	[34] Speed deviation fault	● The load is too heavy or stalled.	● Check for the load. If the load is normal, increase speed deviation detection time or prolong the ACC/DEC time. ● Check motor parameter settings and re-perform motor parameter autotuning. ● Check speed loop control parameter settings.
E35	[35] Mal-adjustment fault	● Load exception. ● Incorrect SM parameter settings. ● Autotuned motor parameters are inaccurate. ● The VFD is not connected to the motor. ● Flux weakening application.	● Check for overload or stalling. ● Check motor parameter and counter EMF settings. ● Re-perform motor parameter autotuning. ● Increase the maladjustment detection time. ● Adjust flux weakening coefficient and current loop parameters.
E36	[36] Electronic underload fault	● The VFD reports underload pre-alarm according to the setting.	● Check the load and underload pre-alarm threshold.
E37	[37] Encoder disconnection fault	● Incorrect encoder line sequence, or signal wires poorly connected. ● The encoder signal is interfered. ● Encoder is damaged.	● Check whether the encoder wiring is normal, and route the encoder cable separately from the power cable. ● Use a shielded cable for the encoder cable, and ensure the shield layer is grounded reliably.

Fault code display	Fault type	Possible cause	Solution
			Ensure the system is grounded reliably. ● Replace the encoder with a new one.
E38	[38] Encoder reserve-rotation fault	● The encoder speed signal is contrary to the motor running direction.	● Reset encoder direction.
E39	[39] Encoder Z-pulse disconnection fault	● Z signal wires are disconnected.	● Check the wiring of Z signal and perform the wiring again.
E59	[59] Motor overtemperature fault	● Motor overtemperature input terminal is valid. ● The temperature detection resistance is abnormal. ● Long-time overload running or exception occurred.	● Check the wiring of the motor overtemperature input terminal (terminal function 57). ● Check whether the temperature sensor is proper ● Check the motor and perform maintenance on the motor.
E40	[40] Safe torque off	● Safe torque off function is enabled by external forces.	● -
E41	[41] Exception occurred to safe circuit of channel 1	● The wiring of STO is improper ● Fault occurred to external switch of STO. ● Channel safety circuit hardware fault.	● Check whether terminal wiring of STO is proper and firm enough. ● Check whether the external switch of STO can work properly ● Replace the control board.
E42	[42] Exception occurred to safe circuit of channel 2		
E43	[43] Exception occurred to both channel 1 and channel 2	● Hardware fault occurred to STO circuit.	● Replace the control board.
E44	[44] Safety code	● Control board is faulty.	● Replace the control

Fault code display	Fault type	Possible cause	Solution
	FLASH CRC check fault		board.
E55	[55] Duplicate expansion card type	● The two inserted expansion cards are of the same type	● You should not insert two cards with the same type. Check the type of expansion card, and remove one card after power-off.
	[55] Repetitive expansion card type (full closed-loop)	● If two PG cards are used simultaneously when the full closed-loop control is not enabled, an alarm will be triggered.	● Set the ones place of P46.00 to 1 to enable the full closed-loop control.
E56	[56] Encoder UVW loss	● No electric level variation occurred to UVW signal	● Check the UVW wiring. ● Check whether the encoder is damaged.
E60	[60] Failure to identify the card at slot 1	● There is data transmission in interfaces of card slot 1, however, it cannot read the card type.	● Check whether the expansion card in the slot is supported. ● Stabilize the expansion card interface after power-off, and check whether the fault persists at next power-on. ● Check whether the insertion port or card slot is damaged. If yes, replace the insertion port or card slot after power-off.
E61	[61] Failure to identify the card at slot 2	● There is data transmission in interfaces of card slot 2, however, it cannot read the card type.	
E62	[62] Failure to identify the card at slot 3	● There is data transmission in interfaces of card slot 3, however, it cannot read the card type.	
E63	[63] Communication timeout of expansion card in card slot 1	● There is no data transmission in interface of card slot 1.	
E64	[64] Communication timeout of expansion	● There is no data transmission in	

Fault code display	Fault type	Possible cause	Solution
	card in card slot 2	interfaces of card slot 2	
E65	[65] Communication timeout of expansion card in card slot 3	● There is no data transmission in interface of card slot 3.	
E29	[29] PROFIBUS card communication timeout fault	● No data transmission between the communication card and the host controller (or PLC).	● Check whether the communication card wiring is loose or disconnected.
E30	[30] Ethernet card communication timeout fault	● There is no data transmission between the communication card and the host controller.	
E31	[31] CANopen card communication timeout fault	● No data transmission between the communication card and the host controller (or PLC).	
E57	[57] PROFINET card communication timeout fault	● No data transmission between the communication card and the host controller (or PLC).	
E66	[66] EtherCAT card communication timeout fault	● No data transmission between the communication card and the host controller (or PLC).	
E67	[67] BACnet card communication timeout fault	● No data transmission between the communication card and the host controller (or PLC).	
E68	[68] DeviceNet card communication timeout fault	● No data transmission between the communication card	

Fault code display	Fault type	Possible cause	Solution
		and the host controller (or PLC).	
E58	[58] CAN master/slave card communication timeout fault	● There is no data transmission between the CAN master and slave communication cards.	
E69	[69] CAN slave fault in master/slave synchronization	● Fault occurred to one of the CAN slave VFDs.	● Detect the CAN slave VFD and analyze the corresponding fault cause.
E45–E54	[45]–[54]: Programmable card customized faults 1–10	● Programmable card user program logic error. ● Programmable card customized fault points experienced malfunctions.	● Check the programmable card user program logic. ● Conduct troubleshooting based on actual customized faults.
E82	[82] EC PT100 detected OH	● The EC PT100 temperature sensor obtains inaccurate temperature or it is calibrated inaccurately. ● Equipment or ambient temperature too high.	● Set related parameters for calibration. ● Lower the equipment or ambient temperature.

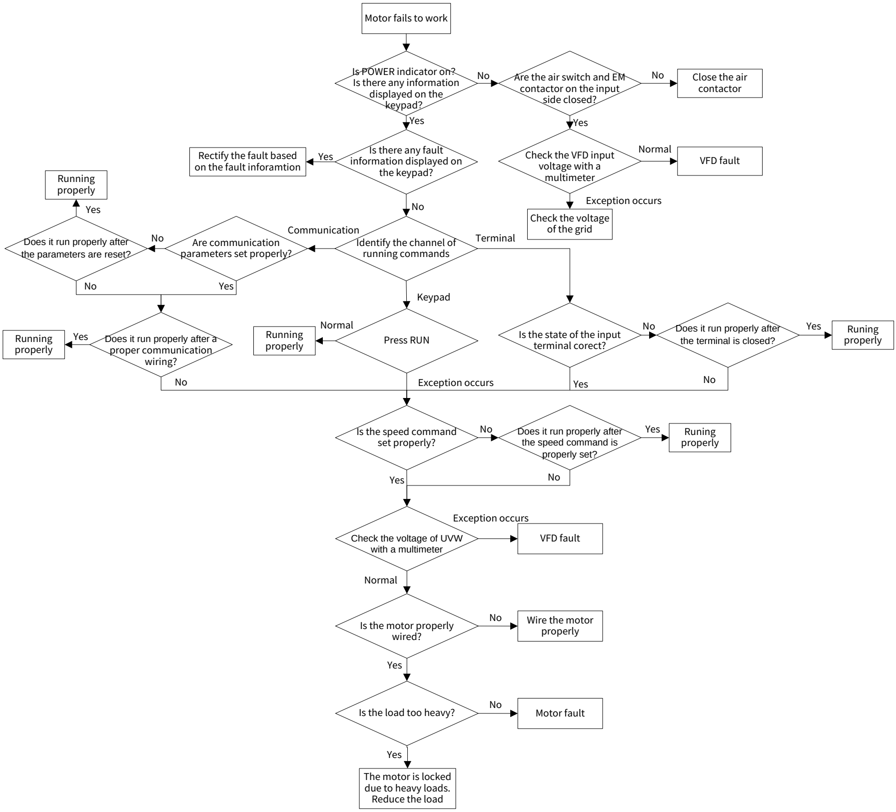
Fault code display	Fault type	Possible cause	Solution
E83	[83] EC PT1000 detected OH	● The temperature sensor obtains inaccurate temperature or it is calibrated inaccurately. ● Equipment or ambient temperature too high.	
E95	[95] EtherNet IP communication timeout	● No data transmission between the communication card and the host controller (or PLC).	● Check whether the communication card wiring is loose or disconnected.
E96	[96] No upgrade bootloader	● Upgrade bootloader missing.	● Contact us.
E92	[92] AI1 disconnection	● AI1 input too low. ● AI1 wiring disconnected.	● Connect a 5V or 10mA power source to check whether the input is normal. ● Check the wiring or replace the cable.
E93	[93] AI2 disconnection	● AI2 input too low. ● AI2 wiring disconnected.	
E94	[94] AI3 disconnection	● AI3 input too low. ● AI3 wiring disconnected.	

8.2.2 Other status

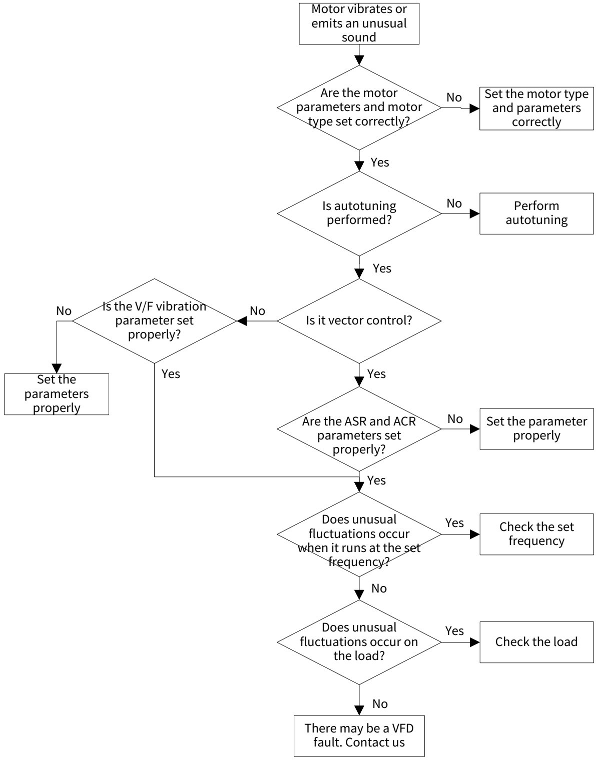
Fault code display	Status type	Possible cause	Solution
PoFF	System power failure	● The system is powered off or the bus voltage is too low.	● Check the grid conditions.

8.3 Analysis on common faults

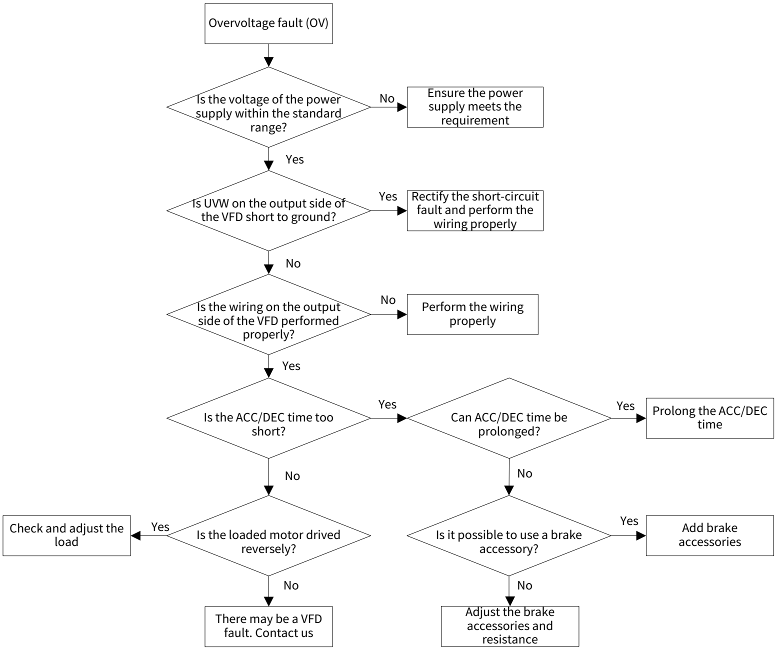
8.3.1 Motor fails to work



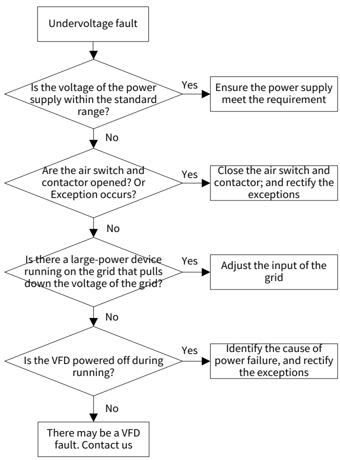
8.3.2 Motor vibrates



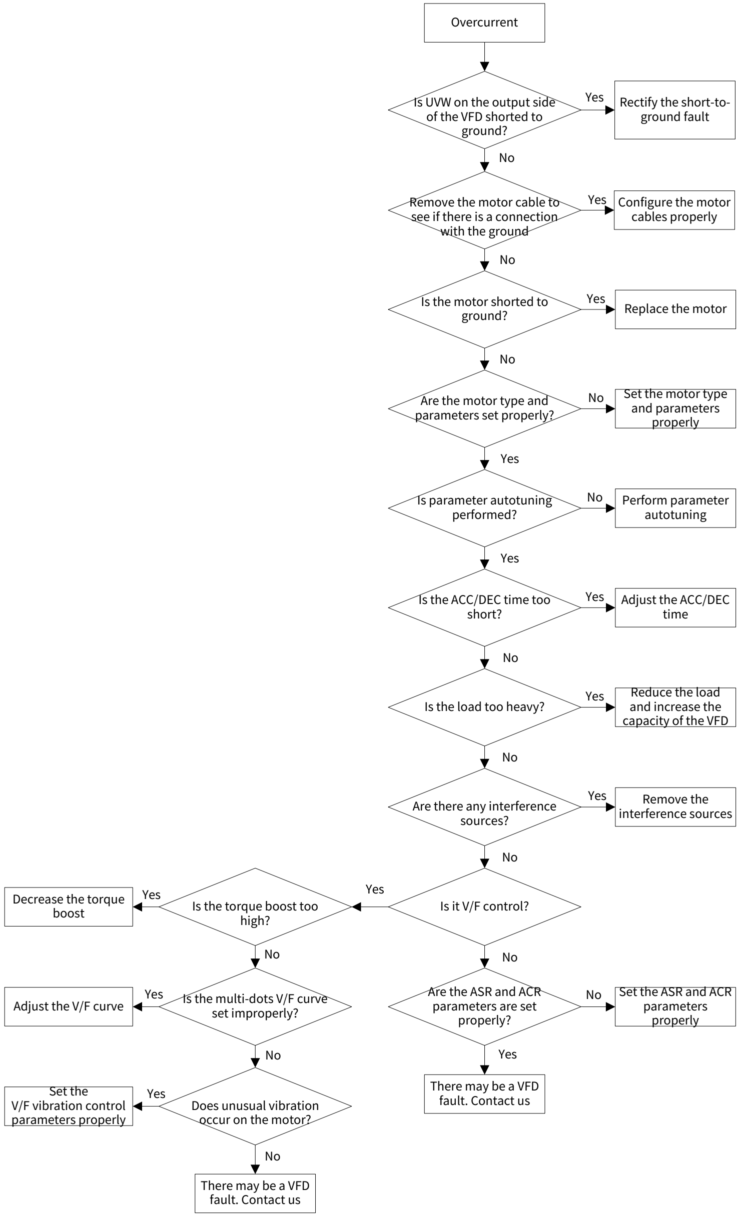
8.3.3 Overvoltage



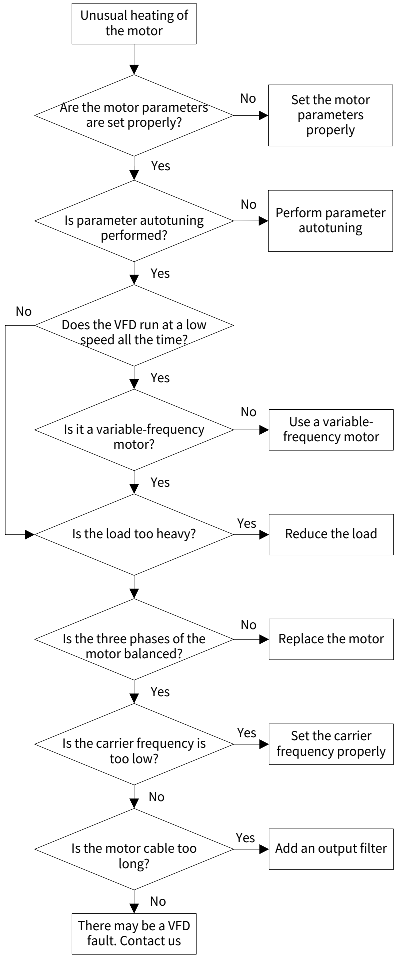
8.3.4 Undervoltage



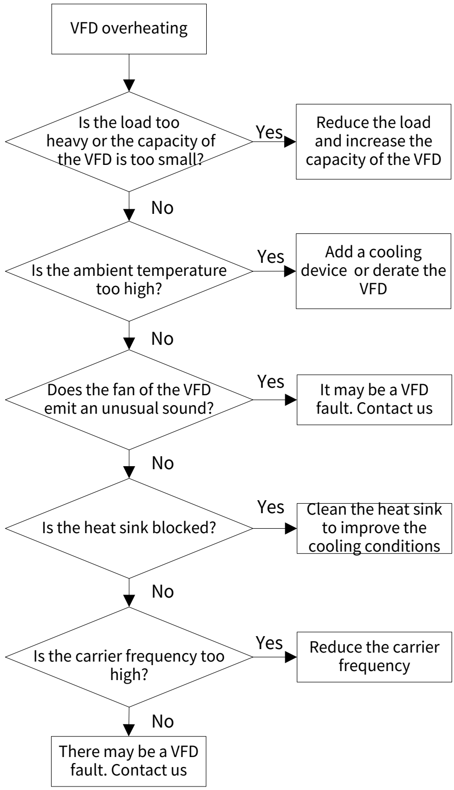
8.3.5 Overcurrent



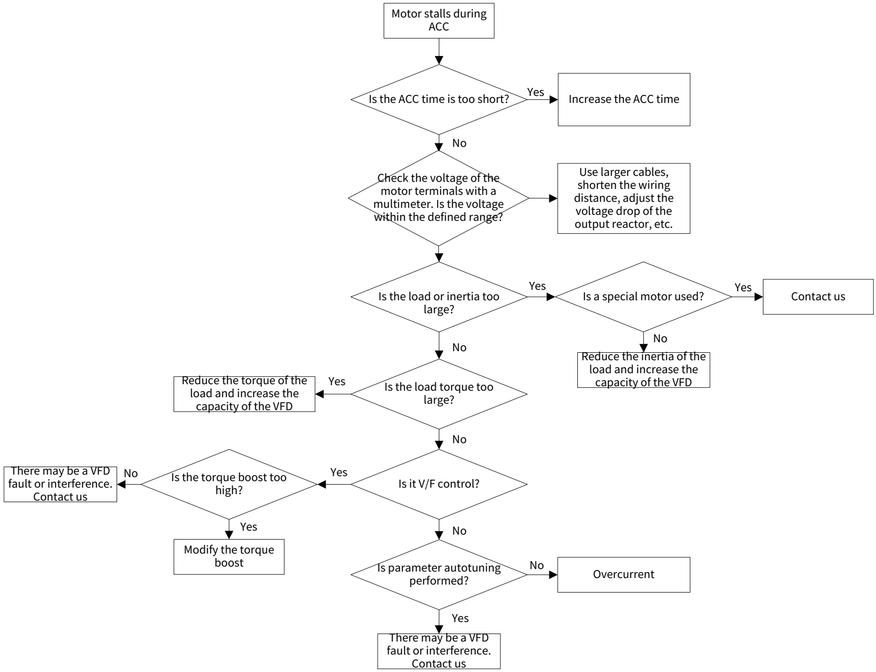
8.3.6 Motor overheating



8.3.7 VFD overheating



8.3.8 Motor stalls during ACC



8.4 Countermeasures on common interference

8.4.1 Interference problems of meter switch and sensors

■ **Symptom and solution**

<table>
<tr><th>Symptom</th><th>Solution</th></tr>
<tr><td>The upper or lower limit is wrongly displayed, for example, 999 or -999.</td><td rowspan="3">● Check and ensure that the sensor feedback cable is 20cm or farther away from the motor cable.
● Check and ensure that the ground wire of the motor is connected to the PE terminal of the VFD (if the ground wire of the motor has been connected to the ground block, you need to use a multimeter to measure and ensure that the resistance between the ground block and PE terminal is lower than 1.5 Ω). At the same time, you can short connect J10 at the VFD input end.</td></tr>
<tr><td>The display of values jumps (usually occurring on pressure transmitters).</td></tr>
<tr><td>The display of values is stable, but there is a large deviation, for example, the temperature is dozens of degrees higher than the common temperature (usually occurring on thermocouples).</td></tr>
</table>

<table>
<tr><th>Symptom</th><th>Solution</th></tr>
<tr><td>A signal collected by a sensor is not displayed but functions as a drive system running feedback signal. For example, the VFD is expected to decelerate when the upper pressure limit of the compressor is reached, but in actual running, it starts to decelerate before the upper pressure limit is reached.</td><td rowspan="3">● Try to add a safety capacitor of 0.1μF to the signal end of the feedback signal terminal of the sensor.
● Try to add a safety capacitor of 0.1μF to the power end of the sensor meter (pay attention to the voltage of the power supply and the voltage endurance of the capacitor).
● For interference on meters connected to the AO terminal of the VFD, If AO uses 0–20mA current signal, add a capacitor of 0.47μF between the AO and GND terminals; if AO uses 0–10V voltage signal, add a capacitor of 0.1μF between the AO and GND terminals.
● The signal cable needs to use the shielded cable, and the shield layer must be grounded reliably to the PE or GND.</td></tr>
<tr><td>All kinds of meters (such as frequency meter and current meter) connected to the VFD AO terminals display very inaccurate values.</td></tr>
<tr><td>Proximity switches are used in the system. After the VFD is started, the indicator of a proximity switch flickers, and the output level flips.</td></tr>
</table>

Note:

- When a decoupling capacitor is required, add it to the terminal of the device connected to the sensor. For example, if a thermocouple is to transmit signals of 0 to 20 mA to a temperature meter, the capacitor needs to be added on the terminal of the temperature meter; if an electronic ruler is to transmit signals of 0 to 30 V to a PLC signal terminal, the capacitor needs to be added on the terminal of the PLC.
- If a large number of meters or sensors are disturbed, it is recommended that you configure an external C2 filter on the VFD input power end. For details, see section D.3.2 EMC filter.

8.4.2 Interference on RS485 communication

■ **Symptom and solution**

<table>
<tr><th>Symptom</th><th>Solution</th></tr>
<tr><td>Check whether the RS485 communication bus is disconnected or in poor contact.</td><td rowspan="2">● Arrange the communication cables and motor cables in different cable trays.
● In multi-VFD application scenarios, adopt the chrysanthemum connection mode to connect the communication cables between VFDs, which can</td></tr>
<tr><td>Check whether the A and B wires of the RS485 communication bus are</td></tr>
</table>

Symptom	Solution
connected reversely.	improve the anti-interference capability.
Check whether the communication protocol of the VFD is consistent with that of the host controller. Check whether the communication protocol (such as the baud rate, data bits, and check bit) of the VFD is consistent with that of the host computer.	● In multi-VFD application scenarios, check and ensure that the driving capacity of the master is sufficient. ● In the connection of multiple VFDs, you need to configure one 120 Ω terminal resistor on each end. ● Check and ensure that the ground wire of the motor is connected to the PE terminal of the VFD (if the ground wire of the motor has been connected to the ground block, you need to use a multimeter to measure and ensure that the resistance between the ground block and PE terminal is lower than 1.5 Ω). At the same time, you can short connect J10 at the VFD input end. ● Do not connect the VFD and motor to the same ground terminal as the host controller (such as the PLC, HMI, and touch screen). It is recommended that you connect the VFD and motor to the power ground, and connect the host controller separately to a ground stud. ● Try to short the signal reference ground terminal (GND) of the VFD with that of the upper computer controller to ensure that ground potential of the communication chip on the control board of the VFD is consistent with that of the communication chip of the upper computer. ● Try to short GND of the VFD to its ground terminal (PE). ● Try to add a safety capacitor of 0.1μF at the power supply end of the host controller (PLC, HMI, or touch screen). Alternatively, use a magnet ring (Fe-based nanocrystalline magnet rings are recommended). Pass the L/N cable or +/- cable of the host controller power supply through the magnet ring in the same direction and wind around the magnet ring for 8 turns.

8.4.3 Failure to stop and indicator shimmering due to motor cable coupling

- Symptom and solution

Symptom	Solution
● Failure to stop In a VFD system where an S terminal is used to control the start and stop, the motor cable and control cable are arranged in the same cable tray. After the system is started properly, the S terminal cannot be used to stop the inverter.	● Check and ensure that the exception signal cable is arranged 20 cm or farther away from the motor cable. ● Add a safety capacitor of 0.1μF between the digital input terminal (DI) and the COM terminal. ● Connect the digital input terminal (DI) that controls the start and stop to other idle digital input terminals in parallel. For example, if DI1 is used to control the start and stop and DI4 is idle, you can try to short connect DI1 to DI4.
● Indicator shimmering After the VFD is started, the relay indicator, power distribution box indicator, PLC indicator, and indication buzzer shimmer, blink, or emit unusual sounds unexpectedly.	

Note: If the controller (such as PLC) in the system controls more than five VFDs at the same time through digital input terminals (S), this scheme is not applicable.

8.4.4 Leakage current and interference on RCD

- **Working principle**

VFDs output high-frequency PWM voltage to drive motors. In this process, the distributed capacitance between the internal IGBT of a VFD and the heat sink and that between the stator and rotor of a motor may inevitably cause the VFD to generate high-frequency leakage current to the ground. A residual current operated protective device (RCD) is used to detect the power-frequency leakage current when a grounding fault occurs on a circuit. The application of a VFD may cause misoperation of a RCD.

- **Rules for selecting RCDs**

1. Inverter systems are special. In these systems, it is required that the rated residual current of common RCDs at all levels is larger than 200 mA, and the VFDs are grounded reliably.

2. For RCDs, the time limit of an action needs to be longer than that of a next action, and the time difference between two actions need to be longer than 20ms. For example, 1s, 0.5s, and 0.2s.
3. For circuits in VFD systems, electromagnetic RCDs are recommended. Electromagnetic RCDs have strong anti-interference capability, and thus can prevent the impact of high-frequency leakage current.

Electronic RCD	Electromagnetic RCD
Low cost, high sensitivity, small in volume, susceptible to voltage fluctuation of the grid and ambient temperature, and weak anti-interference capability	Requiring highly sensitive, accurate, and stable zero-phase sequence current transformer, using permalloy high-permeability materials, complex process, high cost, not susceptible to voltage fluctuation of the power supply and ambient temperature, strong anti- interference capability

■ **Symptom and solution**

Symptom	Solution
The RCD is triggered immediately upon powering on the VFD.	● Solution to RCD misoperation (handling the VFD) Try to remove the jumper cap at "EMC/J10" from the middle casing of the VFD. Try to decrease the carrier frequency to 1.5kHz (P00.14=1.5). Try to modify the modulation method to "3PH modulation and 2PH modulation" (P08.40=0x0000). ● Solution to RCD misoperation (handling the system power distribution) Check and ensure that the power cable is not soaking in water. Check and ensure that the cables are not damaged or. Check and ensure that no secondary grounding is performed on the neutral wire. Check and ensure that the main power cable terminal is in good contact with the air switch or contactor (all screws are tightened). Check 1PH powered devices, and ensure that no
The RCD is triggered after the VFD starts running.	

Symptom	Solution
	earth lines are used as neutral wires by these devices. Do not use shielded cables as VFD power cables and motor cables.

8.4.5 Live device chassis

■ **Live device housing description**

After the VFD is started, there is sensible voltage on the housing, and you may feel an electric shock when touching the housing. The chassis, however, is not live (or the voltage is far lower than the human safety voltage) when the VFD is powered on but not running.

■ **Symptom and solution**

Symptom	Solution
Live device housing	● If there is power distribution grounding or ground stud on the site, ground the VFD cabinet housing through the power ground or stud. ● If there is no grounding on the site, you need to connect the motor housing to the VFD grounding terminal PE, and ensure that the jumper at "EMC/J10" at the middle of the VFD housing is shorted already.

9 Inspection and maintenance

9.1 Daily inspection and regular maintenance

The VFD internal components will become aging due to the influence of environmental temperature, humidity, dust, vibration and other factors, which causes the potential failure or shortens the service life. Therefore, to extend the VFD service life and prevent safety hazards, daily inspection and regular maintenance are required.

Check item	Content	Method
Daily inspection: Recommended on each day.		
Ambient environment	Whether the ambient temperature, humidity, vibration, dust, gas, and oil are too great, and whether there is condensation or water droplets inside and outside the machine	Visual inspection, and use instruments for measurement.
	Whether there are foreign matters, such as tools, or dangerous substances placed nearby	Visual inspection
Power supply voltage	Whether the voltage between the main circuit and control circuit is normal	Multimeter or voltage meter
Keypad	Whether display is clear	Visual inspection
	Whether some characters or fields are displayed incompletely	Visual inspection
Fan	Whether it runs normally	Visual inspection
Load	Whether the motor is overloaded or overheating, or it sounds abnormally.	Visual and auditory inspection, instrument based inspection
Regular maintenance: Recommended on a quarterly basis, especially in harsh environments such as with dust, oil, or corrosive gases. Before regular maintenance, cut off the power and wait at least 15 min.		
Machine	Whether the bolts become loose or come off	Visual inspection
	Whether the machine is deformed, cracked, or damaged, or the color changes due to overheating and aging	Visual inspection
	Whether much dirt or dust is attached	Visual inspection
	Whether there is abnormal sound or vibration, odor, discoloration (transformer, reactor and fan)	Auditory, olfactory, and visual inspection
Motor	Whether the installation is secure, motor insulation is normal, and the fan runs properly	Instrument or visual inspection

Check item	Content	Method
Cable	Whether there is discoloration, deformation, or damage	Visual inspection
	Whether the cable connectors or bolts become loose	Visual inspection
Connection terminal	Whether there is overheating or damage	Visual inspection, instrument based inspection
Electrolytic capacitor	Whether there is electrolyte leakage, discoloration, cracks, and housing expansion	Visual inspection
	Whether the safety valve is exposed outside	Visual inspection
External braking resistor	Whether there is displacement caused due to overheating	Olfactory and visual inspection
	Whether aging, skin breakage, or wire damage occurs to the resistor cable	Visual inspection, or measuring with a multimeter after removing one cable end
Contactor and relay	Whether there is vibration sound during running	Auditory inspection
	Check whether the contacts are in good contact.	Visual inspection
Control PCB and connector	Whether the screws and connectors become loose	Screw them up.
	Whether there is unusual smell or discoloration	Olfactory and visual inspection
	Whether there is corrosion or rust stains	Visual inspection
Ventilation duct	Whether there are foreign matters blocking or attached to the cooling fan, air inlets, or air outlets	Visual inspection

For more details about maintenance, contact the local INVT office, or visit our website https://www.invt.com, and choose **Support** > **Services**.

9.2 Replacement of wearing parts

The wearing parts of VFD mainly include the cooling fan and electrolytic capacitor, of which the service life is closely related to the running environment and maintenance condition. In normal use at the ambient temperature of 40°C, the general life time is as follows:

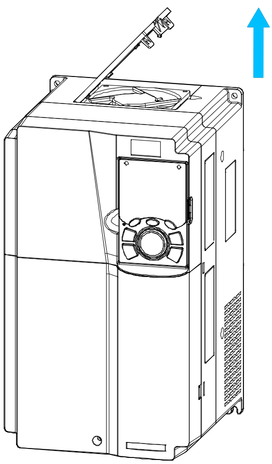
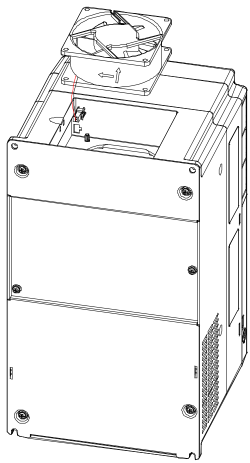
Part	Service life
Fan	≥ 5 years
Electrolytic capacitor	≥ 5 years

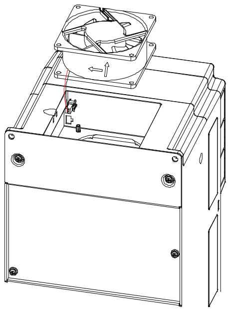
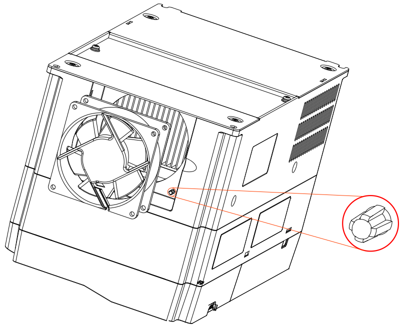
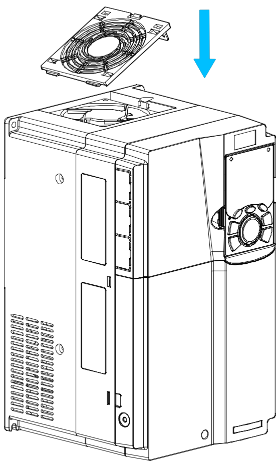
9.2.1 Cooling fan

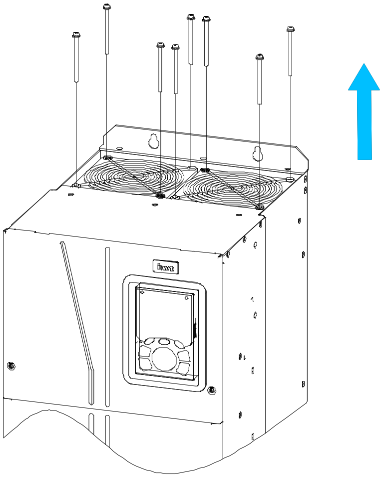
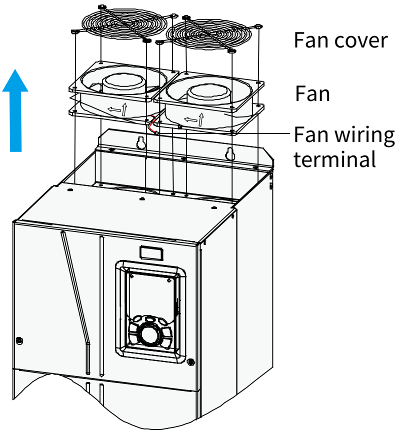
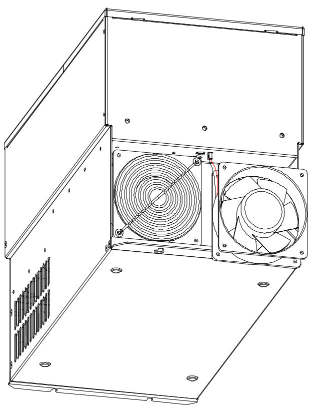
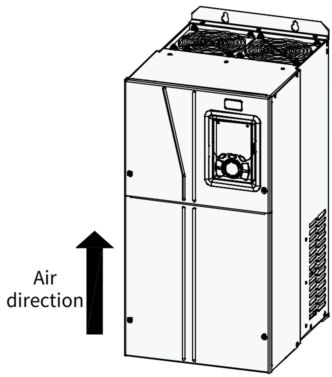
- **Possible damage cause**

  Bearing wear, blade aging, water, oil, dust and other environmental factors may cause circuit board damage.

- **Cooling fan replacement procedure**

<table>
<tr><th colspan="2">Disassembling a fan (380V 075G/090P and lower)</th></tr>
<tr><td>Step 1 Press the snap of the plastic fan cover gently to remove the fan cover.
</td><td>Step 2 Lift the fan upward, and remove the fan connection terminal.
</td></tr>
</table>

<table>
<tr><th colspan="2">Assembling a fan (380V 075G/090P and lower)</th></tr>
<tr><td>Step 1 Insert the fan connection terminal into the power outlet that comes with the machine. See the following figure.
</td><td>Step 2 Place the fan into the target mounting area and align the four fixing holes at the fan bottom with the positioning posts.
</td></tr>
<tr><td colspan="2">Step 3 Close the fan cover and press the snap.
</td></tr>
</table>

<table>
<tr><th colspan="2">Disassembling a fan (380V 090G/110P–500G)</th></tr>
<tr>
<td>Step 1 Remove screws from the fan cover with a screwdriver.
</td>
<td>Step 2 Take out the fan cover and fan, and remove the fan connection terminal.

</td>
</tr>
<tr><th colspan="2">Assembling a fan (380V 090G/110P–500G)</th></tr>
<tr>
<td>Step 1 Insert the fan connection terminal into the power outlet that comes with the machine. See the following figure.
</td>
<td>Step 2 When putting the fan and fan cover into the mounting place, align the mounting holes with the fixing holes, and fasten the screws.
Step 3 After replacement, check the air direction and ensure that the fan blows upward.

</td>
</tr>
</table>

Note:

- Before disassembling or installing the VFD, stop the VFD, cut off the power, and wait at least 15 minutes.
- Different VFD models may be slightly different in the fan quantity and position. The fan disassembly and assembly methods may be different.
- When installing the fan, ensure the air arrow points upward, and regardless of whether the fan is installed at the bottom or the top, to ensure that the fan blows upward.

9.2.2 Electrolytic capacitor

- **Possible damage cause**

The possible causes include high input power harmonics, high ambient temperature, frequent load jumps, and electrolyte aging.

- **Filter capacitor replacement**

It is recommended that a professional be asked for the replacement because the filter capacitor involves VFD internal components.

9.3 Reforming

If the VFD has been left unused for a long time, you need to follow the instructions to reform the DC bus electrolytic capacitor before using it. The storage time is calculated from the date the VFD is delivered. For detailed operation, contact us.

Storage time	Operation principle
Less than 1 year	No charging operation is required.
1 to 2 years	Before the first run, apply the voltage of one class lower than the VFD voltage class to the VFD for 1 hour.
2 to 3 years	Use a voltage controlled power supply to charge the VFD: ● Charge the VFD at 25% of the rated voltage for 30 minutes, ● and then charge it at 50% of the rated voltage for 30 minutes, ● at 75% for another 30 minutes, ● and finally charge it at 100% of the rated voltage for 30 minutes.
More than 3 years	Use a voltage controlled power supply to charge the VFD: ● Charge the VFD at 25% of the rated voltage for 2 hours, ● and then charge it at 50% of the rated voltage for 2 hours, ● at 75% for another 2 hours, ● and finally charge it at 100% of the rated voltage for 2 hours.

The method for using a voltage controlled power supply to charge the VFD is described as follows:

The selection of a voltage controlled power supply depends on the power supply of the VFD. For VFDs with an incoming voltage of 1PH/3PH 230 V AC, you can use a 230 V AC/2 A voltage regulator. Both 1PH and 3PH VFDs can be charged with a 1PH voltage controlled power supply (connect L+ to R, and N to S or T). All the DC bus capacitors share one rectifier, and therefore they are all charged.

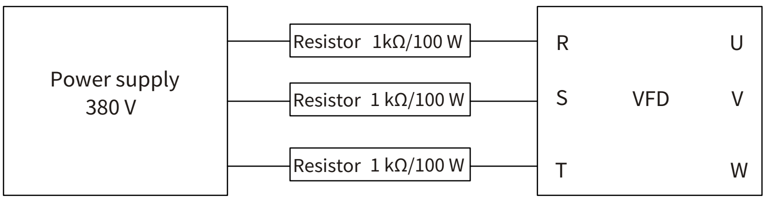
For VFDs of a high voltage class, ensure that the voltage requirement (for example, 380 V) is met during charging. Capacitor changing requires little current, and therefore you can use a small-capacity power supply (2 A is sufficient).

The method for using a resistor (incandescent lamp) to charge the drive is described as follows:

If you directly connect the drive device to a power supply to charge the DC bus capacitor, it needs to be charged for a minimum of 60 minutes. The charging operation must be performed at a normal indoor temperature without load, and you must connect a resistor in series mode in the 3PH circuit of the power supply.

For a 380 V drive device, use a resistor of 1 kΩ/100W. If the voltage of the power supply is no higher than 380 V, you can also use an incandescent lamp of 100W. If an incandescent lamp is used, it may go off or the light may become very weak.

Figure 9-1 380V driving-device charging circuit example



Appendix A Derating

If the ambient temperature at the VFD installation site exceeds 40°C, the VFD installation site altitude exceeds 1000m, a cover with heat dissipation vents is used, or the carrier frequency is higher than the recommended (see P00.14), the VFD needs to be derated.

A.1 Derating due to temperature

When the temperature is higher than 40°C, the rated output current is derated by 1% for each increased 1°C.

Note: It is not recommended to use the VFD at an environment with the temperature higher than 50°C. If you do, we shall not hold accountable for the consequences caused.

A.2 Derating due to altitude

When the VFD installation site altitude is lower than 1000m, the VFD can run at the rated power. When the altitude exceeds 1000m, derate by 1% for every increase of 100m. When the altitude exceeds 3000m, consult our local dealer or office for details.

A.3 Derating due to carrier frequency

The carrier frequency of the VFD varies with power class. The VFD rated power is defined based on the carrier frequency factory setting. If the carrier frequency exceeds the factory setting, the VFD power is derated. For specific derating requirements at different carrier frequencies, see the following table.

Table A-1 Derating for 380V 2kHz–8kHz carrier frequency

Model	Carrier frequency						
	2kHz	3kHz	4kHz	5kHz	6kHz	7kHz	8kHz
GD350C-1R5G-4	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GD350C-2R2G-4	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GD350C-004G-4	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GD350C-5R5G-4	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GD350C-7R5G-4	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GD350C-011G-4	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
GD350C-015G-4	100.00%	100.00%	100.00%	90.44%	82.13%	75.00%	68.69%
GD350C-018G-4	100.00%	100.00%	100.00%	92.26%	85.42%	79.37%	73.95%
GD350C-022G-4	100.00%	100.00%	100.00%	92.40%	85.60%	79.47%	74.00%
GD350C-030G-4	100.00%	100.00%	100.00%	100.00%	100.00%	97.70%	90.58%
GD350C-037G-4	100.00%	100.00%	100.00%	91.79%	84.56%	78.16%	72.47%

Model	Carrier frequency						
	2kHz	3kHz	4kHz	5kHz	6kHz	7kHz	8kHz
GD350C-045G-4	100.00%	100.00%	100.00%	89.52%	80.49%	72.83%	66.20%
GD350C-055G-4	100.00%	100.00%	100.00%	90.43%	82.61%	75.22%	69.39%
GD350C-075G-4	100.00%	90.33%	82.00%	74.67%	68.20%	62.53%	57.60%
GD350C-090G-4	100.00%	89.36%	80.03%	72.09%	65.17%	59.17%	53.94%
GD350C-110G-4	100.00%	91.53%	83.95%	77.21%	71.16%	65.81%	60.98%
GD350C-132G-4	100.00%	89.23%	80.00%	72.12%	65.38%	59.54%	54.42%
GD350C-160G-4	100.00%	100.00%	100.00%	94.26%	86.39%	79.38%	73.18%
GD350C-185G-4	100.00%	100.00%	92.50%	84.56%	77.50%	71.21%	65.65%
GD350C-200G-4	100.00%	90.92%	82.76%	75.66%	69.34%	63.71%	58.74%
GD350C-220G-4	100.00%	100.00%	92.71%	84.47%	77.20%	70.87%	65.27%
GD350C-250G-4	100.00%	90.42%	82.08%	74.79%	68.35%	62.75%	57.79%
GD350C-280G-4	100.00%	100.00%	94.34%	86.42%	79.34%	73.11%	67.55%
GD350C-315G-4	100.00%	91.17%	83.33%	76.33%	70.08%	64.58%	59.67%
GD350C-355G-4	100.00%	90.31%	81.92%	74.46%	68.00%	62.31%	57.28%
GD350C-400G-4	100.00%	100.00%	97.85%	88.82%	80.83%	73.81%	67.61%
GD350C-450G-4	100.00%	94.82%	85.91%	77.99%	70.98%	64.80%	59.37%
GD350C-500G-4	100.00%	90.41%	81.92%	74.36%	67.67%	61.79%	56.60%

Table A-2 Derating for 380V 9kHz–15kHz carrier frequency

Model	Carrier frequency						
	9kHz	10kHz	11kHz	12kHz	13kHz	14kHz	15kHz
GD350C-1R5G-4	93.24%	86.49%	81.08%	76.22%	71.89%	67.84%	64.05%
GD350C-2R2G-4	94.60%	89.60%	84.60%	80.60%	76.80%	73.00%	69.60%
GD350C-004G-4	94.00%	88.42%	83.37%	78.74%	74.53%	70.53%	66.74%
GD350C-5R5G-4	93.71%	88.00%	83.00%	78.21%	74.00%	70.14%	66.57%
GD350C-7R5G-4	92.97%	86.76%	81.00%	76.00%	71.46%	67.30%	63.68%
GD350C-011G-4	93.68%	87.92%	82.64%	77.80%	73.41%	69.28%	65.52%
GD350C-015G-4	63.13%	58.28%	54.00%	50.16%	-	-	-
GD350C-018G-4	69.11%	64.82%	60.92%	57.37%	-	-	-
GD350C-022G-4	69.11%	64.67%	60.71%	57.11%	-	-	-
GD350C-030G-4	84.30%	78.72%	73.70%	69.20%	-	-	-
GD350C-037G-4	67.44%	62.97%	58.96%	55.36%	-	-	-
GD350C-045G-4	60.43%	55.43%	51.09%	47.28%	-	-	-
GD350C-055G-4	51.30%	47.48%	44.00%	41.00%	-	-	-
GD350C-075G-4	53.27%	49.40%	45.93%	42.87%	-	-	-
GD350C-090G-4	49.39%	45.44%	41.94%	38.83%	-	-	-

Model	Carrier frequency						
	9kHz	10kHz	11kHz	12kHz	13kHz	14kHz	15kHz
GD350C-110G-4	56.63%	52.74%	49.26%	46.09%	-	-	-
GD350C-132G-4	50.00%	46.12%	42.69%	39.65%	-	-	-
GD350C-160G-4	67.64%	62.75%	58.39%	54.46%	-	-	-
GD350C-185G-4	60.68%	56.29%	52.38%	48.85%	-	-	-
GD350C-200G-4	54.29%	50.37%	46.87%	43.71%	-	-	-
GD350C-220G-4	60.33%	56.00%	52.09%	48.64%	-	-	-
GD350C-250G-4	53.42%	49.58%	46.13%	43.06%	-	-	-
GD350C-280G-4	62.57%	58.15%	54.19%	50.60%	-	-	-
GD350C-315G-4	55.27%	51.37%	47.87%	44.70%	-	-	-
GD350C-355G-4	52.89%	48.98%	45.51%	42.42%	-	-	-
GD350C-400G-4	62.14%	57.25%	52.92%	49.08%	-	-	-
GD350C-450G-4	54.56%	50.27%	46.46%	43.10%	-	-	-
GD350C-500G-4	52.02%	47.93%	44.30%	41.09%	-	-	-

Appendix B Application standards

B.1 List of application standards

The following table describes the application standards that VFDs comply with.

EN/ISO 13849-1	Safety of machinery—Safety-related parts of control systems—Part 1: General principles for design
IEC/EN 60204-1	Safety of machinery. Electrical equipment of machines. Part 1: General requirements
IEC/EN 62061	Safety of machinery—Safety-related functional safety of electrical, electronic, and programmable electronic control systems
IEC/EN 61800-3	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods
IEC/EN 61800-5-1	Adjustable speed electrical power drive systems—Part 5-1: Safety requirements—Electrical, thermal and energy
IEC/EN 61800-5-2	Adjustable speed electrical power drive systems—Part 5-2: Safety requirements—Function

B.2 CE/TUV/UL/CCS certification

The CE mark affixed to the VFD indicates that the VFD is CE-compliant, meeting the regulations of the European low-voltage directive (2014/35/EU) and EMC directive (2014/30/EU).

The TUV mark affixed to the VFD indicates that the VFD is TUV-compliant. TUV certification includes TUV-MARK, TUV-CE, TUV-CB, GS, and VDE certifications, which has high authority and recognition in the field of electronic appliances and components.

The UL mark affixed to the VFD indicates that the VFD has passed UL certification. UL certification is a voluntary certification in the United States (but mandatory in some states), and products that have passed the certification meet the relevant UL standard requirements can enter the US market.

The CCS mark affixed to the VFD indicates that the VFD is CCS-compliant. CCS is the ship inspection certification of China Classification Society. The certified products can be used on ships.

B.3 EMC compliance declaration

Electro Magnetic Compatibility (EMC) describes the ability of electronic and electrical devices to work properly in the electromagnetic environment and not to generate electromagnetic interference that affects other local devices or systems. The VFD is compliant with the EMC product standard (EN 61800-3) and applied to both the first environment and the second environment.

B.4 EMC product standard

The EMC product standard (EN 61800-3) describes the EMC requirements on VFDs.

Application environment categories:

First environment: Civilian environment, including application scenarios where the VFD is directly connected without intermediate transformer to a low-voltage power supply network which supplies residential buildings.

Second environment: All locations outside a residential area.

Category C1: VFD of rated voltage lower than 1000V, applied to the first environment.

C2: Rated voltage lower than 1000V, non-plug, socket, or mobile devices; power drive systems that must be installed and operated by specialized personnel when applied to environments of Category I.

Note: The product may generate radio interference in some environments, you need to take measures to reduce the interference.

VFDs of C3: Rated voltage lower than 1000 V, applied to the second environment. They cannot be applied to the first environment.

Note: VFDs of category C3 cannot be applied to civilian low-voltage public grids. When applied to such grids, the VFD may generate radio frequency electromagnetic interference.

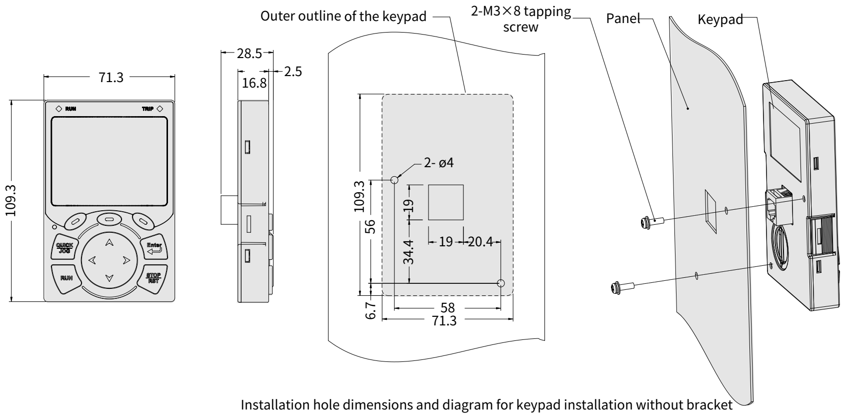
Category C4: VFD of rated voltage higher than 1000V, or rated current higher or equal to 400A, applied to complex systems in the second environment.

Note: The EMC standard IEC/EN 61800-3 no longer restricts the power distribution of the VFD, but defines the use, installation, and commissioning of the VFD. Specialized personnel or organizations must have the necessary skills (including the EMC-related knowledge) for installing and/or performing commissioning on the electrical drive systems.

Appendix C Dimension drawings

C.1 Keypad structure

Figure C-1 Keypad structure



Note: The flat keypad cable must be selected for the following power ratings; both flat and standard keyboard cables are applicable to other power ratings.

Name	Length (m)	Ordering code	Applied to
Flat keypad cable	1	67004–00053	380V 1R5G–022G 380V 355G–500G
	2	67004–00010	
	3	67004–00013	
	5	67004–00052	

C.2 VFD overall dimensions

Figure C-2 380V 1R5G–037G outline and installation dimensions

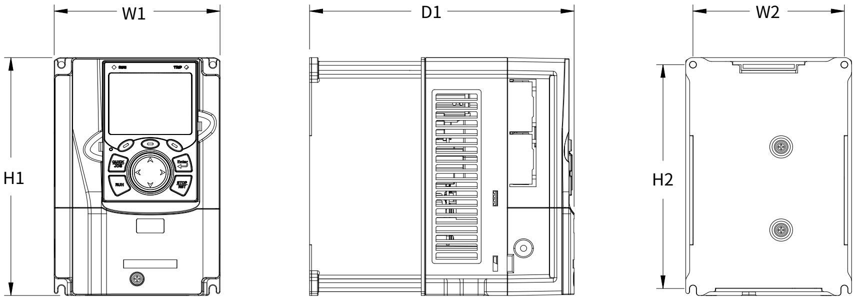


Figure C-3 380V 045G–075G outline and installation dimensions

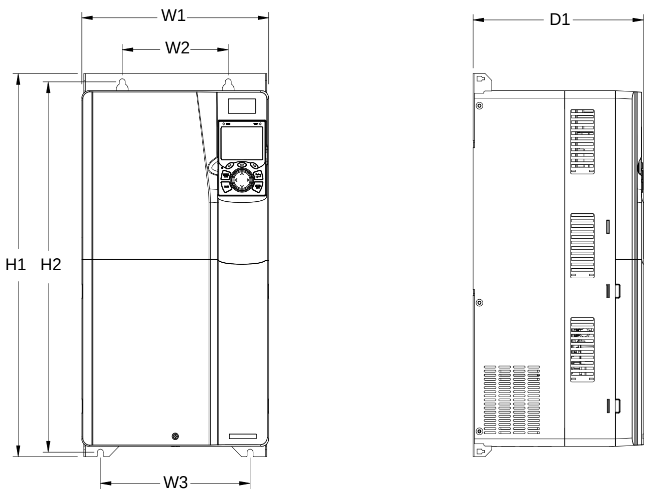


Figure C-4 380V 090G–110G outline and installation dimensions

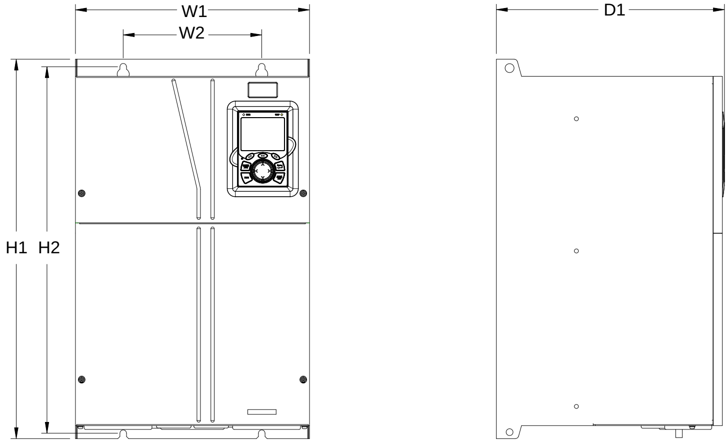


Figure C-5 380V 132G–200G outline and installation dimensions

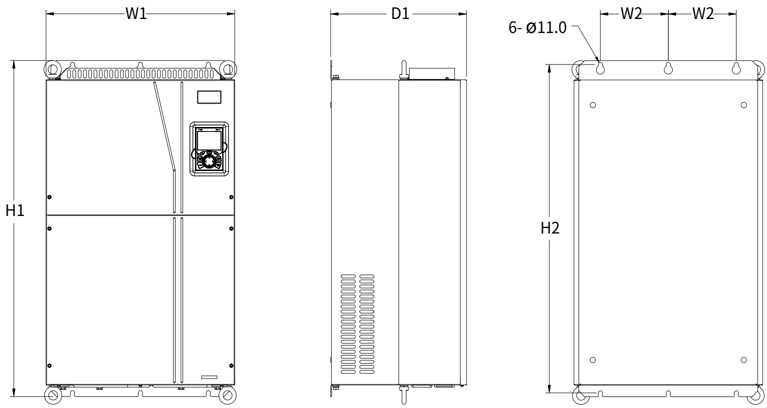


Figure C-6 380V 220G–315G outline and installation dimensions

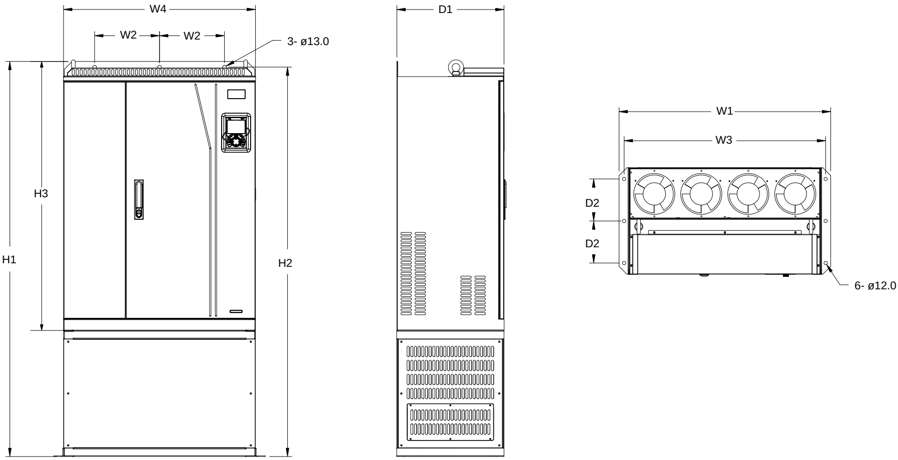


Figure C-7 380V 355G–500G outline and installation dimensions

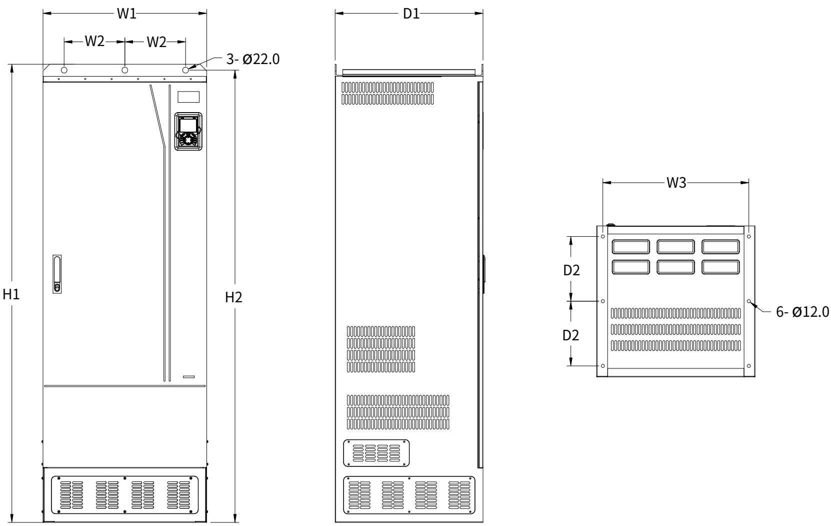


Table C-1 Dimensions and mounting hole size (mm)

VFD model	Outline dimensions					Mounting hole distance				Hole diameter
	W1	W4	H1	H3	D1	W2	W3	H2	D2	
1R5G–2R2G	126	-	186	-	185	115	-	175	-	Ø5
004G–5R5G	126	-	186	-	201	115	-	175	-	Ø5
7R5G	146	-	256	-	192	131	-	243.5	-	Ø6
011G–015G	170	-	320	-	220	151	-	303.5	-	Ø6
018G–022G	200	-	340.6	-	208	185	-	328.6	-	Ø6
030G–037G	250	-	400	-	223	230	-	380	-	Ø6
045G–075G	282	-	560	-	258	160	226	542	-	Ø9
090G–110G	338	-	554	-	330	200	-	535	-	Ø10
132G–200G	500	-	872	-	360	180	-	850	-	Ø11
220G–315G	750	680	1410	960	380	230	714	1390	150	Ø13/12
355G–500G	620	-	1700	-	560	230	572	1678	240	Ø22/12

C.3 Dimensions for parallel VFDs

Figure C-8 Parallel outline and mounting dimensions diagram for 380V 560–630kW VFD models

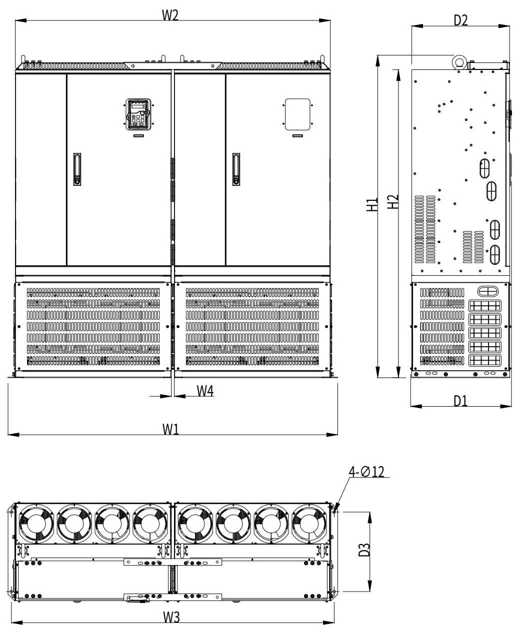


Figure C-9 Parallel outline and mounting dimensions diagram for 380V 710–3000kW VFD models

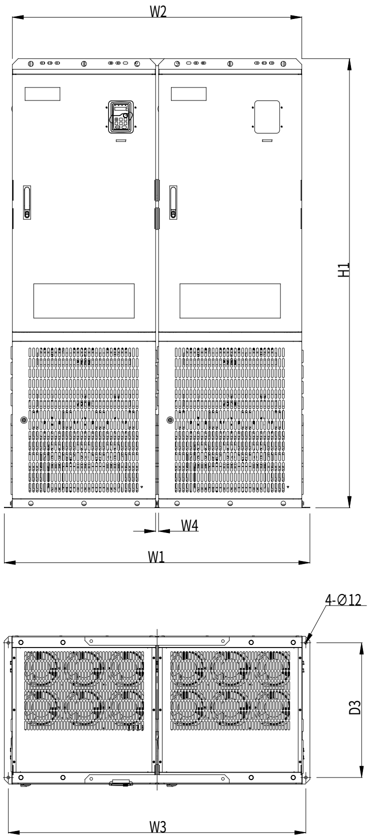


Table C-2 Parallel dimensions and mounting hole size of 380V VFDs

VFD model	Outline dimensions (mm)						Mounting hole spacing (mm)			Mounting hole diameter (mm)
	W1	W2	W4	H1	H2	D1	D2	W3	D3	
560–630kW	1447	1383	13	1419.9	1356	442.5	429.5	1417	350	Ø12
710–1000kW	1323	1253	13	1900	-	636.3	625.5	1288	570	Ø12
1200–1500kW	1956	1886	13	1900	-	636.3	625.5	1921	570	Ø12
2000kW	2589	2519	13	1900	-	636.3	625.5	2554	570	Ø12
2500kW	3222	3152	13	1900	-	636.3	625.5	3187	570	Ø12
3000kW	3855	3785	13	1900	-	636.3	625.5	3820	570	Ø12

Appendix D Peripheral accessories

D.1 Cable

Cables mainly include power cables and control cables. For the selection of cable types, see the following table.

Cable type		Symmetrical shielded cable	Four-core cable	Double-shielded twisted-pair cable	Single-shielded twisted-pair cable
Power cable	Input power cable	√	-	-	-
	Motor cable	√	-	-	-
Control cable	Analog signal control cable	-	-	√	-
	Digital signal control cable	-	-	√	√

D.1.1 Power cable

Power cables mainly include input power cables and motor cables. To meet the EMC requirements stipulated in the CE standards, it is recommended to use symmetrical shielded cables as motor cables and input power cables (as shown in the following figure). Compared with four-core cables, symmetrical shielded cables can reduce electromagnetic radiation as well as the current and loss of the motor cables.

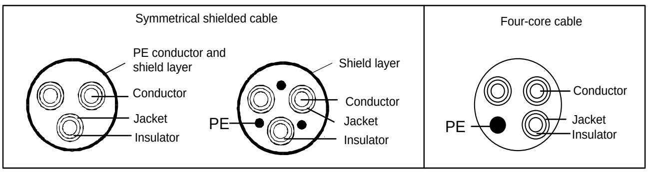


Table D-1 Power cable related parameters

VFD model	Recommended cable size (mm^2)				Fixing screw	
	R, S, T U, V, W	PE	P1, (+)	PB, (+), (-)	Terminal screw	Fastening torque (Nm)
GD350C-1R5G-4	1.0/1.0	1.0/1.0	1.0/1.0	1.0/1.0	M4	1.2–1.5
GD350C-2R2G-4	1.0/1.5	1.0/1.5	1.0/1.5	1.0/1.5	M4	1.2–1.5
GD350C-004G-4	1.5/2.5	1.5/2.5	1.5/2.5	1.5/2.5	M4	1.2–1.5

VFD model	Recommended cable size (mm²)				Fixing screw	
	R, S, T U, V, W	PE	P1, (+)	PB, (+), (-)	Terminal screw	Fastening torque (Nm)
GD350C-5R5G-4	2.5/4	2.5/4	2.5/4	2.5/4	M4	1.2–1.5
GD350C-7R5G-4	4/6	4/6	4/6	4/6	M4	1.2–1.5
GD350C-011G-4	6/10	6/10	6/10	6/10	M5	2–2.5
GD350C-015G-4	10/10	10/10	10/10	10/10	M5	2–2.5
GD350C-018G-4	10/10	10/10	10/10	10/10	M5	2–2.5
GD350C-022G-4	10/16	10/16	10/16	10/16	M6	4–6
GD350C-030G-4	16/25	16/16	16/25	16/25	M6	4–6
GD350C-037G-4	25/25	16/16	25/25	25/25	M6	4–6
GD350C-045G-4	25/35	16	25/35	25/35	M8	9–11
GD350C-055G-4	35/50	16/25	35/50	35/50	M8	9–11
GD350C-075G-4	50/70	25/35	50/70	50/70	M8	9–11
GD350C-090G-4	70/95	35/50	70/95	70/95	M12	31–40
GD350C-110G-4	95/95	50/50	95/95	95/95	M12	31–40
GD350C-132G-4	95/150	50/70	95/150	95/150	M12	31–40
GD350C-160G-4	150/185	70/95	150/185	150/185	M12	31–40
GD350C-185G-4	185/185	95/95	185/185	185/185	M12	31–40
GD350C-200G-4	185/2×95	95/95	185/2×95	185/2×95	M12	31–40
GD350C-220G-4	2×95/2×95	95/95	2×95/2×95	2×95/2×95	M12	31–40
GD350C-250G-4	2×95/2×150	95/150	2×95/2×150	2×95/2×150	M12	31–40
GD350C-280G-4	2×150/2×150	150/150	2×150/2×150	2×150/2×150	M12	31–40
GD350C-315G-4	2×150/2×185	150/185	2×150/2×185	2×150/2×185	M12	31–40
GD350C-355G-4	2×185/3×150	185/2×120	2×185/3×150	2×185/3×150	M12	31–40
GD350C-400G-4	3×150	2×120/2×150	3×150	3×150	M12	31–40
GD350C-450G-4	3×185	2×150/2×150	3×185	3×185	M12	31–40
GD350C-500G-4	3×185	2×150	3×185	3×185	M12	31–40

Note:

- The cables recommended for the main circuit can be used in scenarios where the ambient temperature is lower than 40°C, the wiring distance is shorter than 100m, and the current is the rated current.
- In the table, the cable conductor temperature limit is 70 °C. If you use a cable with the conductor temperature limit of 90 °C, the cable must comply with relevant national standards and specifications.
- The terminals P1, (+), PB, and (-) are used to connect to DC reactors and braking

accessories.

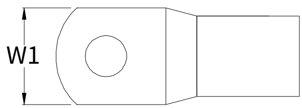
- If the electrical conductivity of the motor cable shield layer does not meet the requirements, a separate PE conductor must be used.
- The input power cables and motor cables must be able to carry the corresponding load currents.
- The maximum temperature margin of the motor cables in continuous operation cannot be lower than 70°C.
- The conductivity of the PE grounding conductor is the same as that of the phase conductor, that is, the cross-sectional areas are the same.
- For cable selection of parallel VFDs, see the manual for Goodrive series parallel VFDs.

■ **Crimp terminal selection**

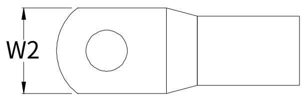
The cross-sectional area of the cable needs to be increased for some reasons, for example, excessive long cables or cable laying. When the width of the copper tube terminal exceeds the allowable width of the VFD terminal, the narrow head terminals can be used.

GTNR terminal reference brand: Suzhou Yuanli; SC, SG terminal reference brands: Richeng

The series name of the crimp terminal varies from manufacturers.



GTNR, SC series



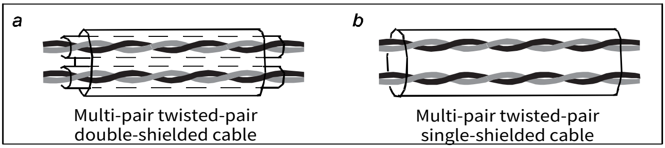
SG narrow-head series

VFD model	GTNR series, SC series	SG narrow-head series
030G and below	✓	-
037G and above	✓	-

D.1.2 Control cable

Control cables mainly include analog signal control cables and digital signal control cables. Analog signal control cables use twisted double shielded cables (Figure a), with a separate shielded twisted pair for each signal and different ground wires for different analog signals. For digital signals, a double-shielded cable is preferred, but single-shielded or unshielded twisted pairs can also be used (Figure b).

Figure D-1 Control cable diagram



Note:

- Analog signal cables and digital signal cables must be routed separately.
- For frequency signals, only shielded cables can be used. A relay cable needs to carry the metal braided shield layer.

D.2 Breaker and electromagnetic contactor

The circuit breaker is mainly used to prevent electric shock accidents and short circuits to the ground that may cause leakage current fire. The electromagnetic contactor is mainly used to control the main circuit power on and off, which can effectively cut off the input power of the VFD in case of system failure to ensure safety. The fuse/breaker model selection for a VFD in a parallel product is consistent with that for a single VFD, and the capacity of the fuse/breaker for a parallel product is twice the rated current of the parallel product. (For details about the rated current of each parallel product, see section 2.3 Product ratings.

Table D-2 Parameters related to circuit breakers, fuses and contactors

VFD model	Breaker rated current (A)	Fast-acting fuse rated current (A)	Contactor rated current AC-3 (A)
GD350C-1R5G-4	10	10	9
GD350C-2R2G-4	13	16	9
GD350C-004G-4	25	32	16
GD350C-5R5G-4	32	40	26
GD350C-7R5G-4	40	50	26
GD350C-011G-4	50	63	38
GD350C-015G-4	63	80	40
GD350C-018G-4	63	80	50
GD350C-022G-4	80	100	63
GD350C-030G-4	100	125	75
GD350C-037G-4	125	160	95
GD350C-045G-4	160	200	95
GD350C-055G-4	160	200	145
GD350C-075G-4	200	250	145

VFD model	Breaker rated current (A)	Fast-acting fuse rated current (A)	Contactor rated current AC-3 (A)
GD350C-090G-4	250	315	185
GD350C-110G-4	315	355	210
GD350C-132G-4	400	500	300
GD350C-160G-4	400	500	300
GD350C-185G-4	500	630	400
GD350C-200G-4	500	630	400
GD350C-220G-4	630	800	460
GD350C-250G-4	630	800	460
GD350C-280G-4	800	1000	580
GD350C-315G-4	800	1000	580
GD350C-355G-4	1000	1250	750
GD350C-400G-4	1000	1250	750
GD350C-450G-4	1250	1600	750
GD350C-500G-4	1250	1600	1250(AC-1)

Note: The accessory specifications described in the preceding table are ideal values. You can select accessories based on the site conditions, but try not to use those with lower values.

D.3 Optional parts

Reactors, filters, braking components, and mounting brackets are external accessories and need to be specifically specified when purchasing.

D.3.1 Harmonic filter

To enhance grid protection, reduce harmonic interference from the VFD to the grid, and improve input power factor, consider configuring external DC reactors, input reactors, or passive harmonic filters based on your specific application needs.

If you want to use long cables between the VFD and the motor, select external output reactors, dv/dt attenuation filters, or sine-wave filters based on the motor cable length. This helps mitigate excessive dv/dt, reducing voltage stress on the motor windings as well as protecting them, and extending the motor's lifespan. Refer to the following table for recommended output filter selections according to motor cable length.

Table D-3 Output filter selection for motor cable lengths

Output filter type	Shielded cable length	Non-shielded cable length
Output reactor (1%)	30m–100m	50m–150m
dv/dt decrement filters	100m–230m	150m–450m

Output filter type	Shielded cable length	Non-shielded cable length
Sine filters	230m–500m	450m–1000m

Table D-4 Reactor model selection

VFD power	Input reactor	Output reactor	DC reactor
1.5kW	GDL-ACL0005-4CU	GDL-OCL0005-4CU	/
2.2kW	GDL-ACL0006-4CU	GDL-OCL0006-4CU	/
3kW	GDL-ACL0014-4CU	GDL-OCL0010-4CU	/
4kW	GDL-ACL0014-4CU	GDL-OCL0010-4CU	/
5.5kW	GDL-ACL0020-4CU	GDL-OCL0014-4CU	/
7.5kW	GDL-ACL0025-4CU	GDL-OCL0020-4CU	/
11kW	GDL-ACL0035-4AL	GDL-OCL0025-4CU	/
15kW	GDL-ACL0040-4AL	GDL-OCL0035-4AL	/
18.5kW	GDL-ACL0051-4AL	GDL-OCL0040-4AL	Standard
22kW	GDL-ACL0051-4AL	GDL-OCL0050-4AL	Standard
30kW	GDL-ACL0070-4AL	GDL-OCL0060-4AL	Standard
37kW	GDL-ACL0090-4AL	GDL-OCL0075-4AL	Standard
45kW	GDL-ACL0110-4AL	GDL-OCL0092-4AL	Standard
55kW	GDL-ACL0150-4AL	GDL-OCL0115-4AL	Standard
75kW	GDL-ACL0150-4AL	GDL-OCL0150-4AL	Standard
90kW	GDL-ACL0220-4AL	GDL-OCL0220-4AL	Standard
110kW	GDL-ACL0220-4AL	GDL-OCL0220-4AL	Standard
132kW	GDL-ACL0265-4AL	GDL-OCL0265-4AL	GDL-DCL0300-4AL
160kW	GDL-ACL0330-4AL	GDL-OCL0330-4AL	GDL-DCL0365-4AL
185kW	GDL-ACL0390-4AL	GDL-OCL0400-4AL	GDL-DCL0455-4AL
200kW	GDL-ACL0390-4AL	GDL-OCL0400-4AL	GDL-DCL0455-4AL
220kW	GDL-ACL0450-4AL	GDL-OCL0450-4AL	GDL-DCL0505-4AL
250kW	GDL-ACL0500-4AL	GDL-OCL0500-4AL	GDL-DCL0550-4AL
280kW	GDL-ACL0500-4AL	GDL-OCL0560-4AL	GDL-DCL0675-4AL
315kW	GDL-ACL0580-4AL	GDL-OCL0660-4AL	GDL-DCL0675-4AL
355kW	Standard	GDL-OCL0660-4AL	GDL-DCL0810-4AL
400kW	Standard	GDL-OCL0720-4AL	GDL-DCL0810-4AL
450kW	Standard	GDL-OCL0820-4AL	GDL-DCL1000-4AL
500kW	Standard	GDL-OCL1000-4AL	GDL-DCL1000-4AL

Note:

- The rated input voltage drop of input reactor is designed to ⩾ 1.5%.
- The rated output voltage drop of output reactor is designed to 1%.

Table D-5 Filter model selection

VFD power	Input filter	Output filter	
	Passive harmonic filters	dv/dt decrement filters	Sine filters
1.5kW	GDL-H0006-4AL	GDL-DUL0005-4CU	GDL-OSF0005-4AL
2.2kW	GDL-H0006-4AL	GDL-DUL0005-4CU	GDL-OSF0005-4AL
3kW	GDL-H0014-4AL	GDL-DUL0010-4CU	GDL-OSF0010-4AL
4kW	GDL-H0014-4AL	GDL-DUL0010-4CU	GDL-OSF0010-4AL
5.5kW	GDL-H0020-4AL	GDL-DUL0014-4CU	GDL-OSF0014-4AL
7.5kW	GDL-H0025-4AL	GDL-DUL0020-4CU	GDL-OSF0020-4AL
11kW	GDL-H0032-4AL	GDL-DUL0025-4CU	GDL-OSF0025-4AL
15kW	GDL-H0040-4AL	GDL-DUL0032-4CU	GDL-OSF0032-4AL
18.5kW	GDL-H0047-4AL	GDL-DUL0040-4AL	GDL-OSF0040-4AL
22kW	GDL-H0056-4AL	GDL-DUL0045-4AL	GDL-OSF0045-4AL
30kW	GDL-H0070-4AL	GDL-DUL0060-4AL	GDL-OSF0060-4AL
37kW	GDL-H0080-4AL	GDL-DUL0075-4AL	GDL-OSF0075-4AL
45kW	GDL-H0100-4AL	GDL-DUL0100-4AL	GDL-OSF0095-4AL
55kW	GDL-H0130-4AL	GDL-DUL0120-4AL	GDL-OSF0120-4AL
75kW	GDL-H0160-4AL	GDL-DUL0150-4AL	GDL-OSF0150-4AL
90kW	GDL-H0190-4AL	GDL-DUL0180-4AL	GDL-OSF0180-4AL
110kW	GDL-H0225-4AL	GDL-DUL0220-4AL	GDL-OSF0220-4AL
132kW	GDL-H0265-4AL	GDL-DUL0260-4AL	GDL-OSF0260-4AL
160kW	GDL-H0320-4AL	GDL-DUL0320-4AL	GDL-OSF0320-4AL
185kW	GDL-H0400-4AL	GDL-DUL0400-4AL	GDL-OSF0400-4AL
200kW	GDL-H0400-4AL	GDL-DUL0400-4AL	GDL-OSF0400-4AL
220kW	GDL-H0485-4AL	GDL-DUL0480-4AL	GDL-OSF0480-4AL
250kW	GDL-H0485-4AL	GDL-DUL0480-4AL	GDL-OSF0480-4AL
280kW	GDL-H0545-4AL	GDL-DUL0540-4AL	GDL-OSF0600-4AL
315kW	GDL-H0610-4AL	GDL-DUL0600-4AL	GDL-OSF0600-4AL
355kW	GDL-H0800-4AL	GDL-DUL0800-4AL	GDL-OSF0800-4AL
400kW	GDL-H0800-4AL	GDL-DUL0800-4AL	GDL-OSF0800-4AL
450kW	GDL-H1000-4AL	GDL-DUL1000-4AL	GDL-OSF1000-4AL
500kW	GDL-H1000-4AL	GDL-DUL1000-4AL	GDL-OSF1000-4AL

Note:

- The preceding table lists only external accessories. You need to specify whether external or built-in accessories are needed in your purchase order.
- For the selection of accessories with different material requirements than those

listed above, please refer to the low-voltage VFD GDL series filter option brochure.

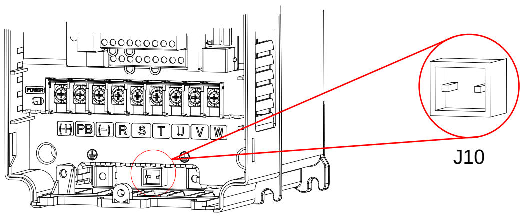
- The passive harmonic filter input voltage is 380V–400V 50Hz.

D.3.2 EMC filter

A filter is used to prevent the surrounding interference and prevent the interference from the VFD during running Selecting this series of filters can meet the CE certification requirements for emissions in Class C2 of EN 61800-3. J10 is not connected in factory for the 380V 110G/132P and lower VFD models. Connect the J10 packaged with the manual if the requirements of level C3 need to be met. J10 is connected in factory for the 380V 132G/160P and higher VFD models, all of which meet the requirements of level C3.

Note: Disconnect J10 in the following situations.

- The EMC filter is applicable to the neutral-grounded grid system. If it is used for the IT grid system (that is, non-neutral grounded grid system), disconnect J10.
- If leakage protection occurs during configuration of a residual-current circuit breaker, disconnect J10.



- Do not connect C3 filters in IT power systems.

FLT – P 04 045 L – B

A B C D E F

Field	Description
A	FLT: EMC filter series
B	Filter type P: Power input filter L: Output filter
C	Voltage class 04: AC 3PH 380V (-15%)–440V (+10%) 06: AC 3PH 520V (-15%)–690V (+10%)
D	3-digit code indicating the rated current. For example, 015 indicates 15 A.
E	EMC filter performance L: General

Field	Description
	H: High-performance
F	EMC filter application environment A: First environment (IEC61800-3), category C1 (EN 61800-3) B: First environment (IEC61800-3), category C2 (EN 61800-3) C: Second environment (IEC61800-3), category C3 (EN 61800-3)

Table D-6 EMC filter model selection

VFD model	Input filter	Output filter
GD350C-1R5G-4	FLT-P04006L-B	FLT-L04006L-B
GD350C-2R2G-4		
GD350C-004G-4	FLT-P04016L-B	FLT-L04016L-B
GD350C-5R5G-4		
GD350C-7R5G-4	FLT-P04032L-B	FLT-L04032L-B
GD350C-011G-4		
GD350C-015G-4	FLT-P04045L-B	FLT-L04045L-B
GD350C-018G-4		
GD350C-022G-4	FLT-P04065L-B	FLT-L04065L-B
GD350C-030G-4		
GD350C-037G-4	FLT-P04100L-B	FLT-L04100L-B
GD350C-045G-4		
GD350C-055G-4	FLT-P04150L-B	FLT-L04150L-B
GD350C-075G-4		
GD350C-090G-4	FLT-P04240L-B	FLT-L04240L-B
GD350C-110G-4		
GD350C-132G-4		
GD350C-160G-4	FLT-P04400L-B	FLT-L04400L-B
GD350C-185G-4		
GD350C-200G-4		
GD350C-220G-4	FLT-P04600L-B	FLT-L04600L-B
GD350C-250G-4		
GD350C-280G-4		
GD350C-315G-4	FLT-P04800L-B	FLT-L04800L-B
GD350C-355G-4		
GD350C-400G-4		
GD350C-450G-4	FLT-P041000L-B	FLT-L041000L-B
GD350C-500G-4		

Note:

- The input EMI meets the C2 requirements after an input filter is configured.
- The preceding table lists only external accessories. You need to specify whether external or built-in accessories are needed in your purchase order.

D.3.3 Braking component

The braking component includes braking resistors and braking units, which can be used to dissipate the regenerative energy generated by the motor, greatly improving braking and deceleration capabilities. When the VFD driving a high-inertia load decelerates or needs to decelerate abruptly, the motor runs in the power generation state and transmits the load-carrying energy to the DC circuit of the VFD, causing the bus voltage of the VFD to rise. If the bus voltage exceeds a specific value, the VFD reports an overvoltage fault. To prevent this from happening, you need to configure braking components. An external braking unit is required for the GD series high power parallel VFD. Select braking resistors according to the specific requirements (such as the braking torque and braking usage) on site.

Table D-7 Braking component selection for 380V models

VFD model	Braking unit model	Resistance applicable for 100% braking torque (Ω)	Braking resistor dissipation power (kW)			Min. allowed braking resistance (Ω)
			10% braking ratio	50% braking ratio	80% braking ratio	
GD350C-1R5G-4	Built-in braking unit	326	0.23	1.1	1.8	170
GD350C-2R2G-4		222	0.33	1.7	2.6	130
GD350C-004G-4		122	0.6	3	4.8	80
GD350C-5R5G-4		89	0.75	4.1	6.6	60
GD350C-7R5G-4		65	1.1	5.6	9	47
GD350C-011G-4		44	1.7	8.3	13.2	31
GD350C-015G-4		32	2	11	18	23
GD350C-018G-4		27	3	14	22	19
GD350C-022G-4		22	3	17	26	17
GD350C-030G-4		17	5	23	36	17
GD350C-037G-4		13	6	28	44	11.7
GD350C-045G-4	Optional built-in or external DBU100H-110-4	10	7	34	54	6.4
GD350C-055G-4		8	8	41	66	
GD350C-075G-4		6.5	11	56	90	

VFD model	Braking unit model	Resistance applicable for 100% braking torque (Ω)	Braking resistor dissipation power (kW)			Min. allowed braking resistance (Ω)
			10% braking ratio	50% braking ratio	80% braking ratio	
GD350C-090G-4	Optional built-in or external DBU100H-160-4	5.4	14	68	108	4.4
GD350C-110G-4		4.5	17	83	132	
GD350C-132G-4	DBU100H-220-4	3.7	20	99	158	3.2
GD350C-160G-4	DBU100H-320-4	3.1	24	120	192	2.2
GD350C-185G-4		2.8	28	139	222	
GD350C-200G-4		2.5	30	150	240	
GD350C-220G-4	DBU100H-400-4	2.2	33	165	264	1.8
GD350C-250G-4		2.0	38	188	300	
GD350C-280G-4	Quantity: Two DBU100H-320-4	3.6*2	21*2	105*2	168*2	2.2*2
GD350C-315G-4		3.2*2	24*2	118*2	189*2	
GD350C-355G-4		2.8*2	27*2	132*2	210*2	
GD350C-400G-4		2.4*2	30*2	150*2	240*2	
GD350C-450G-4	Quantity: Two DBU100H-400-4	2.2*2	34*2	168*2	270*2	1.8*2
GD350C-500G-4		2.0*2	38*2	186*2	300*2	

D.3.4 Mounting bracket

D.3.4.1 Keypad mounting bracket

The external keypad can be mounted directly with M3 threaded screws or with a keypad bracket. For VFDs of 380V 1R5G–075G models, the keypad mounting bracket is an optional part. For those of 380V 090G–500G models, you can use optional brackets or use the standard keypad brackets externally.

Figure D-2 Keypad mounting bracket for 380V 1R5G–500G (optional)

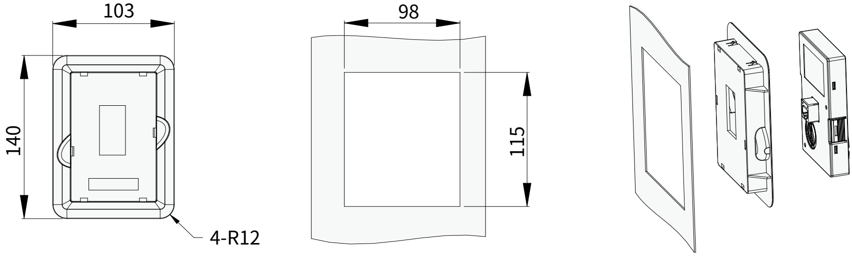


Table D-8 Keypad mounting bracket selection

Name	Ordering code	Applied to
Keypad mounting bracket	19005–00149	380V 1R5G–500G

D.3.4.2 Flange mounting bracket

Flange mounting is applicable to 380V 200G and lower models. When the flange mounting method is used, the (optional part) flange mounting plate is required for the 380V 1R5G–110G VFD models but not required for the 132G–200G VFD models.

Table D-9 Flange mounting bracket selection

Name	Ordering code	Applied to
Flange mounting bracket	19005–00005	380V 1R5G–5R5G
	19005–00013	380V 7R5G
	19005–00006	380V 011G–015G
	19005–00094	380V 018G–022G
	19005–00093	380V 030G–037G
	19005–00092	380V 045G–075G
	19005–00091	380V 090G–110G

Figure D-3 Flange mounting dimensions and hole positions for VFDs of 380V 1R5G–075G

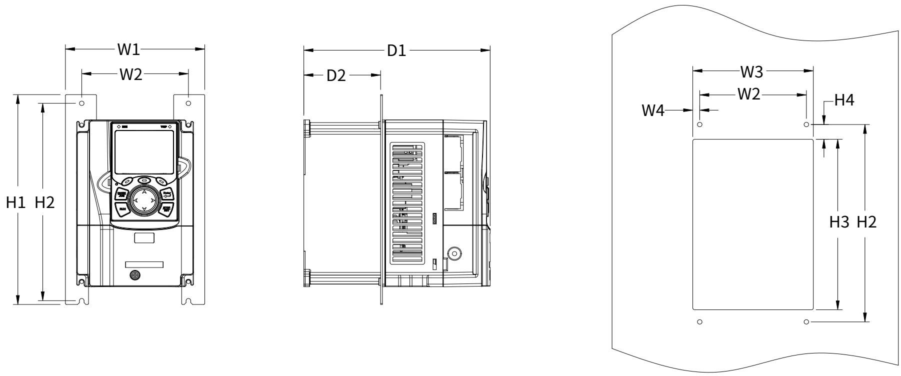


Figure D-4 Flange mounting dimensions and hole positions for VFDs of 380V 090G–110G

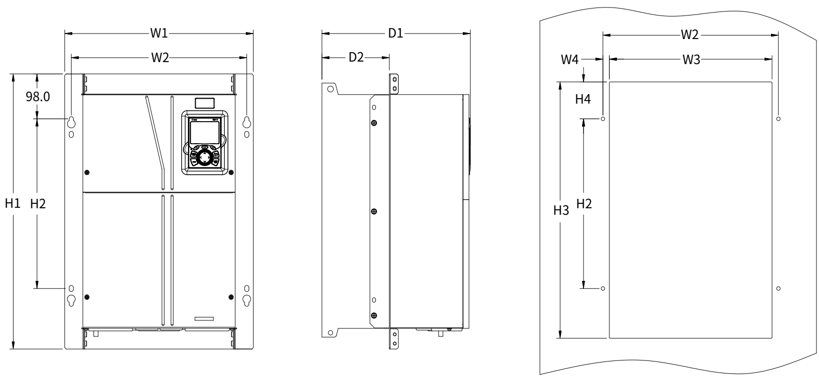


Figure D-5 Flange mounting dimensions and hole positions for VFDs of 380V 132G–200G

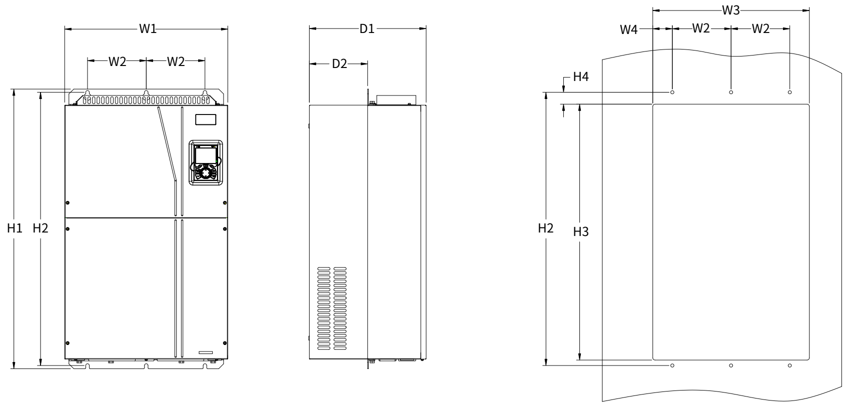


Table D-10 Flange mounting dimensions for 380V models (unit: mm)

VFD model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Hole diameter
1R5G–2R2G	150.2	115	130	7.5	234	220	190	13.5	185	65.5	Ø5
004G–5R5G	150.2	115	130	7.5	234	220	190	13.5	201	83	Ø5
7R5G	170.2	131	150	9.5	292	276	260	6	192	84.5	Ø6
011G–015G	191.2	151	174	11.5	370	351	324	12	220	113	Ø6
018G–022G	266	250	224	13	371	250	350.6	20.3	208	104	Ø6
030G–037G	316	300	274	13	430	300	410	55	223	118.3	Ø6
045G–075G	352	332	306	12	580	400	570	80	258	133.8	Ø9
090G–110G	418.5	389.5	361	14.2	600	370	559	108.5	330	149.5	Ø10
132G–200G	500	180	480	60	872	850	796	37	360	178.5	Ø11

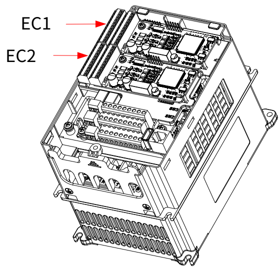
Appendix E Expansion card

E.1 Expansion card function description and installation

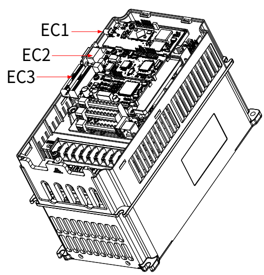
E.1.1 Function description

The VFD can be equipped with various expansion cards to extend its application functions. The VFDs of 5R5G and lower models can be configured with 2 expansion cards at the same time, and the VFDs of 7R5G and higher models can be configured with 3 expansion cards. Expansion cards need to be purchased separately. The expansion card size is 108×39mm.

Figure E-1 Expansion card installation position



VFD of 5R5G or lower with expansion cards installed



VFD of 7R5G or higher with expansion cards installed

•

Figure E-2 Model definition

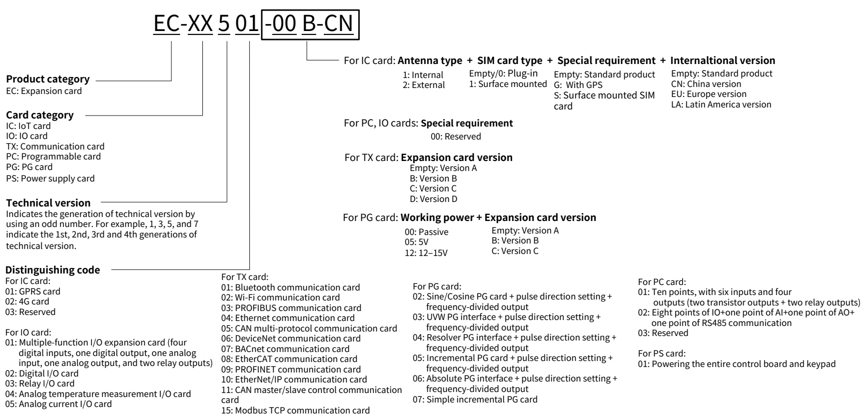


Table E-1 Function description

Expansion card type	Model	Specification	Ordering code
IO expansion card 1	EC-IO501-00	● Four digital inputs ● One digital output ● One analog input ● One analog output ● Two relay outputs: one double-contact output and one single-contact output	11023–00083
IO expansion card 2	EC-IO502-00	● Four digital inputs ● One PT100 ● One PT1000 ● Two relay outputs: single-contact NO output	11023–00119
Programmable card	EC-PC502-00	● Adopting the global mainstream programmable card development environment, supporting multiple programming languages such as the instruction language, ladder diagram, and sequential function chart. ● Supporting resumable commissioning and task period execution mode selection ● Providing a user program storage space of 16K steps and data storage space of 8K words ● Six digital inputs ● Two relay outputs ● One analog input and one analog output ● One RS485 communication channel, master/slave switchover by host controller ● Supporting saving data of 1k words at power off	11023–00146
Bluetooth communication	EC-TX501-1	● Supporting Bluetooth 4.0 ● With INVT's mobile APP, you can set the	11023–00088
	EC-TX501-2		11023–00089

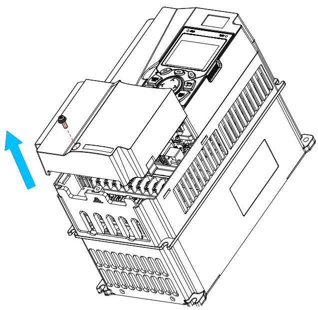
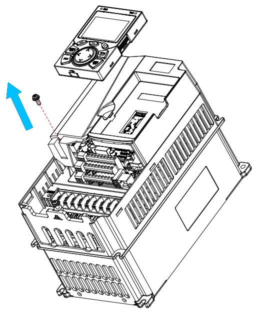
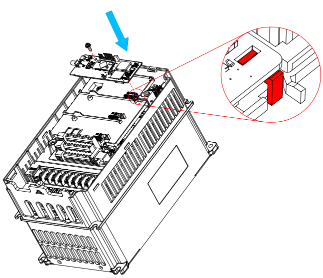
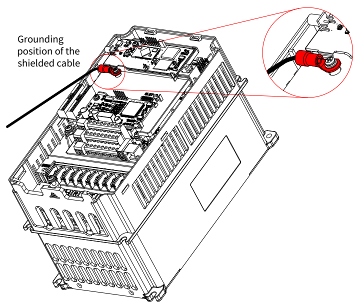
Expansion card type	Model	Specification	Ordering code
card		parameters and monitor the VFD status through Bluetooth communication. ● Max. communication distance in an unobstructed environment: 30m ● EC-TX501-1 with a built-in antenna, applicable to molded case machines ● EC-TX502-2 is equipped with an external sucker antenna and applicable to sheet metal machines	
Wi-Fi communication card	EC-TX502-1	● Meeting requirements of IEEE802.11b/g/n ● Enabling local or remote monitoring through Wi-Fi communication with the mobile APP INVT Workshop ● Max. communication distance in an unobstructed environment: 30m ● EC-TX502-1 with a built-in antenna, applicable to molded case machines ● EC-TX502-2 is equipped with an external sucker antenna and applicable to sheet metal machines	11023–00101
	EC-TX502-2		11023–00102
PROFIBUS-DP communication card	EC-TX503D	● Supporting the PROFIBUS-DP protocol	11023–00151
CAN multi-protocol communication card	EC-TX505D	● Based on the CAN2.0A and CAN2.0B physical layer ● Supporting the CANopen protocol ● Adopting INVT master-slave control proprietary protocol	11023–00164
EtherCAT communication card	EC-TX508B	● EtherCAT COE 402 protocol ● Automatic network address configuration	11023–00150
PROFINET communication	EC-TX509C	Supporting the PROFINET protocol	11023–00149

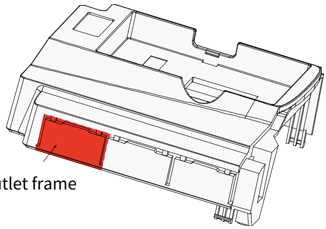
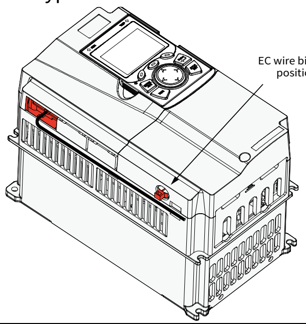
Expansion card type	Model	Specification	Ordering code
card			
EtherNet IP communication card	EC-TX510B	When the switch selects EtherNet IP: ● Supporting the EtherNet IP protocol and EtherNet IP slaves ● Equipped with two EtherNet IP ports, supporting 10/100M half/full duplex operating ● Equipped with two RJ45 interfaces, which do not distinguish the direction and can be swappable ● Supporting star and line IP network topologies When the switch selects Modbus TCP: ● Supporting the Modbus TCP protocol and Modbus TCP slave nodes ● Equipped with two Modbus TCP ports, supporting 10/100M half/full duplex operating ● Supporting star and line TCP network topologies When the switch selects Ethernet: ● Supporting INVT Ethernet protocol Supporting the connection to INVT's host controller monitoring software INVT Workshop for monitoring and oscillography, allowing multi-card networking monitoring	11023–00197
Sin/Cos PG card	EC-PG502	● Applicable to Sin/Cos encoders with or without CD signals ● Supporting the frequency-divided output of A, B, and Z ● Supporting input of pulse train reference	11023–00109
Incremental PG card with UVW	EC-PG503-05	● Applicable to differential encoders of 5V ● Supporting the orthogonal input of A, B, and Z ● Supporting the pulse input of phase U, V,	11023–00085

Expansion card type	Model	Specification	Ordering code
		and W ● Supporting the frequency-divided output of A, B, and Z ● Supporting input of pulse train reference	
Resolver PG card	EC-PG504-00	● Applicable to resolver encoders ● Supporting frequency-divided output of resolver-simulated A, B, Z ● Supporting input of pulse train reference	11023–00086
Multi-function incremental PG card	EC-PG505-12	● Applicable to OC encoders of 5V or 12V ● Applicable to push-pull encoders of 5V or 12V ● Applicable to differential encoders of 5V ● Supporting the orthogonal input of A, B, and Z ● Supporting the frequency-divided output of A, B, and Z ● Supporting input of pulse train reference	11023–00087
24V incremental PG card	EC-PG505-24B	● Applicable to OC encoders of 24V ● Applicable to push-pull encoders of 24V ● Supporting the orthogonal input of A, B, and Z ● Supporting the frequency-divided output of A, B, and Z ● Supporting input of pulse train reference	11023–00139
Simplified incremental PG card	EC-PG507-12	● Applicable to OC encoders of 5V or 12V ● Applicable to push-pull encoders of 5V or 12V ● Applicable to differential encoders of 5V	11023–00115
24V simplified incremental PG card	EC-PG507-24	● Applicable to OC encoders of 24V ● Applicable to push-pull encoders of 24V ● Applicable to differential encoders of 24V	11023–00121
Absolute SSI communication PG card	EC-PG508-5B	● SSI signal, differential input of 5V ● Applicable to encoders of 24V or 5V ● Pulse reference supporting 5V differential, 24V push-pull, and OC encoders.	11023–00177

E.1.2 Installation and wiring

	Make sure the device have been powered off before installation.
Note	● The expansion card can be installed in any one of the SLOT1, SLOT2, and SLOT3 card slots according to the actual wiring. ● If interference occurs on the external wires after the expansion card is installed, change the installation slot flexibly to facilitate the wiring. For example, since the connector of the DP card connection cable is large, you are recommended to install the card in SLOT1. ● To ensure high anti-interference capability in closed-loop control, you need to use a shielded cable as the encoder cable and ground the two ends of the cable. That is, connect the motor side shield layer to the motor housing, and connect the PG card side shield layer to the PE terminal.

Step 1 Unscrew the lower part of the housing and remove the lower cover. 	Step 2 Unscrew the screws in the middle of the housing and remove the upper cover. 
Step 3 Align the expansion card positioning holes with the machine positioning studs, insert the expansion card and secure it with screws (M3*10). 	Step 4 Conduct wiring based on the expansion card type and connect the shielded cable as follows. 
Step 5 Cut off the outlet frame on the left	Step 6 Lead the cable out of the outlet frame

side of the upper cover. 	and then install the upper cover, keypad and lower cover in order. 

E.2 I/O expansion card

E.2.1 I/O expansion card 1 (EC-IO501-00)

The EC-IO501-00 expansion card is a multi-functional I/O expansion card that can be applied to scenarios where the local I/O interfaces are insufficient. It expands four digital inputs, one digital output, one analog input, one analog output, and two relay outputs. It uses European-style screw terminals for relay output and spring terminals for the others. CME and COM are shorted through J3 before delivery, and J5 is a jumper for selecting the output type (voltage or current) of AO2.

Figure E-3 EC-IO501-00 expansion card

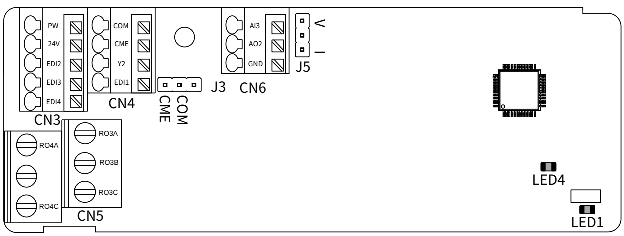


Table E-2 Terminal description

Category	Symbol	Name	Specifications
Power supply	PW	External power	● Used to provide input digital working power from the external to the internal ● Voltage range: 12–30V ● PW and +24V have been short connected before delivery.
Analog	AI3—GND	Analog input 1	● Input range: For AI3, 0–10V or 0–20mA

Category	Symbol	Name	Specifications
input/output			● Input impedance: 20kΩ for voltage input or 250Ω for current input ● Whether voltage or current is used for input is set through the corresponding function code. ● Resolution: 5mV when 10V corresponds to 50Hz ● Deviation: ±0.5% (input of 5V or 10mA or higher at the temperature of 25°C)
	AO2—GND	Analog output 1	● Output range: 0–10V or 0–20mA ● Whether voltage or current is used for output is set through the jumper J5. ● Deviation: ±0.5% (output of 5V or 10mA or higher at the temperature of 25°C)
Digital input and output	EDI1—COM	Digital input 1	● Internal impedance: 3.3kΩ ● 12–30V voltage input is acceptable ● Bi-direction input terminal ● Max. input frequency: 1kHz
	EDI2—COM	Digital input 2	
	EDI3—COM	Digital input 3	
	EDI4—COM	Digital input 4	
	Y2—CME	Digital output	● Switch capacity: 50mA/30V ● Output frequency range: 0–1kHz ● The terminals CME and COM are shorted through J3 before delivery.
Relay output	RO3A	NO contact of relay 3	● Contact capacity: 3A/AC 250V, 1A/DC 30V ● Cannot be used as high frequency digital output.
	RO3B	NC contact of relay 3	
	RO3C	Common contact of relay 3	
	RO4A	NO contact of relay 4	
	RO4C	Common contact of relay 4	

Table E-3 Indicator description

Symbol	Name	Description
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is

Symbol	Name	Description
		connected with the control board. Off: The expansion card is disconnected from the control board.
LED4	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

E.2.2 I/O expansion card 2 (EC-IO502-00)

The EC-IO502-00 expansion card can be used in scenarios where the local I/O interfaces of VFD cannot meet the application requirements. It can provide four digital inputs, one PT100 temperature measuring input (PT1+), one PT1000 temperature measuring input (PT2+), and two relay outputs. It provides relay outputs and digital inputs through European-style screw terminals and temperature measuring inputs through spring terminals.

Figure E-4 EC-IO502-00 expansion card

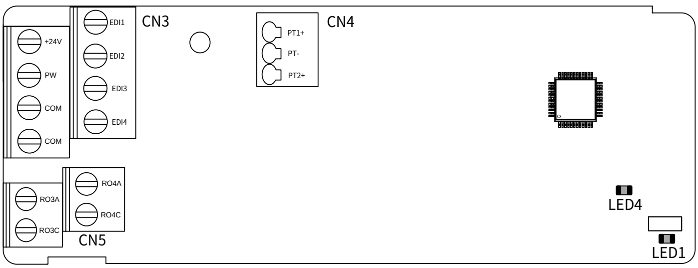


Table E-4 Terminal description

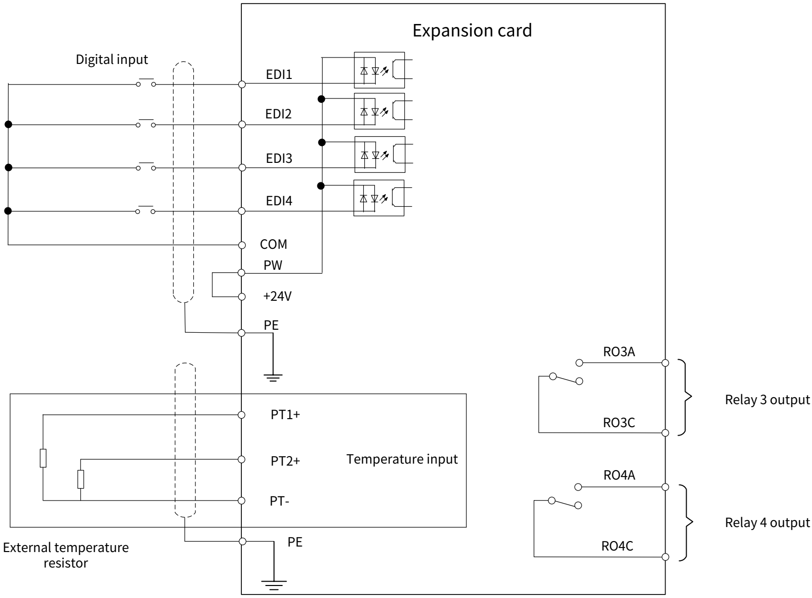
Category	Symbol	Name	Specifications
Power supply	PW	External power	External power input terminal for digital input circuits Voltage range: 24(-20%)–48VDC(+10%), 24(-10%)–48VAC(+10%) voltage input
	+24V	Internal power	User power supply provided by the VFD. Max. output current: 200mA
	COM	Power reference	Common terminal of +24V
Digital input	EDI1—COM	Digital input 1	● Internal impedance: 6.6kΩ ● Supporting the voltage input of external power (-20%)24–48VDC(+10%) and (-10%)24–48VAC(+10%) ● Supporting the internal power 24V
	EDI2—COM	Digital input 2	
	EDI3—COM	Digital input 3	
	EDI4—COM	Digital input 4	

Category	Symbol	Name	Specifications
			● Bi-direction input terminal, supporting both NPN and PNP ● Max. input frequency: 1kHz ● All are programmable digital input terminals, the functions of which can be set through function codes
Temperature detection input	PT1+	PT100 resistor input	Independent PT100 and PT1000 inputs: PT1+ connects to PT100 resistor, while PT2+ connects to PT1000 resistor. ● Resolution: 1°C ● Range: -20°C–150°C ● Detection precision: 3°C ● Supporting offline protection
	PT2+	PT1000 resistor input	
	PT-	Reference input of PT100/PT1000	Reference zero potential of PT100/PT1000
Relay output	RO3A	Contact A of NO relay 3	● RO3 output; RO3A: NO; RO3C: COM ● Contact capacity: 3A/AC 250V, 1A/DC 30V
	RO3C	Contact C of NO relay 3	
	RO4A	Contact A of NO relay 4	● RO4 output; RO4A: NO; RO4C: COM ● Contact capacity: 3A/AC 250V, 1A/DC 30V
	RO4C	Contact C of NO relay 4	

Table E-5 Indicator description

Symbol	Name	Description
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED4	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Figure E-5 Control circuit wiring of I/O expansion card 2

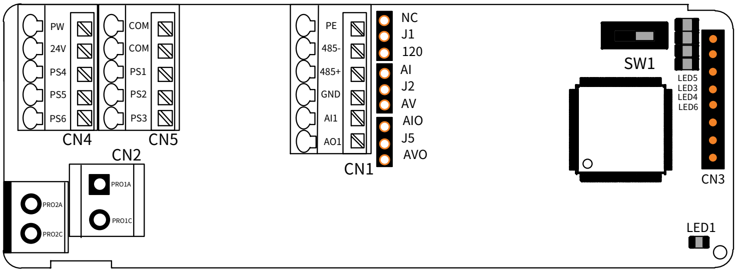


E.3 Programmable expansion card (EC-PC502-00)

The EC-PC502-00 expansion card adopts the global mainstream programmable expansion card development environment and supports the instruction language (IL), ladder diagram (LD), and sequential function chart (SFC), which can replace some micro PLC applications. It supplies a user program storage space of 16K steps and data storage space of 8K words, and supports saving data of 1K words at power off, facilitating secondary development.

EC-PC502-00 has six switching inputs, two relay outputs, one analog input, one analog output, one RS485 communication channel (supporting master/slave switchover). It uses European-style screw terminals for relay outputs and uses spring terminals for the others.

Figure E-6 EC-PC502-00 expansion card



"SW1" indicates the start/stop switch of the programmable expansion card and "120" indicates 120Ω terminal resistor. By default, J1 connects to NC, J2 to AV, and J5 to AVO. The terminals are arranged as follows.

Table E-6 Terminal description

Category	Terminal symbol	Terminal name	Specifications
Power supply	PW	External power	● Used to provide input digital working power from the external to the internal ● Voltage range: 12–30V ● PW and +24V should be short-connected.
	24V	Internal power	● Internal output power, 100mA
Digital input/output	PS1—COM	Digital input 1	● Internal impedance: 4kΩ ● 12–30V voltage input is acceptable ● Bi-direction input terminal ● Max. input frequency: 1kHz ● Source/sink inputs, and the input type should be consistent
	PS2—COM	Digital input 2	
	PS3—COM	Digital input 3	
	PS4—COM	Digital input 4	
	PS5—COM	Digital input 5	
	PS6—COM	Digital input 6	
Analog input/output	AI1	Analog input 1	● Input range: For AI1, 0–10V or 0–20mA; ● Input impedance: 20KΩ for voltage input or 250Ω for current input ● Whether voltage or current is used for input is set through the jumper "AI/AV" and J2. ● Resolution: 5mV when 10V corresponds to 50Hz ● Deviation: ±1% (25°C, full measuring range)
	AO1	Analog output 1	● Output range: 0–10V or 0–20mA ● Whether voltage or current is used for output is set through the jumper "AIO/AVO"

Category	Terminal symbol	Terminal name	Specifications
			and J5. ● Deviation: ±1% (25°C, full measuring range)
Relay output	PRO1A	NO contact of relay 1	● Contact capacity: 2A/AC 250V, 1A/DC 30V ● Cannot be used as high frequency digital output.
	PRO1C	Common contact of relay 1	
	PRO2A	NO contact of relay 2	
	PRO2C	Common contact of relay 2	

Table E-7 Indicator description

Symbol	Name	Description
LED1	Power indicator	PWR power indicator On: The expansion card is powered on. Off: The expansion card is not powered on.
LED3	Communication indicator	COMM communication indicator On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED4	Fault indicator	ERR fault indicator Blinking (On: 500ms; Off: 500ms): An error occurs to the expansion card. (The error type can be queried through the host controller software Auto Station.) Off: No fault
LED5	Power indicator	PWR power indicator On: The expansion card is powered on. Off: The expansion card is not powered on.
LED6	Status indicator	RUN status indicator On: The PLC program is running. Off: The PLC program stops.

E.4 Communication card

E.4.1 Bluetooth communication card (EC-TX501) and Wi-Fi communication card (EC-TX502)

Wireless communication cards are usually used in scenarios where direct operation from the local keypad is not possible due to limited space for inverter installation. With the use of wireless communication cards, a long-distance control up to 30 meters is possible through the mobile APP.

Figure E-7 EC-TX501/502 expansion card

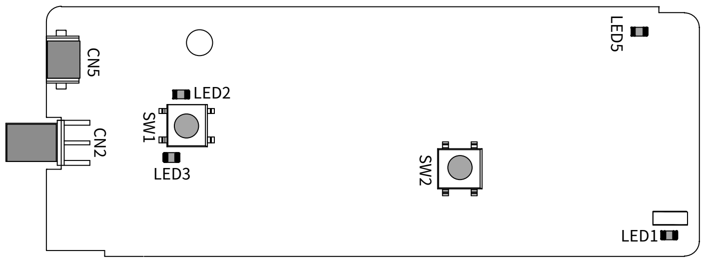
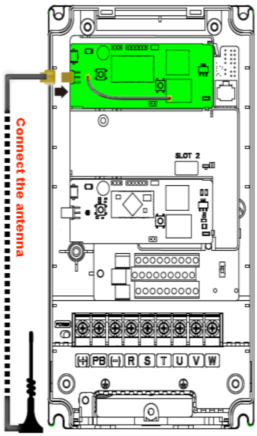


Table E-8 Indicator description

Symbol	Name	Description
LED1/LED3	Status indicator	Expansion card status indicator On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Communication indicator	Bluetooth communication status indicator On: Bluetooth is online and data can be exchanged. Off: Bluetooth is offline.
LED5	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.
SW1	Wi-Fi factory reset button	It is used to restore the expansion card to default values and return to the local monitoring mode.
SW2	Wi-Fi hardware reset button	It is used to restart the expansion card.

You can choose a PCB antenna or an external sucker antenna according to the actual installation environment to get good Bluetooth signal. If the VFD is a molded case machine and located in an open space, you can use a built-in PCB antenna; and if it is a sheetmetal machine and located in a metal cabinet, you need to use an external sucker antenna.

<table>
<tr>
<td>Step 1 Install a wireless communication card and an external sucker antenna.
Install a wireless communication card on the VFD, and then lead the SMA connector of the sucker antenna into the VFD and screw it to the CN2 terminal, as shown in the following figure. Place the antenna base on the chassis to reveal it. Try to keep it unblocked.


</td>
<td>Step 2 Step 2 Download the APP INVT Workshop.
Scan the QR code from the VFD nameplate to download INVT Workshop. For details, see the manual for the wireless communication card.


</td>
</tr>
</table>

E.4.2 PROFIBUS-DP communication card (EC-TX503D)

Figure E-8 EC-TX503D expansion card

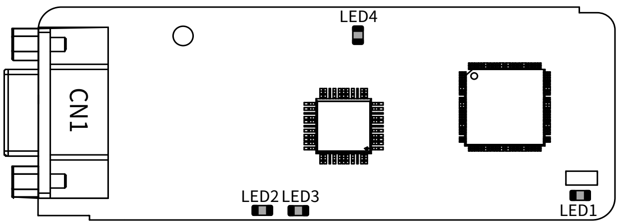
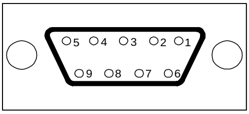


Table E-9 CN1 description

CN1	Connector pin	Description

<table>
<tr><th>CN1</th><th colspan="2">Connector pin</th><th>Description</th></tr>
<tr><td rowspan="10">
9-pin D-type connector</td><td>1</td><td>-</td><td>Unused</td></tr>
<tr><td>2</td><td>-</td><td>Unused</td></tr>
<tr><td>3</td><td>B-Line</td><td>Data+ (twisted pair 1)</td></tr>
<tr><td>4</td><td>RTS</td><td>Request sending</td></tr>
<tr><td>5</td><td>GND_BUS</td><td>Isolation ground</td></tr>
<tr><td>6</td><td>+5V BUS</td><td>Isolated power supply of 5 V DC</td></tr>
<tr><td>7</td><td>-</td><td>Unused</td></tr>
<tr><td>8</td><td>A-Line</td><td>Data- (twisted pair 2)</td></tr>
<tr><td>9</td><td>-</td><td>Unused</td></tr>
<tr><td>Housing</td><td>SHLD</td><td>PROFIBUS cable shielding line</td></tr>
</table>

Note:

- +5V BUS and GND_BUS are bus terminators. Devices such as optical transceivers (RS485) may need to obtain power through these pins.
- Some devices use RTS to determine the direction of transmission and reception. In normal applications, only A-Line B-Line, and the shield layer need to be used.

Table E-10 Indicator description

Symbol	Name	Description
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Communication indicator	On: The expansion card is connected with the master device and data exchange can be performed. Off: The expansion card is disconnected from the master device.
LED3	Fault indicator	On: The expansion card is offline and data exchange cannot be performed. Blinking (On: 500ms; Off: 500ms): A configuration error occurs. The length of the user parameter data set during the initialization of the communication card is different from that during the network configuration. Blinking (On: 250ms; Off: 250ms): User parameter data is incorrect. The length or content of the user parameter data

Symbol	Name	Description
		set during the initialization of the communication card is different from that during the network configuration. Blinking (On: 125ms; Off: 125ms): An error occurs in the ASIC initialization of PROFIBUS communication. Off: No fault
LED4	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Note: For details, see the manual of the communication card.

E.4.3 CAN multi-protocol communication card (EC-TX505D)

Figure E-9 EC-TX505D expansion card

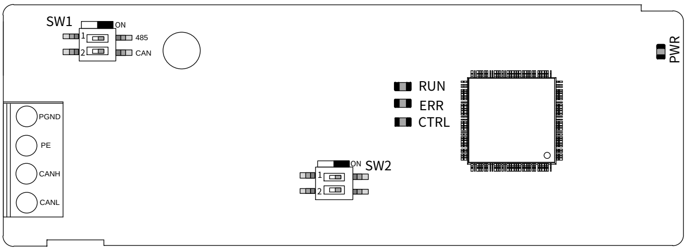


Table E-11 Parts on the EC-TX505D expansion card

Symbol	Name	Description
PGND	Isolation ground	Isolation ground
PE	Shielded cable	CAN bus shielding
CANH	CAN positive input	CAN bus high level signal
CANL	CAN negative input	CAN bus low level signal
CAN	CAN terminal resistor switch	OFF: CAN_H and CAN_L are not connected to the terminal resistor
		ON: CAN_H and CAN_L are connected to the terminal resistor

Note: For this card, before power-on, set the SW2 switch according to the mapping between protocols and positions.

SW2

1	2	Protocol type
OFF	OFF	CANopen
ON	OFF	CAN master/slave

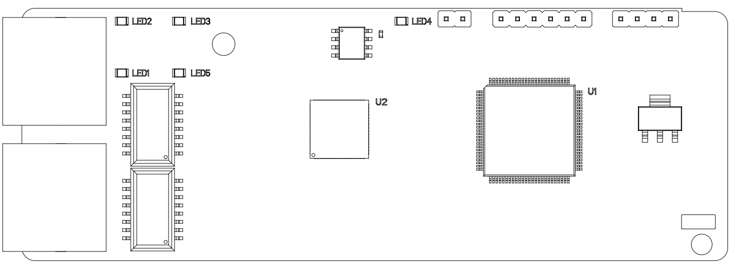
Table E-12 Indicator description

Indicator	Definition	Function
CTRL	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
RUN	Run indicator	On: The communication card is in the operating state. Blinking (On: 250ms; Off: 250ms): The communication card is in the pre-operation state. Off: A fault occurs; the reset pin of the communication card and the power supply are not properly connected; the expansion card is in a stopped state.
ERR	Fault indicator	On: The CAN controller bus is off; a fault occurs on the VFD; received frame lost or incorrect. Off: The communication card is in the working state.
PWR	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Note: For details, see the manual of the communication card.

E.4.4 EtherCAT communication card (EC-TX508B)

Figure E-10 EC-TX508B expansion card



- Communication port

Standard RJ45 ports are used in EtherCAT communication. The communication card provides two RJ45 ports with transmission direction defined. Figure E-11 shows the ports. IN (indicating input) and OUT (indicating output) are EtherCAT wiring network ports. Table E-13 describes the interface function.

Figure E-11 RJ45 interface

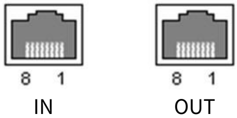


Table E-13 RJ45 interface function

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	n/c	Not connected
5	n/c	Not connected
6	RX-	Receive Data-
7	n/c	Not connected
8	n/c	Not connected

The EtherCAT communication card provides five LED indicators and four net port indicators to indicate its states. Figure E-12 shows the position and Table E-14 describes the interface function.

Figure E-12Status indicator positions

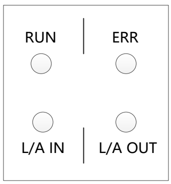
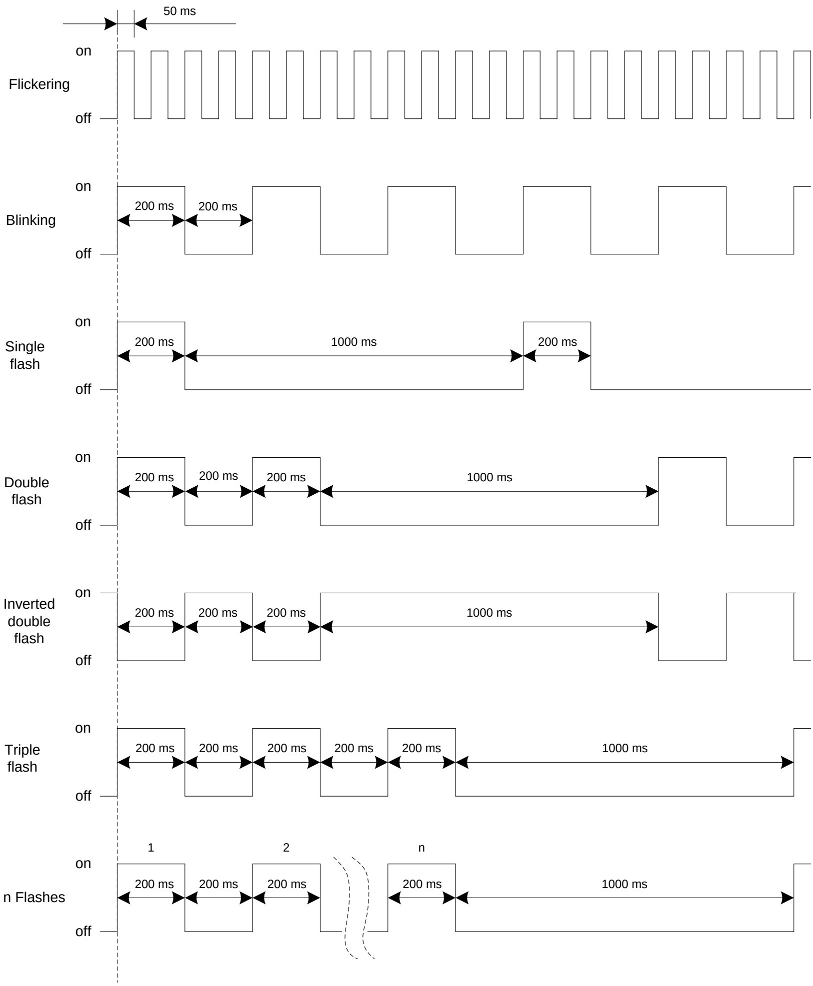


Table E-14 Status indicator definitions

Name	Color	Function
RUN	Green	It indicates the EtherCAT operation state. Off: Init state Blinking (On: 0.2s; Off: 0.2s): Pre-OP state Single flash (On: 1s; Off: 1s): Safe-OP state On: OP state
ERR	Red	It indicates the EtherCAT fault state. Off: No fault

Name	Color	Function
		Blinking (On: 0.2s; Off: 0.2s): Init, Pre-OP fault state Single flash (On: 1s; Off: 1s): Safe-OP fault state ON: OP fault state Double flash: Process data watchdog timeout
L/A IN	Green	Off: There is no link. On: There is a link but no activity. Flickering: There is a link and activity.
L/A OUT	Green	Off: There is no link. On: There is a link but no activity. Flickering: There is a link and activity.
PWR	Red	3.3V power indicator
Network port indicator (IN)	Yellow	Off: Ethernet connection is not established. On: Ethernet connection is successful.
	Green	Off: There is no link. On: There is a link but no activity. Blinking: There is a link and activity.
Network port indicator (OUT)	Yellow	Off: Ethernet connection is not established. On: Ethernet connection is successful.
	Green	Off: There is no link. On: There is a link but no activity. Blinking: There is a link and activity.

Figure E-13 Indicator flash rate



- EtherCAT conformance test

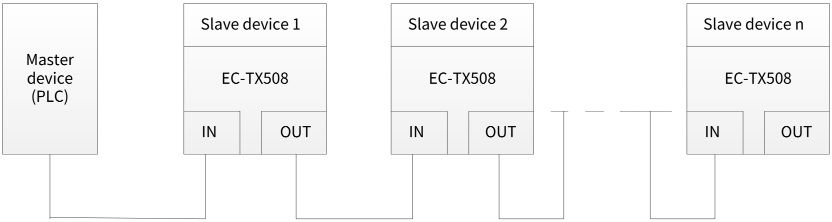
The product has passed the EtherCAT conformance test certification. EtherCAT® is a registered trademark and patented technology, authorized by Beckhoff Automation GmbH, Germany.

Figure E-14 EtherCAT conformance test logo

- Electrical connection

An EtherCAT network often consists of a master (such as PLC) and multiple slaves (such as drives or bus expansion terminals). Each EtherCAT slave has two standard Ethernet interfaces. Figure E-15 shows the electrical connection. It also supports star network topology, but requires a professional switch.

Figure E-15 Linear network topology electrical connection



E.4.5 PROFINET communication card (EC-TX509C)

The terminal CN2 of the PROFINET communication card adopts standard RJ45 interfaces, which are not distinguished from each other and can be interchangeably inserted.

Figure E-16 EC-TX509C expansion card

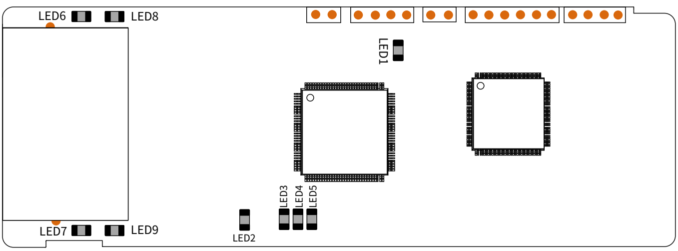


Table E-15 Indicator description

Symbol	Name	Description
LED1	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.
LED2	Status indicator	Bus status indicator On: No network connection Blinking (On: 500ms; Off: 500ms): Network connection with

Symbol	Name	Description
		PROFINET controller is normal, but the communication is not established. Off: The communication with the PROFINET controller has been established.
LED3	Fault indicator	On: PROFINET diagnosis exists. Off: No PROFINET diagnosis.
LED4	Status indicator	Slave ready indicator On: TPS-1 protocol stack has started. Blinking (On: 500ms; Off: 500ms): TPS-1 waits for MCU initialization. Off: TPS-1 protocol stack does not start.
LED5	Maintenance status indicator	Reserved
LED6/7	Status indicator	Network port status indicator On: The expansion card has been connected with the PC/PLC by using a network cable. Off: The expansion card has not been connected with the PC/PLC.
LED8/9	Communication indicator	Network port communication indicator On: The expansion card and the PC/PLC are communicating. Off: The expansion card and the PC/PLC have no communication yet.

The PROFINET communication card can be used in a linear network topology and a star network topology.

Figure E-17 Linear network topology electrical connection

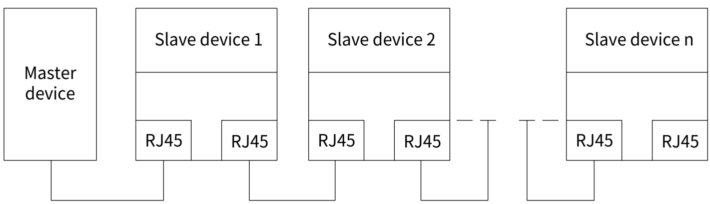
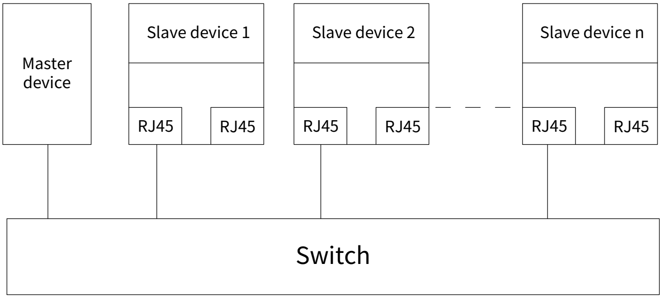


Figure E-18 Star network topology electrical connection

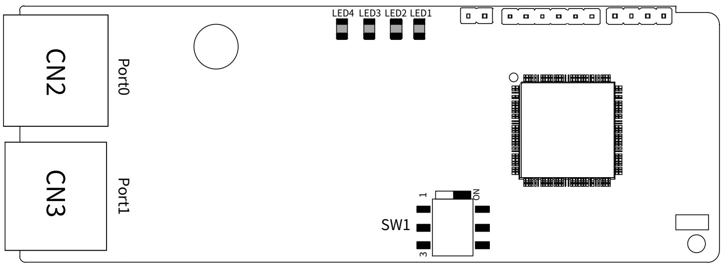


Note: For the star network topology, you need to prepare PROFINET switches.

E.4.6 EtherNet IP multi-protocol communication card (EC-TX510B)

The communication terminals CN1 and CN2 of the expansion card adopts standard the RJ45 interfaces, which can be interchangeably inserted. It supports selecting the protocol via the DIP switch before power-on. The default selection is EtherNet IP, with Modbus TCP and Ethernet communication as optional choices.

Figure E-19 EC-TX510B expansion card



Note: For this card, before power-on, set the SW1 switch according to the mapping between protocols and positions.

Table E-16 SW1 definition

SW1			
1	**2**	**3**	**Protocol type**
ON	ON	ON	EtherNet IP
OFF	ON	ON	Ethernet
ON	OFF	ON	Modbus TCP
Other	Other	Other	Reserved

Table E-17 LED description when selecting the EtherNet/IP protocol

Indicator	Color	Definition	Function
LED1	Green	On	The expansion card is shaking hands with the VFD.
		Blinking (1Hz)	The expansion card and VFD communicate properly.
		Off	The expansion card and VFD communicate improperly.
LED2	Green	On	The communication between the expansion card and PLC is online and data exchange is allowed.
		Off	The communication between the expansion card and PLC is not online.
LED3	Red	On	Failed to set up I/O between the expansion card and the PLC.
		Blinking (1Hz)	Incorrect PLC configuration.
		Blinking (2Hz)	The expansion card failed to send data to the PLC.
		Blinking (4Hz)	The connection between the expansion card and PLC timed out.
		Off	No fault
LED4	Red	On	3.3V power indicator

Table E-18 LED description when selecting the Modbus TCP protocol

Indicator	Color	Definition	Function
LED1	Green	On	The expansion card is shaking hands with the VFD.
		Blinking (1Hz)	The expansion card and VFD communicate properly.
		Off	The expansion card and VFD communicate improperly.
LED2	Green	On	The communication between the expansion card and PLC is online and data exchange is allowed.
		Off	The communication between the expansion card and PLC is not online.
LED3	Red	On	Expansion card has no valid data received.
		Blinking (1Hz)	The message function code is not used or defined
		Blinking (8Hz)	Message address error
		Off	No fault
LED4	Red	On	3.3V power indicator

Table E-19 LED description when selecting the Ethernet protocol

Indicator	Color	Definition	Function
LED1	Green	On	The expansion card is shaking hands with the VFD.
		Blinking (1Hz)	The expansion card and VFD communicate properly (handshake successful).
		Off	The expansion card and VFD communicate improperly.

Indicator	Color	Definition	Function
LED2	Green	On	The connection between the expansion card and PC is successful.
		Off	The expansion card fails to connect with PC (abnormal network cable).
LED3	Red	Blinking (4Hz)	The expansion card is successfully connected to the PC but communication fails (abnormal IP address).
		Off	No fault
LED4	Red	On	3.3V power indicator

Electrical connection:

The communication card adopts standard RJ45 interfaces, supporting both linear and star network connections. The electrical connection diagram is shown as follows.

Note: Use CAT5, CAT5e, or CAT6 network cables for electrical wiring. When the communication distance is greater than 50m, use high-quality network cables that meet the high-quality standards.

Figure E-20 Linear network topology electrical connection

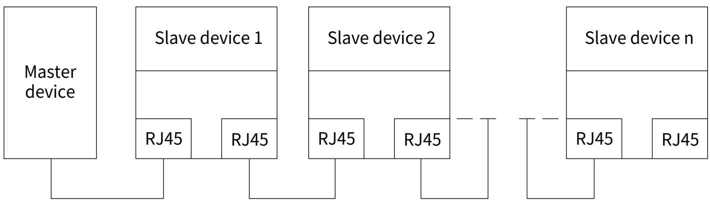
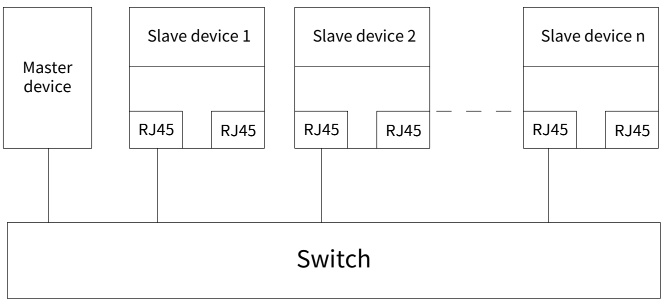


Figure E-21 Star network topology electrical connection



Note: For the star network topology, you need to prepare Ethernet switches.

E.5 PG expansion card

E.5.1 Sin/Cos PG card (EC-PG502)

Figure E-22 EC-PG502 expansion card

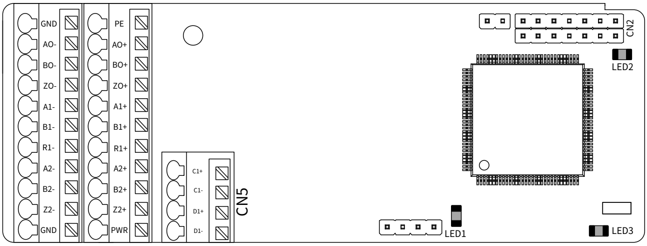


Table E-20 Terminal description

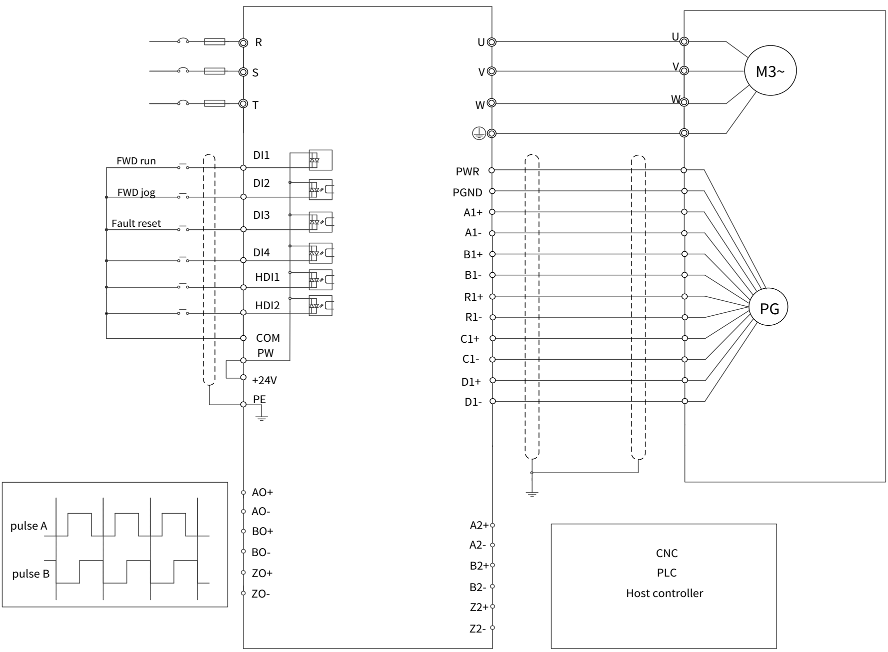
Terminal symbol	Terminal name	Specifications
PWR	Encoder power	Voltage: 5V ± 5%☒ Max. output current: 150mA
GND		
A1+	Encoder interface	● Supporting Sin/Cos encoders ● SINA/SINB/SINC/SIND 0.6–1.2Vpp; SINR 0.2–0.85Vpp ● Max. frequency response of A/B signals: 200kHz☒ Max. frequency response of C/D signals: 1kHz
A1-		
B1+		
B1-		
R1+		
R1-		
C1+		
C1-		
D1+		
D1-		
A2+	Pulse reference	● Supporting 5V differential signal ● Response frequency: 200kHz
A2-		
B2+		
B2-		
Z2+		
Z2-		
AO+	Frequency-divided output	● Differential output of 5V ● Supporting frequency division of 1255, which can be set through P20.16 or P24.16. Max. output frequency: 200kHz
AO-		
BO+		
BO-		
ZO+		
ZO-		

Table E-21 Indicator description

Symbol	Name	Description
LED1	Encoder signal indicator	On: Encoder signals are normal. Blinking (On: 500ms; Off: 500ms): C1 or D1 of the encoder is disconnected. Off: A1 or B1 of the encoder is disconnected.
LED2	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.
LED3	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.

The following figure shows the external wiring of the PG card when it is used in combination with an encoder with CD signals.

Figure E-23 External wiring of the PG card and an encoder with CD signals



Note: If the encoder does not have CD signals, it is not necessary to connect the C1+, C1-, D1+, D1- terminals of the PG expansion card.

E.5.2 UVW incremental PG card (EC-PG503-05)

The EC-PG503-05 expansion card adopts spring terminals and supports the input of absolute position signals, integrating the advantages of absolute and incremental encoders.

Figure E-24 EC-PG503-05 expansion card

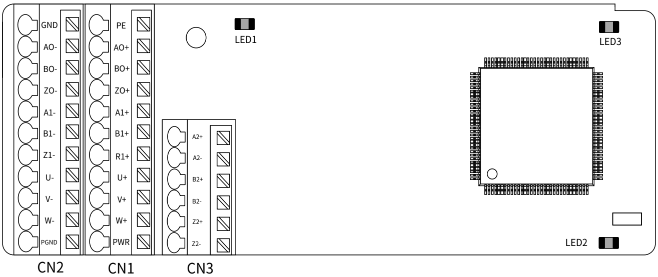


Table E-22 Terminal description

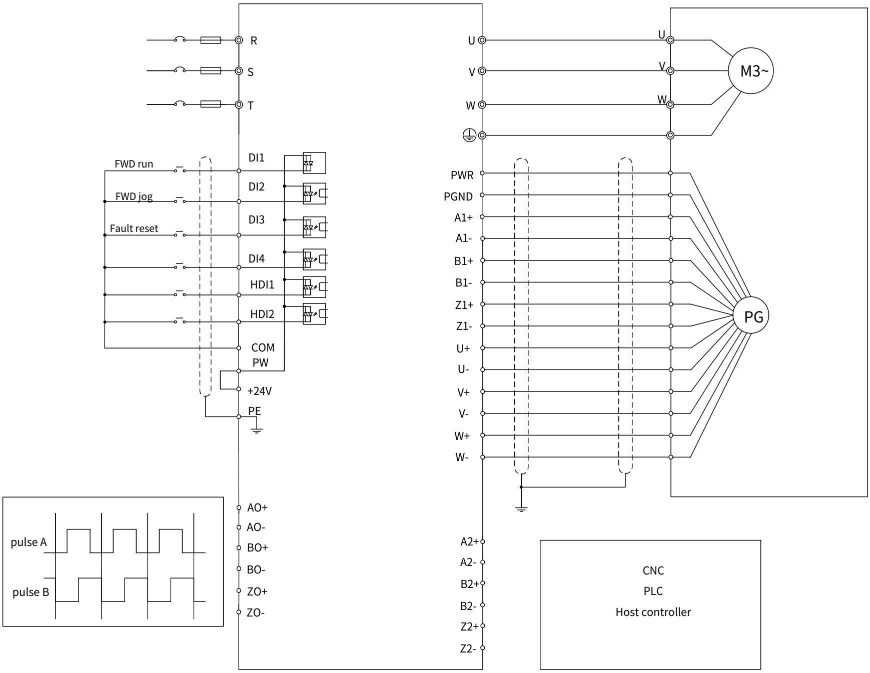
Terminal symbol	Terminal name	Specifications
PWR	Encoder power	Voltage: 5V ± 5%☒ Max. current: 200mA
PGND		
A1+	Encoder interface	● Differential incremental PG interface of 5V ● Response frequency: 400kHz
A1-		
B1+		
B1-		
Z1+		
Z1-		
A2+	Pulse reference	● Differential input of 5V ● Response frequency: 200kHz
A2-		
B2+		
B2-		
Z2+		
Z2-		
AO+	Frequency-divided output	● Differential output of 5V ● Supporting frequency division of 1255, which can be set through P20.16 or P24.16
AO-		
BO+		
BO-		

Terminal symbol	Terminal name	Specifications
ZO+		
ZO-		
U+	UVW encoder interface	● Absolute position (UVW information) of the hybrid encoder, differential input of 5V ● Response frequency: 40kHz
U-		
V+		
V-		
W+		
W-		

Table E-23 Indicator description

Symbol	Name	Description
LED1	Encoder signal indicator	Blinking (On: 500ms; Off: 500ms): A1 or B1 signal is disconnected during encoder rotating. On: Encoder signals are normal.
LED2	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED3	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Figure E-25 External wiring diagram when using EC-PG503-05



E.5.3 Resolver PG card (EC-PG504-00)

The EC-PG504-00 expansion card adopts spring terminals and can be used in combination with a resolver of excitation voltage 7Vrms.

Figure E-26 EC-PG504-00 expansion card

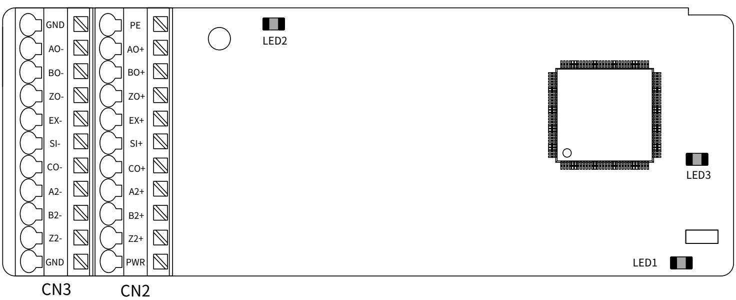


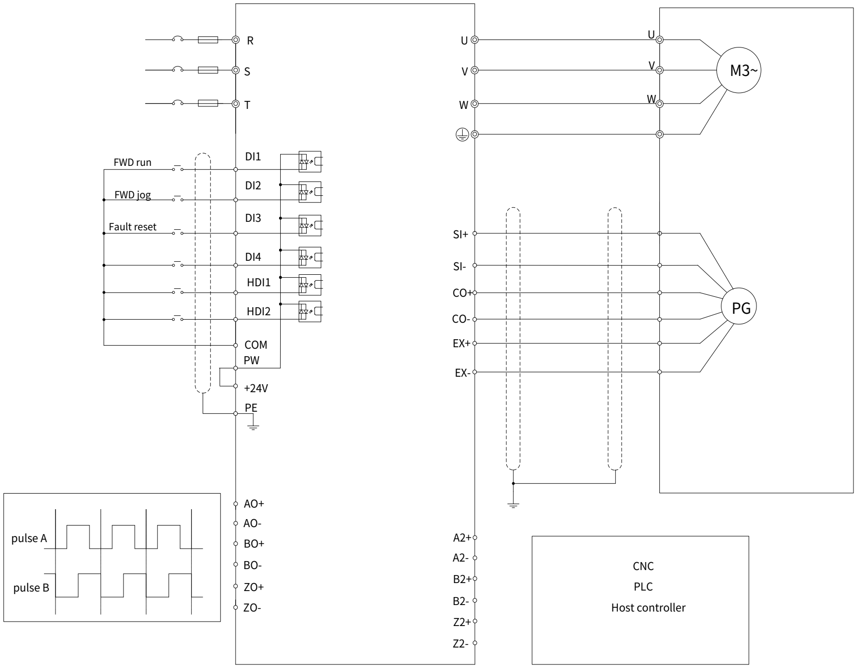
Table E-24 Terminal description

Terminal symbol	Terminal name	Specifications
SI+	Encoder signal input	Recommended resolver transformation ratio: 0.5
SI-		
CO+		
CO-		
EX+	Encoder excitation signal	● Factory setting of excitation: 10kHz ● Supporting resolvers with an excitation voltage of 7Vrms
EX-		
A2+	Pulse reference	● Differential input of 5V ● Response frequency: 200kHz
A2-		
B2+		
B2-		
Z2+		
Z2-		
AO+	Frequency-divided output	● Differential output of 5V ● Frequency-divided output of resolver simulated A1, B1, and Z1, which is equal to an incremental PG card of 1024 pps. Supporting frequency division of 1–255, which can be set through P20.16 or P24.16 Max. output frequency: 200kHz
AO-		
BO+		
BO-		
ZO+		
ZO-		

Table E-25 Indicator description

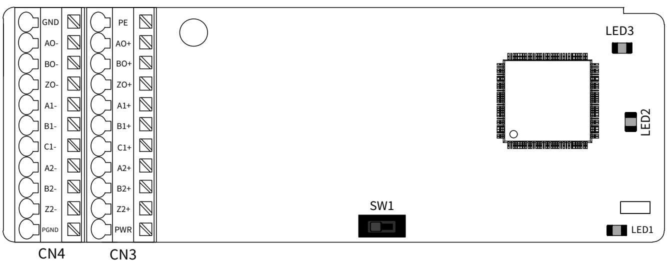
Symbol	Name	Description
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Encoder signal indicator	On: Encoder signals are normal. Blinking (On: 500ms; Off: 500ms): The encoder signals are not stable. Off: Encoder is disconnected.
LED3	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Figure E-27 External wiring diagram when using EC-PG504-00



E.5.4 Multifunction incremental PG card (EC-PG505-12)

Figure E-28 EC-PG505-12 expansion card



SW1: the switch used to set the voltage class (5V or 12V) of the power supply of the encoder. It can be operated with an auxiliary tool.

Table E-26 Terminal description

Terminal symbol	Terminal name	Specifications
PWR	Encoder power	Voltage: 5V/12V ± 5% Max. output: 150 mA Select the voltage class through SW1 based on the voltage class of the used encoder.
PGND		
A1+	Encoder interface	● Applicable to 5V/12V push-pull encoders ● Applicable to 5V/12V OC encoders ● Applicable to 5V differential encoders ● Response frequency: 400kHz
A1-		
B1+		
B1-		
Z1+		
Z1-		
A2+	Pulse reference	● Supporting the same signal types as the encoder signal types ● Response frequency: 400kHz
A2-		
B2+		
B2-		
Z2+		
Z2-		
AO+	Frequency-divided output	● Differential output of 5V ● Supporting frequency division of 1–255, which can be set through P20.16 or P24.16
AO-		
BO+		
BO-		
ZO+		
ZO-		

Table E-27 Indicator description

Symbol	Name	Description
LED1	Signal indicator	Blinking (On: 500ms; Off: 500ms): A1 or B1 signal is disconnected during encoder rotating. On: Other cases
LED2	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.
LED3	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.

The EC-PG505-12 expansion card is configured with a pull-up resistor and can work in combination with multiple types of incremental encoders through various external wiring modes. For the wiring methods, see Figure E-29, Figure E-30, Figure E-31.

Figure E-29 External wiring diagram when used with an open collector encoder

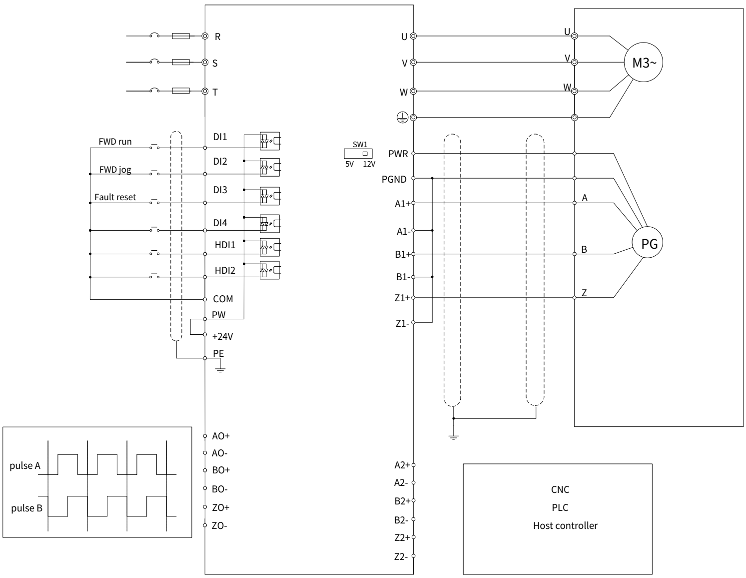


Figure E-30 External wiring diagram when used with a push-pull encoder

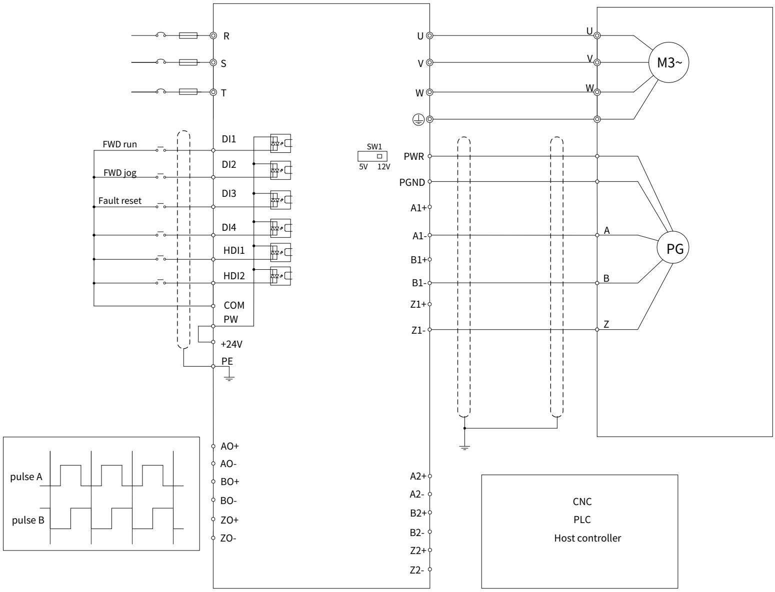
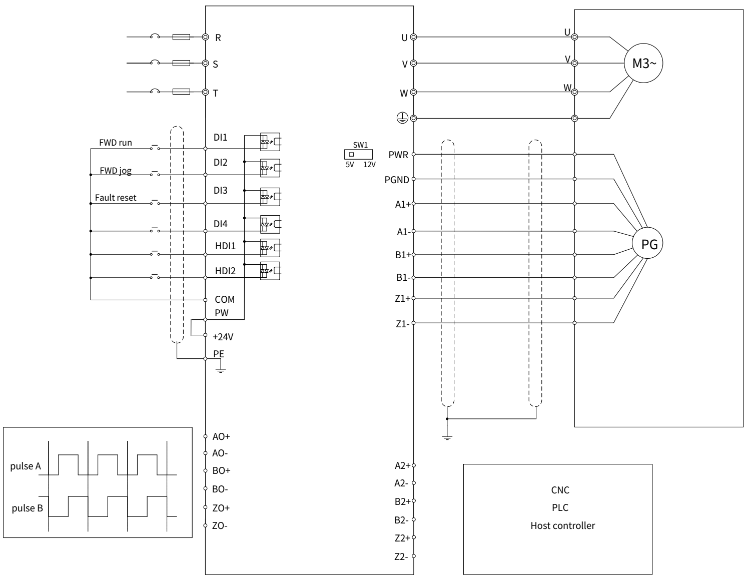


Figure E-31 External wiring diagram when used with a differential encoder



E.5.5 24V incremental PG card (EC-PG505-24B)

Figure E-32 EC-PG505-24B expansion card

Table E-28 Terminal description

Symbol	Name	Specifications
PWR	Encoder power	Voltage: 24V ± 5% Max. output current: 150mA
PGND		
A1+	Encoder interface	● Applicable to 24V push-pull encoders ● Applicable to 24V OC encoders ● Applicable to 24V differential encoders ● Response frequency: 400kHz
A1-		
B1+		
B1-		
Z1+		
Z1-		
A2+	Pulse reference	● Applicable to 24V push-pull and OC encoders ● Applicable to 5V differential encoders ● Response frequency: 400kHz
A2-		
B2+		
B2-		
Z2+		
Z2-		
AO+	Frequency-divided output	● Supporting open collector output with a pull-up resistor externally connected to the input port ● Supporting frequency division of 1–255, which can be set through P20.16 or P24.16 ● Supporting frequency-divided output source selection, which can be set through P20.17 or P24.17
BO+		
ZO+		

Table E-29 Indicator description

Symbol	Name	Description
LED1	Signal indicator	Blinking (On: 500ms; Off: 500ms): A1 or B1 signal is disconnected during encoder rotating.

Symbol	Name	Description
		On: Other cases
LED2	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.
LED3	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.

The EC-PG505-24B uses spring terminals, and AO-, BO-, and ZO- are internally shorted to PGND. The expansion card is configured with a pull-up resistor and can work in combination with multiple types of incremental encoders through various external wiring modes. For the wiring methods, see Figure E-33, Figure E-34.

Figure E-33 External wiring diagram when used with an open collector encoder

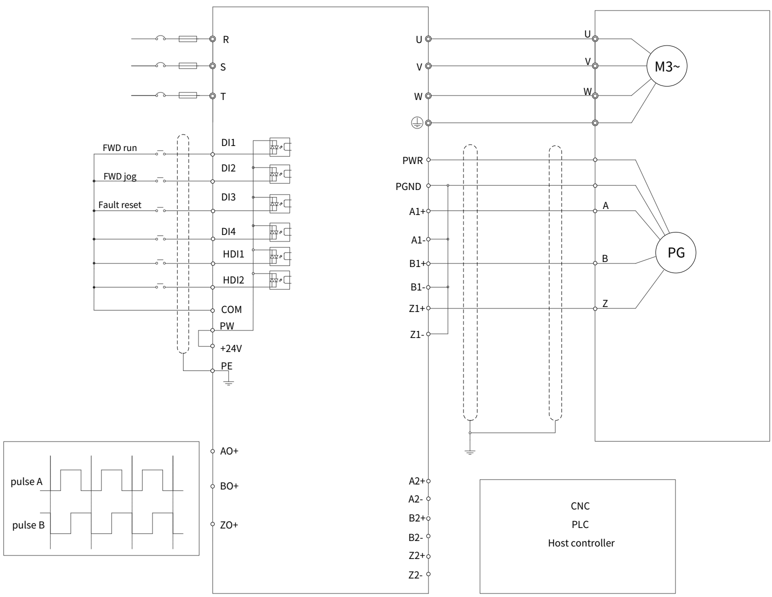
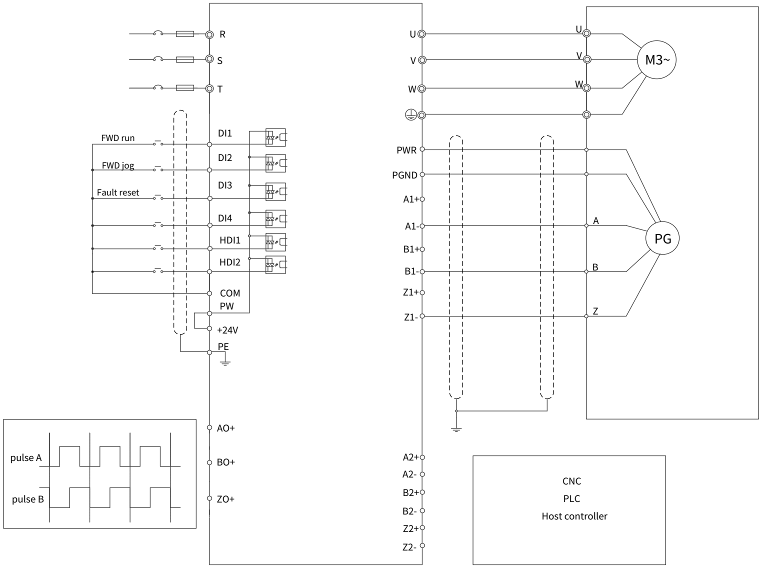
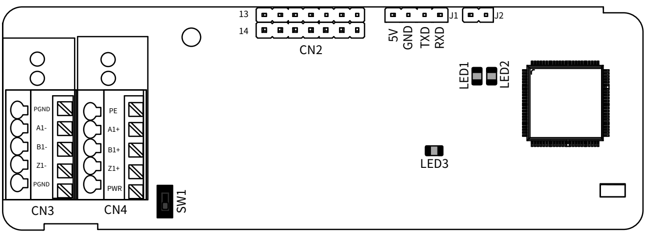


Figure E-34 External wiring diagram when used with a push-pull encoder



E.5.6 Simplified incremental PG card (EC-PG507-12)

Figure E-35 EC-PG507-12 expansion card



SW1: the switch used to set the voltage class (5V or 12V) of the power supply of the encoder. It can be operated with an auxiliary tool.

Table E-30 Terminal description

Symbol	Name	Specifications
PWR	Encoder power	Voltage: 5V/12V ± 5%⊠ Max. output: 150mA⊠ Select the voltage class through SW1 based on the voltage class of the used encoder.
PGND		
A1+	Encoder	● Applicable to 5V/12V push-pull encoders

Symbol	Name	Specifications
A1-	interface	● Applicable to 5V/12V OC encoders ● Applicable to 5V differential encoders ● Response frequency: 400kHz ● Supporting the encoder cable length of up to 50m
B1+		
B1-		
Z1+		
Z1-		

Table E-31 Indicator description

Symbol	Name	Description
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Signal indicator	Off: A1 or B1 of the encoder is disconnected. On: Encoder signals are normal.
LED3	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Note: EC-PG507-12 can work in combination with multiple types of incremental encoders through various external wiring modes, which are similar to the wiring methods of EC-PG505-12.

E.5.7 24V simplified incremental PG card (EC-PG507-24)

Figure E-36 EC-PG507-24 expansion card

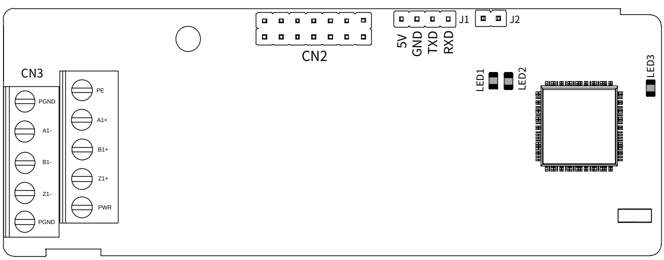


Table E-32 Terminal description

Symbol	Name	Specifications
PE	Grounding terminal	Connected to the ground to enhance the anti-interference performance
PWR	Encoder power	Voltage: 24V ± 5%

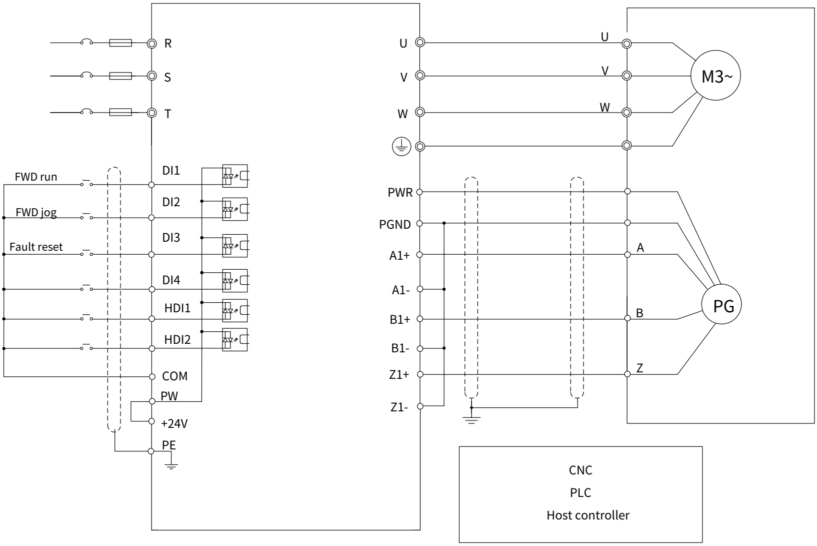
Symbol	Name	Specifications
PGND		Max. output current: 150mA (PGND is the isolation power ground.)
A1+	Encoder interface	● Applicable to 24V push-pull encoders ● Applicable to 24V OC encoders ● Applicable to 24V differential encoders ● Response frequency: 200kHz ● Supporting the encoder cable length of up to 100m
A1-		
B1+		
B1-		
Z1+		
Z1-		

Table E-33 Indicator description

Symbol	Name	Description
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Signal indicator	On: Encoder pulses are normal. Off: A1 or B1 of the encoder is disconnected.
LED3	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

The EC-PG507-24 expansion card uses 5.08mm pitch terminals. It is equipped with a pull-up resistor internally. It can work in combination with multiple types of incremental encoders through various external wiring methods, as shown in the following figures.

Figure E-37 External wiring diagram when used with an open collector encoder



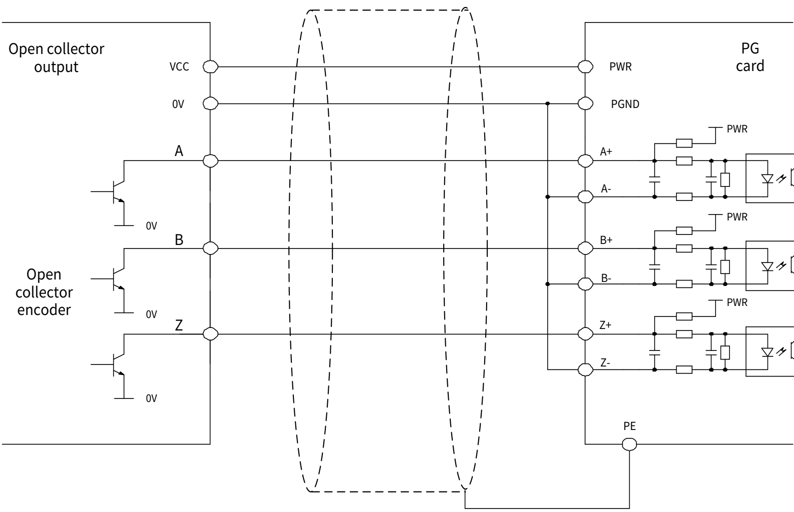
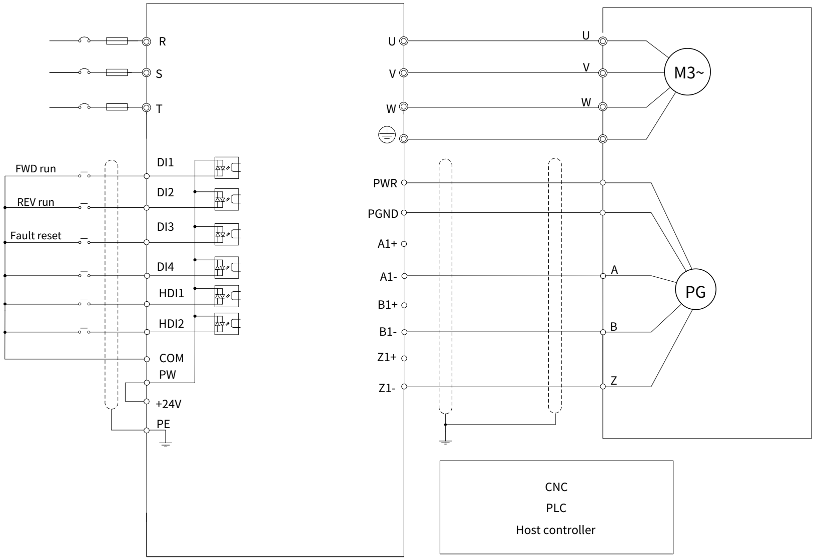


Figure E-38 External wiring diagram when used with a push-pull encoder



Using a shielded cable

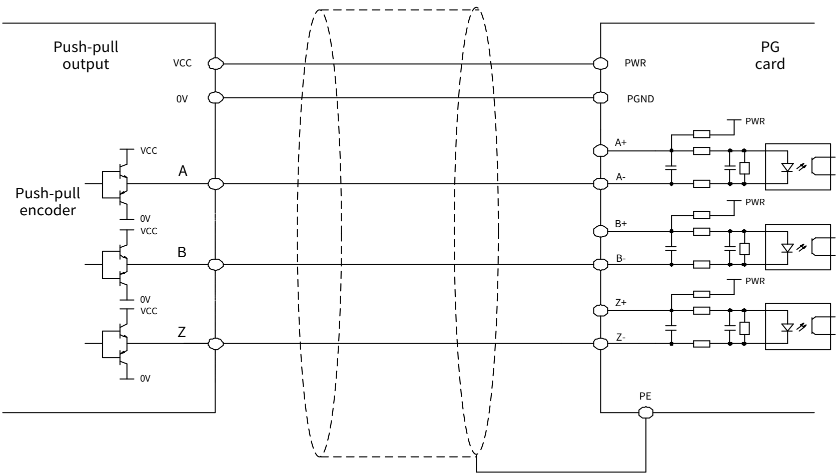
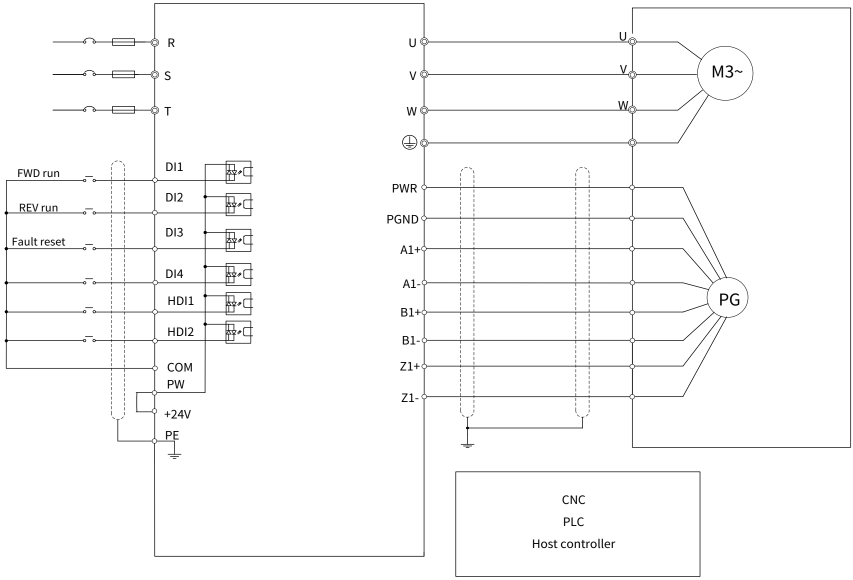
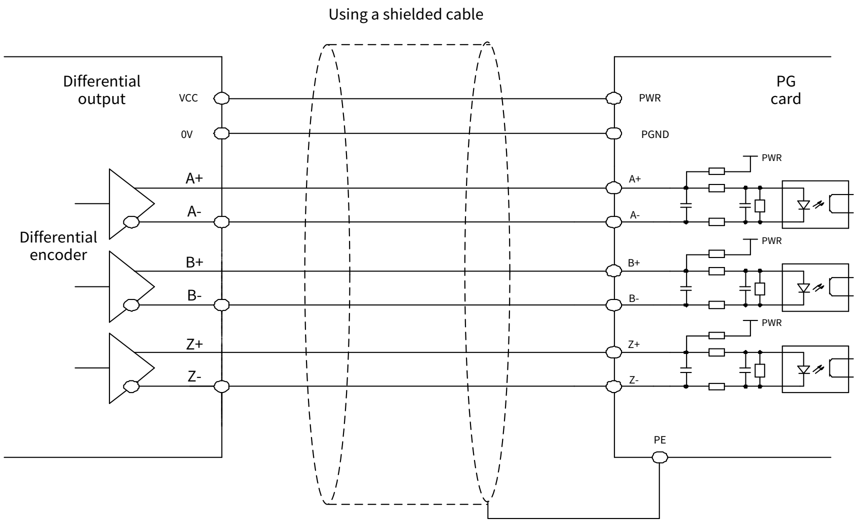


Figure E-39 External wiring diagram when used with a differential encoder





E.5.8 Absolute SSI communication PG card (EC-PG508-5B)

Figure E-40 EC-PG508-5B expansion card

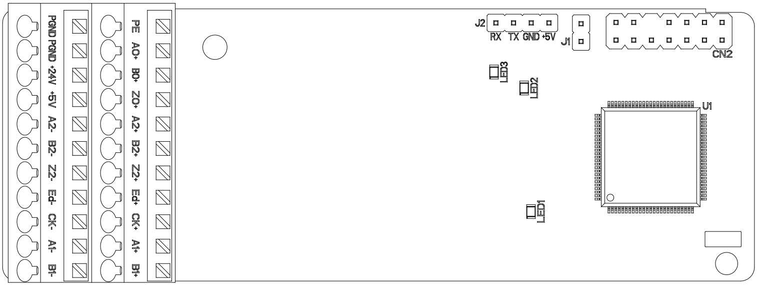


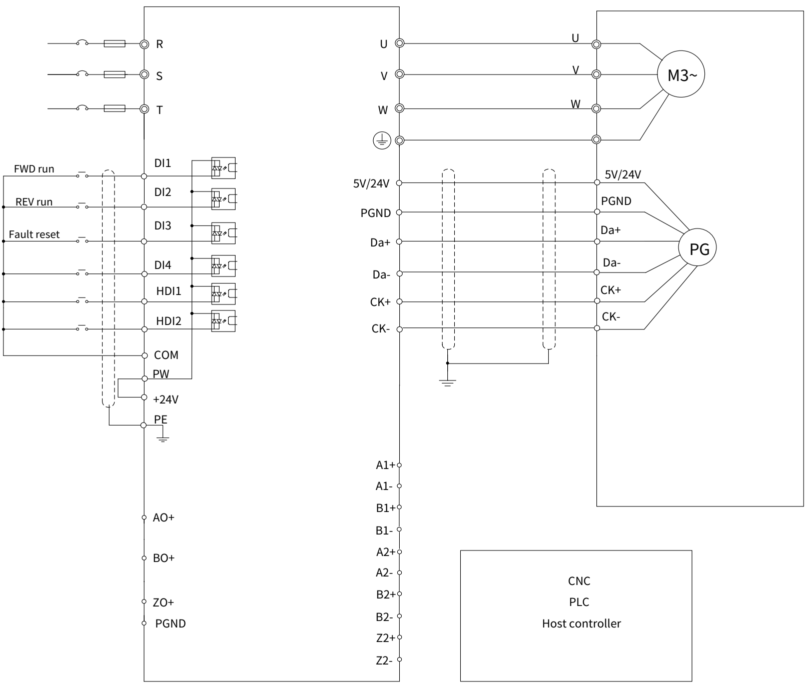
Table E-34 Terminal description

Signal	Port	Description
5V	Encoder power	Voltage: 5.2V ± 5% Max. output current: 150mA
PGND		
24V		Voltage: 24V ± 5% Max. output current: 100mA
PGND		
PE	Encoder shield ground	It is recommended to ground the two ends of the shielded wire.
Da+	Encoder interface	SSI signal, 5V differential input, interrupted clock signal synchronization, with clock frequency up to 736K
Da-		
CK+		
CK-		
A1+	Reserved	-
A1-		
B1+		
B1-		
A2+	Incremental input signal	● Supporting 5V differential, 24V push-pull, OC encoder signals ● Response frequency: 400kHz
A2-		
B2+		
B2-		
Z2+		
Z2-		
AO+	Frequency-divided output	● Supporting open collector output ● Response frequency: 400kHz ● Supporting frequency-divided output source selection, which can be set through the corresponding function code
BO+		
ZO+		

Table E-35 Indicator description

Indicator	Definition	Function
LED1	Status indicator	On: The expansion card is connecting with the control board. Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Reserved	-
LED3	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Figure E-41 SSI absolute signal encoder wiring diagram



Three types of input signal encoders are supported: 5V differential incremental encoder, 24V push-pull output incremental encoder, and 24V collector open incremental encoder.

Figure E-42 Wiring of an SSI absolute encoder and 5V differential incremental encoder in a fully closed-loop mode

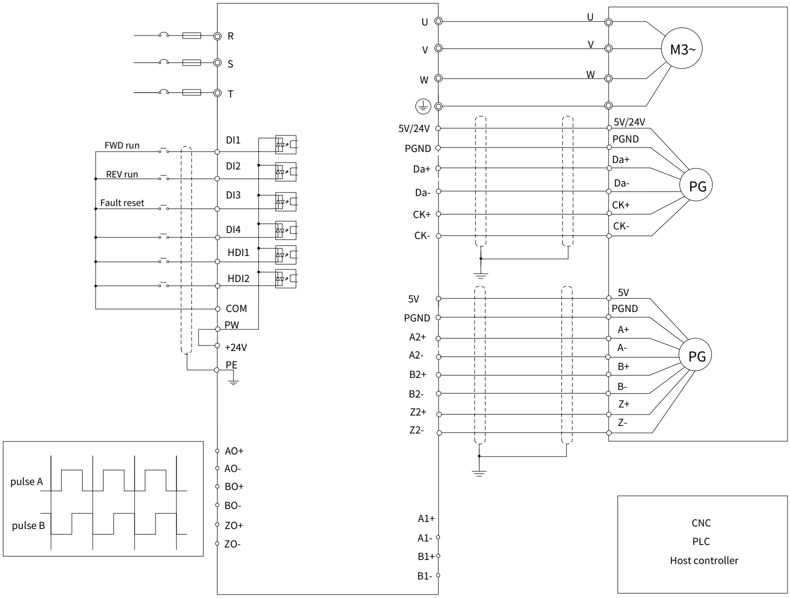


Figure E-43 Wiring of an SSI absolute encoder and 24V open collector incremental encoder in a fully closed-loop mode

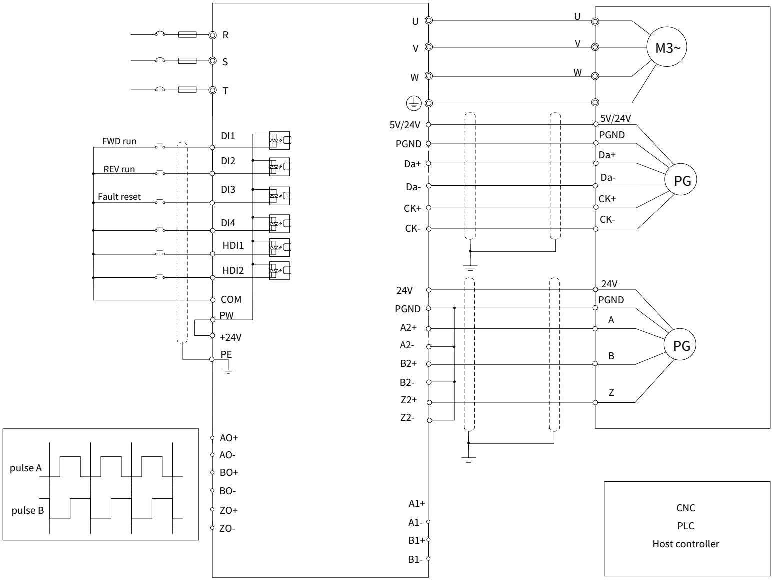
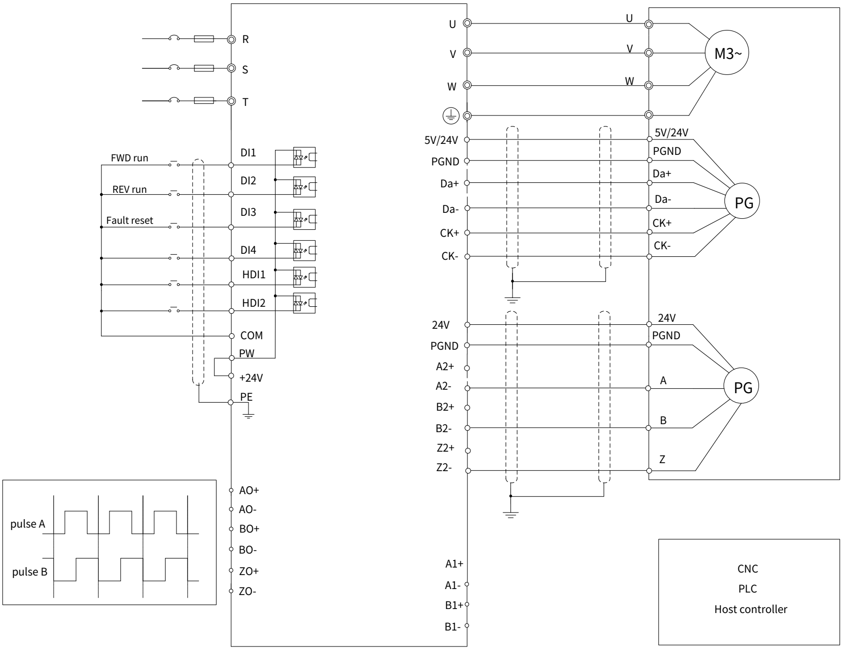


Figure E-44 Wiring of an SSI absolute encoder and 24V push-pull incremental encoder in a fully closed-loop mode



For the method of connecting the SSI card to an incremental encoder, refer to the preceding three wiring methods in a fully closed-loop mode.

It supports Tamagawa and Endat with the same hardware EC-PG508-5B, but different software

Figure E-45 Wiring diagram for Tamagawa PG card

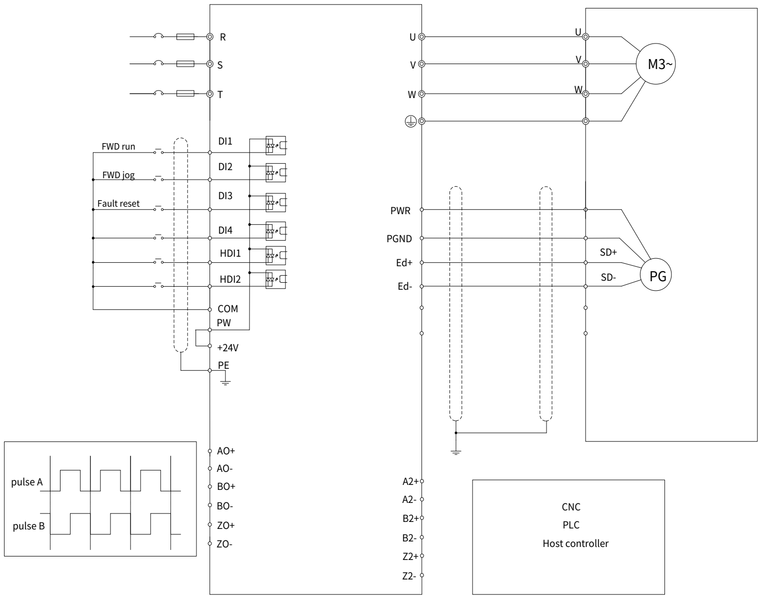
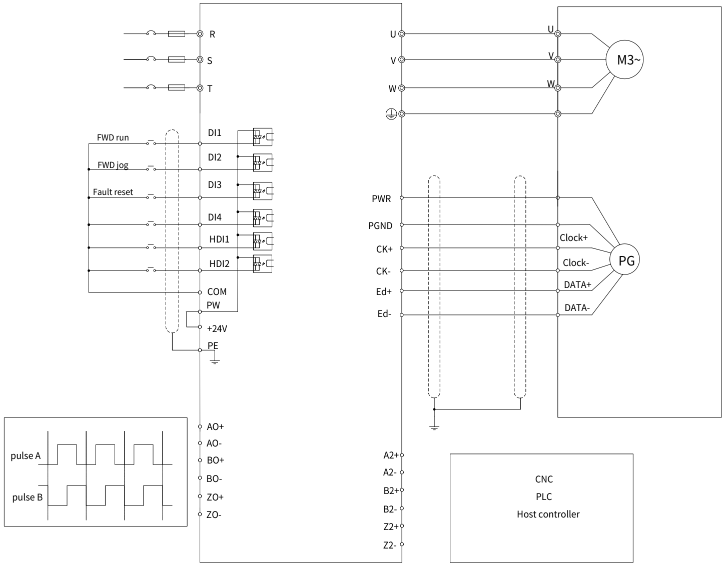


Figure E-46 Wiring diagram for Endat encoder



E.6 IoT expansion card

E.6.1 GPRS expansion card (EC-IC501-2)

After configuring the EC-IC501-2 expansion card, the functions of remote device monitoring, historical data query, fault alarm push, and remote device upgrade can be realized through the INVT industrial Internet platform.

Figure E-47 EC-IC501-2 expansion card

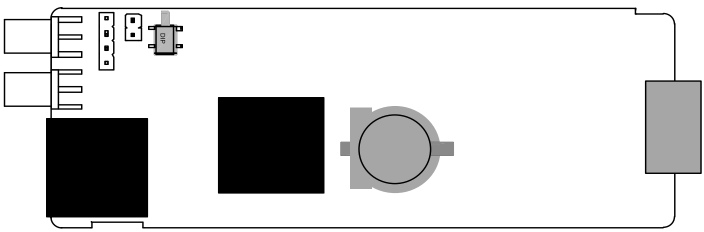


Table E-36 Pins of CN6

Pin	Name	Description
1	485-	485B
2	485+	485A

Pin	Name	Description
3	GND	Power ground
4	24V	24V power supply

Table E-37 Indicator description

Symbol	Name	Description
LED1	Status indicator	Blinking (On: 500ms; Off: 500ms): The expansion card is connected with the control board. Off: The expansion card is disconnected from the control board.
LED2	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.
LED3	Run indicator	On: The expansion card communicates properly. Off: The expansion card is not communicating.
LED4	Signal indicator	GPRS status indicator Blinking (On: 64ms; Off: 300ms): GPRS connects to the network. Blinking (On: 64ms; Off: 800ms): GPRS does not connect to the network.
LED5	Status indicator	GPRS module status indicator On: The GPRS module is turned on. Off: The GPRS module is not turned on.

Note: For details about the operation, see the manual of the EC series GPRS expansion card.

E.6.2 4G expansion card (EC-IC502-2-CN, EC-IC502-2-EU, EC-IC502-2-LA)

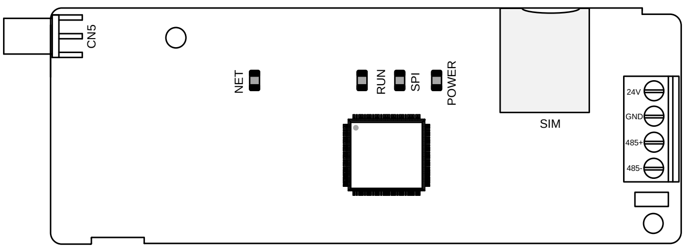


Table E-38 Terminal description

Port label	Description
24V	Power supply +
GND	Power supply -
485+	485A

Port label	Description
485-	485B
4G	4G antenna
CN5	SIM card socket

Table E-39 Indicator description

Symbol	Name	Description
NET	Network indicator	Blinking (On: 600ms; Off: 600ms): No SIM card/Network registration in progress/Registration failed. Blinking (On: 75ms; Off: 75ms): Data link established.
RUN	Run indicator	On: System exceptions happened. Blinking (On: 1s; Off: 1s): The system runs properly. Off: System exceptions happened.
SPI	Signal indicator	On: Connection failed or no connection. Blinking (On: 1s; Off: 1s): Connection between the expansion card and VFD control board is successful.
POWER	Power indicator	On: The expansion card is powered on. Off: The expansion card is not powered on.

Note:

- Only the domestic version comes with a 4G SIM card as standard.
- For details, see the manual of the EC series 4G expansion card.

Appendix F STO function

STO (Safe Torque Off) function turns off the drive output by shutting down the drive signal, cutting off the electrical power supply to the motor and thus stopping the outward torque output (see Figure F-1). When STO is activated, this function prevents the motor from accidentally starting if the motor is in static state. If the motor is rotating, it will continue to rotate by inertia until it comes to rest. If the motor has a brake, the brake closes immediately.

The VFD supplies the STO function and conforms to IEC 61508, IEC 61800-5-2, IEC62061, and ISO13849-1 standards.

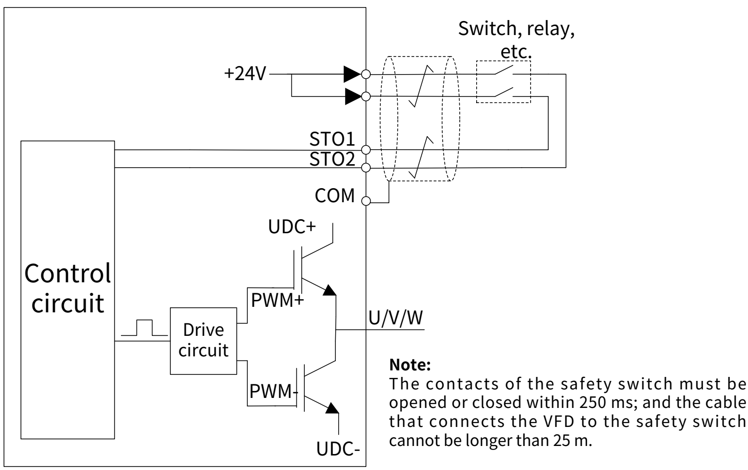
Safety standard related data

IEC/EN 61508 (Class A system)							ISO 13849**			
SIL	PFH	HFT	SFF	λdu	λdd	PTI*	PL	CCF	DC	Category
2	8.73×10^{-10}	1	71.23%	1.79×10^{-9}	0	1 year	d	57	60%	3

* PTI: Proof test interval

** Depends on the classification defined on the EN ISO 13849-1.

Figure F-1 STO circuit



F.1 STO function logic table

The following table describes the input states and corresponding faults of the STO function.

STO input state	Corresponding fault
STO1 and STO2 opened simultaneously	The STO function is triggered, and the drive stops running. Fault code: 40: Safe torque off (STO)
STO1 and STO2 closed simultaneously	The STO function is not triggered, and the drive runs properly.
One of STO1 and STO2 opened, and the other closed	STL1, STL2, or STL3 fault occurred. Fault code: 41: Channel STO1 exception (STL1) 42: Channel STO2 exception (STL2) 43: Channel STO1 and STO2 exceptions (STL3)

F.2 STO channel delay description

The following table describes the trigger and indication delay of the STO channels.

STO mode	STO trigger delay[1] and indication delay[2]
STO fault: STL1	Trigger delay < 10ms Indication delay < 280ms
STO fault: STL2	Trigger delay < 10ms Indication delay < 280ms
STO fault: STL3	Trigger delay < 10ms Indication delay < 280ms
STO fault: STO	Trigger delay < 10ms Indication delay < 100ms

1: STO trigger delay: time interval between trigger the STO function and switching off the drive output

2: STO instruction delay: Time interval between trigger the STO function and STO output state indication

F.3 STO function checklist

Check the items described in the following table to ensure that the STO function can be properly used.

	Item
☐	Ensure that the drive can be run or stopped randomly during commissioning.
☐	Stop the drive (if it is running), disconnect the input power supply, and isolate the drive from the power cable through the switch.

	Item
☐	Check the STO circuit connection according to the circuit diagram.
☐	Check whether the shielding layer of the STO input cable is connected to the +24 V reference ground COM.
☐	Connect to the power.
☐	Test the STO function as follows after the motor stops running: ● If the drive is running, send a stop command to it and wait until the shaft of the motor stops rotating. ● Activate the STO circuit and send a start command to the drive. Ensure that the motor does not start. ● Deactivate the STO circuit.
☐	Restart the drive, and check whether the motor is running properly.
☐	Test the STO function as follows when the motor is running: ● Start the drive. Ensure that the motor is running properly. ● Activate the STO circuit. ● The drive reports an STO fault (for details, see chapter 8 Fault handling). Ensure that the motor coasts to stop rotating. ● Deactivate the STO circuit.
☐	Restart the drive, and check whether the motor is running properly.

Appendix G Energy efficiency data

Table G-1 Power loss and IE class

Model	Relative loss (%)								Standby loss (W)	IE class
	(0;25)	(0;50)	(0;100)	(50;25)	(50;50)	(50;100)	(90;50)	(90;100)		
GD350C-1R5G-4	1.54	1.50	1.67	1.12	1.04	1.45	0.91	1.45	3	IE2
GD350C-2R2G-4	2.21	2.58	3.22	2.37	2.73	3.46	2.76	3.34	5	
GD350C-004G-4	1.13	1.40	2.05	1.14	1.43	2.14	1.41	2.28	6	
GD350C-5R5G-4	1.09	1.47	2.43	1.12	1.53	2.56	1.52	2.64	11	
GD350C-7R5G-4	1.06	1.37	2.06	1.11	1.45	2.45	1.46	2.69	7	
GD350C-011G-4	0.61	0.84	1.55	0.61	1.04	1.97	0.99	2.16	9	
GD350C-015G-4	0.42	0.52	1.27	0.55	0.73	1.46	0.78	1.66	9	
GD350C-018G-4	0.54	0.74	1.22	0.77	1.03	1.70	0.96	1.65	11	
GD350C-022G-4	0.47	0.67	1.21	0.67	0.90	1.54	0.87	1.38		
GD350C-030G-4	0.53	0.71	1.24	0.72	0.90	1.45	0.85	1.50	13	
GD350C-037G-4	0.47	0.69	1.39	0.63	0.88	1.60	0.99	1.72	14	
GD350C-045G-4	0.49	0.69	1.39	0.78	1.00	1.64	0.97	1.66	21	
GD350C-055G-4	0.51	0.69	1.26	0.71	0.89	1.47	0.88	1.40	22	
GD350C-075G-4	0.44	0.61	1.12	0.51	0.69	1.29	0.76	1.42		
GD350C-090G-4	0.42	0.59	1.15	0.47	0.65	1.29	0.90	1.48	25	
GD350C-110G-4	0.43	0.63	1.30	0.48	0.75	1.64	0.80	1.78	28	
GD350C-132G-4	0.47	0.59	1.06	0.61	0.71	1.28	0.85	1.43	55	
GD350C-160G-4	0.59	0.71	1.36	1.22	0.97	1.87	1.00	1.84		
GD350C-185G-4	0.63	0.76	1.21	1.17	1.12	1.70	1.08	1.61		
GD350C-200G-4	0.53	0.71	1.42	0.74	0.94	1.81	1.00	1.84		
GD350C-220G-4	0.33	0.42	0.69	0.85	0.95	1.33	1.10	1.18	80	
GD350C-250G-4	0.38	0.59	1.22	0.65	0.92	1.67	0.93	1.74		
GD350C-280G-4	0.40	0.59	1.10	0.64	0.89	1.58	1.12	1.35		
GD350C-315G-4	0.56	0.35	0.79	0.94	0.94	1.63	1.36	2.22		
GD350C-355G-4	0.37	0.47	0.98	0.91	1.11	1.95	1.42	2.44		
GD350C-400G-4	0.17	0.26	0.42	0.28	0.41	0.74	0.47	0.92		
GD350C-450G-4	0.31	0.54	0.98	0.46	0.62	1.02	0.67	0.85		
GD350C-500G-4	0.32	0.55	0.98	0.45	0.61	1.02	0.66	0.83		

Table G-2 Rated specifications

Model	Apparent power (kVA)	Rated output power (kW)	Rated output current (A)	Max. working temperature (°C)	Rated power frequency (Hz)	Rated power voltage (V)
GD350C-1R5G-4	2.4	1.5	3.7	50°C (Derate by 1% for every increase of 1°C when the temperature exceeds 40°C.)	50Hz/60Hz Allowed range: 47–63Hz	3PH 380V
GD350C-2R2G-4	3.2	2.2	5			
GD350C-004G-4	6.2	4	9.5			
GD350C-5R5G-4	9.2	5.5	14			
GD350C-7R5G-4	12.1	7.5	18.5			
GD350C-011G-4	16.4	11	25			
GD350C-015G-4	21.0	15	32			
GD350C-018G-4	25.0	18.5	38			
GD350C-022G-4	29.6	22	45			
GD350C-030G-4	39.4	30	60			
GD350C-037G-4	49.3	37	75			
GD350C-045G-4	60.5	45	92			
GD350C-055G-4	75.6	55	115			
GD350C-075G-4	98.7	75	150			
GD350C-090G-4	118.4	90	180			
GD350C-110G-4	141.5	110	215			
GD350C-132G-4	171.1	132	260			
GD350C-160G-4	200.7	160	305			
GD350C-185G-4	223.7	185	340			
GD350C-200G-4	250.1	200	380			
GD350C-220G-4	279.7	220	425			
GD350C-250G-4	315.9	250	480			
GD350C-280G-4	348.8	280	530			
GD350C-315G-4	394.9	315	600			
GD350C-355G-4	427.8	355	650			
GD350C-400G-4	473.8	400	720			
GD350C-450G-4	539.7	450	820			
GD350C-500G-4	566.0	500	860			

Appendix H Function parameter list

The function parameters of the VFD are divided into groups by function. Among the function parameter groups, the P98 group is the analog input and output calibration group, while the P99 group contains the factory function parameters, which are user inaccessible. Each group includes several function codes (each function code identifies a function parameter). A three-level menu style is applied to function codes. For example, "P08.08" indicates the 8th function code in the P08 group. The VFD supplies the password protection function. For detail settings, see P07.00. The parameters adopt the decimal system (DEC) and hexadecimal system (0–F). If the hexadecimal system is adopted, all bits are mutually independent on data during parameter editing. The symbols in the table are described as follows:

"○" indicates that the value of the parameter can be modified when the VFD is in stopped or running state.

"◎" indicates that the value of the parameter cannot be modified when the VFD is in running state.

"●" indicates that the value of the parameter is detected and recorded, and cannot be modified. (When "Restore factory settings" is performed, the actual detected parameter values or recorded values will not be restored.)

Group P00 Basic functions

Function code	Name	Description	Default	Modify
P00.00	Speed control mode	Specifies a speed control mode. Setting range: 0–3 0: SVC mode 0 1: SVC mode 1 2: Space voltage vector control mode 3: Closed-loop vector control mode **Note:** Before using a vector control mode, enable the VFD to perform motor parameter autotuning first.	2	◎
P00.01	Channel of running commands	Specifies a channel of running commands. Setting range: 0–2 0: Keypad 1: Terminal 2: Communication	0	○
P00.02	Communication	The function code is used to select a	0	○

Function code	Name	Description	Default	Modify
	mode of running commands	communication mode of running commands. Setting range: 0–6 0: Modbus/Modbus TCP communication 1: PROFIBUS/CANopen/DeviceNet communication 2: Ethernet communication 3: EtherCAT/PROFINET/EtherNet IP communication 4: Programmable expansion card 5: Wireless communication card 6: USB (reserved) **Note:** The Modbus TCP communication mode of option 0 and options 1, 2, 3, 4 and 5 are extended functions which are applicable with corresponding cards.		
P00.03	Max. output frequency	The function code is used to set the max. output frequency of the VFD, which is the basis of the frequency setting and the acceleration (ACC) and deceleration (DEC) speed. Setting range: Max(P00.04, 10.00)–599.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	Specifies the upper limit of the VFD output frequency, which should be smaller than or equal to the max. output frequency. If the set frequency is higher than the upper limit of the running frequency, the upper limit of the running frequency is used for running. Setting range: P00.05–P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of running frequency	Specifies the lower limit of the VFD output frequency. If the set frequency is lower than the lower limit of the running frequency, the lower limit of the running frequency is used for running. Setting range: 0.00Hz–P00.04 (Upper limit	0.00Hz	◎

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>of running frequency)
Note: Max. output frequency ⩾ Upper limit of frequency ⩾ Lower limit of frequency</td><td></td><td></td></tr>
<tr><td>P00.06</td><td>Setting channel of A frequency command</td><td rowspan="2">Specifies the frequency command source.
Setting range: 0–25
0: P00.10
1: AI1
2: AI2
3–4: Reserved
5: High-speed pulse HDI1
6: High-speed pulse HDI2
7: Simple PLC program
8: Multi-step speed running
9: PID control
10: Modbus/Modbus TCP communication
11: PROFIBUS/CANopen/DeviceNet communication
12: Ethernet communication
13: Pulse train
14: EtherCAT/PROFINET/ EtherNet IP communication
15: Programmable card
16–18: Reserved
19: EAI1
20: EAI2
21: EAI3
22: Reserved
23: EHDI1
24: Reserved
25: Dedicated frequency channel for specialized equipment</td><td>0</td><td>○</td></tr>
<tr><td>P00.07</td><td>Setting channel of B frequency command</td><td>24</td><td>○</td></tr>
<tr><td>P00.08</td><td>Reference object of B frequency command</td><td>Specifies the reference object of B frequency command.
Setting range: 0–1
0: Max. output frequency
1: A frequency command</td><td>0</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P00.09	Combination mode of setting source	The function code is used to set the combination mode of A/B frequency setting source. Setting range: 0–5 0: A 1: B 2: (A+B) 3: (A-B) 4: Max(A, B) 5: Min(A, B)	0	○
P00.10	Setting frequency through keypad	The function code is used to set the initial VFD frequency set value when A and B frequency commands are set by keypad. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P00.11	ACC time 1	Specifies the ACC time of ramp frequency. Setting range: 0.0–3600.0s	Model depended	○
P00.12	DEC time 1	Specifies the DEC time of ramp frequency. Setting range: 0.0–3600.0s	Model depended	○
P00.13	Running direction	Specifies the running direction. Setting range: 0–2 0: Run in default direction 1: Run at the opposite direction. 2: Disable reverse running.	0	○
P00.14	Carrier frequency setting	Specifies the carrier frequency. A high carrier frequency will have an ideal current waveform, few current harmonics, and small motor noise, but it will increase the switch loss, increase VFD temperature, and impact the output capacity. At the same time, the VFD current leakage and electrical magnetic interference will increase. On the contrary, an extremely-low a carrier frequency may cause unstable operation at low frequency, decrease the torque, or even lead to oscillation.	Model depended	○

Function code	Name	Description	Default	Modify
		The carrier frequency has been properly set in the factory before the VFD is delivered. In general, you do not need to modify it. The mapping between VFD models and default carrier frequency values is as follows: 380V 1.5–11kW: 8kHz 380V 15–55kW: 4kHz 380V 75kW and above: 2kHz Setting range: 1.0–15.0kHz **Note:** When the frequency used exceeds the default carrier frequency, the VFD needs to derate by 10% for each increased of 1kHz.		
P00.15	Motor parameter autotuning	Setting range: 0x000–0x234 Ones place: Motor basic parameter autotuning 0: No operation 1: Complete parameter rotary autotuning 2: Complete parameter static autotuning 3: Partial parameter static autotuning 4: VFD parameter autotuning Tens place: Initial pole angle autotuning 0: No operation 1: Rotary autotuning 2: Static autotuning 3: Rotary autotuning 2 Hundreds place: System inertia autotuning 0: No operation 1: Mode 1 2: Mode 2	0x000	◎
P00.16	AVR function selection	The function code is used to set the VFD automatic voltage regulation (AVR) function, which can eliminate the impact of the bus voltage fluctuation on the VFD output voltage. Setting range: 0–1	1	○

Function code	Name	Description	Default	Modify
		0: Invalid 1: Valid during the whole process		
P00.17	Reserved	-	-	-
P00.18	Function parameter restoration	Specifies the function parameter restoration. Setting range: 0–6 0: No operation 1: Restore to default values (excluding motor parameters) 2: Clear fault records 3–4: Reserved 5: Restore to default values (factory test mode) 6: Restore to default values (including motor parameters) **Note:** For a customized version, when 1 is selected, only customized parameters are restored to default values; when 5 is selected, parameters are restored to default values for the corresponding standard version (including motor parameters). For a standard version, except that selecting 5 will restore the default values of motor parameters and the parameters whose values cannot be modified although restoring the default values is selected, all the other functions are the same regardless of whether 1 or 5 is selected, while the options 5 and 6 have the same function.	0	◎

Group P01 Start and stop control

Function code	Name	Description	Default	Modify
P01.00	Start mode	Specifies the start mode. Setting range: 0–4	0	◎

Function code	Name	Description	Default	Modify
		0: Direct start 1: Start after DC braking 2: Start after speed tracking (with exciting) 3: Start after speed tracking (without excitation) 4: Start after speed tracking (software) **Note:** This function is available for the 004G and above models.		
P01.01	Starting frequency of direct start	The function code is used to set the initial frequency during VFD start. Setting range: 0.00Hz–P00.03	0.50Hz	◎
P01.02	Starting frequency hold time	Specifies the hold time of starting frequency. Setting range: 0.0–50.0s	0.0s	◎
P01.03	Braking current before start	Specifies the DC braking current before startup. Setting range: 0.0–100.0%	0.0%	◎
P01.04	Braking time before start	Specifies the DC braking time before startup. Setting range: 0.00–50.00s	0.00s	◎
P01.05	ACC and DEC mode	Specifies the changing mode of the frequency during start and running. 0: Linear type. The output frequency increases or decreases linearly. 1: S curve. The output frequency increases or decreases according to the S curve. **Note:** The S curve is generally applied to elevators, conveyors, and other application scenarios where smoother start or stop is required. When S curve mode is selected, P01.06, P01.07, P01.27, and P01.28 need to be set accordingly.	0	◎
P01.06	Time of starting segment of ACC S curve	Specifies the time of the starting segment of the ACC S curve. It works with P01.07 to determine the curvature of the S curve. Setting range: 0.0–50.0s	0.1s	◎
P01.07	Time of ending	Specifies the time of the ending segment	0.1s	◎

Function code	Name	Description	Default	Modify
	segment of ACC S curve	of the ACC S curve. It works with P01.06 to determine the curvature of the S curve. Setting range: 0.0–50.0s		
P01.08	Stop mode	Specifies the stop mode. Setting range: 0–1 0: Decelerate to stop. After a stop command takes effect, the VFD lowers output frequency based on the DEC mode and the defined DEC time; after the frequency drops to the stop speed (P01.15), the VFD stops. 1: Coast to stop. After a stop command takes effect, the VFD ceases the output immediately, and the load coasts to stop according to mechanical inertia.	0	○
P01.09	Starting frequency of DC braking for stop	The function code is used to set the starting frequency of DC braking for stop. Setting range: 0.00Hz–P00.03 (Max. output frequency)	0.00Hz	○
P01.10	Demagnetization time	Specifies the demagnetization time, that is, the wait time before DC braking for stop. Setting range: 0.00–30.00s	0.00s	○
P01.11	DC braking current for stop	Specifies the DC braking current for stop, that is, the DC braking energy. Setting range: 0.0–100.0% (of the rated VFD output current)	0.0%	○
P01.12	DC braking time for stop	Specifies the duration of DC braking. Setting range: 0.00–50.00s **Note**: If the time is set to 0, the DC braking is disabled, and the VFD decelerates to stop within the specified time.	0.00s	○
P01.13	FWD/REV running deadzone time	The function code is used to set the transition time of the threshold set by P01.14 during VFD FWD/REV rotation switching. Setting range: 0.0–3600.0s	0.0s	○

Function code	Name	Description	Default	Modify
P01.14	FWD/REV running switching mode	The function code is used to set the FWD/REV running switching mode. Setting range: 0–2 0: Switch at zero frequency 1: Switch at the starting frequency 2: Switch after the speed reaches the stop speed with a delay	1	◎
P01.15	Stop speed	Specifies the stop speed (frequency). Setting range: 0.00Hz–P00.03 (Max. output frequency)	0.50Hz	◎
P01.16	Stop speed detection mode	Specifies the stop speed detection mode. If the detected value is less than the value of P01.15, the VFD stops. Setting range: 0–1 0: Detect by the set speed (unique in V/F mode) 1: Detect by the feedback speed	0	◎
P01.17	Stop speed detection time	The function code is used to set the stop speed detection time. Setting range: 0.00–100.00s	0.50s	◎
P01.18	Terminal-based running command protection at power-on	Specifies whether the terminal running command is valid at power-on. Setting range: 0–1 0: The terminal running command is invalid at power-on 1: The terminal running command is valid at power-on	0	○
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	The function code is used to specify the running state of the VFD when the set frequency is below the lower limit. Setting range: 0x00–0x12 Ones place: Action selection 0: Run at the frequency lower limit 1: Stop 2: Sleep Tens place: Stop mode 0: Coast to stop 1: Decelerate to stop	0x00	◎

Function code	Name	Description	Default	Modify
P01.20	Wake-up-from-sleep delay	Specifies the wake-up-from-sleep delay time. Setting range: 0.0–3600.0s (Valid when the ones place of P01.19=2)	0.0s	○
P01.21	Power-off restart selection	Specifies whether the VFD automatically runs after re-power on. Setting range: 0–1 0: Disable 1: Enable. If the restart condition is met, the VFD will run automatically after waiting the time defined by P01.22.	0	○
P01.22	Wait time for restart after power-off	Specifies the wait time before the automatic running of the VFD that is re-powered on. Setting range: 0.0–3600.0s (Valid only when P01.21=1)	1.0s	○
P01.23	Start delay	Setting range: 0.0–600.0s	0.0s	○
P01.24	Stop speed delay	Setting range: 0.0–600.0s	0.0s	○
P01.25	Open-loop 0Hz output selection	Setting range: 0–2 0: Output without voltage 1: Output with voltage 2: Output with the DC braking current for stop	0	○
P01.26	DEC time for emergency stop	Setting range: 0.0–60.0s	2.0s	○
P01.27	Time of starting segment of DEC S curve	Setting range: 0.0–50.0s	0.1s	◎
P01.28	Time of ending segment of DEC S curve	Setting range: 0.0–50.0s	0.1s	◎
P01.29	Short-circuit braking current	Setting range: 0.0–150.0% (of the rated VFD output current)	0.0%	○
P01.30	Hold time of short-circuit braking for start	When the VFD starts in direct start mode (P01.00=0), set P01.30 to a non-zero value to enter short-circuit braking. Setting range: 0.00–50.00s	0.00s	○
P01.31	Hold time of	During stop, if the running frequency of	0.00s	○

Function code	Name	Description	Default	Modify
	short-circuit braking for stop	VFD is lower than the starting frequency of brake for stop (P01.09), set P01.31 to a non-zero value to enter short-circuit braking for stop, and then carry out DC braking in the time specified by P01.12 (See descriptions for P01.09–P01.12). Setting range: 0.00–50.00s		
P01.32	Pre-exciting time for jogging	Setting range: 0.000–10.000s	0.300s	○
P01.33	Starting frequency of braking for stop in jogging	Setting range: 0.00Hz–P00.03	0.00Hz	○
P01.34	Sleep delay	Setting range: 0–3600.0s	0.0s	○
P01.35	Speed tracking method	Setting range: 0x000–0x112 Ones place: Speed tracking method selection 0:Track according to stop frequency 1:Track according to rated frequency 2:Track according to max. frequency Tens place: Tracking direction 0:Single (set) direction 1:Dual (forward and reverse) directions Hundreds place: Tracking current limit (sending no wave when the value exceeded) 0: 20% (relative to the larger of VFD current and motor current) 1: 10% (relative to the larger of VFD current and motor current)	0x000	○
P01.36	Speed tracking fast/slow selection	Setting range: 0–10000	300	○
P01.37	Speed tracking voltage coefficient	Setting range: 0–50	10	○

Group P02 Parameters of motor 1

Function code	Name	Description	Default	Modify
P02.00	Type of motor 1	Setting range: 0–2	0	◎

Function code	Name	Description	Default	Modify
		0: Asynchronous motor (AM) 1: Permanent magnet synchronous motor 2: Synchronous reluctance motor		
P02.01	Rated power of AM 1	Setting range: 0.1–3000.0kW	Model depended (0.4)	◎
P02.02	Rated frequency of AM 1	Setting range: 0.01Hz–P00.03 (Max. output frequency)	Model depended (50.00)	◎
P02.03	Rated speed of AM 1	Setting range: 1–60000RPM	Model depended (1400)	◎
P02.04	Rated voltage of AM 1	Setting range: 0–1200V	Model depended (380)	◎
P02.05	Rated current of AM 1	Setting range: 0.8–6000.0A	Model depended (1.0)	◎
P02.06	Stator resistance of AM 1	Setting range: 0.001–65.535Ω	Model depended (0.001)	○
P02.07	Rotor resistance of AM 1	Setting range: 0.001–65.535Ω	Model depended (0.001)	○
P02.08	Leakage inductance of AM 1	Setting range: 0.1–6553.5mH	Model depended (0.1)	○
P02.09	Mutual inductance of AM 1	Setting range: 0.1–6553.5mH	Model depended (0.1)	○
P02.10	No-load current of AM 1	Setting range: 0.1–6553.5A	Model depended (0.1)	○
P02.11	Magnetic saturation coefficient 1 of iron core of AM 1	Setting range: 0.0–100.0%	80.0%	○

Function code	Name	Description	Default	Modify
P02.12	Magnetic saturation coefficient 2 of iron core of AM 1	Setting range: 0.0–100.0%	68.0%	○
P02.13	Magnetic saturation coefficient 3 of iron core of AM 1	Setting range: 0.0–100.0%	57.0%	○
P02.14	Magnetic saturation coefficient 4 of iron core of AM 1	Setting range: 0.0–100.0%	40.0%	○
P02.15	Rated power of SM 1	Setting range: 0.1–3000.0kW	Model depended (0.4)	◎
P02.16	Rated frequency of SM 1	Setting range: 0.01Hz–P00.03 (Max. output frequency)	Model depended (50.00)	◎
P02.17	Number of pole pairs of SM 1	Setting range: 1–128	2	◎
P02.18	Rated voltage of SM 1	Setting range: 0–1200V	Model depended (380)	◎
P02.19	Rated current of SM 1	Setting range: 0.8–6000.0A	Model depended (1.0)	◎
P02.20	Stator resistance of SM 1	Setting range: 0.001–65.535Ω	Model depended (0.001)	○
P02.21	Direct-axis inductance of SM 1	Setting range: 0.01–655.35mH	Model depended (0.01)	○
P02.22	Quadrature-axis inductance of SM 1	Setting range: 0.01–655.35mH	Model depended (0.01)	○
P02.23	Counter-emf constant of SM 1	Setting range: 0–10000	300	○

Function code	Name	Description	Default	Modify
P02.24	Initial pole position of SM 1	Setting range: 0x0000–0xFFFF	0x0000	●
P02.25	Rotation frequency percentage setting for SM 1 counter-emf identifying	Setting range: 5.0%–100.0%	60.0%	◎
P02.26	Overload protection selection of motor 1	Setting range: 0–2 0: No protection 1: Common motor (with low-speed compensation) As the cooling effect of a common motor is degraded at low speed running, the corresponding electronic thermal protection value needs to be adjusted properly, the low compensation indicates lowering the overload protection threshold of the motor whose running frequency is lower than 30Hz. 2: Frequency-variable motor (without low-speed compensation) The heat dissipation function for a variable-frequency motor is not impacted by the rotation speed, and therefore it is not necessary to adjust the protection value at low speed running.	2	◎
P02.27	Overload protection coefficient of motor 1	Specifies the motor overload protection coefficient. A small motor overload protection coefficient indicates a great overload multiplication (M). when M=116%, protection is performed after motor overload lasts for 1 hour; when M=150%, protection is performed after motor overload lasts for 12 minutes; when M=180%, protection is performed	100.0%	○

Function code	Name	Description	Default	Modify
		after motor overload lasts for 5 minutes; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M⩾400%, protection is performed immediately. Setting range: 20.0%–150.0%		
P02.28	Power display calibration coefficient of motor 1	Used to adjust the power display value of motor 1. However, it does not affect the control performance of the VFD. Setting range: 0.00–3.00	1.00	○
P02.29	Parameter display of motor 1	Setting range: 0–1 0: Display by motor type. In this mode, only parameters related to the present motor type are displayed. 1: Display all. In this mode, all the motor parameters are displayed.	0	○
P02.30	System inertia of motor 1	Setting range: 0.001–30.000kg・m^2	0.001 kg・m^2	○
P02.31	Motor parameter model calculation	Setting range: 0–1 0: Invalid 1: Enable	0	◎
P02.32	Power factor of AM 1	Setting range: 0.00–1.00 **Note:** For asynchronous motors, P02.32 need to be set according to the motor nameplate before P02.31 is enabled; otherwise, the calculation may deviate.	0.85	○
P02.33	Rated speed high word of AM 1	Setting range: 0–30(10krpm)	0	◎
P02.34	AM1 iron core saturation coefficient 1	0.0–200.0%	125.0	○
P02.35	AM1 iron core saturation coefficient 2	0.0–200.0%	125.0	○

Function code	Name	Description	Default	Modify
P02.36	AM1 mutual inductance saturation coefficient 1	0.0–200.0%	88.0	○
P02.37	AM1 mutual inductance saturation coefficient 2	0.0–200.0%	88.0	○
P02.38	AM1 mutual inductance flux weakening coefficient 1	0.0–200.0%	112.5	○
P02.39	AM1 mutual inductance flux weakening coefficient 2	0.0–200.0%	117.6	○
P02.40	AM1 mutual inductance flux weakening coefficient 3	0.0–200.0%	122.8	○
P02.41	AM1 mutual inductance flux weakening coefficient 4	0.0–200.0%	125.0	○
P02.42	SM1 D-axis inductance saturation coefficient 1	100–10000	4096	○
P02.43	SM1 D-axis inductance saturation coefficient 2	100–10000	4096	○
P02.44	SM1 D-axis inductance saturation coefficient 3	100–10000	4096	○
P02.45	SM1 D-axis	100–10000	3686	○

Function code	Name	Description	Default	Modify
	inductance saturation coefficient 4			
P02.46	SM1 D-axis inductance saturation coefficient 5	100–10000	3277	○
P02.47	SM1 D-axis inductance saturation coefficient 6	100–10000	2867	○
P02.48	SM1 D-axis inductance saturation coefficient 7	100–10000	2458	○
P02.49	SM1 D-axis inductance saturation coefficient 8	100–10000	2048	○
P02.50	SM1 Q-axis inductance saturation coefficient 1	100–10000	4096	○
P02.51	SM1 Q-axis inductance saturation coefficient 2	100–10000	4096	○
P02.52	SM1 Q-axis inductance saturation coefficient 3	100–10000	4096	○
P02.53	SM1 Q-axis inductance saturation coefficient 4	100–10000	3686	○
P02.54	SM1 Q-axis inductance	100–10000	3277	○

Function code	Name	Description	Default	Modify
	saturation coefficient 5			
P02.55	SM1 Q-axis inductance saturation coefficient 6	100–10000	2867	○
P02.56	SM1 Q-axis inductance saturation coefficient 7	100–10000	2458	○
P02.57	SM1 Q-axis inductance saturation coefficient 8	100–10000	2048	○
P02.58	Counter-emf identification of SM 1	0–10000V	0	○

Group P03 Vector control of motor 1

Function code	Name	Description	Default	Modify
P03.00	Speed-loop proportional gain 1 of motor 1	Setting range: 0.0–200.0 **Note:** Applicable only to vector control mode.	20.0	○
P03.01	Speed-loop integral time 1 of motor 1	Setting range: 0.000–10.000s **Note:** Applicable only to vector control mode.	0.200s	○
P03.02	Low-point frequency for speed-loop switching of motor 1	Setting range: 0.00Hz–P03.05 **Note:** Applicable only to vector control mode.	5.00Hz	○
P03.03	Speed-loop proportional gain 2 of motor 1	Setting range: 0.0–200.0 **Note:** Applicable only to vector control mode.	20.0	○
P03.04	Speed-loop integral time 2 of	Setting range: 0.000–10.000s **Note:** Applicable only to vector control	0.200s	○

Function code	Name	Description	Default	Modify
	motor 1	mode.		
P03.05	High-point frequency for speed-loop switching of motor 1	Setting range: P03.02–P00.03 (Max. output frequency) **Note:** It is applicable only to vector control mode.	10.00 Hz	○
P03.06	Speed-loop output filter of motor 1	0–8 (corresponding to 0–2^8/10ms)	0	○
P03.07	Motor 1 vector control slip compensation coefficient (electromotive)	Slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy of the system. Adjusting the parameter properly can control the speed steady-state error. Setting range: 50–200%	100%	○
P03.08	Motor 1 vector control slip compensation coefficient (for power generation)	Slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy of the system. Adjusting the parameter properly can control the speed steady-state error. Setting range: 50–200%	100%	○
P03.09–P03.10	Reserved	-	-	-
P03.11	Torque setting method selection	Setting range: 0–25 0: P03.12 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication	0	○

Function code	Name	Description	Default	Modify
		12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated torque setting channel for specialized equipment **Note:** For these settings, 100% corresponds to the motor rated current.		
P03.12	Torque set through keypad	Setting range: -300.0%–300.0% (of the motor rated current)	20.0%	○
P03.13	Torque reference filter time	Setting range: 0.000–10.000s	0.010s	○
P03.14	Setting source of forward rotation frequency upper limit in torque control	Setting range: 0–25 0: Set by P03.16 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card	0	○

Function code	Name	Description	Default	Modify
		16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated forward rotation frequency upper limit in torque control for specialized equipment **Note:** 100% corresponds to the max. frequency.		
P03.15	Setting source of reverse rotation upper-limit frequency in torque control	Setting range: 0–25 0: Set by P03.17 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated reverse rotation frequency	0	○

Function code	Name	Description	Default	Modify
		upper limit in torque control for specialized equipment **Note:** 100% corresponds to the max. frequency.		
P03.16	Forward rotation frequency upper limit set through keypad in torque control	Specifies the frequency limit when P03.14=1. P03.17 sets the value when P03.15=1. Setting range: 0.00Hz–P00.03	Model depended (50.00)	○
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control	The function code is used to set the frequency limit when P03.15=1. Setting range: 0.00Hz–P00.03	Model depended (50.00)	○
P03.18	Setting source of electromotive torque upper limit	Setting range: 0–25 0: P03.20 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved	0	○

Function code	Name	Description	Default	Modify
		25: Dedicated electromotive torque upper limit for specialized equipment **Note:** For these settings, 100% corresponds to the motor rated current.		
P03.19	Setting source of braking torque upper limit	Setting range: 0–25 0: Set by P03.21 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated electromotive torque upper limit for specialized equipment **Note:** For these settings, 100% corresponds to the motor rated current.	0	○
P03.20	Electromotive torque upper limit set through keypad	Specifies the torque limit. Setting range: 0.0–300.0% (of the motor rated current)	180.0%	○
P03.21	Braking torque upper limit set	Specifies the torque limit. Setting range: 0.0–300.0% (of the motor	180.0%	○

Function code	Name	Description	Default	Modify
	through keypad	rated current)		
P03.22	Weakening coefficient in constant power zone	Used when the AM is in flux-weakening control. Setting range: 0.1–2.0	1.0	○
P03.23	Lowest weakening point of AM in constant power zone	Setting range: 5%–100%	10%	○
P03.24	Max. voltage limit	Specifies the max. VFD output voltage, which is a percentage of the motor rated voltage. Set the value according to onsite conditions. Setting range: 0.0–120.0%	100.0%	○
P03.25	Pre-exciting time	Specifies the pre-exciting time. Pre-exciting is performed for the motor when the VFD starts up. A magnetic field is built up inside the motor to improve the torque performance during the start process. Setting range: 0.000–10.000s **Note:** Pre-excitation can improve the starting capability of AM with loads. For an AM, set 0 to disable the pre-excitation process. For an SM, if P13.01 is set to an enabling option, the pre-excitation process is directly skipped.	0.300s	○
P03.26	Flux-weakening proportional gain	Setting range: 0–8000	1000	○
P03.27	Speed display selection in vector control	Setting range: 0–1 0: Display the actual value 1: Display the set value	0	○
P03.28	Static friction compensation coefficient	Setting range: 0.0–100.0%	0.0%	○
P03.29	Corresponding frequency point of static friction	Setting range: 0.50Hz–P03.31	1.00Hz	○

Function code	Name	Description	Default	Modify
P03.30	High speed friction compensation coefficient	Setting range: 0.0–100.0%	0.0%	○
P03.31	Corresponding frequency of high speed friction torque	Setting range: P03.29–P00.03 (Hz)	50.00Hz	○
P03.32	Enabling torque control	Setting range: 0–1 0: Disable 1: Enable	0	○
P03.33	Flux-weakening integral gain	Setting range: 0.0–300.0%	100.0%	○
P03.34	Reserved	-	-	-
P03.35	Control mode optimization selection	Setting range: 0x0000–0x1111 Ones place: Torque command selection 0: Torque reference 1: Torque current reference Tens place: Reserved Hundreds place: indicates whether to enable speed-loop integral separation 0: Disable 1: Enable Thousands place: Reserved	0x0000	○
P03.36	Speed-loop differential gain of motor 1	Setting range: 0.00–10.00s	0.00s	○
P03.37–P03.39	-	-	-	-
P03.40	Enabling inertia compensation	Setting range: 0–1 0: Disable 1: Enable	0	○
P03.41	Upper limit of inertia compensation torque	The function code is used to limit the max. inertia compensation torque to prevent inertia compensation torque from being too large. Setting range: 0.0–150.0% (of the motor rated torque)	10.0%	○

Function code	Name	Description	Default	Modify
P03.42	Inertia compensation filter times	The function code is used to set the filter times of inertia compensation torque to smooth the inertia compensation torque. Setting range: 0–10	7	○
P03.43	Inertia identification torque	The function code is used to set the inertia identification torque. Setting range: 0.0–100.0% (of the motor rated torque)	10.0%	○
P03.44	Enabling motor inertia identification	Setting range: 0–2 0: No operation 1: Mode 1 2: Mode 2	0	◎
P03.45	SM 1 max. flux weakening current	0.0–200.0%	50.0%	○
P03.46–P03.47	Reserved	-	-	-
P03.48	Motor 1 speed-loop overshoot suppression gain	Setting range: 0–400	0	◎
P03.49	Motor 1 closed-loop speed observer bandwidth	Setting range: 1.0–200.0	10.0	○
P03.50	Motor 1 vector control energy-saving mode selection	0–3 0: Invalid 1: Max. efficiency (recommended) 2: Optimal power factor 3: MTPA	0	◎
P03.51	Motor 1 energy-saving optimization coefficient	0.0–100.0%	0.0%	○
P03.52	Flux weakening electromotive coefficient	0.0–100.0%	100.0	○

Function code	Name	Description	Default	Modify
P03.53	Flux weakening power generation coefficient	0.0–100.0%	100.0%	○
P03.54	Current-loop band width of motor 1	Setting range: 0–2000 **Note:** The smaller the current loop bandwidth, the slower the response, but the better the current waveform.	400	○
P03.55	Reserved	-	-	-
P03.56	Vector control loop optimization parameter	Setting range: 0x000–0xFFF Bit 0: Enable voltage feedforward compensation (valid in FVC) Bit 1: Enable axis-d voltage cross decoupling (valid in FVC) Bit 2: Enable axis-q voltage cross decoupling (valid in FVC) Bit 3: Enable closed-loop disturbance feedforward compensation Bit 4: Axis-q voltage restriction selection 0: Limit to 1.2 times the rated motor voltage 1: Limit to d-axis voltage Bit5: Enable mutual inductance adaptive 0: Invalid 1: Enable Bit6: Enable straight axis inductor Ld saturation 0: Invalid 1: Enable (suitable for synchronous reluctance motors or synchronous motors where the inductance varies greatly with current) Bit7: Enable cross-axis inductor Lq saturation 0: Invalid 1: Enable (suitable for synchronous reluctance motors or synchronous motors where the inductance varies greatly with current)	0x137	◎

Function code	Name	Description	Default	Modify
		Bit8: Enable torque control current optimization 0: Invalid 1: Enable (suitable for small torque tension control applications) Bit9: Reserved Bit10: Enable speed loop optimization 0: Invalid 1: Enable (inertia recognition is required) Bit11: Output voltage limitation (when the bus voltage is higher than the standard bus voltage, the maximum output voltage is the rated voltage of the motor) 0: Invalid 1: Enable Bit12–bit15: Reserved		
P03.57	Motor 1 FVC switches to SVC mode	Setting range: 0x00–0x11 Ones place: Enable switchover 0: Invalid 1: Enable Tens place: Switch to SVC mode selection 0: Switch to SVC0 mode 1: Switch to SVC1 mode	0x00	◎
P03.58	Motor 1 fast exciting current	Setting range: 0.0–200.0%	0.0%	◎
P03.59	Current control mode selection	Setting range: 0–2 0: Conventional mode 1: Current control optimization 1 2: Current control optimization 2	0	◎
P03.60	Speed loop bandwidth	Setting range: 0–100Hz	2Hz	○
P03.61–P03.67	Reserved	-	-	-
P03.68	Upper limit frequency bias value in torque control	Setting range: 0.00Hz–P00.03	0.00Hz	○

Function code	Name	Description	Default	Modify
P03.69	Upper limit frequency ACC/DEC selection in torque control	Setting range: 0–4 0: No limit on acceleration or deceleration 1: ACC/DEC time 1 2: ACC/DEC time 2 3: ACC/DEC time 3 4: ACC/DEC time 4	0	○

Group P04 Motor 1 V/F control

Function code	Name	Description	Default	Modify
P04.00	V/F curve setting of motor 1	Specifies the V/F curve of motor 1 to meet the needs of different loads. Setting range: 0–5 0: Straight-line V/F curve (applicable to constant torque loads) 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) Curves 2 – 4 are applicable to the torque loads such as fans and water pumps. You can adjust according to the characteristics of the loads to achieve best performance. 5: Customized V/F (V/F separation); in this mode, V can be separated from F and F can be adjusted through the frequency setting channel set by P00.06 or the voltage setting channel set by P04.27 to change the characteristics of the curve.	0	◎
P04.01	Torque boost of motor 1	Setting range: 0.0% (automatic Torque boost); 0.1% –10.0%	0.0%	○
P04.02	Torque boost cut-off of motor 1	Setting range: 0.0%–50.0%	20.0%	○
P04.03	V/F frequency point 1 of motor 1	When P04.00=1 (multi-dot V/F curve), you can set the V/F curve through P04.03–P04.08.	0.00Hz	○

Function code	Name	Description	Default	Modify
		Setting range: 0.00Hz–P04.05 **Note:** V1<V2<V3, f1<f2<f3 Too high voltage for low frequency will cause motor overheat or damage and cause VFD overcurrent stall or overcurrent protection.		
P04.04	V/F voltage point 1 of motor 1	Setting range: 0.0%–110.0% (of the rated voltage of motor 1) **Note:** Refer to the description for P04.03.	0.0%	○
P04.05	V/F frequency point 2 of motor 1	Setting range: P04.03–P04.07 **Note:** Refer to the description for P04.03.	0.00Hz	○
P04.06	V/F voltage point 2 of motor 1	Setting range: 0.0%–110.0% (of the rated voltage of motor 1) **Note:** Refer to the description for P04.03.	0.0%	○
P04.07	V/F frequency point 3 of motor 1	Setting range: P04.05–P02.02 (Rated frequency of AM 1) or P04.05– P02.16 (Rated frequency of SM 1) **Note:** Refer to the description for P04.03.	0.00Hz	○
P04.08	V/F voltage point 3 of motor 1	Setting range: 0.0%–110.0% (of the rated voltage of motor 1) **Note:** Refer to the description for P04.03.	0.0%	○
P04.09	V/F slip compensation gain of motor 1	The function code is used to compensate for the motor rotating speed change caused by load change in the space voltage vector mode, and thus improve the rigidity of the mechanical characteristics of the motor. Setting range: 0.0–200.0%	100.0%	○
P04.10	Low-frequency oscillation control factor of motor 1	In space voltage vector control mode, the motor, especially the large-power motor, may experience current oscillation at certain frequencies, which may cause unstable motor running, or even VFD overcurrent. You can adjust the two function codes properly to eliminate such phenomenon. Setting range: 0–100	10	○
P04.11	High-frequency	Setting range: 0–100	10	○

Function code	Name	Description	Default	Modify
	oscillation control factor of motor 1			
P04.12	Oscillation control threshold of motor 1	Setting range: 0.00Hz–P00.03 (Max. output frequency)	30.00Hz	○
P04.13	Motor 1 voltage setting channel selection	Setting range: 0–25 0: Set by P04.14 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20–25: Reserved	0	○
P04.14	Motor 1 voltage set through keypad	Setting range: 0.0–100.0% (of the motor rated voltage)	100.0%	○
P04.15	Motor 1 voltage increase time	Setting range: 0.0–3600.0s	5.0s	○
P04.16	Motor 1 voltage step-down time	Setting range: 0.0–3600.0s	5.0s	○
P04.17	Max. output voltage of motor 1	Setting range: P04.18–100.0% (of the motor rated voltage)	100.0%	◎
P04.18	Min. output voltage of motor 1	Setting range: 0.0%–P04.17 (of the motor rated voltage)	0.0%	◎

Function code	Name	Description	Default	Modify
P04.19	Motor 1 V/F constant power zone weakening coefficient	Setting range: 1.00–1.30	1.00	○
P04.20	Pull-in current 1 in SM 1 V/F control	Setting range: -100.0–100.0% (of the motor rated current)	30.0%	○
P04.21	Pull-in current 2 in SM 1 V/F control	Setting range: -100.0–100.0% (of the motor rated current)	10.0%	○
P04.22	V/F control pull-in current frequency switching point for SM 1	Setting range: 0.0 –200.0% (of the motor rated frequency)	20.0%	○
P04.23	Reactive current closed-loop proportional coefficient in SM 1 V/F control	Setting range: 0–500	50	○
P04.24	V/F control reactive current closed-loop integral time for SM 1	Setting range: 0–300	30	○
P04.25	Reserved	-	-	-
P04.26	Enabling IF mode for motor 1	Setting range: 0–1	0	○
P04.27	Current setting in IF mode for motor 1	Setting range: 0.0–200.0%	120.0%	○
P04.28	Proportional coefficient in IF mode for motor 1	Setting range: 0–5000	350	○
P04.29	Integral coefficient in IF mode for motor 1	Setting range: 0–5000	150	○
P04.30	IF switch-out frequency point for motor 1	Setting range: 0.00Hz–P04.31	10.00Hz	○

Function code	Name	Description	Default	Modify
P04.31	End frequency point for motor 1 switching off IF mode	Setting range: P04.30–P00.03 (Hz)	25.00Hz	○
P04.32	V/F control energy-saving mode selection for AM 1	Setting range: 0–3 0: Disable (Energy-saving is ineffective) 1: Max. efficiency 2:Optimal power factor 3: Max. torque per ampere (MTPA)	0	◎
P04.33	V/F control energy-saving optimization coefficient for AM 1	Setting range: 25.0–400.0%	100.0%	○

Group P05 Input terminals

Function code	Name	Description	Default	Modify
P05.00	HDI input type	Setting range: 0x00–0x22 Ones place: HDI1 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI2 Tens place: HDI2 input type 0: High-speed pulse input 1: Digital 2: Speed measurement pulse input, used together with HDI1	0x00	◎
P05.01	Function of DI1	Setting range: 0–95 0: No function 1: Run forward 2: Run reversely 3: Three-wire running control 4: Jog forward 5: Jog reversely	1	◎
P05.02	Function of DI2		4	◎
P05.03	Function of DI3		7	◎
P05.04	Function of DI4		0	◎
P05.05	Reserved		0	●
P05.06	Reserved		0	●
P05.07	Reserved		0	●

Function code	Name	Description	Default	Modify
P05.08	Reserved	6: Coast to stop	0	●
P05.09	Reserved	7: Fault reset	0	●
P05.10	Reserved	8: Pause running	0	●
P05.11	Function of HDI1	9: External fault input	0	◎
P05.12	Function of HDI2	10: Increase frequency setting (UP) 11: Decrease frequency setting (DOWN) 12: Clear the frequency increase/decrease setting 13: Switch between A setting and B setting 14: Switch between combination setting and A setting 15: Switch between combination setting and B setting 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Pause multi-step speed running 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control 26: Pause wobbling frequency 27: Reset wobbling frequency 28: Counter reset 29: Switch between speed control and torque control 30: Disable ACC/DEC 31: Trigger the counter 32: Reserved 33: Clear the frequency increase/decrease setting temporarily 34: DC braking 35: Switch from motor 1 to motor 2 36: Switch the running command channel to keypad 37: Switch the running command channel	0	◎

Function code	Name	Description	Default	Modify
		to terminal 38: Switch the running command channel to communication 39: Pre-exciting command 40: Clear electricity consumption 41: Keep electricity consumption 42: Switch the setting source of braking torque upper limit to keypad 43: Position reference point input (only valid for S2, S3 and S4) 44: Disable spindle orientation 45: Spindle zeroing / Local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zeroing position selection 2 48: Spindle indexing selection 1 49: Spindle indexing selection 2 50: Spindle indexing selection 3 51: Terminal for switching between position control and speed control 52: Disable pulse input 53: Clear position deviation 54: Switch position proportional gains 55: Enable cyclic digital positioning 56: Emergency stop 57: Motor overtemperature fault input 58: Enable rigid tapping 59: Switch to V/F control 60: Switch to FVC control 61: Switch PID polarities 62: Reserved 63: Enable servo 64: Limit on forward running 65: Limit on reverse running 66: Clear encoder counting 67: Increase pulses 68: Enable pulse superposition 69: Decrease pulses		

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>70: Electronic gear selection
71: Switch to the master
72: Switch to the slave
73: Reset roll diameter
74: Winding/unwinding switchover
75: Tension control pre-driving
76: Disable roll diameter calculation
77: Clear alarm display
78: Manual braking in tension control
79: Trigger a forcible material feeding interrupt signal
80: Initial roll diameter 1
81: Initial roll diameter selection 2
82: Trigger fire mode control
83: Switch tension PID parameters
84: PID pause
85: Thickness switchover selection 1
86: Thickness switchover selection 2
87: Clearing length
88: Reserved
89: Switching between open-loop torque mode and closed-loop speed mode
90: Clear residual pulses
91–95: Reserved</td><td></td><td></td></tr>
<tr><td>P05.13</td><td>Reserved</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P05.14</td><td>Input terminal polarity</td><td>Setting range: 0x000–0xFFF<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4–9</td><td>Bit10</td><td>Bit11</td></tr><tr><td>DI1</td><td>DI2</td><td>DI3</td><td>DI4</td><td>Reserved</td><td>HDI1</td><td>HDI2</td></tr></table></td><td>0x000</td><td>○</td></tr>
<tr><td>P05.15</td><td>Digital input filter time</td><td>Setting range: 0.000–1.000s</td><td>0.010s</td><td>○</td></tr>
<tr><td>P05.16</td><td>Virtual terminal setting</td><td>Setting range: 0x000–0xFFF<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4–9</td><td>Bit10</td><td>Bit11</td></tr><tr><td>DI1</td><td>DI2</td><td>DI3</td><td>DI4</td><td>Reserved</td><td>HDI1</td><td>HDI2</td></tr></table></td><td>0x000</td><td>◎</td></tr>
<tr><td>P05.17</td><td>Terminal control mode</td><td>Setting range: 0–3
0: Two-wire control mode 1
1: Two-wire control mode 2
2: Three-wire control mode 1</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Default	Modify
		3: Three-wire control mode 2		
P05.18	DI1 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.19	DI1 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P05.20	DI2 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.21	DI2 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P05.22	DI3 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.23	DI3 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P05.24	DI4 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.25	DI4 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P05.26–P05.37	Reserved	-	-	-
P05.38	HDI1 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.39	HDI1 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P05.40	HDI2 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P05.41	HDI2 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P05.42	AI1 lower limit	0.00V–P05.44	0.00V	○
P05.43	Corresponding setting of AI1 lower limit	-300.0–300.0%	0.0%	○
P05.44	AI1 upper limit	P05.42–10.00V	10.00V	○
P05.45	Corresponding setting of AI1 upper limit	-300.0–300.0%	100.0%	○
P05.46	AI1 input filter time	0.000–10.000s	0.030s	○
P05.47	AI2 lower limit	-10.00V–P05.49	-10.00V	○
P05.48	Corresponding	-300.0–300.0%	-100.0%	○

Function code	Name	Description	Default	Modify
	setting of AI2 lower limit			
P05.49	AI2 middle value 1	P05.47–P05.51(V)	0.00V	○
P05.50	Corresponding setting of AI2 middle value 1	-300.0–300.0%	0.0%	○
P05.51	AI2 middle value 2	P05.49–P05.53(V)	0.00V	○
P05.52	Corresponding setting of AI2 middle value 2	-300.0–300.0%	0.0%	○
P05.53	AI2 upper limit	P05.51–10.00V	10.00V	○
P05.54	Corresponding setting of AI2 upper limit	-300.0–300.0%	100.0%	○
P05.55	AI2 input filter time	0.000–10.000s	0.030s	○
P05.56–P05.65	Reserved	-	-	-
P05.66	HDI1 lower limit frequency	0.000kHz–P05.68	0.000kHz	○
P05.67	Corresponding setting of HDI1 lower limit frequency	-300.0–300.0%	0.0%	○
P05.68	HDI1 upper limit frequency	P05.66–50.000kHz	50.000 kHz	○
P05.69	Corresponding setting of HDI1 upper limit frequency	-300.0–300.0%	100.0%	○
P05.70	HDI1 frequency input filter time	0.000–10.000(s)	0.030	○
P05.71	HDI2 lower limit frequency	0.000kHz–P05.73	0.000kHz	○
P05.72	Corresponding setting of HDI2 lower limit frequency	-300.0–300.0%	0.0%	○

Function code	Name	Description	Default	Modify
P05.73	HDI2 upper limit frequency	P05.71–50.000kHz	50.000 kHz	○
P05.74	Corresponding setting of HDI2 upper limit frequency	-300.0–300.0%	100.0%	○
P05.75	HDI2 frequency input filter time	0.000–10.000s	0.030s	○
P05.76	AI input signal type selection	0x0–0x3 Bit0: AI1 input signal type selection 0: Voltage 1: Current Bit1: Reserved	0x0	◎

Group P06 Output terminals

Function code	Name	Description	Default	Modify
P06.00	HDO1 output type	Setting range: 0–1 0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, see P06.27–P06.31. 1: Open collector output. For details about the related functions, see P06.02.	0	◎
P06.01	DO1 output	Setting range: 0–63 0: Invalid 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Running in zero speed 10: Upper limit frequency reached	0	○
P06.02	Reserved		0	●
P06.03	Reserved		0	●
P06.04	HDO1 output		0	○
P06.05	RO1 output		1	○
P06.06	RO2 output		5	○
P06.07	Reserved		0	●
P06.08	Reserved		0	●

Function code	Name	Description	Default	Modify
		11: Frequency lower limit reached 12: Ready for running 13: Pre-exciting 14: Overload pre-alarm 15: Underload pre-alarm 16: Simple PLC stage completed 17: Simple PLC cycle completed 18: Set counting value reached 19: Designated counting value reached 20: External fault is valid 21: Reserved 22: Running time reached 23: Modbus/ Modbus TCP communication virtual terminal output 24: PROFIBUS/CANopen/DeviceNet communication virtual terminal output 25: Ethernet communication virtual terminal output 26: DC bus voltage established 27: Z pulse output 28: Superposing pulses 29: STO action 30: Positioning completed 31: Spindle zeroing completed 32: Spindle scale division completed 33: Reserved 34: EtherCAT/PROFINET/EtherNet IP communication virtual terminal output 35: Reserved 36: Speed/position control switchover completed 37: Any frequency reached 38–40: Reserved 41: DO1 from the programmable card 42: DO2 from the programmable card 43: HDO1 from the programmable card 44: RO1 from the programmable card 45: RO2 from the programmable card		

Function code	Name	Description	Default	Modify
		46: RO3 from the programmable card 47: RO4 from the programmable card 48: EAI1 detected OH pre-alarm 49: EAI2 detected OH pre-alarm 50: AIAO detected OT pre-alarm 51: Stopped or running at zero speed 52: Disconnection detected in tension control 53: Tension control specified roll diameter reached 54: Tension control stop roll diameter reached 55: Tension control length reached 56: Fire control mode enabled 57: DI1 terminal status 58: DI2 terminal status 59: DI3 terminal status 60: DI4 terminal status 61: HDI1 terminal status 62: HDI2 terminal status 63: Brake output		
P06.09	Output terminal polarity selection	Setting range: 0x00–0xFF Bit0: DO1; Bit1–2: Reserved; Bit3: HDO1; Bit4: RO1; Bit5: RO2; Bit6–7: Reserved	0x00	○
P06.10	DO1 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P06.11	DO1 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P06.12	DO2 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P06.13	DO2 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P06.14	DO3 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P06.15	DO3 switch-off delay	Setting range: 0.000–50.000s	0.000s	○

Function code	Name	Description	Default	Modify
P06.16	HDO1 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P06.17	HDO1 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P06.18	RO1 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P06.19	RO1 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P06.20	RO2 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P06.21	RO2 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P06.22–P06.25	Reserved	-	-	-
P06.26	AO1 output	Setting range: 0–63 0: Running frequency 1: Set frequency 2: Ramp reference frequency 3: Rotational speed (100% corresponds to the speed corresponding to the max. output frequency) 4: Output current (100% corresponds to twice the VFD rated current) 5: Output current (100% corresponds to twice the motor rated current) 6: Output voltage (100% corresponds to 1.5 times the VFD rated voltage) 7: Output power (100% corresponds to twice the motor rated power) 8: Set torque (100% corresponds to twice the motor rated torque) 9: Output torque (Absolute value, 100% corresponds to twice the motor rated torque) 10: AI1 input 11: AI2 input 12: AI3 input	0	○
P06.27	AO2 output		0	○
P06.28	HDO1 high-speed pulse output		0	○

Function code	Name	Description	Default	Modify
		13: Reserved 14: HDI1 input 15: HDI2 input 16: Value 1 set through Modbus/Modbus TCP communication 17: Value 2 set through Modbus/Modbus TCP communication 18: Value 1 set through PROFIBUS/CANopen/DeviceNet communication 19: Value 2 set through PROFIBUS/CANopen/DeviceNet communication 20: Value 1 set through Ethernet communication 21: Value 2 set through Ethernet communication 22: Value 1 set through EtherCAT/PROFINET/EtherNet IP communication 23: Value 2 set through EtherCAT/ PROFINET/EtherNet IP communication 24: Torque current (100% corresponds to triple the motor rated current) 25: Exciting current (100% corresponds to triple the motor rated current) 26: Set frequency (bipolar) 27: Ramp reference frequency (bipolar) 28: Rotational speed of running (bipolar) 29: AO1 from the programmable card 30: AO2 from the programmable card 31: Rotational speed of running (100% corresponds to the speed at twice the motor rated frequency) 32: Output torque (Actual value, 100% corresponds to twice the motor rated torque) 33: AIAO detected temperature output		

Function code	Name	Description	Default	Modify
		34: Set tension output 35: EAI1 input 36: EAI2 input 37: EAI3 input 38: Reserved 39: EHDI1 input 40–63: Reserved Note: When AO1 uses current output, 100% indicates the output of 20mA; when AO1 uses voltage output, 100% indicates the output of 10V. For HDO1, 100% corresponds to the output of P06.44.		
P06.29	AO1 output lower limit	-300.0%–P06.31	0.0%	○
P06.30	AO1 output corresponding to lower limit	0.00–10.00V	0.00V	○
P06.31	AO1 output upper limit	P06.29–300.0%	100.0%	○
P06.32	AO1 output corresponding to upper limit	0.00–10.00V	10.00V	○
P06.33	AO1 output filter time	0.000–10.000s	0.000s	○
P06.34	AO2 output lower limit	-300.0%–P06.36	0.0%	○
P06.35	AO2 output corresponding to lower limit	0.00–10.00V	0.00V	○
P06.36	AO2 output upper limit	P06.34–300.0%	100.0%	○
P06.37	AO2 output corresponding to upper limit	0.00–10.00V	10.00V	○
P06.38	AO2 output filter time	0.000–10.000s	0.000s	○
P06.39	AO output type	0x0–0x3	0x0	◎

Function code	Name	Description	Default	Modify
	(reserved)	Bit0: AO1 output signal selection 0: Voltage 1: Current Bit1: AO2 output signal selection 0: Voltage 1: Current		
P06.40	AO1 output current setting (reserved)	0.000–20.000mA	4.000mA	○
P06.41	AO2 output current setting (reserved)	0.000–20.000mA	4.000mA	○
P06.42	HDO1 output lower limit	-300.0%–P06.44	0.0%	○
P06.43	HDO1 output corresponding to lower limit	0.00–50.00kHz	0.00kHz	○
P06.44	HDO1 output upper limit	P06.42–300.0%	100.0%	○
P06.45	HDO1 output corresponding to upper limit	0.00–50.00kHz	50.00kHz	○
P06.46	HDO1 output filter time	0.000–10.000s	0.000s	○
P06.47	AI/AO temperature detection option	0x000–0x014 Ones place: Temperature sensor type 0: None 1: PT100 2: PT1000 3: KTY84 4: PTC Tens place: AI input source 0: AI1 1: AI2 (Reserved) Hundreds place: Reserved Usage: To select current-type output for AO1, connect one end of the temperature	0x000	○

Function code	Name	Description	Default	Modify
		resistor to AI1 (voltage-type) and AO1 (current-type), and the other end to GND. When using HVAC, the wiring method for measuring PTC sensors is as follows: Connect the PTC sensor between the +10V terminal and AI1, and it can only measure resistances ranging from 1.5kΩ to 30.0kΩ.		
P06.48	AIAO detected temperature OT protection threshold	0.0–200.0°C	110.0°C	○
P06.49	AIAO detected temperature OT pre-alarm threshold	0.0–200.0°C	90.0°C	○
P06.50	AI/AO detected temperature calibration value	-20.0–200.0°C	0.0°C	○
P06.51	AIAO detected temperature	-20.0–200.0°C	0.0°C	/●
P06.52	Reserved	0–0	0	●
P06.53	Actual PTC resistance	0–60000Ω	0Ω	●
P06.54	PTC resistance alarm threshold	0–60000Ω	750Ω	○
P06.55	PTC resistance alarm reset threshold	0–60000Ω	150Ω	○
P06.56	PTC calibration	0–100	50	○

Group P07 Human-machine interface (HMI)

Function code	Name	Description	Default	Modify
P07.00	User password	By default, the user password is not enabled (the default value is 0). When you set the function code to a non-zero	0	○

Function code	Name	Description	Default	Modify
		number, password protection is enabled. If you set the function code to 00000, the previous user password is cleared and password protection is disabled. After the user password setting takes effect, you need to enter the password to view or edit parameters. Please remember your password and save it in a secure place. After you exit the function code editing interface, the password protection function is enabled within 1 minute. If password protection is enabled,"0.0.0.0.0" is displayed when you press the PRG/ESC key again to enter the function code editing interface. You need to enter the correct user password to enter the interface. Setting range: 0–65535		
P07.01	Reserved	-	-	-
P07.02	Function of QUICK/JOG key	Setting range: 0x00–0x27 Ones place: Function of QUICK/JOG 0: No function 1: Jog 2: Reserved 3: Switch between forward and reverse rotating 4: Clear the UP/DOWN setting 5: Coast to stop 6: Switch command channels in sequence 7: Reserved Tens place: Reserved	0x01	◎
P07.03	Sequence of switching running-command channels by pressing	The function code is used to set the sequence of switching running-command channels by pressing the key when P07.02=6. Setting range: 0–3	0	○

Function code	Name	Description	Default	Modify
	QUICK/JOG	0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication		
P07.04	Stop function validity of STOP/RST	Specifies the validness range of the STOP/RST stop function. For fault reset, STOP/RST is valid in any conditions. Setting range: 0–3 0: Valid for keypad control only 1: Valid both for keypad and terminal control 2: Valid both for keypad and communication control 3: Valid for all control modes	0	○
P07.05	Selection 1 of parameters displayed in running state	Setting range: 0x0000–0xFFFF Bit 0: Running frequency (Hz on) Bit 1: Set frequency (Hz blinking) Bit 2: Bus voltage (V on) Bit3: Output voltage (V on) Bit4: Output current (A on) Bit5: Running speed (rpm on) Bit6: Output power (% on) Bit7: Output torque (% on) Bit8: PID reference value (% blinking) Bit 9: PID feedback value (% on) Bit10: Input terminal state Bit11: Output terminal status Bit12: Set torque (% on) Bit13: Pulse count value Bit14: Motor overload percentage (% on) Bit15: Current step number of PLC	0x03FF	○
P07.06	Selection 2 of parameters displayed in running state	Setting range: 0x0000–0xFFFF Bit0: AI1 (V on) Bit 1: AI2 value (V on) Bit2: AI3 (V on) Bit3: High-speed pulse HDI1 frequency Bit4: High-speed pulse HDI2 frequency	0x0000	○

Function code	Name	Description	Default	Modify
		Bit5: VFD overload percentage (% on) Bit6: Ramp frequency reference (Hz on) Bit7: Linear speed Bit 8: AC incoming current Bit 9: Frequency upper limit Bit10–bit15: Reserved		
P07.07	Reserved	-	-	-
P07.08	Selection of parameters displayed in stopped state	Setting range: 0x0000–0xFFFF Bit0: Set frequency (Hz on, blinking slowly) Bit 1: Bus voltage (V on) Bit2: Input terminal state Bit3: Output terminal state Bit4: PID reference value (% blinking) Bit 5: PID feedback value (% on) Bit6: Set torque (% on) Bit 7: AI1 value (V on) Bit 8: AI2 value (V on) Bit9: AI3 (V on) Bit10: High-speed pulse HDI1 frequency Bit11: High-speed pulse HDI2 frequency Bit 12: Counting value Bit 13: PLC and current step number of multi-step speed Bit 14: Frequency upper limit Bit15: Reserved	0x00FF	○
P07.09–P07.10	Reserved	-	-	-
P07.11	Rectifier bridge temperature	Setting range: -20.0–120.0°C	0.0°C	●
P07.12	Inverter module temperature	Setting range: -20.0–120.0°C	0.0°C	●
P07.13	Control board software version	Setting range: 1.00–655.35	Version depended	●
P07.14	Drive software version	Setting range: 1.00–655.35	Version depended	●
P07.15	Software version (FPGA)	Setting range: 1.00–655.35	Version depended	●

Function code	Name	Description	Default	Modify
P07.16	Reserved	-	-	-
P07.17	VFD model	Setting range: 0x0000–0xFFF1 Bit0–bit1: G type or P type 0X0: G type 0x1: P type Bit2–bit3: Chip model 0x0: First model 0x1: Second model 0x2: Third model 0x3: Fourth model Bit4–bit11: Chip type and manufacturer 0x00: DSP(TI) 0x01–0x20: Reserved 0x21: MCU(ST) 0x22–0xFF: Reserved Bit12–bit15: VFD series 0x0: GD350 0x1: GD350A 0x2: GD350-UL 0x3: GD350 IP55 0x4: GD350N 0x5: GD350NA 0x6: GD350N-UL 0x7: GD350N IP55 0x8: GD350C 0x9–0xF: Reserved **Note:** Bit4–bit8 indicate the chip manufacturer (such as TI, ST), while Bit9–bit11 indicate the chip type (such as DSP, MCU).	Model depended	●
P07.18	VFD rated power	Setting range: 0.4–3000.0kW	0.4	●
P07.19	VFD rated voltage	Setting range: 50–1200V	380	●
P07.20	VFD rated current	Setting range: 0.1–6000.0A	0.1	●
P07.21	Factory bar code 1	Setting range: 0x0000–0xFFFF	Model depended	●
P07.22	Factory bar code 2	Setting range: 0x0000–0xFFFF	Model depended	●

Function code	Name	Description	Default	Modify
P07.23	Factory bar code 3	Setting range: 0x0000–0xFFFF	Model depended	●
P07.24	Factory bar code 4	Setting range: 0x0000–0xFFFF	Model depended	●
P07.25	Factory bar code 5	Setting range: 0x0000–0xFFFF	Model depended	●
P07.26	Factory bar code 6	Setting range: 0x0000–0xFFFF	Model depended	●
P07.27	Present fault type	Setting range: 0–100 0: No fault 1: Inverter unit U-phase protection (E1) 2: Inverter unit V-phase protection (E2) 3: Inverter unit W-phase protection (E3) 4: Overcurrent during acceleration (E4) 5: Overcurrent during deceleration (E5) 6: Overcurrent during constant speed running (E6) 7: Overvoltage during acceleration (E7) 8: Overvoltage during deceleration (E8) 9: Overvoltage during constant speed running (E9) 10: DC bus undervoltage (E10) 11: Motor overload (E11) 12: VFD overload (E12) 13: Phase loss on input side (E13) 14: Phase loss on output side (E14) 15: Rectifier module overheat (E15) 16: Inverter module overheat (E16) 17: External fault (E17) 18: Modbus/Modbus TCP communication fault (E18) 19: Current detection fault (E19) 20: Motor autotuning fault (E20) 21: EEPROM operation error (E21) 22: PID feedback offline (E22) 23: Reserved 24: Running time reached (E24)	0	●
P07.28	Last fault type		0	●
P07.29	2nd-last fault type		0	●
P07.30	3rd-last fault type		0	●
P07.31	4th-last fault type		0	●
P07.32	5th-last fault type		0	●

Function code	Name	Description	Default	Modify
		25: Electronic overload (E25) 26: Keypad communication error (E26) 27: Parameter upload error (E27) 28: Parameter download error (E28) 29: PROFIBUS communication fault (E29) 30: Reserved 31: CANopen communication fault (E31) 32: To-ground short-circuit fault 1 (E32) 33: To-ground short-circuit fault 2 (E33) 34: Speed deviation fault (E34) 35: Mal-adjustment fault (E35) 36: Underload fault (E36) 37: Encoder disconnection (E37) 38: Encoder reversal (E38) 39: Encoder Z-pulse disconnection (E39) 40: Safe torque off (E40) 41: Exception occurred to safety circuit of channel 1 (E41) 42: Exception occurred to safety circuit of channel 2 (E42) 43: Exception occurred to channel 1 and channel 2 (E43) 44: Safety code FLASH CRC fault (E44) 45: Programmable card customized fault 1 (E45) 46: Programmable card customized fault 2 (E46) 47: Programmable card customized fault 3 (E47) 48: Programmable card customized fault 4 (E48) 49: Programmable card customized fault 5 (E49) 50: Programmable card customized fault 6 (E50) 51: Programmable card customized fault 7 (E51) 52: Programmable card customized fault 8		

Function code	Name	Description	Default	Modify
		(E52) 53: Programmable card customized fault 9 (E53) 54: Programmable card customized fault 10 (E54) 55: Repetitive expansion card type (E55) 56: Encoder UVW loss fault (E56) 57: PROFINET communication fault (E57) 58: CAN communication fault (E58) 59: Motor overtemperature fault (E59) 60: Failure to identify the card at slot 1 (E60) 61: Failure to identify the card at slot 2 (E61) 62: Failure to identify the card at slot 3 (E62) 63: Communication timeout of the card in slot 1 (E63) 64: Communication timeout of the card in slot 2 (E64) 65: Communication timeout of the card in slot 3 (E65) 66: EtherCAT communication fault (E66) 67–68: Reserved 69:aster/slave synchronous CAN slave fault (E69) 70–81: Reserved 82: EAI1 detected overtemperature fault (E82) 83: EAI2 detected overtemperature fault (E83) 84–91: Reserved 92: AI1 disconnection (E92) 93: AI2 disconnection (E93) 94: Reserved 95: EtherNet IP communication timeout (E95) 96: No upgrade bootload (E96)		

Function code	Name	Description	Default	Modify
		97: Low battery (E209) 98: Position overtravel (E630) 99. DEC time setting error (E631) 100: Position tracking deviation exceeds limit (E632)		
P07.33	Running frequency at present fault	Setting range: 0.00Hz–P00.03	0.00Hz	●
P07.34	Ramp reference frequency at present fault	Setting range: 0.00Hz–P00.03	0.00Hz	●
P07.35	Output voltage at present fault	Setting range: 0–1200V	0V	●
P07.36	Output current at present fault	Setting range: 0.0–6300.0A	0.0A	●
P07.37	Bus voltage at present fault	Setting range: 0.0–2000.0V	0.0V	●
P07.38	Temperature at present fault	Setting range: -20.0–120.0°C	0.0°C	●
P07.39	Input terminal status at present fault	Setting range: 0x0000–0xFFFF	0x0000	●
P07.40	Output terminal status at present fault	Setting range: 0x0000–0xFFFF	0x0000	●
P07.41–P07.43	Reserved	-	-	-
P07.44	Running frequency at last fault	0.00Hz–P00.03	0.00Hz	●
P07.45	Ramp reference frequency at last fault	0.00Hz–P00.03	0.00Hz	●
P07.46	Output voltage at last fault	0–1200V	0V	●
P07.47	Output current at last fault	0.0–6300.0A	0.0A	●
P07.48	Bus voltage at last fault	0.0–2000.0V	0.0V	●

Function code	Name	Description	Default	Modify
P07.49	Temperature at last fault	-20.0–120.0°C	0.0°C	●
P07.50	Input terminal status at last fault	0x0000–0xFFFF	0x0000	●
P07.51	Output terminal status at last fault	0x0000–0xFFFF	0x0000	●
P07.52–P07.54	Reserved	-	-	-
P07.55	Running frequency at 2nd-last fault	0.00Hz–P00.03	0.00Hz	●
P07.56	Ramp reference frequency at 2nd-last fault	0.00Hz–P00.03	0.00Hz	●
P07.57	Output voltage at 2nd-last fault	0–1200V	0V	●
P07.58	Output current at 2nd-last fault	0.0–6300.0A	0.0A	●
P07.59	Bus voltage at 2nd-last fault	0.0–2000.0V	0.0V	●
P07.60	Temperature at 2nd-last fault	-20.0–120.0°C	0.0°C	●
P07.61	Input terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000	●
P07.62	Output terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000	●
P07.63–P07.71	Reserved	-	-	-
P07.72	Frequency display coefficient	0.01–10.00	1.00	○
P07.73	Rotational speed display coefficient	0.1–999.9%	100.0%	○
P07.74	Linear speed display coefficient	0.1–999.9%	1.0%	○
P07.75	Local accumulative	0–65535h	0h	●

Function code	Name	Description	Default	Modify
	running time			
P07.76	VFD electricity consumption MSB	0–65535kkWh	0kkWh	●
P07.77	VFD electricity consumption LSB	0.0–999.9kWh	0.0kWh	●

Group P08 Enhanced functions

Function code	Name	Description	Default	Modify
P08.00	ACC time 2	Setting range: 0.0–3600.0s	Model depended	○
P08.01	DEC time 2	Setting range: 0.0–3600.0s	Model depended	○
P08.02	ACC time 3	Setting range: 0.0–3600.0s	Model depended	○
P08.03	DEC time 3	Setting range: 0.0–3600.0s	Model depended	○
P08.04	ACC time 4	Setting range: 0.0–3600.0s	Model depended	○
P08.05	DEC time 4	Setting range: 0.0–3600.0s	Model depended	○
P08.06	Switching frequency of ACC/DEC time	Setting range: 0.00Hz–P00.03 (Max. output frequency) 0.00Hz, no switchover.☒ If the running frequency is greater than P08.19, switch to ACC/DEC time 2.	0.00Hz	○
P08.07	Reference frequency of ACC/DEC time	Setting range: 0–2 0: Max. output frequency 1: Set frequency 2: 100Hz **Note:** Valid for straight ACC/DEC only.	0	◎
P08.08	Running frequency of jog	Setting range: 0.00Hz–P00.03	5.00Hz	○
P08.09	ACC time for jogging	Setting range: 0.0–3600.0s	Model depended	○
P08.10	DEC time for	Setting range: 0.0–3600.0s	Model	○

Function code	Name	Description	Default	Modify
	jogging		depended	
P08.11	Jump frequency 1	The VFD can avoid mechanical resonance points by setting jump frequencies. When the set frequency is within the range of jump frequency, the VFD runs at the boundary of jump frequency. The VFD supports the setting of three jump frequencies. If the jump frequency points are set to 0, this function is invalid. Setting range: 0.00Hz–P00.03 (Max. output frequency)	0.00Hz	○
P08.12	Jump frequency amplitude 1		0.00Hz	○
P08.13	Jump frequency 2		0.00Hz	○
P08.14	Jump frequency amplitude 2		0.00Hz	○
P08.15	Jump frequency 3		0.00Hz	○
P08.16	Jump frequency amplitude 3		0.00Hz	○
P08.17	Wobbling frequency amplitude percentage	Setting range: 0.0–100.0% (of the set frequency)	0.0%	○
P08.18	Amplitude of sudden jump frequency	Setting range: 0.0–50.0% (of the amplitude of wobbling frequency)	0.0%	○
P08.19	Rise time of wobbling frequency	Setting range: 0.1–3600.0s	5.0s	○
P08.20	Fall time of wobbling frequency	Setting range: 0.1–3600.0s	5.0s	○
P08.21	Output torque display filter times	Setting range: 0–8 **Note:** A smaller value indicates faster filtering and quicker response.	0	◎
P08.22	Output torque display selection	Setting range: 0–1 0: Based on torque current 1: Based on output power	0	○
P08.23	Number of decimal points of frequency	Setting range: 0–1 0: Two 1: One	0	○
P08.24	Number of decimal places of linear speed	Setting range: 0–3 0: None 1: One 2: Two	0	○

Function code	Name	Description	Default	Modify
		3: Three		
P08.25	Set counting value	Setting range: P08.26–65535	0	○
P08.26	Designated counting value	Setting range: 0–P08.25	0	○
P08.27	Set running time	Setting range: 0–65535min	0min	○
P08.28	Auto fault reset count	Specifies the number of automatic fault reset times when the VFD uses automatic fault reset. When the number of continuous reset times exceeds the value, the VFD reports a fault and stops. After VFD starts, If no fault occurred within 600s after the VFD starts, the number of automatic fault reset times is cleared. Setting range: 0–10	0	○
P08.29	Auto fault reset interval	Specifies the time interval from when a fault occurred to when automatic fault reset takes effect. Setting range: 0.1–3600.0s	1.0s	○
P08.30	Reserved	-	-	-
P08.31	Channel for switching between motor 1 and motor 2	Setting range: 0x00–0x15 Ones place: Switchover channel 0: Terminal 1: Modbus/Modbus TCP communication 2: PROFIBUS/CANopen/DeviceNet communication 3: Ethernet communication 4: EtherCAT/PROFINET/ EtherNet IP communication 5: Reserved Tens place: indicates whether to enable switchover during running 0: Disable 1: Enable	0x00	◎
P08.32	FDT1 electrical level detection value	Used to view the FDT1 electrical level detection value. When the output frequency exceeds the corresponding frequency of FDT electrical level, the	Model depended	○

Function code	Name	Description	Default	Modify
		multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value). Setting range: 0.00Hz–P00.03 (Max. output frequency)		
P08.33	FDT1 lagging detection value	Used to view the FDT1 lagging detection value. When the output frequency exceeds the corresponding frequency of FDT electrical level, the multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value). Setting range: 0.0–100.0% (relative to FDT1 electrical level)	5.0%	○
P08.34	FDT2 electrical level detection value	Used to view the FDT2 electrical level detection value. When the output frequency exceeds the corresponding frequency of FDT electrical level, the multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value). Setting range: 0.00Hz–P00.03 (Max. output frequency)	Model depended	○
P08.35	FDT2 lagging detection value	Used to view the FDT2 lagging detection value. When the output frequency exceeds the corresponding frequency of FDT	5.0%	○

Function code	Name	Description	Default	Modify
		electrical level, the multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value). Setting range: 0.0–100.0% (relative to FDT2 electrical level)		
P08.36	Detection value for frequency being reached	When the output frequency is within the detection range, the multifunction digital output terminal outputs the signal of "Frequency reached". Setting range: 0.00Hz–P00.03 (Max. output frequency) **Note:** It corresponds to DO function 8, a frequency signal is output when it is at the set frequency ±P08.36.	0.00Hz	○
P08.37	Detection value for any frequency reached	Setting range: 0.00Hz–P00.03	1.00Hz	○
P08.38	Detection time for any frequency being reached	Setting range: 0.0–3600.0s	0.5s	○
P08.39	Enabling dynamic braking	Setting range: 0–1 0: Disable 1: Enable	1	○
P08.40	Dynamic braking threshold voltage	Setting range: 200.0–2000.0V For 220V: 380.0V For 380V: 700.0V For 660V: 1120.0V	Model depended	○
P08.41	Cooling-fan running mode	Setting range: 0x0–0x2 Ones place: Run mode 0: Normal mode 1: Permanent running after power-on 2: Run mode 2 **Note:** In addition to the running	0x0	○

Function code	Name	Description	Default	Modify
		requirements in normal run mode, Run mode 2 has the feature that the fan can only run when the ramp frequency is greater than 0.		
P08.42	PWM selection	Setting range: 0x0000–0x1223 Ones place: PWM mode selection 0: Switch from SVPWM to DPWM-U overmodulation 1: SPWM overmodulation throughout the entire process 2: Low harmonic SVPWM modulation (valid when the thousands place is 0) 3: Switch from SVPWM to DPWM-I (valid when the thousands place is 0) Tens place: PWM low-speed carrier frequency limit 0: Low-speed carrier frequency limit mode 1 1: Low-speed carrier frequency limit mode 2 2: No limit on low-speed carrier frequency Hundreds place: Deadzone compensation method 0: Compensation method 1 1: Compensation method 2 (only for vector control) 2: Compensation method 3 (only for vector control) Thousands place: SVPWM mode selection 0: SVPWM using three-order harmonic injection method 1: Traditional SPWM	0x1101	◎
P08.43	Overmodulation selection	Setting range: 0x0000–0x1111 Ones place: 0: Disable 1: Overmodulation enabled Tens place: 0: Deepened overmodulation disabled	0x0001	◎

Function code	Name	Description	Default	Modify
		1: Deepened overmodulation enabled Hundreds place: Carrier frequency limit 0:Yes 1:No Thousands place: Reserved		
P08.44	UP/DOWN terminal control setting	Setting range: 0x000–0x221 Ones place: Whether the setting made through UP/DOWN is valid. 0: The setting made through UP/DOWN is valid. 1: The setting made through UP/DOWN is invalid. Ones place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority Hundreds place: Action selection for stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received	0x000	○
P08.45	LED keypad potentiometer integral rate	Setting range: 0.01–10.00s	0.10s	○
P08.46	UP/DOWN terminal control setting	Setting range: 0x000–0x221 Ones place: Frequency setting selection 0: The setting made through UP/DOWN is valid. 1: The setting made through UP/DOWN is invalid. Tens place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the	0x000	○

Function code	Name	Description	Default	Modify
		priority Hundreds place: Action selection for stop 0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received		
P08.47	Frequency integral rate of the UP terminal	Setting range: 0.01Hz/s–P00.03/s	0.50Hz/s	○
P08.48	Frequency integral rate of the DOWN terminal	Setting range: 0.01Hz/s–P00.03/s	0.50Hz/s	○
P08.49	Action selection at power-off during frequency setting	Setting range: 0x000–0x111 Ones place: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off. 1: Clear the setting at power-off. Tens place: Action selection at power-off during frequency adjusting through MODBUS communication 0: Save the setting at power-off. 1: Clear the setting at power-off. Hundreds place: Action selection at power-off during frequency setting through DP communication 0: Save the setting at power-off. 1: Clear the setting at power-off.	0x000	○
P08.50	Initial electricity consumption MSB	Setting range: 0–59999kkWh	0kkWh	○
P08.51	Initial electricity consumption LSB	Setting range: 0.0–999.9kWh	0.0kWh	○
P08.52	Magnetic flux braking	Setting range: 0–150 **Note:** 0: Invalid; 100–150: A greater coefficient indicates greater braking strength.	0	○
P08.53	Reserved	-	-	-

Function code	Name	Description	Default	Modify
P08.54	VFD input power factor	Setting range: 0.00–1.00	0.56	○
P08.55	STO lock selection	Setting range: 0–1 0: Lock upon STO alarm 1: No lock upon STO alarm **Note:** "Lock upon an STO alarm" indicates resetting is required after state restoration if STO occurs. "No lock upon STO alarm" indicates the STO alarm disappears automatically after state restoration if STO occurs.	0	○
P08.56–P08.57	Reserved	-	-	-
P08.58	Enabling auto carrier frequency reduction	Setting range: 0–1 0: Disable 1: Enable	0	○
P08.59	Min. carrier frequency	Setting range: 1.0–15.0kHz	Model depended	●
P08.60	Temperature point of auto carrier frequency reduction	Setting range: 40.0–85.0°C	70.0°C	○
P08.61	Interval of carrier frequency reduction	Setting range: 0–30min	10min	○
P08.62	Frequency threshold of the start of drop control	Setting range: 0.00Hz–P00.03	2.00Hz	○
P08.63	Frequency decrease ratio in drop control	Setting range: 0.00Hz–P00.03	0.00Hz	○
P08.64	Output current filter time	Setting range: 0.000–10.000s	0.000s	○
P08.65	Reserved	-	-	-
P08.66	DPWM switching frequency point	Setting range: 0.0–100.0%	25.0%	○

Function code	Name	Description	Default	Modify
P08.67	Random PWM modulation depth	Setting range: 0.0–100.0%	0.0%	○
P08.68	Reserved	-	-	-
P08.69	DC bus voltage sampling delay compensation	Setting range: 0–2000	0	○
P08.70–P08.71	Reserved	-	-	-
P08.72	Process application macro	Setting range: 0–3 0: Disable 1: High-speed fan application macro 2: Centrifugal machine application macro 3: Oil pumping unit application macro	0	◎
P08.73–P08.76	Reserved	-	-	-
P08.77	Deadzone compensation calibration coefficient	Setting range: 0.0–200.0%	90.0%	○
P08.78	Deadzone compensation offset	Setting range: 0–1000	27	○
P08.79	Max. current	Setting range: 0–40960 (0 indicates invalid.)	0	○
P08.80	Deadzone identification current step number	Setting range: 0–64	0	○
P08.81	Reserved	-	-	-
P08.82	Star-connected motor speed setting	Setting range: 0–1000rpm	20rpm	○
P08.83	Star-connected current limit	Setting range: 0.0–100.0%	20.0%	○
P08.84	Stop mode selection	Setting range: 0–2 0: Coast to stop 1: Reserved	0	○

Function code	Name	Description	Default	Modify
		2: Star shorting		
P08.85	Servo lock time after brake closing	Setting range: 0.0–30.0s	1.0s	○
P08.86	Electromagnetic brake closing delay	Setting range: 0.0–30.0s	2.0s	○
P08.87	Brake closing speed limit	Setting range: 0–1000rpm	5rpm	○
P08.88	Brake release delay	Setting range: 0.0–30.0s	2.0s	○

Group P09 PID control

Function code	Name	Description	Default	Modify
P09.00	PID reference source	The function code is used to determine the target given channel during the PID process. Setting range: 0–25 0: Set by P09.01 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2	0	○

Function code	Name	Description	Default	Modify
		21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated PID setting channel for specialized equipment **Note:** The set target of process PID is a relative value, for which 100% equals 100% of the feedback signal of the controlled system. The system always calculates a related value (0.0–100.0%).		
P09.01	PID digital setting	Setting range: -100.0%–100.0%	0.0%	○
P09.02	PID feedback source	The function code is used to select the PID feedback channel. Setting range: 0–25 0: Reserved 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1	1	○

Function code	Name	Description	Default	Modify
		24: Reserved 25: Dedicated PID setting channel for specialized equipment **Note:** The reference channel and feedback channel cannot be duplicated. Otherwise, effective PID control cannot be achieved.		
P09.03	PID output characteristics selection	Setting range: 0–1 0: PID output is positive. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will decrease to balance the PID. Example: PID control on strain during winding. 1: PID output is negative. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will increase to balance the PID. Example: PID control on tension during unwinding.	0	○
P09.04	Proportional gain (Kp)	The function code is used to set the proportional gain P of PID input. Setting range: 0.00–100.00	1.00	○
P09.05	Integral time (Ti)	Determines the speed of the integral adjustment on the deviation of PID feedback and reference from the PID regulator. Setting range: 0.00–10.00s	0.90s	○
P09.06	Differential time (Td)	Determines the strength of the change ratio adjustment on the deviation of PID feedback and reference from the PID regulator. Setting range: 0.00–10.00s	0.00s	○
P09.07	Low frequency point for PID parameter switching	Setting range: 0.00Hz–P09.11	5.00Hz	○
P09.08	High-frequency	Setting range: 0.00–100.00	1.80	○

Function code	Name	Description	Default	Modify
	proportional gain (Kp)			
P09.09	High-frequency integral time (Ti)	Setting range: 0.00–10.00s	0.90s	○
P09.10	High-frequency differential time (Td)	Setting range: 0.00–10.00s	0.00s	○
P09.11	High frequency point for PID parameter switching	Setting range: P09.07–P00.03 (Hz)	10.00Hz	○
P09.12	Sampling cycle (T)	Setting range: 0.001–1.000s	0.001s	○
P09.13	PID control deviation limit	Setting range: 0.0–100.0%	0.0%	○
P09.14	PID output upper limit	setting range: P09.15–100.0% (of the max. frequency or max. voltage)	100.0%	○
P09.15	PID output lower limit	setting range: -100.0%–P09.14 (of the max. frequency or max. voltage)	0.0%	○
P09.16	Feedback offline detection value	Setting range: 0.0–100.0%	0.0%	○
P09.17	Feedback offline detection time	Setting range: 0.0–3600.0s	1.0s	○
P09.18	PID control selection	Setting range: 0x0000–0x1111 Ones place: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens place: 0: Same as the main reference direction 1: Contrary to the main reference direction Hundreds place: 0: Limit as per the max. frequency 1: Limit as per A frequency Thousands place: 0: A+B frequency. ACC/DEC of main reference A frequency source precharging	0x0001	○

Function code	Name	Description	Default	Modify
		is invalid. 1: A+B frequency. Acceleration /deceleration of main reference A frequency source precharging is valid. **Note:** The ACC/DEC time corresponding to the thousands place is determined by ACC time 4 of P08.04.		
P09.19	ACC/DEC time of PID command	Setting range: 0.0–1000.0s	0.0s	○
P09.20	PID output filter time	Setting range: 0.000–10.000s	0.000s	○

Group P10 Simple PLC and multi-step speed control

Function code	Name	Description	Default	Modify
P10.00	Simple PLC mode	Setting range: 0–2 0: Stop after running once. The VFD stops automatically after running for one cycle, and it can be started only after receiving the running command. 1: Keep running in the final value after running for one cycle. The VFD keeps the running frequency and direction of the last section after a single cycle. 2: Cyclic running. The VFD enters the next cycle after completing one cycle until receiving the stop command.	0	○
P10.01	Simple PLC memory selection	Setting range: 0–1 0: Do not memorize at power outage 1: Memorize at power outage The PLC memories its running stage and running frequency before power-off.	0	○
P10.02	Multi-step speed 0	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.03	Running time of step 0	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○

Function code	Name	Description	Default	Modify
P10.04	Multi-step speed 1	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.05	Running time of step 1	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.06	Multi-step speed 2	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.07	Running time of step 2	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.08	Multi-step speed 3	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.09	Running time of step 3	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.10	Multi-step speed 4	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.11	Running time of step 4	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.12	Multi-step speed 5	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.13	Running time of step 5	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.14	Multi-step speed 6	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.15	Running time of step 6	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.16	Multi-step speed 7	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.17	Running time of step 7	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.18	Multi-step speed 8	Setting range: -300.0–300.0% The setting 100.0% corresponds to the	0.0%	○

Function code	Name	Description	Default	Modify
		max. output frequency (P00.03).		
P10.19	Running time of step 8	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.20	Multi-step speed 9	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.21	Running time of step 9	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.22	Multi-step speed 10	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.23	Running time of step 10	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.24	Multi-step speed 11	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.25	Running time of step 11	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.26	Multi-step speed 12	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.27	Running time of step 12	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.28	Multi-step speed 13	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.29	Running time of step 13	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.30	Multi-step speed 14	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.31	Running time of step 14	Setting range: 0.0–6553.5s (min) The time unit is specified by P10.37.	0.0s (min)	○
P10.32	Multi-step speed 15	Setting range: -300.0–300.0% The setting 100.0% corresponds to the max. output frequency (P00.03).	0.0%	○
P10.33	Running time of	Setting range: 0.0–6553.5s (min)	0.0s (min)	○

Function code	Name	Description	Default	Modify
	step 15	The time unit is specified by P10.37.		
P10.34	ACC/DEC time of steps 0–7 of simple PLC	Setting range: 0x0000–0xFFFF	0x0000	○
P10.35	ACC/DEC time of steps 8–15 of simple PLC	Setting range: 0x0000–0xFFFF	0x0000	○
P10.36	PLC restart mode	Setting range: 0–1 0: Restart from step 1 Restart from the first step, namely if the VFD stops during running (caused by stop command, fault or power down), it will run from the first step after restart. 1: Resume from the paused step If the VFD stops during running (caused by stop command or fault), it records the running time of current step. It enters this step automatically after restart, and then continues running at the frequency defined by this step in the remaining time.	0	◎
P10.37	Multi-step time unit	Setting range: 0–1 0: second; the running time of each step is counted in seconds 1: minute; the running time of each step is counted in minutes	0	◎

Group P11 Protection parameters

Function code	Name	Description	Default	Modify

Function code	Name	Description	Default	Modify
P11.00	Protection against phase loss	Setting range: 0x000–0x111 Ones place: 0: Disable software input phase loss protection. 1: Enable software input phase loss protection. Tens place: 0: Output phase loss protection disabled 1: Protection against output phrase loss enabled Hundreds place: 0: Disable hardware input phase loss protection. 1: Enable hardware input phase loss protection. **Note:** Default value for 2.2kW and below: 0x011, default value for above 2.2kW: 0x110.	Model depended	○
P11.01	Frequency drop at transient power-off	Setting range: 0–1 0: Disable 1: Enable	0	○
P11.02	Enabling dynamic braking in standby mode	Setting range: 0–1 0: Disable 1: Enable	1	◎
P11.03	Overvoltage stalling protection	Setting range: 0–1 0: Disable 1: Enable	1	○
P11.04	Overvoltage stalling protection voltage	380V: 120–150% (standard bus voltage)	136%	○
		220V: 120–150% (standard bus voltage)	120%	
P11.05	Current limit mode	During accelerated running, as the load is too large, the actual acceleration rate of motor is lower than that of output frequency. To prevent the VFD trip due to overcurrent during acceleration, take the current limit measures. Setting range: 0x000–0x111	0x001	◎

Function code	Name	Description	Default	Modify
		Ones place: Current limit action selection 0: Invalid 1: Always valid Tens place: Action selection upon hardware current limit overload 0:The VFD stops upon a hardware current limit overload fault 1: Keep running Hundreds place: SM hardware current limit action enabling 0: Disable 1: Enable **Note:** The hundreds place is controlled by the ones place; if the ones place is 0, the hundreds place is inactive.		
P11.06	Automatic current limit threshold	Setting range: 50.0–200.0% (of the rated VFD output current)	160.0%	◎
P11.07	Frequency drop rate during current limit	Setting range: 0.00Hz/s–P00.03/s	10.00 Hz/s	◎
P11.08	Pre-alarm selection for VFD/motor OL/UL	Setting range: 0x0000–0x1132 Ones place: Overload/underload (OL/UL) pre-alarm detection method 0: Motor OL/UL pre-alarm, relative to the motor rated current. 1: VFD OL/UL pre-alarm, relative to the VFD rated current. 2: Motor output torque OL/UL pre-alarm, relative to motor rated torque. Tens place: Action selection after OL/UL fault condition is triggered 0: The VFD continues to work, while keeping the OL/UL pre-alarm. 1: For a UL fault, the VFD continues to work, while keeping the pre-alarm; for an OL fault, it reports the fault and stops. 2: For an OL fault, the VFD continues to	0x0000	○

Function code	Name	Description	Default	Modify
		work, while keeping the pre-alarm; for a UL fault, it reports the fault and stops. 3: The VFD reports the OL/UL fault and stops. Hundreds place: Detection method 0: Always detect 1: Detect during constant-speed running Thousands place: VFD overload current reference selection 0: Related to current calibration coefficient 1: Irrelated to current calibration coefficient		
P11.09	Overload pre-alarm detection threshold	If the VFD or motor output current is larger than the overload pre-alarm detection level (P11.09), and the duration exceeds the overload pre-alarm detection time (P11.10), overload pre-alarm signal will be outputted. Setting range: P11.11–200% (relative value determined by the ones place of P11.08)	150%	○
P11.10	Overload pre-alarm detection time	Setting range: 0.1–3600.0s	1.0s	○
P11.11	Underload pre-alarm detection threshold	Underload pre-alarm signal will be outputted if the output current of the VFD or motor is lower than underload pre-alarm detection level (P11.11), and the duration exceeds underload pre-alarm detection time (P11.12). Setting range: 0 –P11.09 (relative value determined by the ones place of P11.08)	50%	○
P11.12	Underload pre-alarm detection time	Underload pre-alarm signal will be outputted if the output current of the VFD or motor is lower than underload pre-alarm detection level (P11.11), and the duration exceeds underload pre-alarm detection time (P11.12).	1.0s	○

Function code	Name	Description	Default	Modify
		Setting range: 0.1–3600.0s		
P11.13	Fault output terminal action upon fault occurring	Specifies the action of fault output terminals at undervoltage and fault reset. Setting range: 0x00–0x11 Ones place: Action selection for an underload fault 0: Act at undervoltage 1: Do not act at undervoltage Tens place: Action selection during automatic reset 0: Act during automatic reset 1: Do not act during the automatic reset period	0x00	○
P11.14	Speed deviation detection value	Specifies the speed deviation detection value. Setting range: 0.0–50.0%	10.0%	○
P11.15	Speed deviation detection time	Specifies the speed deviation detection time. If the speed deviation detection time is smaller than the set value, the VFD continues running. Setting range: 0.0–10.0s **Note:** Speed deviation protection is invalid when this parameter is set to 0.0s.	2.0s	○
P11.16	Automatic frequency-reduction during voltage drop	Setting range: 0–1 0: Invalid 1: Valid	0	○
P11.17	Proportional coefficient of voltage regulator during undervoltage stall	Specifies the proportional coefficient of the bus voltage regulator during undervoltage stall. Setting range: 0–127	30	○
P11.18	Integral coefficient of voltage regulator during undervoltage stall	Specifies the integral coefficient of the bus voltage regulator during undervoltage stall. Setting range: 0–1000	40	○
P11.19	Proportional coefficient of	Specifies the proportional coefficient of the active current regulator during	25	○

Function code	Name	Description	Default	Modify
	current regulator during undervoltage stall	undervoltage stall. Setting range: 0–1000		
P11.20	Integral coefficient of current regulator during undervoltage stall	Specifies the integral coefficient of the active current regulator during undervoltage stall. Setting range: 0–2000	150	○
P11.21	Proportional coefficient of voltage regulator during overvoltage stall	Specifies the proportional coefficient of the bus voltage regulator during overvoltage stall. Setting range: 0–127	60	○
P11.22	Integral coefficient of voltage regulator during overvoltage stall	Specifies the integral coefficient of the bus voltage regulator during overvoltage stall. Setting range: 0–1000	5	○
P11.23	Proportional coefficient of current regulator during overvoltage stall	Specifies the proportional coefficient of the active current regulator during overvoltage stall. Setting range: 0–1000	60	○
P11.24	Integral coefficient of current regulator during overvoltage stall	Specifies the integral coefficient of the active current regulator during overvoltage stall. Setting range: 0–2000	250	○
P11.25	VFD overload integral enabling	Setting range: 0–1 0: Disable The overload timing value is reset to zero after the VFD is stopped. In this case, the determination of VFD overload takes more time, and therefore the effective protection over the VFD is weakened. 1: Enable The overload timing value is not reset, and the overload timing value is accumulative. In this case, the determination of VFD overload takes less time, and therefore the protection over the VFD can be performed	0	◎

Function code	Name	Description	Default	Modify
		more quickly.		
P11.26–P11.27	Reserved	-	-	-
P11.28	SPO switch-on detection delay time	Setting range: 0.0–60.0s **Note:** The SPO detection is started only after the VFD runs for the delay time P11.28 to avoid false alarms caused by the unstable frequency. When the frequency is stable, the delay time will be skipped. This time is invalid for AM SVC0 and SVC1 control modes.	5.0s	○
P11.29	SPO unbalance factor	Setting range: 0–10	6	○
P11.30	Reserved	-	-	-
P11.31	Fault selection 1	Setting range of P11.31: 11–9000	11	○
P11.32	Fault selection 2	Setting range of P11.32: 11–9000	12	○
P11.33	Fault selection 3	Setting range of P11.33: 11–9000	13	○
P11.34	Fault selection 4	Setting range of P11.34: 11–9000	14	○
P11.35	Fault level processing group 1	Setting range of P11.35: 0x0000 –0x3333 Ones place (P11.31 Fault selection 1): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Tens place (P11.32 Fault selection 2): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Hundreds place (P11.33 Fault selection 3): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed	0x0000	○

Function code	Name	Description	Default	Modify
		according to P11.56 3: Screen out fault 4–15: Reserved Thousands place (P11.34 Fault selection 4): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved **Note:** After using the fault level grouping function, the P07 group fault record only records the data at the time when a fault is reported, for example, the fault data is recorded only when fault level selections are 0 and 1, while for selections 1 and 5, the fault data at the moment of the fault is recorded, not the data when the fault is reported after shutdown. E12, E23, E35, and E36 support modes 0 and 1; E15, E16, E19, E20, E21, E24, E27, E28, E32, E33, E40, E41, E42, E43, E44, E82, E83, E630, E631, and E632 support mode 0.		
P11.36	Fault selection 5	Setting range of P11.36: 11–9000	17	○
P11.37	Fault selection 6	Setting range of P11.37: 11–9000	18	○
P11.38	Fault selection 7	Setting range of P11.38: 11–9000	22	○
P11.39	Fault selection 8	Setting range of P11.39: 11–9000	23	○
P11.40	Fault level processing group 2	Setting range of P11.40: 0x0000 –0x3333 Ones place (P11.36 Fault selection 5): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Tens place (P11.37 Fault selection 6): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Hundreds place (P11.38 Fault selection 7): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Thousands place (P11.39 Fault selection 8): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved		
P11.41	Fault selection 9	Setting range of P11.41: 11–9000	25	○
P11.42	Fault selection 10	Setting range of P11.42: 11–9000	26	○
P11.43	Fault selection 11	Setting range of P11.43: 11–9000	29	○
P11.44	Fault selection 12	Setting range of P11.44: 11–9000	30	○
P11.45	Fault level processing group 3	Setting range of P11.45: 0x0000 –0x3333 Ones place (P11.41 Fault selection 9): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Tens place (P11.42 Fault selection 10): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved	0x0000	○

Function code	Name	Description	Default	Modify
		Hundreds place (P11.43 Fault selection 11): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Thousands place (P11.44 Fault selection 12): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved		
P11.46	Fault selection 13	Setting range of P11.46: 11–9000	31	○
P11.47	Fault selection 14	Setting range of P11.47: 11–9000	34	○
P11.48	Fault selection 15	Setting range of P11.48: 11–9000	35	○
P11.49	Fault selection 16	Setting range of P11.49: 11–9000	36	○
P11.50	Fault level processing group 4	Setting range of P11.50: 0x0000 –0x3333 Ones place (P11.46 Fault selection 13): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Tens place (P11.47 Fault selection 14): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Hundreds place (P11.48 Fault selection 15): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed	0x0000	○

Function code	Name	Description	Default	Modify
		according to P11.56 3: Screen out fault 4–15: Reserved Thousands place (P11.49 Fault selection 16): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved		
P11.51	Fault selection 17	Setting range of P11.51: 11–9000	37	○
P11.52	Fault selection 18	Setting range of P11.52: 11–9000	38	○
P11.53	Fault selection 19	Setting range of P11.53: 11–9000	39	○
P11.54	Fault selection 20	Setting range of P11.54: 11–9000	56	○
P11.55	Fault level processing group 5	Setting range of P11.55: 0x0000 –0x3333 Ones place (P11.51 Fault selection 17): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Tens place (P11.52 Fault selection 18): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Hundreds place (P11.53 Fault selection 19): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved Thousands place (P11.54 Fault selection	0x0000	○

Function code	Name	Description	Default	Modify
		20): 0: Report a fault 1: Report a fault after deceleration to stop 2: Pre-alarm, with the action executed according to P11.56 3: Screen out fault 4–15: Reserved		
P11.56	Action for fault pre-alarm	Setting range: 0–4 0: Run at the set frequency 1: Run at the output frequency at the time of failure 2: Run at the upper limit frequency 3: Run at the lower limit frequency 4: Run at the backup frequency upon exceptions	0	○
P11.57	Backup frequency upon exceptions	Setting range: 0.00Hz–P00.03	0.00Hz	○
P11.58	Fire mode function	Setting range: 0–2 0: Invalid 1: Fire mode 1 2: Fire mode 2 **Note:** When P11.58=0, the fire mode is invalid. In this case, the VFD runs in normal mode and stops when encountering a fault. When the fire mode function is valid, the VFD runs at the speed specified by P11.54. In fire mode 1, the VFD always runs at the speed specified by P11.59 except when the VFD has been damaged. In fire mode 2, the VFD always runs at the speed specified by P11.59, but stops upon the following faults: OUT1, OUT2, OUT3, OC1, OC2, OC3, OV1, OV2, OV3, and SPO. After the fire mode is active for 5 minutes, this flag is reset, and no warranty of repair is granted.	0	◎
P11.59	Running frequency	Setting range: 0.00Hz–P00.03	50.00Hz	○

Function code	Name	Description	Default	Modify
	in fire mode			
P11.60	Fire mode flag	Setting range: 0–1	0	●
P11.61	Multi-turn absolute encoder battery alarm masking	Setting range: 0–1	0	○
P11.62–P11.64	Reserved	-	-	-
P11.65	CBC current limiting coefficient	Setting range: 0.0–100.0%	100.0%	○
P11.66	ItE detection delay	Setting range: 0.000–60.000s	2.000s	○
P11.67	AI1 disconnection detection threshold	Setting range: 0.00–10.00V	0.00V	○
P11.68	AI2 disconnection detection threshold	Setting range: 0.00–10.00V	0.00V	○

Group P13 SM control

Function code	Name	Description	Default	Modify
P13.00	SM injected-current decrease ratio	Specifies the reduction rate of the input reactive current. When the active current of the synchronous motor increases to some extent, the input reactive current can be reduced to improve the power factor of the motor. Setting range: 0.0%–100.0% (of the motor rated current)	80.0%	○
P13.01	Detection mode of initial pole	Setting range: 0–2 0: No detection 1: High frequency superposition 2: Pulse superposition	2	◎
P13.02	Pull-in current 1	Specifies the pole position orientation current. It is valid within the lower limit of pull-in current switch-over frequency	30.0%	○

Function code	Name	Description	Default	Modify
		threshold. If you need to increase the start torque, increase the value of this function parameter properly. Setting range: -100.0%–100.0% (of the motor rated current)		
P13.03	Pull-in current 2	Used to set the pole position orientation current. It is valid within the upper limit of pull-in current switch-over frequency threshold. You do not need to change the value in most cases. Setting range: -100.0%–100.0% (of the motor rated current)	0.0%	○
P13.04	Pull-in current switching frequency	Setting range: 0.0 –200.0% (of the motor rated frequency)	20.0%	○
P13.05	Reserved	-	-	-
P13.06	High-frequency superposition voltage	Specifies the pulse current threshold when the initial magnetic pole position is detected in the pulse mode. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–300% (of the motor rated voltage)	80.0%	◎
P13.07	Control parameter 0	Setting range: 0.0–400.0	0.0	○
P13.08	Vector control optimization mode	Setting range: 0x0000–0xFFFF Bit 0: Enable counter-emf self-adaptation (only applicable to PM-SVC1) Bit 1: Enable SM weakening flux optimization (working with P03.22 to adjust the compensation) Bit 2: Enable current loop parameter optimization Bit3: Reserved Bit 4: Enable SM MTPA Bit 5: Enable SM SVC0 optimization Bit 6: Stator resistance online regulation		

Function code	Name	Description	Default	Modify
		Bit 7: Initial position identifying optimization Bit 8: Enable optimization of SM reverse polarity Bit 9: Enable optimization of SM reverse salient polarity Bit10–bit15: Reserved		
P13.09	Reserved	-	-	-
P13.10	Initial compensation angle of SM	0.0–359.9	0.0	○
P13.11	Mal-adjustment detection time	Used to adjust the responsiveness of anti-maladjustment function. If the load inertia is large, increase the value of this parameter properly, however, the responsiveness may slow down accordingly. Setting range: 0.0–10.0s	0.5s	○
P13.12	Reserved	-	-	-
P13.13	High-frequency pull-in current	Setting range: 0.0–300.0% (of the rated VFD output current)	20.0%	◎
P13.14	SVC speed feedback bandwidth	Setting range: 10.0–200.0rad/s	62.5 rad/s	◎
P13.15	SM back-emf adaptive bandwidth	Setting range: 1–100	1	○
P13.16	SRM observer adjustment coefficient	Setting range: 5.0–200.0%	100.0%	○
P13.17	SRM optimization parameter	Setting range: 0x0–0x2	0x0	○
P13.18	SRM current angle correction	Setting range: -90.0–90.0°	45.0°	○
P13.19	Observer coefficient 1	Setting range: 0–200	2	○
P13.20	Observer	Setting range: 0–200	8	○

Function code	Name	Description	Default	Modify
	coefficient 2			
P13.21	Observer coefficient 3	Setting range: 0.0–20.0	0.1	○
P13.22	Observer coefficient 4	Setting range: 0.0–5000.0	0.0	○
P13.23–P13.25	Reserved	-	-	-
P13.26	Enable vector control start IF	Setting range: 0x00–0x12 Ones place: Enable IF 0: Invalid 1: Valid during ACC/DEC 2: Valid only during ACC Tens place: Enable stator resistance identification (reserved)	0x00	◎
P13.27	Vector control IF current setting	Setting range: 0.0–130.0%	100.0%	◎
P13.28	Vector control IF switch-out frequency point	Setting range: 0.0–100.0%	10.0%	○
P13.29	High-frequency pull-in voltage percentage	Setting range: 0.0–100.0%	0.0%	○
P13.30	High-frequency pull-in phase-lock loop bandwidth	Setting range: 0.0–100.0%	0.0%	○
P13.31–P13.32	Reserved	-	-	-

Group P14 Serial communication

Function code	Name	Description	Default	Modify
P14.00	Local communication address	Setting range: 1–247 When the master writes the slave communication address to 0 indicating a broadcast address in a frame, all the salves on the Modbus bus receive the frame but	1	○

Function code	Name	Description	Default	Modify
		do not respond to it. The communication addresses on the communication network are unique, which is the basis of the point-to-point communication. **Note:** The slave address cannot be set to 0.		
P14.01	Communication baud rate setting	The function code is used to set the data transmission speed between the host controller and the VFD. Setting range: 0–7 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 115200 bps **Note:** The baud rate set on the VFD must be consistent with that on the host controller. Otherwise, the communication fails. A greater baud rate indicates faster communication.	4	○
P14.02	Data bit check	Setting range: 0–5 0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU **Note:** The data format set on the VFD must be consistent with that on the host controller. Otherwise, the communication fails.	1	○
P14.03	Communication response delay	Setting range: 0–200ms	5ms	○

Function code	Name	Description	Default	Modify
P14.04	485 communication timeout period	Setting range: 0.0 (invalid)–60.0s	0.0s	○
P14.05	Transmission fault processing	Setting range: 0–3 0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)	0	○
P14.06	Modbus communication processing action selection	Setting range: 0x000–0x111 Ones place: Write operation response 0: Respond to write operations 1: Not respond to write operations Tens place: Communication password protection 0: Communication user password protection is invalid. 1: Communication user password protection is valid. Hundreds place: User-defined address 0: User-defined addresses specified by group P16 are invalid. 1: User-defined addresses specified by group P16 are valid.	0x000	○
P14.07–P14.47	Reserved	-	-	-
P14.48	Channel selection for mapping between PZDs and function codes	Setting range: 0x00–0x12 Ones place: Channel for mapping function codes to PZDs 0: Reserved 1: Group P15 2: Group P16 Tens place: Save function at power off 0: Disable 1: Enable	0x12	○

Function code	Name	Description	Default	Modify
P14.49	Mapped function code of received PZD2	Setting range: 0x0000–0xFFFF	0x0000	○
P14.50	Mapped function code of received PZD3	Setting range: 0x0000–0xFFFF	0x0000	○
P14.51	Mapped function code of received PZD4	Setting range: 0x0000–0xFFFF	0x0000	○
P14.52	Mapped function code of received PZD5	Setting range: 0x0000–0xFFFF	0x0000	○
P14.53	Mapped function code of received PZD6	Setting range: 0x0000–0xFFFF	0x0000	○
P14.54	Mapped function code of received PZD7	Setting range: 0x0000–0xFFFF	0x0000	○
P14.55	Mapped function code of received PZD8	Setting range: 0x0000–0xFFFF	0x0000	○
P14.56	Mapped function code of received PZD9	Setting range: 0x0000–0xFFFF	0x0000	○
P14.57	Mapped function code of received PZD10	Setting range: 0x0000–0xFFFF	0x0000	○
P14.58	Mapped function code of received PZD11	Setting range: 0x0000–0xFFFF	0x0000	○
P14.59	Mapped function code of received PZD12	Setting range: 0x0000–0xFFFF	0x0000	○
P14.60	Mapped function code of sent PZD2	Setting range: 0x0000–0xFFFF	0x0000	○
P14.61	Mapped function code of sent PZD3	Setting range: 0x0000–0xFFFF	0x0000	○
P14.62	Mapped function	Setting range: 0x0000–0xFFFF	0x0000	○

Function code	Name	Description	Default	Modify
	code of sent PZD4			
P14.63	Mapped function code of sent PZD5	Setting range: 0x0000–0xFFFF	0x0000	○
P14.64	Mapped function code of sent PZD6	Setting range: 0x0000–0xFFFF	0x0000	○
P14.65	Mapped function code of sent PZD7	Setting range: 0x0000–0xFFFF	0x0000	○
P14.66	Mapped function code of sent PZD8	Setting range: 0x0000–0xFFFF	0x0000	○
P14.67	Mapped function code of sent PZD9	Setting range: 0x0000–0xFFFF	0x0000	○
P14.68	Mapped function code of sent PZD10	Setting range: 0x0000–0xFFFF	0x0000	○
P14.69	Mapped function code of sent PZD11	Setting range: 0x0000–0xFFFF	0x0000	○
P14.70	Mapped function code of sent PZD12	Setting range: 0x0000–0xFFFF	0x0000	○
P14.71	PZD communication control word expression format	Setting range: 0–1 0: Decimal format 1: Binary format	0	◎
P14.72–P14.75	Reserved	-	-	-
P14.76	Enable upgrade program	Setting range: 0x0–0x1 Ones place: Enable upgrade 0: Disable 1: Main control board upgrade	0x0	◎
P14.77	MCU bootload software version	Setting range: 0.00–655.35	0.00	●
P14.78	DSP bootload software version	Setting range: 0.00–655.35	0.00	●
P14.79	Display of no upgrade bootload fault	Setting range: 0–1 0: Display 1: Do not display	0	○

Group P16 Communication user-defined function group

Function code	Name	Description	Default	Modify
P16.00	User-defined read address 1	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.01	Local address corresponding to user-defined read address 1	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.02	Ethernet monitoring card IP address 1	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.03	Local address corresponding to user-defined read address 2	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.04	User-defined read address 3	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.05	Local address corresponding to user-defined read address 3	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.06	User-defined read address 4	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.07	Local address corresponding to user-defined read address 4	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.08	User-defined read address 5	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.09	Local address corresponding to user-defined read address 5	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.10	User-defined read address 6	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.11	Local address corresponding to	Setting range: 0x0000–0xFFFF	0xFFFF	◎

Function code	Name	Description	Default	Modify
	user-defined read address 6			
P16.12	User-defined read address 7	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.13	Local address corresponding to user-defined read address 7	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.14	User-defined read address 8	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.15	Local address corresponding to user-defined read address 8	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.16	User-defined read address 9	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.17	Local address corresponding to user-defined read address 9	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.18	User-defined read address 10	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.19	Local address corresponding to user-defined read address 10	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.20	User-defined read address 11	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.21	Local address corresponding to user-defined read address 11	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.22	User-defined read address 12	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.23	Local address corresponding to user-defined read	Setting range: 0x0000–0xFFFF	0xFFFF	◎

Function code	Name	Description	Default	Modify
	address 12			
P16.24	User-defined read address 13	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.25	Local address corresponding to user-defined read address 13	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.26	User-defined read address 14	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.27	Local address corresponding to user-defined read address 14	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.28	User-defined read address 15	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.29	Local address corresponding to user-defined read address 15	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.30	User-defined read address 16	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.31	Local address corresponding to user-defined read address 16	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.32	User-defined write address 1	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.33	Local address corresponding to user-defined write address 1	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.34	User-defined write address 2	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.35	Local address corresponding to user-defined write address 2	Setting range: 0x0000–0xFFFF	0xFFFF	◎

Function code	Name	Description	Default	Modify
P16.36	User-defined write address 3	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.37	Local address corresponding to user-defined write address 3	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.38	User-defined write address 4	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.39	Local address corresponding to user-defined write address 4	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.40	User-defined write address 5	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.41	Local address corresponding to user-defined write address 5	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.42	User-defined write address 6	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.43	Local address corresponding to user-defined write address 6	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.44	User-defined write address 7	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.45	Local address corresponding to user-defined write address 7	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.46	User-defined write address 8	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.47	Local address corresponding to user-defined write address 8	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.48	User-defined write	Setting range: 0x0000–0xFFFF	0xFFFF	◎

Function code	Name	Description	Default	Modify
	address 9			
P16.49	Local address corresponding to user-defined write address 9	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.50	User-defined write address 10	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.51	Local address corresponding to user-defined write address 10	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.52	User-defined write address 11	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.53	Local address corresponding to user-defined write address 11	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.54	User-defined write address 12	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.55	Local address corresponding to user-defined write address 12	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.56	User-defined write address 13	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.57	Local address corresponding to user-defined write address 13	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.58	User-defined write address 14	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.59	Local address corresponding to user-defined write address 14	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.60	User-defined write address 15	Setting range: 0x0000–0xFFFF	0xFFFF	◎

Function code	Name	Description	Default	Modify
P16.61	Local address corresponding to user-defined write address 15	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.62	User-defined write address 16	Setting range: 0x0000–0xFFFF	0xFFFF	◎
P16.63	Local address corresponding to user-defined write address 16	Setting range: 0x0000–0xFFFF	0xFFFF	◎

Group P17 Status viewing

Function code	Name	Description	Default	Modify
P17.00	Set frequency	Displays the present set frequency of the VFD. Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.01	Output frequency	Displays the present output frequency of the VFD. Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	Displays the present ramp reference frequency of the VFD. Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	Displays the present output voltage of the VFD. Setting range: 0–1200V	0V	●
P17.04	Output current	Displays the valid value of present output current of the VFD. Setting range: 0.0–5000.0A	0.0A	●
P17.05	Motor rotation speed	Displays the present motor rotation speed. Setting range: 0–65535RPM	0RPM	●
P17.06	Torque current	The function code is used to display the present torque current of the VFD. Setting range: -3000.0–3000.0A	0.0A	●
P17.07	Exciting current	The function code is used to display the present exciting current of the VFD.	0.0A	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>Setting range: -3000.0–3000.0A</td><td></td><td></td></tr>
<tr><td>P17.08</td><td>Motor power</td><td>The function code is used to display the present motor power. 100% corresponds to the rated motor power.
Setting Range: -300.0–300.0% (of the motor rated power)</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.09</td><td>Motor output torque</td><td>Displays the present output torque of the VFD. 100% corresponds to the motor rated torque.
Setting range: -250.0–250.0%</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.10</td><td>Estimated motor frequency</td><td>Used to indicate the estimated motor rotor frequency under the open-loop vector condition.
Setting range: 0.00–P00.03</td><td>0.00Hz</td><td>●</td></tr>
<tr><td>P17.11</td><td>DC bus voltage</td><td>Displays the present DC bus voltage of the VFD.
Setting range: 0.0–2000.0V</td><td>0.0V</td><td>●</td></tr>
<tr><td>P17.12</td><td>Digital input terminal State</td><td>Displays the present digital input terminal state of the VFD.
Setting range: 0x000–0xFFF
<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4–9</td><td>Bit10</td><td>Bit11</td></tr><tr><td>DI1</td><td>DI2</td><td>DI3</td><td>DI4</td><td>Reserved</td><td>HDI1</td><td>HDI2</td></tr></table></td><td>0x000</td><td>●</td></tr>
<tr><td>P17.13</td><td>Digital output terminal state</td><td>Displays the present digital output terminal state of the VFD.
Setting range: 0x00–0xFF
<table><tr><td>Bit0</td><td>Bit1–2</td><td>Bit3</td><td>Bit4</td><td>Bit5</td><td>Bit6–7</td></tr><tr><td>DO1</td><td>Reserved</td><td>HDO1</td><td>RO1</td><td>RO2</td><td>Reserved</td></tr></table></td><td>0x00</td><td>●</td></tr>
<tr><td>P17.14</td><td>Digital adjustment value</td><td>The function code is used to display the adjustment on the VFD through the UP/DOWN terminal.
Setting range: 0.00Hz–P00.03</td><td>0.00Hz</td><td>●</td></tr>
<tr><td>P17.15</td><td>Torque reference value</td><td>Indicates the percentage of the rated torque of the present motor, displaying the torque reference.
Setting range: -300.0%–300.0%</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.16</td><td>Linear speed</td><td>Setting range: 0–65535</td><td>0</td><td>●</td></tr>
</table>

Function code	Name	Description	Default	Modify
P17.17	Reserved	-	-	-
P17.18	Count value	Setting range: 0–65535	0	●
P17.19	AI1 input voltage	Displays the AI1 input signal. Setting range: 0.00–10.00V	0.00V	●
P17.20	AI2 input voltage	The function code is used to display the AI2 input signal. Setting range: -10.00V–10.00V	0.00V	●
P17.21–P17.22	Reserved	-	-	-
P17.23	HDI1 input frequency	Setting range: 0.000–50.000kHz	0.000kHz	●
P17.24	HDI2 input frequency	Setting range: 0.000–50.000kHz	0.000kHz	●
P17.25	PID reference value	Setting range: -100.0–100.0%	0.0%	●
P17.26	PID feedback value	Setting range: -100.0–100.0%	0.0%	●
P17.27	Motor power factor	Setting range: -1.00–1.00	0.00	●
P17.28	Duration of this run	Setting range: 0–65535min	0min	●
P17.29	Present step of simple PLC	Setting range: 0–15	0	●
P17.30	Motor ASR controller output	Setting range: -300.0–300.0%	0.0%	●
P17.31	Open-loop SM pole angle	Setting range: 0.0–360.0	0.0	●
P17.32	Phase compensation of SM	Setting range: -180.0–180.0	0.0	●
P17.33	High-frequency superposition current of SM	Setting range: 0.0–200.0%	0.0%	●
P17.34	Motor flux linkage	Setting range: 0.0–200.0%	0.0%	●
P17.35	Exciting current reference	Setting range: -3000.0–3000.0A	0.0A	●
P17.36	Torque current reference	Setting range: -3000.0–3000.0A	0.0A	●
P17.37	AC incoming current	Setting range: 0.0–5000.0A	0.0A	●

Function code	Name	Description	Default	Modify
P17.38	Output torque	Setting range: -3000.0–3000.0Nm	0.0Nm	●
P17.39	Motor overload count value	Setting range: 0–65535	0	●
P17.40	Process PID output	Setting range: -100.0–100.0%	0.0%	●
P17.41	Function codes in parameter download error	Setting range: 0.00–99.99	0.00	●
P17.42	Motor control mode	Setting range: 0x000–0x123 Ones place: Control mode 0: Vector 0 1: Vector 1 2: VF control 3: Closed-loop vector control Tens place: Control status 0: Speed control 1: Torque control 2: Position control Hundreds place: Motor number 0: Motor 1 1: Motor 2	0x000	●
P17.43	Electromotive torque upper limit	Setting range: 0.0–300.0%	0.0	●
P17.44	Braking torque upper limit	Setting range: 0.0–300.0%	0.0	●
P17.45	Forward rotation upper-limit frequency in torque control	Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.46	Reverse rotation upper-limit frequency in torque control	Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.47	Inertia compensation torque	Setting range: -100.0–100.0%	0.0%	●
P17.48	Friction compensation torque	Setting range: -100.0–100.0%	0.0%	●

Function code	Name	Description	Default	Modify
P17.49	Motor pole pairs	Setting range: 0–65535	0	●
P17.50	VFD overload count value	Setting range: 0–65535	0	●
P17.51	Frequency set by A source	Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.52	Frequency set by B source	Setting range: 0.00Hz–P00.03	0.00Hz	●
P17.53	PID proportional output	Setting range: -100.0–100.0%	0.0%	●
P17.54	PID integral output	Setting range: -100.0–100.0%	0.0%	●
P17.55	PID differential output	Setting range: -100.0–100.0%	0.0%	●
P17.56	Present proportional gain	Setting range: 0.00–100.00	0.00	●
P17.57	Present integral time	Setting range: 0.00–10.00s	0.00s	●
P17.58	Present differential time	Setting range: 0.00–10.00s	0.00s	●
P17.59	Actual carrier frequency	Setting range: 0.000–15.000kHz	0.000kHz	●
P17.60	SM signal to noise ratio	Setting range: 0.0–1000.0	0.0	●
P17.61	Counter-emf of SM	Setting range: 0–1200V	0V	●
P17.62	Present motor speed display MSB	Setting range: 0–30(10kRPM)	0	●
P17.63	Reserved	-	-	-
P17.64	VFD status word 2	Setting range: 0x0000–0xFFFF Bit0: Ready for running (0: Bus voltage not established; 1: Bus voltage established) Bit1–bit2: Motor number (00b: Motor 1; 01b: Motor 2; 10–11b: Reserved) Bit3: Motor type (0: Asynchronous motor; 1: Synchronous motor) Bit4: Overload pre-alarm (0: No overload pre-alarm; 1: Overload pre-alarm present) Bit5–bit6: Command channel (00b: Keypad channel; 01b: Terminal channel; 10b:	0x0000	●

Function code	Name	Description	Default	Modify
		Communication channel; 11b: Reserved) Bit 7: Reserved Bit8–bit9: Operation mode (00b: Speed mode; 01b: Torque mode; 10–11b: Position mode) Bit10–bit11: Control mode (00: SVC0; 01: SVC1; 10: VF; 11: FVC) Bit12–bit15: Reserved		
P17.65	VFD status word 3	Setting range: 0x0000–0xFFFF Bit 0: Running protection flag Bit 1: Running Bit 2: Running direction (1=REV, 0=FWD) Bit 3: Jogging Bit 4: Pre-alarming Bit 5: In fault Bit 6: Running paused Bit 7: In sleep Bit 8: In PoFF state Bit 9: Undervoltage due to transient power loss Bit 10: Overvoltage stall Bit 11: Pre-exciting Bit 12: DC braking Bit 13: Identifying parameters Bit 14: Flux weakening (reserved) Bit15: Reserved	0x0000	●
P17.66	CPU load rate	Setting range: 0.0–100.0% **Note:** It refers to the ADC sampling interrupt and the 8k interrupt occupying half (double sampling and double updating) of the carrier cycle time. If the carrier frequency is too high, it will lead to high load, thereby reducing the carrier frequency to avoid incomplete program execution.	0.0%	●
P17.67–P17.69	Reserved	-	-	-

Function code	Name	Description	Default	Modify
P17.70	Alarm code	Setting range: 0–65535	0	●
P17.71–P17.77	Reserved	-	-	-
P17.78	FVC and SVC angle difference	Setting range: -360.0–360.0°	0.0°	●
P17.79	FVC and SVC speed difference	Setting range: -327.67–327.67Hz	0.00Hz	●
P17.80	Present stator resistance	Setting range: 0.000–60.000Ω	0.000Ω	●
P17.81	CW	Setting range: 0–65535	0	●
P17.82	SW	Setting range: 0–65535	0	●

Group P18 Status viewing in closed-loop control

Function code	Name	Description	Default	Modify
P18.00	Actual frequency of encoder	The function code is used to indicate the actual-measured encoder frequency. The value of forward running is positive; the value of reverse running is negative. Setting range: -999.9–3276.7Hz	0.0Hz	●
P18.01	Encoder position count value	The function code is used to indicate the encoder count value, quadruple frequency. Setting range: 0–65535	0	●
P18.02	Encoder Z pulse count value	The function code is used to indicate the count value of the encoder Z pulse. Setting range: 0–65535	0	●
P18.03	Position reference value MSB	The function code is used to indicate the MSB of position reference value. It is cleared after stop. Setting range: 0–30000	0	●
P18.04	Position reference value LSB	The function code is used to indicate the LSB of position reference value. It is cleared after stop. Setting range: 0–65535	0	●
P18.05	Position feedback value MSB	The function code is used to indicate the MSB of position feedback value. It is cleared after stop.	0	●

Function code	Name	Description	Default	Modify
		Setting range: 0–30000		
P18.06	Position feedback value LSB	The function code is used to indicate the LSB of position feedback value. It is cleared after stop. Setting range: 0–65535	0	●
P18.07	Position deviation	The function code is used to indicate the deviation between the reference position and actual running position. Setting range: -32768–32767	0	●
P18.08	Position of position reference point	The function code is used to indicate the position of reference point of Z pulse when the spindle stops accurately. Setting range: 0–65535	0	●
P18.09	Present position setting of spindle	The function code is used to indicate the present position setup when the spindle stops accurately. Setting range: 0.00–359.99	0.00	●
P18.10	Present position of spindle accurate stop	Present position of spindle accurate stop. Setting range: 0–65535	0	●
P18.11	Encoder Z pulse direction	The function code is used to indicate the Z pulse direction. When the spindle stops accurately, there may be a couple of pulses' error between the position of forward and reverse orientation, which can be eliminated by adjusting Z pulse direction of P20.02 or exchanging phase AB of encoder. Setting range: 0–1 0: Forward 1: Reverse	0	●
P18.12	Encoder Z pulse angle	Reserved. Setting range: 0.00–359.99	0.00	●
P18.13	Encoder Z pulse error times	Reserved. Setting range: 0–65535	0	●
P18.14	High-order bit of count value of PG card pulse feedback	The function code is used to indicate the encoder pulse count value. The count value is accumulated only if the VFD is powered on.	0	●

Function code	Name	Description	Default	Modify
		Setting range: 0–65535		
P18.15	Low-order bit of PG card pulse feedback count value	The function code is used to indicate the encoder pulse count value. The count value is accumulated only if the VFD is powered on. Setting range: 0–65535	0	●
P18.16	Speed measured by main control board	Setting range: -3276.8–3276.7Hz	0.0Hz	●
P18.17	Pulse command frequency	The function code is used to indicate that the pulse command (A2/B2 terminal) is converted to the set frequency, and it is valid under the pulse position mode and pulse speed mode. Setting range: -3276.8–3276.7Hz	0.0Hz	●
P18.18	Pulse command feedforward	The function code is used to indicate that the pulse command (A2/B2 terminal) is converted to the set frequency, and it is valid under the pulse position mode and pulse speed mode. Setting range: -3276.8–3276.7Hz	0.0Hz	●
P18.19	Position regulator output	Setting range: -327.68–3276.7Hz	0.00Hz	●
P18.20	Count value of resolver	The function code is used to indicate the count value of the resolver. Setting range: 0–65535	0	●
P18.21	Resolver angle	The function code is used to indicate the pole position angle read by the resolver-type encoder. Setting range: 0.00–359.99	0.00	●
P18.22	Closed-loop SM pole angle	The function code is used to indicate the present pole position. Setting range: 0.00–359.99	0.00	●
P18.23	Reserved	-	-	-
P18.24	High-order bit of PG card pulse reference count value	The function code is used to indicate the pulse command (A2,B2) count value. The count value is accumulated only if the VFD is powered on. Setting range: 0–65535	0	●

Function code	Name	Description	Default	Modify
P18.25	Low-order bit of PG card pulse reference count value	The function code is used to indicate the pulse command (A2,B2) count value. The count value is accumulated only if the VFD is powered on. Setting range: 0–65535	0	●
P18.26	Speed measured by PG card	Setting range: -3276.8–3276.7Hz	0.0Hz	●
P18.27	Encoder UVW sectors	Setting range: 0–7	0	●
P18.28	Encoder PPR display	Setting range: 0–65535	0	●
P18.29	Angle compensation value of SM	Setting range: -180.0–180.0°	0.0°	●
P18.30	Z pulse angle of SM	Setting range: 0.00–655.35°	0.00°	●
P18.31	Z pulse value of pulse reference	Setting range: 0–65535	0	●
P18.32	Main control board measured value of pulse reference	Setting range: -3276.8–3276.7Hz	0.0Hz	●
P18.33	PG card measured value of pulse reference	Setting range: -3276.8–3276.7Hz	0.0Hz	●
P18.34	Present encoder filter width	Setting range: 0–63	0	●
P18.35	Reserved	-	-	-
P18.36	Absolute encoder present number of turns	Setting range: 0–65535	0	●
P18.37	Encoder feedback value MSB	Setting range: 0–65535	0	●
P18.38	Encoder feedback value LSB	Setting range: 0–65535	0	●
P18.39	Position loop direction	Setting range: 0–1	0	●
P18.40	Encoder 2 detected	Setting range: 0–65535	0	●

Function code	Name	Description	Default	Modify
	frequency			
P18.41	Encoder 2 position count value	Setting range: 0–65535	0	●
P18.42	Encoder 2 Z-pulse count value	Setting range: 0–65535	0	●
P18.43	Encoder 2 P-path pulse count MSB	Setting range: 0–65535	0	●
P18.44	Encoder 2 P-path pulse count LSB	Setting range: 0–65535	0	●
P18.45	PG card 2 F-path pulse count MSB	0–65535	0	●
P18.46	PG card 2 F-path pulse count LSB	0–65535	0	●
P18.47–P18.59	Reserved	-	-	-
P18.60	Search homing terminal position (MSB)	Setting range: 0x0000–0xFFFF	0x0000	●
P18.61	Search homing terminal position (LSB)	Setting range: 0x0000–0xFFFF	0x0000	●
P18.62	Absolute position command - highest bit	Setting range: 0x0000–0xFFFF	0x0000	●
P18.63	Absolute position command - middle high bit	Setting range: 0x0000–0xFFFF	0x0000	●
P18.64	Absolute position command - middle high bit	Setting range: 0x0000–0xFFFF	0x0000	●
P18.65	Absolute position command - lowest bit	Setting range: 0x0000–0xFFFF	0x0000	●
P18.66	Absolute position feedback - highest bit	Setting range: 0x0000–0xFFFF	0x0000	●
P18.67	Absolute position	Setting range: 0x0000–0xFFFF	0x0000	●

Function code	Name	Description	Default	Modify
	feedback - middle high bit			
P18.68	Absolute position feedback - middle low bit	Setting range: 0x0000–0xFFFF	0x0000	●
P18.69	Absolute position feedback - lowest bit	Setting range: 0x0000–0xFFFF	0x0000	●

Group P20 Encoder of motor 1

Function code	Name	Description	Default	Modify
P20.00	Motor 1 encoder type display	Setting range: 0–6 0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder 4: SSI 5: TFORMAT 6: Reserved	0	●
P20.01	Motor 1 encoder pulse count	The function code is used to indicate the number of pulses generated when the encoder revolves for one circle. Setting range: 0–16000	1024	◎
P20.02	Motor 1 encoder direction	Setting range: 0x000–0x111 Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds place: CD/UVW pole signal direction 0: Forward 1: Reverse	0x000	◎
P20.03	Motor 1 encoder disconnection	Setting range: 0.0–10.0s	2.0s	○

Function code	Name	Description	Default	Modify
	fault detection time			
P20.04	Motor 1 encoder reversal fault detection time	Setting range: 0.0–100.0s	0.8s	○
P20.05	Motor 1 filter times of encoder detection	Setting range: 0x00–0x99 Ones place: Low-speed filter times, corresponding to 2^(0–9)×125μs Tens place: High-speed filter times, corresponding to 2^(0–9)×125μs	0x33	○
P20.06	Motor 1 to encoder shaft speed ratio	You need to set the function parameter when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.000–65.535	1.000	○
P20.07	Control parameters of SM	Setting range: 0x0000–0xFFFF Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Reserved Bit4: Reserved Bit5: Reserved Bit6: Enable the CD signal calibration Bit7: Reserved Bit8: Do not detect encoder faults during autotuning Bit9: Enable Z pulse detection optimization Bit 10: Enable the initial Z pulse calibration optimization Bit11: Update initial angle Bit12: Clear the Z pulse arrival signal after stop Bit13: Enable encoder direction identification Bit14: Detect Z pulse after one rotation Bit15: Reserved	0x2003	○
P20.08	Enable motor 1 encoder Z pulse offline detection	Setting range: 0x00–0x11 Ones place: Z pulse detection 0: No detection	0x10	○

Function code	Name	Description	Default	Modify
		1: Enable Tens place: UVW pulse detection (for SM) 0: Disable 1: Enable		
P20.09	Motor 1 encoder Z pulse initial angle	Relative electric angle between the encoder Z pulse and the motor pole position. Setting range: 0.00–359.99	0.00	○
P20.10	SM 1 pole initial angle	Relative electric angle between the encoder position and the motor pole position. Setting range: 0.00–359.99	0.00	○
P20.11	Initial pole position autotuning of SM 1	Setting range: 0–3 0: No operation 1: Rotary autotuning 1 (DC braking) 2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning 2 (initial angle identification)	0	◎
P20.12	Motor 1 speed measurement optimization selection	Setting range: 0–3 0: No optimization 1: Optimization mode 1 2: Optimization mode 2 3: Optimization mode 3 (observe disturbance)	1	◎
P20.13	Motor 1 encoder CD signal zero offset gain	Setting range: 0–65535	0	○
P20.14	Motor 1 encoder type selection	Setting range: 0x00–0x11 Ones place: Incremental encoder 0: without UVW 1: With UVW Tens place: Sin/Cos encoder 0: without CD signal 1: With CD signal	0x00	◎
P20.15	Motor 1 speed measurement	Setting range: 0–1 0: PG card	0	◎

Function code	Name	Description	Default	Modify
	method	1: Locally measured through HDIA and HDIB. Only the 24V incremental encoders are supported.		
P20.16	Motor 1 encoder frequency division coefficient	Setting range: 0–255 When the function parameter is set to 0 or 1, frequency division of 1:1 is implemented.	0	○
P20.17	Motor 1 encoder pulse filter processing selection	Setting range: 0x0000–0xFFFF Bit0: Encoder channel P input filter enabling 0: Disable 1: Enable Bit 1: Encoder P-channel input filter method 0: Self-adaptive filter 1: Use P20.18 filter parameter Bit2: Encoder channel P frequency-division output filter enabling 0: Disable 1: Enable Bit3: Pulse reference channel F frequency-division output filter enabling 0: Disable 1: Enable Bit4: Pulse reference channel F filter enabling 0: Disable 1: Enable Bit5: Pulse reference channel F filter mode 0: Self-adaptive filter 1: Use P20.19 filter parameter Bit6: Frequency-divided output source setting 0: Encoder 1: Pulse reference Bit7–15: Reserved	0x0033	○
P20.18	Motor 1 pulse	Setting range: 0–63	2	○

Function code	Name	Description	Default	Modify
	feedback (P-path) filter width	The filter time is P20.18*0.25μs. The value 0 or 1 indicates 0.25μs.		
P20.19	Motor 1 pulse reference (F-path) filter width	Setting range: 0–63 The filter time is P20.19*0.25μs. The value 0 or 1 indicates 0.25μs.	2	○
P20.20	Motor 1 pulse reference (F-path) pulse count	Setting range: 0–16000	1024	◎
P20.21	Enabling SM 1 angle compensation	Setting range: 0–1	0	○
P20.22	Frequency point of motor 1 speed measurement mode switchover	Setting range: 0.00Hz–P00.03 **Note:** This parameter is valid only when P20.12 is set to 0.	1.00Hz	○
P20.23	Motor 1 angle compensation coefficient	Setting range: -200.0–200.0%	100.0%	○
P20.24	SM 1 initial pole angle autotuning turns	Setting range: 1–128	2	◎
P20.25	Absolute encoder type selection	Setting range: 0–1	0	○
P20.26	Single-turn resolution of absolute encoder	Setting range: 0–31	13	○
P20.27	Multi-turn resolution of absolute encoder	Setting range: 0–31	12	○
P20.28	Subdivision sinA signal zero offset	Setting range: -200–200	0	○
P20.29	Subdivision sinB signal zero offset	Setting range: -200–200	0	○
P20.30	Subdivision sinB signal gain	Setting range: -200–200	0	○
P20.31	Sin/Cos encoder subdivision bits	Setting range: 0–11	8	◎

Function code	Name	Description	Default	Modify
P20.32	Sin/Cos encoder subdivision disable selection	Setting range: 0–1 0: Disable 1: Enable	0	◎
P20.33	Use zero drift correction result	Setting range: 0–1 0: Do not use 1: Use	0	◎

Group P21 Position control

Function code	Name	Description	Default	Modify
P21.00	Positioning mode	Setting range: 0x0000–0x3031 Ones place: Control mode selection 0: Speed control 1: Position control Tens place: Position command source 0: Pulse train 1: Digital position 2: Positioning of photoelectric switch during stop 3: Position JOG Hundreds place: (Reserved) Thousands place: Servo mode (Reserved) 0: Disable servo, without position deviation 1: Disable servo, with position deviation 2: Enable servo, without position deviation 3: Enable servo, with position deviation	0x0000	○
P21.01	Pulse command mode	Setting range: 0x0000–0x3133 Ones place: Pulse mode 0: A/B quadrature pulse; A precedes B 1: A is PULSE and B is SIGN If channel B is of low electric level, the edge counts up; if channel B is of high electric level, the edge counts down. 2: A is positive PULSE Channel A is positive pulse; channel B needs no wiring	0x0000	◎

Function code	Name	Description	Default	Modify
		3: A/B dual-channel pulse; channel A pulse edge counts up, channel B pulse edge counts down Tens place: Pulse direction 0: Pulse direction setting: forward 1: Pulse direction setting: reverse 2: Pulse direction set by running direction 3: Pulse direction set by running direction Hundreds place: Frequency multiplication selection for pulse +direction (reserved) 0: No frequency multiplication 1: Frequency multiplication Thousands place: Pulse control selection 0: Inertia filter, without overspeed control 1: Average moving filter, without overspeed control 2: Inertia filter, with overspeed control 3: Average moving filter, with overspeed control		
P21.02	Position loop gain 1 (static)	The two automatic position regulator (APR) gains are switched based on the switching mode set through P21.04. When the spindle orientation function is used, the gains are switched automatically, regardless of the setting of P21.04. P21.03 is used for dynamic running, and P21.02 is used for maintaining the locked state. Setting range: 0.0–400.0	20.0	○
P21.03	Position loop gain 2 (dynamic)	The two automatic position regulator (APR) gains are switched based on the switching mode set through P21.04. When the spindle orientation function is used, the gains are switched automatically, regardless of the setting of P21.04. P21.03 is used for dynamic running, and P21.02 is used for maintaining the locked state. Setting range: 0.0–400.0	30.0	○

Function code	Name	Description	Default	Modify
P21.04	APR gain switchover mode	Setting range: 0–2 0: No switchover 1: Torque command 2: Speed command	0	○
P21.05	Position gain switchover threshold in torque command	Setting range: 0.0–100.0% (of the motor rated torque)	10.0%	○
P21.06	Position gain switchover threshold in speed command	Setting range: 0.0–100.0% (of the motor rated speed)	10.0%	○
P21.07	Smooth filter coefficient for gain switchover	The function code is used to indicate the smooth filter coefficient for APR gain switchover. Setting range: 0–15	5	○
P21.08	Output limit of position controller	Setting range: 0.0–100.0% (of max. output frequency P00.03)	20.0%	○
P21.09	Positioning completion zone	Setting range: 0–1000	10	○
P21.10	Detection time for positioning completion	Setting range: 0.0–1000.0ms	10.0ms	○
P21.11	Numerator of position command ratio	Setting range: 1–65535	1000	○
P21.12	Denominator of position command ratio	Setting range: 1–65535	1000	○
P21.13	Position feedforward gain	Setting range: 0.00–120.00% For pulse train reference only (position control)	100.00%	○
P21.14	Position feedforward filter time constant	Setting range: 0.0–3200.0ms For pulse train reference only (position control)	3.0ms	○
P21.15	Position command filter time constant	Setting range: 0.0–3200.0ms	0.0ms	◎

Function code	Name	Description	Default	Modify
P21.16	Digital positioning mode	Setting range: 0x0000–0xFFFF Bit 0: Positioning mode 0: Relative position 1: Absolute position (Origin mode. This function is reserved.) Bit1: Positioning cycle selection 0: Terminal-based cyclic positioning 1: Automatic cyclic positioning Bit2: Cyclic mode 0: Continuous 1: Reciprocating (support the automatic cyclic positioning) Bit3: P46.03+P21.17 digital command setting mode 0: Incremental 1: Position type (do not support the continuous mode) Bit4: Origin searching mode (reserved) 0: Search for the origin only for once 1: Search for the origin in every time of running Bit5: Origin calibration mode (reserved) 0: Calibration in real time 1: One-time calibration Bit6: Positioning completion signal selection 0: Valid in the positioning completion signal holding time (P21.25) 1: Always valid Bit7: Initial positioning selection (for terminal-based cyclic positioning) 0: Invalid (do not rotate) 1: Valid Bit8: Positioning enable signal selection (for terminal-based cyclic positioning. If it is automatic cyclic positioning, it is always enabled.) 0: Pulse signal 1: Electrical level signal	0x0000	○

Function code	Name	Description	Default	Modify
		Bit 9: Position source 0: Set by P21.17+P46.03 1: Dp/CANopen/PROFINET/ Ethernet IP communication Bit 10: Indicates whether to save encoder pulse count value at power-off 0: No 1: Yes Bit11: Reserved Bit 12: Positioning curve setting (Reserved) 0: Straight line 1: S curve Bit13–bit15: Reserved		
P21.17	Position set in digital mode (LSB)	Setting Range: 0–65535 (MSB is set in P46.03.)	0	○
P21.18	Positioning speed setting	Setting range: 0–6 0: Set by P21.19 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDIA 5: High-speed pulse HDIB 6: Dp/CANopen/PROFINET/ Ethernet IP communication	0	○
P21.19	Positioning speed set in digital mode	Setting range: 0.0–100.0% (of the max. output frequency)	20.0%	○
P21.20	Positioning ACC time	The function code is used to set the ACC/DEC time in the positioning process. Positioning ACC time means the time needed if the VFD speeds up from 0Hz to the max. output frequency (P00.03). Setting range: 0.00–100.00s	3.00s	○
P21.21	Positioning DEC time	The function code is used to set the ACC/DEC time in the positioning process. Positioning DEC time means the time needed if the VFD speeds down from the max. output frequency (P00.03) to 0Hz. Setting range: 0.00–100.00s	3.00s	○

Function code	Name	Description	Default	Modify
P21.22	Positioning holding time	The function code is used to set the holding time after the destination position is reached. Setting range: 0.000–60.000s	0.100s	○
P21.23	Origin searching speed	Setting range: 0.00Hz–P00.03	2.00Hz	○
P21.24	Origin bias	Setting range: 0–65535	0	○
P21.25	Positioning completion signal holding time	The function code is used to indicate the time for holding the positioning completion signal. This parameter is also valid for the positioning in spindle orientation. Setting range: 0.000–60.000s	0.200s	○
P21.26	Pulse superposition	The function is valid in the pulse speed reference (P00.06=12) or pulse position mode (P21.00=1). 1. Input terminal function 68 (Pulse superposition enable) When the rising edge of the terminal is detected, add the value set in P21.26 to the set pulse value, and compensate to the pulse reference channel based on the pulse superposition speed set in P21.27. 2. Input terminal function 67 (Pulse increment) When the terminal is valid, superpose the pulse value to the pulse reference channel based on the pulse superposition speed set in P21.27. **Note:** Terminal filter P05.09 may affect the actual superposed value. 3. Input terminal function 69 (Pulse decrement) The time sequence of this function is same as the above. The difference is that this terminal is the pulse number that is superposed degressively. **Note:** The pulses mentioned above are superposed to A2 and B2 of pulse reference channel. Functions such as filtering and	0	○

Function code	Name	Description	Default	Modify
		electronic gear are still valid for superposed pulses. 4. Output terminal function 28 (In pulse superposition) During the pulse superposition, the output terminal is valid. After the pulse superposition is completed, the output terminal is invalid. Setting range: 0–65535		
P21.27	Pulse superposition rate	Setting range: 0.0–6553.5pulse/ms	8.0 pulse/ms	○
P21.28	ACC/DEC time after pulse inhibition	Setting range: 0.0–3000.0s	5.0s	○
P21.29	Speed feedforward filter time constant	Filter time constant detected by the pulse train when the speed reference source is set to the pulse train (P00.06=12 or P00.07=12). Setting range: 0.0–3200.0ms (Pulse train speed mode)	10.0ms	○
P21.30	Numerator of the 2nd command ratio	Setting range: 1–65535	1000	○
P21.31	Speed measuring method of pulse reference	Setting range: 0–2 0: By main control board 1: By PG card 2: Hybrid method	0	○
P21.32	Pulse reference feedforward source	Setting range: 0x0–0x1	0x0	◎
P21.33	Setting of encoder count value clearing	Setting range: 0–65535	0	◎

Group P22 Spindle positioning

Function code	Name	Description	Default	Modify
P22.00	Spindle	Setting range: 0x0000–0xFFFF	0x0000	○

Function code	Name	Description	Default	Modify
	positioning mode selection	Bit0: Enable spindle positioning 0: Disable 1: Enable Bit1: Spindle positioning reference point selection. Select the encoder Z pulse or the photoelectric switch (set to function 43) as the spindle accurate stop reference point. 0: Z pulse input 1: DI2/DI3/DI4 terminal input Bit2: Search for reference point 0: Search only once 1: Search each time Bit3: Enable reference point calibration 0: Disable 1: Enable Bit4: Positioning mode selection 1 0: Set direction positioning 1: Nearest direction positioning Bit5: Positioning mode selection 2. It is valid when bit4 is set to 0. 0: Forward positioning 1: Reverse positioning Bit6: Zeroing command selection 0: Electric level mode 1: Pulse mode. Executing the positioning (zeroing and indexing) command does not need a running command. If there is a run command, it will automatically switch back to the speed mode. Bit7: Reference point calibration mode 0: Calibrate at the first time 1: Calibration in real time Bit8: Action selection after zeroing signal cancellation (electric level type) 0: Switch to speed mode 1: Position lock mode Bit9: Positioning completion signal selection		

Function code	Name	Description	Default	Modify
		0: Electrical level signal 1: Pulse signal Bit10: Z pulse signal source 0: Motor 1: Spindle Bit11–bit15: Reserved **Note:** Speed mode has higher priority than indexing, and indexing mode is only active in Bit6=1 pulse mode.		
P22.01	Speed of spindle orientation	The function code is used to indicate that during spindle orientation, the speed of the position point of orientation will be searched, and then it will switch over to position control orientation. Setting range: 0.00Hz–P00.03	10.00Hz	○
P22.02	DEC time of spindle accurate stop	Used to indicate the DEC time of spindle accurate stop. Spindle orientation deceleration time means the time needed for the VFD to decelerate from the max. output frequency (P00.03) to 0Hz. Setting range: 0.1–100.0s	3.0s	○
P22.03	Spindle zeroing position 0	You can select four spindle zeroing positions by terminals (functions 46 and 47). Setting range: 0–65535	0	○
P22.04	Spindle zeroing position 1	Setting range: 0–65535	0	○
P22.05	Spindle zeroing position 2	Setting range: 0–65535	0	○
P22.06	Spindle zeroing position 3	Setting range: 0–65535	0	○
P22.07	Spindle indexing angle 1	You can select seven spindle indexing angles by terminals (functions 48, 49, and 50). Setting range: 0.00–359.99	15.00	○
P22.08	Spindle indexing angle 2	Setting range: 0.00–359.99	30.00	○
P22.09	Spindle indexing	Setting range: 0.00–359.99	45.00	○

Function code	Name	Description	Default	Modify
	angle 3			
P22.10	Spindle indexing angle 4	Setting range: 0.00–359.99	60.00	○
P22.11	Spindle indexing angle 5	Setting range: 0.00–359.99	90.00	○
P22.12	Spindle indexing angle 6	Setting range: 0.00–359.99	120.00	○
P22.13	Spindle indexing angle 7	Setting range: 0.00–359.99	180.00	○
P22.14	Spindle drive ratio	The function code is used to set the reduction ratio of the spindle and the mounting shaft of the encoder. Setting range: 0.001–30.000	1.000	○
P22.15	Spindle zero-point communication setting	The function code is used to set the spindle zero-point offset. If the selected spindle zero point is P22.03, the final spindle zero point will be the sum of P22.03 and P22.15. Setting range: 0–39999	0	○
P22.16–P22.17	Reserved	-	-	-
P22.18	Rigid tapping selection	Setting range: 0x00–0x71 Ones place: Enabling selection 0: Disable (This function can be enabled through a terminal (configured with function 58) 1: Enable (internally) Tens place: Analog input port selection 0: Invalid 1: AI1 2: AI2 3–4: Reserved 5: EAI1 6: EAI2 7: EAI3	0x00	◎
P22.19	Absolute encoder multi-turn overflow value	Setting range: 0.0–1000.0ms (Rigid tapping analog filter time)	1.0ms	○

Function code	Name	Description	Default	Modify
P22.20	Absolute encoder multi-turn offset value	Setting range: 0.00Hz–P00.03 (Rigid tapping maximum frequency)	50.00Hz	○
P22.21	Absolute encoder zero offset 32–48 bits	Setting range: 0.00Hz–P00.03 (Rigid tapping analog zero drift corresponding frequency)	0.00Hz	○
P22.22	Absolute encoder zero offset MSB	Setting range: 0–0	0	●
P22.23	Absolute encoder zero offset LSB	Setting range: 0–0	0	●
P22.24	Pulse count difference setting	Setting range: 0–0	0	●

Group P23 Communication expansion card 1 functions

Function code	Name	Description	Default	Modify
P23.00	Reserved	-	-	-
P23.01	Communication slave address	Setting range: 0–127	2	/◎
P23.02	Received PZD2	Setting range: 0–31 0: Invalid 1: Set frequency (0–Fmax, unit: 0.01Hz) 2: PID reference (-1000–1000, in which 1000 corresponds to 100.0%) 3: PID feedback (-1000–1000, in which 1000 corresponds to 100.0%) 4: Torque setting (-3000–+3000, in which 1000 corresponds to 100.0% of the motor rated current) 5: Setting of the upper limit of forward running frequency (0–Fmax, unit: 0.01Hz) 6: Setting of the upper limit of reverse running frequency (0–Fmax, unit: 0.01Hz) 7: Upper limit of the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)	0	○
P23.03	Received PZD3		0	○
P23.04	Received PZD4		0	○
P23.05	Received PZD5		0	○
P23.06	Received PZD6		0	○
P23.07	Received PZD7		0	○
P23.08	Received PZD8		0	○
P23.09	Received PZD9		0	○
P23.10	Received PZD10		0	○
P23.11	Received PZD11		0	○
P23.12	Received PZD12		0	○

Function code	Name	Description	Default	Modify
		8: Upper limit of braking torque (0–3000, in which 1000 corresponds to 100% of the motor rated current) 9: Virtual input terminal command. Range: 0x000–0xFFF 10: Virtual output terminal command. Range: 0x00–0xFF 11: Voltage setting (special for V/F separation) (0–1000, in which 1000 corresponds to 100% of the motor rated voltage) 12: AO1 output setting 1 (0–+1000, in which 1000 corresponds to 100.0%) 13: AO2 output setting 2 (0–+1000, in which 1000 corresponds to 100.0%) 14: MSB of position reference (signed) 15: LSB of position reference (unsigned) 16: High bit of position feedback (signed) 17: Low bit of position feedback (unsigned) 18: Position feedback setting flag (position feedback can be set only after this flag is set to 1 and then to 0) 19: Function parameter mapping (PZD2–PZD12 correspond to P14.49–P14.59) 20: IO card virtual input terminal command. Range: 0x000–0x1FF 21: IO card virtual output terminal command, range: 0x00–0x1F 22–31: Reserved		
P23.13	Sent PZD2	Setting range: 0–40 0: Invalid 1: Running frequency (×100, Hz) 2: Set frequency (×100, Hz) 3: Bus voltage (×10, V) 4: Output voltage (×1, V) 5: Output current (×10, A)	0	○
P23.14	Sent PZD3		0	○
P23.15	Sent PZD4		0	○
P23.16	Sent PZD5		0	○
P23.17	Sent PZD6		0	○
P23.18	Sent PZD7		0	○
P23.19	Sent PZD8		0	○

Function code	Name	Description	Default	Modify
P23.20	Sent PZD9	6: Actual output torque (×10, %) 7: Actual output power (×10, %) 8: Rotation speed of running (×1, RPM) 9: Linear speed of running (×1, m/s) 10: Ramp reference frequency 11: Fault code 12: AI1 input (×100, V) 13: AI2 input (×100, V) 14: Reserved 15: Reserved 16: HDI1 frequency value (*1000, kHz) 17: HDI2 frequency value (*1000, kHz) 18: Terminal input status 19: Terminal output status 20: PID reference (×100, %) 21: PID feedback (×100, %) 22: Reserved 23: High bit of position reference (signed) 24: LSB of position reference (unsigned) 25: High bit of position feedback (signed) 26: Low bit of position feedback (unsigned) 27: Status word 2 28: PG card pulse feedback count high bit 29: PG card pulse feedback count low bit 30: PG card pulse reference count MSB 31: PG card pulse reference count LSB 32: Function parameter mapping (PZD2–PZD12 correspond to P14.60–P14.70) 33: Status word 3 34–35: Reserved 36: EAI1 input (×100, V) 37: EAI2 input (×100, V) 38: EAI3 input (×100, V) 39: Reserved 40: EHDI1 frequency value (×1000, kHz)	0	○
P23.21	Sent PZD10		0	○
P23.22	Sent PZD11		0	○
P23.23	Sent PZD12		0	○
P23.24	Reserved	-	-	-
P23.25	PROFIBUS communication	Setting range: 0.0–60.0s	5.0s	○

Function code	Name	Description	Default	Modify
	timeout time			
P23.26	CANopen communication timeout time	Setting range: 0.0–60.0s	5.0s	○
P23.27	CANopen communication baud rate	Setting range: 0–7 0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps 4: 125kbps 5: 100kbps 6: 50kbps 7: 20kbps	3	◎

Group P24 Communication expansion card 2 functions

Function code	Name	Description	Default	Modify
P24.00	Six-in-one expansion card type	Setting range: 0–15 0: None 1: EtherCAT card 2–15: Reserved	0	◎
P24.01	Reserved	-	-	-
P24.02	Ethernet monitoring card IP address 1	Setting range: 0–255	192	◎
P24.03	Ethernet monitoring card IP address 2	Setting range: 0–255	168	◎
P24.04	Ethernet monitoring card IP address 3	Setting range: 0–255	0	◎
P24.05	Ethernet monitoring card IP address 4	Setting range: 0–255	1	◎
P24.06	Ethernet monitoring card	Setting range: 0–255	255	◎

Function code	Name	Description	Default	Modify
	subnet mask 1			
P24.07	Ethernet monitoring card subnet mask 2	Setting range: 0–255	255	◎
P24.08	Ethernet monitoring card subnet mask 3	Setting range: 0–255	255	◎
P24.09	Ethernet monitoring card subnet mask 4	Setting range: 0–255	0	◎
P24.10–P24.13	Reserved	-	-	-
P24.14	Ethernet monitoring variable address 1	Setting range: 0x0000–0xFFFF	0x0000	○
P24.15	Ethernet monitoring variable address 2	Setting range: 0x0000–0xFFFF	0x0000	○
P24.16	Ethernet monitoring variable address 3	Setting range: 0x0000–0xFFFF	0x0000	○
P24.17	Ethernet monitoring variable address 4	Setting range: 0x0000–0xFFFF	0x0000	○
P24.18	Ethernet monitoring variable address 5	Setting range: 0x0000–0xFFFF	0x0000	○
P24.19	Ethernet monitoring variable address 6	Setting range: 0x0000–0xFFFF	0x0000	○
P24.20	Ethernet monitoring variable address 7	Setting range: 0x0000–0xFFFF	0x0000	○
P24.21	Ethernet monitoring variable address 8	Setting range: 0x0000–0xFFFF	0x0000	○
P24.22–	Reserved	-	-	-

Function code	Name	Description	Default	Modify
P24.23				
P24.24	Time to identify expansion card in card slot 1	Setting range: 0.0–600.0s **Note:** Setting it to 0.0 means no timeout detection.	0.0s	○
P24.25	Time to identify expansion card in card slot 2	Setting range: 0.0–600.0s **Note:** Setting it to 0.0 means no timeout detection.	0.0s	○
P24.26	Time to identify expansion card in card slot 3	Setting range: 0.0–600.0s **Note:** Setting it to 0.0 means no timeout detection.	0.0s	○
P24.27	Communication timeout time of expansion card in card slot 1	Setting range: 0.0–600.0s **Note:** Setting it to 0.0 means no timeout detection.	0.0s	○
P24.28	Communication timeout time of expansion card in card slot 2	Setting range: 0.0–600.0s **Note:** Setting it to 0.0 means no timeout detection.	0.0s	○
P24.29	Communication timeout time of expansion card in card slot 3	Setting range: 0.0–600.0s **Note:** Setting it to 0.0 means no timeout detection.	0.0s	○
P24.30	Reserved	-	-	-
P24.31	PROFINET communication timeout time	Setting range: 0.0–60.0s **Note:** Setting it to 0.0 means no timeout detection.	5.0s	○
P24.32	EtherNet IP communication timeout period	Setting range: 0.0–60.0s **Note:** Setting it to 0.0 means no timeout detection.	5.0s	○
P24.33	Reserved	-	-	-
P24.34	Modbus TCP communication timeout time	Setting range: 0.0–60.0s **Note:** Setting it to 0.0 means no timeout detection.	5.0s	○
P24.35	Bluetooth pairing code	Setting range: 0–65535	0	●
P24.36	Bluetooth host type	Setting range: 0–10 0: No host connection 1: Mobile App	0	●

Function code	Name	Description	Default	Modify
		2: Bluetooth box 3–10: Reserved		
P24.37	Industrial Ethernet communication card IP address 1	Setting range: 0–255	192	◎
P24.38	Industrial Ethernet communication card IP address 2	Setting range: 0–255	168	◎
P24.39	Industrial Ethernet communication card IP address 3	Setting range: 0–255	0	◎
P24.40	Industrial Ethernet communication card IP address 4	Setting range: 0–255	20	◎
P24.41	Industrial Ethernet communication card subnet mask 1	Setting range: 0–255	255	◎
P24.42	Industrial Ethernet communication card subnet mask 2	Setting range: 0–255	255	◎
P24.43	Industrial Ethernet communication card subnet mask 3	Setting range: 0–255	255	◎
P24.44	Industrial Ethernet communication card subnet mask 4	Setting range: 0–255	0	◎
P24.45	Save EtherCAT-written data	Setting range: 0–1	0	◎
P24.46	Reserved	-	-	-
P24.47	Input pulse frequency enabling	Setting range: 0–1	0	◎
P24.48	EtherCAT slave address	Setting range: 0–65535	0	◎
P24.49	DC	Setting range: 0–8	2	◎

Function code	Name	Description	Default	Modify
	synchronization period selection			
P24.50	EtherCAT fault detection time	Setting range: 0.0–60.0s	5.0s	○
P24.51	EtherCAT supported PLC type	Setting range: 0–8	0	◎
P24.52	EtherCAT operation mode	Setting range: 0–2	0	◎
P24.53	Ethernet monitoring value attribute	Setting range: 0x0000–0xFFFF	0x0000	◎

Group P25 I/O card input functions

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P25.00</td><td>EHDI1 input type</td><td>Setting range: 0–1
0: EHDI1 is high-speed pulse input
1: EHDI1 is digital input</td><td>0</td><td>◎</td></tr>
<tr><td>P25.01</td><td>Function of EDI1</td><td rowspan="9">Same as the description for P05.01</td><td>0</td><td>◎</td></tr>
<tr><td>P25.02</td><td>Function of EDI2</td><td>0</td><td>◎</td></tr>
<tr><td>P25.03</td><td>Function of EDI3</td><td>0</td><td>◎</td></tr>
<tr><td>P25.04</td><td>Function of EDI4</td><td>0</td><td>◎</td></tr>
<tr><td>P25.05</td><td>Reserved</td><td>0</td><td>●</td></tr>
<tr><td>P25.06</td><td>Reserved</td><td>0</td><td>●</td></tr>
<tr><td>P25.07</td><td>Reserved</td><td>0</td><td>●</td></tr>
<tr><td>P25.08</td><td>Reserved</td><td>0</td><td>●</td></tr>
<tr><td>P25.09</td><td>Function of EHDI1</td><td>0</td><td>◎</td></tr>
<tr><td>P25.10</td><td>Expansion card input terminal polarity</td><td>Setting range: 0x000–0x10F<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4–7</td><td>Bit8</td></tr><tr><td>EDI1</td><td>EDI2</td><td>EDI3</td><td>EDI4</td><td>Reserved</td><td>EHDI1</td></tr></table></td><td>0x000</td><td>○</td></tr>
<tr><td>P25.11</td><td>Expansion card virtual terminal setting</td><td>Setting range: 0x000–0x10F (0: disable, 1: enable)<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4–7</td><td>Bit8</td></tr><tr><td>EDI1</td><td>EDI2</td><td>EDI3</td><td>EDI4</td><td>Reserved</td><td>EHDI1</td></tr></table></td><td>0x000</td><td>◎</td></tr>
<tr><td>P25.12</td><td>EDI1 switch-on</td><td>The function code is used to define the</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
	delay	delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off. Setting range: 0.000–50.000s		
P25.13	EDI1 switch-off delay		0.000s	○
P25.14	EDI2 switch-on delay		0.000s	○
P25.15	EDI2 switch-off delay		0.000s	○
P25.16	EDI3 switch-on delay		0.000s	○
P25.17	EDI3 switch-off delay		0.000s	○
P25.18	EDI4 switch-on delay		0.000s	○
P25.19	EDI4 switch-off delay		0.000s	○
P25.20–P25.27	Reserved	-	-	-
P25.28	EHDI1 switch-on delay	Setting range: 0.000–50.000s	0.000s	○
P25.29	EHDI1 switch-off delay	Setting range: 0.000–50.000s	0.000s	○
P25.30	EAI1 lower limit	Setting range: 0.00V–P25.32	0.00V	○
P25.31	Corresponding setting of EAI1 lower limit	Setting range: -300.0–300.0%	0.0%	○
P25.32	EAI1 upper limit	Setting range: P25.30–10.00V	10.00V	○
P25.33	Corresponding setting of EAI1 upper limit	Setting range: -300.0–300.0%	100.0%	○
P25.34	EAI1 input filter time	Setting range: 0.000–10.000s	0.030s	○
P25.35	EAI2 lower limit	Setting range: 0.00V–P25.37	0.00V	○
P25.36	Corresponding setting of EAI2 lower limit	Setting range: -300.0–300.0%	0.0%	○
P25.37	EAI2 upper limit	Setting range: P25.35–10.00V	10.00V	○
P25.38	Corresponding setting of EAI2	Setting range: -300.0–300.0%	100.0%	○

Function code	Name	Description	Default	Modify
	upper limit			
P25.39	EAI2 input filter time	Setting range: 0.000–10.000s	0.030s	○
P25.40	EAI3 lower limit	Setting range: 0.00V–P25.42	0.00V	○
P25.41	Corresponding setting of EAI3 lower limit	Setting range: -300.0–300.0%	0.0%	○
P25.42	EAI3 upper limit	Setting range: P25.40–10.00V	10.00V	○
P25.43	Corresponding setting of EAI3 upper limit	Setting range: -300.0–300.0%	100.0%	○
P25.44	EAI3 input filter time	Setting range: 0.000–10.000s	0.030s	○
P25.45–P25.49	Reserved	-	-	-
P25.50	EHDI1 lower limit frequency	Setting range: 0.000kHz–P25.52	0.000kHz	○
P25.51	Corresponding setting of EHDI1 lower limit frequency	Setting range: -300.0–300.0%	0.0%	○
P25.52	EHDI1 upper limit frequency	Setting range: P25.50–50.000kHz	50.000 kHz	○
P25.53	Corresponding setting of EHDI1 upper limit frequency	Setting range: -300.0–300.0%	100.0%	○
P25.54	EHDI1 frequency input filter time	Setting range: 0.000–10.000s	0.030s	○
P25.55	EAI input signal selection	Setting range: 0x0–0xF Bit0: EAI1 input signal selection 0: Voltage 1: Current Bit1: EAI2 input signal selection 0: Voltage 1: Current Bit2: EAI3 input signal selection	0x0	○

Function code	Name	Description	Default	Modify
		0: Voltage 1: Current Bit3: EAI4 input signal selection 0: Voltage 1: Current		
P25.56	Reserved	-	-	-
P25.57	EAI1 measurement temperature sensor selection	Setting range: 0x0–0x3 Ones place: Temperature sensor type 0: None 1: PT100 2: PT1000 (Reserved) 3: KTY84 (Reserved)	0x0	◎
P25.58	EAI1 detected OH protection threshold	Setting range: 0.0–150.0°C	120.0°C	○
P25.59	EAI1 overtemperature pre-alarm point	Setting range: 0.0–150.0°C	100.0°C	○
P25.60	EAI1 detected temperature calibration value	Setting range: -20.0–200.0°C	0.0°C	○
P25.61	EAI1 temperature display	Setting range: -20.0–200.0°C	0.0°C	/●
P25.62	EAI2 temperature detection enabling	Setting range: 0x0–0x3 Ones place: Temperature sensor type 0: None 1: PT100 (Reserved) 2: PT1000 3: KTY84 (Reserved)	0x00	◎
P25.63	EAI2 detected OH protection threshold	Setting range: 0.0–150.0°C	120.0°C	○
P25.64	EAI2 overtemperature pre-alarm point	Setting range: 0.0–150.0°C	100.0°C	○
P25.65	EAI2 detected temperature calibration value	Setting range: -20.0–200.0°C	0.0°C	○

Function code	Name	Description	Default	Modify
P25.66	EAI2 temperature display	Setting range: -20.0–200.0°C	0.0°C	/●
P25.67	EAI3 temperature detection enabling	Setting range: 0x0–0x3 Ones place: Temperature sensor type 0: None 1: PT100 2: PT1000 3: KTY84	0x00	◎
P25.68	EAI3 detected OH protection threshold	Setting range: 0.0–150.0°C	120.0°C	○
P25.69	EAI3 overtemperature pre-alarm point	Setting range: 0.0–150.0°C	100.0°C	○
P25.70	EAI3 detected temperature calibration value	Setting range: -20.0–200.0°C	0.0°C	○
P25.71	EAI3 temperature display	Setting range: -20.0–200.0°C	0.0°C	/●

Group P26 I/O card output functions

Function code	Name	Description	Default	Modify
P26.00	EHDO1 output type	Setting range: 0–1 0: Open collector high-speed pulse output 1: Open collector output	0	◎
P26.01	EHDO1 output	Same as the description for P06.01	0	○
P26.02	EDO1 output		0	○
P26.03	Reserved		0	●
P26.04	ERO1 output		0	○
P26.05	ERO2 output		0	○
P26.06	Reserved		0	●
P26.07	Reserved		0	●
P26.08	Reserved		0	●
P26.09	Reserved		0	●
P26.10	Reserved		0	●

Function code	Name	Description	Default	Modify
P26.11	Reserved		0	●
P26.12	Expansion card output terminal polarity	Setting range: 0x00–0x1F Bit0: EDO1 Bit1: Reserved Bit2: EHDO1 Bit3: ERO1 Bit4: ERO2	0x00	○
P26.13	EHDO1 switch-on delay	The function code is used to define the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off. Setting range: 0.000–50.000s **Note:** P26.13 and P26.14 are valid only when P26.00=1.	0.000s	○
P26.14	EHDO1 switch-off delay		0.000s	○
P26.15	EDO1 switch-on delay	The function code is used to define the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off. Setting range: 0.000–50.000s	0.000s	○
P26.16	EDO1 switch-off delay		0.000s	○
P26.17	Reserved		0	●
P26.18	Reserved		0	●
P26.19	ERO1 switch-on delay		0.000s	○
P26.20	ERO1 switch-off delay		0.000s	○
P26.21	ERO2 switch-on delay		0.000s	○
P26.22	ERO2 switch-off delay		0.000s	○
P26.23	Reserved		0	●
P26.24	Reserved		0	●
P26.25	Reserved		0	●
P26.26	Reserved		0	●
P26.27	Reserved		0	●
P26.28	Reserved		0	●
P26.29	Reserved		0	●
P26.30	Reserved		0	●
P26.31	Reserved		0	●

Function code	Name	Description	Default	Modify
P26.32	Reserved		0	●
P26.33	Reserved		0	●
P26.34	Reserved		0	●
P26.35	EAO1 output	Same as the description for P06.26	0	○
P26.36	EAO2 output		0	○
P26.37	EAO3 output		0	○
P26.38	Reserved	-	-	-
P26.39	EAO1 output lower limit	Setting range: -300.0%–P26.41	0.0%	○
P26.40	EAO1 output corresponding to lower limit	Setting range: 0.00–10.00V	0.00V	○
P26.41	EAO1 output upper limit	Setting range: P26.39–300.0%	100.0%	○
P26.42	EAO1 output corresponding to upper limit	Setting range: 0.00–10.00V	10.00V	○
P26.43	EAO1 output filter time	Setting range: 0.000–10.000s	0.000s	○
P26.44	EAO2 output lower limit	Setting range: -300.0%–P26.46	0.0%	○
P26.45	EAO2 output corresponding to lower limit	Setting range: 0.00–10.00V	0.00V	○
P26.46	EAO2 output upper limit	Setting range: P26.44–300.0%	100.0%	○
P26.47	EAO2 output corresponding to upper limit	Setting range: 0.00–10.00V	10.00V	○
P26.48	EAO2 output filter time	Setting range: 0.000–10.000s	0.000s	○
P26.49	EAO3 output lower limit	Setting range: -300.0%–P26.51	0.0%	○
P26.50	EAO3 output corresponding to lower limit	Setting range: 0.00–10.00V	0.00V	○
P26.51	EAO3 output upper	Setting range: P26.49–300.0%	100.0%	○

Function code	Name	Description	Default	Modify
	limit			
P26.52	EAO3 output corresponding to upper limit	Setting range: 0.00–10.00V	10.00V	○
P26.53	EAO3 output filter time	Setting range: 0.000–10.000s	0.000s	○

Group P27 Programmable expansion card functions

Function code	Name	Description	Default	Modify
P27.00	Enabling PLC card functions	Setting range: 0–1 The function code is used to enable the programmable card function. This function is reserved.	0	◎
P27.01	C_WrP1	Setting range: 0–65535 The function code is used for the VFD to write a value to WrP1 of the programmable card.	0	○
P27.02	C_WrP2	Setting range: 0–65535 The function code is used for the VFD to write a value to WrP2 of the programmable card.	0	○
P27.03	C_WrP3	Setting range: 0–65535 Value that the VFD writes to WrP3 on the programmable card.	0	○
P27.04	C_WrP4	Setting range: 0–65535 Value that the VFD writes to WrP4 on the programmable card.	0	○
P27.05	C_WrP5	Setting range: 0–65535 Value that the VFD writes to WrP5 on the programmable card.	0	○
P27.06	C_WrP6	Setting range: 0–65535 Value that the VFD writes to WrP6 on the programmable card.	0	○
P27.07	C_WrP7	Setting range: 0–65535 The function code is used for the VFD to	0	○

Function code	Name	Description	Default	Modify
		write a value to WrP7 of the programmable card.		
P27.08	C_WrP8	Setting range: 0–65535 Value that the VFD writes to WrP8 on the programmable card.	0	○
P27.09	C_WrP9	Setting range: -9999–32767 The function code is used for the VFD to write a value to WrP9 of the programmable card.	0	○
P27.10	C_WrP10	Setting range: -9999–32767 The function code is used for the VFD to write a value to WrP10 of the programmable card.	0	○
P27.11	Programmable card status	The function code is used to display the status of the programmable card. Setting range: 0–1 0: Stop 1: Run	0	●
P27.12	C_MoP1	Setting range: 0–65535 The function code is used for the VFD to monitor/view the MoP1 value of the PLC.	0	●
P27.13	C_MoP2	Setting range: 0–65535 The function code is used for the VFD to monitor/view the MoP2 value of the PLC.	0	●
P27.14	C_MoP3	Setting range: 0–65535 The function code is used for the VFD to monitor/view the MoP3 value of the PLC.	0	●
P27.15	C_MoP4	Setting range: 0–65535 The function code is used for the VFD to monitor/view the MoP4 value of the PLC.	0	●
P27.16	C_MoP5	Setting range: 0–65535 The function code is used for the VFD to monitor/view the MoP5 value of the PLC.	0	●
P27.17	C_MoP6	Setting range: 0–65535 The function code is used for the VFD to monitor/view the MoP6 value of the PLC.	0	●
P27.18	C_MoP7	Setting range: 0–65535 The function code is used for the VFD to	0	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>monitor/view the MoP7 value of the PLC.</td><td></td><td></td></tr>
<tr><td>P27.19</td><td>C_MoP8</td><td>Setting range: 0–65535
The function code is used for the VFD to monitor/view the MoP8 value of the PLC.</td><td>0</td><td>●</td></tr>
<tr><td>P27.20</td><td>C_MoP9</td><td>Setting range: -9999–32767
The function code is used for the VFD to monitor/view the MoP9 value of the PLC.</td><td>0</td><td>●</td></tr>
<tr><td>P27.21</td><td>C_MoP10</td><td>Setting range: -9999–32767
The function code is used for the VFD to monitor/view the MoP10 value of the PLC.</td><td>0</td><td>●</td></tr>
<tr><td>P27.22</td><td>Digital input terminal status of programmable card</td><td>Setting range: 0x00–0x3F<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4</td><td>Bit5</td></tr><tr><td>PDI1</td><td>PDI2</td><td>PDI3</td><td>PDI4</td><td>PDI5</td><td>PDI6</td></tr></table></td><td>0x00</td><td>●</td></tr>
<tr><td>P27.23</td><td>Digital output terminal status of programmable card</td><td>Setting range: 0x0–0x3
Bit0: PRO1
Bit1: PRO2</td><td>0x0</td><td>●</td></tr>
<tr><td>P27.24</td><td>AI1 of the programmable card</td><td>0–65535</td><td>0</td><td>●</td></tr>
<tr><td>P27.25</td><td>AO1 from programmable card</td><td>0–65535</td><td>0</td><td>●</td></tr>
<tr><td>P27.26</td><td>Length of data sent by programmable card and PZD communication object</td><td>Setting range: 0x00–0x28
Ones place: Quantity of data sent from the programmable card and VFD (that is, quantity of data sent from the programmable card + from VFD sending table 1 + from VFD sending table 2)
0: 0+24+60
1: 12+24+60
2: 24+24+60
3: 36+24+60
4: 48+24+60
5: 60+48+60
6: 72+24+60
7: 84+24+60</td><td>0x03</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		8: 96+96+96 Tens place: Card that communicates with the programmable card through PZD (valid only when the ones place of P27.26 is 5) 0: DP card 1: CANopen card 2: PN card **Note:** P27.26 can be changed at any time, but the change will only take effect after the re-power on.		
P27.27	Programmable card save function at power off	Setting range: 0–1 0: Disable 1: Enable	1	◎

Group P28 Master/slave control

Function code	Name	Description	Default	Modify
P28.00	Master/slave mode	Setting range: 0–2 0: Master/slave control is invalid. 1: The local device is the master. 2: The local device is the slave.	0	◎
P28.01	Master/slave communication data selection	Setting range: 0–1 0: CAN 1: Reserved	0	◎
P28.02	Master/slave control mode	Setting range: 0x00–0x12 Ones place: Master/slave running mode selection 0: Master/slave mode 0. (Both the master and slave use speed control, and power balancing is performed by droop control.) 1: Master/slave mode 1. (The master and slave must be in the same type of vector control. When the master is in speed control, the slave is forced into torque control.) 2: Master/slave mode 2 (The slave switches	0x01	◎

Function code	Name	Description	Default	Modify
		from speed mode (master/slave mode 0) to torque mode (master/slave mode 1) at a frequency point.) Tens place: Slave start command source 0: Master 1: Determined by P00.01 (reserved)		
P28.03	Slave speed gain	Setting range: 0.0–500.0%	100.0%	○
P28.04	Slave torque gain	Setting range: 0.0–500.0%	100.0%	○
P28.05	Speed/torque mode switching frequency point in master/slave mode 2	Setting range: 0.00Hz–P00.03	5.00Hz	○
P28.06	Number of slaves	Setting range: 0–15	1	◎
P28.07–P28.16	Reserved	-	-	-
P28.17	CAN slave torque offset	Setting range: -100.0–100.0%	0.0%	○
P28.18	CAN communication address	Setting range: 0–127	1	◎
P28.19	CAN communication baud rate	Setting range: 0–5 0: 50kbps 1: 100kbps 2: 125kbps 3: 250kbps 4: 500kbps 5: 1Mbps	2	◎
P28.20	CAN communication timeout time	Setting range: 0.0–60.0s	5.0s	○

Group P29 Expansion card status viewing

Function code	Name	Description	Default	Modify
P29.00	Expansion card type	Setting range: 0–50	0	●

Function code	Name	Description	Default	Modify
	of card slot 1	0: No card		
P29.01	Expansion card type of card slot 2	1: PLC card 2: I/O card	0	●
P29.02	Expansion card type of card slot 3	3: Incremental PG card 4: Incremental PG card with UVW 5: Ethernet communication card 6: PROFIBUS communication card 7: Bluetooth card 8: Resolver PG card 9: CANopen communication card 10: WIFI card 11: PROFINET communication card 12: Sine-cosine PG card without CD signals 13: Sine-cosine PG card with CD signals 14: Absolute encoder PG card 15: CAN master/slave communication card 16: Modbus TCP communication card 17: EtherCAT communication card 18: BACnet communication card (reserved) 19: DeviceNet communication card (reserved) 20: PT100/PT1000 temperature detection card 21: EtherNet IP card 22: MECHATROLINK card (reserved) 23: Bluetooth card 2 24–26: Reserved 27: Endat card 28–31: Reserved 32: SSI card 33: Reserved 34: TFORMAT card 35–50: Reserved	0	●
P29.03	Software version of expansion card in	Setting range: 0.00–655.35	0.00	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td>slot 1</td><td></td><td></td><td></td></tr>
<tr><td>P29.04</td><td>Software version of expansion card at slot 2</td><td>Setting range: 0.00–655.35</td><td>0.00</td><td>●</td></tr>
<tr><td>P29.05</td><td>Software version of expansion card at slot 3</td><td>Setting range: 0.00–655.35</td><td>0.00</td><td>●</td></tr>
<tr><td>P29.06</td><td>Terminal input status of I/O card</td><td>Setting range: 0x000–0x10F<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4–7</td><td>Bit8</td></tr><tr><td>EDI1</td><td>EDI2</td><td>EDI3</td><td>EDI4</td><td>Reserved</td><td>EHDI1</td></tr></table></td><td>0x000</td><td>●</td></tr>
<tr><td>P29.07</td><td>Terminal output status of I/O card</td><td>Setting range: 0x00–0x1F<table><tr><td>Bit0</td><td>Bit1</td><td>Bit2</td><td>Bit3</td><td>Bit4</td></tr><tr><td>EDI1</td><td>Reserved</td><td>EHDO1</td><td>ERO1</td><td>ERO2</td></tr></table></td><td>0x0000</td><td>●</td></tr>
<tr><td>P29.08</td><td>Reserved</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P29.09</td><td>EAI1 input voltage of I/O card</td><td>Setting range: 0.00–10.00V</td><td>0.00V</td><td>●</td></tr>
<tr><td>P29.10</td><td>EAI2 input voltage of I/O card</td><td>Setting range: 0.00–10.00V</td><td>0.00V</td><td>●</td></tr>
<tr><td>P29.11</td><td>EAI3 input voltage of I/O card</td><td>Setting range: 0.00–10.00V</td><td>0.00V</td><td>●</td></tr>
<tr><td>P29.12–P29.13</td><td>Reserved</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>P29.14</td><td>Alarm display value</td><td>Setting range: 0–4
0: No alarm
1: PT100 detected OH alarm (A-Ot1)
2: PT1000 detected OH alarm (A-Ot2)
3: PT100 disconnection alarm (A-Pt1)
4: PT1000 disconnection alarm (A-Pt2)</td><td>0</td><td>●</td></tr>
<tr><td>P29.15</td><td>VFD control word</td><td>Setting range: 0x0000–0xFFFF</td><td>0x0000</td><td>●</td></tr>
<tr><td>P29.16</td><td>VFD status word</td><td>Setting range: 0x0000–0xFFFF</td><td>0x0000</td><td>●</td></tr>
<tr><td>P29.17</td><td>Ethernet monitoring variable 1 present value</td><td>Setting range: 0–65535</td><td>0</td><td>●</td></tr>
<tr><td>P29.18</td><td>Ethernet monitoring variable 2 present value</td><td>Setting range: 0–65535</td><td>0</td><td>●</td></tr>
</table>

Function code	Name	Description	Default	Modify
P29.19	Ethernet monitoring variable 3 present value	Setting range: 0–65535	0	●
P29.20	Ethernet monitoring variable 4 present value	Setting range: 0–65535	0	●
P29.21	Ethernet monitoring variable 5 present value	Setting range: 0–65535	0	●
P29.22	Ethernet monitoring variable 6 present value	Setting range: 0–65535	0	●
P29.23	Ethernet monitoring variable 7 present value	Setting range: 0–65535	0	●
P29.24	Ethernet monitoring variable 8 present value	Setting range: 0–65535	0	●

Group P34 Parameters of motor 2

Function code	Name	Description	Default	Modify
P34.00	Type of motor 2	Setting range: 0–2 0: Asynchronous motor (AM) 1: Permanent magnet synchronous motor 2: Synchronous reluctance motor	0	◎
P34.01	Rated power of AM 2	Setting range: 0.1–3000.0kW	Model depended (0.4)	◎
P34.02	Rated frequency of AM 2	Setting range: 0.01Hz–P00.03	Model depended (50.00)	◎
P34.03	Rated speed of AM 2	Setting range: 1–60000rpm	Model depended (1400)	◎

Function code	Name	Description	Default	Modify
P34.04	Rated voltage of AM 2	Setting range: 0–1200V	Model depended (380)	◎
P34.05	Rated current of AM 2	Setting range: 0.8–6000.0A	Model depended (1.0)	◎
P34.06	Stator resistance of AM 2	Setting range: 0.001–65.535Ω	Model depended (0.001)	○
P34.07	Rotor resistance of AM 2	Setting range: 0.001–65.535Ω	Model depended (0.001)	○
P34.08	Leakage inductance of AM 2	Setting range: 0.1–6553.5mH	Model depended (0.1)	○
P34.09	Mutual inductance of AM 2	Setting range: 0.1–6553.5mH	Model depended (0.1)	○
P34.10	No-load current of AM 2	Setting range: 0.1–6553.5A	Model depended (0.1)	○
P34.11	Magnetic saturation coefficient 1 of iron core of AM 2	Setting range: 0.0–100.0%	80.0%	○
P34.12	Magnetic saturation coefficient 2 of iron core of AM 2	Setting range: 0.0–100.0%	68.0%	○
P34.13	Magnetic saturation coefficient 3 of iron core of AM 2	Setting range: 0.0–100.0%	57.0%	○
P34.14	Magnetic saturation coefficient 4 of iron core of AM 2	Setting range: 0.0–100.0%	40.0%	○
P34.15	Rated power of SM 2	Setting range: 0.1–3000.0kW	Model depended (0.4)	◎

Function code	Name	Description	Default	Modify
P34.16	Rated frequency of SM 2	Setting range: 0.01Hz–P00.03	Model depended (50.00)	◎
P34.17	Number of pole pairs of SM 2	Setting range: 1–128	2	◎
P34.18	Rated voltage of SM 2	Setting range: 0–1200V	Model depended (380)	◎
P34.19	Rated current of SM 2	Setting range: 0.8–6000.0A	Model depended (1.0)	◎
P34.20	Stator resistance of SM 2	Setting range: 0.001–65.535Ω	Model depended (0.001)	○
P34.21	Direct-axis inductance of SM 2	Setting range: 0.01–655.35mH	Model depended (0.01)	○
P34.22	Quadrature-axis inductance of SM 2	Setting range: 0.01–655.35mH	Model depended (0.01)	○
P34.23	Counter-emf of SM 2	Setting range: 0–10000V	300V	○
P34.24	Initial pole position of SM 2	Setting range: 0x0000–0xFFFF	0x0000	●
P34.25	SM 2 counter-emf identification frequency percentage	Setting range: 5.0 –100.0% (of the motor rated frequency)	60.0%	◎
P34.26	Overload protection selection of motor 2	Setting range: 0–2 0: No protection 1: Common motor (with low-speed compensation) 2: Frequency-variable motor (without low-speed compensation)	2	◎
P34.27	Overload protection coefficient of motor 2	Setting range: 20.0–150.0%	100.0%	○

Function code	Name	Description	Default	Modify
P34.28	Power display calibration coefficient of motor 2	Setting range: 0.00–3.00	1.00	○
P34.29	Parameter display of motor 2	Setting range: 0–1 0: Display by motor type 1: Display all	0	○
P34.30	System inertia of motor 2	Setting range: 0.001–65.535kg • m^2	0.001 kg • m^2	○
P34.31	Motor 2 parameter model calculation	Setting range: 0–1 0: Disable 1: Enable	0	◎
P34.32	Power factor of AM 2	Setting range: 0.00–1.00 **Note:** For asynchronous motors, P34.32 need to be set according to the motor nameplate before P34.31 is enabled; otherwise, the calculation may deviate.	0.85	○
P34.33	Rated speed high word of AM 2	Setting range: 0–30(10kRPM)	0	◎
P34.34	AM2 iron core saturation coefficient 1	Setting range: 0.0–200.0%	125.0%	○
P34.35	AM2 iron core saturation coefficient 2	Setting range: 0.0–200.0%	125.0%	○
P34.36	AM2 mutual inductance saturation coefficient 1	Setting range: 0.0–200.0%	88.0%	○
P34.37	AM2 mutual inductance saturation coefficient 2	Setting range: 0.0–200.0%	88.0%	○
P34.38	AM2 mutual inductance flux weakening	Setting range: 0.0–200.0%	112.5%	○

Function code	Name	Description	Default	Modify
	coefficient 1			
P34.39	AM2 mutual inductance flux weakening coefficient 2	Setting range: 0.0–200.0%	117.6%	○
P34.40	AM2 mutual inductance flux weakening coefficient 3	Setting range: 0.0–200.0%	122.8%	○
P34.41	AM2 mutual inductance flux weakening coefficient 4	Setting range: 0.0–200.0%	125.0%	○
P34.42	SM2 D-axis inductance saturation coefficient 1	Setting range: 100–10000	4096	○
P34.43	SM2 D-axis inductance saturation coefficient 2	Setting range: 100–10000	4096	○
P34.44	SM2 D-axis inductance saturation coefficient 3	Setting range: 100–10000	4096	○
P34.45	SM2 D-axis inductance saturation coefficient 4	Setting range: 100–10000	3686	○
P34.46	SM2 D-axis inductance saturation coefficient 5	Setting range: 100–10000	3277	○
P34.47	SM2 D-axis inductance saturation	Setting range: 100–10000	2867	○

Function code	Name	Description	Default	Modify
	coefficient 6			
P34.48	SM2 D-axis inductance saturation coefficient 7	Setting range: 100–10000	2458	○
P34.49	SM2 D-axis inductance saturation coefficient 8	Setting range: 100–10000	2048	○
P34.50	SM2 Q-axis inductance saturation coefficient 1	Setting range: 100–10000	4096	○
P34.51	SM2 Q-axis inductance saturation coefficient 2	Setting range: 100–10000	4096	○
P34.52	SM2 Q-axis inductance saturation coefficient 3	Setting range: 100–10000	4096	○
P34.53	SM2 Q-axis inductance saturation coefficient 4	Setting range: 100–10000	3686	○
P34.54	SM2 Q-axis inductance saturation coefficient 5	Setting range: 100–10000	3277	○
P34.55	SM2 Q-axis inductance saturation coefficient 6	Setting range: 100–10000	2867	○
P34.56	SM2 Q-axis inductance saturation	Setting range: 100–10000	2458	○

Function code	Name	Description	Default	Modify
	coefficient 7			
P34.57	SM2 Q-axis inductance saturation coefficient 8	Setting range: 100–10000	2048	○
P34.58	Counter-emf identification of SM 2	Setting range: 0–10000V	0V	○

Group P35 Vector control of motor 2

Function code	Name	Description	Default	Modify
P35.00	Speed-loop proportional gain 1 of motor 2	Setting range: 0.0–200.0	20.0	○
P35.01	Speed-loop integral time 1 of motor 2	Setting range: 0.000–10.000s	0.200s	○
P35.02	Low-point frequency for speed-loop switching of motor 2	Setting range: 0.00Hz–P35.05	5.00Hz	○
P35.03	Speed-loop proportional gain 2 of motor 2	Setting range: 0.0–200.0	20.0	○
P35.04	Speed-loop integral time 2 of motor 2	Setting range: 0.000–10.000s	0.200s	○
P35.05	High-point frequency for speed-loop switching of motor 2	Setting range: P35.02–P00.03 (Hz)	10.00Hz	○
P35.06	Speed-loop output filter of motor 2	Setting range: 0–8 **Note:** 0–8 corresponds to 0–2^8/10ms.	0	○
P35.07	Electromotive slip compensation coefficient of vector	Setting range: 50–200%	100%	○

Function code	Name	Description	Default	Modify
	control for motor 2			
P35.08	Braking slip compensation coefficient of vector control for motor 2	Setting range: 50–200%	100%	○
P35.09–P35.10	Reserved	-	-	-
P35.11	Torque setting method selection of motor 2	Setting range: 0–25 0: Set by P35.12 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated torque setting channel for specialized equipment **Note:** 100% corresponds to the motor rated current.	0	○
P35.12	Motor 2 torque set through keypad	Setting range: -300.0–300.0% (of the motor rated current)	20.0%	○
P35.13	Motor 2 torque	Setting range: 0.000–10.000s	0.010s	○

Function code	Name	Description	Default	Modify
	reference filter time			
P35.14	Motor 2 forward rotation upper limit frequency source in torque control	Setting range: 0–25 0: Set by P35.16 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated forward rotation frequency upper limit in torque control for specialized equipment **Note:** 100% corresponds to the max. frequency.	0	○
P35.15	Motor 2 reverse rotation upper limit frequency source in torque control	Setting range: 0–25 0: Set by P35.17 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2	0	○

Function code	Name	Description	Default	Modify
		7: Reserved 8: Multi-step speed running 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated reverse rotation frequency upper limit in torque control for specialized equipment		
P35.16	Motor 2 forward rotation upper limit frequency in torque control	Setting range: 0.00Hz–P00.03	Model depended (50.00)	○
P35.17	Motor 2 reverse rotation upper limit frequency in torque control	Setting range: 0.00Hz–P00.03	Model depended (50.00)	○
P35.18	Setting source of motor 2 electromotive torque upper limit	Setting range: 0–25 0: Set by P35.20 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication	0	○

Function code	Name	Description	Default	Modify
		11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated electromotive torque upper limit for specialized equipment **Note:** 100% corresponds to the motor rated current.		
P35.19	Setting source of motor 2 braking torque upper limit	Setting range: 0–25 0: Set by P35.21 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3	0	○

Function code	Name	Description	Default	Modify
		22: Reserved 23: EHDI1 24: Reserved 25: Dedicated braking torque upper limit for specialized equipment **Note:** 100% corresponds to the motor rated current.		
P35.20	Motor 2 electromotive torque upper limit set through keypad	Setting range: 0.0–300.0% (of the motor rated current) **Note:** For the asynchronous machine on the new platform, 100% relative to the rated torque current of the motor.	180.0%	○
P35.21	Motor 2 braking torque upper limit set through keypad	Setting range: 0.0–300.0% (of the motor rated current) **Note:** For the asynchronous machine on the new platform, 100% relative to the rated torque current of the motor.	180.0%	○
P35.22	Motor 2 weakening coefficient in constant power zone	Setting range: 0.1–2.0	1.0	○
P35.23	Lowest weakening point of AM 2 in constant power zone	Setting range: 5–100%	10%	○
P35.24	Max. voltage limit of motor 2	Setting range: 0.0–120.0%	100.0%	○
P35.25	Pre-exciting time of motor 2	Setting range: 0.000–10.000s **Note:** Pre-excitation can improve the starting capability of AM with loads. For an AM, set 0 to disable the pre-excitation process. For an SM, if P13.01 is set to an enabling option, the pre-excitation process is directly skipped.	0.300s	○
P35.26	Motor 2 flux-weakening proportional gain	Setting range: 0–8000	1000	○
P35.27	Motor 2 speed	Setting range: 0–1	0	○

Function code	Name	Description	Default	Modify
	display selection in vector control	0: Display the actual value 1: Display the set value		
P35.28	Motor 2 static friction compensation coefficient	Setting range: 0.0–100.0%	0.0%	○
P35.29	Frequency point corresponding to motor 2 static friction	Setting range: 0.00Hz–P35.31	1.00Hz	○
P35.30	Motor 2 high speed friction compensation coefficient	Setting range: 0.0–100.0%	0.0%	○
P35.31	Frequency corresponding to motor 2 high speed friction torque	Setting range: P35.29–P00.03 (Hz)	50.00Hz	○
P35.32	Enabling torque control of motor 2	Setting range: 0–1 0: Disable 1: Enable	0	○
P35.33	Motor 2 flux-weakening integral gain	Setting range: 0.0–300.0%	100.0%	○
P35.34	Reserved	-	-	-
P35.35	Motor 2 control mode optimization selection	Setting range: 0x0000–0x1111 Ones place: Torque command selection 0: Torque reference 1: Torque current reference Tens place: Reserved Hundreds place: indicates whether to enable speed-loop integral separation 0: Disable 1: Enable Thousands place: Reserved	0x0000	○
P35.36	Speed-loop differential gain of motor 2	Setting range: 0.00–10.00s	0.00s	○

Function code	Name	Description	Default	Modify
P35.37–P35.39	Reserved	-	-	-
P35.40	Enable motor 2 inertia compensation	Setting range: 0–1 0: Disable 1: Enable	0	○
P35.41	Upper limit of motor 2 inertia compensation torque	Setting range: 0.0–150.0% (of the motor rated torque)	10.0%	○
P35.42	Motor 2 inertia compensation filter times	Setting range: 0–10	7	○
P35.43	Motor 2 inertia identification torque	Setting range: 0.0–100.0% (of the motor rated torque)	10.0%	○
P35.44	Motor 2 inertia identification enabling	Setting range: 0–2 0: No operation 1: Mode 1 2: Mode 2	0	◎
P35.45	SM 2 max. flux weakening current	Setting range: 0.0–200.0%	50.0%	○
P35.46–P35.47	Reserved	-	-	-
P35.48	Motor 2 speed-loop overshoot suppression gain	Setting range: 0–400	0	◎
P35.49	Motor 2 closed-loop speed observer bandwidth	Setting range: 1.0–200.0	10.0	○
P35.50	Motor 2 vector energy-saving mode selection	Setting range: 0–3 0: Invalid 1: Max. efficiency 2:Optimal power factor 3: MTPA	0	◎
P35.51	Motor 2 vector energy-saving optimization	Setting range: 25.0–400.0%	100.0%	○

Function code	Name	Description	Default	Modify
	coefficient			
P35.52–P35.53	Reserved	-	-	-
P35.54	Current-loop band width of motor 2	Setting range: 0–2000 **Note:** The smaller the current loop bandwidth, the slower the response, but the better the current waveform.	400	○
P35.55	Reserved	-	-	-
P35.56	Vector control loop optimization parameter	Setting range: 0x000–0xFFF Bit 0: Enable voltage feedforward compensation (valid in FVC) Bit 1: Enable axis-d voltage cross decoupling (valid in FVC) Bit 2: Enable axis-q voltage cross decoupling (valid in FVC) Bit 3: Enable closed-loop disturbance feedforward compensation Bit 4: Axis-q voltage restriction selection 0: Limit to 1.2 times the rated motor voltage 1: Limit to d-axis voltage Bit5: Reserved Bit6: Enable D-axis inductance saturation (valid in vector control mode) Bit7: Enable Q-axis inductance saturation (valid in vector control mode) Bit8–bit11: Reserved	0x037	◎
P35.57	Motor 2 FVC switches to SVC mode	Setting range: 0x00–0x11 Ones place: Enable switchover 0: Disable 1: Enable Tens place: Switch to SVC mode selection 0: Switch to SVC0 mode 1: Switch to SVC1 mode	0x00	◎
P35.58	Motor 2 fast exciting current	Setting range: 0.0–200.0%	0.0%	◎
P35.59–P35.67	Reserved	-	-	-
P35.68	Upper limit	Setting range: 0.00Hz–P00.03	0.00Hz	○

Function code	Name	Description	Default	Modify
	frequency bias value in torque control			
P35.69	Upper limit frequency ACC/DEC selection in torque control	Setting range: 0–4 0: No limit on acceleration or deceleration 1: ACC/DEC time 1 2: ACC/DEC time 2 3: ACC/DEC time 3 4: ACC/DEC time 4	0	○

Group P36 Motor 2 V/F control

Function code	Name	Description	Default	Modify
P36.00	V/F curve setting of motor 2	Setting range: 0–5 0: Straight-line V/F curve 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) 5: Customized V/F curve (V/F separation) **Note:** The n-th power torque reduction is linear below 1/3 frequency to prevent the calculated power curve voltage from being too low, which could result in the motor being unable to drive the load.	0	◎
P36.01	Torque boost of motor 2	Setting range: 0.0–10.0% (of the rated voltage of motor 2) For different motor power ratings, the internal program imposes different upper limits on torque boost, specifically as follows: ≤0.8kW, 10.0%; ≤2.2kW, 8.0%; ≤4.0kW, 6.0%; ≤7.5kW, 4.0%; ≤37.0kW, 2.0%; ≤132.0kW, 1.5%; ≤500.0kW, 1.0%; >500.0kW, 0.8%	0.0%	○
P36.02	Torque boost	Setting range: 0.0 –50.0% (of the rated	20.0%	○

Function code	Name	Description	Default	Modify
	cut-off of motor 2	frequency of motor 2)		
P36.03	V/F frequency point 1 of motor 2	Setting range: 0.00Hz–P36.05	0.00Hz	○
P36.04	V/F voltage point 1 of motor 2	Setting range: 0.0–110.0% (of the rated voltage of motor 2)	0.0%	○
P36.05	V/F frequency point 2 of motor 2	Setting range: P36.03–P36.07 (Hz)	0.00Hz	○
P36.06	V/F voltage point 2 of motor 2	Setting range: 0.0–110.0% (of the rated voltage of motor 2)	0.0%	○
P36.07	V/F frequency point 3 of motor 2	Setting range: P36.05–P02.02 (P02.00=0 Rated frequency of AM 2) or P36.05–P02.16 (P02.00=1 Rated frequency of SM 2)	0.00Hz	○
P36.08	V/F voltage point 3 of motor 2	Setting range: 0.0–110.0% (of the rated voltage of motor 2)	0.0%	○
P36.09	V/F slip compensation gain of motor 2	Setting range: 0.0–200.0%	100.0%	○
P36.10	Low-frequency oscillation control factor of motor 2	Setting range: 0–100	10	○
P36.11	High-frequency oscillation control factor of motor 2	Setting range: 0–100	10	○
P36.12	Oscillation control threshold of motor 2	Setting range: 0.00Hz–P00.03	30.00Hz	○
P36.13	Motor 2 voltage setting channel selection	Setting range: 0–25 0: Set by P36.14 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Multi-step speed running 9: PID control	0	○

Function code	Name	Description	Default	Modify
		10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 24: Reserved 25: Dedicated voltage setting channel for specialized equipment		
P36.14	Motor 2 voltage set through keypad	Setting range: 0.0–100.0% (of the rated voltage of motor 2)	100.0%	○
P36.15	Motor 2 voltage increase time	Setting range: 0.0–3600.0s	5.0s	○
P36.16	Motor 2 voltage step-down time	Setting range: 0.0–3600.0s	5.0s	○
P36.17	Max. output voltage of motor 2	Setting range: P36.18–100.0% (of the rated voltage of motor 2)	100.0%	◎
P36.18	Min. output voltage of motor 2	Setting range: 0.0%–P36.17 (of the rated voltage of motor 2)	0.0%	◎
P36.19	Motor 2 V/F constant power zone weakening coefficient	Setting range: 1.00–1.30	1.00	○
P36.20	Pull-in current 1 in SM 2 V/F control	Setting range: -100.0–100.0% (of the rated voltage of motor 2)	30.0%	○
P36.21	Pull-in current 2 in SM 2 V/F control	Setting range: -100.0–100.0% (of the rated voltage of motor 2)	10.0%	○
P36.22	V/F control pull-in current frequency	Setting range: 0.0 –200.0% (of the rated frequency of motor 2)	20.0%	○

Function code	Name	Description	Default	Modify
	switching point for SM 2			
P36.23	Reactive current closed-loop proportional coefficient in SM 2 V/F control	Setting range: 0–500	50	○
P36.24	V/F control reactive current closed-loop integral time for SM 2	Setting range: 0–300	30	○
P36.25	Reserved	-	-	-
P36.26	Enabling IF mode for motor 2	Setting range: 0–1	0	○
P36.27	Current setting in IF mode for motor 2	Setting range: 0.0–200.0%	120.0%	○
P36.28	Proportional coefficient in IF mode for motor 2	Setting range: 0–5000	350	○
P36.29	Integral coefficient in IF mode for motor 2	Setting range: 0–5000	150	○
P36.30	IF switch-out frequency point for motor 2	Setting range: 0.00Hz–P36.31	10.00Hz	○
P36.31	End frequency point for motor 2 switching off IF mode	Setting range: P36.30–P00.03 (Hz)	25.00Hz	○
P36.32	V/F control energy-saving mode selection for AM 2	Setting range: 0–3 0: Disable (Energy-saving is ineffective) 1: Max. efficiency 2:Optimal power factor 3: Max. torque per ampere (MTPA)	0	◎
P36.33	AM 2 VF energy-saving	Setting range: 25.0–400.0%	100.0%	○

Function code	Name	Description	Default	Modify
	optimization coefficient			

Group P40 Encoder of motor 2

Function code	Name	Description	Default	Modify
P40.00	Motor 2 encoder type display	Setting range: 0–6 0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder 4: SSI 5: TFORMAT 6: Endat	0	●
P40.01	Motor 2 encoder pulse count	Setting range: 0–16000	1024	◎
P40.02	Motor 2 encoder direction	Setting range: 0x000–0x111 Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds place: CD/UVW pole signal direction 0: Forward 1: Reverse	0x000	◎
P40.03	Motor 2 encoder disconnection fault detection time	Setting range: 0.0–10.0s	2.0s	○
P40.04	Motor 2 encoder reversal fault detection time	Setting range: 0.0–100.0s	0.8s	○
P40.05	Motor 2 filter times of encoder detection	Setting range: 0x00–0x99 Ones place: Low-speed filter times, corresponding to 2^(0–9)×125μs Tens place: High-speed filter times,	0x33	○

Function code	Name	Description	Default	Modify
		corresponding to 2^(0–9)×125μs		
P40.06	Motor 2 to encoder shaft speed ratio	Setting range: 0.000–65.535	1.000	○
P40.07	Motor 2 encoder detection control parameter	Setting range: 0x0000–0xFFFF Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3–bit5: Reserved Bit6: Enable the CD signal calibration Bit7: Reserved Bit8: Do not detect encoder faults during autotuning Bit9: Enable Z pulse detection optimization Bit 10: Enable the initial Z pulse calibration optimization Bit11: Update initial angle Bit12: Clear the Z pulse arrival signal after stop Bit13: Enable encoder direction identification Bit14: Detect Z pulse after one rotation Bit15: Reserved	0x2003	○
P40.08	Enable motor 2 encoder Z pulse offline detection	Setting range: 0x00–0x11 Ones place: Z pulse detection 0: No detection 1: Enable Tens place: UVW pulses (for SMs) 0: No detection 1: Enable	0x10	○
P40.09	Motor 2 encoder Z pulse initial angle	Setting range: 0.00–359.99	0.00	○
P40.10	SM 2 pole initial angle	Setting range: 0.00–359.99	0.00	○
P40.11	Initial pole position autotuning of SM 2	Setting range: 0–3 0: No operation 1: Rotary autotuning 1 2: Static autotuning	0	◎

Function code	Name	Description	Default	Modify
		3: Rotary autotuning 2		
P40.12	Motor 2 speed measurement optimization selection	Setting range: 0–3 0: No optimization 1: Optimization mode 1 2: Optimization mode 2 3: Optimization mode 3 (observe disturbance)	1	◎
P40.13	Motor 2 encoder CD signal zero offset gain	Setting range: 0–65535	0	○
P40.14	Motor 2 encoder type selection	Setting range: 0x00–0x11 Ones place: Incremental encoder 0: Without UVW 1: With UVW Tens place: Sin/Cos encoder 0: without CD signal 1: With CD signal	0x00	◎
P40.15	Motor 2 speed measurement method	Setting range: 0–1 0: PG card 1: Locally measured through HDI1 and HDI2. Only the 24V incremental encoders are supported.	0	◎
P40.16	Motor 2 encoder frequency division coefficient	Setting range: 0–255	0	○
P40.17	Motor 2 encoder pulse filter processing selection	Setting range: 0x0000–0xFFFF Bit0: Encoder channel P input filter enabling 0: Disable 1: Enable Bit 1: Encoder P-channel input filter method 0: Self-adaptive filter 1: Use P40.18 filter parameter Bit2: Encoder channel P frequency-division output filter enabling 0: Disable 1: Enable	0x0033	○

Function code	Name	Description	Default	Modify
		Bit3: Pulse reference channel F frequency-division output filter enabling 0: Disable 1: Enable Bit4: Pulse reference channel F filter enabling 0: Disable 1: Enable Bit5: Pulse reference channel F filter mode 0: Self-adaptive filter 1: Use P40.19 filter parameter Bit6: Frequency-divided output source setting 0: Encoder 1: Pulse reference Bit7–bit15: Reserved		
P40.18	Motor 2 pulse feedback (P-path) filter width	Setting range: 0–63 0 and 1 represent 0.25μs, while the others are P20.18*0.25μs.	2	○
P40.19	Motor 2 pulse reference (F-path) filter width	Setting range: 0–63 0 and 1 represent 0.25μs, while the others are P20.18*0.25μs.	2	○
P40.20	Motor 2 pulse reference (F-path) pulse count	Setting range: 0–16000	1024	◎
P40.21	Enabling SM 2 angle compensation	Setting range: 0–1	1	○
P40.22	Frequency point of motor 2 speed measurement mode switchover	Setting range: 0.00Hz–P00.03	1.00Hz	○
P40.23	Motor 2 angle compensation coefficient	Setting range: -200.0–200.0%	100.0%	○
P40.24	SM 2 initial pole angle autotuning turns	Setting range: 1–128	2	◎

Function code	Name	Description	Default	Modify
P40.25	Absolute encoder type selection	Setting range: 0–1	0	○
P40.26	Single-turn resolution of absolute encoder	Setting range: 0–31	13	○
P40.27	Multi-turn resolution of absolute encoder	Setting range: 0–31	12	○
P40.28	Subdivision SinA signal zero offset	Setting range: -200–200	0	○
P40.29	Subdivision SinB signal zero offset	Setting range: -200–200	0	○
P40.30	Subdivision SinB signal gain	Setting range: -200–200	0	○
P40.31	Sin/Cos encoder subdivision bits	Setting range: 0–11	8	◎
P40.32	Sin/Cos encoder subdivision disable selection	Setting range: 0–1 0: Enable 1: Disable	0	◎

Group P41 Tension control basic parameters

Function code	Name	Description	Default	Modify
P41.00	Tension control mode	Setting range: 0–8 0: Standard model 1: Open-loop torque mode 2: Closed-loop speed mode 3: Closed-loop torque mode 4: Constant linear speed mode (reserved) 5: Traction mode 6: Standard winding/unwinding mode 7: Direct speed torque mode (torque or speed execution, requires inertia compensation and friction compensation) 8: Wire alignment mode (reserved) **Note:** The value 0 indicates the VFD enables general-purpose functions. A	0	◎

Function code	Name	Description	Default	Modify
		non-zero value indicates the VFD enables the tension control function.		
P41.01	Winding/unwinding mode	Setting range: 0–1 0: Winding 1: Unwinding **Note:** The motor forward rotation direction is the winding direction. When using the tension control mode, check whether the motor rotation direction is correct in the winding mode; if not, change the rotation direction by swapping two phase wires of the motor. After the rotation direction is corrected, the winding mode can be switched to the unwinding mode by setting P41.01 to 1 or changing the winding/unwinding switchover terminals.	0	◎
P41.02	Winding upper limit frequency	Setting range: 0.00Hz–P00.03	50.00Hz	◎
P41.03	Unwinding upper limit frequency	Setting range: 0.00Hz–P00.03	1.00Hz	◎
P41.04	Frequency upper limit channel	Setting range: 0–7 0: Set by P41.05 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Automatic upper limit (winding operates at the present frequency)	0	◎
P41.05	Actual upper limit frequency	Setting range: 0.01Hz–P00.03	0.00Hz	●
P41.06	Reel mechanical transmission rate	Setting range: 0.01–300.00	1.00	◎
P41.07	Torque reference in debugging mode	Setting range: 0.0–300.0%	0.0%	○
P41.08	Static friction torque	Setting range: 0.0–100.0%	0.0%	○

Function code	Name	Description	Default	Modify
	compensation			
P41.09	Dynamic friction torque compensation	Setting range: 0.0–100.0%	0.0%	○
P41.10	Torque compensation for max. linear speed	Setting range: 0.0–100.0%	0.0%	○
P41.11	Static friction frequency threshold	Setting range: 0.01Hz–P00.03	1.00Hz	○
P41.12	Dynamic friction frequency threshold	Setting range: 0.01Hz–P00.03	5.00Hz	○
P41.13	Linear speed input method	Setting range: 0–15 0: Linear speed is 0 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Max. linear speed 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Pulse train 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card	0	◎
P41.14	Max. linear speed	Setting range: 0.0–3000.0m/min	300.0 m/min	◎
P41.15	Real-time linear speed	Setting range: 0.0m/min–P41.14	0.0 m/min	●
P41.16	Roll diameter calculation	Setting range: 0–22 0: Not calculated	0	◎

Function code	Name	Description	Default	Modify
	method	1: AI1 calibration method 2: AI2 calibration method 3–4: Reserved 5: HDI1 calibration method 6: HDI2 calibration method 7: Linear speed 8: PG thickness accumulation method 9: SVC estimation method 10: Automatic recognition switching 11–18: Reserved 19: EAI1 calibration method 20: EAI2 calibration method 21: EAI3 calibration method 22: Reserved		
P41.17	Max. roll diameter	Setting range: 1–10000mm **Note:** The set minimum value should be greater than P41.18 to P41.25.	1200mm	◎
P41.18	Winding initial roll diameter 0	Setting range: 1mm–P41.17	80mm	◎
P41.19	Winding initial roll diameter 1	Setting range: 1mm–P41.17	100mm	◎
P41.20	Winding initial roll diameter 2	Setting range: 1mm–P41.17	120mm	◎
P41.21	Winding initial roll diameter 3	Setting range: 1mm–P41.17	150mm	◎
P41.22	Unwinding initial roll diameter 0	Setting range: 1mm–P41.17	800mm	◎
P41.23	Unwinding initial roll diameter 1	Setting range: 1mm–P41.17	900mm	◎
P41.24	Unwinding initial roll diameter 2	Setting range: 1mm–P41.17	1000mm	◎
P41.25	Unwinding initial roll diameter 3	Setting range: 1mm–P41.17	1200mm	◎
P41.26	Roll diameter change rate 2	Setting range: 0.01–10.00mm/T	1.00 mm/T	◎
P41.27	Roll diameter reset selection	Setting range: 0–2 0: Terminal reset	0	◎

Function code	Name	Description	Default	Modify
		1: Stop reset 2: Communication reset (When this option is selected, it automatically changes to 0 after resetting once.)		
P41.28	Min. linear speed for roll diameter calculation	Setting range: 0.1–300.0m/min	15.0 m/min	◎
P41.29	Roll diameter calculation interval	Setting range: 0.000–30.000s	1.000s	○
P41.30	Monotonicity selection for roll diameter calculation	Setting range: 0–1 0: No requirement 1: Winding can only increase, unwinding can only decrease.	1	◎
P41.31	Roll diameter change rate 1	0.00mm/T–P41.26	0.10 mm/T	◎
P41.32	Material type	Setting range: 0–1 0: Wire 1: Strip	1	◎
P41.33	Width of the I-beam wheel	Setting range: 1–10000mm	1000mm	◎
P41.34	Wire diameter 0 or strip thickness 0	Setting range: 0.001–60.000m	0.100 mm	◎
P41.35	Wire diameter 1 or strip thickness 1	Setting range: 0.001–60.000m	0.150 mm	◎
P41.36	Wire diameter 2 or strip thickness 2	Setting range: 0.001–60.000m	0.200 mm	◎
P41.37	Wire diameter 3 or strip thickness 3	Setting range: 0.001–60.000m	0.250 mm	◎
P41.38	Real-time material diameter or thickness	Setting range: 0.000–60.000m	0.000 mm	●
P41.39	Pulses per revolution of equipment shaft	Setting range: 0–65535	600	◎
P41.40	Real-time pulse count	Setting range: 0–65535 **Note:** When 65535 is exceeded, it	0	/●

Function code	Name	Description	Default	Modify
		changes to 0.		
P41.41	Roll diameter calculation filter time	Setting range: 0.000–10.000s	3.000s	○
P41.42	Real-time roll diameter	Setting range: 0mm–P41.17	0mm	◎
P41.43	Real-time roll diameter	Setting range: 0mm–P41.17	0mm	/●
P41.44	Present working mode	Setting range: 0x00–0x1F	0x00	●
P41.45	Material density	Setting range: 0–60000kg/m³	0kg/m³	◎
P41.46	Material inertia	Setting range: 0.00–300.00kg・m²	0.00 kg・m²	○
P41.47	Mechanical inertia	Setting range: 0.00–300.00kg・m²	0.00 kg・m²	○
P41.48	Traction machine ACC time	Setting range: 0.00–300.00s **Note:** The value 0 indicates automatic calculation.	15.00s	◎
P41.49	Traction machine DEC time	Setting range: 0.00–300.00s	15.00s	◎
P41.50	Inertia compensation torque	Setting range: 0.0–300.0%	0.0%	●
P41.51	Linear acceleration	Setting range: -99.00–99.00m/s²	0.00 m/s²	●
P41.52	Inertia compensation ACC/DEC time	Setting range: 0.000–10.000s	0.100s	◎
P41.53	Pulses per revolution of equipment (*100)	Setting range: 0–65535	0	●
P41.54	Reserved	-	-	-
P41.55	Tension giving method selection	Setting range: 0–23 0: Set by P41.56 1: AI1 2: AI2 3–4: Reserved	0	◎

Function code	Name	Description	Default	Modify
		5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reserved 8: Direct torque setting 9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1		
P41.56	Digital setting of given tension	Setting range: 0N–P41.57	0N	○
P41.57	Max. tension	Setting range: 0N–60000N	10000N	◎
P41.58	Tension giving change time	Setting range: 0.00–60.00s	0.00s	○
P41.59	Tension taper input method	Setting range: 0–23 0: Set by P41.60 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved	0	◎

Function code	Name	Description	Default	Modify
		14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1		
P41.60	Digital tension taper	Setting range: 0.00–100.00%	0.00	○
P41.61	Tension taper method	Setting range: 0–3 0: Curve taper 1: Single-segment linear taper (denominator 1000) 2: Two-segment linear taper (interpolation) 3: Twenty-segment linear taper (interpolation) The minimum roll diameter corresponds to the current tension; the intermediate roll diameter corresponds to the intermediate taper; the maximum roll diameter corresponds to the maximum taper. Curve taper: 1 - (Max. roll diameter - Min. roll diameter) * P41.60 / (Real-time roll diameter + P41.62) * Given tension.	1	◎
P41.62	Tension taper compensation	Setting range: 0–10000mm	1mm	○
P41.63	Intermediate roll diameter	Setting range: P41.18–P41.22	500	○
P41.64	Intermediate tension	Setting range: 0.00–100.00%	80.00%	○
P41.65	Max. roll diameter	Setting range: 0.00–100.00%	50.00%	○
P41.66–P41.68	Reserved	-	-	-
P41.69	Set tension value	Setting range: 0–30000N	0N	●
P41.70	Taper tension value	Setting range: 0–30000N	0N	●

Function code	Name	Description	Default	Modify
P41.71	Output frequency filter time	Setting range: 0.000–10.000s	0.010s	○
P41.72	Output frequency for roll diameter calculation	Setting range: 0.00Hz–P00.03	0.00Hz	●
P41.73	Linear speed stabilization time	Setting range: 0–60s	20s	○
P41.74	Set roll diameter	Setting range: 0mm–P41.17	0mm	○
P41.75	Stop roll diameter	Setting range: 0mm–P41.17	0mm	○
P41.76	Min. roll diameter	Setting range: 0mm–P41.17	96mm	○
P41.77	Winding/Unwinding reverse direction selection	Setting range: 0–1 0: Normal 1: Reverse winding/unwinding	0	◎
P41.78	Main traction wheel roll diameter	Setting range: 1–10000mm	500mm	◎
P41.79	Main traction wheel transmission ratio	Setting range: 0.01–300.00	1.00	◎
P41.80	Pulses per revolution of traction motor	Setting range: 1–10000	1024	◎
P41.81	Linear speed sampling time	Setting range: 1–200ms	25ms	◎
P41.82	Sampling time pulse count L	Setting range: 0–65535	0	●
P41.83	Linear speed filter time	Setting range: 0.000–10.000s	0.000s	○
P41.84	Zero-speed offset effectiveness in torque mode	0–1 0: Invalid 1: Valid	0	○
P41.85–P41.87	Reserved	-	-	-
P41.88	HDIA pulse count	Setting range: 0–65535	0	●
P41.89	HDIB pulse count	Setting range: 0–65535	0	●
P41.90	HDIA percentage	Setting range: 0.00–100.00%	0.00%	●
P41.91	HDIB percentage	Setting range: 0.00–100.00%	0.00%	●

Function code	Name	Description	Default	Modify
P41.92	Actual length	Setting range: 0–65535m	0m	●

Group P42 Tension control closed-loop functions

Function code	Name	Description	Default	Modify
P42.00	PID setting method	Setting range: 0–23 0: Set by P42.01 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Reference tension 8–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1	0	◎
P42.01	Pendulum position reference	Setting range: 0.00–10.00V	5.00V	○
P42.02	Position reference ACC time	Setting range: 0.000–20.000s	0.000s	○
P42.03	Position reference DEC time	Setting range: 0.000–20.000s	0.000s	○
P42.04	Position reference start position selection	Setting range: 0–1 0: Feedback position 1: Present position	0	◎

Function code	Name	Description	Default	Modify
P42.05	Pendulum/tension feedback selection	Setting range: 0–23 0: Reserved 1: AI1 2: AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Output torque (Calibrated at 200.0%) 8–9: Reserved 10: Modbus/Modbus TCP communication 11: PROFIBUS/CANopen/DeviceNet communication 12: Ethernet communication 13: Reserved 14: EtherCAT/PROFINET/ EtherNet IP communication 15: Programmable expansion card 16–18: Reserved 19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1	2	◎
P42.06	PID control action selection	Setting range: 0–1 0: Direct action 1: Reverse action **Note:** When PID automatically completes the winding/unwinding switch, the control action is also switched.	0	◎
P42.07	PID output control selection	Setting range: 0–4 0: Max. frequency 1: Reference given frequency A 2: Max. tension 3: Reference tension 4: Reference given frequency B	0	◎
P42.08	Reserved	-	-	-
P42.09	PID control parameter selection	Setting range: 0–5 0: Use the first set of parameters	0	◎

Function code	Name	Description	Default	Modify
		1: Adjust based on roll diameter (linear change between initial winding diameter and initial unwinding diameter) 2: Adjust based on frequency 3: Adjust based on linear speed 4: Adjust based on deviation 5: Terminal P41.00=6, 4(Winding); 2(Unwinding).		
P42.10	Proportional gain 1	Setting range: 0.000–30.000 P41.00=6, 0.060(Winding); 0.300(Unwinding).	0.200	○
P42.11	Integral time 1	Setting range: 0.00–30.00s	0.00s	○
P42.12	Differential time 1	Setting range: 0.000–30.000s	0.000s	○
P42.13	Proportional gain 2	Setting range: 0.000–30.000 P41.00=6, 0.100(Winding); 0.400(Unwinding).	0.200	○
P42.14	Integral time 2	Setting range: 0.00–30.00s	0.00s	○
P42.15	Differential time 2	Setting range: 0.000–30.000s	0.000s	○
P42.16	PID1 switch point	Setting range: 0.00–100.00%	4.00%	○
P42.17	PID2 switch point	Setting range: 0.00–100.00% P41.00=6, 45(Winding); 90(Unwinding).	45.00%	○
P42.18	PID deviation limit	Setting range: 0.00–100.00%	0.00%	○
P42.19	PID integral separation	Setting range: 0.00–100.00% When it is set to 100%, integral separation is disabled.	100.00%	○
P42.20	PID differential limit	Setting range: 0.00–100.00%	0.00%	○
P42.21	PID output upper limit	Setting range: 0.00–100.00%	100.00%	○
P42.22	PID output lower limit	Setting range: 0.00–100.00% P41.00=6, 100(Winding); 50(Unwinding).	100.00%	○
P42.23	PID calculation cycle	Setting range: 1–1000ms	1ms	○
P42.24	Reserved	-	-	-
P42.25	PID start delay	Setting range: 0.000–10.000s	0.000s	○
P42.26	PID output filter time	Setting range: 0.000–10.000s	0.000s	○
P42.27	PID reference value	Setting range: 0.00–100.00%	0.00%	●

Function code	Name	Description	Default	Modify
P42.28	PID feedback value	Setting range: 0.00–100.00%	0.00%	●
P42.29	PID deviation value	Setting range: -100.00–100.00%	0.00%	●
P42.30	PID—Kp monitoring	Setting range: -100.00–100.00%	0.00%	●
P42.31	PID—Ki monitoring	Setting range: -100.00–100.00%	0.00%	●
P42.32	PID output percentage	Setting range: -100.00–100.00%	0.00%	●
P42.33	Deviation 0	Setting range: 0.00–P42.34 (%)	4.00%	○
P42.34	Deviation 1	Setting range: P42.33–P42.35 (%)	12.00%	○
P42.35	Deviation 2	Setting range: P42.34–P42.36 (%)	22.00%	○
P42.36	Deviation 3	Setting range: P42.35–P42.37 (%)	37.00%	○
P42.37	Deviation 4	Setting range: P42.36–P42.38 (%)	52.00%	○
P42.38	Deviation 5	Setting range: P42.37–100.00%	72.00%	○
P42.39	Soft startup integral time	Setting range: 0.0–1000.0s 167.0(Winding); 143.0(Unwinding).	167.0s	○
P42.40	Integral time 1	Setting range: 0.0–1000.0s 909.0(Winding); 555.0(Unwinding).	909.0s	○
P42.41	Integral time 2	Setting range: 0.0–1000.0s 333.0(Winding); 200.0(Unwinding).	333.0s	○
P42.42	Integral time 3	Setting range: 0.0–1000.0s 133.0(Winding); 77.0(Unwinding).	133.0s	○
P42.43	Integral time 4	Setting range: 0.0–1000.0s 67.0(Winding); 36.0(Unwinding).	67.0s	○
P42.44	Integral time 5	Setting range: 0.0–1000.0s 25.0(Winding); 13.5(Unwinding).	25.0s	○
P42.45	Integral time 6	Setting range: 0.0–1000.0s 9.0(Winding); 5.0(Unwinding).	9.0s	○
P42.46	Deviation integral actual value	Setting range: 0.00–500.00%	0.00%	●
P42.47	Deviation integral action channel selection	Setting range: 0–23 0: Reserved 1: Feedforward gain*AI1 2: Feedforward gain*AI2 3–4: Reserved 5: High-speed pulse HDI1 6: High-speed pulse HDI2 7: Feedforward gain*10V 8–18: Reserved	1	◎

Function code	Name	Description	Default	Modify
		19: EAI1 20: EAI2 21: EAI3 22: Reserved 23: EHDI1 1 or 2(Winding); 7(Unwinding).		
P42.48	Deviation integral range selection	Setting range: 0–2 0: Feedforward gain unchanged 1: 0–feedforward gain upper limit 2: -feedforward gain upper limit – +feedforward gain upper limit	1	◎
P42.49	Deviation integral upper limit	Setting range: 0.00–500.00%	500.00%	◎
P42.50	Deviation integral gain	Setting range: 0.00–500.00%	50.00%	◎
P42.51	Deviation integral power-off memorizing selection	Setting range: 0x00–0x11 Ones place: 0: Automatic reset 1: Terminal reset (shared roll diameter reset terminal) Tens place: 0: Save at power off 1: Do not save at power off	0x10	◎
P42.52	Low-speed PID output limit	Setting range: 0.00–100.00%	0.00%	◎
P42.53	Low-speed PID range	Setting range: 0.00–100.00%	2.00%	◎
P42.54	Low-speed PID re-effective time	Setting range: 0.000–60.000s	0.000s	○
P42.55	Reverse control	Setting range: 0–2 0: Enable 1: Disable 1 2: Disable 2 (Reverse rotation, frequency reference is 0)	0	◎
P42.56	Zero-speed control	Setting range: 0–1 0: Zero speed run (Reverse rotation, frequency reference is 0)	0	◎

Function code	Name	Description	Default	Modify
		1: Self-adaptive operation (reverse, PID feedforward no longer active)		
P42.57	Reserved	Setting range: 0.000–65.000s	0.000s	●
P42.58	Feeding interrupt detection upper limit	Setting range: 0.00–10.00V	0.00V	◎
P42.59	Offline detection lower limit	Setting range: 0.00–10.00V	0.00V	◎
P42.60	Feeding interrupt detection filter time	Setting range: 0–10000ms	500ms	○
P42.61	Start delay for feeding interrupt detection	Setting range: 0.0–10.0s	6.0s	○
P42.62	Continued running time after feeding interrupt	Setting range: 0.0–60.0s	10.0s	○
P42.63	Continued running frequency after feeding interrupt	Setting range: 0.00Hz–P00.03	5.00Hz	◎
P42.64	Offline detection method	Setting range: 0–1 0: Automatic 1: External terminal signal	0	◎

Group P43 Tension control auxiliary functions

Function code	Name	Description	Default	Modify
P43.00	Winding pre-drive frequency gain	Setting range: 50.00–200.0%	105.00%	◎
P43.01	Unwinding pre-drive frequency gain	Setting range: 50.00–200.0%	95.00%	◎
P43.02	Pre-drive control delay	Setting range: 0.0–60.0s (Roll diameter calculation is paused during pre-drive process)	1.0s	○
P43.03	Fixed length setting	Setting range: 0–65535m	10000m	◎
P43.04	Pulses per meter	Setting range: 0.01–655.35	1.00	◎

Function code	Name	Description	Default	Modify
P43.05	Creeping speed	Setting range: 0.1–200.0m/min	5.0m/min	◎
P43.06	Fixed creeping length	Setting range: 0–1000m	10m	◎
P43.07	Fixed length output control	Setting range: 0–1 0: No output at length reached 1: Output at length reached	1	◎
P43.08	Segmented roll diameter 1 setting	Setting range: 0–P43.09 (from initial roll diameter to first section roll diameter range)	100	○
P43.09	Segmented roll diameter 2 setting	Setting range: P43.08–P43.10	150	○
P43.10	Segmented roll diameter 3 setting	Setting range: P43.09–P43.11	200	○
P43.11	Segmented roll diameter 4 setting	Setting range: P43.10–P43.12	230	○
P43.12	Segmented roll diameter 5 setting	Setting range: P43.11–P43.13	280	○
P43.13	Segmented roll diameter 6 setting	Setting range: P43.12–P43.14	320	○
P43.14	Segmented roll diameter 7 setting	Setting range: P43.13–P43.15	350	○
P43.15	Segmented roll diameter 8 setting	Setting range: P43.14–P43.16	380	○
P43.16	Segmented roll diameter 9 setting	Setting range: P43.15–P43.17	400	○
P43.17	Segmented roll diameter 10 setting	Setting range: P43.16–P43.18	420	○
P43.18	Segmented roll diameter 11 setting	Setting range: P43.17–P43.19	450	○
P43.19	Segmented roll diameter 12 setting	Setting range: P43.18–P43.20	460	○
P43.20	Segmented roll diameter 13 setting	Setting range: P43.19–P43.21	470	○
P43.21	Segmented roll diameter 14 setting	Setting range: P43.20–P43.22	480	○
P43.22	Segmented roll diameter 15 setting	Setting range: P43.21–P43.23	500	○

Function code	Name	Description	Default	Modify
P43.23	Segmented roll diameter 16 setting	Setting range: P43.22–P43.24	520	○
P43.24	Segmented roll diameter 17 setting	Setting range: P43.23–P43.25	560	○
P43.25	Segmented roll diameter 18 setting	Setting range: P43.24–P43.26	600	○
P43.26	Segmented roll diameter 19 setting	Setting range: P43.25–P43.27	620	○
P43.27	Segmented roll diameter 20 setting	Setting range: P43.26–P41.17	680	○
P43.28	Taper 1	Setting range: 0.00–100.00% (value from initial roll diameter to segmented roll diameter 1)	1.00%	○
P43.29	Taper 2	Setting range: 0.00–100.00%	3.00%	○
P43.30	Taper 3	Setting range: 0.00–100.00%	5.00%	○
P43.31	Taper 4	Setting range: 0.00–100.00%	10.00%	○
P43.32	Taper 5	Setting range: 0.00–100.00%	15.00%	○
P43.33	Taper 6	Setting range: 0.00–100.00%	20.00%	○
P43.34	Taper 7	Setting range: 0.00–100.00%	25.00%	○
P43.35	Taper 8	Setting range: 0.00–100.00%	30.00%	○
P43.36	Taper 9	Setting range: 0.00–100.00%	32.00%	○
P43.37	Taper 10	Setting range: 0.00–100.00%	35.00%	○
P43.38	Taper 11	Setting range: 0.00–100.00%	38.00%	○
P43.39	Taper 12	Setting range: 0.00–100.00%	40.00%	○
P43.40	Taper 13	Setting range: 0.00–100.00%	42.00%	○
P43.41	Taper 14	Setting range: 0.00–100.00%	44.00%	○
P43.42	Taper 15	Setting range: 0.00–100.00%	46.00%	○
P43.43	Taper 16	Setting range: 0.00–100.00%	48.00%	○
P43.44	Taper 17	Setting range: 0.00–100.00%	50.00%	○
P43.45	Taper 18	Setting range: 0.00–100.00%	52.00%	○
P43.46	Taper 19	Setting range: 0.00–100.00%	54.00%	○
P43.47	Taper 20	Setting range: 0.00–100.00%	56.00%	○

Group P46 Advanced position control

Function code	Name	Description	Default	Modify
P46.00	Feedback source selection	Setting range: 0x0000–0x0321 Ones place: Enable bit for full closed-loop mode 0: Disable 1: Enable Tens place: Speed feedback source 0: PG1-P 1: PG2-P 2: Open loop (reserved) Hundred place: Position feedback source 0: PG1-P 1: PG1-F 2: PG2-P 3: PG2-F Thousands place: Reserved	0x0000	○
P46.01	Numerator of position frequency division ratio (speed source)	The full closed-loop transmission ratio is used to adjust the correspondence between the load and the motor. Setting range: 1–65535	1000	○
P46.02	Denominator of position frequency division ratio (position source)	The full closed-loop transmission ratio is used to adjust the correspondence between the load and the motor. Setting range: 1–65535	1000	○
P46.03	Position set in digital mode (MSB)	Setting range: 0x0000–0xFFFF (MSB is the sign bit.)	0x0000	○
P46.04	Position JOG control word	Setting range: 0x0000–0x0001 Bit0: Direction setting 0:Rotate forward, and then rotate backward 1:Rotate backward, and then rotate forward Bit1–bit15: Reserved **Note:** To enable continuous operation, set P21.16 bit1 to 1 for continuous and automatic triggering.	0x0000	◎

Function code	Name	Description	Default	Modify
P46.05	Number of position JOG forward rotations	Setting range: 0–30000	3	○
P46.06	Number of position JOG reverse rotations	Setting range: 0–30000	3	○
P46.07	Number of position JOG cycles	Setting range: 0–65535	5	○
P46.08	Position negative limit setting (MSB)	Setting range: 0x0000–0xFFFF **Note:** The data type is complementary form. Setting it to 0 disables the position travel limit function.	0x0000	◎
P46.09	Position negative limit setting (LSB)		0xBDC0	◎
P46.10	Position positive limit setting (MSB)	Setting range: 0x0000–0xFFFF **Note:** The data type is complementary form. Setting it to 0 disables the position travel limit function.	0x000F	◎
P46.11	Position positive limit setting (LSB)		0x4240	◎
P46.12	Following - position error fault range	Setting range: 0–500 **Note:** Setting it to 0 disables this function. Tracking error range.	0	○
P46.13	Min. DEC time	Setting range: 0.00–10.00s (reserved) **Note:** In PTPC mode, P46.13 must be less than P21.21; otherwise, fault alarm E631 will be triggered.	0.50	○
P46.14	Origin offset position settings (MSB)	Setting range: 0x0000–0xFFFF **Note:** When it is set to 0, no origin offset.	0x0000	◎
P46.15	Origin offset position settings (LSB)		0x0000	◎
P46.16–P46.17	Reserved	-	-	-
P46.18	Return to origin control bit	Setting range: 0x0000–0x0003 Bite0: Homing enable bit	0x0000	○

Function code	Name	Description	Default	Modify
		0: Disable 1: Start homing Bit1: Set relative position origin (reserved) 0: Yes 1: Set the present position as the relative origin and write to P46.14–P46.16 Bit2–bit15: Reserved		
P46.19	Primary homing search speed	Setting range: 1.0–50.0Hz **Note:** The braking distance must be considered when setting speed for primary homing.	5.0Hz	◎
P46.20	Secondary homing search speed	Setting range: 0.1–10.0Hz **Note:** When the parameter is set to 0.0, the secondary homing function is disabled.	1.0Hz	◎
P46.21	Primary and secondary homing ACC time	Setting range: 0.0–100.0s **Note:** Primary and secondary homing acceleration are consistent.	5.0s	◎
P46.22	Primary and secondary homing DEC time	Setting range: 0.0–100.0s	5.0s	◎
P46.23	Origin control bit	Setting range: 0x0000–0x0007 Bit0: travel overrun action 0: Report over-position fault 1:Direction reversal Bit1: Software travel setting 0: Software travel position limits are set by function codes 1: Software travel autotuning (hardware position limit switch required) Bit2: Origin switch trigger edge selection 0: Triggered at the rising edge. 0: Triggered at the falling edge. Bit3–bit15: Reserved	0x0000	◎
P46.24	Origin switch settings	Setting range: 0x0000–0x2233 Ones place: Position travel search range 0: Hardware switch positive and negative	0x0000	◎

Function code	Name	Description	Default	Modify
		range 1: Software positive and negative travel range 2: Software positive, hardware negative travel range 3: Hardware positive, software negative travel range Tens place: Origin switch selection 0: Reference origin (input terminal 43) 1: Negative limit terminal (input terminal 65) 2: Positive limit terminal (input terminal 64) 3: Full closed-loop encoder - first Z pulse (reserved) Hundreds place: Direction setting in search homing mode 0: Direct reverse 1: Direct forward 2: Reverse direction when homing is activated Thousands place: homing mode selection 0: Direct homing (reference origin + offset distance P46.14–P46.15) 1: Search homing (search origin + offset distance P46.14–P46.15) 2: Search homing once, subsequent direct homing (search origin + offset distance P46.14–P46.15) (reserved) **Note:** During the search homing process, reaching the hardware limit will trigger braking, and the search will continue in the reverse direction. Terminals S2, S3, or S4 must be configured, and terminal 43 is the origin.		
P46.25	Multi-segment position cycle mode (reserved)	Setting range: 0x0000–0x0003 Bit0: Cycle selection 0: End after 15 segments run (no loop)	0x0000	◎

Function code	Name	Description	Default	Modify
		1: Continue to repeat after 15 segments have run (loop) Bit1: Trigger selection 0: Terminal trigger for 0–15 segments 1: Auto trigger for 0–15 segments Bit2–bit15: Reserved **Note:** When the terminal is triggered, the device detects the terminal signal and automatically enters the next segment after completing this segment when the terminal is activated. Otherwise, it locks to the previous segment.		
P46.26–P46.29	Reserved	-	-	-
P46.30	Chasing shear control bit	Setting range: 0x0000–0x0012 Ones place: PTP mode setting 0: PTP mode 1: Chasing shear mode 2: Flying shear mode Tens place: 0: Positive direction chasing shear 1: Negative direction chasing shear **Note:** PTP Mode is a point-to-point control mode where the target position cannot be changed midway. PTPC Mode is a point-to-point control mode where the target position can be changed midway.	0x0000	◎
P46.31	Lead of screw thread	Setting range: 0.000–60.000 **Note:** When the terminal is triggered, the device detects the terminal signal and automatically enters the next segment after completing this segment when the terminal is activated. Otherwise, it locks to the previous segment, and the motor rotates 1 cycle, moving the lead screw by P46.28	5.000	◎

Function code	Name	Description	Default	Modify
		millimeters.		
P46.32	Cutting length/order 0 length (MSB)	Setting range: 0x0000–0xFFFF	0x0000	◎
P46.33	Cutting length/order 0 length (LSB)	Setting range: 0x0000–0xFFFF	0x0320	◎
P46.34	Order 0 count	Setting range: 0–60000	2	◎
P46.35	Cutting length/order 1 length (MSB)	Setting range: 0x0000–0xFFFF	0x0000	◎
P46.36	Cutting length/order 1 length (LSB)	Setting range: 0x0000–0xFFFF	0x0258	◎
P46.37	Order 1 count	Setting range: 0–60000	2	◎
P46.38	Speed chasing zone distance (MSB)	Setting range: 0x0000–0xFFFF	0x0000	◎
P46.39	Speed chasing zone distance (LSB)	Setting range: 0x0000–0xFFFF	0x00C8	◎
P46.40	Synchronization zone distance (MSB)	Setting range: 0x0000–0xFFFF	0x0000	◎
P46.41	Synchronization zone distance (LSB)	Setting range: 0x0000–0xFFFF	0x00C8	◎
P46.42	Travel limit (MSB)	Setting range: 0x0000–0xFFFF	0x0000	◎
P46.43	Travel limit (LSB)	Setting range: 0x0000–0xFFFF	0x03E8	◎

Group P98 AIAO calibration functions

Function code	Name	Description	Default	Modify
P98.00	Calibration parameter group password	Setting range: 0–65535	*****	○
P98.01	AD sampling value of AI1 voltage input	Setting range: 0–4095	0	●
P98.02	AI1 reference voltage 1	Setting range: -0.50–4.00V	0.00V	○

Function code	Name	Description	Default	Modify
P98.03	AD sampling value corresponding to AI1 reference voltage 1	Setting range: 0–4095	0	○
P98.04	AI1 reference voltage 2	Setting range: 6.00–10.50V	10.00V	○
P98.05	AD sampling value corresponding to AI1 reference voltage 2	Setting range: 0–4095	3972	○
P98.06	AD sampling value of AI1 current input	Setting range: 0–4095	0	●
P98.07	AI1 reference current 1	Setting range: -1.00–8.00mA	0.00mA	○
P98.08	AD sampling value corresponding to AI1 reference current 1	Setting range: 0–4095	0	○
P98.09	AI1 reference current 2	Setting range: 12.00–21.00mA	20.00mA	○
P98.10	AD sampling value corresponding to AI1 reference current 2	Setting range: 0–4095	3903	○
P98.11	Sampling value of AI2 voltage input	Setting range: 0–4095	0	●
P98.12	AI2 reference voltage 1	Setting range: -10.50–1.00V	-10.00V	○
P98.13	AD sampling value corresponding to AI2 reference voltage 1	Setting range: 0–4095	136	○
P98.14	AI2 reference voltage 2	Setting range: 4.00–10.50V	10.00V	○
P98.15	AD sampling value corresponding to AI2 reference	Setting range: 0–4095	3958	○

Function code	Name	Description	Default	Modify
	voltage 2			
P98.16	AD sampling value of AI2 current input	Setting range: 0–4095	0	●
P98.17	AI2 reference current 1	Setting range: -1.00–8.00mA	0.00mA	○
P98.18	AD sampling value corresponding to AI2 reference current 1	Setting range: 0–4095	0	○
P98.19	AI2 reference current 2	Setting range: 12.00–21.00mA	20.00mA	○
P98.20	AD sampling value corresponding to AI2 reference current 2	Setting range: 0–4095	3903	○
P98.21	AD sampling value of AI3 voltage input	Setting range: 0–4095	0	●
P98.22	AI3 reference voltage 1	Setting range: -0.50–4.00V	0.00V	○
P98.23	AD sampling value corresponding to AI3 reference voltage 1	Setting range: 0–4095	0	○
P98.24	AI3 reference voltage 2	Setting range: 6.00–10.50V	10.00V	○
P98.25	AD sampling value corresponding to AI3 reference voltage 2	Setting range: 0–4095	3884	○
P98.26	AD sampling value of AI3 current input	Setting range: 0–4095	0	●
P98.27	AI3 reference current 1	Setting range: -1.00–8.00mA	0.00mA	○
P98.28	AD sampling value corresponding to AI3 reference current 1	Setting range: 0–4095	0	○

Function code	Name	Description	Default	Modify
P98.29	AI3 reference current 2	Setting range: 12.00–21.00mA	20.00mA	○
P98.30	AD sampling value corresponding to AI3 reference current 2	Setting range: 0–4095	3958	○
P98.31	Actual voltage value of AO1 for 0V output	Setting range: -1.000–0.010V **Note:** Here, TI defaults to -0.200, and ST defaults to 0.000, with an upper limit of 0.010, because TI uses PWM to send voltage, while ST uses DAC.	0.000V	○
P98.32	Actual voltage value of AO1 for 10V	Setting range: -1.000–12.500V	10.250V	○
P98.33	Actual current value of AO1 for 0mA output	Setting range: -2.000–25.000mA (reserved)	-0.400mA	○
P98.34	Actual current value of AO1 for 20mA output	Setting range: -2.000–25.000mA (reserved)	20.500mA	○
P98.35	Actual voltage value of AO2 for 0V output	Setting range: -1.000–12.500V	-0.200V	○
P98.36	Actual voltage value of AO2 for 10V	Setting range: -1.000–12.500V	10.250V	○
P98.37	Actual current value of AO2 for 0mA output	Setting range: -2.000–25.000mA (reserved)	-0.400mA	○
P98.38	Actual current value of AO2 for 20mA output	Setting range: -2.000–25.000mA (reserved)	20.500mA	○
P98.39–P98.40	Reserved	-	-	-
P98.41	This is for setting the frequency decimal point.	Setting range: 0–1	0	○
P98.42	Motor parameter calibration selection	Setting range: 0.0–100.0	37.0	○

Your Trusted Industry Automation Solution Provider

Shenzhen INVT Electric Co., Ltd.
Address: INVT Guangming Technology Building, Songbai Road, Matian,
Guangming District, Shenzhen, China

INVT Power Electronics (Suzhou) Co., Ltd.
Address: No. 1 Kunlun Mountain Road, Science & Technology Town,
Gaoxin District, Suzhou, Jiangsu, China

Website: www.invt.com

INVT mobile website INVT e-manual

66001-01455

Manual information may be subject to change without prior notice.

202503 (V1.0)