Operation Manual

IPE300 Series
Engineering VFD

SHENZHEN INVT ELECTRIC CO., LTD.

No.	Change description	Version	Release date
1	First release.	V1.0	November 2022
2	Deleted the content related to the expansion card EC-PC502-00.	V1.1	July 2023

Preface

Thanks for choosing IPE300 series variable-frequency drive (VFD) of booksize.

If not otherwise specified in this manual, the VFD always indicates IPE300 series VFD in booksize design, which is a single-drive system oriented to engineering applications. The VFDs feature high reliability, usability, maintainability, environment adaptability, and wide power range, provide enriched functions, and support flexible configuration. The VFD can be widely used in equipment driving with demanding reliability and performance requirements in the metallurgy, petroleum, chemical, building material, HVAC water supply, municipal engineering, paper making, electric power, power source industries.

In order to meet diversified customer demands, the VFD provides abundant expansion cards including PLC programmable card, communication card, and I/O expansion card to achieve various functions as needed. Each VFD can be installed with two expansion cards at most.

The VFD supports Modbus, CANopen, PROFIBUS-DP, PROFINET, Ethernet/IP and other international mainstream communication methods, connecting seamless with the host controller and DCS control system.

The VFD uses high power density design. Some models carry built-in DC reactor and braking unit to save installation space. Through overall EMC design, it can satisfy the low noise and low electromagnetic interference requirements to cope with challenging grid, temperature, humidity and dust conditions, thus greatly improving product reliability.

This manual instructs you how to install, wire, set parameters for, diagnose and remove faults for, and maintain the VFD, and also lists related precautions. Before installing the VFD, read through this manual carefully to ensure the proper installation and running with the excellent performance and powerful functions into full play.

If the end user is a military unit or the product is used for weapon manufacturing, please comply with relevant export control regulations in the Foreign Trade Law of the People's Republic of China, and complete necessary formalities.

The manual is subject to change without prior notice.

Manuals for IPE300 series engineering VFD include:

Name	Order No.
IPE300 series engineering VFD	66001-00812
IPE300 series engineering VFD (booksize)	66001-01052

Contents

1 Safety precautions

1.1 What this chapter contains

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 your or your customers' failure to follow the safety precautions.

1.2 Safety definition

Danger: Severe personal injury or even death can result if related requirements are not followed.

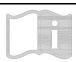
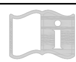
Warning: Personal injury or equipment damage can result if related requirements are not followed.

Note: Actions taken to ensure proper running.

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.

1.3 Warning symbols

Warnings caution you about conditions that can result in severe injury or death and/or equipment damage and advice on how to prevent dangers. The following table lists the warning symbols in this manual.

Symbol	Name	Description	Abbreviation
 Danger	Danger	Severe personal injury or even death can result if related requirements are not followed.	
 Warning	Warning	Personal injury or equipment damage can result if related requirements are not followed.	
 Forbid	Electrostatic discharge	The PCBA may be damaged if related requirements are not followed.	
 Hot	Hot sides	Do not touch. The VFD base may become hot.	
	Electric shock	As high voltage still presents in the bus capacitor after power off, wait for at least five minutes (or 15 min / 25 min, depending on the warning symbols on the machine) after power off to prevent electric shock.	
	Read manual	Read the operation manual before operating the equipment.	
Note	Note	Actions taken to ensure proper running.	**Note**

1.4 Safety guidelines

✧ 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. Ensure all the input power supplies have been disconnected before wiring or inspection, 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.

VFD model	Minimum waiting time
380V 0011–0132	5 minutes
380V 0160–0355	15 minutes
380V 0400 and higher	25 minutes

✧ Do not refit the VFD unless authorized; otherwise fire, electric shock or other injury may result.

✧ The base may become hot when the machine is running. Do not touch. Otherwise, you may get burnt.

✧ The electrical parts and components inside the VFD are electrostatic sensitive. Take measurements to prevent electrostatic discharge when performing related operations.

1.4.1 Delivery and installation

✧ Do not install the VFD on inflammables. In addition, prevent the VFD from contacting or adhering to inflammables.

✧ Connect the optional braking parts (such as braking resistors, braking units or feedback units) according to the wiring diagrams.

✧ Do not run the VFD if it is damaged or incomplete.

✧ Do not contact the VFD with damp objects or body parts. Otherwise, electric shock may result.

Note:

1. Select appropriate tools for VFD delivery and installation to ensure the safe and proper running and avoid physical injury or death. To ensure personal safety, take mechanical protective measures like wearing safety shoes and working uniforms.
2. Protect the VFD against physical shock or vibration during the delivery and installation.
3. Do not carry the VFD only by its front cover as the cover may fall off.
4. The installation site must be away from children and other public places.
5. Use the VFD in proper environments. (For details, see "Installation environment".)
6. Prevent the screws, cables and other conductive parts from falling into the VFD.

7. As leakage current of the VFD during running may exceed 3.5mA, ground properly and ensure the grounding resistance is less than 10Ω. The conductivity of PE grounding conductor is the same as that of the phase conductor (The cross-sectional area of the PE grounding conductor for 30kW and higher models can be reduced).
8. R, S and T are the power input terminals, and U, V and W are the output motor terminals. Connect the input power cables and motor cables properly; otherwise, damage to the VFD may occur.

1.4.2 Commissioning and running

	✧ Cut off all power supplies connected to the VFD before terminal wiring, and wait for at least the time designated on the VFD after disconnecting the power supplies. ✧ High voltage presents inside the VFD during running. Do not carry out any operation on the VFD during running except for keypad setup. 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. ✧ 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. ✧ During driving a permanent magnet SM, besides above-mentioned items, the following work must be done before installation and maintenance: a) All input power supplies have been disconnected, including the main power and control power. b) The permanent-magnet SM has been stopped, and the voltage on output end of the VFD is lower than 36V. c) After the permanent-magnet SM has stopped, wait for at least the time designated on the VFD, and ensure the voltage between + and - is lower than 36V. d) During operation, it is a must to ensure the permanent-magnet SM 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 permanent-magnet SM and the VFD.

Note:

1. Do not switch on or switch off the input power supplies of the VFD frequently.
2. If the VFD has been stored for a long time without being used, check the capacitors, perform capacitor reforming (see “Maintenance”), and carry out pilot run for the VFD before the use.
3. Close the VFD front cover before running; otherwise, electric shock may occur.

1.4.3 Maintenance and component replacement

	✧ Only trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement for the VFD. ✧ Cut off all power supplies connected to the VFD before terminal wiring, and wait for at least the time designated on the VFD after disconnecting the power supplies. ✧ During maintenance and component replacement, take measures to prevent screws, cables and other conductive matters from falling into the internal of the VFD.

Note:

1. Use proper torque to tighten screws.
2. During maintenance and component replacement, keep the VFD and its parts and components away from combustible materials and ensure they have no combustible materials adhered.
3. Do not carry out insulation voltage-endurance test on the VFD, or measure the control circuits of the VFD with a megohmmeter.
4. During maintenance and component replacement, take proper anti-static measures on the VFD and its internal parts.

1.4.4 Disposal

	✧ The VFD contains heavy metals. Dispose of a scrap VFD as industrial waste.
	✧ Dispose of a scrap product separately at an appropriate collection point but not place it in the normal waste stream.

2 Quick startup

2.1 What this chapter contains

This chapter introduces the basic installation and commissioning rules that you need to follow to realize quick installation and commissioning.

2.2 Unpacking inspection

Check the following after receiving the product.

1.	Whether the packing box is damaged or dampened. If any problems are found, contact the local INVT dealer or office.
2.	Whether the model identifier on the exterior surface of the packing box is consistent with the purchased model. If any problems are found, contact the local INVT dealer or office.
3.	Whether the interior surface of the packing box is abnormal, for example, in wet condition, or whether the enclosure of the VFD is damaged or cracked. If any problems are found, contact the local INVT dealer or office.
4.	Whether the VFD nameplate is consistent with the model identifier on the exterior surface of the packing box. If any problems are found, contact the local INVT dealer or office.
5.	Whether the accessories (including the manual, keypad, and expansion card) inside the packing box are complete.If any problems are found, contact the local INVT dealer or office.

2.3 Checking before use

Check the following before using the VFD.

1.	Mechanical type of the load to be driven by the VFD to verify whether the VFD will be overloaded during work. Whether the power class of the VFD needs to be increased.
2.	Whether the actual running current of the motor is less than the rated current of the VFD.
3.	Whether the control accuracy required by the load is the same as that is provided by the VFD.
4.	Whether the grid voltage is consistent with the rated voltage of the VFD.
5.	Check whether expansion cards are needed for selected functions.

2.4 Environment checking

Check the following before installing the VFD:

1.	Whether the actual ambient temperature exceeds 40°C. When the temperature exceeds 40°C, derate 1% for every increase of 1°C. Do not use the VFD when the ambient temperature exceeds 50°C.
Note: When the VFD is built in a cabinet, the ambient temperature is the temperature of air in the cabinet.	

2.	Whether the actual ambient temperature is lower than -10°C. If the temperature is lower than -10°C, use heating devices. **Note: When the VFD is built in a cabinet, the ambient temperature is the temperature of air in the cabinet.**
3.	Whether the altitude of the application site exceeds 1000m. When the installation site altitude exceeds 1000 m, derate 1% for every increase of 100m.
4.	Whether the actual environment humidity exceeds 90% or condensation occurs. If yes, take additional protective measures.
5.	Whether there is direct sunlight or biological invasion in the environment where the VFD is to be used. If yes, take additional protective measures.
6.	Whether there is dust or inflammable and explosive gas in the environment where the VFD is to be used. If yes, take additional protective measures.

2.5 Checking after installation

Check the following after the VFD installation is complete.

1.	Whether the input power cables and motor cables meet the current-carrying capacity requirements of the actual load.
2.	Whether correct accessories are selected for the VFD, the accessories are correctly and properly installed, and the installation cables meet the capacity carrying requirements of all components (including the reactor, input filter, output reactor, output filter, DC reactor, braking unit and braking resistor).
3.	Whether the VFD is installed on non-flammable materials and the heat-radiating accessories (such as the reactor and braking resistor) are away from flammable materials.
4.	Whether all control cables and power cables are run separately and Whether the routing complies with EMC requirement.
5.	Whether all grounding systems are properly grounded according to the requirements of the VFD.
6.	Whether all the installation clearances of the VFD meet the requirements in the manual.
7.	Whether the installation mode conforms to the instructions in the operation manual. It is recommended that the VFD be installed uprightly.
8.	Whether the external connection terminals of the VFD are tightly fastened and the torque is appropriate.
9.	Whether there are screws, cables, or other conductive items left in the VFD. If yes, get them out.

2.6 Basic commissioning

Complete the basic commissioning as follows before the actual use of the VFD:

1.	According to the actual motor parameters, select the motor type, set motor parameters, and select the VFD control mode.
2.	Check whether autotuning is required. If possible, de-couple the VFD from the motor load to start dynamic parameter autotuning. If the VFD cannot be de-coupled from the load, perform static autotuning.
3.	Adjust the ACC/DEC time according to the actual work condition of the load.
4.	Perform device commissioning by means of jogging and check whether the motor rotational direction is correct. If not, change the rotation direction by swapping any two phase wires of the motor.
5.	Set all control parameters and then perform actual run.

3 Product overview

3.1 What this chapter contains

This chapter mainly introduces the operation principles, product features, layouts, nameplates and model designation rules.

3.2 Basic principles

The VFD is used to control asynchronous AC induction motor and permanent-magnet synchronous motor. The following figure shows the main circuit diagram of the VFD unit.

The rectifier converts 3PH AC voltage into DC voltage, and the capacitor bank of intermediate circuit stabilizes the DC voltage. The inverter converts DC voltage into AC voltage that can be used by an AC motor. When the circuit voltage exceeds the maximum limit value, external braking resistor will be connected to intermediate DC circuit to consume the feedback energy.

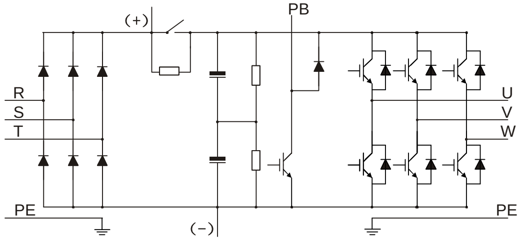


Figure 3-1 380V (0018 and lower) main circuit diagram

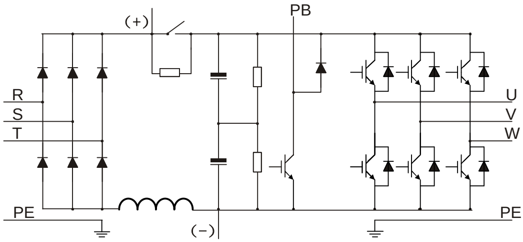


Figure 3-2 380V (0022–0045) main circuit diagram

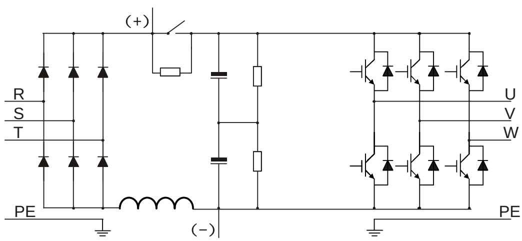


Figure 3-3 380V (0055 and higher) main circuit diagram

The VFD cabinet is a product that integrates circuit breakers, contactors, input reactors, output reactors, and other peripheral accessories into a cabinet on the basis of the VFD unit. The following figure shows the main circuit diagram.

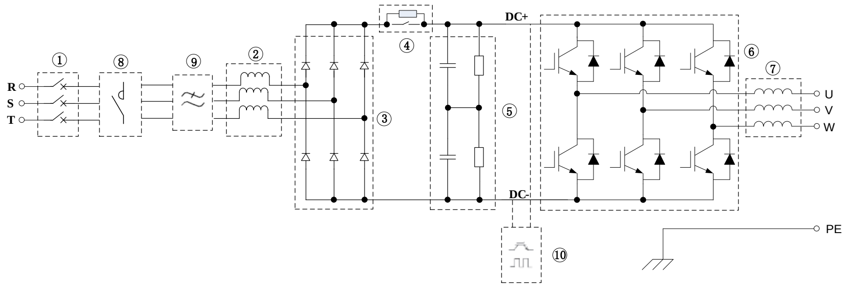


Figure 3-4 Cabinet main circuit diagram

No.	Name	Description
1	Breaker	To switch the circuit on and off, and automatically cut off the circuit to protect the power supply and VFD in case of abnormality.
2	AC input reactor	To suppress AC voltage and current harmonics.
3	Rectifier	To convert AC current to DC current.
4	Buffer component	To prevent excessive impulse current at power-up.
5	Capacitor component	To stabilize the DC voltage, and filter out the AC part from the DC voltage.
6	Inverter	To convert DC current to AC current.
7	AC output reactor	To suppress peak voltage to protect the motor and VFD.
8	Contactor	To switch the circuit on and off, optional.
9	Input filter	To suppress harmonics to reduce interference to the grid, optional.
10	Braking unit	To transfer excess energy to the braking resistor at dynamic braking, optional.

Note: Only one of the input filter and the braking unit can be selected. If you need both, please contact INVT.

3.3 Product specifications

Description		Specifications
Power input	Input voltage (V)	AC 3PH 380V(-15%) – 440V(+10%); Rated voltage: 380V
	Input current (A)	See section "Product ratings".
	Input frequency (Hz)	50Hz or 60Hz; Allowed range: 47–63Hz
Power output	Output voltage (V)	0–Input voltage (V)
	Output current (A)	See section "Product ratings".
	Output power (kW)	See section "Product ratings".
	Output frequency (Hz)	0–400Hz

Description		Specifications
Technical control performance	Control mode	Space voltage vector control, and sensorless vector control (SVC)
	Motor type	Asynchronous motor (AM) and permanent magnetic synchronous motor (SM)
	Speed ratio	Asynchronous motor (AM): 1:200 (SVC), synchronous motor (SM): 1:20 (SVC)
	Speed control accuracy	± 0.2% (SVC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	< 20ms (SVC)
	Torque control accuracy	10% (SVC)
	Starting torque	For AMs: 0.25Hz/150% (SVC) For SMs: 2.5Hz/150% (SVC)
	Overload capacity	150% for 1 minute (for the G type) 110% for 1 minute (for the P type)
Running control performance	Frequency setting method	Settings can be implemented through digital, analog, pulse frequency, multi-step speed running, simple PLC, PID, Modbus communication, Profibus communication and so on. Settings can be combined and the setting channels can be switched.
	Automatic voltage regulation	The output voltage can be kept constant although the grid voltage changes.
	Fault protection	More than 30 protection functions, such as protection against overcurrent, overvoltage, undervoltage, overtemperature, phase loss, and overload
	Speed tracking restart	Used to implement impact-free smooth startup for rotating motors **Note: The function is available only for the 0011 and higher VFD models.**
Peripheral interface	Terminal analog input resolution	No more than 20mV
	Terminal digital input resolution	No more than 2ms
	Analog input	Two inputs; AI1: 0–10V/0–20mA; AI2: -10–10V
	Analog output	Two outputs. AO0, AO1: 0–10V/0–20mA
	Digital input	Four regular inputs; max. frequency: 1kHz; internal impedance: 3.3kΩ Two high-speed inputs. Max. frequency: 50kHz

Description		Specifications
	Digital output	One high-speed pulse output; max. frequency: 50kHz One Y terminal open collector output, sharing the terminal with S4. The function can be selected through a jumper.
	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 and SLOT2 Supporting PG cards, programmable expansion cards, communication cards, I/O cards and so on
Other	Mounting method	Supports wall-mounting, floor-mounting and flange-mounting.
	Temperature of running environment	-10°C – 50°C. Derating is required when the ambient temperature exceeds 40°C.
	IP rating	IP20
	Pollution level	Level 2
	Cooling method	Forced air cooling
	Braking unit	The braking unit has been built in the 380V 0045 and lower VFD models. It is optional for the 380V 0055–0132 (inclusive) models and can be built in the VFD.
	EMC filter	All series of 380V meet the IEC61800-3 C3 requirements. Optional external filters can be used to meet the IEC61800-3 C2 requirements.

3.4 Product nameplate

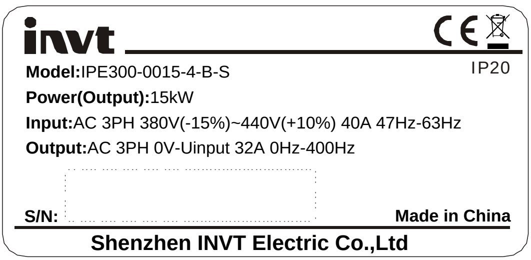


Figure 3-5 Product nameplate

Note: The preceding are standard product nameplate examples. The marking such as "CE" or "IP20" on the nameplate is marked according to actual certification conditions.

3.5 Model designation code

A model designation code contains product information. You can find the model designation code on the VFD nameplate.

IPE300-16-0015-4-B-L3-S

① ② ③ ④ ⑤ ⑥ ⑦

Figure 3-6 Model description

Field	Symbol	Name	Remarks
Product series abbreviation	①	Product series abbreviation	IPE300: IPE300 series engineering VFD
Product category	②	Product category	Empty: VFD unit 16: VFD cabinet
Rated power	③	Power range	0015: 15kW
Voltage class	④	Voltage class	4: AC 3PH 380V(-15%) – 440V(+10%) Rated voltage: 380V
Braking unit	⑤	Braking unit configuration	B: Built-in braking unit **Note:** The braking unit has been built in the 0045 and lower VFD models as a standard configuration. Therefore, this field is omitted. The built-in braking unit is optional for 0055–0132 models. "-B" is added for the models with built-in braking unit.
Reactor	⑥	Reactor configuration	Default: No output reactor L3: Built-in output reactor
Product version	⑦	Product version	Empty: Standard version S: Booksize

Note:

1. The 0045 and lower models carry built-in braking units, the 0055–0132 (inclusive) models can be configured with optional built-in braking units, and the 0160 and higher models can be configured with external braking units.
2. The 0022–0110 (inclusive) models carry built-in DC reactors, and the 0200 and higher models supports built-in output reactors.

3.6 Product ratings

3.6.1 Ratings of VFD unit

Table 3-1 Ratings of VFD unit

VFD model	Light-load application			Heavy overload application			Full load power dissipation (W)	Blowing rate (m^3/h)	Weight (kg)
	Output power (kW)	Input current (A)	Output current (A)	Output power (kW)	Input current (A)	Output current (A)			
IPE300-0011-4-B-S	11	30	23	7.5	25	18.5	338	56.29	3
IPE300-0015-4-B-S	15	40	32	11	32	25	511	149.14	6
IPE300-0018-4-B-S	18.5	45	38	15	40	32	525		
IPE300-0022-4-B-S	22	51	45	18.5	45	38	589	170.36	8.5
IPE300-0030-4-B-S	30	64	60	22	51	45	745		
IPE300-0037-4-B-S	37	80	75	30	64	60	959	340.79	16
IPE300-0045-4-B-S	45	98	92	37	80	75	1126		
IPE300-0055-4-S	55	128	115	45	98	92	1189	752.32	25
IPE300-0075-4-S	75	139	150	55	128	115	1473		
IPE300-0090-4-S	90	168	170	75	139	150	1879		
IPE300-0110-4-S	110	201	215	90	168	180	2016	849.5	41
IPE300-0132-4-S	132	265	260	110	201	215	2587		
IPE300-0160-4-S	160	310	305	132	265	260	2780	1443	78
IPE300-0185-4-S	185	345	340	160	310	305	3004		
IPE300-0200-4-S	200	385	380	185	345	340	3177	1798	122
IPE300-0220-4-S	220	430	425	200	385	380	3609		
IPE300-0250-4-S	250	460	480	220	430	425	3927		
IPE300-0280-4-S	280	500	530	250	460	480	5598	2697	124
IPE300-0315-4-S	315	580	600	280	500	530	6121		
IPE300-0355-4-S	355	625	650	315	580	600	6608		
IPE300-0400-4-S	400	715	720	355	625	650	6976		175
IPE300-0450-4-S	450	840	820	400	715	720	7658		
IPE300-0500-4-S	500	890	860	450	840	820	8000		

Note:

1. The VFD input current is measured in cases where the input voltage is 380V.
2. The rated output current is the output current when the output voltage is 380V.
3. Within the allowable input voltage range, the output current/power cannot exceed the rated output current/power.

3.6.2 Ratings of VFD cabinet

Table 3-2 Ratings of VFD cabinet

<table>
<tr><th rowspan="2">VFD model</th><th colspan="3">Light-load application</th><th colspan="3">Heavy overload application</th><th rowspan="2">Full load power dissipation (W)</th><th rowspan="2">Blowing rate (m^3/h)</th><th rowspan="2">Weight (kg)</th></tr>
<tr><th>Output power (kW)</th><th>Input current (A)</th><th>Output current (A)</th><th>Output power (kW)</th><th>Input current (A)</th><th>Output current (A)</th></tr>
<tr><td>IPE300-16-0110-4-S</td><td>110</td><td>201</td><td>215</td><td>90</td><td>168</td><td>180</td><td>2185</td><td rowspan="2">849.5</td><td rowspan="2">314</td></tr>
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<tr><td>IPE300-16-0160-4-S</td><td>160</td><td>280</td><td>305</td><td>132</td><td>230</td><td>260</td><td>2949</td><td rowspan="2">1443</td><td rowspan="2">366</td></tr>
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<tr><td>IPE300-16-0200-4-S</td><td>200</td><td>350</td><td>380</td><td>185</td><td>320</td><td>340</td><td>3455</td><td rowspan="3">1798</td><td rowspan="3">418</td></tr>
<tr><td>IPE300-16-0220-4-S</td><td>220</td><td>385</td><td>425</td><td>200</td><td>350</td><td>380</td><td>3894</td></tr>
<tr><td>IPE300-16-0250-4-S</td><td>250</td><td>435</td><td>480</td><td>220</td><td>385</td><td>425</td><td>4258</td></tr>
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<tr><td>IPE300-16-0315-4-S</td><td>315</td><td>550</td><td>600</td><td>280</td><td>480</td><td>530</td><td>6945</td></tr>
<tr><td>IPE300-16-0355-4-S</td><td>355</td><td>605</td><td>650</td><td>315</td><td>550</td><td>600</td><td>7789</td></tr>
<tr><td>IPE300-16-0400-4-S</td><td>400</td><td>680</td><td>720</td><td>355</td><td>605</td><td>650</td><td>8243</td><td rowspan="3">511</td></tr>
<tr><td>IPE300-16-0450-4-S</td><td>450</td><td>770</td><td>820</td><td>400</td><td>680</td><td>720</td><td>9099</td></tr>
<tr><td>IPE300-16-0500-4-S</td><td>500</td><td>850</td><td>860</td><td>450</td><td>770</td><td>820</td><td>9496</td></tr>
</table>

3.7 Structure

3.7.1 Structure of VFD unit

The VFD structure is shown in the following figure (taking the 380V 0030 VFD model as an example).

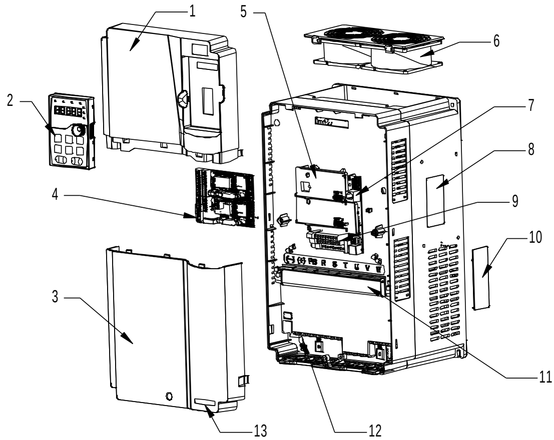
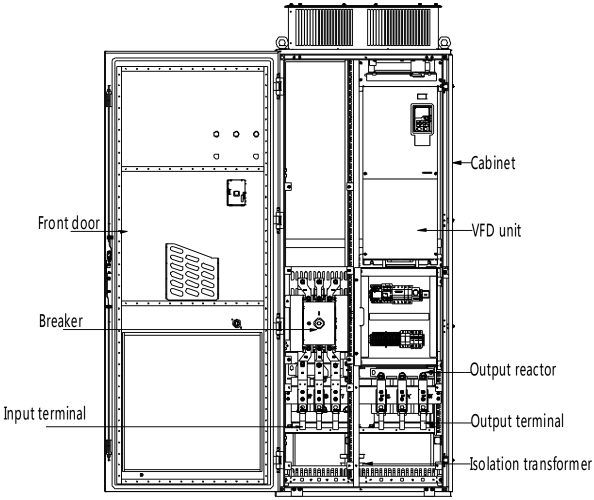


Figure 3-7 VFD unit structure

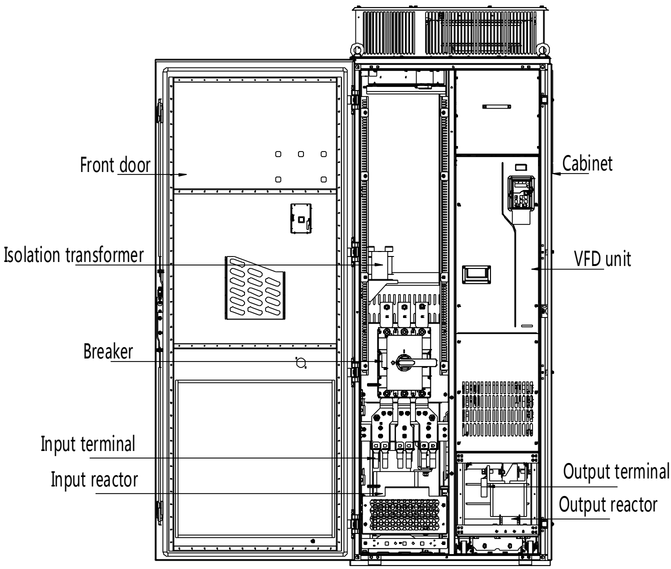
No.	Name	Description
1	Upper cover	Protects internal components and parts.
2	Keypad	For details, see section "Keypad instruction".
3	Lower cover	Protects internal components and parts.
4	Expansion card	Optional. For details, see "Expansion card".
5	Baffle of control board	Protects the control board and install expansion cards.
6	Cooling fan	For details, see section "Expansion card".
7	Keypad interface	Connects the keypad.
8	Nameplate	For details, see section "Product overview".
9	Control circuit terminals	For details, see section "Installation guidelines".
10	Cover plate of heat emission hole	Optional. Cover plate can upgrade protection level, however, as it will also increase internal temperature, derated use is required.
11	Main circuit terminals	For details, see section "Installation guidelines".
12	POWER indicator	Power supply indicator
13	Product label	For details, see section "Model designation code"

3.7.2 Layout of VFD cabinet

The following figure shows the layout of the 110–185kW cabinet.



The following figure shows the layout of the 200–500kW cabinet.



Note: The product configuration varies with the power cabinet. For details, see section 3.7.3.

3.7.3 Cabinet configuration table

Code	Name	16S6 0110–0132	16S7 0160–0185	16S8 0200–0250	16S9 0280–0355	16S10 0400–0500
Main circuit configuration						
-	Breaker	●	●	●	●	●
E250	AC fast fuse	□	□	□	□	□
E255	Main contactor	□	□	□	□	□
E150	Braking unit	□	□	□	□	□
E203	Input reactor	□	□	●	●	●
E204	DC reactor	●	●	□	□	□
E205	Output reactor	□	□	□	□	□
-	Variable-frequency unit	●	●	●	●	●
Control circuit						
-	Safety relay	●	●	●	●	●
-	Cabinet lights	●	●	●	●	●
E108	Cabinet heater	□	□	□	□	□
-	Emergency stop, class 0	●	●	●	●	●
E110	Emergency stop, class 1	□	□	□	□	□
-	Local/Remote switching	□	□	□	□	□
E112	Motor fan output (4–6A)	□	□	□	□	□
E113	Motor fan output (6–10A)	□	□	□	□	□
E114	Motor fan output (10–16A)	□	□	□	□	□
IP rating						
-	IP20	●	●	●	●	●
C121	IP21	□	□	□	□	□
Installation						
C201	100mm base	□	□	□	□	□
C202	200mm base	□	□	□	□	□
C211	Lifting ring	●	●	●	●	●

Note: ● means standard configuration; □ means optional configuration.

4 Installation guidelines

4.1 What this chapter contains

This chapter describes the mechanical installation and electrical installation of the VFD.

	✧ Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in "Safety precautions". Ignoring these safety precautions may lead to physical injury or death, or device damage. ✧ Ensure the VFD power has been disconnected before installation. If the VFD has been powered on, disconnect the VFD power and wait for at least the time specified 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. If recommendations given by INVT are not followed, the VFD may experience problems that the warranty does not cover.

4.2 Installation environment

The installation environment is essential for the VFD to operate with best performance in the long run. Install the VFD in an environment that meets the following requirements.

Environment	Condition
Installation site	Indoor
Ambient temperature	✧ -10–+50°C ✧ When the ambient temperature exceeds 40°C, derate 1% for every increase of 1°C. ✧ Do not use the VFD when the ambient temperature exceeds 50°C. ✧ In order to improve reliability, do not use the VFD in the places where the temperature changes rapidly. ✧ When the VFD is used in a closed space, such as control cabinet, use a cooling fan or air conditioner for cooling, preventing the internal temperature from exceeding the temperature required. ✧ 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.

Environment	Condition
Relative humidity (RH)	✧ RH: less than 90% ✧ Condensation is not allowed. ✧ The max. RH cannot exceed 60% in the environment where there are corrosive gases.
Storage temperature	-30–60.0°C
Running environment	Install the VFD in a place: ✧ Away from electromagnetic radiation sources ✧ Away from oil mist, corrosive gases, and combustible gases ✧ Without the chance for foreign objects such as metal powder, dust, oil and water to fall into the VFD (do not install the VFD onto combustible objects such as wood) ✧ Without radioactive substances and combustible objects ✧ Without hazard gases and liquids ✧ With low salt content ✧ Without direct sunlight
Altitude	✧ Lower than 1000 meters ✧ When the altitude exceeds 1000m, derate by 1% for every additional 100m. ✧ When the installation site altitude exceeds 3000m, consult the local INVT dealer or office.
Vibration	Max. vibration acceleration: 5.8m/s^2 (0.6g)
Installation direction	Install the VFD vertically to ensure good heat dissipation performance.

Note:

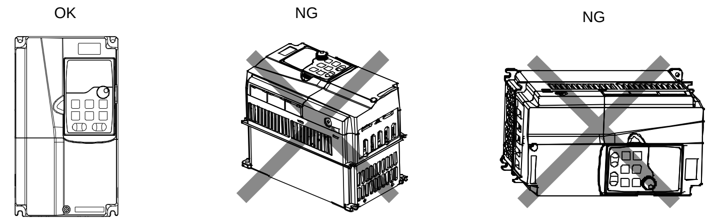
1. The VFD must be installed in a clean and well-ventilated environment based on the housing IP rating.
2. The cooling air must be clean enough and free from corrosive gases and conductive dust.

4.3 VFD unit installation

4.3.1 Installation direction

The VFD unit can be installed on the wall or in a cabinet.

The VFD must be installed vertically. Check the installation position according to following requirements. For details about the outline dimensions, see Appendix C Dimension drawings.



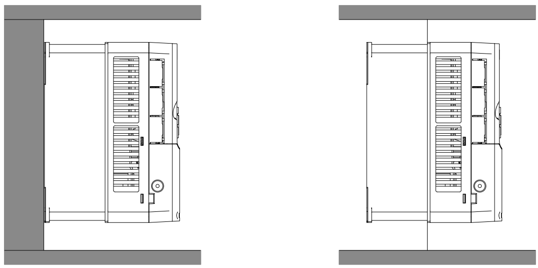
A. Vertical installation B. Horizontal installation C. Transverse installation

Figure 4-1 Installation direction

4.3.2 Installation method

There are three kinds of installation modes based on different VFD dimensions.

- ✧ Wall-mounting: applicable to 380V 0185 and lower models.
- ✧ Flange-mounting: applicable to 380V 0185 and lower models.
- ✧ Floor-mounting: applicable to 380V 0200–0500 models.



Wall-mounting Flange-mounting

Figure 4-2 Installation method

1. Mark the installation hole positions. For details about the installation hole positions, see Appendix C Dimension drawings.
2. Mount the screws or bolts onto the designated positions.
3. Lean the VFD against the wall.
4. Tighten the screws.

Note:

1. The flange mounting plate must be used for flange mounting.
2. The 380V 0200–0500 models with optional output AC reactors also supports floor mounting.

4.3.3 Installing one unit

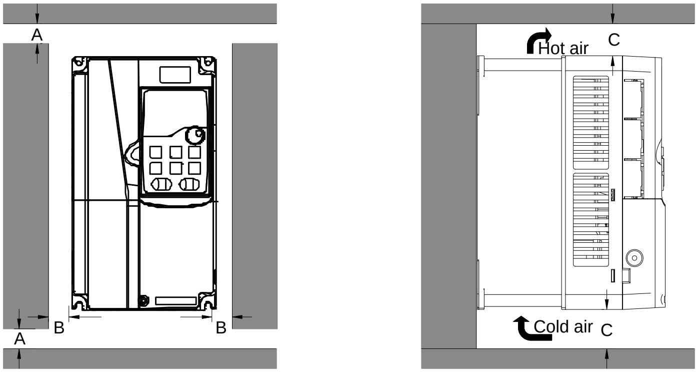


Figure 4-3 Installing one VFD

Note: For clearances A, B, and C, each must be 100mm at least.

4.3.4 Multiple-VFD installation

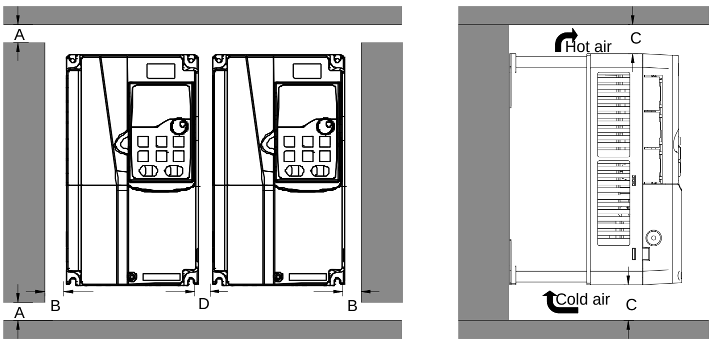


Figure 4-4 Parallel installation

Note:

1. When you install VFDs in different sizes, align the top of each VFD before installation for the convenience of future maintenance.
2. For clearances A, B, C, and D, each must be 100mm at least.

4.3.5 Vertical installation

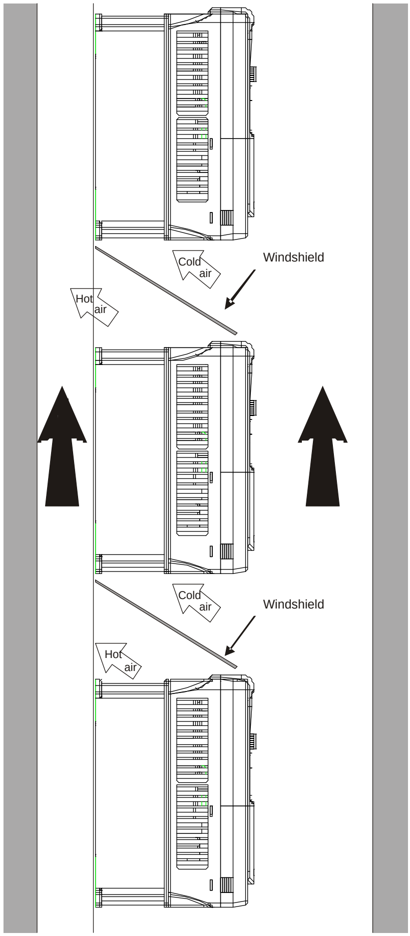


Figure 4-5 Vertical installation

Note: During vertical installation, you must install windshield, otherwise, the VFD will experience mutual interference, and the heat dissipation effect will be degraded.

4.3.6 Tilted installation

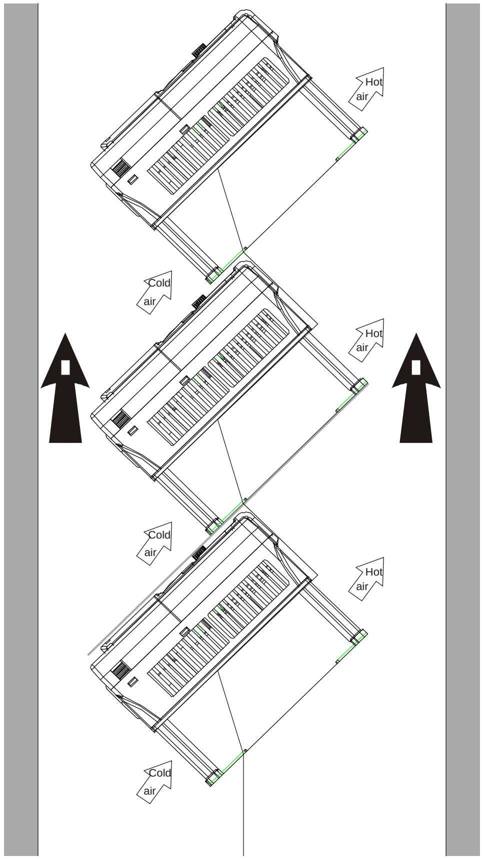


Figure 4-6 Tilted installation

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.

4.4 VFD cabinet installation

4.4.1 Transportation

The VFD cabinet is shipped in a wooden box with pallets, which are heavy as a whole and must be carried with a lifting tool, such as a forklift and crane; operators must be professionally trained; the inverter unit must be transported in strict accordance with the allowed ways marked on the box, and not allowed to be transported upside down or on the sides.

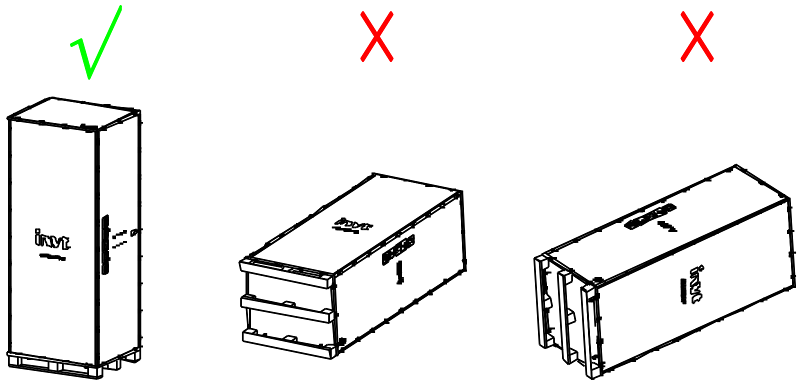


Figure 4-7 Transportation requirements

When transported with a forklift, the VFD must be fixed to the pallets and transported together, which means you are not allowed to remove the pallets to transport the VFD. If the forklift's fork tines are too short, it may cause the unit/cabinet to tip over, resulting in serious injury, property damage or even death.

When transported with a crane, the VFD must be fixed to the pallets and lifted together.

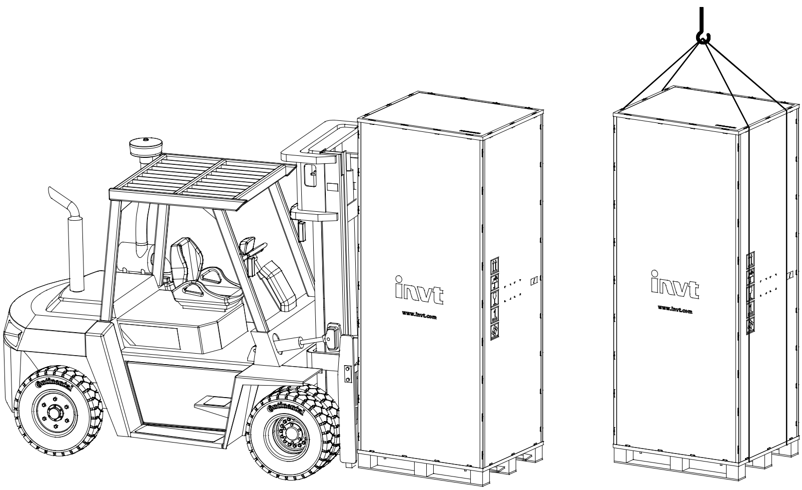


Figure 4-8 Transportation means

4.4.2 Unpacking

The cabinet is delivered in the wooden box padded with EPE.

To remove the packing, do as follows:

Step 1 Place the well-packed unit in an empty and flat place.

Step 2 Use tools such as a pry bar or large one-piece screwdriver to remove the wooden box cover and the steel tongue nails of the surrounding boards.

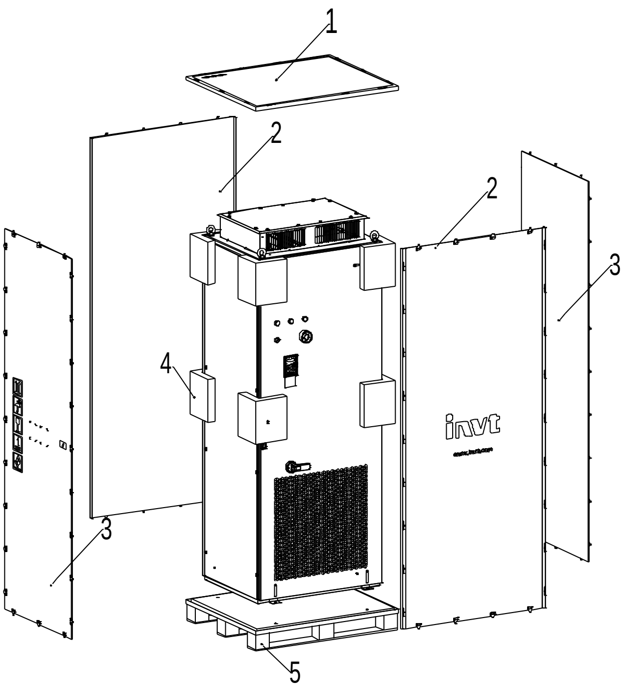
Step 3 Remove the surrounding boards and EPE filling materials from the wooden box.

Step 4 Cut off the plastic windings.

Step 5 Take out of the cabinet.

Step 6 Ensure that the unit is intact without any damage.

Note: Dispose of or recycle packaging in accordance with local regulations.



No	Name
1	Cover
2	Front and rear panels
3	Left and right panels
4	EPE
5	Base plate

Figure 4-9 Unpacking

To lift the device with the steel lifting holes at the top corners, the lifting rope or slings must be installed into the hole of the lifting holes and fixed to ensure safety. See Figure 4-10 for details.

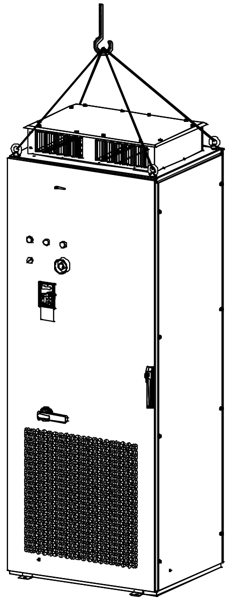


Figure 4-10 Lifting diagram

4.4.3 Installation

4.4.3.1 Installation site check

The installation site should be well ventilated or shaded for a good heat dissipation.

The installation environment meets the specification requirements.

The wall/material near the installation site should be non-combustible material.

The floor should be made of non-combustible material, and flat and strong to withstand the weight of the device. Check the level of the floor with a level, and ensure that the maximum allowable deviation of the level of the ground surface is 5mm per 3m. The installation site should be leveled if necessary, as the cabinet is not equipped with adjustable feet.

To facilitate maintenance, do not install the cabinet in a high place (i.e. higher than the front place).

4.4.3.2 Installation description

The cabinet is floor mounted and fixed to the ground.

When the channel steel base is not available on the site, fix the cabinet directly to the ground through 4 fixing anchor bolts. For the installation dimensions, see section C.4 VFD cabinet dimensions.

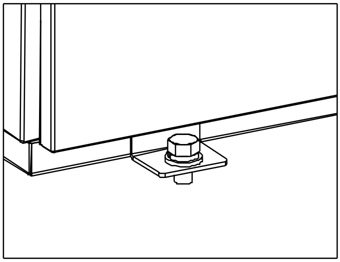


Figure 4-11 Anchor bolt installation diagram

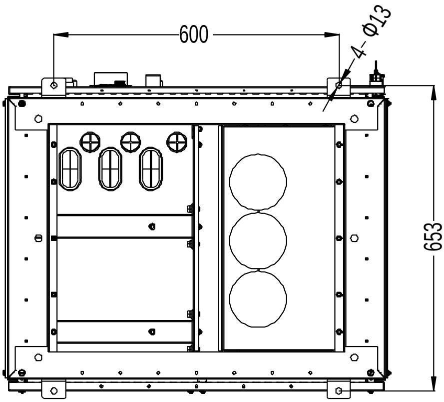


Figure 4-12 Installation without channel steel base

When the channel steel base is available on the site, fix the channel steel base with the ground, and then fix the base and the cabinet with screws. For the installation dimensions, see section C.4 VFD cabinet dimensions.

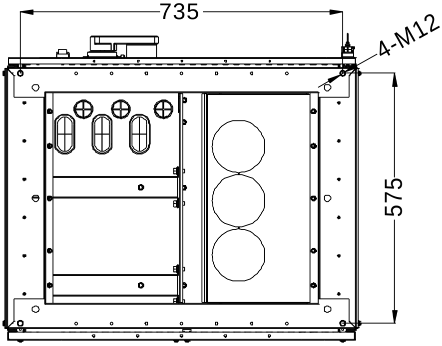


Figure 4-13 Installation with channel steel base

To ensure reliable cabinet installation and good heat dissipation, the ventilation clearances must be kept from the front, back, top and sides of the cabinet. For the minimum clearance, see Figure 4-11.

A minimum clearance of 800mm should be reserved in front of the cabinet to facilitate cabinet maintenance.

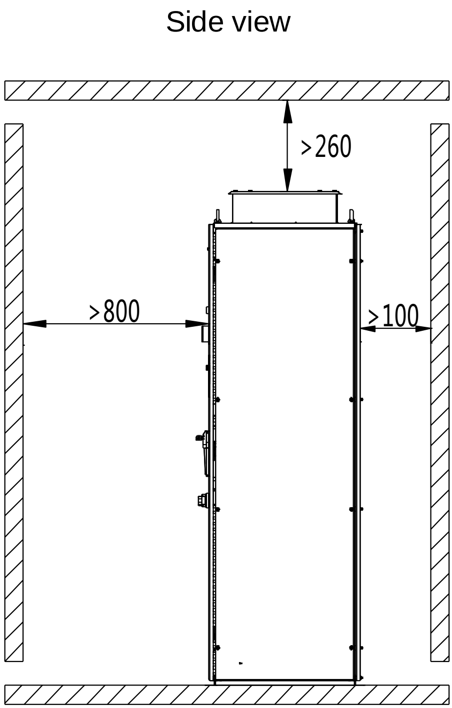


Figure 4-14 Installation space requirements

Violation of the requirements in the installation space and heat dissipation will shorten the VFD life and may result in VFD failure or malfunction.

4.5 Standard wiring of the main circuit

4.5.1 Main circuit wiring diagram of VFD unit

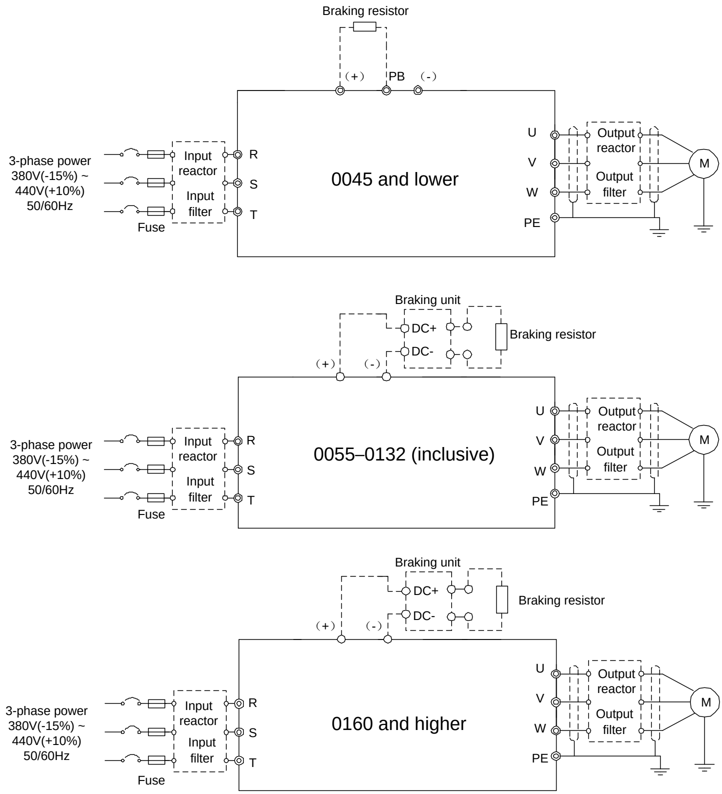


Figure 4-15 Main circuit wiring diagram for AC 3PH 380V(-15%) – 440V(+10%)

Note:

1. The fuse, braking unit, braking resistor, input reactor, input filter, output reactor and output filter are optional parts. For details, see Appendix D "Optional peripheral accessories".
2. Before connecting the braking resistor, remove the yellow warning label with PB, (+) and (-) from the terminal block; otherwise, poor contact may occur.
3. Built-in braking unit is optional for the 380V 0055–0132 models.

4.5.2 Main circuit terminal diagram of VFD unit

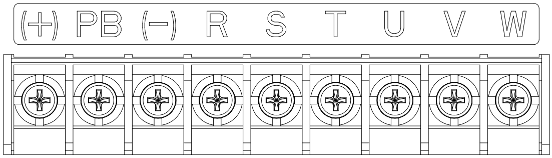


Figure 4-16 Main circuit terminal diagram for 3PH 380V 0030kW and lower

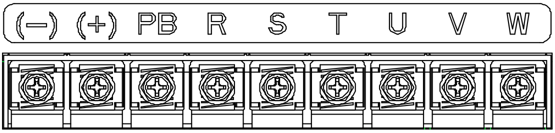


Figure 4-17 Main circuit terminal diagram for 3PH 380V 0037–0045kW

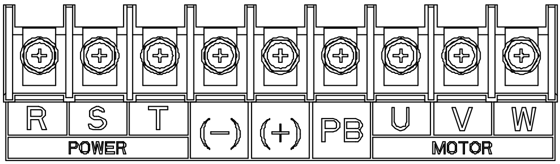


Figure 4-18 Main circuit terminal diagram for 3PH 380V 0055–0132kW

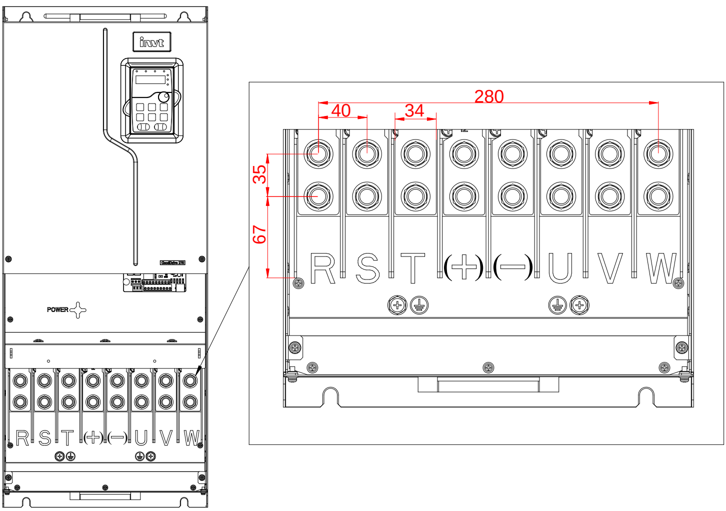
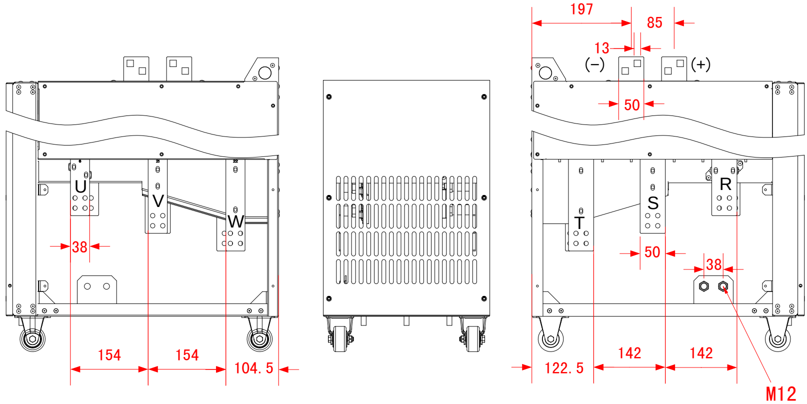
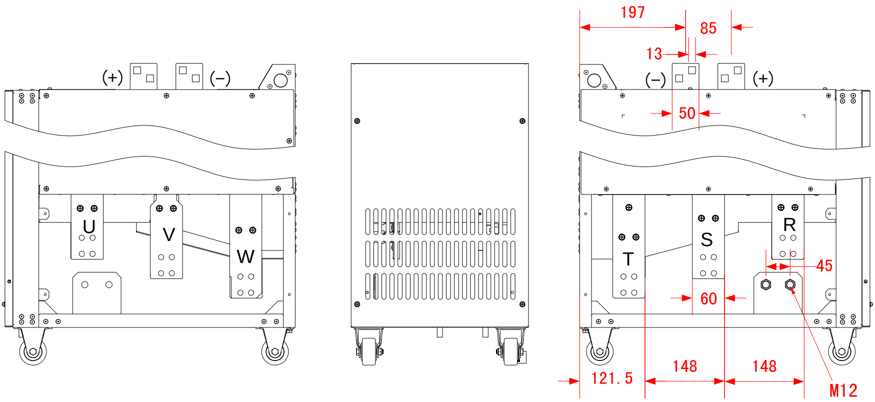


Figure 4-19 Main circuit terminal diagram for 3PH 380V 0160–0185kW (unit: mm)



Right view Front view Left view

Figure 4-20 Main circuit terminal diagram for 3PH 380V 0200–0355kW (unit: mm)



Right view Front view Left view

Figure 4-21 Main circuit terminal diagram for 3PH 380V 0400–0500kW (unit: mm)

Terminal	**Terminal name**			**Description**
	380V 0045 and lower	**380V 0055–0132 (inclusive)**	**380V 0160 and higher**	
R, S, T	Main circuit power input			3PH AC input terminals, connecting to the grid
U, V, W	VFD outputs			3PH AC output terminals, which connect to the motor in most cases

Terminal	Terminal name: 380V 0045 and lower	Terminal name: 380V 0055–0132 (inclusive)	Terminal name: 380V 0160 and higher	Description
(+)	Braking unit terminal 1			(+) and (-) connect to the external braking unit.
(-)	Not available	Braking unit terminal 2		
PB	Braking resistor terminal 2		Not available	PB and (+) connect to external braking resistor terminal
PE	Grounding terminal for safe protection			Each machine must carry two PE terminals and proper grounding is required

Note:

1. 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 VFD end and motor end.
2. Braking resistor, braking unit and DC reactor are optional parts.
3. Route the motor cable, input power cable and control cable separately.
4. "Not available" means this terminal is not for external connection.

4.5.3 Main circuit wiring diagram of VFD cabinet

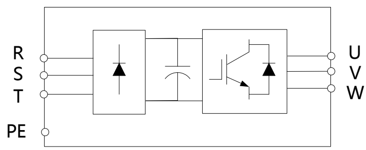


Figure 4-22 Main circuit wiring diagram of VFD cabinet

4.5.4 Main circuit terminal diagram of VFD cabinet

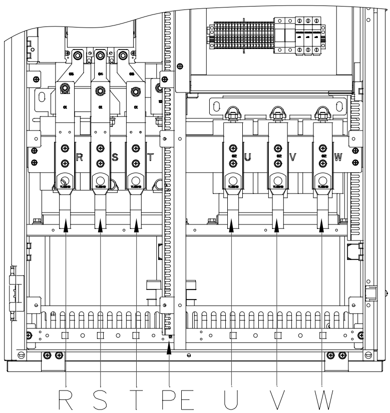


Figure 4-23 Main circuit terminal diagram for 110–185kW VFD cabinet

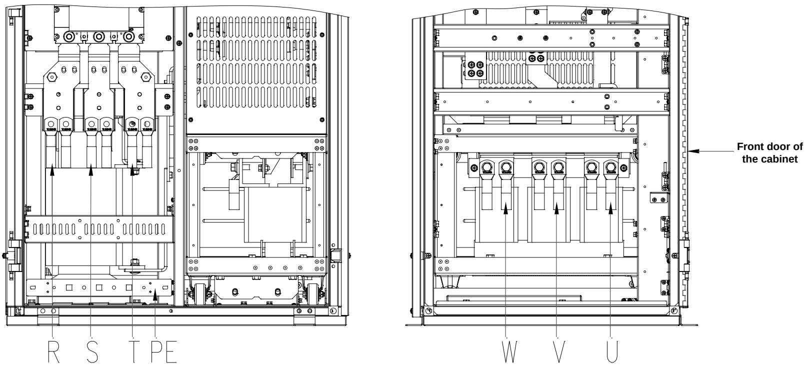


Figure 4-24 Main circuit terminal diagram for 200–500kW VFD cabinet

Main circuit terminal description of VFD cabinet:

No.	Name	Description
1	R, S, T	3PH AC input terminals
2	U, V, W	3PH AC output terminals
3	PE	Grounding terminal

4.5.5 Wiring procedure for main circuit terminals

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.
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.
3. Connect optional parts such as the braking resistor that carries cables to designated positions.
4. Fasten all the cables outside the VFD mechanically if allowed.

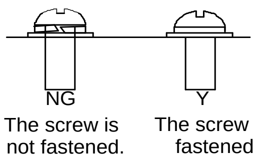


Figure 4-25 Screw installation diagram

4.6 Standard wiring of the control circuit

4.6.1 Wiring of basic control circuit

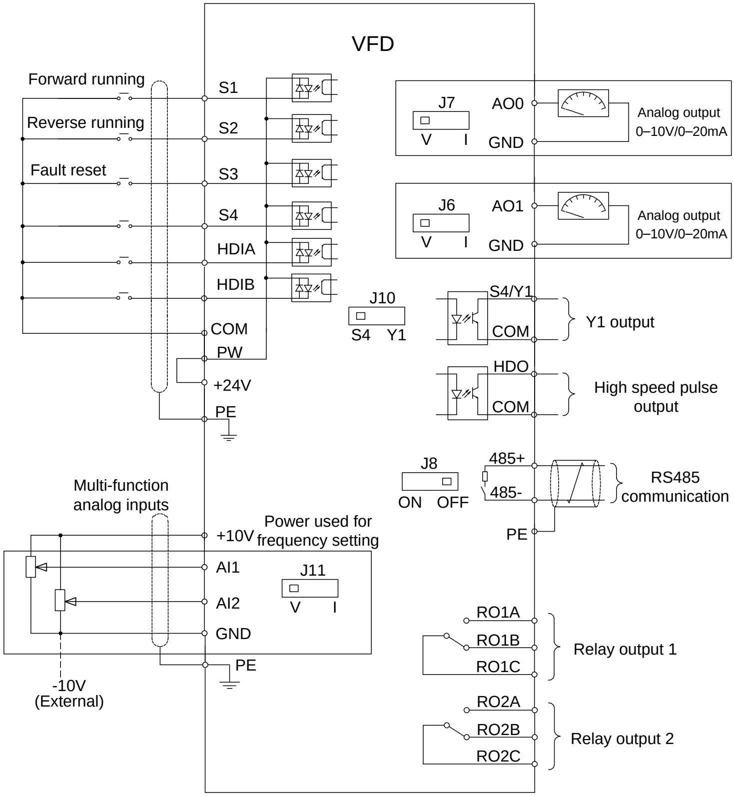


Figure 4-26 Wiring diagram of basic control circuit

Terminal name	Description
+10V	Locally provided +10.5V power supply
AI1	Input range: For AI1, 0–10V or 0–20mA; for AI2, -10V – +10V
AI2	Input impedance: 20kΩ for voltage input or 250Ω for current input Function code P05.50 specifies whether to use voltage or current input. Resolution: 5mV when 10V corresponds to 50Hz Deviation: ±0.5% at 25°C, when input is above 5V/10mA
GND	Reference ground of +10.5V
AO0	Output range: 0(2)–10V or 0(4)–20mA

<table>
<tr><th>Terminal name</th><th colspan="2">Description</th></tr>
<tr><td>AO1</td><td colspan="2">Whether voltage or current is used for output of AO0 and AO1 is set through jumpers J7 and J6.
Error: ±0.5% when output is 5V at 25°C.</td></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/AC250V, 1A/DC30V</td></tr>
<tr><td>RO2B</td></tr>
<tr><td>RO2C</td></tr>
<tr><td>HDO</td><td colspan="2">Switch capacity: 200mA/30V
Output frequency range: 0–50kHz
Duty ratio: 50%</td></tr>
<tr><td>COM</td><td colspan="2">Reference ground of +24V</td></tr>
<tr><td>Y1</td><td colspan="2">Switch capacity: 50mA/30V
Output frequency range: 0–1kHz
Y1 and S4 share the output terminal. The selection is made through J10.</td></tr>
<tr><td>485+</td><td colspan="2" rowspan="2">RS485 communication port, RS485 differential signal port and standard RS485 communication port must use shielded twisted pairs; the 120ohm terminal matching resistor for RS485 communication is connected through jumper J8.</td></tr>
<tr><td>485-</td></tr>
<tr><td>PE</td><td colspan="2">Grounding terminal</td></tr>
<tr><td>PW</td><td colspan="2">External power input terminal for digital input circuits
Voltage range: 12–24V</td></tr>
<tr><td>24V</td><td colspan="2">User power supply provided by the VFD. Max. output current: 200mA</td></tr>
<tr><td>S1</td><td>Digital input 1</td><td rowspan="4">1. Internal impedance: 3.3kΩ
2. 12–30V voltage input is acceptable
3. Bi-direction input terminals, supporting both NPN and PNP connection methods
4. Max. input frequency: 1kHz
5. Programmable digital input terminals, the functions of which can be set through the related parameters
6. S4 and Y1 share the output terminal. The selection is made through J10.</td></tr>
<tr><td>S2</td><td>Digital input 2</td></tr>
<tr><td>S3</td><td>Digital input 3</td></tr>
<tr><td>S4</td><td>Digital input 4</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%
Supporting quadrature encoder input; with the speed measurement function</td></tr>
<tr><td>HDIB</td></tr>
</table>

4.6.2 Input/output signal connection diagram

Set NPN /PNP mode and internal/external power via U-shaped jumper. NPN internal mode is adopted by default.

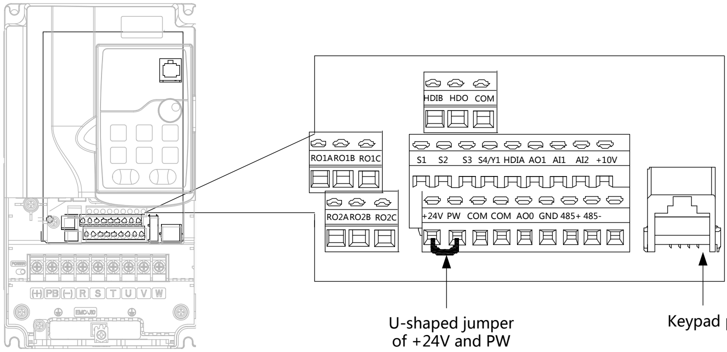


Figure 4-27 Position of U-shaped jumpers

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

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

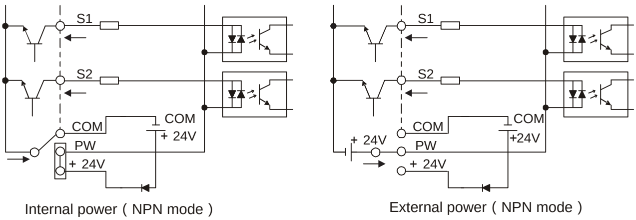


Figure 4-28 NPN mode

If the input signal comes from the PNP transistor, set the U-shaped jumper based on the power used according to the following figure.

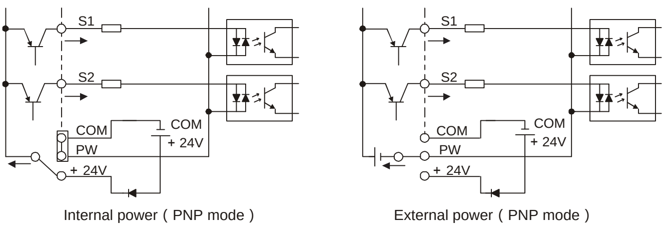


Figure 4-29 PNP mode

4.7 Wiring protection

4.7.1 Protecting the VFD and input power cable in case of short circuit

The VFD and input power cable can be protected in case of short circuit, avoiding thermal overload.

Carry out protective measures according to the following figure.

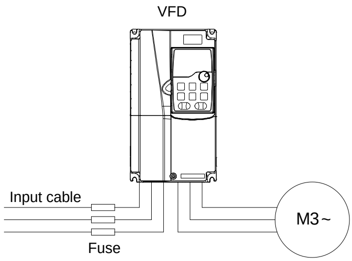


Figure 4-30 Fuse configuration

Note: Select the fuse according to the manual. 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.

4.7.2 Protecting the motor and motor cable in case of short circuit

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

	✧ 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.

4.7.3 Protecting the motor against thermal overload

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

4.7.4 Bypass connection

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.

	✧ 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.

If frequent switchover is needed, 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 Basic operation guidelines

5.1 What this chapter contains

This chapter describes the buttons, indicators, and display of the keypad, as well as the method of using the keyboard to view and modify the function code settings.

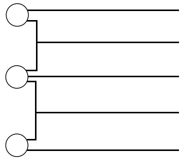
5.2 Keypad instruction

The keypad is provided to control the VFD, read status data and set parameters.

Figure 5-1 Keypad

Note: The LED keypad is a standard part for the VFD. In addition, the LCD keypad (an optional part) can be provided as required. The LCD keypad supports HD display in multi language, with parameter copy function. Its installation size is compatible with LED keypad.

No.	Name		Description
1	Status indicator	RUN/TUNE	Off: The VFD is stopped Blinking: The VFD is in parameter autotuning. On: The VFD is running.
		FWD/REV	Forward or reverse running indicator Off: The VFD is running forward. On: The VFD is running.
		LOCAL/REMOT	Indicates whether the VFD is controlled through the keypad, terminals, or communication. Off: The VFD is controlled through the keypad. Blinking: The VFD is controlled through terminals. On: The VFD is controlled remotely.

<table>
<tr><th>No.</th><th colspan="2">Name</th><th colspan="2">Description</th></tr>
<tr><td>2</td><td></td><td>TRIP</td><td colspan="2">Fault indicator
On: The VFD is in fault state.
Off: The VFD is in normal state.
Blinking: The VFD is in pre-alarm state.</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Unit indicator</td><td colspan="3">Unit displayed currently</td></tr>
<tr><td rowspan="5"></td><td>Hz</td><td>Frequency unit</td></tr>
<tr><td>RPM</td><td>Rotation speed unit</td></tr>
<tr><td>A</td><td>Current unit</td></tr>
<tr><td>%</td><td>Percentage</td></tr>
<tr><td>V</td><td>Voltage unit</td></tr>
<tr><td>3</td><td>Digital display zone</td><td colspan="3">Five-digit LED displays various monitoring data and alarm codes such as the frequency setting and output frequency.
<table>
<tr><th>Display</th><th>Means</th><th>Display</th><th>Means</th><th>Display</th><th>Means</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>2</td><td>2</td></tr>
<tr><td>3</td><td>3</td><td>4</td><td>4</td><td>5</td><td>5</td></tr>
<tr><td>6</td><td>6</td><td>7</td><td>7</td><td>8</td><td>8</td></tr>
<tr><td>9</td><td>9</td><td>A.</td><td>A</td><td>b.</td><td>B</td></tr>
<tr><td>C.</td><td>C</td><td>d</td><td>d</td><td>E.</td><td>E</td></tr>
<tr><td>F.</td><td>F</td><td>H.</td><td>H</td><td>I.</td><td>I</td></tr>
<tr><td>L.</td><td>L</td><td>n.</td><td>N</td><td>n</td><td>n</td></tr>
<tr><td>o</td><td>o</td><td>P.</td><td>P</td><td>r</td><td>r</td></tr>
<tr><td>S.</td><td>S</td><td>t</td><td>t</td><td>U.</td><td>U</td></tr>
<tr><td>v</td><td>v</td><td>.</td><td>.</td><td>-</td><td>-</td></tr>
</table></td></tr>
<tr><td>4</td><td>Digital potentiometer</td><td colspan="3">Reserved</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Keys</td><td></td><td>Programming key</td><td>Press it to enter or exit level-1 menus or delete a parameter.</td></tr>
<tr><td></td><td>Confirmation key</td><td>Press it to enter menus in cascading mode or confirm the setting of a parameter.</td></tr>
<tr><td></td><td>UP key</td><td>Press it to increase data or move upward.</td></tr>
<tr><td></td><td>Down key</td><td>Press it to decrease data or move downward.</td></tr>
<tr><td></td><td>Right-shifting key</td><td>Press it to select display parameters rightward in the interface for the VFD in stopped or running state or to select digits to change during parameter setting.</td></tr>
</table>

No.	Name			Description
			Run key	Press it to run the VFD when using the keypad for control.
			Stop/ Reset key	Press it to stop the VFD that is running. The function of this key is restricted by P07.04. In fault alarm state, this key can be used for reset in any control modes.
			Multifunction shortcut key	The function of this key is determined by P07.02.

5.3 Keypad display

The keypad displays information such as the stopped-state parameters, running-state parameters, and fault status, and allows you to modify function codes.

5.3.1 Displaying stopped-state parameters

When the VFD is in stopped state, the keypad displays stopped-state parameters. See Figure 5-2.

In the stopped state, various kinds of parameters can be displayed. You can determine which parameters are displayed in stopped state by setting function code P07.07. For details, see the description of P07.07.

In stopped state, there are 15 parameters that can be selected for display, including the set frequency, bus voltage, PID reference value, PID feedback value, input terminal status, output terminal status, torque setting, PLC and the present step of multi-step speed, AI1 value, AI2 value, AI3 value, high-speed pulse HDI frequency, pulse counting value, length value, and upper limit frequency (Hz on). You can press >>/SHIFT to shift selected parameters from left to right or press QUICK/JOG (P07.02=2) to shift selected parameters from right to left.

5.3.2 Displaying running-state parameters

After receiving a valid running command, the VFD enters the running state, and the keypad displays running-state parameters, with the RUN/TUNE indicator on. The on/off state of the FWD/REV indicator is determined by the actual running direction. See Figure 5-2.

In running state, there are 25 parameters that can be selected for display, including the running frequency, set frequency, bus voltage, output voltage, output current, running speed, output power, output torque, PID reference value, PID feedback value, input terminal status, output terminal status, torque setting, length value, PLC and the current step of multi-step speed, AI1, AI2, AI3, high-speed pulse HDI frequency, motor overload percentage, VFD overload percentage, ramp reference value, linear speed, AC input current, and upper limit frequency (Hz on). You can determine which parameters are displayed in stopped state by setting function codes P07.05 and P07.06. You can press >>/SHIFT to shift selected parameters from left to right or press QUICK/JOG to shift selected parameters from right to left.

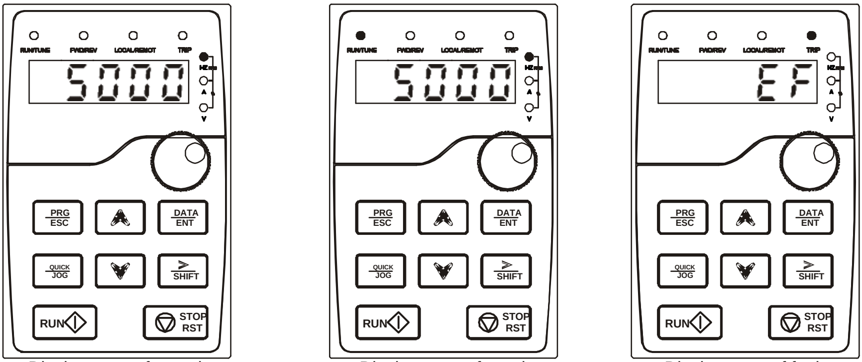
5.3.3 Displaying fault information

After detecting a fault signal, the VFD enters the fault alarm state immediately, the fault code blinks on the keypad, and the TRIP indicator is on. You can perform fault reset by using the STOP/RST key, control terminals, or communication commands.

If the fault persists, the fault code is continuously displayed.

5.3.4 Editing function codes

You can press the PRG/ESC key to enter the editing mode in stopped, running, or fault alarm state (if a user password is used, see the description of P07.00). The editing mode contains two levels of menus in the following sequence: Function code group or function code number → Function code setting. You can press the DATA/ENT key to enter the function parameter display interface. In the function parameter display interface, you can press the DATA/ENT key to save parameter settings or press the PRG/ESC key to exit the parameter display interface.



Display state of stopping parameters | Display state of running parameters | Display state of fault parameters

Figure 5-2 Status display

5.4 Operation procedure

You can operate the VFD by using the keypad. For details about function code descriptions, see the function code list.

5.4.1 Modifying function codes

The VFD provides three levels of menus, including:

• Function code group number (level-1 menu)

• Function code number (level-2 menu)

• Function code setting (level-3 menu)

Note: When performing operations on the level-3 menu, you can press the PRG/ESC or DATA/ENT key to return to the level-2 menu. If you press the DATA/ENT key, the set value of the parameter is saved to the control board first, and then the level-2 menu is returned, displaying the next function code. If you press the PRG/ESC key, the level-2 menu is returned directly, without saving the set value of the parameter, and the current function code is displayed.

If you enter the level-3 menu but the parameter does not have a digit blinking, the parameter cannot be modified due to either of the following reasons:

• It is read only. Read-only parameters include actual detection parameters and running record parameters.

• It cannot be modified in running state and can be modified only in stopped state.

Example: Change the value of P00.01 from 0 to 1.

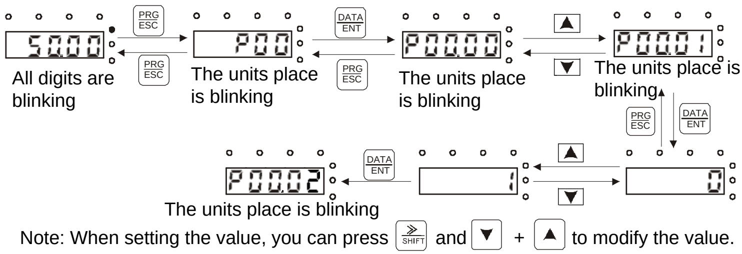


Figure 5-3 Modifying a parameter

5.4.2 Setting a password for the VFD

The VFD provides the user password protection function. When you set P07.00 to a non-zero value, the value is the user password. 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.

To disable the password protection function, you need only to set P07.00 to 0.

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.

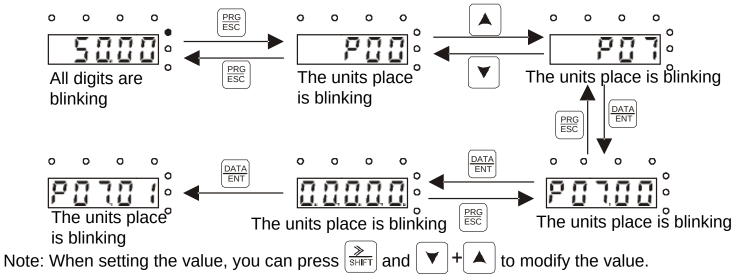


Figure 5-4 Setting a password

5.4.3 Viewing VFD status

The VFD provides group P17 for status viewing. You can enter group P17 for viewing.

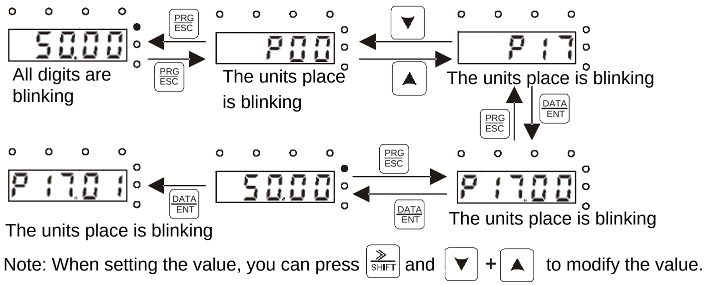


Figure 5-5 Viewing a parameter

5.5 Basic operation description

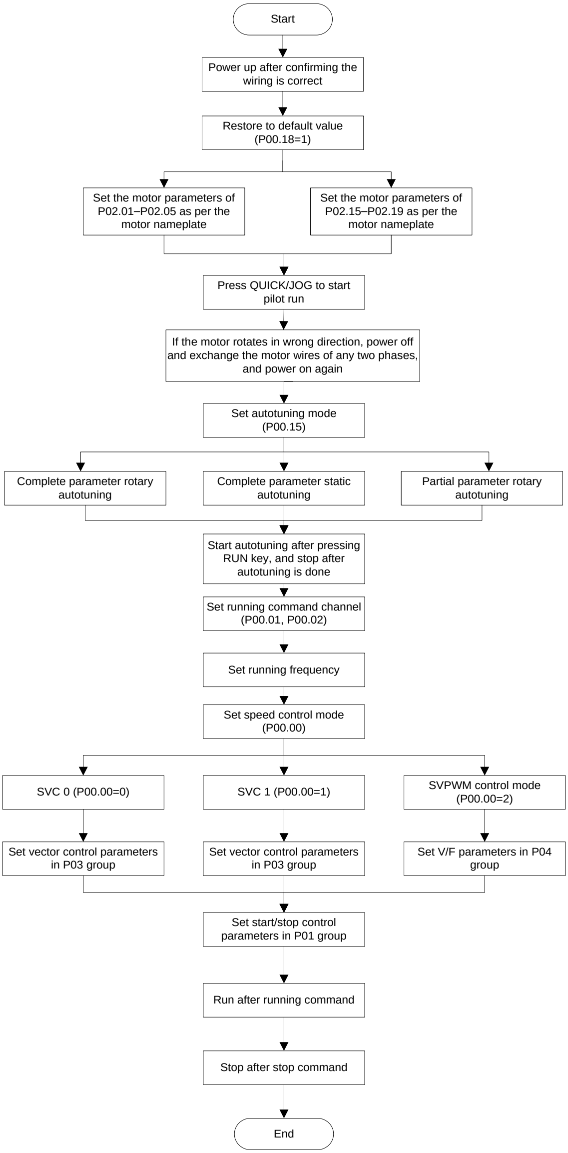
5.5.1 What this section describes

This section introduces the function modules inside the VFD.

	✧ Ensure that all terminals have been securely connected. ✧ Ensure that the motor power matches the VFD power.

5.5.2 Common commissioning procedure

The common commissioning procedure is as follows (taking motor 1 as an example).



Note: If a fault occurred, find out the fault cause according to "Troubleshooting".

The running command channel can be set by terminal commands besides P00.01 and P00.02.

Channel of running commands P00.01	Multifunction terminal function 36 Switch the running command channel to keypad	Multifunction terminal function 37 Switch the running command channel to terminal	Multifunction terminal function 38 Switch the running command channel to communication
Keypad	/	Terminal	Communication
Terminal	Keypad	/	Communication
Communication	Keypad	Terminal	/

Note: "/" indicates this multifunction terminal is invalid under present reference channel.

Related parameter list:

Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: Sensorless vector control (SVC) mode 1 2: Space voltage vector control mode **Note:** Before using a vector control mode (0 or 1), enable the VFD to perform motor parameter autotuning first.	2
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
P00.02	Communication mode of running commands	0: Modbus/Modbus TCP 1: PROFIBUS/CANopen/DeviceNet 2: Ethernet 3: EtherCAT/PROFINET/EtherNet IP 4: Programmable expansion card 5: Wireless communication card	0
P00.15	Motor parameter autotuning	0: No operation 1: Complete rotary parameter autotuning 2: Complete static parameter autotuning 3: Partial static parameter autotuning 4: Complete rotary parameter autotuning 2 (for asynchronous motors) 5: Partial static parameter autotuning 2 (for asynchronous motors)	0
P00.18	Function parameter restore	0: No operation 1: Restore default values (excluding motor parameters)	0

Function code	Name	Description	Default
		2: Clear fault records 3: Lock keypad parameters 4: Reserved 5: Restore default values (for factory test mode) 6: Restore default values (including motor parameters) **Note: After the selected operation is performed, the function code is automatically restored to 0. Restoring the default values may delete the user password. Exercise caution when using this function.**	
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
P02.01	Rated power of AM 1	0.1–3000.0kW	Model depended
P02.02	Rated frequency of AM 1	0.01Hz–P00.03(Max. output frequency)	50.00Hz
P02.03	Rated speed of AM 1	1–60000rpm	Model depended
P02.04	Rated voltage of AM 1	0–1200V	Model depended
P02.05	Rated current of AM 1	0.8–6000.0A	Model depended
P02.15	Rated power of SM 1	0.1–3000.0kW	Model depended
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.17	Number of pole pairs of SM 1	1–128	2
P02.18	Rated voltage of SM 1	0–1200V	Model depended
P02.19	Rated current of SM 1	0.8–6000.0A	Model depended
P05.01–P05.06	Function selection of multifunction digital input terminals (S1–S4, HDIA,	36: Switch the running command channel to keypad 37: Switch the running command channel to terminal	

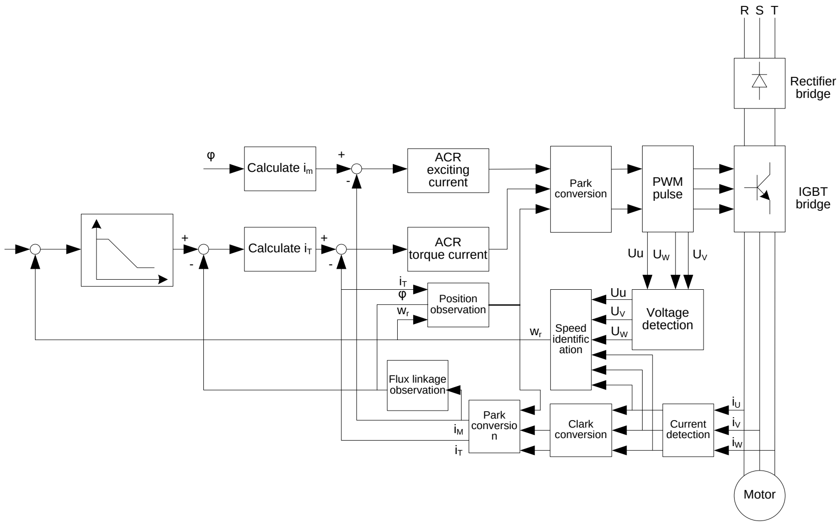
Function code	Name	Description	Default
	HDIB)	38: Switch the running command channel to communication	
P07.01	Parameter copy	Range: 0–4 0: No operation 1: Upload parameters to the keypad 2: Download all parameters (including motor parameters) 3: Download non-motor parameters 4: Download motor parameters	0
P07.02	Function of QUICK/JOG	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

5.5.3 Vector control

AMs feature high order, nonlinearity, strong coupling and multi-variables, which increase difficulty to control AMs during actual application. The vector control technology solves this situation as follows: measures and controls the stator current vector of the AM, and then decomposes the stator current vector into exciting current (current component that generates internal magnet field) and torque current (current component that generates torque) based on field orientation principle, and therefore controls the amplitude values and phase positions of the two components (namely, controls the stator current vector of the AM) to realize decoupled control on exciting current and torque current, thus achieving high-performance speed regulation of the AM.

The VFD uses the sensor-less vector control algorithm, which can be used to drive AMs and permanent-magnet SMs simultaneously. As the core algorithm of vector control is based on accurate motor parameter models, the accuracy of motor parameters affects vector control performance. It is recommended to enter accurate motor parameters and autotune motor parameters before executing vector control.

As the vector control algorithm is complicated, exercise caution before modifying vector control function parameters.



Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: Sensorless vector control (SVC) mode 1 2: Space voltage vector control mode **Note:** Before using a vector control mode (0 or 1), enable the VFD to perform motor parameter autotuning first.	2
P00.15	Motor parameter autotuning	0: No operation 1: Complete rotary parameter autotuning 2: Complete static parameter autotuning 3: Partial static parameter autotuning 4: Complete rotary parameter autotuning 2 (for asynchronous motors) 5: Partial static parameter autotuning 2 (for asynchronous motors)	0
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
P03.00	Speed-loop proportional gain 1	0.0–200.0	20.0
P03.01	Speed-loop integral time 1	0.000–10.000s	0.200s

Function code	Name	Description	Default
P03.02	Low-point frequency for switching	0.00Hz–P03.05	5.00Hz
P03.03	Speed-loop proportional gain 2	0.0–200.0	20.0
P03.04	Speed-loop integral time 2	0.000–10.000s	0.200s
P03.05	High-point frequency for switching	P03.02–P00.03 (Max. output frequency)	10.00Hz
P03.06	Speed-loop output filter	0–8 (0–2^8/10ms)	0
P03.07	Electromotive slip compensation coefficient of vector control	50%–200%	100%
P03.08	Braking slip compensation coefficient of vector control	50%–200%	100%
P03.09	Current-loop proportional coefficient P	0–65535	1000
P03.10	Current-loop integral coefficient I	0–65535	1000
P03.11	Torque setting method	0–1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDIA 6: Multi-step torque 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: Pulse frequency HDIB	1

Function code	Name	Description	Default
		11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable expansion card **Note: For these settings, 100% corresponds to the motor rated current.**	
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	50.0%
P03.13	Torque reference filter time	0.000–10.000s	0.010s
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved **Note: For these settings, 100% corresponds to the maximum frequency.**	0
P03.15	Setting source of reverse rotation upper-limit frequency in torque control	0: Keypad (P03.17) 1–11: Same as those for P03.14	0
P03.16	Forward rotation upper-limit frequency set through keypad in torque control	Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control		50.00Hz

Function code	Name	Description	Default
P03.18	Setting source of electromotive torque upper limit	0: Keypad (P03.20) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable expansion card 11: Reserved **Note: For these settings, 100% corresponds to triple the motor rated current.**	0
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1–10: Same as those for P03.18	0
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
P03.21	Braking torque upper limit set through keypad		180.0%
P03.22	Weakening coefficient in constant power zone	0.1–2.0	0.3
P03.23	Lowest weakening point in constant power zone	10%–100%	20%
P03.24	Max. voltage limit	0.0–120.0%	100.0%
P03.25	Pre-exciting time	0.000–10.000s	0.300s

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P03.32</td><td>Enabling torque control</td><td>0: Disable
1: Enable</td><td>0</td></tr>
<tr><td>P03.35</td><td>Control optimization setting</td><td>0x0000–0x1111
Ones place: Reserved
0: Reserved
1: Reserved
Tens place: Reserved
0: Reserved
1: Reserved
Hundreds place: indicates whether to enable speed-loop integral separation
0: Disable
1: Enable
Thousands place: Reserved
0: Reserved
1: Reserved</td><td>0x0000</td></tr>
<tr><td>P03.36</td><td>Speed-loop differential gain</td><td>0.00–10.00s</td><td>0.00s</td></tr>
<tr><td>P03.37</td><td>High-frequency current-loop proportional coefficient</td><td rowspan="3">In the vector control mode, when the frequency is lower than the current-loop high-frequency switching threshold (P03.39), the current-loop PI parameters are P03.09 and P03.10; and when the frequency is higher than the current-loop high-frequency switching threshold, the current-loop PI parameters are P03.37 and P03.38.
P03.37 setting range: 0–20000
P03.38 setting range: 0–20000
P03.39 setting range: 0.0–100.0% (of the max. frequency)</td><td>1000</td></tr>
<tr><td>P03.38</td><td>High-frequency current-loop integral coefficient</td><td>1000</td></tr>
<tr><td>P03.39</td><td>Current-loop high-frequency switching threshold</td><td>100.0%</td></tr>
<tr><td>P17.32</td><td>Flux linkage</td><td>0.0–200.0%</td><td>0.0%</td></tr>
</table>

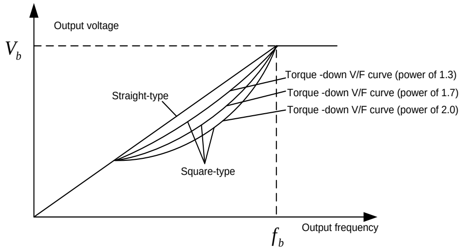
5.5.4 Space voltage vector control mode

The VFD also carries built-in space voltage vector control function. The space voltage vector control mode can be used in cases where mediocre control precision is enough. In cases where a VFD needs to drive multiple motors, it is also recommended to adopt space voltage vector control mode.

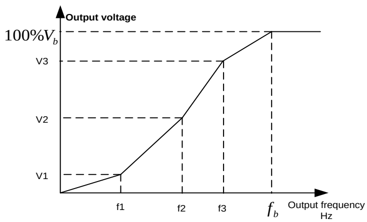
The VFD provides multiple kinds of V/F curve modes to meet different field needs. You can select corresponding V/F curve or set the V/F curve as needed.

Suggestions:

1. **For the load featuring constant moment, such as conveyor belt which runs in straight line, as the whole running process requires constant moment, it is recommended to adopt the straight line V/F curve.**
2. **For the load featuring decreasing moment, such as fan and water pumps, as there is a power (square or cube) relation 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.**



The VFD also provides multi-point V/F curves. You can change the V/F curves output by the VFD 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



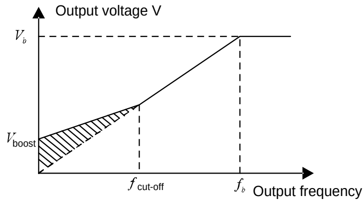
The VFD provides dedicated function codes for the space voltage control mode. You can improve the space voltage control performance by means of setting.

(1) Torque boost

The torque boost function can effectively compensate for the low-speed torque performance in space voltage control. Automatic torque boost has been set by default, which enables the VFD to adjust the torque boost value based on actual load conditions.

Note:

1. Torque boost takes effect only at the torque boost cut-off frequency.
2. If torque boost is too large, the motor may encounter low-frequency vibration or overcurrent. If such a situation occurs, reduce the torque boost value.



(2) 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.

Note:

1. This function is generally used in light load or no-load cases.
2. This function is no applicable to the cases where sudden load changes often occur.

(3) V/F slip compensation gain

Space voltage vector control belongs to an open-loop mode. Sudden motor load changes cause motor speed fluctuation. In cases where strict speed requirements must be met, you can set the slip compensation gain to compensate for the speed change caused by load fluctuation through VFD internal output adjustment.

The setting range of slip compensation gain is 0–200%, in which 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

(4) Oscillation control

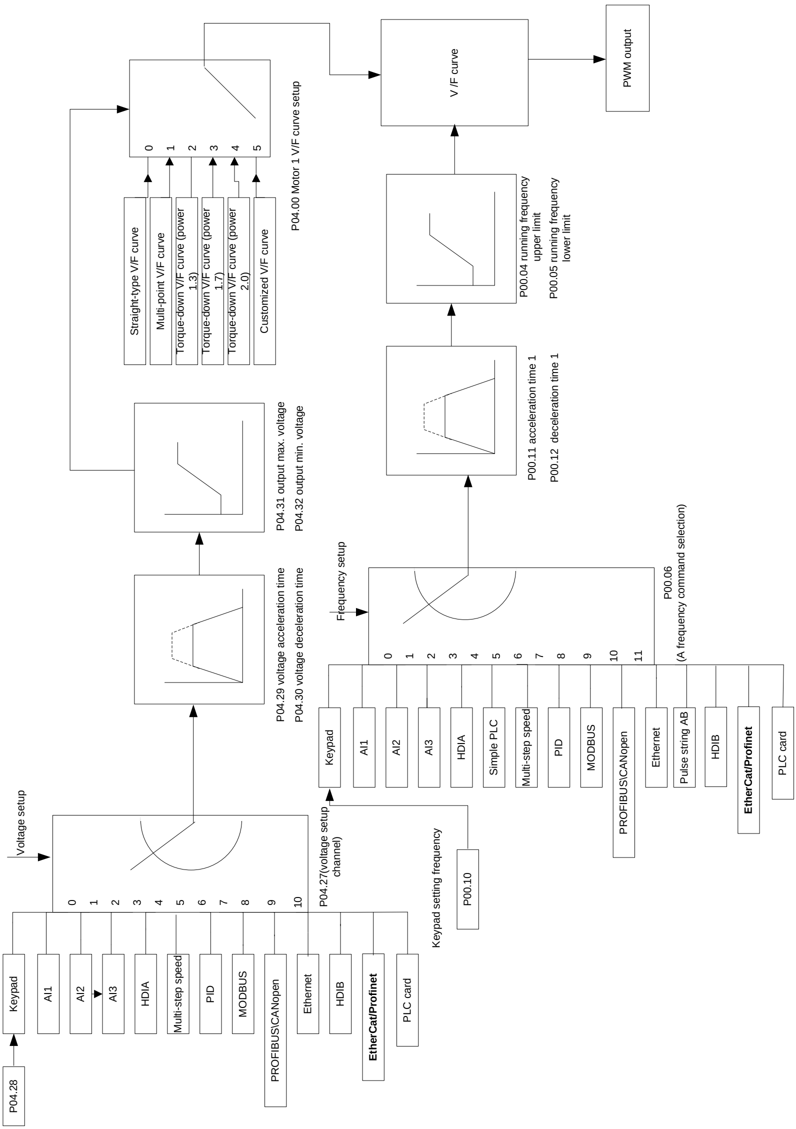
Motor oscillation often occurs in space voltage vector control in large-power driving applications. To solve this problem, the VFD provides two oscillation factor function codes. You can set the function codes based on the oscillation occurrence frequency.

Note: A greater value indicates better control effect. However, if the value is too large, the VFD output current may be too large.

(5) AM IF control

Generally, the IF control mode is valid for AMs. It can be used for SMs only when the frequency is extremely low. Therefore, the IF control mode described in this manual is only involved with AMs. 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.

Customized V/F curve (V/F separation) function:



When selecting the customized V/F curve function, you can specify the setting channels and acceleration/deceleration time of voltage and frequency respectively, which form a real-time V/F curve in combination manner.

Note: This type of V/F curve separation can be applied in various variable-frequency power sources. However, exercise caution when setting parameters as improper settings may cause equipment damage.

Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: Sensorless vector control (SVC) mode 1 2: Space voltage vector control mode **Note:** Before using a vector control mode (0 or 1), enable the VFD to perform motor parameter autotuning first.	2
P00.03	Max. output frequency	P00.04–400.00Hz	50.00Hz
P00.04	Upper limit of running frequency	P00.05–P00.03	50.00Hz
P00.05	Lower limit of running frequency	0.00Hz–P00.04	0.00Hz
P00.11	ACC time 1	0.0–3600.0s	Model depended
P00.12	DEC time 1	0.0–3600.0s	Model depended
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
P02.02	Rated frequency of AM 1	0.01Hz–P00.03(Max. output frequency)	50.00Hz
P02.04	Rated voltage of AM 1	0–1200V	Model depended
P04.00	V/F curve setting of motor 1	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)	0
P04.01	Torque boost of motor 1	0.0%: (automatic) 0.1%–10.0%	0.0%
P04.02	Torque boost cut-off of motor 1	0.0%–50.0% (of the rated frequency of motor 1)	20.0%
P04.03	V/F frequency point 1 of motor 1	0.00Hz–P04.05	0.00Hz
P04.04	V/F voltage point 1 of motor 1	0.0%–110.0%	0.0%

Function code	Name	Description	Default
P04.05	V/F frequency point 2 of motor 1	P04.03–P04.07	0.00Hz
P04.06	V/F voltage point 2 of motor 1	0.0%–110.0%	0.0%
P04.07	V/F frequency point 3 of motor 1	P04.05–P02.02 or P04.05–P02.16	0.00Hz
P04.08	V/F voltage point 3 of motor 1	0.0%–110.0%	0.0%
P04.09	V/F slip compensation gain of motor 1	0.0–200.0%	100.0%
P04.10	Low-frequency oscillation control factor of motor 1	0–100	10
P04.11	High-frequency oscillation control factor of motor 1	0–100	10
P04.12	Oscillation control threshold of motor 1	0.00Hz–P00.03 (Max. output frequency)	30.00Hz
P04.13	V/F curve setting of motor 2	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)	0
P04.14	Torque boost of motor 2	0.0%: (automatic) 0.1%–10.0%	0.0%
P04.15	Torque boost cut-off of motor 2	0.0%–50.0% (of the rated frequency of motor 1)	20.0%
P04.16	V/F frequency point 1 of motor 2	0.00Hz–P04.18	0.00Hz
P04.17	V/F voltage point 1 of motor 2	0.0%–110.0%	0.0%
P04.18	V/F frequency point 2 of motor 2	P04.16–P04.20	0.00Hz
P04.19	V/F voltage point 2 of motor 2	0.0%–110.0%	0.0%
P04.20	V/F frequency point 3 of motor 2	P04.18–P02.02 or P04.18–P02.16	0.00Hz

Function code	Name	Description	Default
P04.21	V/F voltage point 3 of motor 2	0.0%–110.0%	0.0%
P04.22	V/F slip compensation gain of motor 2	0.0–200.0%	100.0%
P04.23	Low-frequency oscillation control factor of motor 2	0–100	10
P04.24	High-frequency oscillation control factor of motor 2	0–100	10
P04.25	Oscillation control threshold of motor 2	0.00Hz–P00.03 (Max. output frequency)	30.00Hz
P04.26	Energy-saving run	0: Disable 1: Automatic energy-saving run	0
P04.27	Voltage setting channel	0: Keypad; Output voltage is determined by P04.28 1: AI1 2: AI2 3: AI3 4: HDIA 5: Multi-step running 6: PID 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable expansion card 13: Reserved	0
P04.28	Voltage set through keypad	0.0%–100.0% (of the motor rated voltage)	100.0%
P04.29	Voltage increase time	0.0–3600.0s	5.0s
P04.30	Voltage decrease time	0.0–3600.0s	5.0s
P04.31	Max. output voltage	P04.32 –100.0% (of the motor rated voltage)	100.0%
P04.32	Min. output voltage	0.0%–P04.31 (motor rated voltage)	0.0%

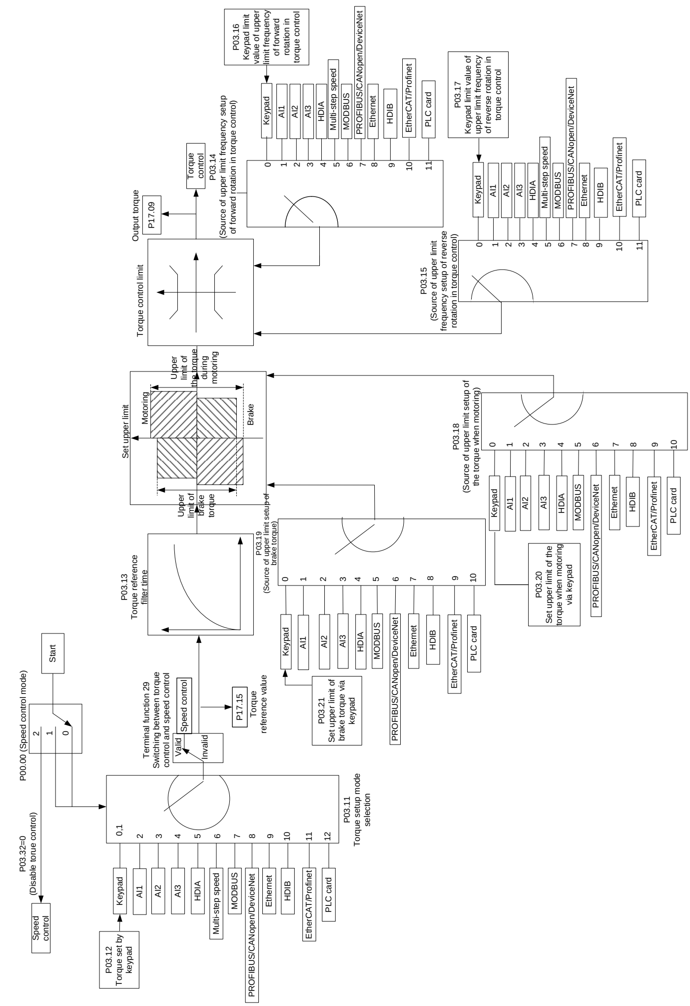
Function code	Name	Description	Default
P04.33	Weakening coefficient in constant power zone	1.00–1.30	1.00
P04.34	Pull-in current 1 in SM V/F control	When the SM VF control mode is enabled, the function code is used to set the reactive current of the motor when the output frequency is lower than the frequency specified by P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	20.0%
P04.35	Pull-in current 2 in SM V/F control	When the SM VF control mode is enabled, the function code is used to set the reactive current of the motor when the output frequency is higher than the frequency specified by P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	10.0%
P04.36	Frequency threshold for pull-in current switching in SM V/F control	When the SM VF control mode is enabled, the function code is used to set the frequency threshold for the switching between pull-in current 1 and pull-in current 2. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz
P04.37	Reactive current closed-loop proportional coefficient in SM V/F control	When the SM VF control mode is enabled, the function code is used to set the proportional coefficient of reactive current closed-loop control. Setting range: 0–3000	50
P04.38	Reactive current closed-loop integral time in SM V/F control	When the SM VF control mode is enabled, the function code is used to set the integral coefficient of reactive current closed-loop control. Setting range: 0–3000	30
P04.39	Reactive current closed-loop output limit in SM VF control	When the SM VF control mode is enabled, the function code is used to set the output limit of the reactive current closed-loop control. A greater value indicates a higher reactive closed-loop compensation voltage and higher output power of the motor. In general, you do not need to modify the function code. Setting range: 0–16000	8000
P04.40	Enabling IF mode for AM 1	0: Disable 1: Enable	0

Function code	Name	Description	Default
P04.41	Forward current setting in IF mode for AM 1	When IF control is adopted for AM 1, the function code is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%
P04.42	Proportional coefficient in IF mode for AM 1	When IF control is adopted for AM 1, the function code is used to set the proportional coefficient of the output current closed-loop control. Setting range: 0–5000	350
P04.43	Integral coefficient in IF mode for AM 1	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. Setting range: 0–5000	150
P04.44	Frequency threshold for switching off IF mode for AM 1	When IF control is adopted for AM 1, the function code is used to set the frequency threshold for switching off the output current closed-loop control. When the frequency is lower than the value of the function code, the current closed-loop control in the IF control mode is enabled; and when the frequency is higher than that, the current closed-loop control in the IF control mode is disabled. Setting range: 0.00Hz–P04.50	10.00Hz
P04.45	Enabling IF mode for AM 2	0: Disable 1: Enable	0
P04.46	Forward current setting in IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%
P04.47	Proportional coefficient in IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the proportional coefficient of output current closed-loop control. Setting range: 0–5000	350
P04.48	Integral coefficient in IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the integral coefficient of output current closed-loop control. Setting range: 0–5000	150

Function code	Name	Description	Default
P04.49	Frequency threshold for switching off IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the frequency threshold for switching off the output current closed-loop control. When the frequency is lower than the value of the function code, the current closed-loop control in the IF control mode is enabled; and when the frequency is higher than that, the current closed-loop control in the IF control mode is disabled. Setting range: 0.00Hz–P04.51	10.00Hz
P04.50	End frequency point for switching off IF mode for AM 1	P04.44– P00.03	25.00Hz
P04.51	End frequency point for switching off IF mode for AM 2	P04.49– P00.03	25.00Hz
P04.52	VF energy-saving mode selection	0: Max. efficiency 1: Optimal power factor 2: MTPA	0
P04.53	VF energy-saving gain coefficient	0.0%–400.0%	100.0%

5.5.5 Torque control

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.



Function code	Name	Description	Default
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: Sensorless vector control (SVC) mode 1 2: Space voltage vector control mode **Note:** Before using a vector control mode (0 or 1), enable the VFD to perform motor parameter autotuning first.	2

Function code	Name	Description	Default
P03.32	Enabling torque control	0: Disable 1: Enable	0
P03.11	Torque setting method	0: Keypad (P03.12) 1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDIA 6: Multi-step torque 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: Pulse frequency HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable expansion card **Note: For these settings, 100% corresponds to the motor rated current.**	0
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	50.0%
P03.13	Torque reference filter time	0.000–10.000s	0.010s
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved **Note: For these settings, 100% corresponds to the maximum frequency.**	0
P03.15	Setting source of	0: Keypad (P03.17)	0

Function code	Name	Description	Default
	reverse rotation upper-limit frequency in torque control	1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved **Note: For these settings, 100% corresponds to the maximum frequency.**	
P03.16	Forward rotation upper-limit frequency set through keypad in torque control	0.00Hz–P00.03 (Max. output frequency)	50.00Hz
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control	0.00Hz–P00.03 (Max. output frequency)	50.00Hz
P03.18	Setting source of electromotive torque upper limit	0: Keypad (P03.20) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable expansion card	0

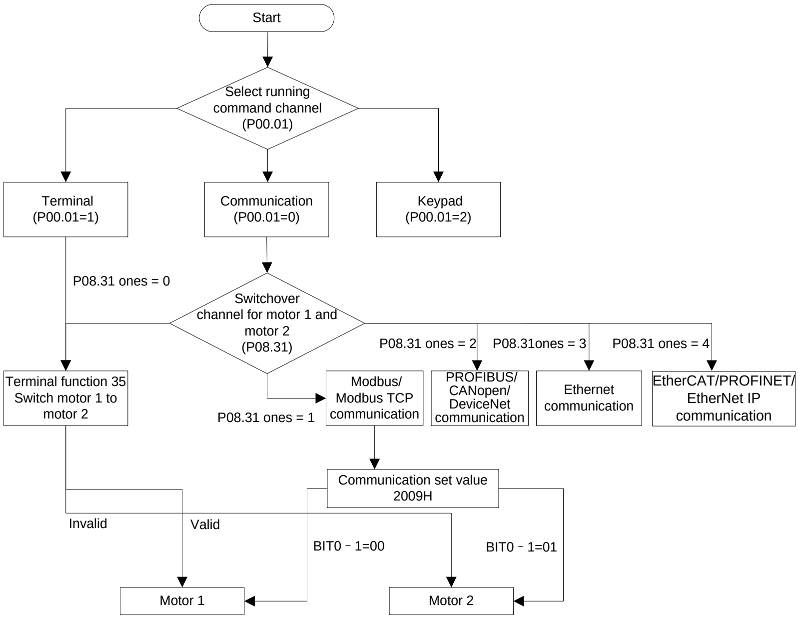
Function code	Name	Description	Default
		11: Reserved **Note: For these settings, 100% corresponds to triple the motor rated current.**	
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET communication 10: Programmable expansion card 11: Reserved **Note: For these settings, 100% corresponds to triple the motor rated current.**	0
P03.20	Electromotive torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
P03.21	Braking torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
P17.09	Output torque	-250.0–250.0%	0.0%
P17.15	Torque reference value	-300.0–300.0% (of the motor rated current)	0.0%

5.5.6 Motor parameters

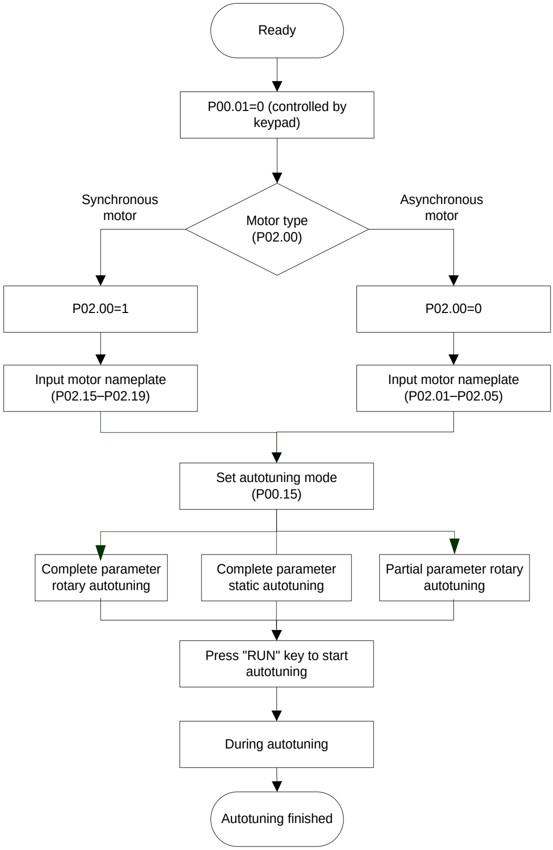
	✧ Check the safety conditions surrounding the motor and load machineries before autotuning as physical injury may occur due to sudden start of motor during autotuning. ✧ Although the motor does not run during static autotuning, the motor is still supplied with power. Do not touch the motor during autotuning; otherwise, electric shock

	may occur. Do not touch the motor before autotuning is completed.
⚠	✧ If the motor has been connected to a load, do not carry out rotary autotuning. Otherwise, the VFD may malfunction or may be damaged. If rotary autotuning is carried out on a motor which has been connected to a load, incorrect motor parameter settings and motor action exceptions may occur. Disconnect from the load to carry out autotuning if necessary.

The VFD can drive both AMs and SMs, and it supports two sets of motor parameters, which can be switched over by multifunction digital input terminals or communication modes.



The control performance of the VFD is based on accurate motor models. Therefore, you need to carry out motor parameter autotuning before running a motor for the first time (taking motor 1 as an example).



Note:

1. Motor parameters must be set correctly according to the motor nameplate.
2. If rotary autotuning is selected during motor autotuning, disconnect the motor from the load to put the motor in static and no-load state. Otherwise, the motor parameter autotuning results may be incorrect. In addition, autotune P02.06–P02.10 for AMs and autotune P02.20–P02.23 for SMs.
3. If static autotuning is selected for motor autotuning, there is no need to disconnect the motor from the load, but the control performance may be impacted as only a part of the motor parameters have been autotuned. In addition, autotune P02.06–P02.10 for AMs and autotune P02.20–P02.22 for SMs. P02.23 can be obtained through calculation.
4. Motor autotuning can be carried out on the present motor only. If you need to perform autotuning on the other motor, switch the motor through selecting the switch-over channel of motor 1 and motor 2 by setting the ones place of P08.31.

Related parameter list:

Function code	Name	Description	Default
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
P00.15	Motor parameter autotuning	0: No operation 1: Complete rotary parameter autotuning 2: Complete static parameter autotuning 3: Partial static parameter autotuning 4: Complete rotary parameter autotuning 2 (for asynchronous motors) 5: Partial static parameter autotuning 2 (for asynchronous motors)	0
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
P02.01	Rated power of AM 1	0.1–3000.0kW	Model depended
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.03	Rated speed of AM 1	1–60000rpm	Model depended
P02.04	Rated voltage of AM 1	0–1200V	Model depended
P02.05	Rated current of AM 1	0.8–6000.0A	Model depended
P02.06	Stator resistance of AM 1	0.001–65.535Ω	Model depended
P02.07	Rotor resistance of AM 1	0.001–65.535Ω	Model depended
P02.08	Leakage inductance of AM 1	0.1–6553.5mH	Model depended
P02.09	Mutual inductance of AM 1	0.1–6553.5mH	Model depended
P02.10	No-load current of AM 1	0.1–6553.5A	Model depended
P02.15	Rated power of SM 1	0.1–3000.0kW	Model depended
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.17	Number of pole pairs of SM 1	1–128	2

Function code	Name	Description	Default
P02.18	Rated voltage of SM 1	0–1200V	Model depended
P02.19	Rated current of SM 1	0.8–6000.0A	Model depended
P02.20	Stator resistance of SM 1	0.001–65.535Ω	Model depended
P02.21	Direct-axis inductance of SM 1	0.01–655.35mH	Model depended
P02.22	Quadrature-axis inductance of SM 1	0.01–655.35mH	Model depended
P02.23	Counter-emf constant of SM 1	0–10000	300
P05.01–P05.06	Function selection of multifunction digital input terminals (S1–S4, HDIA, HDIB)	35: Switch from motor 1 to motor 2	
P08.31	Switching between motor 1 and motor 2	0x00–0x14 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 Tens place: indicates whether to enable switchover during running 0: Disable 1: Enable	00
P12.00	Type of motor 2	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
P12.01	Rated power of AM 2	0.1–3000.0kW	Model depended
P12.02	Rated frequency of AM 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P12.03	Rated speed of AM 2	1–60000rpm	Model depended
P12.04	Rated voltage of AM 2	0–1200V	Model depended
P12.05	Rated current of AM 2	0.8–6000.0A	Model depended

Function code	Name	Description	Default
P12.06	Stator resistance of AM 2	0.001–65.535Ω	Model depended
P12.07	Rotor resistance of AM 2	0.001–65.535Ω	Model depended
P12.08	Leakage inductance of AM 2	0.1–6553.5mH	Model depended
P12.09	Mutual inductance of AM 2	0.1–6553.5mH	Model depended
P12.10	No-load current of AM 2	0.1–6553.5A	Model depended
P12.15	Rated power of SM 2	0.1–3000.0kW	Model depended
P12.16	Rated frequency of SM 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P12.17	Number of pole pairs of SM 2	1–128	2
P12.18	Rated voltage of SM 2	0–1200V	Model depended
P12.19	Rated current of SM 2	0.8–6000.0A	Model depended
P12.20	Stator resistance of SM 2	0.001–65.535Ω	Model depended
P12.21	Direct-axis inductance of SM 2	0.01–655.35mH	Model depended
P12.22	Quadrature-axis inductance of SM 2	0.01–655.35mH	Model depended
P12.23	Counter-emf constant of SM 2	0–10000	300

5.5.7 Start/stop control

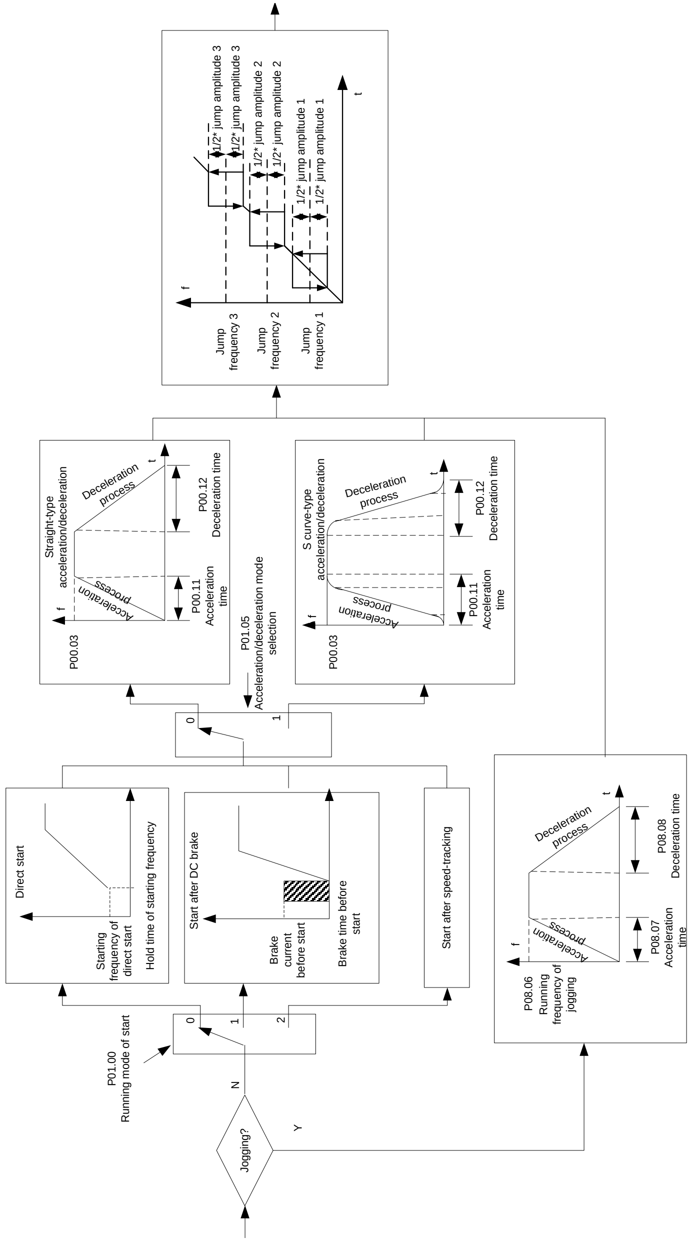
The start/stop control of the VFD involves three states: start after a running command is given at power-on; start after power-off restart is effective; start after automatic fault reset. The three start/stop control states are described in the following.

There are three start modes for the VFD, which are start at starting frequency, start after DC braking, and start after speed tracking. You can select the proper start mode based on actual conditions.

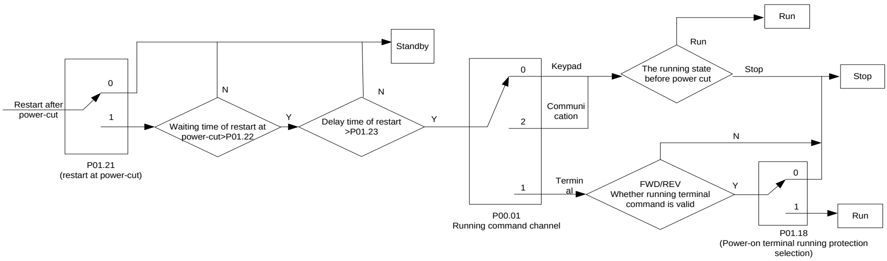
For large-inertia load, especially in cases where reversal may occur, you can choose to start after DC braking or start after speed tracking.

Note: It is recommended to drive SMs in direct start mode.

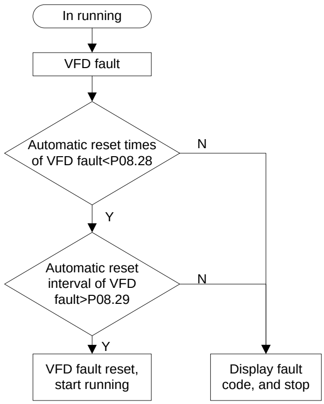
1. Logic diagram for start after a running command is given at power-on



2. Logic diagram for start after power-off restart is effective



3. Logic diagram for start after automatic fault reset



Related parameter list:

Function code	Name	Description	Default
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
P00.11	ACC time 1	0.0–3600.0s	Model depended
P00.12	DEC time 1	0.0–3600.0s	Model depended
P01.00	Start mode	0: Direct start 1: Start after DC braking 2: Start after speed tracking **Note:** For AMs, speed tracking is not supported in SVC 0, and software speed	0

Function code	Name	Description	Default
		tracking is supported in other modes. For details, see parameters **P01.35**–**P01.41**. For AMs, you do not need to modify parameters **P01.35**–**P01.41**.	
P01.01	Starting frequency of direct start	0.00–50.00Hz	0.50Hz
P01.02	Starting frequency hold time	0.0–50.0s	0.0s
P01.03	Braking current before start	0.0–100.0%	0.0%
P01.04	DC braking time before start	0.00–50.00s	0.00s
P01.05	ACC/DEC mode	0: Linear type 1: S curve **Note:** If mode 1 is selected, set P01.06, P01.07, P01.27 and P01.28	0
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0
P01.09	Starting frequency of DC braking for stop	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P01.10	Wait time before DC braking for stop	0.00–50.00s	0.00s
P01.11	DC braking current for stop	0.0–100.0%	0.0%
P01.12	DC braking time for stop	0.00–50.00s	0.00s
P01.13	FWD/REV running deadzone time	0.0–3600.0s	0.0s
P01.14	FWD/REV running switching mode	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	0.00–100.00Hz	0.50 Hz
P01.16	Stop speed detection mode	0: Detect by the set speed (unique in space voltage vector control mode) 1: Detect by the feedback speed	1
P01.18	Terminal-based running command protection at power-on	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	Setting range: 0x00–0x12 Ones place: Action selection	0x00

Function code	Name	Description	Default
	frequency lower limit (valid when frequency lower limit greater than 0)	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	0.0–3600.0s (valid when the ones place of P01.19 is 2)	0.0s
P01.21	Power-off restart selection	0: Disable 1: Enable	0
P01.22	Wait time for restart after power-off	0.0–3600.0s (valid when P01.21 is 1)	1.0s
P01.23	Start delay	0.0–60.0s	0.0s
P01.24	Stop speed delay	0.0–100.0s	0.0s
P01.25	Open-loop 0Hz output selection	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	0.0–60.0s	2.0s
P01.27	Time of starting segment of DEC S curve	0.0–50.0s	0.1s
P01.28	Time of ending segment of DEC S curve	0.0–50.0s	0.1s
P01.29	Short-circuit braking current	0.0–150.0% (of the VFD rated current)	0.0%
P01.30	Hold time of short-circuit braking for start	0.00–50.00s	0.00s
P01.31	Hold time of short-circuit braking for stop	0.00–50.00s	0.00s
P05.01–P05.06	Digital input function selection	1: Run forward 2: Run reversely 4: Jog forward 5: Jog reversely 6: Coast to stop 7: Reset faults 8: Pause running 21: ACC/DEC time selection 1	

Function code	Name	Description	Default
		22: ACC/DEC time selection 2 30: Disable ACC/DEC	
P08.00	ACC time 2	0.0–3600.0s	Model depended
P08.01	DEC time 2	0.0–3600.0s	Model depended
P08.02	ACC time 3	0.0–3600.0s	Model depended
P08.03	DEC time 3	0.0–3600.0s	Model depended
P08.04	ACC time 4	0.0–3600.0s	Model depended
P08.05	DEC time 4	0.0–3600.0s	Model depended
P08.06	Running frequency of jog	0.00Hz–P00.03 (Max. output frequency)	5.00Hz
P08.07	ACC time for jogging	0.0–3600.0s	Model depended
P08.08	DEC time for jogging	0.0–3600.0s	Model depended
P08.19	Switching frequency of ACC/DEC time	0.00–P00.03(Max. frequency) 0.00Hz: No switchover If the running frequency is greater than P08.19, switch to ACC/DEC time 2.	0
P08.21	Reference frequency of ACC/DEC time	0: Max. output frequency 1: Set frequency 2: 100Hz **Note: Valid only for straight-line ACC/DEC.**	0
P08.28	Auto fault reset count	0–10	0
P08.29	Auto fault reset interval	0.1–3600.0s	1.0s

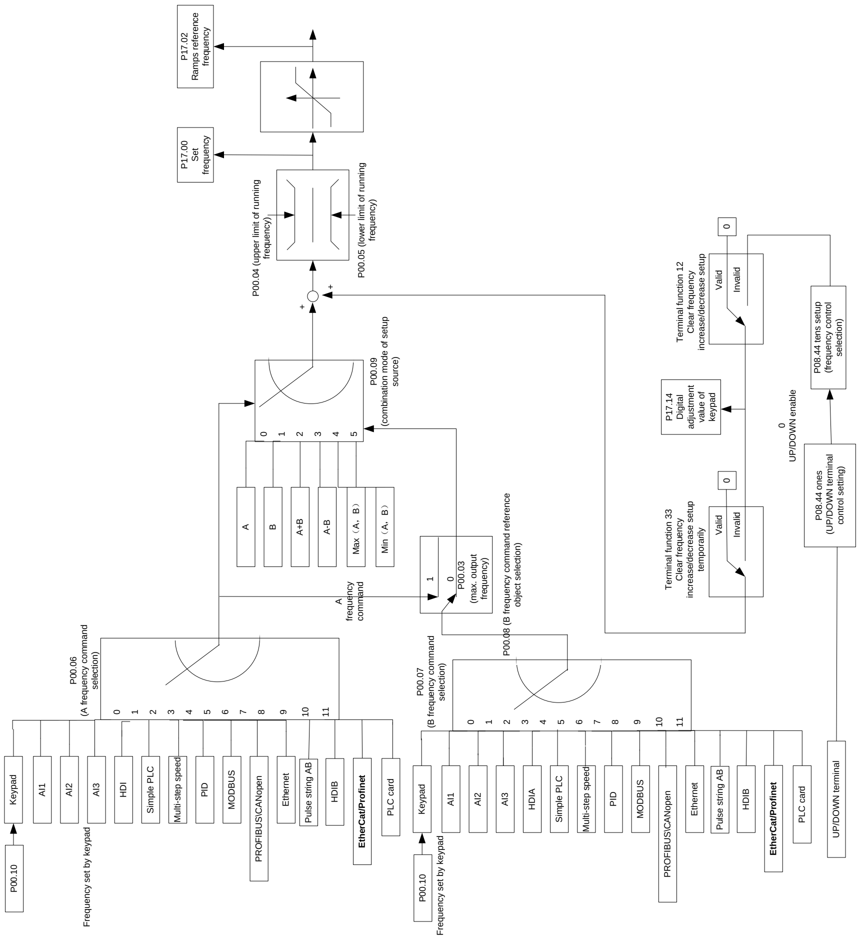
5.5.8 Frequency setting

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 by setting multifunction terminals.

There is one input mode for auxiliary reference channel, namely terminal UP/DOWN switch input. By setting function codes, you can enable the corresponding reference mode and the impact made on the VFD frequency reference by this reference mode.

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

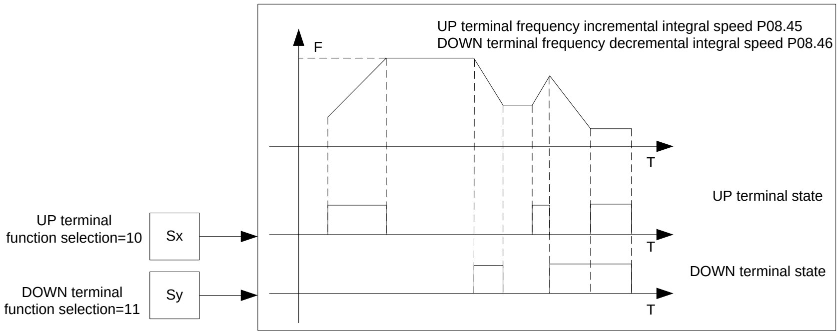


The VFD supports switchover between different reference channels, and the rules for channel switchover are shown as follows.

Present reference channel P00.09	Multifunction terminal function 13 (Switch from channel A to channel B)	Multifunction terminal function 14 (Switch from combined setting to channel A)	Multifunction 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

Note: "/" indicates this multifunction terminal is invalid under present reference channel.

When setting the auxiliary frequency inside the VFD via multi-function terminal UP (10) and DOWN (11), you can increase/decrease the frequency quickly by setting P08.45 (UP terminal frequency incremental change rate) and P08.46 (DOWN terminal frequency decremental change rate).



Related parameter list:

Function code	Name	Description	Default
P00.03	Max. output frequency	P00.04–400.00Hz	50.00Hz
P00.04	Upper limit of running frequency	P00.05–P00.03	50.00Hz
P00.05	Lower limit of running frequency	0.00Hz–P00.04	0.00Hz
P00.06	Setting channel of A frequency command	0: Keypad 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDIA	0
P00.07	Setting channel of B frequency command		15

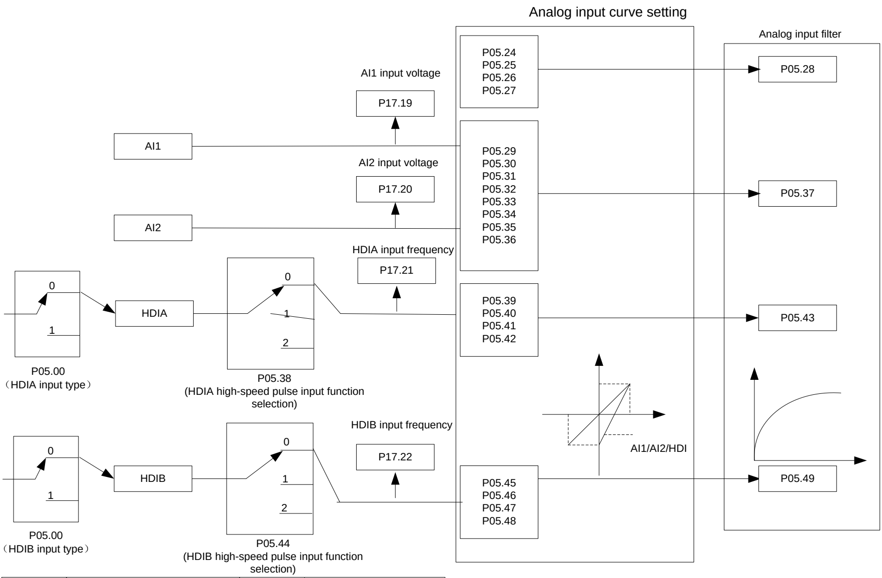
Function code	Name	Description	Default
		5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus/Modbus TCP communication 9: PROFIBUS/CANopen/DeviceNet communication 10: Ethernet communication 11: High-speed pulse HDIB 12: Reserved 13: EtherCAT/PROFINET/EtherNet IP communication 14: Programmable expansion card 15–17: Reserved	
P00.08	Reference object of B frequency command	0: Max. output frequency 1: A frequency command	0
P00.09	Combination mode of setting source	0: A 1: B 2: (A+B) 3: (A-B) 4: Max(A, B) 5: Min(A, B)	0
P05.01–P05.06	Function selection of multifunction digital input terminals (S1–S4, HDIA, HDIB)	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	
P08.42	LED keypad digit control setting	0x000–0x1223 Ones place: Frequency control enabling selection 0: Controls through both the ∧/∨ key and digital potentiometer are valid. 1: Only control through the ∧/∨ key is valid. 2: Only control through the digital	0x0000

Function code	Name	Description	Default
		potentiometer is valid. 3: Controls through the ∧/∨ key and digital potentiometer are 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. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received Thousands place: Indicates whether to enable the integral function through the ∧/∨ key and digital potentiometer. 0: Enable the integral function 1: Disable the integral function	
P08.43	LED keypad digital potentiometer integral rate	0.01–10.00s	0.10s
P08.44	UP/DOWN terminal control setting	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 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

Function code	Name	Description	Default
P08.45	Frequency increment change rate of the UP terminal	0.01–50.00Hz/s	0.50Hz/s
P08.46	Frequency reduce rate of the DOWN terminal	0.01–50.00Hz/s	0.50Hz/s
P17.00	Set frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.02	Ramp reference frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.14	Digital adjustment value	0.00Hz–P00.03	0.00Hz

5.5.9 Analog input

The VFD carries two analog input terminals (AI1 is 0–10V/0–20mA (voltage input or current input can be set by P05.50); AI2 is -10–10V) and two high-speed pulse input terminals. Each input can be filtered separately, and the corresponding reference curve can be set by adjusting the reference corresponds to the max. value and min. value.



P05.00	Ones: 0: HDIA is high-speed pulse input 1: HDIA is digital input	P05.38	0: Set input via frequency 1: Reserved 2: Input via encoder
P05.00	Tens: 0: HDIB is high-speed pulse input 1: HDIB is digital input	P05.44	0: Set input via frequency 1: Reserved 2: Input via encoder

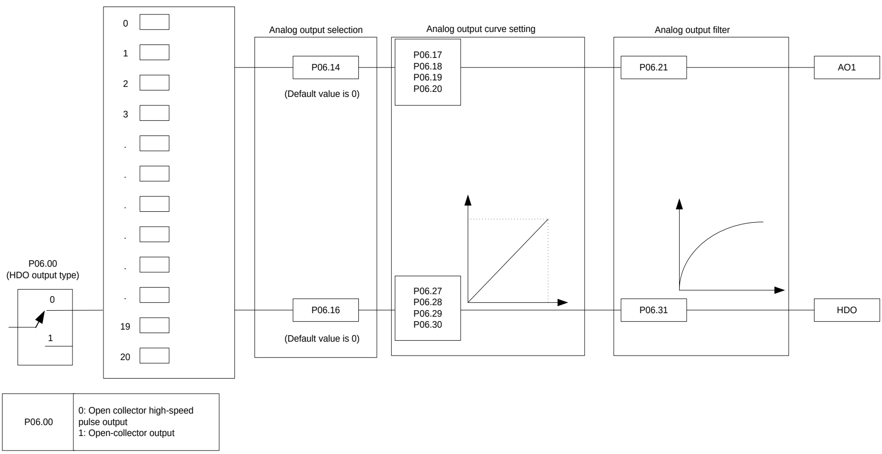
Related parameter list:

Function code	Name	Description	Default
P05.00	HDI input type	0x00–0x11 Ones place: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens place: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0x00
P05.24	AI1 lower limit	0.00V–P05.26	0.00V
P05.25	Corresponding setting of AI1 lower limit	-300.0%–300.0%	0.0%
P05.26	AI1 upper limit	P05.24–10.00V	10.00V
P05.27	Corresponding setting of AI1 upper limit	-300.0%–300.0%	100.0%
P05.28	AI1 input filter time	0.000s–10.000s	0.100s
P05.29	AI2 lower limit	-10.00V–P05.31	-10.00V
P05.30	Corresponding setting of AI2 lower limit	-300.0%–300.0%	-100.0%
P05.31	AI2 middle value 1	P05.29–P05.33	0.00V
P05.32	Corresponding setting of AI2 middle value 1	-300.0%–300.0%	0.0%
P05.33	AI2 middle value 2	P05.31–P05.35	0.00V
P05.34	Corresponding setting of AI2 middle value 2	-300.0%–300.0%	0.0%
P05.35	AI2 upper limit	P05.33–10.00V	10.00V
P05.36	Corresponding setting of AI2 upper limit	-300.0%–300.0%	100.0%
P05.37	AI2 input filter time	0.000s–10.000s	0.100s
P05.38	HDIA high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Reserved	0
P05.39	HDIA lower limit frequency	0.000kHz–P05.41	0.000kHz
P05.40	Corresponding setting of HDIA lower limit frequency	-300.0%–300.0%	0.0%
P05.41	HDIA upper limit frequency	P05.39–50.000kHz	50.000kHz
P05.42	Corresponding setting of HDIA upper limit frequency	-300.0%–300.0%	100.0%

Function code	Name	Description	Default
P05.43	HDIA frequency input filter time	0.000s–10.000s	0.030s
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Reserved	0
P05.45	HDIB lower limit frequency	0.000kHz–P05.47	0.000kHz
P05.46	Corresponding setting of HDIB lower limit frequency	-300.0%–300.0%	0.0%
P05.47	HDIB upper limit frequency	P05.45–50.000kHz	50.000kHz
P05.48	Corresponding setting of HDIB upper limit frequency	-300.0%–300.0%	100.0%
P05.49	HDIB frequency input filter time	0.000s–10.000s	0.030s
P05.50	AI1 input signal type	0–1 0: Voltage 1: Current	0

5.5.10 Analog output

The VFD carries two analog output terminals (0–10V/0–20mA) and one high-speed pulse output terminal. Analog output signals can be filtered separately, and the proportional relation 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.



Terminal output is described as follows:

Value	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 rated power
8	Set torque value	0–Twice the motor rated current
9	Output torque	0–Twice the motor rated current
10	AI1 input	0–10V/0–20mA
11	AI2 input	-10V–10V
12	AI3 input	0–10V/0–20mA
13	High-speed pulse HDIA input	0.00–50.00kHz
14	Value 1 set through Modbus/Modbus TCP communication	-1000–1000, 1000 corresponds to 100.0%
15	Value 2 set through Modbus/Modbus TCP communication	-1000–1000, 1000 corresponds to 100.0%
16	Value 1 set through PROFIBUS/CANopen/DeviceNet communication	-1000–1000, 1000 corresponds to 100.0%
17	Value 2 set through PROFIBUS/CANopen/DeviceNet communication	-1000–1000, 1000 corresponds to 100.0%
18	Value 1 set through Ethernet communication	-1000–1000, 1000 corresponds to 100.0%
19	Value 2 set through Ethernet communication	-1000–1000, 1000 corresponds to 100.0%
20	High-speed pulse HDIA input	0.00–50.00kHz
21	Value 1 set through EtherCAT/PROFINET communication	-1000–1000, 1000 corresponds to 100.0%
22	Torque current (bipolar, 100% corresponding to 10V)	0–Twice the motor rated current
23	Exciting current (100% corresponds to 10V)	0–Motor rated current
24	Set frequency (bipolar)	0–Max. output frequency
25	Ramp reference frequency (bipolar)	0–Max. output frequency
26	Rotational speed (bipolar)	0–Max. output frequency

Value	Function	Description
28	AO1 from the PLC	1000 corresponds to 100.0%.
29	AO2 from the PLC	1000 corresponds to 100.0%.
30	Rotational speed	0–Twice the motor rated synchronous rotation speed
31–48	Reserved	

Related parameter list:

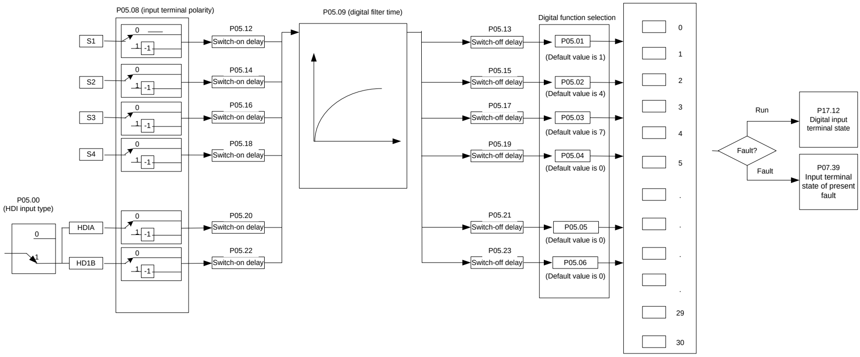
Function code	Name	Description	Default
P06.00	HDO output type	0: Open collector high-speed pulse output 1: Open collector output	0
P06.14	AO1 output selection	0: Running frequency 1: Set frequency 2: Ramp reference frequency 3: Rotational speed (100% corresponds to the speed corresponding to the max. 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 13: High-speed pulse HDIA input 14: Value 1 set through Modbus/Modbus TCP communication 15: Value 2 set through Modbus/Modbus	0
P06.15	AO0 output selection		0
P06.16	HDO high-speed pulse output		0

Function code	Name	Description	Default
		TCP communication 16: Value 1 set through PROFIBUS/CANopen/DeviceNet communication 17: Value 2 set through PROFIBUS/CANopen/DeviceNet communication 18: Value 1 set through Ethernet communication 19: Value 2 set through Ethernet communication 20: High-speed pulse HDIB input 21: Value 1 set through EtherCAT/PROFINET/EtherNet IP communication 22: Torque current (100% corresponds to triple the motor rated current) 23: Exciting current (100% corresponds to triple the motor rated current) 24: Set frequency (bipolar) 25: Ramp reference frequency (bipolar) 26: Rotational speed (bipolar) 27: Value 2 set through EtherCAT/PROFINET/EtherNet IP communication 28: C_AO1 from PLC 29: C_AO2 from PLC 30: Rotational speed 31–48: 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 HDO, 100% indicates the output specified by P06.30.	
P06.17	AO1 output lower limit	-300.0%– P06.19	0.0%
P06.18	AO1 output corresponding to lower limit	0.00V–10.00V	0.00V

Function code	Name	Description	Default
P06.19	AO1 output upper limit	P06.17–300%	100.0%
P06.20	AO1 output corresponding to upper limit	0.00V–10.00V	10.00V
P06.21	AO1 output filter time	0.000s–10.000s	0.000s
P06.22	AO0 output lower limit	-300.0%–P06.23	0.0%
P06.23	AO0 output corresponding to lower limit	0.00V–10.00V	0.00V
P06.24	AO0 output upper limit	P06.35–300.0%	100.0%
P06.25	AO0 output corresponding to upper limit	0.00V–10.00V	10.00V
P06.26	AO0 output filter time	0.000s–10.000s	0.000s
P06.27	HDO output lower limit	-300.0%– P06.29	0.0%
P06.28	HDO output corresponding to lower limit	0.00–50.00kHz	0.0kHz
P06.29	HDO output upper limit	P06.27–100.0%	100.0%
P06.30	HDO output corresponding to upper limit	0.00–50.00kHz	50.00kHz
P06.31	HDO output filter time	0.000s–10.000s	0.000s
P06.32	Reserved	0–65535	0
P06.33	Detection value for frequency being reached	0.00Hz–P00.03	1.00Hz
P06.34	Frequency reaching detection time	0.0–3600.0s	0.5s

5.5.11 Digital input

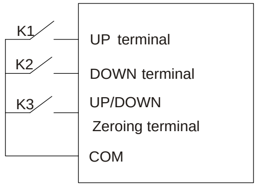
The VFD carries four programmable digital input terminals and two HDI input terminals. The function of all the digital input terminals can be programmed through function codes. HDI input terminal can be set to act as high-speed pulse input terminal or common digital input terminal; if it is set to act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



This parameter is used to set the corresponding function of digital multi-function input terminals.

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

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 VFD.
2	Run reversely	
3	Three-wire running control	The terminal is used to determine the three-wire 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 VFD blocks output, and the stop process of motor is uncontrolled by the VFD. 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 VFD 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 VFD will revert to the state before stop.
9	External fault input	When external fault signal is transmitted to the VFD, the VFD releases fault alarm and stops.

<table>
<tr><th>Setting</th><th>Function</th><th>Description</th></tr>
<tr><td>10</td><td>Increase frequency setting (UP)</td><td rowspan="3">Used to change the frequency increase/decrease command when the frequency is given by external terminals.


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.</td></tr>
<tr><td>12</td><td>Decrease frequency setting (DOWN)</td></tr>
<tr><td>12</td><td>Clear the frequency increase/decrease setting</td></tr>
<tr><td>13</td><td>Switch between A setting and B setting</td><td rowspan="3">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.</td></tr>
<tr><td>14</td><td>Switch between combination setting and A setting</td></tr>
<tr><td>15</td><td>Switch between combination setting and B setting</td></tr>
<tr><td>16</td><td>Multi-step speed terminal 1</td><td rowspan="4">A total of 16-step speeds can be set by combining digital states of these four terminals.
Note: Multi-step speed 1 is the low-order bit, and multi-step speed 4 is the high-order bit.
<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>17</td><td>Multi-step speed terminal 2</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>
</table>

Setting	Function	Description
23	Simple PLC stop reset	Used to clear the previous PLC state memory information and restart the simple PLC process.
24	Pause simple PLC	Used to pause the simple PLC. When the function is revoked, the simple PLC resumes the running.
25	Pause PID control	PID is ineffective temporarily, and the VFD maintains current frequency output.
26	Pause wobbling frequency (stop at current frequency)	The VFD pauses at current output. After this function is canceled, it continues wobbling-frequency operation at current frequency.
27	Reset wobbling frequency (back to center frequency)	The set frequency of VFD reverts to center frequency.
28	Reset the counter	The counter is cleared.
29	Switch between speed control and torque control	The VFD switches from torque control mode to speed control mode, or vice versa.
30	Disable ACC/DEC	Used to ensure the VFD is not impacted by external signals (except for stop command), and maintains the present output frequency.
31	Trigger the counter	Used to enable the counter to count pulses.
33	Clear the frequency increase/decrease setting temporarily	When the terminal is closed, the frequency value set by UP/DOWN can be cleared to restore the reference frequency to the frequency given by frequency command channel; when the terminal is opened, it restores to the frequency value after frequency increase/decrease setting.
34	DC braking	The VFD starts DC brake immediately after the command becomes valid.
35	Switch between motor 1 and motor 2	When the function is enabled, you can realize switchover control of two motors.
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.

Setting	Function	Description
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.
43–72	Reserved	
73	Enable RO output 1	When the terminal is valid and a relay terminal function is set to “54: S terminal input 1 is valid”, the relay outputs actions.
74	Enable RO output 2	When the terminal is valid and a relay terminal function is set to “55: S terminal input 1 is valid”, the relay outputs actions.
75	Brake release command input	When the terminal is active in the brake control mode, the release command is output.
76	Brake feedback signal	When the terminal is active in the brake control mode, the brake feedback signal is received.
77	PTC overtemperature detection	
78	MODBUS-PROFIBUS switchover (reserved)	
77–79	Reserved	

Related parameter list:

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P05.00</td><td>HDI input type</td><td>0x00–0x11
Ones place: HDIA input type
0: HDIA is high-speed pulse input
1: HDIA is digital input
Tens place: HDIB input type
0: HDIB is high-speed pulse input
1: HDIB is digital input</td><td>0x00</td></tr>
<tr><td>P05.01</td><td>Function of S1</td><td rowspan="4">0–79
0: No function
1: Forward running
2: Reverse running</td><td>1</td></tr>
<tr><td>P05.02</td><td>Function of S2</td><td>4</td></tr>
<tr><td>P05.03</td><td>Function of S3</td><td>7</td></tr>
<tr><td>P05.04</td><td>Function of S4</td><td>0</td></tr>
</table>

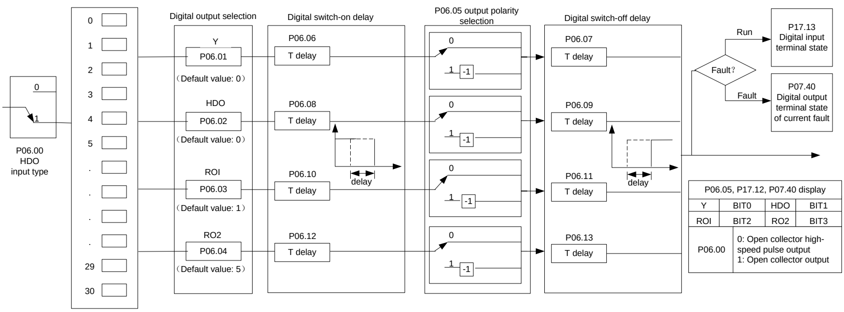
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P05.05</td><td>Function of HDIA</td><td rowspan="3">3: Three-wire running control
4: Forward jogging
5: Reverse jogging
6: Coast to stop
7: Fault reset
8: Pause running
9: External fault input
10: Increase 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</td><td>0</td></tr>
<tr><td>P05.06</td><td>Function of HDIB</td><td>0</td></tr>
<tr><td>P05.07</td><td>Reserved</td><td>0</td></tr>
</table>

Function code	Name	Description	Default
		36: Switch the running command channel to keypad 37: Switch the running command channel 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 43–55: Reserved 56: Emergency stop 57–72: Reserved 73: Enable RO output 1 74: Enable RO output 2 75: Brake release command input 76: Brake feedback signal 77: PTC overtemperature detection 78: MODBUS-PROFIBUS switchover (reserved) 79: Reserved	
P05.08	Input terminal polarity	0x00–0x3F	0x00
P05.09	Digital input filter time	0.000–1.000s	0.010s
P05.10	Virtual terminal setting	0x00–0x3F (0: disable, 1: enable) BIT0: S1 virtual terminal BIT1: S2 virtual terminal BIT2: S3 virtual terminal BIT3: S4 virtual terminal BIT4: HDIA virtual terminal BIT5: HDIB virtual terminal	0x00
P05.11	Terminal control mode	0: Two-wire control mode 1 1: Two-wire control mode 2 2: Three-wire control mode 1 3: Three-wire control mode 2	0
P05.12	S1 switch-on delay	0.000–50.000s	0.000s
P05.13	S1 switch-off delay	0.000–50.000s	0.000s
P05.14	S2 switch-on delay	0.000–50.000s	0.000s

Function code	Name	Description	Default
P05.15	S2 switch-off delay	0.000–50.000s	0.000s
P05.16	S3 switch-on delay	0.000–50.000s	0.000s
P05.17	S3 switch-off delay	0.000–50.000s	0.000s
P05.18	S4 switch-on delay	0.000–50.000s	0.000s
P05.19	S4 switch-off delay	0.000–50.000s	0.000s
P05.20	HDIA switch-on delay	0.000–50.000s	0.000s
P05.21	HDIA switch-off delay	0.000–50.000s	0.000s
P05.22	HDIB switch-on delay	0.000–50.000s	0.000s
P05.23	HDIB switch-off delay	0.000–50.000s	0.000s
P07.39	Input terminal status at present fault		0
P17.12	Digital input terminal status		0

5.5.12 Digital output

The VFD carries two groups of relay output terminals, one open collector Y output terminal and one high-speed pulse output (HDO) terminal. The function of all the digital output terminals can be programmed through function codes, of which the high-speed pulse output terminal HDO can also be set to high-speed pulse output or digital output by function code.



The following table lists the function code options. A same output terminal function can be repeatedly selected.

Value	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

Value	Function	Description
		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	VFD in 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 frequency.
11	Lower limit frequency reached	The ON signal is output when the running frequency reaches the lower limit frequency.
12	Ready for running	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	Output ON signal after the pre-alarm time elapsed based on the pre-alarm threshold; see P11.08–P11.10 for details.
15	Underload pre-alarm	The ON signal is output 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.
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

Value	Function	Description
		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 above 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.
30–32	Reserved	
33	Speed limit reached in torque control	When the frequency is limited, 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.
35	Reserved	
36	Speed/position control switchover completed	When the mode switchover is completed, the output is valid.
37	Any frequency reached	
38–40	Reserved	
41	Y1 from the programmable card	Y1 from the programmable card
42	Y2 from the programmable card	Y2 from the programmable card
43	HDO from the programmable card	HDO from the programmable card
44	RO1 from the programmable card	RO1 from the programmable card
45	RO2 from the programmable card	RO2 from the programmable card
46	RO3 from the programmable card	RO3 from the programmable card
47	RO4 from the programmable card	RO4 from the programmable card
48	Auxiliary motor 1 startup	
49	Auxiliary motor 2 startup	
50	Remote brake (DP communication)	
51	PT100 pre-alarm	
52	PT1000 pre-alarm	
53	OFF1 main contactor actuation	
54	S terminal input 1 is valid	

Value	Function	Description
55	S terminal input 2 is valid	
56	Brake release command action	
57–60	Reserved	

Related parameter list:

Function code	Name	Description	Default
P06.00	HDO output type	0: Open collector high-speed pulse output 1: Open collector output	0
P06.01	Y1 output	0–60 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 11: Lower limit frequency 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	0
P06.02	HDO output		0
P06.03	RO1 output		1
P06.04	RO2 output		5

Function code	Name	Description	Default
		output 26: DC bus voltage established 27: Z pulse output 28: Superposing pulses 29: STO action 30–32: Reserved 33: Speed limit reached in torque control 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: Y1 from the programmable card 42: Y2 from the programmable card 43: HDO from the programmable card 44: RO1 from the programmable card 45: RO2 from the programmable card 46: RO3 from the programmable card 47: RO4 from the programmable card 48: Auxiliary motor 1 startup 49: Auxiliary motor 2 startup 50: Remote brake (DP communication) 51: PT100 pre-alarm 52: PT1000 pre-alarm 53: OFF1 main contactor actuation 54: S terminal input 1 is valid 55: S terminal input 2 is valid 56: Brake release command action 57–60: Reserved	
P06.05	Output terminal polarity selection	0x00–0x0F	0x00
P06.06	Y switch-on delay	0.000–50.000s	0.000s
P06.07	Y switch-off delay	0.000–50.000s	0.000s
P06.08	HDO switch-on delay	0.000–50.000s (valid when P06.00 is 1)	0.000s
P06.09	HDO switch-off delay	0.000–50.000s (valid when P06.00 is 1)	0.000s

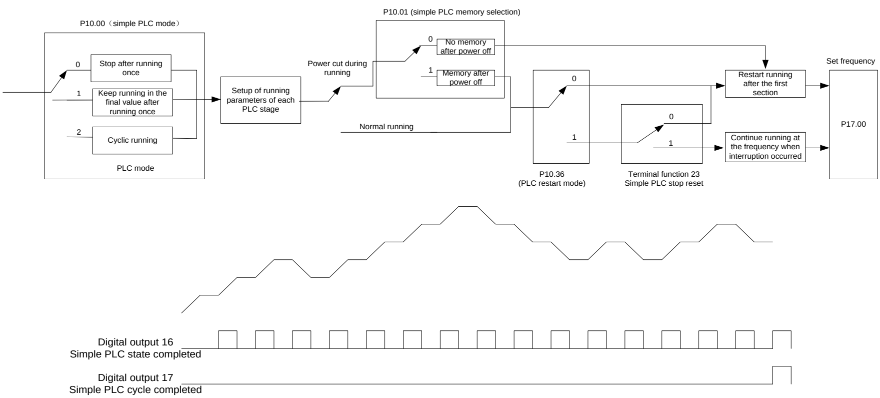
Function code	Name	Description	Default
P06.10	RO1 switch-on delay	0.000–50.000s	0.000s
P06.11	RO1 switch-off delay	0.000–50.000s	0.000s
P06.12	RO2 switch-on delay	0.000–50.000s	0.000s
P06.13	RO2 switch-off delay	0.000–50.000s	0.000s
P07.40	Output terminal status at present fault	0x0000–0xFFFF	0x0000
P17.13	Digital output terminal status	0x00–0x0F	0x00

5.5.13 Simple PLC

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. Previously, such function was realized with external PLC, while now, the VFD itself can achieve this function.

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), one ON signal can be output by the multifunction relay.



Related parameter list:

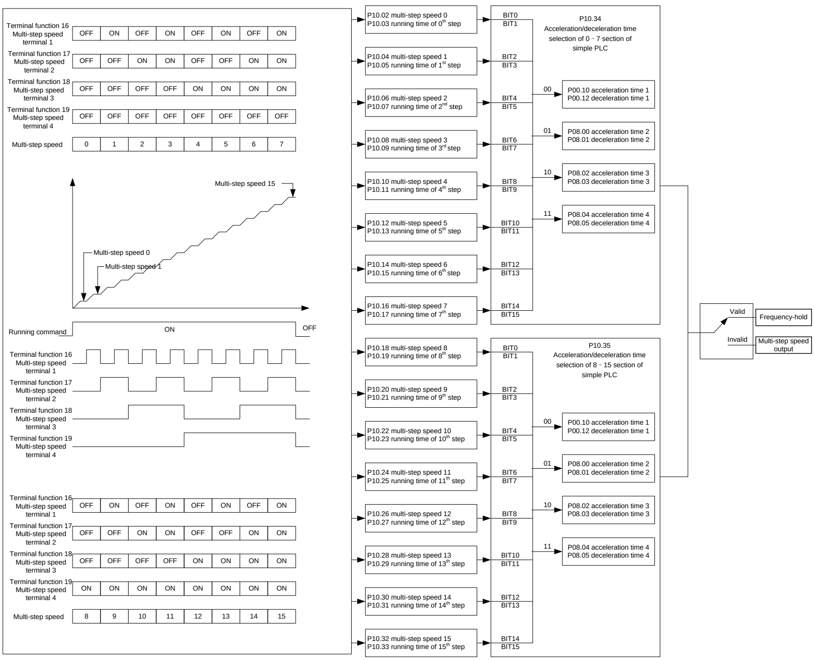
Function code	Name	Description	Default
P05.01–P05.06	Digital input function selection	23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control	

Function code	Name	Description	Default
P06.01–P06.04	Digital output function selection	16: Simple PLC stage reached 17: Simple PLC cycle reached	
P10.00	Simple PLC mode	0: Stop after running once 1: Keep running with the final value after running once 2: Cyclic running	0
P10.01	Simple PLC memory selection	0: Do not memorize at power outage 1: Memorize at power outage	0
P10.02	Multi-step speed 0	-100.0–100.0%	0.0%
P10.03	Running time of step 0	0.0–6553.5s (min)	0.0s
P10.04	Multi-step speed 1	-100.0–100.0%	0.0%
P10.05	Running time of step 1	0.0–6553.5s (min)	0.0s
P10.06	Multi-step speed 2	-100.0–100.0%	0.0%
P10.07	Running time of step 2	0.0–6553.5s (min)	0.0s
P10.08	Multi-step speed 3	-100.0–100.0%	0.0%
P10.09	Running time of step 3	0.0–6553.5s (min)	0.0s
P10.10	Multi-step speed 4	-100.0–100.0%	0.0%
P10.11	Running time of step 4	0.0–6553.5s (min)	0.0s
P10.12	Multi-step speed 5	-100.0–100.0%	0.0%
P10.13	Running time of step 5	0.0–6553.5s (min)	0.0s
P10.14	Multi-step speed 6	-100.0–100.0%	0.0%
P10.15	Running time of step 6	0.0–6553.5s (min)	0.0s
P10.16	Multi-step speed 7	-100.0–100.0%	0.0%
P10.17	Running time of step 7	0.0–6553.5s (min)	0.0s
P10.18	Multi-step speed 8	-100.0–100.0%	0.0%
P10.19	Running time of step 8	0.0–6553.5s (min)	0.0s
P10.20	Multi-step speed 9	-100.0–100.0%	0.0%
P10.21	Running time of step 9	0.0–6553.5s (min)	0.0s
P10.22	Multi-step speed 10	-100.0–100.0%	0.0%
P10.23	Running time of step 10	0.0–6553.5s (min)	0.0s
P10.24	Multi-step speed 11	-100.0–100.0%	0.0%
P10.25	Running time of step 11	0.0–6553.5s (min)	0.0s
P10.26	Multi-step speed 12	-100.0–100.0%	0.0%
P10.27	Running time of step 12	0.0–6553.5s (min)	0.0s
P10.28	Multi-step speed 13	-100.0–100.0%	0.0%
P10.29	Running time of step 13	0.0–6553.5s (min)	0.0s
P10.30	Multi-step speed 14	-100.0–100.0%	0.0%
P10.31	Running time of step 14	0.0–6553.5s (min)	0.0s
P10.32	Multi-step speed 15	-100.0–100.0%	0.0%
P10.33	Running time of step 15	0.0–6553.5s (min)	0.0s

Function code	Name	Description	Default
P10.34	ACC/DEC time of steps 0–7 of simple PLC	0x0000–0xFFFF	0x0000
P10.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000–0xFFFF	0x0000
P10.36	PLC restart mode	0: Restart from step 1 1: Resume from the paused step	0
P17.00	Set frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.27	Simple PLC and actual step of multi-step speed	0–15	0

5.5.14 Multi-step speed running

Set the parameters used in multi-step speed running. The VFD can set 16-step speeds, which are selectable by multi-step speed terminals 1–4, corresponding to multi-step speed 0 to multi-step speed 15.



Related parameter list:

Function code	Name	Description	Default

Function code	Name	Description	Default
P05.01–P05.06	Digital input function selection	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	
P10.02	Multi-step speed 0	-100.0–100.0%	0.0%
P10.03	Running time of step 0	0.0–6553.5s (min)	0.0s
P10.04	Multi-step speed 1	-100.0–100.0%	0.0%
P10.05	Running time of step 1	0.0–6553.5s (min)	0.0s
P10.06	Multi-step speed 2	-100.0–100.0%	0.0%
P10.07	Running time of step 2	0.0–6553.5s (min)	0.0s
P10.08	Multi-step speed 3	-100.0–100.0%	0.0%
P10.09	Running time of step 3	0.0–6553.5s (min)	0.0s
P10.10	Multi-step speed 4	-100.0–100.0%	0.0%
P10.11	Running time of step 4	0.0–6553.5s (min)	0.0s
P10.12	Multi-step speed 5	-100.0–100.0%	0.0%
P10.13	Running time of step 5	0.0–6553.5s (min)	0.0s
P10.14	Multi-step speed 6	-100.0–100.0%	0.0%
P10.15	Running time of step 6	0.0–6553.5s (min)	0.0s
P10.16	Multi-step speed 7	-100.0–100.0%	0.0%
P10.17	Running time of step 7	0.0–6553.5s (min)	0.0s
P10.18	Multi-step speed 8	-100.0–100.0%	0.0%
P10.19	Running time of step 8	0.0–6553.5s (min)	0.0s
P10.20	Multi-step speed 9	-100.0–100.0%	0.0%
P10.21	Running time of step 9	0.0–6553.5s (min)	0.0s
P10.22	Multi-step speed 10	-100.0–100.0%	0.0%
P10.23	Running time of step 10	0.0–6553.5s (min)	0.0s
P10.24	Multi-step speed 11	-100.0–100.0%	0.0%
P10.25	Running time of step 11	0.0–6553.5s (min)	0.0s
P10.26	Multi-step speed 12	-100.0–100.0%	0.0%
P10.27	Running time of step 12	0.0–6553.5s (min)	0.0s
P10.28	Multi-step speed 13	-100.0–100.0%	0.0%
P10.29	Running time of step 13	0.0–6553.5s (min)	0.0s
P10.30	Multi-step speed 14	-100.0–100.0%	0.0%

Function code	Name	Description	Default
P10.31	Running time of step 14	0.0–6553.5s (min)	0.0s
P10.32	Multi-step speed 15	-100.0–100.0%	0.0%
P10.33	Running time of step 15	0.0–6553.5s (min)	0.0s
P10.34	ACC/DEC time of steps 0–7 of simple PLC	0x0000–0xFFFF	0x0000
P10.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000–0xFFFF	0x0000
P17.27	Simple PLC and actual step of multi-step speed	0–15	0

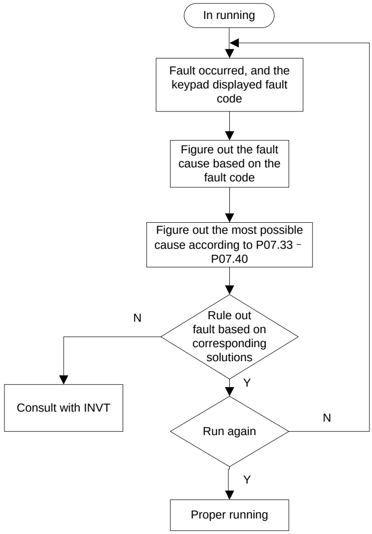
5.5.15 Local encoder input

The VFD supports pulse count function by inputting the count pulse from HDI high-speed pulse port. When the actual count value is no less than the set value, digital output terminal will output count-value-reached pulse signal, and the corresponding count value will be zeroed out.

Function code	Name	Description	Default
P05.00	HDI input type	0x00–0x11 Ones place: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens place: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0x00
P05.38	HDIA high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Reserved	0
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Reserved	0

5.5.16 Fault handling

The following provides fault handling information.



Related parameter list:

Function code	Name	Description	Default
P07.27	Present fault type	0–79 0: No fault 1: Inverter unit U-phase protection (OUt1) 2: Inverter unit V-phase protection (OUt2) 3: Inverter unit W-phase protection (OUt3) 4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed running (OC3) 7: Overvoltage during acceleration (OV1) 8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed running (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: VFD overload (OL2) 13: Phase loss on input side (SPI)	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
		14: Phase loss on output side (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: Modbus/Modbus TCP communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation error (EEP) 22: PID feedback offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time reached (END) 25: Electronic overload (OL3) 26: Keypad communication error (PCE) 27: Parameter upload error (UPE) 28: Parameter download error (DNE) 29: Profibus communication fault (E_dP) 30: Ethernet communication fault (E-NET) 31: CANopen communication fault (E-CAN) 32: To-ground short-circuit fault 1 (ETH1) 33: To-ground short-circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Mal-adjustment fault (STo) 36: Underload fault (LL) 37–44: Reserved 45: PLC card customized fault 1 (P-E1) 46: PLC card customized fault 2 (P-E2) 47: PLC card customized fault 3 (P-E3) 48: PLC card customized fault 4 (P-E4) 49: PLC card customized fault 5 (P-E5) 50: PLC card customized fault 6 (P-E6) 51: PLC card customized fault 7 (P-E7) 52: PLC card customized fault 8 (P-E8) 53: PLC card customized fault 9 (P-E9) 54: PLC card customized fault 10 (P-E10) 55: Duplicate expansion card type (E-Err) 56: Encoder UVW lost (ENCUV)	

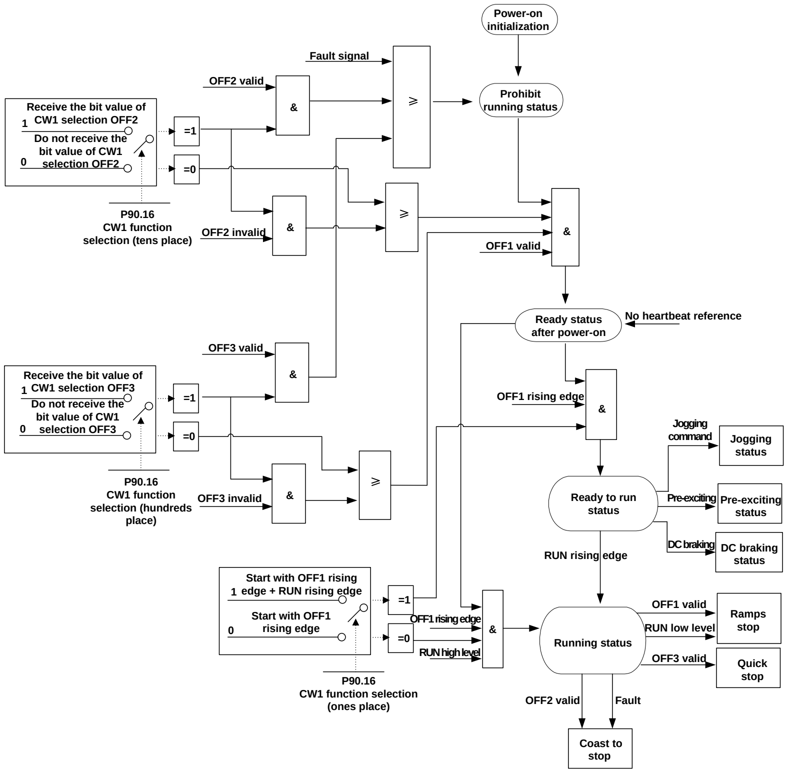
Function code	Name	Description	Default
		57: PROFINET communication timeout fault (E-PN) 58: CAN communication timeout (SECAN) 59: Motor overtemperature fault (OT) 60: Failure to identify the card at slot 1 (F1-Er) 61: Failure to identify the card at slot 2 (F2-Er) 62: Reserved 63: Communication timeout of the card at slot 1 (C1-Er) 64: Communication timeout of the card at slot 2 (C2-Er) 65: Reserved 66: EtherCAT communication timeout fault (E-CAT) 67: BACnet communication timeout fault (E-BAC) 68: DeviceNet communication timeout fault (E-DEV) 69: CAN slave fault in master/slave synchronization (S-Err) 70: Expansion card PT100 overtemperature (OtE1) 71: Expansion card PT1000 overtemperature (OtE2) 72: EtherNet IP communication timeout fault (E-EIP) 73: Brake feedback signal error (E-brF) 74: Motor OH (E-OHt) 75–79: Reserved	
P07.33	Running frequency at present fault	0.00–630.00Hz	0.00Hz
P07.34	Ramp reference frequency at present fault	0.00–630.00Hz	0.00Hz
P07.35	Output current at present fault	0–1200V	0V
P07.36	Output current at present fault	0.0–6300.0A	0.0A
P07.37	Bus voltage at present fault	0.0–2000.0V	0.0V

Function code	Name	Description	Default
P07.38	Max. temperature at present fault	-20.0–120.0°C	0.0°C
P07.39	Input terminal status at present fault	0x0000–0xFFFF	0
P07.40	Output terminal status at present fault	0x0000–0xFFFF	0
P07.41	Running frequency at last fault	0.00–630.00Hz	0.00Hz
P07.42	Ramp reference frequency at last fault	0.00–630.00Hz	0.00Hz
P07.43	Output voltage at last fault	0–1200V	0V
P07.44	Output current at last fault	0.0–6300.0A	0.0A
P07.45	Bus voltage at last fault	0.0–2000.0V	0.0V
P07.46	Max. temperature at last 1 fault	-20.0–120.0°C	0.0°C
P07.47	Input terminal status at last fault	0x0000–0xFFFF	0
P07.48	Output terminal status at last fault	0x0000–0xFFFF	0
P07.49	Running frequency at 2nd-last fault	0.00–630.00Hz	0.00Hz
P07.50	Ramp reference frequency at 2nd-last fault	0.00–630.00Hz	0.00Hz
P07.51	Output voltage at 2nd-last fault	0–1200V	0V
P07.52	Output current at 2nd-last fault	0.0–6300.0A	0.0A
P07.53	Bus voltage at 2nd-last fault	0.0–2000.0V	0.0V
P07.54	Max. temperature at last 2 fault	-20.0–120.0°C	0.0°C
P07.55	Input terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000
P07.56	Output terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000

5.5.17 PROFIBUS-DP free programming function

5.5.17.1 PROFIBUS-DP state machine

PROFIBUS-DP meets the state machine logic as shown in the following figure when communicating.



5.5.17.2 Free programming of control word (CW) and state word (SW)

CW 1 programming can be completed through P90.00–P90.15.

Function code	Name	Description	Default
P90.00	Bit 00 selection of CW 1	0–32	1
P90.01	Bit 01 selection of CW 1	0: Invalid	2
P90.02	Bit 02 selection of CW 1	1: OFF1 (0: ramps stop; ↑: ramps startup)	3
P90.03	Bit 03 selection of CW 1	2: OFF2 (0: coast to stop; 1: disable)	4
P90.04	Bit 04 selection of CW 1	3: OFF3 (0: quick stop; 1: invalid)	0
P90.05	Bit 05 selection of CW 1	4: RUN (0: ramps stop; ↑: ramps startup)	0
P90.06	Bit 06 selection of CW 1	5: Ramps set value enable (0: disable; 1:	0

Function code	Name	Description	Default
P90.07	Bit 07 selection of CW 1	enable)	6
P90.08	Bit 08 selection of CW 1	6: Fault reset (0: Invalid; 1: Valid)	7
P90.09	Bit 09 selection of CW 1	7: Jog forward (0: disable; 1: enable)	8
P90.10	Bit 10 selection of CW 1	8: Jog reversely (0: disable; 1: enable)	9
P90.11	Bit 11 selection of CW 1	9: Heartbeat reference (0: no heartbeat; 1:	0
P90.12	Bit 12 selection of CW 1	The RUN command in control word 1 is	0
P90.13	Bit 13 selection of CW 1	valid only when the heartbeat is enabled	0
P90.14	Bit 14 selection of CW 1	and the bit is 1.)	0
P90.15	Bit 15 selection of CW 1	10: Pre-exciting (0: disable; 1: enable) 11: DC braking (0: disable; 1: enable) 12: Drop control (0: disable; 1: enable) 13: Run forward (0: disable; 1: forward) 14: Run reversely (0: disable; 1: reverse) 15: Switch to the master (0: disable; 1: switch to master) 16: Switch to slave (0: disable; 1: switch to slave) 17: Switch between speed control and torque control (0: disable; 1: enable) 18: Run command to switch between local and remote (0: remote; 1: Local. Select a local mode based on the thousand bit of P90.16.) 19: Switch between motor groups (0: motor group 1; 1: motor group 2) 20: Remote brake output (0: disable; 1: brake output relay is valid, corresponding to output terminal 50: remote brake) 21: Reserved 22: Clear encoder pulse count value (0: disable; 1: set the present encoder pulse count value to the value of P22.24) 23–32: Reserved	0

Similarly, complete the programming of CW2, SW1, and SW2 through P90.18–P90.65.

5.5.17.3 Free programming of process data

Received PZD programming can be completed through P15.02–P15.12.

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th></tr>
<tr><td>P15.02</td><td>Received PZD2</td><td rowspan="11">Value after the calculation with P91.00–P91.21
0: Invalid
1: Set frequency (0–Fmax (Unit: 0.01Hz))
2: PID reference (0–1000, in which 1000 corresponds to 100.0%)
3: PID feedback (0–1000, 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: 0.01 Hz)
6: Setting of the upper limit of reverse running frequency (0–Fmax, unit: 0.01 Hz)
7: Upper limit of the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)
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: 0x000–0x3FF
10: Virtual output terminal command. Range: 0x00–0x0F
11: Voltage setting (special for V/F separation)
(0–1000, in which 1000 corresponds to 100.0% of the motor rated voltage)
12: AO1 output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%)
13: AO2 output setting 2 (-1000–+1000, in which 1000 corresponds to 100.0%)
14–18: Reserved
19–20: Reserved
21: Control word 2
22: Set frequency (*100, Hz, with sign, -Fmax – Fmax)</td><td>0</td></tr>
<tr><td>P15.03</td><td>Received PZD3</td><td>0</td></tr>
<tr><td>P15.04</td><td>Received PZD4</td><td>0</td></tr>
<tr><td>P15.05</td><td>Received PZD5</td><td>0</td></tr>
<tr><td>P15.06</td><td>Received PZD6</td><td>0</td></tr>
<tr><td>P15.07</td><td>Received PZD7</td><td>0</td></tr>
<tr><td>P15.08</td><td>Received PZD8</td><td>0</td></tr>
<tr><td>P15.09</td><td>Received PZD9</td><td>0</td></tr>
<tr><td>P15.10</td><td>Received PZD10</td><td>0</td></tr>
<tr><td>P15.11</td><td>Received PZD11</td><td>0</td></tr>
<tr><td>P15.12</td><td>Received PZD12</td><td>0</td></tr>
</table>

Function code	Name	Description	Default
		23: Set rotation speed (*1, rpm, without sign, 0–60000) 24: Set rotation speed (*1, rpm, with sign, -30000–30000) 25: Auxiliary frequency setting (*100, Hz, with sign, -50.00Hz – 50.00Hz) 26: Auxiliary torque setting (*10, %, with sign, -50.0% – 50.0%) 27: Reduction rate of drop control (*100, Hz, 0.00 – 50.00Hz) 28: Number of slaves (0–15, valid when the VFD is the master in master-slave control mode) 29–47: Reserved	

Similarly, sent PZD programming can be completed through P15.13–P15.23.

5.5.17.4 Free conversion of process data base values

Take received PZD2 as an example: Data received internally by VFD = Received PZD * P91.00/P91.01

Function code	Name	Description	Default
P91.00	Numerator of received PZD2 conversion base value	$\text{Actual received value} = \dfrac{\text{Received PZD} \times \text{Numerator of received PZD conversion base value}}{\text{Denominator of received PZD2 conversion base value}}$	16384
P91.01	Denominator of received PZD2 conversion base value		16384

Take sent PZD2 as an example: PZD2 sent value = VFD internal value * P91.22/P91.23

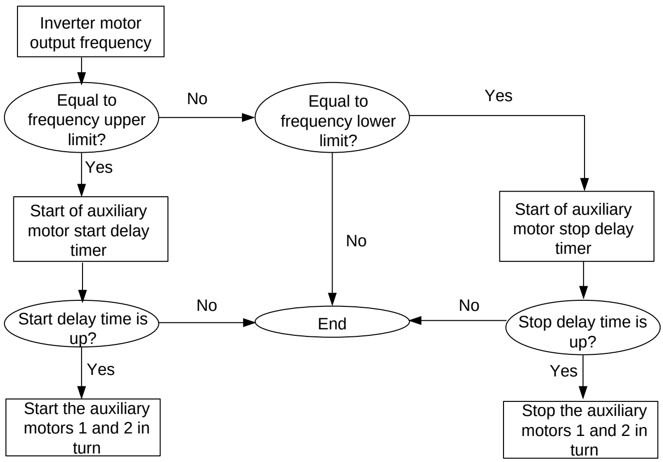
Function code	Name	Description	Default
P91.22	Numerator of sent PZD2 conversion base value	$\text{Sent PZD} = \dfrac{\text{Actual value} \times \text{Numerator of sent PZD conversion base value}}{\text{Denominator of sent PZD2 conversion base value}}$	16384
P91.23	Denominator of sent PZD2 conversion base value		16384

5.5.18 Water supply function

This function code group provides simple water supply function, which is controlled by setting frequency or feedback pressure value.

Function code	Name	Description	Default
P92.10	Auxiliary motor selection	0: No auxiliary motor 1: Auxiliary motor 1 2: Auxiliary motor 2 3: Auxiliary motor 1 and 2	0
P92.11	Auxiliary motor 1 start/stop delay time	0.0–3600.0s	5.0s
P92.12	Auxiliary motor 2 start/stop delay time	0.0–3600.0s	5.0s

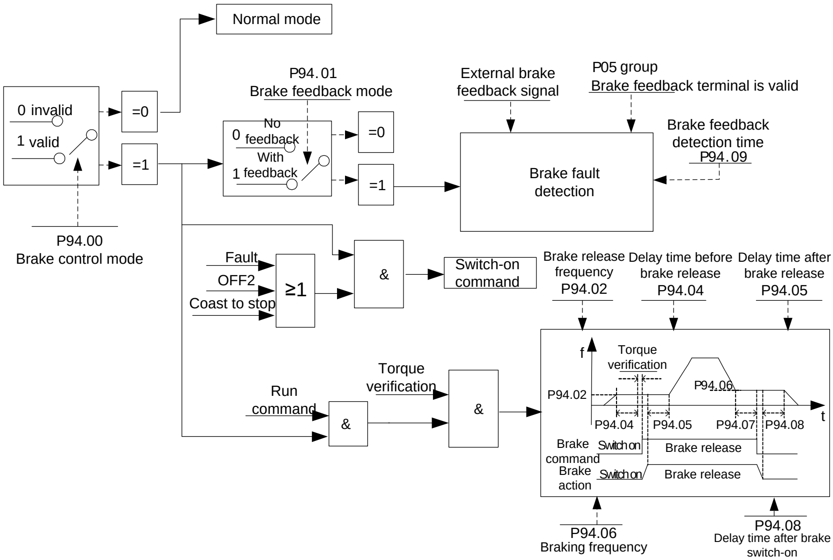
P92.10–P92.12 are used to configure the simple water supply system, which accomplishes the constant pressure water supply with one-drive-three function, i.e. one VFD driving one converter pump and two power frequency pumps. See the following figure for its logic principle.



5.5.19 Brake control function

P94 group provides the parameter setting of brake control. When the drive is not active, the brake is used to protect the drive from undesired movements, such as caused by potential energy loads or vertical running loads.

See the following figure for its logic principle.


Normal mode
0 invalid
1 valid
=0
=1
P94.00
Brake control mode
P94.01
Brake feedback mode
0 No feedback
1 With feedback
=0
=1
External brake feedback signal
P05 group
Brake feedback terminal is valid
Brake feedback detection time
P94.09
Brake fault detection
Fault
OFF2
Coast to stop
≥1
&
Switch-on command
Brake release frequency
P94.02
Delay time before brake release
P94.04
Delay time after brake release
P94.05
Run command
&
Torque verification
&
f
Torque verification
P94.02
P94.06
t
P94.04
P94.05
P94.07
P94.08
Brake command
Switch on
Brake release
Brake action
Switch on
Brake release
P94.06
Braking frequency
P94.08
Delay time after brake switch-on

6 Function parameter list

6.1 What this chapter contains

This chapter lists all the function codes and corresponding description of each function code.

6.2 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 P08.

The function group numbers correspond to the level-1 menus, the function codes correspond to the level-2 menus, and the function parameters correspond to the level-3 menus.

1. The content of the function code table is as follows:

Column 1 "Function code": Code of the function group and parameter.

Column 2 "Name": Full name of the function parameter.

Column 3 "Description": Detailed description of the function parameter.

Column 4 "Default": Initial value set in factory.

Column 5 "Modify": Whether the parameter can be modified, and conditions for the modification

"○" 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.

(The VFD automatically checks and constrains the modification of parameters, which helps prevent incorrect modifications.)

2. The parameters adopt the decimal system (DEC). If the hexadecimal system is adopted, all bits are mutually independent on data during parameter editing, and the setting ranges at some bits can be hexadecimal (0–F).

3. "Default" indicates the factory setting of the function parameter. If the value of the parameter is detected or recorded, the value cannot be restored to the factory setting.

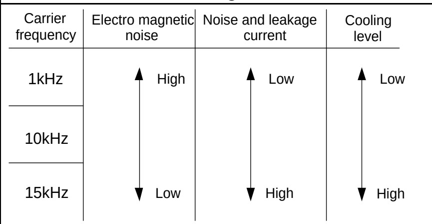
4. To better protect parameters, the VFD provides the password protection function. After a password is set (that is, P07.00 is set to a non-zero value), "0.0.0.0.0" is displayed when you press the PRG/ESC key to enter the function code editing interface. You need to enter the correct user password to enter the interface. For the factory parameters, you need to enter the correct factory password to enter the interface. (You are not advised to modify the factory

parameters. Incorrect parameter setting may cause operation exceptions or even damage to the VFD.) If password protection is not in locked state, you can change the password any time. You can set P07.00 to 0 to cancel the user password. When P07.00 is set to a non-zero value during power-on, parameters are prevented from being modified by using the user password function. When you modify function parameters through serial communication, the user password protection function is also applicable and compliant with the same rule.

P00 group—Basic functions

Function code	Name	Description	Default	Modify
P00.00	Speed control mode	0: Sensorless vector control (SVC) mode 0 1: Sensorless vector control (SVC) mode 1 2: Space voltage vector control mode **Note:** Before using a vector control mode (0 or 1), enable the VFD to perform motor parameter autotuning first.	2	◎
P00.01	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0	○
P00.02	Communication mode of running commands	0: Modbus/Modbus TCP 1: PROFIBUS/CANopen/DeviceNet 2: Ethernet 3: EtherCAT/PROFINET/EtherNet IP 4: Programmable expansion card 5: Wireless communication card **Note:** The options 1, 2, 3, 4, and 5 are add-on functions and are available only when corresponding expansion cards are configured.	0	○
P00.03	Max. output frequency	The function code is used to set the max. output frequency of the VFD. Pay attention to the function code because it is the foundation of the frequency setting and the speed of acceleration (ACC) and deceleration (DEC). Setting range: Max (P00.04, 10.00)–630.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	The upper limit of the running frequency is the upper limit of the output frequency of the VFD, which is lower than or equal to the max. output frequency. When the set frequency is higher than the upper limit of the running frequency, the upper limit of	50.00Hz	◎

<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>the running frequency is used for running.
Setting range: P00.05–P00.03 (Max. output frequency)</td><td></td><td></td></tr>
<tr><td>P00.05</td><td>Lower limit of running frequency</td><td>The lower limit of the running frequency is the lower limit of the output frequency of the VFD, When the set frequency is lower than the lower limit of the running frequency, the lower limit of the running frequency is used for running.
Note: Max. output frequency ≥ Upper limit of frequency ≥ Lower limit of frequency
Setting range: 0.00Hz–P00.04 (Upper limit of running frequency)</td><td>0.00Hz</td><td>◎</td></tr>
<tr><td>P00.06</td><td>Setting channel of A frequency command</td><td rowspan="2">0: Keypad
1: AI1
2: AI2
3: AI3
4: High-speed pulse HDIA
5: Simple PLC program
6: Multi-step speed running
7: PID control
8: Modbus/Modbus TCP communication
9: PROFIBUS/CANopen/DeviceNet communication
10: Ethernet communication
11: High-speed pulse HDIB
12: Reserved
13: EtherCAT/PROFINET/EtherNet IP communication
14: Programmable expansion card
15–17: Reserved</td><td>0</td><td>○</td></tr>
<tr><td>P00.07</td><td>Setting channel of B frequency command</td><td>15</td><td>○</td></tr>
<tr><td>P00.08</td><td>Reference object of B frequency command</td><td>0: Max. output frequency
1: A frequency command</td><td>0</td><td>○</td></tr>
<tr><td>P00.09</td><td>Combination mode of setting source</td><td>0: A
1: B
2: (A+B)
3: (A-B)
4: Max(A, B)</td><td>0</td><td>○</td></tr>
</table>

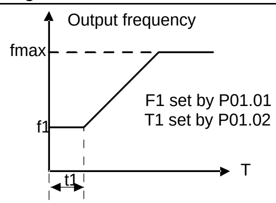
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>5: Min(A, B)</td><td></td><td></td></tr>
<tr><td>P00.10</td><td>Frequency set through keypad</td><td>When A and B frequency commands select the keypad for setting, the value of the function code is the original setting one of the frequency data of the VFD.
Setting range: 0.00Hz–P00.03 (Max. output frequency)</td><td>50.00Hz</td><td>○</td></tr>
<tr><td>P00.11</td><td>ACC time 1</td><td rowspan="2">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.
The VFD has four groups of ACC/DEC time, which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group.
P00.11 and P00.12 setting range: 0.0–3600.0s</td><td>Model depended</td><td>○</td></tr>
<tr><td>P00.12</td><td>DEC time 1</td><td>Model depended</td><td>○</td></tr>
<tr><td>P00.13</td><td>Running direction</td><td>0: Run at the default direction.
1: Run at the opposite direction.
2: Disable reverse running</td><td>0</td><td>○</td></tr>
<tr><td>P00.14</td><td>Carrier frequency setting</td><td>

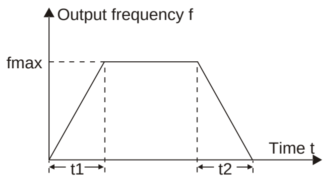
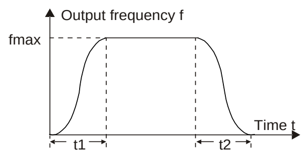
The relationship between models and carrier frequencies is as follows:
<table>
<tr><th colspan="2">Model</th><th>Default carrier frequency</th></tr>
<tr><td rowspan="3">380V</td><td>11–15kW</td><td>8kHz</td></tr>
<tr><td>18–75kW</td><td>4kHz</td></tr>
<tr><td>>90kW</td><td>2kHz</td></tr>
</table>
Advantage of high carrier frequency: ideal current waveform, little current harmonic wave</td><td>Model depended</td><td>○</td></tr>
</table>

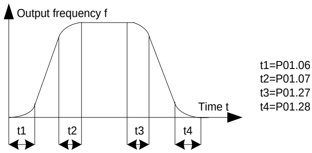
Function code	Name	Description	Default	Modify
		and motor noise. Disadvantage of high carrier frequency: increasing the switch loss, increasing VFD temperature and the impact to the output capacity. The VFD needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase. On the contrary, an extremely-low carrier frequency may cause unstable operation at low frequency, decrease the torque, or even lead to oscillation. The carrier frequency has been properly set in the factory before the VFD is delivered. In general, you do not need to modify it. When the frequency used exceeds the default carrier frequency, the VFD needs to derate by 10% for each increase of 1k carrier frequency. Setting range: 1.0–15.0kHz		
P00.15	Motor parameter autotuning	0: No operation 1: Complete rotary parameter autotuning 2: Complete static parameter autotuning 3: Partial static parameter autotuning 4: Complete rotary parameter autotuning 2 (for asynchronous motors) 5: Partial static parameter autotuning 2 (for asynchronous motors)	0	◎
P00.16	AVR function selection	0: Invalid 1: Valid during the whole procedure The auto-adjusting function of the VFD can eliminate the impact on the output voltage of the VFD because of the bus voltage fluctuation.	1	○
P00.17	VFD type	0: G type 1: P type	1	◎
P00.18	Function parameter restore	0: No operation 1: Restore default values (excluding motor parameters) 2: Clear fault records	0	◎

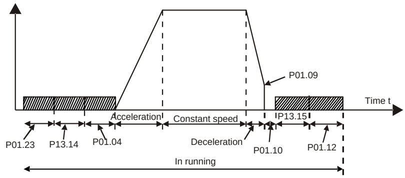
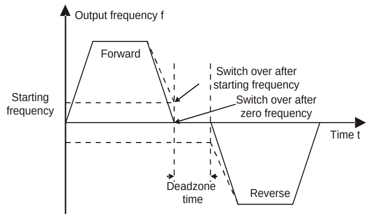
Function code	Name	Description	Default	Modify
		3: Lock keypad parameters 4: Reserved 5: Restore default values (for factory test mode) 6: Restore default values (including motor parameters) **Note:** After the selected operation is performed, the function code is automatically restored to 0. Restoring the default values may delete the user password. Exercise caution when using this function.		

P01 group—Start and stop control

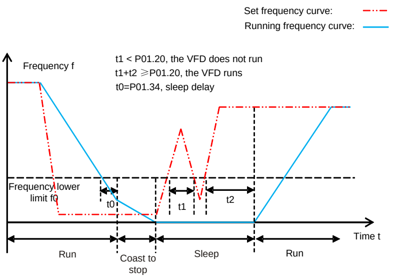
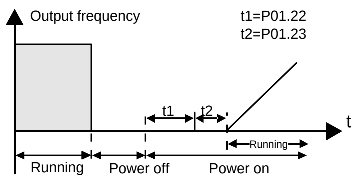
Function code	Name	Description	Default	Modify
P01.00	Start mode	0: Direct start 1: Start after DC braking 2: Start after speed tracking **Note:** For AMs, speed tracking is not supported in SVC 0, and software speed tracking is supported in other modes. For details, see parameters **P01.35**–**P01.41**. For AMs, you do not need to modify parameters **P01.35**–**P01.41**.	0	◎
P01.01	Starting frequency of direct start	The function code indicates the initial frequency during VFD start. See P01.02 (Starting frequency hold time) for detailed information. Setting range: 0.00–50.00Hz	0.50Hz	◎
P01.02	Starting frequency hold time	 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	0.0s	◎

Function code	Name	Description	Default	Modify
		starting frequency, the VFD stops running and keeps in the standby state. The starting frequency is not limited in the lower limit frequency. Setting range: 0.0–50.0s		
P01.03	Braking current before start	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 current. P01.03 setting range: 0.0–100.0% P01.04 setting range: 0.00–50.00s	0.0%	◎
P01.04	Braking time before start		0.00s	◎
P01.05	ACC and DEC mode	Used to indicate 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. The S curve is generally applied to elevators, conveyors, and other application scenarios where smoother start or stop is required.  **Note:** If mode 1 is selected, set **P01.06**, **P01.07, P01.27, and P01.28** accordingly.	0	◎

Function code	Name	Description	Default	Modify
P01.06	Time of starting segment of ACC S curve	The curvature of S curve is determined by the ACC range and ACC/DEC time.  Setting range: 0.0–50.0s	0.1s	◎
P01.07	Time of ending segment of ACC S curve		0.1s	◎
P01.08	Stop mode	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 stops output immediately; and the load coasts to stop according to mechanical inertia.	0	○
P01.09	Starting frequency of DC braking for stop	Starting frequency of DC braking for stop: During the deceleration to stop, the VFD starts DC braking for stop when running frequency reaches the starting frequency determined by P01.09. Wait time before DC braking: The VFD blocks the output before starting DC braking. After this wait time, DC braking is started so as to prevent overcurrent caused by DC braking at high speed. DC braking current for stop: It indicates the applied DC braking energy. Stronger current indicates greater DC braking effect. DC braking time for stop: It indicates the hold time of DC braking. If the time is 0, DC braking is invalid, and the VFD decelerates to stop within the specified time.	0.00Hz	○
P01.10	Demagnetization time		0.00s	○
P01.11	DC braking current for stop		0.0%	○
P01.12	DC braking time for stop		0.00s	○

Function code	Name	Description	Default	Modify
		 P01.09 setting range: 0.00Hz–P00.03 (Max. output frequency) P01.10 setting range: 0.00–30.00s P01.11 setting range: 0.0–100.0% P01.12 setting range: 0.0–50.0s		
P01.13	FWD/REV running deadzone time	This function code indicates the transition time specified in P01.14 during FWD/REV rotation switching. See the following figure:  Setting range: 0.0–3600.0s	0.0s	○
P01.14	FWD/REV running switching mode	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	0.00–100.00Hz	0.50Hz	◎
P01.16	Stop speed detection mode	0: Detect by the set speed (unique in space voltage vector control mode) 1: Detect by the feedback speed	0	◎
P01.17	Stop speed detection time	0.00–100.00s	0.50s	◎
P01.18	Terminal-based running command protection at power-on	When the channel of running commands is terminal control, the system detects the state of the running terminal during power-on. 0: The terminal running command is invalid at power-on. Even the running command is considered as valid during power-on, the VFD	0	○

Function code	Name	Description	Default	Modify
		does not run and it keeps the protection state until the running command is canceled and enabled again. 1: The terminal running command is valid at power-on. If the running command is considered as valid during power-on, the VFD is started automatically after the initialization. **Note: Exercise caution before using this function. Otherwise, serious result may follow.**		
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	The function code determines the running state of the VFD when the set frequency is lower than the lower limit. 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 The VFD coasts to stop when the set frequency is lower than the lower-limit one. If the set frequency exceeds the lower limit one again and it lasts for the time set by P01.20, the VFD resumes the running state automatically. Setting range: 0x00–0x12	0x00	◎
P01.20	Wake-up-from-sleep delay	Used to set the wake-up-from-sleep delay time. When the running frequency of the VFD is lower than the lower limit, the VFD becomes standby. When the set frequency exceeds the lower limit one again and it lasts for the time set by P01.20, the VFD runs automatically.	0.0s	○

Function code	Name	Description	Default	Modify
		 Setting range: 0.0–3600.0s (Valid only when the ones place of P01.19=2)		
P01.21	Power-off restart selection	The function code indicates whether the VFD automatically runs after re-power on. 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	The function code indicates 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	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. Setting range: 0.0–600.0s	0.0s	○
P01.24	Stop speed delay	0.0–600.0s	0.0s	○
P01.25	Open-loop 0Hz output selection	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	0.0–60.0s	2.0s	○

Function code	Name	Description	Default	Modify
P01.27	Time of starting segment of DEC S curve	0.0–50.0s	0.1s	◎
P01.28	Time of ending segment of DEC S curve	0.0–50.0s	0.1s	◎
P01.29	Short-circuit braking current	When the VFD starts in direct start mode (P01.00=0), set P01.30 to a non-zero value to enter short-circuit braking. During stop, if the running frequency of 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 set by P01.12. (See descriptions for P01.09–P01.12.) P01.29 setting range: 0.0–150.0% (VFD) P01.30 setting range: 0.0–50.0s P01.31 setting range: 0.0–50.0s	0.0%	○
P01.30	Hold time of short-circuit braking for start		0.00s	○
P01.31	Hold time of short-circuit braking for stop		0.00s	○
P01.32	Pre-exciting time for jogging	0.000–10.000s	0.300s	○
P01.33	Starting frequency of braking for stop in jogging	0.00–P00.03Hz	0.00Hz	○
P01.34	Sleep delay	0.0–3600.0s	0.0s	○
P01.35	Speed tracking method	0–2 0: From stop frequency 1: From low frequency 2: From max. frequency (P00.03)	0	●
P01.36	Quick/slow selection for speed tracking	1–100s	15s	○
P01.37	Speed tracking current	30%–200%	100%	○
P01.38	Demagnetization time for speed tracking	0.0–5.0s	2.0s	●
P01.39	Advanced control	0x0000–0x0111	0x0110	○

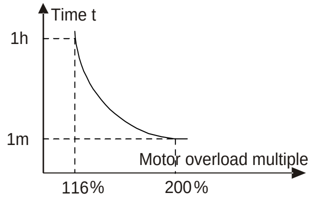
Function code	Name	Description	Default	Modify
	for speed tracking	Ones place: Current giving mode in vector control 0: 120% of current is given during startup, which is switched to the given value based on P01.37 1: The current is given based on P01.37 Tens place: PWM mode selection 0: 2PH modulation mode 1: Based on P08.40 Hundreds place: Reserved 0: Reserved 1: Reserved		
P01.40	Regulation proportional coefficient of speed tracking current	0–3000	1500	○
P01.41	Regulation integral coefficient of speed tracking current	0–3000	1500	○

P02 group—Parameters of motor 1

Function code	Name	Description	Default	Modify
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0	◎
P02.01	Rated power of AM 1	0.1–3000.0kW	Model depended	◎
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (Max. frequency)	50.00Hz	◎
P02.03	Rated speed of AM 1	1–60000rpm	Model depended	◎
P02.04	Rated voltage of AM 1	0–1200V	Model depended	◎
P02.05	Rated current of AM 1	0.8–6000.0A	Model depended	◎
P02.06	Stator resistance of AM 1	0.001–65.535Ω	Model depended	○

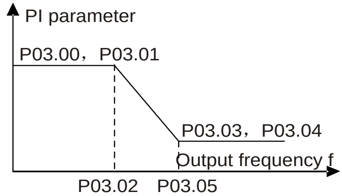
Function code	Name	Description	Default	Modify
P02.07	Rotor resistance of AM 1	0.001–65.535Ω	Model depended	○
P02.08	Leakage inductance of AM 1	0.1–6553.5mH	Model depended	○
P02.09	Mutual inductance of AM 1	0.1–6553.5mH	Model depended	○
P02.10	No-load current of AM 1	0.1–6553.5A	Model depended	○
P02.11	Magnetic saturation coefficient 1 of iron core of AM 1	0.0–100.0%	80.0%	○
P02.12	Magnetic saturation coefficient 2 of iron core of AM 1	0.0–100.0%	68.0%	○
P02.13	Magnetic saturation coefficient 3 of iron core of AM 1	0.0–100.0%	57.0%	○
P02.14	Magnetic saturation coefficient 4 of iron core of AM 1	0.0–100.0%	40.0%	○
P02.15	Rated power of SM 1	0.1–3000.0kW	Model depended	◎
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (Max. frequency)	50.00Hz	◎
P02.17	Number of pole pairs of SM 1	1–128	2	◎
P02.18	Rated voltage of SM 1	0–1200V	Model depended	◎
P02.19	Rated current of SM 1	0.8–6000.0A	Model depended	◎
P02.20	Stator resistance of SM 1	0.001–65.535Ω	Model depended	○

Function code	Name	Description	Default	Modify
P02.21	Direct-axis inductance of SM 1	0.01–655.35mH	Model depended	○
P02.22	Quadrature-axis inductance of SM 1	0.01–655.35mH	Model depended	○
P02.23	Counter-emf of SM 1	0–10000	300	○
P02.24	Reserved	0x0000–0xFFFF	0x0000	●
P02.25	Reserved	0%–50.0% (of the motor rated current)	10%	●
P02.26	Overload protection of motor 1	0: No protection 1: Common motor protection (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: Variable-frequency motor protection (without low speed compensation). Because the heat dissipation function for a variable-frequency motor is not impacted by the rotation speed, it is not necessary to adjust the protection value at low speed running.	2	◎
P02.27	Overload protection coefficient of motor 1	Motor overload multiples M=Iout/(In*K) In is rated motor current, Iout is VFD output current, K is motor overload protection coefficient. A smaller value of "K" indicates a bigger value of "M". When M=116%, protection is performed after motor overload lasts for 1 hour; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M≥400%, protection is performed immediately.	100.0%	○

Function code	Name	Description	Default	Modify
		 Setting range: 20.0%–150.0%		
P02.28	Power display calibration coefficient of motor 1	The function code can be 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	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	0.000–30.000kgm^2	0.000 kgm^2	○
P02.31–P02.32	Reserved	0–65535	0	○

P03 group—Vector control of motor 1

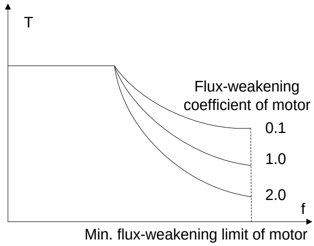
Function code	Name	Description	Default	Modify
P03.00	Speed-loop proportional gain 1	The parameters P03.00–P03.05 are applicable only to vector control mode. Below the switching frequency 1 (P03.02), the speed-loop PI parameters are: P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed-loop PI parameters are: P03.03 and P03.04. PI parameters are obtained according to the linear change of two groups of parameters. See the following figure:	20.0	○
P03.01	Speed-loop integral time 1		0.200s	○
P03.02	Low-point frequency for switching		5.00Hz	○
P03.03	Speed-loop proportional gain 2		20.0	○
P03.04	Speed-loop integral time 2		0.200s	○
P03.05	High-point frequency for		10.00Hz	○

Function code	Name	Description	Default	Modify
	switching	 The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time 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. PI parameters have a close relationship with the inertia of the system. Adjust PI parameters depending on different loads to meet various demands. P03.00 setting range: 0.0–200.0 P03.01 setting range: 0.000–10.000s P03.02 setting range: 0.00Hz–P03.05 P03.03 setting range: 0.0–200.0 P03.04 setting range: 0.000–10.000s P03.05 setting range: P03.02–P00.03 (Max. output frequency)		
P03.06	Speed-loop output filter	0–8 (corresponding to 0–2^8/10ms)	0	○
P03.07	Electromotive slip compensation coefficient of vector control	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	Braking slip compensation coefficient of vector control		100%	○

Function code	Name	Description	Default	Modify
P03.09	Current-loop proportional coefficient P	**Note:** 1. Note: The two function codes impact the dynamic response speed and control accuracy of the system. Generally, you do not need to modify the two function codes. 2. Applicable to SVC mode 0 (P00.00=0). 3. The values of the two function codes are updated automatically after SM parameter autotuning is completed. Setting range: 0–65535	1000	○
P03.10	Current-loop integral coefficient I		1000	○
P03.11	Torque setting method	0–1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDIA 6: Multi-step torque 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet communication 9: Ethernet communication 10: Pulse frequency HDIB 11: EtherCAT/PROFINET/EtherNet IP communication 12: Programmable expansion card **Note: For these settings, 100% corresponds to the motor rated current.**	0	○
P03.12	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	20.0%	○
P03.13	Torque reference filter time	0.000–10.000s	0.010s	○
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet	0	○

Function code	Name	Description	Default	Modify
		communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved **Note: For these settings, 100% corresponds to the maximum frequency.**		
P03.15	Setting source of reverse rotation upper-limit frequency in torque control	0: Keypad (P03.17) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Multi-step setting 6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: Pulse frequency HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved **Note: For these settings, 100% corresponds to the maximum frequency.**	0	○
P03.16	Forward rotation upper-limit frequency set through keypad in torque control	Used to set the frequency upper limits. 100% corresponds to the max. frequency. P03.16 sets the value when P03.14=1; P03.17 sets the value when P03.15=1. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control		50.00Hz	○
P03.18	Setting source of electromotive	0: Keypad (P03.20) 1: AI1	0	○

Function code	Name	Description	Default	Modify
	torque upper limit	2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable expansion card 11: Reserved **Note: For these settings, 100% corresponding to triple the motor rated current.**		
P03.19	Setting source of braking torque upper limit	0: Keypad (P03.21) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDIA 5: Modbus/Modbus TCP communication 6: PROFIBUS/CANopen/DeviceNet communication 7: Ethernet communication 8: Pulse frequency HDIB 9: EtherCAT/PROFINET/EtherNet IP communication 10: Programmable expansion card 11: Reserved **Note: For these settings, 100% corresponds to triple the motor rated current.**	0	○
P03.20	Electromotive torque upper limit set through keypad	Used to set torque limits. Setting range: 0.0–300.0% (of the motor rated current)	180.0%	○
P03.21	Braking torque upper limit set through keypad		180.0%	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P03.22</td><td>Weakening coefficient in constant power zone</td><td rowspan="2">Used when the AM is in flux-weakening control.


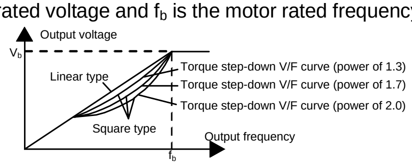
The function codes <u>P03.22</u> and <u>P03.23</u> are valid at constant power. The motor enters the flux-weakening state when the motor runs above the rated speed. Change the flux-weakening curvature by modifying the flux-weakening control coefficient. The larger the coefficient, the steeper the curve, the smaller the coefficient, the smoother the curve.
<u>P03.22</u> setting range: 0.1–2.0
<u>P03.23</u> setting range: 10% –100.0%</td><td>0.3</td><td>○</td></tr>
<tr><td>P03.23</td><td>Lowest weakening point in constant power zone</td><td>20%</td><td>○</td></tr>
<tr><td>P03.24</td><td>Max. voltage limit</td><td>This parameter sets the max. output voltage of the VFD, which is the percentage of motor rated voltage. Set the value according to onsite conditions.
Setting range: 0.0–120%</td><td>100.0%</td><td>○</td></tr>
<tr><td>P03.25</td><td>Pre-exciting time</td><td>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</td><td>0.300s</td><td>○</td></tr>
<tr><td>P03.26</td><td>Flux-weakening proportional gain</td><td>0–8000</td><td>1000</td><td>○</td></tr>
<tr><td>P03.27</td><td>Speed display selection in vector control</td><td>0: Display the actual value
1: Display the set value</td><td>0</td><td>○</td></tr>
<tr><td>P03.28</td><td>Static friction compensation coefficient</td><td>0.0–100.0%</td><td>0.0%</td><td>○</td></tr>
</table>

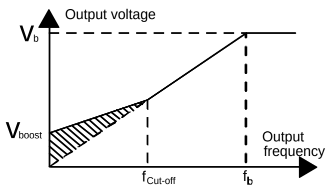
Function code	Name	Description	Default	Modify
P03.29	Corresponding frequency point of static friction	0.50Hz–P03.31	1.00Hz	○
P03.30	High speed friction compensation coefficient	0.0–100.0%	0.0%	○
P03.31	Corresponding frequency of high speed friction torque	P03.29–400.00Hz	50.00Hz	○
P03.32	Enabling torque control	0: Disable 1: Enable	0	◎
P03.33	Flux-weakening integral gain	0–8000	1200	○
P03.34	Flux-weakening control mode (reserved)	0x000–0x112 Ones place: Control mode selection 0: Mode 0 1: Mode 1 2: Mode 2 Tens place: Compensation of inductance saturation coefficient 0: Yes 1: No Hundreds place: Current loop feedforward compensation 0: Yes 1: No **Note:** In Mode 0, the weak magnetic current obtained from the weak magnetic curve is used for calculation of slip coefficient, and the filter time is fixed to 1 (Mode0 is stable). In Mode 1, the actual weak magnetic current is used for calculation of slip coefficient. The filter times depend on the mutual inductance and the rotor resistance. In Mode 2, the actual weak magnetic current is used for calculation of slip coefficient, and the filter time is fixed to 1.	0x000	○

Function code	Name	Description	Default	Modify
P03.35	Control optimization setting	Ones place: Reserved 0: Reserved 1: Reserved Tens place: Reserved 0: Reserved 1: Reserved Hundreds place: indicates whether to enable speed-loop integral separation 0: Disable 1: Enable Thousands place: Reserved 0: Reserved 1: Reserved Range: 0x0000–0x1111	0x0000	○
P03.36	Speed-loop differential gain	0.00–10.00s	0.00s	○
P03.37	High-frequency current-loop proportional coefficient	In the vector control mode, when the frequency is lower than the current-loop high-frequency switching threshold (P03.39), the current-loop PI parameters are P03.09 and P03.10; and when the frequency is higher than the current-loop high-frequency switching threshold, the current-loop PI parameters are P03.37 and P03.38. P03.37 setting range: 0–20000 P03.38 setting range: 0–20000 P03.39 setting range: 0.0–100.0% (of the max. frequency)	1000	○
P03.38	High-frequency current-loop integral coefficient		1000	○
P03.39	Current-loop high-frequency switching threshold		100.0%	○
P03.40	Enabling inertia compensation	0: Disable 1: Enable	0	○
P03.41	Upper limit of inertia compensation torque	The max. inertia compensation torque is limited to prevent inertia compensation torque from being too large. Setting range: 0.0–150.0% (of the motor rated torque)	10.0%	○
P03.42	Inertia compensation filter times	Filter times of inertia compensation torque, used to smooth inertia compensation torque. Setting range: 0–10	7	○

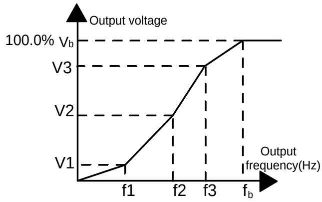
Function code	Name	Description	Default	Modify
P03.43	Inertia identification torque	Due to friction force, it is required to set certain identification torque for the inertia identification to be performed properly. 0.0–100.0% (of the motor rated torque)	10.0%	○
P03.44	Enabling inertia identification	0: No operation 1: Enable	0	◎
P03.45–P03.46	Reserved	0–65535	0	●

P04 group—V/F control

Function code	Name	Description	Default	Modify
P04.00	V/F curve setting of motor 1	This group of function code defines the V/F curve of motor 1 to meet the needs of different loads. 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. **Note:** In the following figure, V_b is the motor rated voltage and f_b is the motor rated frequency.  	0	◎

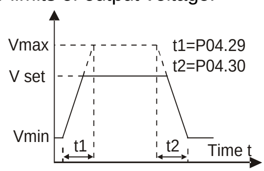
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P04.01</td><td>Torque boost of motor 1</td><td rowspan="2">In order to compensate for low-frequency torque characteristics, you can make some boost compensation for the output voltage. P04.01 is relative to the max. output voltage V_b.
P04.02 defines the percentage of cut-off frequency of manual torque boost to the rated motor frequency f_b. Torque boost can improve the low-frequency torque characteristics of V/F.
You need to select torque boost based on the load. For example, larger load requires larger torque boost, however, 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.
When torque boost is set to 0.0%, the VFD uses automatic torque boost.
Torque boost cut-off threshold: Below this frequency threshold, torque boost is valid; exceeding this threshold will invalidate torque boost.


P04.01 setting range: 0.0%: Automatic; 0.1%–10.0%
P04.02 setting range: 0.0% –50.0%</td><td>0.0%</td><td>○</td></tr>
<tr><td>P04.02</td><td>Torque boost cut-off of motor 1</td><td>20.0%</td><td>○</td></tr>
<tr><td>P04.03</td><td>V/F frequency point 1 of motor 1</td><td rowspan="4">When P04.00=1 (multi-dot V/F curve), you can set the V/F curve through P04.03–P04.08.
The V/F curve is generally set according to the load characteristics of the motor.
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.</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P04.04</td><td>V/F voltage point 1 of motor 1</td><td>0.0%</td><td>○</td></tr>
<tr><td>P04.05</td><td>V/F frequency point 2 of motor 1</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P04.06</td><td>V/F voltage point 2 of motor 1</td><td>0.0%</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P04.07	V/F frequency point 3 of motor 1	 Setting range of P04.03: 0.00Hz–P04.05 Setting range of P04.04: 0.0%–110.0% (of the rated voltage of motor 1) Setting range of P04.05: P04.03–P04.07 Setting range of P04.06: 0.0%–110.0% (of the rated voltage of motor 1) Setting range of P04.07: P04.05–P02.02 (Rated frequency of AM 1) or P04.05– P02.16 (Rated frequency of SM 1) Setting range of P04.08: 0.0%–110.0% (of the rated voltage of motor 1)	0.00Hz	○
P04.08	V/F voltage point 3 of motor 1		0.0%	○
P04.09	V/F slip compensation gain of motor 1	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. You need to calculate the rated slip frequency of the motor as follows: $\Delta f=f_b-n*p/60$ Of which, f_b is the rated frequency of the motor, corresponding to function code P02.02. n is the rated rotating speed of the motor, corresponding to function code P02.03. p is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency Δf of motor 1. 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	10	○
P04.11	High-frequency oscillation control factor of motor 1		10	○

Function code	Name	Description	Default	Modify
P04.12	Oscillation control threshold of motor 1	eliminate such phenomenon. P04.10 setting range: 0–100 P04.11 setting range: 0–100 P04.12 setting range: 0.00Hz–P00.03 (Max. output frequency)	30.00Hz	○
P04.13	V/F curve setting of motor 2	This group of function code defines the V/F curve of motor 2 to meet the needs of different loads. 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:** Refer to the description for P04.00.	0	◎
P04.14	Torque boost of motor 2	**Note:** Refer to the descriptions for P04.01 and P04.02. Setting range of P04.14: 0.0%: Automatic; 0.1%–10.0% Setting range of P04.15: 0.0%–50.0% (of the rated frequency of motor 2)	0.0%	○
P04.15	Torque boost cut-off of motor 2		20.0%	○
P04.16	V/F frequency point 1 of motor 2	**Note:** Refer to the descriptions for P04.03 and P04.08. Setting range of P04.16: 0.00Hz–P04.18 Setting range of P04.17: 0.0%–110.0% (of the rated voltage of motor 2) Setting range of P04.18: P04.16–P04.20 Setting range of P04.19: 0.0%–110.0% (of the rated voltage of motor 2) Setting range of P04.20: P04.18–P12.02 (Rated frequency of AM 2) or P04.18– P12.16 (Rated frequency of SM 2) Setting range of P04.21: 0.0%–110.0% (of the rated voltage of motor 2)	0.00Hz	○
P04.17	V/F voltage point 1 of motor 2		0.0%	○
P04.18	V/F frequency point 2 of motor 2		0.00Hz	○
P04.19	V/F voltage point 2 of motor 2		0.0%	○
P04.20	V/F frequency point 3 of motor 2		0.00Hz	○
P04.21	V/F voltage point 3 of motor 2		0.0%	○
P04.22	V/F slip compensation gain of motor 2	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	0.0%	○

Function code	Name	Description	Default	Modify
		the motor. You need to calculate the rated slip frequency of the motor as follows: $\Delta f = f_b - n*p/60$ Of which, f_b is the rated frequency of the motor 2, corresponding to function code P12.02. n is the rated rotating speed of the motor 2, corresponding to function code P12.03. p is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency Δf of motor 2. Setting range: 0.0–200.0%		
P04.23	Low-frequency oscillation control factor of motor 2	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 of P04.23: 0–100 Setting range of P04.24: 0–100 Setting range of P04.25: 0.00Hz–P00.03 (Max. output frequency)	10	○
P04.24	High-frequency oscillation control factor of motor 2		10	○
P04.25	Oscillation control threshold of motor 2		30.00Hz	○
P04.26	Energy-saving run	0: Disable 1: Automatic energy-saving run In light-load state, the motor can adjust the output voltage automatically to achieve energy saving.	0	◎
P04.27	Voltage setting channel	0: Keypad (The output voltage is determined by P04.28.) 1: AI1 2: AI2 3: AI3 4: HDIA 5: Multi-step speed running (The setting is determined by group P10.) 6: PID 7: Modbus/Modbus TCP communication 8: PROFIBUS/CANopen/DeviceNet	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>communication
9: Ethernet communication
10: HDIB
11: EtherCAT/PROFINET/EtherNet IP communication
12: Programmable expansion card
13: Reserved</td><td></td><td></td></tr>
<tr><td>P04.28</td><td>Voltage set through keypad</td><td>The function code is the voltage digital setting when "keypad" is selected as the voltage setting channel.
Setting range: 0.0%–100.0%</td><td>100.0%</td><td>○</td></tr>
<tr><td>P04.29</td><td>Voltage increase time</td><td rowspan="2">Voltage increase time means the time needed for the VFD to accelerate from min. output voltage to the max. output frequency.
Voltage decrease time means the time needed for the VFD to decelerate from the max. output frequency to min. output voltage.
Setting range: 0.0–3600.0s</td><td>5.0s</td><td>○</td></tr>
<tr><td>P04.30</td><td>Voltage decrease time</td><td>5.0s</td><td>○</td></tr>
<tr><td>P04.31</td><td>Max. output voltage</td><td rowspan="2">The function codes are used to set the upper and lower limits of output voltage.


P04.31 setting range: P04.32 –100.0% (of the motor rated voltage)
P04.32 setting range: 0.00Hz–P04.31</td><td>100.0%</td><td>◎</td></tr>
<tr><td>P04.32</td><td>Output min. voltage</td><td>0.0%</td><td>◎</td></tr>
<tr><td>P04.33</td><td>Weakening coefficient in constant power zone</td><td>1.00–1.30</td><td>1.00</td><td>○</td></tr>
<tr><td>P04.34</td><td>Pull-in current 1 in SM V/F control</td><td>When the SM VF control mode is enabled, the function code is used to set the reactive current of the motor when the output frequency is lower than the frequency specified by P04.36.
Setting range: -100.0%–+100.0% (of the motor rated current)</td><td>20.0%</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P04.35	Pull-in current 2 in SM V/F control	When the SM VF control mode is enabled, the function code is used to set the reactive current of the motor when the output frequency is higher than the frequency specified by P04.36. Setting range: -100.0%–+100.0% (of the motor rated current)	10.0%	○
P04.36	Frequency threshold for pull-in current switching in SM V/F control	When the SM V/F control mode is enabled, the function code is used to set the frequency threshold for the switching between pull-in current 1 and pull-in current 2. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P04.37	Reactive current closed-loop proportional coefficient in SM V/F control	When the SM V/F control mode is enabled, the function code is used to set the proportional coefficient of reactive current closed-loop control. Setting range: 0–3000	50	○
P04.38	Reactive current closed-loop integral time in SM V/F control	When the SM V/F control mode is enabled, the function code is used to set the integral coefficient of reactive current closed-loop control. Setting range: 0–3000	30	○
P04.39	Reactive current closed-loop output limit in SM VF control	When the SM V/F control mode is enabled, the function code is used to set the output limit of the reactive current closed-loop control. A greater value indicates a higher reactive closed-loop compensation voltage and higher output power of the motor. In general, you do not need to modify the function code. Setting range: 0–16000	8000	○
P04.40	Enabling IF mode for AM 1	0: Disable 1: Enable	0	◎
P04.41	Current setting in IF mode for AM 1	When IF control is adopted for AM 1, the function code is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%	○

Function code	Name	Description	Default	Modify
P04.42	Proportional coefficient in IF mode for AM 1	When IF control is adopted for AM 1, the function code is used to set the proportional coefficient of the output current closed-loop control. Setting range: 0–5000	350	○
P04.43	Integral coefficient in IF mode for AM 1	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. Setting range: 0–5000	150	○
P04.44	Frequency threshold for switching off IF mode for AM 1	When IF control is adopted for AM 1, the function code is used to set the frequency threshold for switching off the output current closed-loop control. When the frequency is lower than the value of the function code, the current closed-loop control in the IF control mode is enabled; and when the frequency is higher than that, the current closed-loop control in the IF control mode is disabled. Setting range: 0.00Hz–P04.50	10.00Hz	○
P04.45	Enabling IF mode for AM 2	0: Disable 1: Enable	0	◎
P04.46	Current setting in IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the output current. The value is a percentage in relative to the rated current of the motor. Setting range: 0.0–200.0%	120.0%	○
P04.47	Proportional coefficient in IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the proportional coefficient of output current closed-loop control. Setting range: 0–5000	350	○
P04.48	Integral coefficient in IF mode for AM 2	When IF control is adopted for AM 2, the function code is used to set the integral coefficient of output current closed-loop control. Setting range: 0–5000	150	○
P04.49	Frequency threshold for switching off IF	When IF control is adopted for AM 2, the function code is used to set the frequency threshold for switching off the output current closed-loop	10.00Hz	○

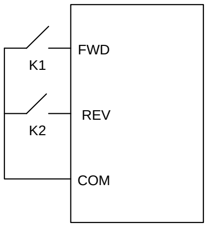
Function code	Name	Description	Default	Modify
	mode for AM 2	control. When the frequency is lower than the value of the function code, the current closed-loop control in the IF control mode is enabled; and when the frequency is higher than that, the current closed-loop control in the IF control mode is disabled. Setting range: 0.00Hz–P04.51		
P04.50	End frequency point for switching off IMVF mode for motor 1	P04.44–P00.03	25.00Hz	○
P04.51	End frequency point for switching off IMVF mode for motor 2	P04.49–P00.03	25.00Hz	○
P04.52	VF energy-saving mode selection	0: Max. efficiency 1: Optimal power factor 2: MTPA	0	○
P04.53	VF energy-saving gain coefficient	0.0%–400.0%	100.0%	○

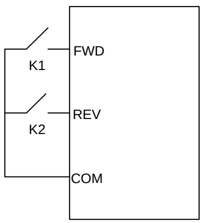
P05 group—Input terminals

Function code	Name	Description	Default	Modify
P05.00	HDI input type	0x00–0x11 Ones place: HDIA input type 0: HDIA is high-speed pulse input 1: HDIA is digital input Tens place: HDIB input type 0: HDIB is high-speed pulse input 1: HDIB is digital input	0x00	◎
P05.01	Function of S1	0–79 0: No function 1: Run forward 2: Run reversely 3: Three-wire running control 4: Jog forward	1	◎
P05.02	Function of S2		4	◎
P05.03	Function of S3		7	◎
P05.04	Function of S4		0	◎
P05.05	Function of HDIA		0	◎
P05.06	Function of HDIB		0	◎

Function code	Name	Description	Default	Modify
		5: Jog reversely 6: Coast to stop 7: Reset faults 8: Pause running 9: External fault input 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		

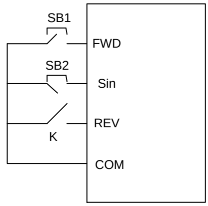
Function code	Name	Description	Default	Modify
		37: Switch the running command channel to terminal 38: Switch the running command channel to communication 39: Pre-exciting command 40: Clear electricity consumption 41: Keep electricity consumption 42: Switch the setting source of braking torque upper limit to keypad 43–55: Reserved 56: Emergency stop 57–72: Reserved 73: Enable RO output 1 74: Enable RO output 2 75: Brake release command input 76: Brake feedback signal 77: PTC overtemperature detection 78: MODBUS-PROFIBUS switchover (reserved) 79: Reserved **Note:** ● Only one of S4 terminal and Y1 terminal can be selected. ● For the function 34: DC braking, the current used in standby is the start braking current, and the current used in normal stop is the stop braking current.		
P05.07	Reserved	0–65535	0	●
P05.08	Input terminal polarity	The function code is used to set the polarity of input terminals. When a bit is 0, the input terminal is positive; when a bit is 1, the input terminal is negative. Setting range: 0x00–0x3F bit0:S1 bit1:S2 bit2:S3 bit3:S4 bit4:HDIA bit5:HDIB	0x00	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P05.09</td><td>Digital input filter time</td><td>The function code is used to set the filter time for S1–S4, HDIA, and HDIB. In strong interference cases, increase the value to avoid maloperation.
Setting range: 0.000–1.000s</td><td>0.010s</td><td>○</td></tr>
<tr><td>P05.10</td><td>Virtual terminal setting</td><td>0x00–0x3F (0: disable, 1: enable)
BIT0: S1 virtual terminal
BIT1: S2 virtual terminal
BIT2: S3 virtual terminal
BIT3: S4 virtual terminal
BIT4: HDIA virtual terminal
BIT5: HDIB virtual terminal</td><td>0x00</td><td>◎</td></tr>
<tr><td>P05.11</td><td>Terminal control mode</td><td>The function code is used to set the mode of terminal control.
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.


<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Reverse running</td></tr>
<tr><td>ON</td><td>ON</td><td>Hold</td></tr>
</table>
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.


<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Stop</td></tr>
<tr><td>ON</td><td>ON</td><td>Reverse running</td></tr>
</table>
2: Three-wire control 1. This mode defines Sin as the enabling terminal, and the running command is generated by FWD, while the</td><td>0</td><td>◎</td></tr>
</table>

<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>
direction is controlled by REV. During running, the Sin terminal needs to be closed, and terminal FWD generates a rising edge signal, then the VFD starts to run in the direction set by the state of terminal REV; the VFD needs to be stopped by disconnecting terminal Sin.

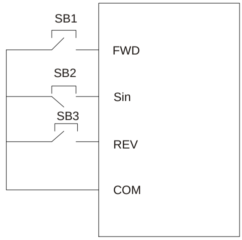


The direction control is as follows during running:

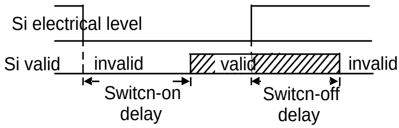
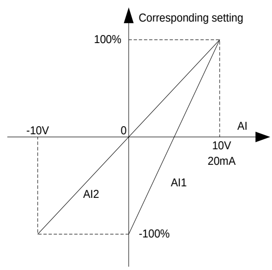
<table>
<tr><th>Sin</th><th>REV</th><th>Previous direction</th><th>Present direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>FWD run</td><td>REV run</td></tr>
<tr><td>REV run</td><td>FWD run</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">ON→OFF</td><td>REV run</td><td>FWD run</td></tr>
<tr><td>FWD run</td><td>REV run</td></tr>
<tr><td rowspan="2">ON→OFF</td><td>ON</td><td rowspan="2" colspan="2">Decelerate to stop</td></tr>
<tr><td>OFF</td></tr>
</table>

Sin: Three-wire control; FWD: Forward running; REV: Reverse running

3: Three-wire control 2. This mode defines Sin 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 Sin 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 Sin.
</td><td></td><td></td></tr>
</table>

<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>

<table>
<tr><th>Sin</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>Forward running</td></tr>
<tr><td>OFF</td><td>Forward running</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>
Sin: 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 valid STOP/RST stop during terminal control. (See <u>P07.04</u>.)</td><td></td><td></td></tr>
<tr><td>P05.12</td><td>S1 switch-on delay</td><td rowspan="7">Used to specify the delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.13</td><td>S1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.14</td><td>S2 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.15</td><td>S2 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.16</td><td>S3 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.17</td><td>S3 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.18</td><td>S4 switch-on delay</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P05.19	S4 switch-off delay	 Setting range: 0.000–50.000s **Note:** After a virtual terminal is enabled, the state of the terminal can be changed only in communication mode. The communication address is 0x200A.	0.000s	○
P05.20	HDIA switch-on delay		0.000s	○
P05.21	HDIA switch-off delay		0.000s	○
P05.22	HDIB switch-on delay		0.000s	○
P05.23	HDIB switch-off delay		0.000s	○
P05.24	AI1 lower limit	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 to different nominal values. See the descriptions of each application section for details. The following figure illustrates the cases of several settings:  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	0.00V	○
P05.25	Corresponding setting of AI1 lower limit		0.0%	○
P05.26	AI1 upper limit		10.00V	○
P05.27	Corresponding setting of AI1 upper limit		100.0%	○
P05.28	AI1 input filter time		0.030s	○
P05.29	AI2 lower limit		-10.00V	○
P05.30	Corresponding setting of AI2 lower limit		-100.0%	○
P05.31	AI2 middle value 1		0.00V	○
P05.32	Corresponding setting of AI2 middle value 1		0.0%	○
P05.33	AI2 middle value 2		0.00V	○
P05.34	Corresponding setting of AI2 middle value 2		0.0%	○
P05.35	AI2 upper limit		10.00V	○
P05.36	Corresponding setting of AI2 upper limit		100.0%	○
P05.37	AI2 input filter time		0.030s	○

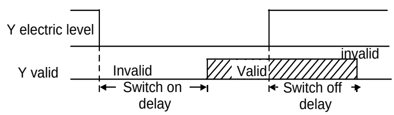
Function code	Name	Description	Default	Modify
		corresponding voltage of 20mA is 10V. AI2 supports the -10–+10V input. Setting range of P05.24: 0.00V–P05.26 Setting range of P05.25: -300.0% –300.0% Setting range of P05.26: P05.24–10.00V Setting range of P05.27: -300.0% –300.0% Setting range of P05.28: 0.000s–10.000s Setting range of P05.29: -10.00V–P05.31 Setting range of P05.30: -300.0% –300.0% Setting range of P05.31: P05.29–P05.33 Setting range of P05.32: -300.0% –300.0% Setting range of P05.33: P05.31–P05.35 Setting range of P05.34: -300.0% –300.0% Setting range of P05.35: P05.33–10.00V Setting range of P05.36: -300.0% –300.0% Setting range of P05.37: 0.000s–10.000s		
P05.38	HDIA high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Reserved	0	◎
P05.39	HDIA lower limit frequency	0.000kHz–P05.41	0.000 kHz	○
P05.40	Corresponding setting of HDIA lower limit frequency	-300.0%–300.0%	0.0%	○
P05.41	HDIA upper limit frequency	P05.39–50.000kHz	50.000 kHz	○
P05.42	Corresponding setting of HDIA upper limit frequency	-300.0%–300.0%	100.0%	○
P05.43	HDIA frequency input filter time	0.000s–10.000s	0.030s	○
P05.44	HDIB high-speed pulse input function selection	0: Set input via frequency 1: Reserved 2: Reserved	0	◎
P05.45	HDIB lower limit	0.000kHz–P05.47	0.000	○

Function code	Name	Description	Default	Modify
	frequency		kHz	
P05.46	Corresponding setting of HDIB lower limit frequency	-300.0%–300.0%	0.0%	○
P05.47	HDIB upper limit frequency	P05.45–50.000kHz	50.000 kHz	○
P05.48	Corresponding setting of HDIB upper limit frequency	-300.0%–300.0%	100.0%	○
P05.49	HDIB frequency input filter time	0.000s–10.000s	0.030s	○
P05.50	AI1 input signal type	0: Voltage 1: Current **Note:** You can set the AI1 input signal type through the corresponding function code.	0	◎
P05.51–P05.52	Reserved	0–65535	0	●
P05.53	AI0 lower limit	0.00V–P05.55	0.00V	○
P05.54	Corresponding setting of AI0 lower limit	-300.0%–300.0%	0.0%	○
P05.55	AI0 upper limit	P05.53–10.00V	10.00V	○
P05.56	Corresponding setting of AI0 upper limit	-300.0%–300.0%	100.0%	○
P05.57	AI0 input filter time	0.000–10.000s	0.030s	○

P06 group—Output terminals

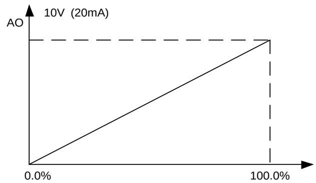
Function code	Name	Description	Default	Modify
P06.00	HDO output type	0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, see P06.27–P06.31. 1: Open collector output. For details about the related functions, see P06.02.	0	◎

Function code	Name	Description	Default	Modify
P06.01	Y1 output	0–60 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 11: Lower limit frequency 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 30–32: Reserved 33: Speed limit reached in torque control 34: EtherCAT/PROFINET/EtherNet IP communication virtual terminal output	0	○
P06.02	HDO output		0	○
P06.03	RO1 output		1	○
P06.04	RO2 output		5	○

<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>35: Reserved
36: Speed/position control switchover completed
37: Any frequency reached
38–40: Reserved
41: Y1 from the programmable card
42: Y2 from the programmable card
43: HDO from the programmable card
44: RO1 from the programmable card
45: RO2 from the programmable card
46: RO3 from the programmable card
47: RO4 from the programmable card
48: Auxiliary motor 1 startup
49: Auxiliary motor 2 startup
50: Remote brake (DP communication)
51: PT100 pre-alarm
52: PT1000 pre-alarm
53: OFF1 main contactor actuation
54: S terminal input 1 is valid
55: S terminal input 2 is valid
56: Brake release command action
57–60: Reserved</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Output terminal polarity selection</td><td>The function code is used to set the polarity of output terminals.
When a bit is 0, the output terminal is positive; when a bit is 1, the output terminal is negative.<table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO2</td><td>RO1</td><td>HDO</td><td>Y1</td></tr></table>Setting range: 0x00–0x0F</td><td>0x00</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y1 switch-on delay</td><td rowspan="5">The function codes specify the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off.
</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.08</td><td>HDO switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.09</td><td>HDO switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.10</td><td>RO1 switch-on delay</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P06.11	RO1 switch-off delay	Setting range: 0.000–50.000s **Note:** P06.08 and P06.09 are valid only when P06.00=1.	0.000s	○
P06.12	RO2 switch-on delay		0.000s	○
P06.13	RO2 switch-off delay		0.000s	○
P06.14	AO1 output selection	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 13: High-speed pulse HDIA input 14: Value 1 set through Modbus/Modbus TCP communication 15: Value 2 set through Modbus/Modbus TCP communication 16: Value 1 set through PROFIBUS/CANopen/DeviceNet communication 17: Value 2 set through PROFIBUS/CANopen/DeviceNet communication	0	○
P06.15	AO0 output		0	○
P06.16	HDO high-speed pulse output		0	○

Function code	Name	Description	Default	Modify
		18: Value 1 set through Ethernet communication 19: Value 2 set through Ethernet communication 20: High-speed pulse HDIB input 21: Value 1 set through EtherCAT/PROFINET/EtherNet IP communication 22: Torque current (100% corresponds to triple the motor rated current) 23: Exciting current (100% corresponds to triple the motor rated current) 24: Set frequency (bipolar) 25: Ramp reference frequency (bipolar) 26: Rotational speed (bipolar) 27: Value 2 set through EtherCAT/PROFINET/EtherNet IP communication 28: AO1 from PLC 29: AO2 from PLC 30: Rotational speed 31–47: Reserved 48: Keypad (for small power models) **Note:** When AO1 uses current output, 100% indicates the output of 20mA; when AO1 uses voltage output, 100% indicates the output of 10V. For HDO, 100% indicates the output specified by P06.30.		
P06.17	AO1 output lower limit	The function codes 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.	0.0%	○
P06.18	AO1 output corresponding to lower limit		0.00V	○
P06.19	AO1 output upper limit		100.0%	○
P06.20	AO1 output corresponding to upper limit		10.00V	○
P06.21	AO1 output filter time		0.000s	○

Function code	Name	Description	Default	Modify
		 Setting range of P06.17: -300.0%–P06.19 Setting range of P06.18: 0.00V–10.00V Setting range of P06.19: P06.17–300.0% Setting range of P06.20: 0.00V–10.00V Setting range of P06.21: 0.000s–10.000s		
P06.22	AO0 output lower limit	-300.0%–P06.24	0.0%	○
P06.23	AO0 output corresponding to lower limit	0.00–10.00V	0.00V	○
P06.24	AO0 output upper limit	P06.22–300.0%	100.0%	○
P06.25	AO0 output corresponding to upper limit	0.00–10.00V	10.00V	○
P06.26	AO0 output filter time	0.000–10.000s	0.000s	○
P06.27	HDO output lower limit	-100.0%– P06.29	0.00%	○
P06.28	HDO output corresponding to lower limit	0.00–50.00kHz	0.00kHz	○
P06.29	HDO output upper limit	P06.27–100.0%	100.0%	○
P06.30	HDO output corresponding to upper limit	0.00–50.00Hz	50.00 kHz	○
P06.31	HDO output filter time	0.000s–10.000s	0.000s	○
P06.32	Reserved	0–65535	0	●

Function code	Name	Description	Default	Modify
P06.33	Detection value for frequency being reached	0.00Hz–P00.03	1.00Hz	○
P06.34	Frequency reaching detection time	0.0–3600.0s	0.5s	○

P07 group—Human-machine interface

Function code	Name	Description	Default	Modify
P07.00	User password	0–65535 When you set the function code to a non-zero 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 is set and takes effect, you cannot enter the parameter menu if you enter an incorrect password. 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. **Note:** Restoring the default values may delete the user password. Exercise caution when using this function.	0	○
P07.01	Parameter copy	Range: 0–4 0: No operation 1: Upload parameters to the keypad 2: Download all parameters (including motor parameters) 3: Download non-motor parameters 4: Download motor parameters	0	◎

Function code	Name	Description	Default	Modify
P07.02	Key function selection	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 QUICK	When P07.02=6, set the sequence of switching running-command channels by pressing this key. 0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	0	○
P07.04	Stop function validity of STOP/RST	Used to specify the stop function validity of STOP/RST. For fault reset, STOP/RST is valid in any conditions. 0: Valid only for keypad control 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	Range: 0x0000–0xFFFF BIT0: Running frequency (HZ on) BIT1: Set frequency (HZ On) BIT2: 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 (% on) BIT9: PID feedback value (% on) BIT10: Input terminal status	0x03FF	○

Function code	Name	Description	Default	Modify
		BIT11: Output terminal status BIT12: Set torque (% on) BIT13: Pulse count value BIT 4: Motor overload percentage (% on) BIT15: PLC and current step number of multi-step speed		
P07.06	Selection 2 of parameters displayed in running state	Range: 0x0000–0xFFFF BIT0: AI1 (V on) BIT1: AI2 (V on) BIT2: AI3 (V on) BIT3: High-speed pulse HDIA frequency BIT4: Reserved BIT5: VFD overload percentage (% on) BIT6: Ramp frequency reference (HZ on) BIT7: Linear speed BIT8: AC incoming current (A on) BIT9: Upper limit frequency (HZ on) BIT10: AI0 (V on)	0x0000	○
P07.07	Selection of parameters displayed in stopped state	0x0000–0xFFFF BIT0: Set frequency (HZ On) BIT1: Bus voltage (V on) BIT2: Input terminal state BIT3: Output terminal state BIT4: PID reference value (% on) BIT5: PID feedback value (% on) BIT6: Set torque (% on) BIT7: AI1 (V on) BIT8: AI2 (V on) BIT9: AI3 (V on) BIT10: High-speed pulse HDIA frequency BIT11: Reserved BIT12: Pulse count value BIT13: PLC and current step number of multi-step speed BIT14: Upper limit frequency (HZ on) BIT15: AI0 (V on)	0x00FF	○
P07.08	Frequency display coefficient	Range: 0.01–10.00 Display frequency = Running frequency * P07.08	1.00	○

Function code	Name	Description	Default	Modify
P07.09	Rotational speed display coefficient	Range: 0.1–999.9% Mechanical rotation speed = 120 * (Displayed running frequency) * P07.09/(Number of motor pole pairs)	100.0%	○
P07.10	Linear speed display coefficient	Range: 0.1–999.9% Linear speed=(Mechanical rotation speed) * P07.10	1.0%	○
P07.11	Rectifier bridge temperature	-20.0–120.0°C	0.0°C	●
P07.12	Inverter module temperature	-20.0–120.0°C	0.0°C	●
P07.13	Control board software version	1.00–655.35	Model depended	●
P07.14	Local accumulative running time	0–65535h	0 h	●
P07.15	VFD electricity consumption MSB	Used to display the electricity consumption of the VFD. VFD electricity consumption = P07.15*1000 + P07.16 Setting range of P07.15: 0–65535 kWh (*1000) Setting range of P07.16: 0.0–999.9 kWh	0 kWh	●
P07.16	VFD electricity consumption LSB		0.0 kWh	●
P07.17	VFD type	0: G type 1: P type	0	●
P07.18	VFD rated power	0.4–3000.0kW	0.4kW	●
P07.19	VFD rated voltage	50–1200V	380V	●
P07.20	VFD rated current	0.1–6000.0A	0.1A	●
P07.21	Factory bar code 1	0x0000–0xFFFF	0xFFFF	●
P07.22	Factory bar code 2	0x0000–0xFFFF	0xFFFF	●
P07.23	Factory bar code 3	0x0000–0xFFFF	0xFFFF	●
P07.24	Factory bar code 4	0x0000–0xFFFF	0xFFFF	●
P07.25	Factory bar code 3	0x0000–0xFFFF	0xFFFF	●
P07.26	Factory bar code 4	0x0000–0xFFFF	0xFFFF	●
P07.27	Present fault type	0–79 0: No fault 1: Inverter unit U-phase protection (OUt1) 2: Inverter unit V-phase protection (OUt2)	0	●
P07.28	Last fault type		0	●
P07.29	2nd-last fault type		0	●
P07.30	3rd-last fault type		0	●

Function code	Name	Description	Default	Modify
P07.31	4th-last fault type	3: Inverter unit W-phase protection (OUt3)	0	●
P07.32	5th-last fault type	4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed running (OC3) 7: Overvoltage during acceleration (OV1) 8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed running (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: VFD overload (OL2) 13: Phase loss on input side (SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheat (OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: Modbus/Modbus TCP communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation error (EEP) 22: PID feedback offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time reached (END) 25: Electronic overload (OL3) 26: Keypad communication error (PCE) 27: Parameter upload error (UPE) 28: Parameter download error (DNE) 29: PROFIBUS communication fault (E_dP) 30: Ethernet communication fault (E-NET) 31: CANopen communication fault (E-CAN) 32: To-ground short-circuit fault 1 (ETH1) 33: To-ground short-circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Mal-adjustment fault (STo) 36: Underload fault (LL) 37–44: Reserved	0	●

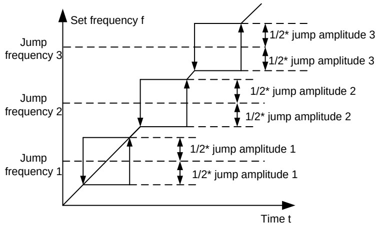
Function code	Name	Description	Default	Modify
		45: Programmable card customized fault 1 (P-E1) 46: Programmable card customized fault 2 (P-E2) 47: Programmable card customized fault 3 (P-E3) 48: Programmable card customized fault 4 (P-E4) 49: Programmable card customized fault 5 (P-E5) 50: Programmable card customized fault 6 (P-E6) 51: Programmable card customized fault 7 (P-E7) 52: Programmable card customized fault 8 (P-E8) 53: Programmable card customized fault 9 (P-E9) 54: Programmable card customized fault 10 (P-E10) 55: Duplicate expansion card type (E-Err) 56: Encoder UVW lost (ENCUV) 57: PROFINET communication timeout fault (E-PN) 58: CAN communication timeout (SECAN) 59: Motor overtemperature fault (OT) 60: Failure to identify the card at slot 1 (F1-Er) 61: Failure to identify the card at slot 2 (F2-Er) 62: Reserved 63: Communication timeout of the card at slot 1 (C1-Er) 64: Communication timeout of the card at slot 2 (C2-Er) 65: Reserved 66: EtherCAT communication timeout fault (E-CAT) 67: BACnet communication timeout fault (E-BAC)		

Function code	Name	Description	Default	Modify
		68: DeviceNet communication timeout fault (E-DEV) 69: CAN slave fault in master/slave synchronization (S-Err) 70: Expansion card PT100 overtemperature (OtE1) 71: Expansion card PT1000 overtemperature (OtE2) 72: EtherNet IP communication timeout fault (E-EIP) 73: Brake feedback signal error (E-brF) 74: Motor OH (E-OHt) 75–79: Reserved		
P07.33	Running frequency at present fault	0.00–630.00Hz	0.00Hz	●
P07.34	Ramp reference frequency at present fault	0.00–630.00Hz	0.00Hz	●
P07.35	Output current at present fault	0–1200V	0V	●
P07.36	Output current at present fault	0.0–6300.0A	0.0A	●
P07.37	Bus voltage at present fault	0.0–2000.0V	0.0V	●
P07.38	Max. temperature at present fault	-20.0–120.0°C	0.0°C	●
P07.39	Input terminal status at present fault	0x0000–0xFFFF	0x0000	●
P07.40	Output terminal status at present fault	0x0000–0xFFFF	0x0000	●
P07.41	Running frequency at last fault	0.00–630.00Hz	0.00Hz	●

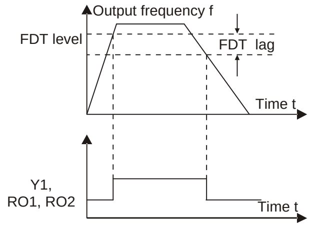
Function code	Name	Description	Default	Modify
P07.42	Ramp reference frequency at last fault	0.00–630.00Hz	0.00Hz	●
P07.43	Output voltage at last fault	0–1200V	0V	●
P07.44	Output current at last fault	0.0–6300.0A	0.0A	●
P07.45	Bus voltage at last fault	0.0–2000.0V	0.0V	●
P07.46	Max. temperature at last fault	-20.0–120.0°C	0.0°C	●
P07.47	Input terminal status at last fault	0x0000–0xFFFF	0	●
P07.48	Output terminal status at last fault	0x0000–0xFFFF	0	●
P07.49	Running frequency at 2nd-last fault	0.00–630.00Hz	0.00Hz	●
P07.50	Ramp reference frequency at 2nd-last fault	0.00–630.00Hz	0.00Hz	●
P07.51	Output voltage at 2nd-last fault	0–1200V	0V	●
P07.52	Output current at 2nd-last fault	0.0–6300.0A	0.0A	●
P07.53	Bus voltage at 2nd-last fault	0.0–2000.0V	0.0V	●
P07.54	Max. temperature at 2nd-last fault	-20.0–120.0°C	0.0°C	●
P07.55	Input terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000	●
P07.56	Output terminal status at 2nd-last fault	0x0000–0xFFFF	0x0000	●

P08 group—Enhanced functions

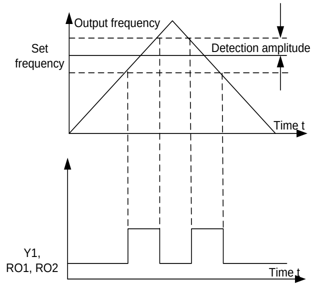
Function code	Name	Description	Default	Modify
P08.00	ACC time 2	For details, see P00.11 and P00.12. The VFD has four groups of ACC/DEC time, which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group. Setting range: 0.0–3600.0s	Model depended	○
P08.01	DEC time 2		Model 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	○
P08.06	Running frequency of jog	The function code is used to define the reference frequency during jogging. Setting range: 0.00Hz–P00.03 (Max. output frequency)	5.00Hz	○
P08.07	ACC time for jogging	ACC time for jogging means the time needed for the VFD to accelerate from 0Hz to the max. output frequency (P00.03). DEC time for jogging means the time needed for the VFD to decelerate from the max. output frequency (P00.03) to 0Hz. Setting range: 0.0–3600.0s	Model depended	○
P08.08	DEC time for jogging		Model depended	○
P08.09	Jump frequency 1	When the set frequency is within the range of jump frequency, the VFD runs at the boundary of jump frequency. The VFD can avoid mechanical resonance points by setting jump frequencies. The VFD supports the setting of three jump frequencies. If the jump frequency points are set to 0, this function is invalid.	0.00Hz	○
P08.10	Jump frequency amplitude 1		0.00Hz	○
P08.11	Jump frequency 2		0.00Hz	○
P08.12	Jump frequency amplitude 2		0.00Hz	○
P08.13	Jump frequency 3		0.00Hz	○
P08.14	Jump frequency amplitude 3		0.00Hz	○

Function code	Name	Description	Default	Modify
		 Setting range: 0.00Hz–P00.03 (Max. output frequency)		
P08.15	Amplitude of wobbling frequency	0.0–100.0% (of the set frequency)	0.0%	○
P08.16	Amplitude of sudden jump frequency	0.0–50.0% (of the amplitude of wobbling frequency)	0.0%	○
P08.17	Rise time of wobbling frequency	0.1–3600.0s	5.0s	○
P08.18	Fall time of wobbling frequency	0.1–3600.0s	5.0s	○
P08.19	Switching frequency of ACC/DEC time	Range: 0.00–P00.03(Max. frequency) 0.00Hz: No switchover If the running frequency is greater than P08.19, switch to ACC/DEC time 2.	0.00Hz	○
P08.20	Frequency threshold of the start of droop control	0.00–50.00Hz	2.00Hz	○
P08.21	Reference frequency of ACC/DEC time	0: Max. output frequency 1: Set frequency 2: 100Hz **Note:** Valid only for straight-line ACC/DEC.	0	◎
P08.22	Output torque calculation method	0: Based on torque current 1: Based on output power	0	○
P08.23	Number of decimal points of frequency	0: Two 1: One	0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P08.24</td><td>Number of decimal points of linear speed</td><td>0: No decimal point
1: One
2: Two
3: Three</td><td>0</td><td>○</td></tr>
<tr><td>P08.25</td><td>Set counting value</td><td>P08.26–65535</td><td>0</td><td>○</td></tr>
<tr><td>P08.26</td><td>Designated counting value</td><td>0–P08.25</td><td>0</td><td>○</td></tr>
<tr><td>P08.27</td><td>Set running time</td><td>0–65535min</td><td>0min</td><td>○</td></tr>
<tr><td>P08.28</td><td>Auto fault reset count</td><td rowspan="2">Auto fault reset count: When the VFD uses automatic fault reset, it is used to set the number of automatic fault reset times. When the number of continuous reset times exceeds the value, the VFD reports a fault and stops.
Auto fault reset interval: Time interval from when a fault occurred to when automatic fault reset takes effect.
After VFD starts, If no fault occurred within 600s after the VFD starts, the number of automatic fault reset times is cleared.
Setting range of P08.28: 0–10
Setting range of P08.29: 0.1–3600.0s</td><td>0</td><td>○</td></tr>
<tr><td>P08.29</td><td>Auto fault reset interval</td><td>1.0s</td><td>○</td></tr>
<tr><td>P08.30</td><td>Frequency decrease ratio in drop control</td><td>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.
Setting range: 0.00–50.00Hz</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P08.31</td><td>Channel for switching between motor 1 and motor 2</td><td>Range: 0x00–0x14
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
Tens place: indicates whether to enable switchover during running</td><td>0x00</td><td>◎</td></tr>
</table>

<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>0: Disable
1: Enable</td><td></td><td></td></tr>
<tr><td>P08.32</td><td>FDT1 electrical level detection value</td><td rowspan="4">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 of P08.32: 0.00Hz–P00.03 (Max. output frequency)
Setting range of P08.33: 0.0–100.0% (FDT1 electrical level)
Setting range of P08.34: 0.00Hz–P00.03 (Max. output frequency)
Setting range of P08.35: 0.0–100.0% (FDT2 electrical level)</td><td>50.00Hz</td><td>○</td></tr>
<tr><td>P08.33</td><td>FDT1 lagging detection value</td><td>5.0%</td><td>○</td></tr>
<tr><td>P08.34</td><td>FDT2 electrical level detection value</td><td>50.00Hz</td><td>○</td></tr>
<tr><td>P08.35</td><td>FDT2 lagging detection value</td><td>5.0%</td><td>○</td></tr>
<tr><td>P08.36</td><td>Detection value for frequency being reached</td><td>When the output frequency is within the detection range, the multifunction digital output terminal outputs the signal of "Frequency reached".</td><td>0.00Hz</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		 Setting range: 0.00Hz–P00.03 (Max. output frequency)		
P08.37	Enabling dynamic braking	0: Disable 1: Enable	0	○
P08.38	Dynamic braking threshold voltage	The function code is used to set the starting bus voltage of energy consumption braking. Adjust this value properly to achieve effective braking for the load. The default value varies depending on the voltage class. Setting range: 200.0–2000.0V	700.0V	○
P08.39	Cooling-fan running and speed regulation mode	Range: 0x0100–0x0101 Ones place: Run mode 0: Normal mode 1: Permanent running after power-on Tens place: Speed regulation mode 0: Reserved Hundreds place: 0: Reserved 1: Automatic speed regulation Thousands place: Reserved	0x0100	○
P08.40	PWM selection	Range: 0x0000–0x1121 Ones place: PWM mode selection 0: PWM mode 1, 3PH modulation and 2PH modulation 1: PWM mode 2, 3PH modulation Tens place: PWM low-speed carrier frequency limit 0: Low-speed carrier limit mode 1	0x1101	◎

Function code	Name	Description	Default	Modify
		1: Low-speed carrier limit mode 2 2: No limit Hundreds place: Deadzone compensation method 0: Compensation method 1 1: Compensation method 2 Thousands place: PWM loading mode selection 0: Interruptive loading 1: Normal loading		
P08.41	Overmodulation selection	Range: 0x0000–0x1111 Ones place: Overmodulation enabling 0: Disable 1: Enable Tens place: Overmodulation mode 0: Mild overmodulation 1: Deepened overmodulation Hundreds place: Carrier frequency limit 0:Yes 1:No Thousands place: Output voltage compensation 0: No 1: Yes	0x1000	◎
P08.42	LED keypad digit control setting	Range: 0x0000–0x1223 Ones place: Frequency control enabling selection 0: Controls through both the ∧/∨ key and digital potentiometer are valid. 1: Only control through the ∧/∨ key is valid. 2: Only control through the digital potentiometer is valid. 3: Controls through the ∧/∨ key and digital potentiometer are 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	0x0000	○

Function code	Name	Description	Default	Modify
		0: Setting is valid. 1: Valid during running, cleared after stop 2: Valid during running, cleared after a stop command is received Thousands place: Indicates whether to enable the integral function through the ∧/∨ key and digital potentiometer. 0: Enable the integral function 1: Disable the integral function		
P08.43	LED keypad digital potentiometer integral rate	0.01–10.00s	0.10s	○
P08.44	UP/DOWN terminal control 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 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	Frequency increment integral rate of the UP terminal	0.01–50.00Hz/s	0.50Hz/s	○
P08.46	Frequency integral rate of the DOWN terminal	0.01–50.00Hz/s	0.50Hz/s	○
P08.47	Action selection at power-off during frequency setting	0x000–0x111 Ones place: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off.	0x000	○

Function code	Name	Description	Default	Modify
		1: Clear the setting at power-off. 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 adjusting through other communication methods 0: Save the setting at power-off. 1: Clear the setting at power-off.		
P08.48	Initial electricity consumption MSB	Used to set the initial electricity consumption. Initial electricity consumption = P08.48*1000 + P08.49 Setting range of P08.48: 0–59999kWh (k) Setting range of P08.49: 0.0–999.9kWh	0kWh	○
P08.49	Initial electricity consumption LSB		0.0kWh	○
P08.50	Magnetic flux braking	The function code is used to enable magnetic flux braking. 0: Invalid 100–150: A larger coefficient indicates stronger braking. The VFD can quickly slow down the motor by increasing the magnetic flux. The energy generated by the motor during braking can be transformed into heat energy by increasing the magnetic flux. The VFD monitors the state of the motor continuously even during the magnetic flux period. Magnetic flux braking can be used for motor stop, as well as for motor rotation speed change. The other advantages include: Braking is performed immediately after the stop command is given. The braking can be started without waiting for magnetic flux weakening. The cooling is better. The current of the stator other than the rotor increases during magnetic flux braking, while the cooling of the stator is more effective than the rotor.	0	○
P08.51	VFD input power	This function code is used to adjust the current	0.56	○

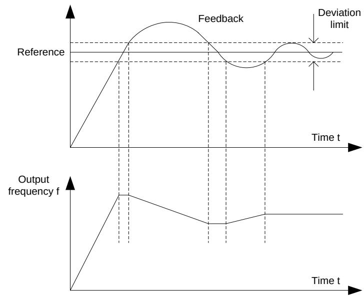
Function code	Name	Description	Default	Modify
	factor	display value on the AC input side. 0.00–1.00		
P08.52	Reserved	/	/	/
P08.53	Upper limit frequency bias value in torque control	0.00Hz–P00.03 (Max. frequency) Note: Valid only for torque control.	0.00Hz	○
P08.54	Upper limit frequency ACC/DEC selection in torque control	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	○
P08.55	Enabling auto carrier frequency reduction	0–1 0: Disable 1: Enable	0	○
P08.56	Temperature point of auto carrier frequency reduction	40.0–80.0°C	65.0°C	○
P08.57	Interval of carrier frequency reduction	0–30min	10min	○

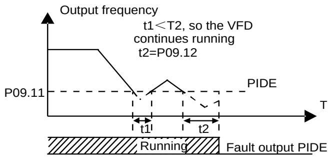
P09 group— PID control

Function code	Name	Description	Default	Modify
P09.00	PID reference source	When frequency command selection (P00.06, P00. 07) is 7, or channel of voltage setup (P04.27) is 6, the running mode of VFD is process PID control. The function code determines the target given channel during the PID process. 0: Set by P09.01 1: AI1 2: AI2 3: AI3 4: High-speed pulse HDIA 5: Multi-step running	0	○

Function code	Name	Description	Default	Modify
		6: Modbus/Modbus TCP communication 7: PROFIBUS/CANopen/DeviceNet communication 8: Ethernet communication 9: High-speed pulse HDIB 10: EtherCAT/PROFINET/EtherNet IP communication 11: Programmable expansion card 12: Reserved 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 (0–100.0%).		
P09.01	PID digital setting	The function code is mandatory when P09.00=0. The base value of The function code is the feedback of the system. Setting range: -100.0%–100.0%	0.0%	○
P09.02	PID feedback source	The function code is used to select the PID feedback channel. 0: AI1 1: AI2 2: AI3 3: High-speed pulse HDIA 4: Modbus/Modbus TCP communication 5: PROFIBUS/CANopen/DeviceNet communication 6: Ethernet communication 7: High-speed pulse HDIB 8: EtherCAT/PROFINET/EtherNet IP communication 9: Programmable expansion card 10: Reserved **Note:** The reference channel and feedback channel cannot be duplicate. Otherwise, effective PID control cannot be achieved.	0	○
P09.03	PID output characteristics	0: PID output is positive. When the feedback signal is greater than the PID reference value,	0	○

Function code	Name	Description	Default	Modify
	selection	the output frequency of the VFD will decrease to balance the PID. Example: PID control on strain during unwinding. 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 strain during unwinding.		
P09.04	Proportional gain (Kp)	The function is applied to the proportional gain P of PID input. P determines the strength of the whole PID adjuster. 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). Setting range: 0.00–100.00	1.80	○
P09.05	Integral time (Ti)	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 (ignoring proportional and differential function) to achieve the max. output frequency (P00.03) or the max. voltage (P04.31). Shorter integral time indicates stronger adjustment. Setting range: 0.00–10.00s	0.90s	○
P09.06	Differential time (Td)	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 (ignoring proportional and integral function) is the max. output frequency (P00.03) or the max.	0.00s	○

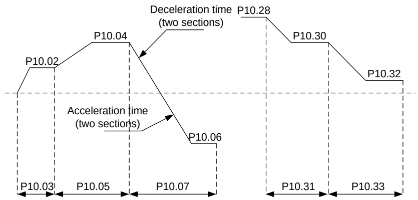
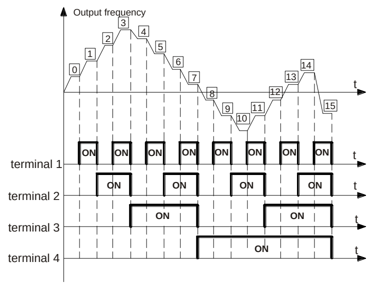
Function code	Name	Description	Default	Modify
		voltage (P04.31). Longer differential time indicates stronger adjustment. Setting range: 0.00–10.00s		
P09.07	Sampling cycle (T)	Used to indicate the sampling cycle of feedback. The regulator calculates in each sampling cycle. A longer sampling cycle indicates slower response. Setting range: 0.001–1.000s	0.001s	○
P09.08	PID control deviation limit	The output of the PID system is relative to the max. deviation of the closed loop reference. As shown in the following figure, the PID regulator stops regulating in the range of deviation limit. Set the function parameter properly to adjust the accuracy and stability of the PID system.  Setting range: 0.0–100.0%	0.0%	○
P09.09	PID output upper limit	The function codes are used to set the upper and lower limits of PID regulator output values. 100.0% corresponds to the max. output frequency (P00.03) or max. voltage (P04.31). P09.09 setting range: P09.10—100.0% P09.10 setting range: -100.0%–P09.09	100.0%	○
P09.10	PID output lower limit		0.0%	○
P09.11	Feedback offline detection value	Used to set the PID feedback offline detection value. 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" and the keypad displays PIDE.	0.0%	○
P09.12	Feedback offline detection time		1.0s	○

Function code	Name	Description	Default	Modify
		 P09.11 setting range: 0.0–100.0% P09.12 setting range: 0.0–3600.0s		
P09.13	PID control selection	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 buffering is invalid. 1: A+B frequency. ACC/DEC of main reference A frequency source buffering is valid. The ACC/DEC is determined by P08.04 (ACC time 4).	0x0001	○
P09.14	Low frequency proportional gain (Kp)	Range: 0.00–100.00 Low-frequency switching point: 5.00Hz, high-frequency switching point: 10.00Hz (P09.04 corresponds to high-frequency parameter), and the middle is the linear interpolation between these two points.	1.00	○
P09.15	ACC/DEC time of PID command	0.0–1000.0s	0.0s	○
P09.16	PID output filter time	0.000–10.000s	0.000s	○
P09.17	Reserved	/	/	/
P09.18	Low frequency integral time	Same as the description for P09.05 Setting range: 0.00–10.00s	0.90s	○
P09.19	Low frequency	Same as the description for P09.06	0.00s	○

Function code	Name	Description	Default	Modify
	differential time	Setting range: 0.00–10.00s		
P09.20	Low frequency point for PID parameter switching	P09.20 setting range: 0.00–P09.21 P09.21 setting range: P09.20–P00.03	5.00Hz	○
P09.21	High frequency point for PID parameter switching		10.00Hz	○
P09.22–P09.28	Reserved	/	/	/

P10 group—Simple PLC and multi-step speed control

Function code	Name	Description	Default	Modify
P10.00	Simple PLC mode	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	0: Do not memorize at power outage 1: Memory after power-off. The PLC memories its running stage and running frequency before power-off.	0	○
P10.02	Multi-step speed 0	Frequency setting range for steps from step 0 to step 15: -100.0–100.0%. 100.0% corresponds to the max. output frequency P00.03. Running time setting range for steps from step 0 to step 15: 0.0–6553.5s(min). The time unit is specified by P10.37. When simple PLC operation is selected, it is required to set P10.02–P10.33 to determine the running frequency and running time of each step.	0.0%	○
P10.03	Running time of		0.0s (min)	○

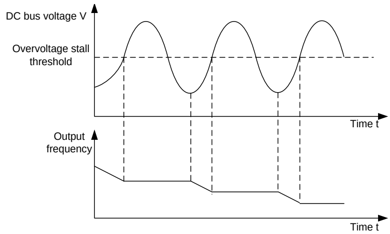
Function code	Name	Description	Default	Modify
	step 0	**Note: The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running.**  When selecting multi-step speed running, the multi-step speed is within the range of -fmax–fmax, and it can be set continuously. The start/stop of multi-step stop running is also determined by P00.01. The VFD supports the setting of 16-step speed, which are set by combined codes of multi-step terminals 1–4 set by S terminals, corresponding to function code P05.01–P05.06) 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,		
P10.04	Multi-step speed 1		0.0%	○
P10.05	Running time of step 1		0.0s (min)	○
P10.06	Multi-step speed 2		0.0%	○
P10.07	Running time of step 2		0.0s (min)	○
P10.08	Multi-step speed 3		0.0%	○
P10.09	Running time of step 3		0.0s (min)	○
P10.10	Multi-step speed 4		0.0%	○
P10.11	Running time of step 4		0.0s (min)	○
P10.12	Multi-step speed 5		0.0%	○
P10.13	Running time of step 5		0.0s (min)	○
P10.14	Multi-step speed 6		0.0%	○
P10.15	Running time of step 6		0.0s (min)	○
P10.16	Multi-step speed 7		0.0%	○
P10.17	Running time of step 7		0.0s (min)	○
P10.18	Multi-step speed 8		0.0%	○
P10.19	Running time of step 8		0.0s (min)	○
P10.20	Multi-step speed 9		0.0%	○
P10.21	Running time of step 9		0.0s (min)	○
P10.22	Multi-step speed 10		0.0%	○
P10.23	Running time of step 10		0.0s (min)	○
P10.24	Multi-step speed 11		0.0%	○
P10.25	Running time of step 11		0.0s (min)	○
P10.26	Multi-step speed		0.0%	○

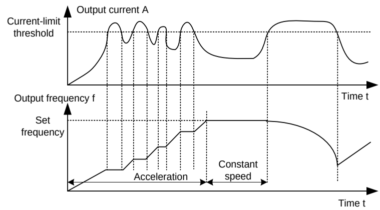
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td>12</td><td rowspan="8">high-speed pulse, PID, and communication settings.
The relation between terminal 1, terminal 2, terminal 3 and terminal 4 are shown in the following (T indicates terminal).
<table>
<tr><td>T 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>T 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>T 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>T 4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr>
<tr><td>Step</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>T 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td>T 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
<tr><td>T 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>T 4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr>
<tr><td>Step</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr>
</table></td><td></td><td></td></tr>
<tr><td>P10.27</td><td>Running time of step 12</td><td>0.0s (min)</td><td>○</td></tr>
<tr><td>P10.28</td><td>Multi-step speed 13</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.29</td><td>Running time of step 13</td><td>0.0s (min)</td><td>○</td></tr>
<tr><td>P10.30</td><td>Multi-step speed 14</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.31</td><td>Running time of step 14</td><td>0.0s (min)</td><td>○</td></tr>
<tr><td>P10.32</td><td>Multi-step speed 15</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.33</td><td>Running time of step 15</td><td>0.0s (min)</td><td>○</td></tr>
<tr><td>P10.34</td><td>ACC/DEC time of steps 0–7 of simple PLC</td><td rowspan="2">The description is as follows:
<table>
<tr><th>Function code</th><th colspan="2">Binary</th><th>Step</th><th>ACC/DEC T1</th><th>ACC/DEC T2</th><th>ACC/DEC T3</th><th>ACC/DEC T4</th></tr>
<tr><td rowspan="8">P10.34</td><td>BIT1</td><td>BIT0</td><td>0</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>1</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>2</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>3</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>4</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>5</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>6</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>7</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td rowspan="8">P10.35</td><td>BIT1</td><td>BIT0</td><td>8</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>9</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT5</td><td>BIT4</td><td>10</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT7</td><td>BIT6</td><td>11</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT9</td><td>BIT8</td><td>12</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT11</td><td>BIT10</td><td>13</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT13</td><td>BIT12</td><td>14</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
<tr><td>BIT15</td><td>BIT14</td><td>15</td><td>00</td><td>01</td><td>10</td><td>11</td></tr>
</table>
Select corresponding acceleration/deceleration</td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.35</td><td>ACC/DEC time of steps 8–15 of simple PLC</td><td>0x0000</td><td>○</td></tr>
</table>

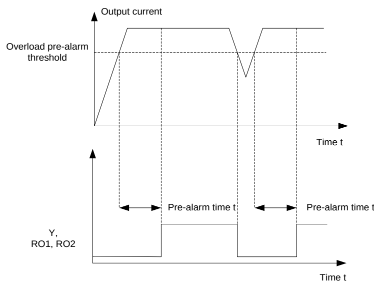
Function code	Name	Description	Default	Modify
		time, and then convert 16-bit binary number into hexadecimal number, finally, and then set corresponding function codes. ACC/DEC time 1 is set by P00.11 and P00.12; ACC/DEC time 2 is set by P08.00 and P08.01; ACC/DEC time 3 is set by P08.02 and P08.03; ACC/DEC time 4 is set by P08.04 and P08.05. Setting range: 0x0000–0xFFFF		
P10.36	PLC restart mode	0: 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: Continue running from the step frequency when interruption occurred, namely if the VFD stops during running (caused by stop command or fault), it will record the running time of current step, and enters this step automatically after restart, then continue running at the frequency defined by this step in the remaining time.	0	◎
P10.37	Multi-step time unit	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	◎

P11 group—Protection parameters

Function code	Name	Description	Default	Modify
P11.00	Protection against phase loss	0x000–0x111 Ones place: 0: Disable software input phase loss protection. 1: Enable software input phase loss protection. Tens place: 0: Disable output phrase loss protection. 1: Enable output phase loss protection. Hundreds place: 0: Disable hardware input phase loss protection. 1: Enable hardware input phase loss protection.	0x110	○

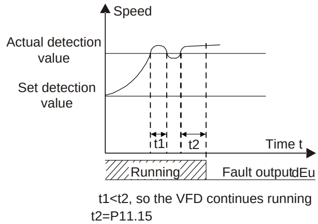
Function code	Name	Description	Default	Modify
P11.01	Frequency drop at transient power-off	0: Disable 1: Enable	0	○
P11.02	Dynamic braking in stop state	0: Enable 1: Disable	0	◎
P11.03	Overvoltage stalling protection	0: Disable 1: Enable 	1	○
P11.04	Overvoltage stalling protection voltage	120–150% (standard bus voltage) (380V)	136%	○
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, if no measures are taken, the VFD may trip due to overcurrent during acceleration. Setting range: 0x00–0x11 Ones place: Current limit action 0: Invalid 1: Valid Tens place: Hardware current limit overload alarm 0: Valid 1: Invalid	0x01	◎
P11.06	Automatic current limit threshold	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	Type G: 160.0% Type P:110.0%	◎
P11.07	Frequency drop rate during current limit		10.00 Hz/s	◎

<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>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.


P11.06 setting range: 50.0–200.0%
P11.07 setting range: 0.00–50.00Hz/s</td><td></td><td></td></tr>
<tr><td>P11.08</td><td>Pre-alarm selection for VFD/motor OL/UL</td><td rowspan="3">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 of P11.08: 0x000–0x132
Enable and define overload pre-alarm function of the VFD and motor.
Ones place:
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:</td><td>0x000</td><td>○</td></tr>
<tr><td>P11.09</td><td>Overload pre-alarm detection level</td><td>Type G: 150%
Type P: 110%</td><td>○</td></tr>
<tr><td>P11.10</td><td>Overload pre-alarm detection time</td><td>1.0s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		0: The VFD continues to work for an OL/UL pre-alarm. 1: The VFD continues to work for a UL pre-alarm but stops running for an OL fault. 2: The VFD continues to work for an OL pre-alarm but stops running for a UL fault. 3. The VFD stops running for an OL/UL alarm. Hundreds place: 0: Detect all the time. 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 Setting range of P11.09: P11.11–200.0% Setting range of P11.10: 0.1–3600.0s		
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 of P11.11: 0–P11.09 Setting range of P11.12: 0.1–3600.0s	50%	○
P11.12	Underload pre-alarm detection time		1.0s	○
P11.13	Fault output terminal action upon fault occurring	Used to set the action of fault output terminals at undervoltage and fault reset. 0x00–0x11 Ones place: 0: Act upon an undervoltage fault 1: Do not act upon an undervoltage fault Tens place: 0: Act during the automatic reset period 1: Do not act during the automatic reset period	0x00	○
P11.14	Speed deviation detection value	0.0–50.0% Used to set the speed deviation detection value.	10.0%	○
P11.15	Speed deviation detection time	Used to set the speed deviation detection time. **Note:** Speed deviation protection is invalid when P11.15=0.0.	2.0s	○

Function code	Name	Description	Default	Modify
		 Setting range: 0.0–10.0s		
P11.16	Automatic frequency-reduction during voltage drop	0–1 0: Invalid 1: Valid	0	○
P11.17	Proportional coefficient of voltage regulator during undervoltage stall	This parameter is used to set the proportional coefficient of the bus voltage regulator during undervoltage stall. Setting range: 0–1000	100	○
P11.18	Integral coefficient of voltage regulator during undervoltage stall	This parameter is used to set the integral coefficient of the bus voltage regulator during undervoltage stall. Setting range: 0–1000	40	○
P11.19	Proportional coefficient of current regulator during undervoltage stall	This parameter is used to set the proportional coefficient of the active current regulator during undervoltage stall. Setting range: 0–1000	25	○
P11.20	Integral coefficient of current regulator during undervoltage stall	This parameter is used to set 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	This parameter is used to set the proportional coefficient of the bus voltage regulator during overvoltage stall. Setting range: 0–1000	60	○
P11.22	Integral coefficient of voltage	This parameter is used to set the integral coefficient of the bus voltage regulator during	10	○

Function code	Name	Description	Default	Modify
	regulator during overvoltage stall	overvoltage stall. Setting range: 0–1000		
P11.23	Proportional coefficient of current regulator during overvoltage stall	This parameter is used to set 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	This parameter is used to set the integral coefficient of the active current regulator during overvoltage stall. Setting range: 0–2000	250	○
P11.25	Enable VFD overload integral	0: Disable 1: Enable When this parameter is set to 0, 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. When this parameter is set to 1, 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 more quickly.	1	◎
P11.26	Reserved	/	/	/
P11.27	VF oscillation control method	0x00–0x11 Ones place: 0: Method 1 1: Method 2 Tens place: 0: Reserved 1: Reserved	0x01	◎
P11.28	Software input phase loss detection method	0–1 0: sin quadrature function detection 100Hz component 1: square waves quadrature function detection 100Hz component	1	○

Function code	Name	Description	Default	Modify
P11.29	Software input phase loss detection limit value	0.0–200.0V **Note:** Sets the maximum peak-to-peak value of the 100Hz component of the bus voltage fluctuation.	40.0V	○
P11.30	Software input phase loss detection time	0.0–20.0s	2.0s	○
P11.31	Fault level group 1	0x0000–0x3333 Ones place(fault 11=OL1): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 12=OL2): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 13=SPI): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 14=SPO): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.32	Fault level group 2	0x0000–0x3333 Ones place(fault 15=OH1): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51	0x0000	○

Function code	Name	Description	Default	Modify
		3: Screen out fault Tens place(fault 16=OH2): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 17=EF): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 18=CE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.33	Fault level group 3	0x0000–0x3333 Ones place(fault 19=ItE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 20=tE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 21=EEP): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○

Function code	Name	Description	Default	Modify
		Thousands place(fault 22=PIDE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.34	Fault level group 4	0x0000–0x3333 Ones place(fault 23=bCE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 24=END): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 25=OL3): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 26=PCE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.35	Fault level group 5	0x0000–0x3333 Ones place(fault 27= UPE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○

Function code	Name	Description	Default	Modify
		Hundreds place(fault 28=DNE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 29=E-DP): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 30=E-NET): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.36	Fault level group 6	0x0000–0x3333 Ones place(fault 31=E-CAN): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 32=ETH1): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 33=ETH2): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 34=dEu): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.37	Fault level group 7	0x0000–0x3333 Ones place(fault 35= STo): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 36=LL): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 37=ENC1O): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 38=ENC1D): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.38	Fault level group 8	0x0000–0x3333 Ones place(fault 39=ENC1Z): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 40=STO): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 41=STL1): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 42=STL2): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.39	Fault level group 9	0x0000–0x3333 Ones place(fault 43=STL3): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 44=CrCE): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 45=P-E1): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 46=P-E2): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.40	Fault level group 10	0x0000–0x3333 Ones place(fault 47=P-E3): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 48=P-E4): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 49=P-E5): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 50=P-E6): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.41	Fault level group 11	0x0000–0x3333 Ones place(fault 51=P-E7): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 52=P-E8): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 53=P-E9): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 54=P-E10): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.42	Fault level group 12	0x0000–0x3333 Ones place(fault 55=E-Err): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 56=ENCU): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 57=E-PN): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 58=SECAN): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.43	Fault level group 13	0x0000–0x3333 Ones place(fault 59=OT): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 60=F1-Er): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 61=F2-Er): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 62=F3-Er): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.44	Fault level group 14	0x0000–0x3333 Ones place(fault 63=C1-Er): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 64=C2-Er): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 65=C3-Er): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 66=E-CAT): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.45	Fault level group 15	0x0000–0x3333 Ones place(fault 67=E-BAC): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 68=E-DEV): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 69= S-Err): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 70=OtE1): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.46	Fault level group 16	0x0000–0x3333 Ones place(fault 71=OtE2): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 72=E-EIP): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 73=E-brF): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 74=E-OHt): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.47	Fault level group 17	0x0000–0x3333 Ones place(fault 75=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 76=Reserved): 0: Report a fault	0x0000	○

Function code	Name	Description	Default	Modify
		1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 77=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 78=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.48	Fault level group 18	0x0000–0x3333 Ones place(fault 79=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 80=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 81=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 82=Reserved): 0: Report a fault 1: Report fault after deceleration stop	0x0000	○

Function code	Name	Description	Default	Modify
		2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.49	Fault level group 19	0x0000–0x3333 Ones place(fault 83=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 84=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 85=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 86=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault	0x0000	○
P11.50	Fault level group 20	0x0000–0x3333 Ones place(fault 87=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Tens place(fault 88=Reserved): 0: Report a fault 1: Report fault after deceleration stop	0x0000	○

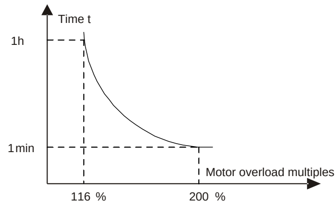
Function code	Name	Description	Default	Modify
		2: Pre-alarm, action executed according to P11.51 3: Screen out fault Hundreds place(fault 89=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault Thousands place(fault 90=Reserved): 0: Report a fault 1: Report fault after deceleration stop 2: Pre-alarm, action executed according to P11.51 3: Screen out fault		
P11.51	Action for fault pre-alarm	0–4 0: Run at 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	○
P11.52	Backup frequency upon exceptions	0.00–630.00(Hz)	0.00	○

P12 group—Parameters of motor 2

Function code	Name	Description	Default	Modify
P12.00	Type of motor 2	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0	◎
P12.01	Rated power of AM 2	0.1–3000.0kW	Model depended	◎
P12.02	Rated frequency of AM 2	0.01Hz–P00.03 (Max. frequency)	50.00Hz	◎
P12.03	Rated speed of AM 2	1–60000rpm	Model depended	◎
P12.04	Rated voltage of	0–1200V	Model	◎

Function code	Name	Description	Default	Modify
	AM 2		depended	
P12.05	Rated current of AM 2	0.8–6000.0A	Model depended	◎
P12.06	Stator resistance of AM 2	0.001–65.535Ω	Model depended	○
P12.07	Rotor resistance of AM 2	0.001–65.535Ω	Model depended	○
P12.08	Leakage inductance of AM 2	0.1–6553.5mH	Model depended	○
P12.09	Mutual inductance of AM 2	0.1–6553.5mH	Model depended	○
P12.10	No-load current of AM 2	0.1–6553.5A	Model depended	○
P12.11	Magnetic saturation coefficient 1 of iron core of AM 2	0.0–100.0%	80%	○
P12.12	Magnetic saturation coefficient 2 of iron core of AM 2	0.0–100.0%	68%	○
P12.13	Magnetic saturation coefficient 3 of iron core of AM 2	0.0–100.0%	57%	○
P12.14	Magnetic saturation coefficient 4 of iron core of AM 2	0.0–100.0%	40%	○
P12.15	Rated power of SM 2	0.1–3000.0kW	Model depended	◎
P12.16	Rated frequency of SM 2	0.01Hz–P00.03 (Max. frequency)	50.00Hz	◎
P12.17	Number of pole pairs of SM 2	1–128	2	◎
P12.18	Rated voltage of SM 2	0–1200V	Model depended	◎

Function code	Name	Description	Default	Modify
P12.19	Rated current of SM 2	0.8–6000.0A	Model depended	◎
P12.20	Stator resistance of SM 2	0.001–65.535Ω	Model depended	○
P12.21	Direct-axis inductance of SM 2	0.01–655.35mH	Model depended	○
P12.22	Quadrature-axis inductance of SM 2	0.01–655.35mH	Model depended	○
P12.23	Counter-emf constant of SM 2	0–10000V	300V	○
P12.24	Initial pole position of synchronous motor 2	0x0000–0xFFFF	0x0000	●
P12.25	Identification current of synchronous motor 2	0–50% (of motor rated current)	10%	●
P12.26	Overload protection of motor 2	0: No protection 1: Common motor (with low-speed compensation) 2: Frequency-variable motor (without low-speed compensation)	2	◎
P12.27	Overload protection coefficient of motor 2	Motor overload multiples M=Iout/(In*K) “In” is rated motor current, “Iout” is VFD output current, “K” is motor overload protection coefficient. A smaller value of “K” indicates a bigger value of “M”. When M=116%, protection is performed after motor overload lasts for 1 hour; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M≥400%, protection is performed immediately.	100.0%	○

Function code	Name	Description	Default	Modify
		 Setting range: 20.0%–150.0%		
P12.28	Power display calibration coefficient of motor 2	0.00–3.00	1.00	○
P12.29	Parameter display of motor 2	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	○
P12.30	System inertia of motor 2	0.000–30.000kgm^2	0.000 kgm^2	○
P12.31–P12.32	Reserved	/	/	/

P13 group—SM control

Function code	Name	Description	Default	Modify
P13.00	SM injected-current decrease ratio	Used to set 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	0: Invalid 1: High-frequency current injection 2: Pulse superimposition	0	◎
P13.02	Injected current 1	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	20.0%	○

Function code	Name	Description	Default	Modify
		torque, increase the value of this function parameter properly. Setting range: -100.0%–100.0% (of the motor rated current)		
P13.03	Injected current 2	Pull-in current is the pole position orientation current; pull-in current 2 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)	10.0%	○
P13.04	Pull-in current switchover frequency	0.00Hz–P00.03(Max. frequency)	10.00Hz	○
P13.05	Reserved	/	/	/
P13.06	High-frequency superposition voltage	Used to set 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: 0.0–300.0% (of the motor rated voltage)	100.0%	◎
P13.07	Control parameter 0	0.0–400.0	0.0	○
P13.08	Control parameter 1	0x0000–0xFFFF	0x0000	○
P13.09	Frequency threshold of phase-lock loop switch-in	Used to set the frequency threshold for enabling the counter-electromotive force phase-locked loop in SVC 0. When the running frequency is lower than the value of the function code, the phase-locked loop is disabled; and when the running frequency is higher than that, the phase-locked loop is enabled. Setting range: 0.00–655.35	2.00	○
P13.10	Reserved	/	/	/
P13.11	Maladjustment detection time	Used to adjust the responsiveness of anti-maladjustment function. If the load inertia is large, increase the value of this parameter	0.5s	○

Function code	Name	Description	Default	Modify
		properly, however, the responsiveness may slow down accordingly. Setting range: 0.0–10.0s		
P13.12	High-frequency compensation coefficient of SM	Valid when the motor speed exceeds the rated speed. If oscillation occurred to the motor, adjust this parameter properly. Setting range: 0.0–100.0%	0.0%	○
P13.13	High-frequency pull-in current	0.0–300.0%	20.0%	◎
P13.14–P13.19	Reserved	/	/	/

P14 group—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 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 communication address of a slave cannot be set to 0.	1	○
P14.01	Communication baud rate	The function code is used to set the rate of data transmission between the upper computer and the VFD. 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps 6: 57600bps 7: 115200bps **Note:** The baud rate set on the VFD must be	4	○

Function code	Name	Description	Default	Modify
		consistent with that on the upper computer. Otherwise, the communication fails. A greater baud rate indicates faster communication.		
P14.02	Data bit check	The data format set on the VFD must be consistent with that on the upper computer. 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	1	○
P14.03	Communication response delay	Setting range: 0–200ms The function code indicates the communication response delay, that is, the interval from when the VFD completes receiving data to when it sends response data to the upper computer. If the response delay is shorter than the rectifier processing time, the rectifier sends response data to the upper computer after processing data. If the delay is longer than the rectifier processing time, the rectifier does not send response data to the upper computer until the delay is reached although data has been processed.	5	○
P14.04	Communication timeout time	Setting range: 0.0 (invalid)–60.0s When the function code is set to 0.0, the communication timeout time is invalid. When the function code is set to a non-zero value, the system reports the "485 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.	0.0s	○
P14.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop according to the stop mode without generating alarms	0	○

Function code	Name	Description	Default	Modify
		(only in the communication-based control mode) 3: Stop according to the stop mode without generating alarms (in all control modes)		
P14.06	Communication processing action	0x000–0x111 Ones place: 0: Respond to write operations 1: Not respond to write operations Tens place: 0: Communication password protection is invalid. 1: Communication password protection is valid. Hundreds place: reserved 0: User-defined addresses specified by P14.07 and P14.08 are invalid 1: User-defined addresses specified by P14.07 and P14.08 are valid	0x000	○
P14.07	User-defined running command address	0x0000–0xFFFF	0x2000	○
P14.08	User-defined frequency setting address	0x0000–0xFFFF	0x2001	○
P14.09–P14.24	Reserved	/	/	/

P15 group—Communication expansion card 1 functions

Function code	Name	Description	Default	Modify
P15.00	Reserved	/	/	/
P15.01	Module address	0–127	2	◎
P15.02	Received PZD2	Value after the calculation with P91.00–P91.21 0: Invalid 1: Set frequency (0–Fmax (Unit: 0.01Hz)) 2: PID reference (0–1000, in which 1000 corresponds to 100.0%) 3: PID feedback (0–1000, in which 1000	0	○
P15.03	Received PZD3		0	○
P15.04	Received PZD4		0	○
P15.05	Received PZD5		0	○
P15.06	Received PZD6		0	○
P15.07	Received PZD7		0	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P15.08</td><td>Received PZD8</td><td rowspan="5">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: 0.01 Hz)
6: Setting of the upper limit of reverse running frequency (0–Fmax, unit: 0.01 Hz)
7: Upper limit of the electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)
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: 0x000–0x3FF
10: Virtual output terminal command. Range: 0x00–0x0F
11: Voltage setting (special for V/F separation) (0–1000, in which 1000 corresponds to 100.0% of the motor rated voltage)
12: AO1 output setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%)
13: AO2 output setting 2 (-1000–+1000, in which 1000 corresponds to 100.0%)
14–20: Reserved
21: Control word 2
22: Set frequency (*100, Hz, with sign, -Fmax – Fmax)
23: Set rotation speed (*1, rpm, without sign, 0–60000)
24: Set rotation speed (*1, rpm, with sign, -30000–30000)
25: Auxiliary frequency setting (*100, Hz, with sign, -50.00Hz – 50.00Hz)
26: Auxiliary torque setting (*10, %, with sign, -50.0% – 50.0%)
27: Reduction rate of drop control (*100, Hz,</td><td>0</td><td>○</td></tr>
<tr><td>P15.09</td><td>Received PZD9</td><td>0</td><td>○</td></tr>
<tr><td>P15.10</td><td>Received PZD10</td><td>0</td><td>○</td></tr>
<tr><td>P15.11</td><td>Received PZD11</td><td>0</td><td>○</td></tr>
<tr><td>P15.12</td><td>Received PZD12</td><td>0</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		0.00 – 50.00Hz) 28: Number of slaves (0–15, valid when the VFD is the master in master-slave control mode) 29–47: Reserved		
P15.13	Sent PZD2	Value after the calculation with P91.22–P91.43 0: Invalid 1: Running frequency (x100, Hz, number without sign) 2: Set frequency (x100, Hz) 3: Bus voltage (x10, V) 4: Output voltage (×1, V) 5: Output current (x10, A) 6: Output torque (x10, Nm, number with sign) 7: Output power (x10, kW, number with sign) 8: Rotation speed of running (x1, RPM, number without sign) 9: Linear speed of running (x1, m/s) 10: Ramp reference frequency 11: Fault code 12: AI1 input (*100, V) 13: AI2 input (*100, V) 14: AI3 input (* 100, V) 15: HDIA frequency value (x1000, kHz) 16: Terminal input status 17: Terminal output status 18: PID reference (x10, %) 19: PID feedback (x10, %) 20: Motor rated torque (x10, Nm) 21–24: Reserved 25: Status word 1 26: HDIB frequency value (x1000, kHz) 27: Status word 2 28: Rotation speed of running (x1, RPM, number with sign, -30000 – 30000) 29: Running frequency (x100, Hz, number with sign, -Fmax – Fmax) 30: Reserved 31: Max. temperature with set time (x10)	0	○
P15.14	Sent PZD3		0	○
P15.15	Sent PZD4		0	○
P15.16	Sent PZD5		0	○
P15.17	Sent PZD6		0	○
P15.18	Sent PZD7		0	○
P15.19	Sent PZD8		0	○
P15.20	Sent PZD9		0	○
P15.21	Sent PZD10		0	○
P15.22	Sent PZD11		0	○
P15.23	Sent PZD12		0	○

Function code	Name	Description	Default	Modify
		32–47: Reserved 32–36: Reserved 37: General VFD status word 38–47: Reserved		
P15.24	Reserved	/	/	/
P15.25	DP communication timeout time	0.0 (invalid)–60.0s	0.0s	○
P15.26	CANopen communication timeout time	0.0 (invalid)–60.0s	0.0s	○
P15.27	CANopen communication baud rate	0: 1000Kbps 1: 800Kbps 2: 500Kbps 3: 250Kbps 4: 125Kbps 5: 100Kbps 6: 50Kbps 7: 20Kbps	0	◎
P15.28	CAN communication address	0–127	1	◎
P15.29	CAN communication baud rate	0: 50Kbps 1: 100Kbps 2: 125Kbps 3: 250Kbps 4: 500Kbps 5: 1Mbps	2	◎
P15.30	CAN communication timeout time	0.0 (invalid)–60.0s	5.0s	○
P15.31–P15.42	Reserved	/	/	/
P15.43	ID of DP device	0x0000–0xFFFF	0x0000	◎
P15.44	DP communication protocol resolution	0: Define CW and SW freely by bit 1: CW and SW fixed (original GD series mode)	0	◎
P15.45–P15.69	Reserved	/	/	/

P16 group—Communication expansion card 2 functions

Function code	Name	Description	Default	Modify
P16.00	Reserved	/	/	/
P16.01	Reserved	/	/	/
P16.02	Ethernet monitoring card IP address 1	0–255	192	◎
P16.03	Ethernet monitoring card IP address 2	0–255	168	◎
P16.04	Ethernet monitoring card IP address 3	0–255	0	◎
P16.05	Ethernet monitoring card IP address 4	0–255	1	◎
P16.06	Ethernet monitoring card subnet mask 1	0–255	255	◎
P16.07	Ethernet monitoring card subnet mask 2	0–255	255	◎
P16.08	Ethernet monitoring card subnet mask 3	0–255	255	◎
P16.09	Ethernet monitoring card subnet mask 4	0–255	0	◎
P16.10	Ethernet monitoring card gateway 1	0–255	192	◎
P16.11	Ethernet monitoring card gateway 2	0–255	168	◎
P16.12	Ethernet monitoring card gateway 3	0–255	0	◎
P16.13	Ethernet	0–255	1	◎

Function code	Name	Description	Default	Modify
	monitoring card gateway 4			
P16.14	Ethernet monitoring variable address 1	0x0000–0xFFFF	0x0000	○
P16.15	Ethernet monitoring variable address 2	0x0000–0xFFFF	0x0000	○
P16.16	Ethernet monitoring variable address 3	0x0000–0xFFFF	0x0000	○
P16.17	Ethernet monitoring variable address 4	0x0000–0xFFFF	0x0000	○
P16.18–P16.23	Reserved	/	/	/
P16.24	Identification time for the expansion card in card slot 1	0.0–600.0s If it is set to 0.0, identification fault will not be detected	0.0s	○
P16.25	Identification time for the expansion card in card slot 2	0.0–600.0s If it is set to 0.0, offline fault will not be detected	0.0s	○
P16.26	Reserved	/	/	/
P16.27	Communication timeout period of expansion card in card slot 1	0.0–600.0s If it is set to 0.0, offline fault will not be detected	0.0s	○
P16.28	Communication timeout period of expansion card in card slot 2	0.0–600.0s If it is set to 0.0, offline fault will not be detected	0.0s	○
P16.29–P16.30	Reserved	/	/	/
P16.31	PROFINET communication timeout time	0.0–60.0s	5.0s	○
P16.32	Received PZD2	0–31	0	○

Function code	Name	Description	Default	Modify
P16.33	Received PZD3	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: 0.01 Hz) 6: Setting of the upper limit of reverse running frequency (0–Fmax. Unit: 0.01 Hz) 7: Upper limit of electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current) 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: 0x000–0x3FF) 10: Virtual output terminal command (Range: 0x00–0x0F) 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 (-1000–+1000, in which 1000 corresponds to 100.0%) 13: AO2 output setting 2 (-1000–1000, in which 1000 corresponds to 100.0%) 14–31: Reserved	0	○
P16.34	Received PZD4		0	○
P16.35	Received PZD5		0	○
P16.36	Received PZD6		0	○
P16.37	Received PZD7		0	○
P16.38	Received PZD8		0	○
P16.39	Received PZD9		0	○
P16.40	Received PZD10		0	○
P16.41	Received PZD11		0	○
P16.42	Received PZD12		0	○
P16.43	Sent PZD2	0–31 0: Invalid 1: Running frequency (x100, Hz) 2: Set frequency (x100, Hz) 3: Bus voltage (x10, V) 4: Output voltage (x1, V)	0	○
P16.44	Sent PZD3		0	○
P16.45	Sent PZD4		0	○
P16.46	Sent PZD5		0	○
P16.47	Sent PZD6		0	○
P16.48	Sent PZD7		0	○

Function code	Name	Description	Default	Modify
P16.49	Sent PZD8	5: Output current (x10, A)	0	○
P16.50	Sent PZD9	6: Actual output torque (x10, Nm)	0	○
P16.51	Sent PZD10	7: Actual output power (x10, kW)	0	○
P16.52	Sent PZD11	8: Rotation speed of running (x1, RPM)	0	○
P16.53	Sent PZD12	9: Linear speed of running (x1, m/s) 10: Ramp reference frequency 11: Fault code 12: AI1 input (x100, V) 13: AI2 input (x100, V) 14: AI3 input (x100, V) 15: HDIA frequency value (x100, kHz) 16: Terminal input status 17: Terminal output status 18: PID reference (x100, %) 19: PID feedback (x100, %) 20: Motor rated torque 21–24: Reserved 25: Status word 26: HDIB frequency value (x100, kHz) 27–31: Reserved	0	○

P17 group—Monitoring parameter group

Function code	Name	Description	Default	Modify
P17.00	Set frequency	Displays the present set frequency of the VFD. Range: 0.00Hz–P00.03	0.00Hz	●
P17.01	Output frequency	Displays the present output frequency of the VFD. Range: 0.00Hz–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	Displays the present ramp reference frequency of the VFD. Range: 0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	Displays the present output voltage of the VFD. Range: 0–1200V	0V	●
P17.04	Output current	Displays the valid value of current output current of the VFD. Range: 0.0–5000.0A	0.0A	●
P17.05	Motor rotation speed	Displays the current motor speed. Range: 0–65535RPM	0RPM	●

Function code	Name	Description	Default	Modify
P17.06	Torque current	Displays the present torque current of the VFD. Range: -3000.0–3000.0A	0.0A	●
P17.07	Exciting current	Displays the present exciting current of the VFD. Range: -3000.0–3000.0A	0.0A	●
P17.08	Motor power	Displays the present motor power; 100% relative to the rated motor power. The positive value is the motoring state while the negative value is the generating state. Range: -300.0–300.0% (relative to the rated motor power)	0.0%	●
P17.09	Motor output torque	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. Range: -250.0–250.0%	0.0%	●
P17.10	Estimated motor frequency	Displays the estimated motor rotor frequency under the open-loop vector condition. Range: 0.00–P00.03	0.00Hz	●
P17.11	DC bus voltage	Displays the present DC bus voltage of the VFD. Range: 0.0–2000.0 V	0V	●
P17.12	Digital input terminal status	Displays the present digital input terminal state of the VFD. Setting range: 0x00–0x3F bit0:S1 bit1:S2 bit2:S3 bit3:S4 bit4:HDIA bit5:HDIB	0x00	●
P17.13	Digital output terminal status	Displays the present digital output terminal state of the VFD. Setting range: 0x00–0x0F bit0:Y1 bit1:HDO bit2:RO1 bit3:RO2	0x00	●

Function code	Name	Description	Default	Modify
P17.14	Digital adjustment value	Displays the adjustment on the VFD through the UP/DOWN terminal. Range: 0.00Hz–P00.03	0.00Hz	●
P17.15	Torque reference value	Relative to the percentage of the rated torque of the present motor, displaying the torque reference. Range: -300.0%–300.0% (of the motor rated current)	0.0%	●
P17.16	Linear speed	0–65535	0	●
P17.17	Reserved	/	/	/
P17.18	Count value	0–65535	0	●
P17.19	AI1 input voltage	Displays the AI1 input signal. Range: 0.00–10.00V	0.00V	●
P17.20	AI2 input voltage	Displays the AI2 input signal. Range: 0.00V–10.00V	0.00V	●
P17.21	HDIA input frequency	Display HDIA input frequency. Range: 0.000–50.000kHz	0.000 kHz	●
P17.22	HDIB input frequency	Display HDIB input frequency. Range: 0.000–50.000kHz	0.000 kHz	●
P17.23	PID reference value	Displays the PID reference value. Range: -100.0–100.0%	0.0%	●
P17.24	PID feedback value	Displays the PID feedback value. Range: -100.0–100.0%	0.0%	●
P17.25	Motor power factor	Displays the power factor of the current motor. Range: -1.00–1.00	0.00	●
P17.26	Duration of this run	Displays the duration of this run of the VFD. Range: 0–65535min	0min	●
P17.27	Simple PLC and actual step of multi-step speed	Displays simple PLC and present step number of multi-step speed. Range: 0–15	0	●
P17.28	Motor ASR controller output Output	Displays the ASR controller output value under the vector control mode, relative to the percentage of rated motor torque. Range: -300.0%–300.0% (of the motor rated current)	0.0%	●
P17.29	Pole angle of open-loop SM	Displays the initial identification angle of SM. Range: 0.0–360.0	0.0	●

Function code	Name	Description	Default	Modify
P17.30	Phase compensation of SM	Displays the phase compensation of SM. Range: -180.0–180.0	0.0	●
P17.31	High-frequency superposition current of SM	0.0%–200.0% (of the motor rated current)	0.0	●
P17.32	Motor flux linkage	0.0%–200.0%	0.0%	●
P17.33	Exciting current reference	Displays the exciting current reference value under the vector control mode. Range: -3000.0–3000.0A	0.0A	●
P17.34	Torque current reference	Displays the torque current reference value under the vector control mode. Range: -3000.0–3000.0A	0.0A	●
P17.35	AC incoming current	Displays the valid value of incoming current on AC side. Range: 0.0–5000.0A	0.0A	●
P17.36	Output torque	Displays the output torque value. 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. Range: -3000.0Nm–3000.0Nm	0.0Nm	●
P17.37	Motor overload count value	0–65535	0	●
P17.38	Process PID output	-100.0%–100.0%	0.0%	●
P17.39	Function codes in parameter download error	0.00–99.99	0.00	●
P17.40	Motor control mode	Setting range: 0x000–0x123 Ones place: Control mode 0: Vector 0 1: Vector 1 2: Space voltage vector control 3: Reserved Tens place: Control status	0x000	●

Function code	Name	Description	Default	Modify
		0: Speed control 1: Torque control Hundreds place: Motor number 0: Motor 1 1: Motor 2		
P17.41	Electromotive torque upper limit	0.0%–300.0% (of the motor rated current)	0.0%	●
P17.42	Braking torque upper limit	0.0%–300.0% (of the motor rated current)	0.0%	●
P17.43	Forward rotation upper-limit frequency in torque control	0.00–P00.03	0.00Hz	●
P17.44	Reverse rotation upper-limit frequency in torque control	0.00–P00.03	0.00Hz	●
P17.45	Inertia compensation torque	-100.0%–100.0%	0.0%	●
P17.46	Friction compensation torque	-100.0%–100.0%	0.0%	●
P17.47	Motor pole pairs	0–65535	0	●
P17.48	VFD overload count value	0–65535	0	●
P17.49	Frequency set by A source	0.00–P00.03	0.00Hz	●
P17.50	Frequency set by B source	0.00–P00.03	0.00Hz	●
P17.51	PID proportional output	-100.0%–100.0%	0.00%	●
P17.52	PID integral output	-100.0%–100.0%	0.00%	●
P17.53	PID differential output	-100.0%–100.0%	0.00%	●
P17.54	Present proportional gain	0–100.00	0.00	●

Function code	Name	Description	Default	Modify
P17.55	Present integral time	0–10.00	0.00s	●
P17.56	Present differential time	0–10.00	0.0s	●
P17.57	Terminal sign status	0x0000–0xFFFF	0x0000	●
P17.58	Control word 1	0x0000–0xFFFF DP communication upper computer sends the value after P90.66 polarity conversion	0x0000	●
P17.59	Status word 1	0x0000–0xFFFF Value uploaded to upper computer via DP communication after P90.68 polarity conversion	0x0000	●
P17.60	Control word 2	0x0000–0xFFFF DP communication upper computer sends the value after P90.67 polarity conversion	0x0000	●
P17.61	Status word 2	0x0000–0xFFFF Value uploaded to upper computer via DP communication after P90.69 polarity conversion	0x0000	●
P17.62	Max. temperature detection value	0.0–200.0°C Max temperature value during the temperature detection cycle (P91.56)	0.0°C	●
P17.63	AB configuration type display	0x0000–0xFFFF Each Bit represents whether the configuration is selected Bit0: Ctrl/Stat & Ref/Fdbk (2+2bytes) Bit1: Ctrl/Stat & Ref/Fdbk (2+4bytes) Bit2: DataLink A (2x2bytes) Bit3: DataLink A (2x4bytes) Bit4: DataLink B (2x2bytes) Bit5: DataLink B (2x4bytes) Bit6: DataLink C (2x2bytes) Bit7: DataLink C (2x4bytes) Bit8: DataLink D (2x2bytes) Bit9: DataLink D (2x4bytes) Bit10: Parameter Access Bit11–Bit15: Reserved	0x0000	●
P17.64	Reserved	/	/	/

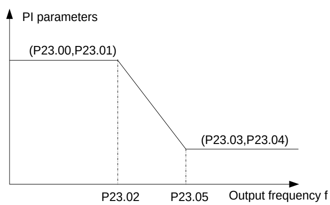
Function code	Name	Description	Default	Modify
P17.65	Brake current	0.0–3000.0A	0.0A	●
P17.66–P17.67	Reserved	/	/	/
P17.68	Current period value of carrier period	0–65535	0	●

P19 group—Expansion card status viewing

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P19.00</td><td>Slot 1 status</td><td rowspan="3">0–65535
0: No card
1: PLC card
2: I/O card
3: Reserved
4: Reserved
5: Ethernet
6: DP
7: Bluetooth card
8: Reserved
9: CANopen Communication card
10: WIFI card
11: PROFINET communication card
12: Reserved
13: Reserved
14: Reserved
15: CAN master/slave communication card
16: Modbus TCP Communication card (reserved)
17: EtherCAT communication card (reserved)
18: BACnet communication card (reserved)
19: DeviceNET communication card (reserved)
20: PT100/PT1000 temperature detection card
21: EtherNet IP card (reserved)
22: MECHATROLINK card (reserved)
23–65535: Reserved</td><td>0</td><td>●</td></tr>
<tr><td>P19.01</td><td>Slot 2 status</td><td>0</td><td>●</td></tr>
<tr><td>P19.02</td><td>Reserved</td><td>0</td><td>●</td></tr>
<tr><td>P19.03</td><td>Software version of expansion card at slot 1</td><td>0.00–655.35</td><td>0.00</td><td>●</td></tr>
</table>

Function code	Name	Description	Default	Modify
P19.04	Software version of expansion card at slot 2	0.00–655.35	0.00	●
P19.05	Reserved	/	/	/
P19.06	Terminal input status of I/O card	0x0000–0xFFFF	0x0000	●
P19.07	Terminal output status of I/O card	0x0000–0xFFFF	0x0000	●
P19.08	Reserved	/	/	/
P19.09	AI3 input voltage of I/O card	0.00–10.00V	0.00V	●
P19.10–P19.39	Reserved	/	/	/

P23 group—Vector control of motor 2

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P23.00</td><td>Speed-loop proportional gain 1</td><td rowspan="6">The parameters P23.00–P23.05 are applicable only to vector control mode. Below the switching frequency 1 (P23.02), the speed-loop PI parameters are: P23.00 and P23.01. Above the switching frequency 2 (P23.05), the speed-loop PI parameters are: P23.03 and P23.04. PI parameters are obtained according to the linear change of two groups of parameters. See the following figure:


The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increasing proportional gain or reducing integral time can</td><td>20.0</td><td>○</td></tr>
<tr><td>P23.01</td><td>Speed-loop integral time 1</td><td>0.200s</td><td>○</td></tr>
<tr><td>P23.02</td><td>Low-point frequency for switching</td><td>5.00Hz</td><td>○</td></tr>
<tr><td>P23.03</td><td>Speed-loop proportional gain 2</td><td>20.0</td><td>○</td></tr>
<tr><td>P23.04</td><td>Speed-loop integral time 2</td><td>0.200s</td><td>○</td></tr>
<tr><td>P23.05</td><td>High-point frequency for switching</td><td>10.00Hz</td><td>○</td></tr>
</table>

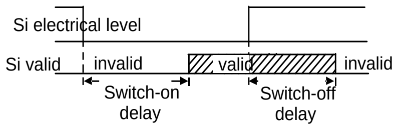
Function code	Name	Description	Default	Modify
		accelerate dynamic response of speed loop; however, if the proportional gain is too large or integral time is too small, system oscillation and overshoot may occur; if proportional gain is too small, stable oscillation or speed offset may occur. PI parameters have a close relationship with the inertia of the system. Adjust PI parameters depending on different loads to meet various demands. P23.00 setting range: 0.0–200.0 P23.01 setting range: 0.000–10.000s P23.02 setting range: 0.00Hz–P23.05 P23.03 setting range: 0.0–200.0 P23.04 setting range: 0.000–10.000s P23.05 setting range: P23.02–P00.03 (Max. output frequency)		
P23.06	Speed-loop output filter	0–8 (corresponding to 0–2^8/10ms)	0	○
P23.07	Electromotive slip compensation coefficient of vector control	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%	○
P23.08	Braking slip compensation coefficient of vector control		100%	○
P23.09	Current-loop proportional coefficient P	**Note:** 1. The two function codes impact the dynamic response speed and control accuracy of the system. Generally, you do not need to modify the two function codes. 2. Applicable to SVC mode 0 (P00.00=0) 3. The values of the two function codes are updated automatically after SM parameter autotuning is completed. Setting range: 0–65535	1000	○
P23.10	Current-loop integral coefficient I		1000	○

Function code	Name	Description	Default	Modify
P23.11	Speed-loop differential gain	0.00–10.00s	0.00s	○
P23.12	High-frequency current-loop proportional coefficient	In the vector control mode, when the frequency is lower than the current-loop high-frequency switching threshold (P23.14), the current-loop PI parameters are P23.09 and P23.10; and when the frequency is higher than the current-loop high-frequency switching threshold, the current-loop PI parameters are P23.12 and P23.13. P23.12 setting range: 0–65535 P23.13 setting range: 0–65535 P23.14 setting range: 0.0–100.0% (of the max. frequency)	1000	○
P23.13	High-frequency current-loop integral coefficient		1000	○
P23.14	Current-loop high-frequency switching threshold		100.0%	○
P23.15–P23.19	Reserved	/	/	/

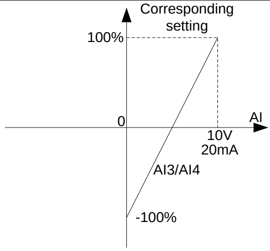
P25 group—I/O card input functions

Function code	Name	Description	Default	Modify
P25.00	HDI3 input type	0: HDI3 is high-speed pulse input 1: HDI3 is digital input	0	◎
P25.01	Function of S5	Same as P05.01	0	◎
P25.02	Function of S6		0	◎
P25.03	Function of S7		0	◎
P25.04	Function of S8		0	◎
P25.05	Function of S9		0	◎
P25.06	Function of S10		0	◎
P25.07	Function of HDI3		0	◎
P25.08	Expansion card input terminal polarity	0x00–0x7F	0x00	○
P25.09	Expansion card virtual terminal setting	0x00–0x7F (0: disable; 1: enable) BIT0: S5 virtual terminal BIT1: S6 virtual terminal BIT2: S7 virtual terminal BIT3: S8 virtual terminal BIT4: S9 virtual terminal	0x00	◎

<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>BIT5: S10 virtual terminal
BIT6: HDI3 virtual terminal</td><td></td><td></td></tr>
<tr><td>P25.10</td><td>HDI3 switch-on delay</td><td rowspan="14">Used to specify the delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off.



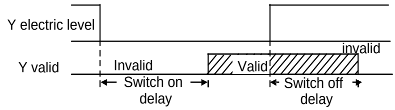
Setting range: 0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.11</td><td>HDI3 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.12</td><td>S5 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.13</td><td>S5 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.14</td><td>S6 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.15</td><td>S6 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.16</td><td>S7 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.17</td><td>S7 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.18</td><td>S8 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.19</td><td>S8 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.20</td><td>S9 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.21</td><td>S9 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.22</td><td>S10 switch-on delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.23</td><td>S10 switch-off delay</td><td>0.000s</td><td>○</td></tr>
<tr><td>P25.24</td><td>AI3 lower limit</td><td rowspan="9">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 to different nominal values. See the descriptions of each application section for details.
The following figure illustrates the cases of several settings:</td><td>0.00V</td><td>○</td></tr>
<tr><td>P25.25</td><td>Corresponding setting of AI3 lower limit</td><td>0.0%</td><td>○</td></tr>
<tr><td>P25.26</td><td>AI3 upper limit</td><td>10.00V</td><td>○</td></tr>
<tr><td>P25.27</td><td>Corresponding setting of AI3 upper limit</td><td>100.0%</td><td>○</td></tr>
<tr><td>P25.28</td><td>AI3 input filter time</td><td>0.030s</td><td>○</td></tr>
<tr><td>P25.29</td><td>AI4 lower limit</td><td>0.00V</td><td>○</td></tr>
<tr><td>P25.30</td><td>Corresponding setting of AI4 lower limit</td><td>0.0%</td><td>○</td></tr>
<tr><td>P25.31</td><td>AI4 upper limit</td><td>10.00V</td><td>○</td></tr>
<tr><td>P25.32</td><td>Corresponding setting of AI4 upper limit</td><td>100.0%</td><td>○</td></tr>
</table>

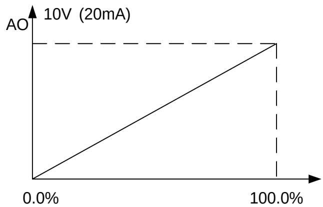
Function code	Name	Description	Default	Modify
P25.33	AI4 input filter time	 Input filter time: to adjust the sensitivity of analog input. Increasing the value properly can enhance analog input anti-interference but may reduce the sensitivity of analog input. **Note:** AI3 and AI4 can support 0–10V/0–20mA input. When AI3 and AI4 select 0–20mA input, the corresponding voltage of 20mA is 10V. Setting range of P25.24: 0.00V–P25.26 Setting range of P25.25: -300.0% –300.0% Setting range of P25.26: P25.24–10.00V Setting range of P25.27: -300.0% –300.0% Setting range of P25.28: 0.000s–10.000s Setting range of P25.29: 0.00V–P25.31 Setting range of P25.30: -300.0% –300.0% Setting range of P25.31: P25.29–10.00V Setting range of P25.32: -300.0% –300.0% Setting range of P25.33: 0.000s–10.000s	0.030s	○
P25.34	HDI3 high-speed pulse input function selection	0: Frequency setting 1: Counting	0	◎
P25.35	HDI3 lower limit frequency	0.000kHz–P25.37	0.000 kHz	○
P25.36	Corresponding setting of HDI3 lower limit frequency	-300.0%–300.0%	0.0%	○
P25.37	HDI3 upper limit frequency	P25.35–50.000kHz	50.000 kHz	○
P25.38	Corresponding setting of HDI3	-100.0%–100.0%	100.0%	○

Function code	Name	Description	Default	Modify
	upper limit frequency			
P25.39	HDI3 frequency input Filter time	0.000s–10.000s	0.030s	○
P25.40	AI3 input signal type	Range: 0–1 0: Voltage 1: Current	0	○
P25.41	AI4 input signal type	Range: 0–1 0: Voltage 1: Current	0	○
P25.42–P25.45	Reserved	/	/	/

P26 group—I/O card output functions

Function code	Name	Description	Default	Modify
P26.00	HDO2 output type	0: Open collector high-speed pulse output 1: Open collector output	0	◎
P26.01	HDO2 output	Same as the description for P06.01	0	○
P26.02	Y2 output selection		0	○
P26.03	Y3 output		0	○
P26.04	RO3 output		0	○
P26.05	RO4 output		0	○
P26.06	RO5 output		0	○
P26.07	RO6 output		0	○
P26.08	RO7 output		0	○
P26.09	RO8 output		0	○
P26.10	RO9 output		0	○
P26.11	RO10 output		0	○
P26.12	Expansion card output terminal polarity	0x0000–0x1FFF RO12…RO3, HDO2, Y3, Y2 in sequence	0x0000	○
P26.13	HDO2 switch-on delay	The function codes specify the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off.	0.000s	○
P26.14	HDO2 switch-off delay		0.000s	○

Function code	Name	Description	Default	Modify
P26.15	Y2 switch-on delay	 Setting range: 0.000–50.000s **Note:** P26.13 and P26.14 are valid only when P26.00=1.	0.000s	○
P26.16	Y2 switch-off delay		0.000s	○
P26.17	Y3 switch-on delay		0.000s	○
P26.18	Y3 switch-off delay		0.000s	○
P26.19	RO3 switch-on delay		0.000s	○
P26.20	RO3 switch-off delay		0.000s	○
P26.21	RO4 switch-on delay		0.000s	○
P26.22	RO4 switch-off delay		0.000s	○
P26.23	RO5 switch-on delay		0.000s	○
P26.24	RO5 switch-off delay		0.000s	○
P26.25	RO6 switch-on delay		0.000s	○
P26.26	RO6 switch-off delay		0.000s	○
P26.27	RO7 switch-on delay		0.000s	○
P26.28	RO7 switch-off delay		0.000s	○
P26.29	RO8 switch-on delay		0.000s	○
P26.30	RO8 switch-off delay		0.000s	○
P26.31	RO9 switch-on delay		0.000s	○
P26.32	RO9 switch-off delay		0.000s	○
P26.33	RO10 switch-on delay		0.000s	○
P26.34	RO10 switch-off delay		0.000s	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P26.35</td><td>AO2 output</td><td rowspan="2">Same as the description for P06.14</td><td>0</td><td>○</td></tr>
<tr><td>P26.36</td><td>AO3 output</td><td>0</td><td>○</td></tr>
<tr><td>P26.37</td><td>Reserved</td><td>/</td><td>/</td><td>/</td></tr>
<tr><td>P26.38</td><td>AO2 output lower limit</td><td rowspan="10">The function codes 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.


Setting range of P26.38: -300.0%–P26.40
Setting range of P26.39: 0.00V–10.00V
Setting range of P26.40: P26.38–300.0%
Setting range of P26.41: 0.00V–10.00V
Setting range of P26.42: 0.000s–10.000s
Setting range of P26.43: -300.0%–P26.45
Setting range of P26.44: 0.00V–10.00V
Setting range of P26.45: P26.43–300.0%
Setting range of P26.46: 0.00V–10.00V
Setting range of P26.47: 0.000s–10.000s</td><td>0.0%</td><td>○</td></tr>
<tr><td>P26.39</td><td>AO2 output corresponding to lower limit</td><td>0.00V</td><td>○</td></tr>
<tr><td>P26.40</td><td>AO2 output upper limit</td><td>100.0%</td><td>○</td></tr>
<tr><td>P26.41</td><td>AO2 output corresponding to upper limit</td><td>10.00V</td><td>○</td></tr>
<tr><td>P26.42</td><td>AO2 output filter time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P26.43</td><td>AO3 output lower limit</td><td>0.0%</td><td>○</td></tr>
<tr><td>P26.44</td><td>AO3 output corresponding to lower limit</td><td>0.00V</td><td>○</td></tr>
<tr><td>P26.45</td><td>AO3 output upper limit</td><td>100.0%</td><td>○</td></tr>
<tr><td>P26.46</td><td>AO3 output corresponding to upper limit</td><td>10.00V</td><td>○</td></tr>
<tr><td>P26.47</td><td>AO3 output filter time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P26.48–P26.52</td><td>Reserved</td><td>/</td><td>/</td><td>/</td></tr>
</table>

P27 group—Master/slave control

Function code	Name	Description	Default	Modify
P27.00	Enabling programable card	0–1 0: Disable 1: Enable	0	◎

Function code	Name	Description	Default	Modify
P27.01	C_WrP1	0–65535	0	○
P27.02	C_WrP2	0–65535	0	○
P27.03	C_WrP3	0–65535	0	○
P27.04	C_WrP4	0–65535	0	○
P27.05	C_WrP5	0–65535	0	○
P27.06	C_WrP6	0–65535	0	○
P27.07	C_WrP7	0–65535	0	○
P27.08	C_WrP8	0–65535	0	○
P27.09	C_WrP9	-9999–32767	0	○
P27.10	C_WrP10	-9999–32767	0	○
P27.11	Programmable card status	0–1 0: Stopped 1: Running	0	●
P27.12	C_WoP1	0–65535	0	●
P27.13	C_WoP2	0–65535	0	●
P27.14	C_WoP3	0–65535	0	●
P27.15	C_WoP4	0–65535	0	●
P27.16	C_WoP5	0–65535	0	●
P27.17	C_WoP6	0–65535	0	●
P27.18	C_WoP7	0–65535	0	●
P27.19	C_WoP8	0–65535	0	●
P27.20	C_WoP9	-9999–32767	0	●
P27.21	C_WoP10	-9999–32767	0	●
P27.22	Digital input terminal status of programmable card	0x00–0x3F Bit0: PS1 Bit1: PS2 Bit2: PS3 Bit3: PS4 Bit4: PS5 Bit5: PS6	0x00	●
P27.23	Digital output terminal status of programmable card	0x0–0x3 Bit0: PRO1 Bit1: PRO2	0x0	●
P27.24	AI1 of programmable card	0–65535	0	●

Function code	Name	Description	Default	Modify
P27.25	AO1 of programmable card	0–65535	0	●
P27.26	Length of data sent by programmable card and PZD communication object	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+36 7: 84+24+36 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	0x03	○
P27.27	Programmable card save function at power failure	0–1 0: Disable 1: Enable	0	○

P28 group—Master/slave control

Function code	Name	Description	Default	Modify
P28.00	Master/slave mode	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	0: CAN 1: RS485 (Reserved)	0	◎

Function code	Name	Description	Default	Modify
P28.02	Master/slave control multifunction mode	Setting range: 0x000–0x112 Ones place: Master/slave running mode 0: Master/slave mode 0 The master and slave adopt speed control and maintain the power balance by droop control. 1: Master/slave mode 1 The master and slave must be in the same type of vector control mode. When the master is in speed control, the slave is forced into torque control. 2: Master/slave mode 2 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: Slave send/master receive data 0: Enable 1: Disable	0x001	◎
P28.03	Slave speed gain	0.0–500.0% The function code is valid only when P28.00=2.	100.0%	○
P28.04	Slave torque gain	0.0–500.0% The function code is valid only when P28.00=2.	100.0%	○
P28.05	Frequency point for switching between speed mode and torque mode in master/slave mode 2	0.00–10.00Hz	5.00Hz	○
P28.06	Number of slaves	0–15	1	◎
P28.07	Slave reference speed filter time	0.000–10.000s	0.010s	○
P28.08	Slave speed offset	-50.00%–50.00% The function code is valid only when P28.00=2.	0.00%	◎
P28.09	Slave reference torque filter time	0.000–10.000s	0.010s	○

Function code	Name	Description	Default	Modify
P28.10	Slave torque offset	-50.0%–50.0% The function code is valid only when P28.00=2.	0.0%	◎
P28.11	Slave reference torque source	0: Master communication reference 1: HDIA channel 2: HDIB channel	0	◎
P28.12–P28.29	Reserved	/	/	/

P90 group—DP control word and status word functions

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P90.00</td><td>Bit 00 selection of CW 1</td><td rowspan="13">0–32
0: Invalid
1: OFF1 (0: ramps stop; ↑: ramps startup)
2: OFF2 (0: coast to stop; 1: disable)
3: OFF3 (0: quick stop; 1: invalid)
4: RUN (0: ramps stop; ↑: ramps startup)
5: Ramps set value enable (0: disable; 1: enable)
6: Fault reset (0: Invalid; 1: Valid)
7: Jog forward (0: disable; 1: enable)
8: Jog reversely (0: disable; 1: enable)
9: Heartbeat reference (0: no heartbeat; 1: The RUN command in control word 1 and received PZD are valid only when the heartbeat is enabled and the bit is 1.)
10: Pre-exciting (0: disable; 1: enable)
11: DC braking (0: disable; 1: enable)
12: Drop control (0: disable; 1: enable)
13: Run forward (0: disable; 1: forward)
14: Run reversely (0: disable; 1: reverse)
15: Switch to the master (0: disable; 1: switch to master)
16: Switch to slave (0: disable; 1: switch to slave)
17: Switch between speed control and torque control (0: disable; 1: enable)
18: Run command to switch between local and remote (0: remote; 1: Local. Select a local mode based on the thousand bit of P90.16.)</td><td>1</td><td>◎</td></tr>
<tr><td>P90.01</td><td>Bit 01 selection of CW 1</td><td>2</td><td>◎</td></tr>
<tr><td>P90.02</td><td>Bit 02 selection of CW 1</td><td>3</td><td>◎</td></tr>
<tr><td>P90.03</td><td>Bit 03 selection of CW 1</td><td>4</td><td>◎</td></tr>
<tr><td>P90.04</td><td>Bit 04 selection of CW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.05</td><td>Bit 05 selection of CW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.06</td><td>Bit 06 selection of CW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.07</td><td>Bit 07 selection of CW 1</td><td>6</td><td>◎</td></tr>
<tr><td>P90.08</td><td>Bit 08 selection of CW 1</td><td>7</td><td>◎</td></tr>
<tr><td>P90.09</td><td>Bit 09 selection of CW 1</td><td>8</td><td>◎</td></tr>
<tr><td>P90.10</td><td>Bit 10 selection of CW 1</td><td>9</td><td>◎</td></tr>
<tr><td>P90.11</td><td>Bit 11 selection of CW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.12</td><td>Bit 12 selection of CW 1</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Default	Modify
P90.13	Bit 13 selection of CW 1	19: Switch between motor groups (0: motor group 1; 1: motor group 2) 20: Remote brake output (0: disable; 1: brake output relay is valid, corresponding to output terminal 50: remote brake) 21: Reserved 22: Clear encoder pulse count value (0: disable; 1: set the present encoder pulse count value to the value of P22.24) 23–32: Reserved	0	◎
P90.14	Bit 14 selection of CW 1		0	◎
P90.15	Bit 15 selection of CW 1		0	◎
P90.16	Partial function selection 1 of CW 1	Setting range: 0x0000–0x2111 Ones place: OFF1 power-off and restart 0: OFF1 rising edge + RUN high level startup 1: OFF1 rising edge + RUN rising edge startup Tens place: OFF2 communication control enable 0: Select the bit of OFF2 as 1 for the forced control word 1, i.e. not activated 1: Select the bit value of OFF2 for the received control word 1 **Note:** When the terminal/keypad gives a free stop command, this bit is invalid. Hundreds place: OFF3 communication control enable 0: Select the forced control word 1 to the bit of OFF3 as 1, i.e. not activated 1: Select the bit value of OFF3 for the received control word 1 Thousands place: Switch to local 0: "18: Run command to switch between local and remote" in CW 1 is not identified. 1: Identify "18: Run command to switch between local and remote" in CW 1, and switch to the local keypad. 2: Identify "18: Run command to switch between local and remote" in CW 1, and switch to the local terminal.	0x0000	◎
P90.17	Partial function selection 2 of CW	Setting range: 0x0000–0x1111 Ones place: Enabling ramps setting of CW1	0x0000	◎

Function code	Name	Description	Default	Modify
	1	0: Invalid 1: The value of the "ramp setpoint" bit selected in control word 1 is valid. Tens place: Reference direction of CW1 0: Invalid (Forward by default) 1: Reference direction valid Hundreds place: Reserved Thousands place: DP drop control selection 0: Disable, common platform method adopted 1: Enable		
P90.18	Bit 0 of CW 2	0: Invalid 1: Drop control enabled 2: Heartbeat reference (0: no heartbeat; 1: The RUN command in control word 1 and received PZD are valid only when the heartbeat is enabled and the bit is 1.) 3: Remote brake output (0: disable; 1: brake output relay is valid, corresponding to output terminal 50: remote brake) 4: Clear encoder pulse count value (0: disable; 1: set the present encoder pulse count value to the value of P22.24) 5–16: Reserved	0	◎
P90.19	Bit 1 of CW 2		0	◎
P90.20	Bit 2 of CW 2		0	◎
P90.21	Bit 3 of CW 2		0	◎
P90.22	Bit 4 of CW 2		0	◎
P90.23	Bit 5 of CW 2		0	◎
P90.24	Bit 6 of CW 2		0	◎
P90.25	Bit 7 of CW 2		0	◎
P90.26	Bit 8 of CW 2		0	◎
P90.27	Bit 9 of CW 2		0	◎
P90.28	Bit 10 of CW 2		0	◎
P90.29	Bit 11 of CW 2		0	◎
P90.30	Bit 12 of CW 2		0	◎
P90.31	Bit 13 of CW 2		0	◎
P90.32	Bit 14 of CW 2		0	◎
P90.33	Bit 15 of CW 2		0	◎
P90.34	Bit 00 selection of SW 1	0–47 0: Invalid Ready status after power on (0: invalid; 1: valid) OFF2/OFF3 invalid and OFF1 activated 2: Ready to run status (0: invalid; 1: valid) OFF2/ OFF3/ OFF1 invalid 3: Running status (0: invalid; 1: running) OFF2/OFF3/OFF1 invalid and RUN activated 4: Faulty status (0: Invalid; 1: Faulty) 5: OFF2 status (0: OFF2 activated; 1: disable) 6: OFF3 status (0: OFF3 activated; 1: disable)	1	◎
P90.35	Bit 01 selection of SW 1		2	◎
P90.36	Bit 02 selection of SW 1		3	◎
P90.37	Bit 03 selection of SW 1		4	◎
P90.38	Bit 04 selection of SW 1		5	◎
P90.39	Bit 05 selection of SW 1		6	◎

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P90.40</td><td>Bit 06 selection of SW 1</td><td rowspan="10">7: Prohibit running status (0: invalid; 1: prohibit running status)
OFF2/OFF3 activated
8: Reserved
9: Speed deviation fault (0: speed deviation; 1: invalid)
10: Remote control (0: disable; 1: remote)
Terminal or comunication remote (0: terminal; 1: communication)
Zero speed status (0: invalid; 1: zero speed)
Jogging status (0: invalid; 1: jogging)
14: Motor running direction (0: forward; 1: reverse)
15: ACC/DEC (0: constant speed; 1: ACC/DEC)
16: Torque limit reached (1: the torque output reaches the limit value)
17: Max. frequency reached (1: The frequency reaches the maximum value.)
18: Motor running group (0: motor 1; 1: motor 2)
19: Motor type (0: AM; 1: SM)
20: End of excitation establishment (Related to P03.25 in Vector 0 mode.) 0: invalid; 1: excitation establishment ends)
21: Excitation status (0: invalid; 1: exciting)
22: Bus voltage established (0: not established; 1: established)
23: Heartbeat feedback (0: invalid; 1: heartbeat feedback)
24: Master mode (0: disable; 1: master mode)
25: Slave mode (0: disable; 1: slave mode)
26: Overcurrent (0: invalid; 1: overcurrent)
27: Bus overvoltage (0: invalid; 1: overvoltage)
28: Bus undervoltage (0: invalid; 1: undervoltage)
29: Motor overload (0: invalid; 1: motor overload)
30: VFD overload (0: invalid; 1: VFD overload)
31: Torque control mode (0: disable; 1: torque mode)
32–47: Reserved</td><td>7</td><td>◎</td></tr>
<tr><td>P90.41</td><td>Bit 07 selection of SW 1</td><td>8</td><td>◎</td></tr>
<tr><td>P90.42</td><td>Bit 08 selection of SW 1</td><td>9</td><td>◎</td></tr>
<tr><td>P90.43</td><td>Bit 09 selection of SW 1</td><td>10</td><td>◎</td></tr>
<tr><td>P90.44</td><td>Bit 10 selection of SW 1</td><td>11</td><td>◎</td></tr>
<tr><td>P90.45</td><td>Bit 11 selection of SW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.46</td><td>Bit 12 selection of SW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.47</td><td>Bit 13 selection of SW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.48</td><td>Bit 14 selection of SW 1</td><td>0</td><td>◎</td></tr>
<tr><td>P90.49</td><td>Bit 15 selection of SW 1</td><td>0</td><td>◎</td></tr>
</table>

Function code	Name	Description	Default	Modify
P90.50	Bit 0 of SW 2	0–63 0–31: Consistent with SW 1 32: Input phrase-loss (0: invalid; 1: input phrase-loss) 33: Output phrase-loss (0: invalid; 1: output phrase-loss) 34: VFD overheating (0: invalid; 1: VFD overheating) 35: PT100 overtemp pre-alarm (0: invalid; 1: overtemp pre-alarm) 36: PT100 overtemp (0: invalid; 1: overtemperature) 37: PT1000 overtemp pre-alarm (0: invalid; 1: overtemp pre-alarm) 38: PT1000 overtemp (0: invalid; 1: overtemperature) 39: Motor overheating input (0: invalid; 1: motor overheating) 40: VFD PoFF status (1: PoFF status) 41: Power-up buffer disconnect (0: invalid; 1: disconnected) 42: S1 status 43: S2 status 44: S3 status 45: S4 status 46–47: Reserved 48: Brake status (0: braking; 1: brake released) 49: Release of braking control reference value (0: invalid; 1: valid) 50: Release of braking control inverter (0: invalid; 1: valid) 51: Brake releasing error warning (0: invalid; 1: valid) 52: Braking error warning (0: invalid; 1: valid) 53: Brake releasing torque verification passed (0: invalid; 1: valid) 54: Brake releasing frequency verification passed (0: invalid; 1: valid) 55–63: Reserved	0	◎
P90.51	Bit 1 of SW 2		0	◎
P90.52	Bit 2 of SW 2		0	◎
P90.53	Bit 3 of SW 2		0	◎
P90.54	Bit 4 of SW 2		0	◎
P90.55	Bit 5 of SW 2		0	◎
P90.56	Bit 6 of SW 2		0	◎
P90.57	Bit 7 of SW 2		0	◎
P90.58	Bit 8 of SW 2		0	◎
P90.59	Bit 9 of SW 2		0	◎
P90.60	Bit 10 of SW 2		0	◎
P90.61	Bit 11 of SW 2		0	◎
P90.62	Bit 12 of SW 2		0	◎
P90.63	Bit 13 of SW 2		0	◎
P90.64	Bit 14 of SW 2		0	◎
P90.65	Bit 15 of SW 2		0	◎

Function code	Name	Description	Default	Modify
P90.66	Reverse received CW 1 per bit	0x0000–0xFFFF	0x0000	◎
P90.67	Reverse received CW 2 per bit	0x0000–0xFFFF	0x0000	◎
P90.68	Reverse sent SW 1 per bit	0x0000–0xFFFF	0x0000	◎
P90.69	Reverse sent SW 2 per bit	0x0000–0xFFFF	0x0000	◎
P90.70	DP communication data interacts with PLC card	0x0000–0x1111 Ones place: CW 1 0: disable 1: enable Tens place: SW 1 0: disable 1: enable Hundreds place: Received PZD2–PZD12 0: disable 1: enable Thousands place: Sent PZD2–PZD12 0: disable 1: enable	0x0000	○
P90.71	DP special function 1 selection	0x000–0x111 Ones place: 0: Invalid 1: In Poff (main contact disconnected), faults can be reset. Tens place: 0: DP control word edge trigger active 1: DP control word level trigger active Hundreds place: 0: Fault E-DP is reported at DP timeout 1: Fault A-DP is reported at DP timeout	0x000	○
P90.72	OFF source selection	0x000–0x444 Ones place: OFF1 command source Tens place: OFF2 command source Hundreds place: OFF3 command source 0: DP communication	0x000	○

Function code	Name	Description	Default	Modify
		1: S1 2: S2 3: S3 4: S4 **Note:** Tens place is valid when the tens place of P90.16 is 1. Hundreds place is valid when the hundreds place of P90.16 is 1.		

P91 group—DP process data functions

Function code	Name	Description	Default	Modify
P91.00	Numerator of received PZD2 conversion base value	0–65535 $$\text{Actual received value} = \frac{\text{Received PZD} \times \text{Numerator of received PZD conversion base value}}{\text{Denominator of received PZD2 conversion base value}}$$	16384	○
P91.01	Denominator of received PZD2 conversion base value		16384	○
P91.02	Numerator of received PZD3 conversion base value		16384	○
P91.03	Denominator of received PZD3 conversion base value		16384	○
P91.04	Numerator of received PZD4 conversion base value		16384	○
P91.05	Denominator of received PZD4 conversion base value		16384	○
P91.06	Numerator of received PZD5 conversion base value		16384	○

Function code	Name	Description	Default	Modify
P91.07	Denominator of received PZD5 conversion base value		16384	○
P91.08	Numerator of received PZD6 conversion base value		16384	○
P91.09	Denominator of received PZD6 conversion base value		16384	○
P91.10	Numerator of received PZD7 conversion base value		16384	○
P91.11	Denominator of received PZD7 conversion base value		16384	○
P91.12	Numerator of received PZD8 conversion base value		16384	○
P91.13	Denominator of received PZD8 conversion base value		16384	○
P91.14	Numerator of received PZD9 conversion base value		16384	○
P91.15	Denominator of received PZD9 conversion base value		16384	○
P91.16	Numerator of received PZD10 conversion base value		16384	○

Function code	Name	Description	Default	Modify
P91.17	Denominator of received PZD10 conversion base value		16384	○
P91.18	Numerator of received PZD11 conversion base value		16384	○
P91.19	Denominator of received PZD11 conversion base value		16384	○
P91.20	Numerator of received PZD12 conversion base value		16384	○
P91.21	Denominator of received PZD12 conversion base value		16384	○
P91.22	Numerator of sent PZD2 conversion base value	0–65535 $\text{Sent PZD} = \frac{\text{Actual value} \times \text{Numerator of sent PZD conversion base value}}{\text{Denominator of sent PZD2 conversion base value}}$	16384	○
P91.23	Denominator of sent PZD2 conversion base value		16384	○
P91.24	Numerator of sent PZD3 conversion base value		16384	○
P91.25	Denominator of sent PZD3 conversion base value		16384	○
P91.26	Numerator of sent PZD4 conversion base value		16384	○

Function code	Name	Description	Default	Modify
P91.27	Denominator of sent PZD4 conversion base value		16384	○
P91.28	Numerator of sent PZD5 conversion base value		16384	○
P91.29	Denominator of sent PZD5 conversion base value		16384	○
P91.30	Numerator of sent PZD6 conversion base value		16384	○
P91.31	Denominator of sent PZD6 conversion base value		16384	○
P91.32	Numerator of sent PZD7 conversion base value		16384	○
P91.33	Denominator of sent PZD7 conversion base value		16384	○
P91.34	Numerator of sent PZD8 conversion base value		16384	○
P91.35	Denominator of sent PZD8 conversion base value		16384	○
P91.36	Numerator of sent PZD9 conversion base value		16384	○
P91.37	Denominator of sent PZD9 conversion base value		16384	○

Function code	Name	Description	Default	Modify
P91.38	Numerator of sent PZD10 conversion base value		16384	○
P91.39	Denominator of sent PZD10 conversion base value		16384	○
P91.40	Numerator of sent PZD11 conversion base value		16384	○
P91.41	Denominator of sent PZD11 conversion base value		16384	○
P91.42	Numerator of sent PZD12 conversion base value		16384	○
P91.43	Denominator of sent PZD12 conversion base value		16384	○
P91.44	Running frequency filter time	0.000–10.000s Valid when "29: Running frequency (number with sign)" is selected for P15 group Sent PZD channel.	0.010s	○
P91.45	Rotational speed filter time	0.000–10.000s Valid when "28: Rotation speed of running (number with sign)" is selected for P15 group Sent PZD channel.	0.010s	○
P91.46	Output current filter time	0.000–10.000s Valid when "5: Output current (number without sign)" is selected for P15 group Sent PZD channel.	0.010s	○
P91.47	Output torque filter time	0.000–10.000s Valid when "6: Output torque (number with sign)" is selected for P15 group Sent PZD channel.	0.010s	○
P91.48	Output power filter time	0.000–10.000s Valid when "7: Output power (number with sign)" is selected for P15 group Sent PZD channel.	0.010s	○

Function code	Name	Description	Default	Modify
P91.49	Bus voltage filter time	0.000–10.000s Valid when "3: Bus voltage (x10, V)" is selected for P15 group Sent PZD channel.	0.010s	○
P91.50	Output voltage filter time	0.000–10.000s Valid when "4: Output voltage (×1, V)" is selected for P15 group Sent PZD channel.	0.010s	○
P91.51	Partial function selection 1 of received PZD	0x00–0x11 Ones place: Auxiliary frequency overlay selection 0: Invalid 1: Valid Tens place: Auxiliary torque overlay selection 0: Invalid 1: Enable (Enabled when P03.40 is disabled)	0x00	◎
P91.52	Partial function selection 2 of received PZD	0x000–0x111 Ones place: DP running speed source 0: Run at set frequency 1: Run at set speed Tens place: Drop rate setting at drop control 0: Keypad 1: DP communication Hundreds place: Setting of the number of slaves 0: Keypad 1: DP communication	0x000	◎
P91.53	Zero speed threshold	0.00–10.00Hz	2.00Hz	○
P91.54	Zero speed detection time	0.0–10.0s	1.0s	○
P91.55	Detection time of torque limit reached	0.0–10.0s	1.0s	○
P91.56	Max. temperature detection cycle	1–60000h	6h	◎
P91.57	AB upper computer DP communication analysis	0: By PPO configuration 1: By AB configuration	0	○

P92 group—Water supply functions

Function code	Name	Description	Default	Modify
P92.00	Sleep function for water supply	0: Invalid 1: Valid	0	◎
P92.01	Pressure feedback source	0: AI1 set value 1: AI2 set value 2: AI3 set value 3: HDIA set value 4: HDIB set value	0	○
P92.02	Sleep check mode	0: At a set frequency less than or equal to P92.03 1: At a feedback pressure greater than or equal to P92.04	0	◎
P92.03	Sleep starting frequency	0.00Hz–P00.03 (Max. output frequency)	10.00Hz	○
P92.04	Sleep start pressure	0.00–100.00%	50.0%	○
P92.05	Delayed entry into sleep time	0.0–3600.0s	5.0s	○
P92.06	Sleep wakeup mode	0: At a set frequency greater than P92.07 1: At a feedback pressure less than P92.08	0	◎
P92.07	Wake-up-from-sleep frequency	0.00–P00.03 (Max. output frequency)	20.00Hz	○
P92.08	Set value of sleep wakeup pressure	0.00–100.00%	10.0%	○
P92.09	Min. sleep time	0.0–3600.0s	5.0s	○
P92.10	Auxiliary motor selection	0: No auxiliary motor 1: Auxiliary motor 1 2: Auxiliary motor 2 3: Auxiliary motor 1 and 2	0	○
P92.11	Auxiliary motor 1 start/stop delay time	0.0–3600.0s	5.0s	○
P92.12	Auxiliary motor 2 start/stop delay time	0.0–3600.0s	5.0s	○

P93 group—PT100/PT1000 temperature protection functions

Function code	Name	Description	Default	Modify
P93.00	Enabling PT100/PT1000 temperature detection	0x00–0x11 Ones place: PT100 temperature detection 0: Disable 1: Enable Tens place: PT1000 temperature detection 0: Disable 1: Enable	0x00	◎
P93.01	PT100 overtemperature protection point	0.0–150.0°C	120.0°C	○
P93.02	PT100 overtemperature pre-alarm point	0.0–150.0°C	100.0°C	○
P93.03	PT100 calibrated temperature upper limit	50.0–150.0°C	120.0°C	○
P93.04	PT100 calibrated temperature lower limit	-20.0–50.0°C	10.0°C	○
P93.05	Digital of PT100 calibrated temperature upper limit	0–4096	2950	○
P93.06	Digital of PT100 calibrated temperature lower limit	0–4096	1270	○
P93.07	PT1000 overtemperature protection point	0.0–150.0°C	120.0°C	○
P93.08	PT1000 overtemperature pre-alarm point	0.0–150.0°C	100.0°C	○
P93.09	PT1000 calibrated temperature upper limit	50.0–150.0°C	120.0°C	○

Function code	Name	Description	Default	Modify
P93.10	PT1000 calibrated temperature lower limit	-20.0–50.0°C	10.0°C	○
P93.11	Digital of PT1000 calibrated temperature upper limit	0–4096	3100	○
P93.12	Digital of PT1000 calibrated temperature lower limit	0–4096	1100	○
P93.13	Enabling PT100/PT1000 disconnection detection	0x00–0x11 Ones place: PT100 disconnection detection 0: Disable 1: Enable Tens place: PT1000 disconnection detection 0: Disable 1: Enable	0x00	◎
P93.14	PT100 present temperature	-50.0–150.0°C	0.0°C	●
P93.15	PT100 present digital	0–4096	0	●
P93.16	PT1000 present temperature	-50.0–150.0°C	0.0°C	●
P93.17	PT1000 present digital	0–4096	0	●
P93.18	Alarm display value	0–6 0: No alarm 1: PT100 overtemperature alarm (A-Ot1) 2: PT1000 overtemperature alarm (A-Ot2) 3: PT100 disconnection alarm (A-Pt1) 4: PT1000 disconnection alarm (A-Pt2) 5: AIAO disconnection alarm (A-OPn) 6: AIAO overtemperature alarm (A-OHt)	0	●
P93.19	Reserved	0–65535	0	●
P93.20	Type of sensor for AI/AO card to	0: No inputs 1: PT100 input	0	○

Function code	Name	Description	Default	Modify
	detect motor temperature	2: PT1000 input 3: KTY84 input 4: PTC input (If AIAO is used, set P93.23=2; if S terminal is used, set P93.23=1) **Note:** Switch the output of AO1 to current, and connect one end of the temperature resistor to AI1 and AO1, and the other end to GND**.** **Note:** When 1–4 is selected, P06.14 is defaulted to "32: Source output at constant current".		
P93.21	AIAO detected temperature	-20.0–200.0°C	0.0°C	●
P93.22	AIAO detected motor overtemperature protection threshold	0.0–200.0°C	110.0°C	○
P93.23	PTC motor protection mode	0: Not detect 1: S terminal input protection 2: AIAO detection protection	0	○
P93.24	AO output current setting when PTC is detected by AIAO	0.000–20.000mA	4.000mA	○
P93.25	Overtemp protection resistance point when PTC is detected by AIAO	0–60000Ω	750Ω	○
P93.26	Actual resistance value when PTC is detected by AIAO	0–60000Ω	0Ω	●
P93.27	Motor overtemp protection selection	0–1 0: Action in P93.29 is conducted when: the detected temperature exceeds the overtemp threshold; the detected resistance exceeds the overtemp protection resistance; PTC selected by terminal function is enabled; or the overtemp fault A-OHt is reported.	0	○

Function code	Name	Description	Default	Modify
		1: VFD stops when: the detected temperature exceeds the overtemp threshold; the detected resistance exceeds the overtemp protection resistance; PTC selected by terminal function is enabled; or the overtemp fault E-OHt is reported.		
P93.28	AIAO disconnection detection	0: Disable 1: Enable. When the disconnection is detected, the fault A-OPn is reported and the action in P93.29 is conducted.	0	○
P93.29	Run mode at warning	0: Normal running 1: Decelerate to stop	0	○
P93.30	AIAO detected temperature compensation value	-50.0°C–50.0°C	0.0°C	○

P94 group—Braking control functions

Function code	Name	Description	Default	Modify
P94.00	Brake enabling	0: Disable 1: Enable	0	◎
P94.01	Brake feedback mode	0: With feedback signal 1: Without feedback signal	1	◎
P94.02	Brake release frequency	Execute the release operation after the VFD output frequency rises to the release frequency. Range: 0.20–20.00Hz	1.00Hz	○
P94.03	Releasing current	Execute the release operation after the VFD output current rises to the release current. Range: 0.0%–P94.10	0.0%	○
P94.04	Delay time before brake release	Hold time before executing release operation. Range: 0.000–5.000s	0.300s	○
P94.05	Delay time after brake release	Hold time after executing release operation. Range: 0.000–5.000s	0.300s	○
P94.06	Braking frequency	Execute the brake switch-on operation after the VFD output frequency drops to the braking frequency. Range: 0.20–20.00Hz	1.00Hz	○

Function code	Name	Description	Default	Modify
P94.07	Delay time before brake switch-on	Hold time before executing brake switch-on operation. Range: 0.000–5.000s	0.300s	○
P94.08	Delay time after brake switch-on	Hold time after executing brake switch-on operation. Range: 0.000–5.000s	0.300s	○
P94.09	Brake feedback exception detection time	When the brake command and the brake feedback signal are not consistent, the fault will be reported after the delay of P94.09. Range: 0.000–20.000	3.000s	○
P94.10	Electromotive torque upper limit at brake switch-on	Indicates the electromotive torque upper limit at brake switch-on. Range: 0.0– 200.0% (of the motor rated current)	180%	○
P94.11	Braking torque upper limit at brake switch-on	Indicates the braking torque upper limit at brake switch-on. Range: 0.0– 200.0% (of the motor rated current)	180%	○

7 Troubleshooting

7.1 What this chapter contains

The chapter tells you how to reset faults and check faults history. A complete list of alarms and fault information as well as possible causes and corrective measures are presented in this chapter.

	✧ Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in "Safety precautions".

7.2 Indications of alarms and faults

The fault is indicated by indicators. When the TRIP indicator is on, the alarm or fault code displayed on the keypad indicates the VFD is in abnormal state. This chapter covers most of the alarms and faults, and their possible causes and corrective measures. If you cannot find out the causes of alarms or faults, contact local INVT office.

7.3 Fault reset

The VFD can be reset by pressing the keypad key STOP/RST, digital inputs, or by cutting off the VFD power. After faults are removed, the motor can be started again.

7.4 Fault history

The function codes from P07.27 to P07.32 record the types of the last six faults. The function codes P07.33–P07.40, P07.41–P07.48, P07.49–P07.56 record the running data of the VFD at the last three faults.

7.5 Faults and solutions

When a fault occurred, handle the fault as follows:

1. Check whether keypad display is improper. If yes, contact the local INVT office.
2. If no, check function group P07 to view the fault record parameters and understand the actual condition.
3. See the following table for a detailed solution and check for exceptions.
4. Rectify the fault or ask for help.
5. Ensure the fault has been rectified, perform fault reset, and run the VFD again.

7.5.1 Faults and solutions

Note: The numbers enclosed in square brackets such as [1], [2] and [3] in the **Fault type** column in the following table indicate the VFD fault type codes read through communication.

Fault code	Fault type	Possible cause	Solution
OUt1	[1] Inverter unit U-phase protection	ACC is too fast. IGBT module is damaged. Misoperation caused by interference.	Increase ACC time. Replace the power unit. Check drive wires. Check whether there is strong
OUt2	[2] Inverter unit V-phase protection		

Fault code	Fault type	Possible cause	Solution
OUt3	[3] Inverter unit W-phase protection	Drive wires are poorly connected. To-ground short circuit occurs.	interference surrounding the peripheral device.
OV1	[7] Overvoltage during ACC	Exception occurred to input voltage. Large energy feedback. Lack of braking units. Energy-consumption braking is not enabled.	Check the input power. Check whether load DEC time is too short. or the motor starts during rotating. Install dynamic brake components. Check the settings of related function codes.
OV2	[8] Overvoltage during DEC		
OV3	[9] Overvoltage during constant speed running		
OC1	[4] Overcurrent during ACC	ACC/DEC is too fast; The voltage of the grid is too low; The VFD power is too small. Load transient or exception occurred. To-ground short circuit or output phase loss occurred; Strong external interference sources; The overcurrent stall protection is not enabled.	Increase ACC/DEC time. Check the input power. Select a VFD with larger power. Check whether the load is short circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth. Check the output wiring. Check whether there is strong interference. Check the setting of related function codes.
OC2	[5] Overcurrent during DEC		
OC3	[6] Overcurrent during constant speed running		
UV	[10] Bus undervoltage	The voltage of the grid is too low. The overvoltage stall protection is not enabled.	Check the grid input power supply. Check the setting of related function codes.
OL1	[11] Motor overload	The voltage of the grid is too low. The motor rated current is set incorrectly. The motor stall occurs or the load transient is too large.	Check the grid voltage. Reset the rated current of the motor. Check the load and adjust the torque boost quantity.
OL2	[12] VFD overload	ACC is too fast. The motor in rotating is restarted. Grid voltage too low.	Increase ACC time. Avoid restart after stop. Check the grid voltage; Select the VFD with larger

Fault code	Fault type	Possible cause	Solution
		Load too large. Power is too small.	power; Select a proper motor.
SPI	[13] Phase loss on input side	Phase loss or violent fluctuation occurred on input R, S, T.	Check the input power. Check the installation wiring.
SPO	[14] Phase loss on output side	Phase loss occurred to U, V, W output (or the three phases of motor is asymmetrical).	Check the output wiring. Check the motor and cables.
OH1	[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. Lower the ambient temperature.
OH2	[16] Inverter module overheat		
EF	[17] External fault	SI external faulty input terminal action.	Check external device input.
CE	[18] RS485 communication fault	Incorrect baud rate. Communication line fault. Incorrect communication address. Communication suffers from strong interference.	Set proper baud rate; Check the wiring of communication interfaces; Set the proper communication address. Change or replace the wire or improve the anti-interference capability.
ItE	[19] Current detection fault	Poor contact of the connector of control board. Hall component damaged. Exception occurred to amplification circuit.	Check the connector and re-plug; Replace the hall component. Replace the main control board.
tE	[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. Motor parameter is set improperly. The parameters gained from autotuning deviate sharply from the standard	Change the VFD model, or adopt V/F mode for control; Set proper motor type and nameplate parameters; Empty the motor load and carry out autotuning again. Check the motor wiring and parameter setup; Check whether the upper limit frequency is larger than 2/3 of

Fault code	Fault type	Possible cause	Solution
		parameters; Autotuning timeout.	the rated frequency.
EEP	[21] EEPROM operation fault	Error in reading or writing control parameters. EEPROM damaged.	Press STOP/RST to reset; Replace the main control board.
PIDE	[22] PID feedback offline fault	PID feedback offline. PID feedback source disappears.	Check PID feedback signal wires; Check PID feedback source.
bCE	[23] Braking unit fault	Fault occurred to the brake circuit or the braking pipe is damaged. Resistance of the external braking resistor is small.	Check the braking unit, and replace with new braking pipe; Increase the brake resistance.
END	[24] Running time reached	The actual running time of the VFD is longer than the internal set running time.	Ask for the supplier and adjust the set running time.
OL3	[25] Electronic overload fault	The VFD reports overload pre-alarm according to the setting.	Check the load and the overload pre-alarm points.
PCE	[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 to determine whether a fault occurs. Check for and remove the external interference source. Replace the hardware and seek maintenance services.
UPE	[27] Parameter upload error	Keypad cable connected improperly or disconnected. Keypad cable too long, causing strong interference. Keypad or mainboard communication circuit error.	Check for and remove the external interference source. Replace the hardware and seek maintenance services. Replace the hardware and seek maintenance services.
DNE	[28] Parameter download error	Keypad cable connected improperly or disconnected. Keypad cable too long, causing strong interference. Data storage error occurred to the keypad.	Check for and remove the external interference source. Replace the hardware and seek maintenance services. Re-back up the data on the keypad.

Fault code	Fault type	Possible cause	Solution
ETH1	[32] To-ground short-circuit fault 1	VFD output is short connected to the ground. Current detection circuit is faulty. Actual motor power setup deviates sharply from the VFD power.	Check whether the motor wiring is normal; Replace the hall component; Replace the main control board; Reset the motor parameters properly.
ETH2	[33] To-ground short-circuit fault 2	VFD output is short connected to the ground. Current detection circuit is faulty. Actual motor power setup deviates sharply from the VFD power.	Check whether the motor wiring is normal; Replace the hall component; Replace the main control board; Reset the motor parameters properly.
dEu	[34] Speed deviation fault	The load is too heavy or stalled.	Check the load to ensure it is proper, and increase the detection time; Check whether the control parameters are set properly.
STo	[35] Mal-adjustment fault	Control parameters of the synchronous motor is set improperly. Autotuned parameters are not accurate; The VFD is not connected to the motor.	Check the load and ensure the load is normal. Check whether control parameters are set correctly. Increase the mal-adjustment detection time.
LL	[36] Electronic underload fault	The VFD reports underload pre-alarm according to the setting.	Check the load and the underload pre-alarm points.
ENC1O	[37] Encoder disconnection fault	Encoder line sequence is wrong, or signal wires are poorly connected.	Check the encoder wiring.
ENC1D	[38] Encoder reserve-rotation fault	The encoder speed signal is contrary to the motor running direction.	Reset encoder direction.
ENC1Z	[39] Encoder Z-pulse disconnection fault	Z signal wires are disconnected.	Check the wiring of Z signal.

Fault code	Fault type	Possible cause	Solution
OT	[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.
CrCE	[44] Safety code FLASH CRC check fault	Control board is faulty.	Replace the control board.
E-Err	[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.
ENCUV	[56] Encoder UVW loss fault	No electric level variation occurred to UVW signal.	Check the wiring of UVW; Encoder is damaged.
F1-Er	[60] Failed to identify the expansion card at card slot 1	There is data transmission in interfaces of card slot 1, however, it cannot read the card type.	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power-off, and check whether the fault persists at next power-on. Check whether the insertion port is damaged, if yes, replace the insertion port after power-off.
F2-Er	[61] Failed to identify the expansion card at card slot 2	There is data transmission in interfaces of card slot 2, however, it cannot read the card type.	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power-off, and check whether the fault persists at next power-on. Check whether the insertion port is damaged. If yes, replace the insertion port after power-off.

Fault code	Fault type	Possible cause	Solution
F3-Er	[62] Failed to identify the expansion card at card slot 3	There is data transmission in interfaces of card slot 3, however, it cannot read the card type.	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power-off, and check whether the fault persists at next power-on. Check whether the insertion port is damaged. If yes, replace the insertion port after power-off.
C1-Er	[63] Communication timeout of expansion card at card slot 1	There is no data transmission in interface at card slot 1.	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power-off, and check whether the fault persists at next power-on. Check whether the insertion port is damaged. If yes, replace the insertion port after power-off.
C2-Er	[64] Communication timeout of expansion card at card slot 2	There is no data transmission in interface at card slot 2.	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power-off, and check whether the fault persists at next power-on. Check whether the insertion port is damaged. If yes, replace the insertion port after power-off.
C3-Er	[65] Communication timeout of expansion card at card slot 3	There is no data transmission in interface at card slot 3.	Confirm whether the expansion card inserted can be supported; Stabilize the expansion card interfaces after power-off, and check whether the fault persists at next power-on. Check whether the insertion port is damaged. If yes, replace the insertion port after power-off.

Fault code	Fault type	Possible cause	Solution
E-DP	[29] PROFIBUS card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-NET	[30] Ethernet card communication timeout fault	There is no data transmission between the communication card and the host controller.	Check whether the communication card wiring is loose or dropped.
E-CAN	[31] CANopen card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-PN	[57] PROFINET card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-CAT	[66] EtherCAT card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-BAC	[67] BACNet card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
E-DEV	[68] DeviceNet card communication timeout fault	There is no data transmission between the communication card and the host controller (or PLC).	Check whether the communication card wiring is loose or dropped.
ESCAN	[58] CAN master/slave card communication timeout fault	There is no data transmission between the CAN master and slave communication cards.	Check whether the communication card wiring is loose or dropped.
S-Err	[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.
OtE1	[70] PT100 overtemperature fault	Present ambient temperature is too high; PT100 detection wiring error; PT100 overtemperature protection setting is improper.	Check the present ambient temperature; Check the PT100 wiring; Check whether the over-temperature fault point of PT100 is set too small.

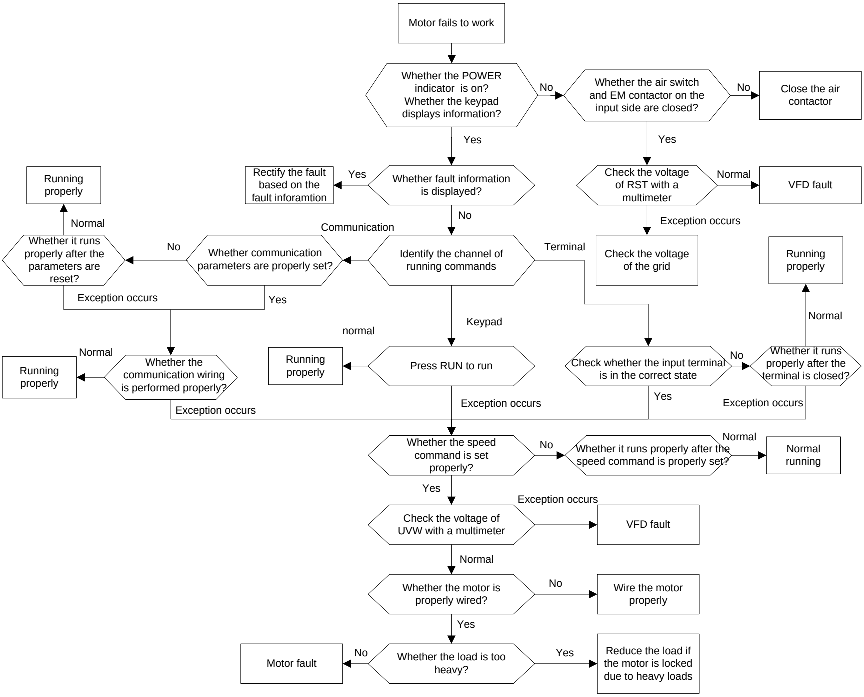
Fault code	Fault type	Possible cause	Solution
OtE2	[71] PT1000 overtemperature fault	Present ambient temperature is too high; PT1000 detection wiring error; PT1000 overtemperature protection setting is improper.	Check the present ambient temperature; Check the PT1000 wiring; Check whether the over-temperature fault point of PT1000 is set too small.
E-brF	[72] Brake switch-on feedback signal error	The brake feedback signal cables are not connected properly.	Check the PID feedback signal wiring.

7.5.2 Other status

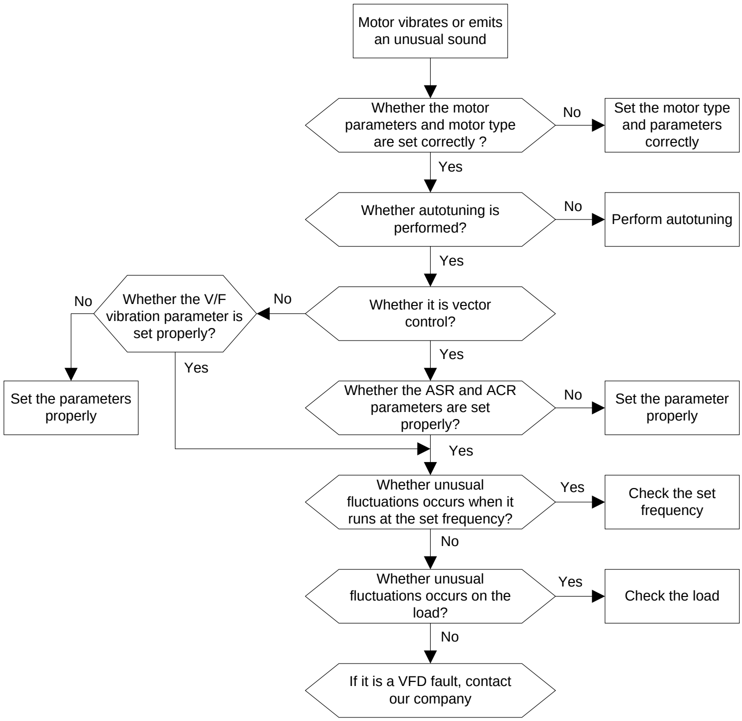
Displayed code	Status type	Possible cause	Solution
PoFF	System power failure	The system is powered off or the bus voltage is too low.	Check the grid conditions.
A-Ot1	PT100 overtemperature warning	Present ambient temperature is too high; PT100 overtemperature pre-alarm setting is improper.	Check the present ambient temperature; Check whether the over-temperature protection point of PT100 is set too small.
A-Ot2	PT1000 overtemperature warning	Present ambient temperature is too high; PT1000 overtemperature pre-alarm setting is improper.	Check the present ambient temperature; Check whether the over-temperature protection point of PT1000 is set too small.
A-Pt1	PT100 disconnection warning	PT100 wiring circuit is disconnected.	Check the PT100 wiring circuit.
A-Pt2	PT1000 disconnection warning	PT1000 wiring circuit is disconnected.	Check the PT1000 wiring circuit.

7.6 Analysis on common faults

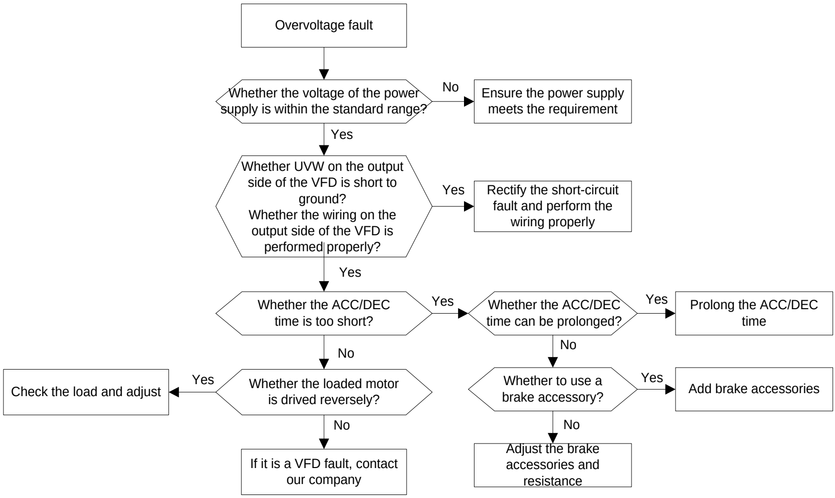
7.6.1 Motor fails to work



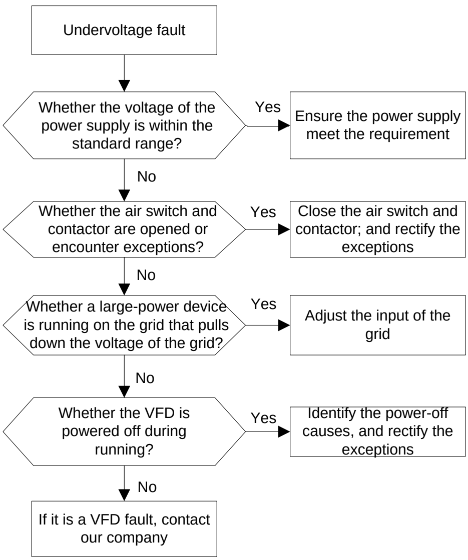
7.6.2 Motor vibrates



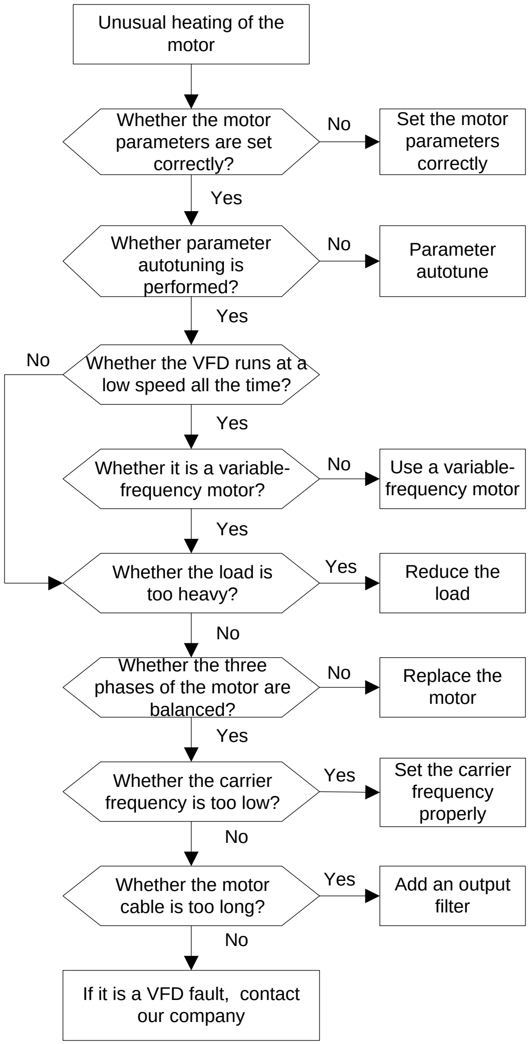
7.6.3 Overvoltage



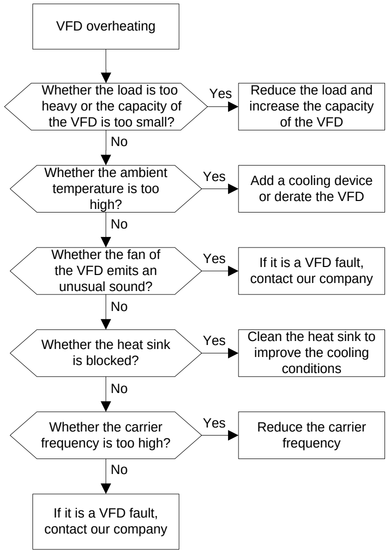
7.6.4 Undervoltage



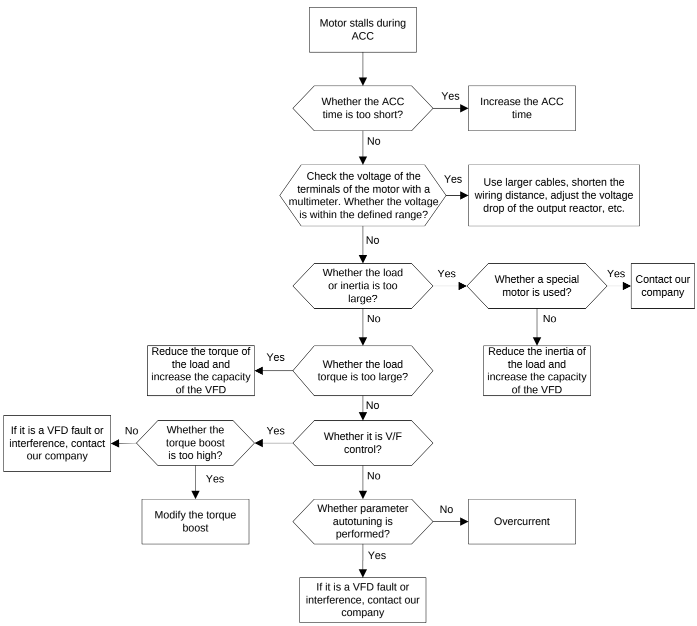
7.6.5 Motor overheating



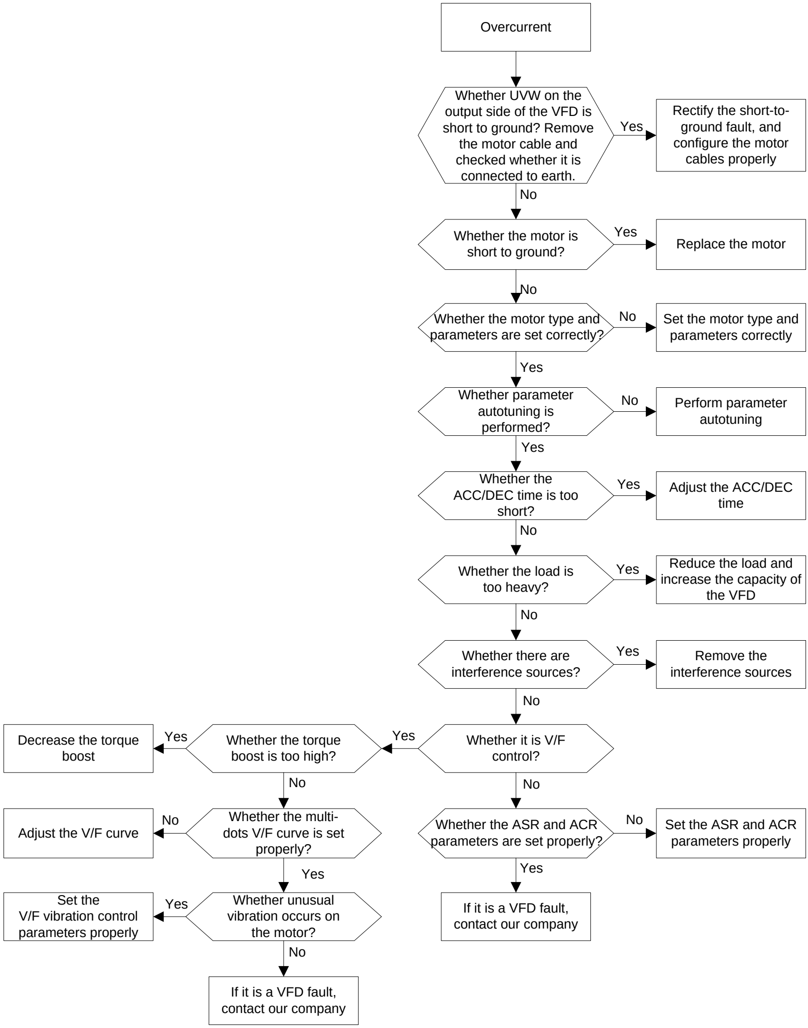
7.6.6 VFD overheating



7.6.7 Motor stalls during ACC



7.6.8 Overcurrent



7.7 Countermeasures on common interference

7.7.1 Interference on meter switches and sensors

Interference phenomenon

Pressure, temperature, displacement, and other signals of a sensor are collected and displayed by a human-machine interaction device. The values are incorrectly displayed as follows after the VFD is started:

1. The upper or lower limit is wrongly displayed, for example, 999 or -999.
2. The display of values jumps (usually occurring on pressure transmitters).
3. 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).
4. 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.
5. After the VFD is started, the display of all kinds of meters (such as frequency meter and current meter) that are connected to the analog output (AO) terminal of the VFD is severely affected, displaying the values incorrectly.
6. Proximity switches are used in the system. After the VFD is started, the indicator of a proximity switch flickers, and the output level flips.

Solution

1. Check and ensure that the feedback cable of the sensor is 20 cm or farther away from the motor cable.
2. 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).
3. Try to add a safety capacitor of 0.1μF to the signal end of the feedback signal terminal of the sensor.
4. 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).
5. 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.

Note:

1. 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.
2. 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 Filter model selection**.**

7.7.2 Interference on RS485 communication

The interference described in this section on RS485 communication mainly includes communication delay, out of synchronization, occasional power-off, or complete power-off that occurs after the VFD is started.

If the communication cannot be implemented properly, regardless of whether the VFD is running, the exception is not necessarily caused by interference. You can find out the causes as follows:

1. Check whether the RS485 communication bus is disconnected or in poor contact.
2. Check whether the two ends of line A or B are connected reversely.
3. Check whether the communication protocol of the VFD is consistent with that of the upper computer. Check whether the communication protocol (such as the baud rate, data bits, and check bit) of the VFD is consistent with that of the upper computer.

If you are sure that communication exceptions are caused by interference, you can resolve the problem through the following measures:

1. Simple inspection.
2. Arrange the communication cables and motor cables in different cable trays.
3. In multi-VFD application scenarios, adopt the chrysanthemum connection mode to connect the communication cables between VFDs, which can improve the anti-interference capability.
4. In multi-VFD application scenarios, check and ensure that the driving capacity of the master is sufficient.
5. In the connection of multiple VFDs, you need to configure one 120 Ω terminal resistor on each end.

Solution

1. 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).
2. 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.
3. Try to short the signal reference ground terminal (GND) of the VFD to that of the host 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 host controller.
4. Try to short GND of the VFD to its ground terminal (PE).
5. Try to add a safety capacitor of 0.1 μF on the power terminal of the upper computer (PLC, HMI, and touch screen). During this process, pay attention to the voltage of the power supply and the

voltage endurance capability of the capacitor. Alternatively, you can use a magnet ring (Fe-based nanocrystalline magnet rings are recommended). Put the power L/N line or +/- line of the upper computer through the magnet ring in the same direction and wind 8 coils around the magnet ring.

7.7.3 Failure to stop and indicator shimmering due to motor cable coupling

Interference phenomenon

1. 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.

2. 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.

Solution

1. Check and ensure that the exception signal cable is arranged 20 cm or farther away from the motor cable.
2. Add a safety capacitor of 0.1μF between the digital input terminal (S) and the COM.
3. Connect the digital input terminal (S) that controls the start and stop to other idle digital input terminals in parallel. For example, if S1 is used to control the start and stop and S4 is idle, you can try to short connect S1 to S4 in parallel.

Note: If the controller (such as PLC) in the system controls more than 5 VFDs at the same time through digital input terminals (S), this scheme is not applicable.

7.7.4 Leakage current and interference on RCD

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.

1. 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

2. Solution to RCD misoperation (handling the VFD)

1) Try to remove the jumper cap at "EMC/J10" on the middle casing of the VFD.

2) Try to reduce the carrier frequency to 1.5 kHz (P00.14=1.5).

3) Try to modify the modulation mode to "3PH modulation and 2PH modulation" (P08.40=00).

3. Solution to RCD misoperation (handling the system power distribution)

1) Check and ensure that the power cable is not soaking in water.

2) Check and ensure that the cables are not damaged or.

3) Check and ensure that no secondary grounding is performed on the neutral wire.

4) Check and ensure that the main power cable terminal is in good contact with the air switch or contactor (all screws are tightened).

5) Check 1PH powered devices, and ensure that no earth wires are used as neutral wires by these devices.

6) Do not use shielded cables as VFD power cables and motor cables.

7.7.5 Live device chassis

After the VFD is started, there is sensible voltage on the chassis, and you may feel an electric shock when touching the chassis. 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.

Solution:

1. If there is power distribution grounding or ground stud on the site, ground the cabinet chassis of the VFD through the power ground or stud.
2. If there is no grounding on the site, you need to connect the motor chassis to the ground terminal PE of the VFD, and ensure that the jumper at "EMC/J10" on the middle casing of the VFD is shorted.

8 Maintenance

8.1 What this chapter contains

This chapter describes how to carry out preventive maintenance on the VFD.

8.2 Periodical inspection

Little maintenance is required when the VFD is installed in an environment that meets requirements. The following table describes the routine maintenance periods recommended by INVT. The following table describes the routine maintenance periods recommended by INVT.

Check scope		Item	Method	Criterion
Ambient environment		Check the temperature, and humidity, and whether there is vibration, dust, gas, oil spray, and water droplets in the environment.	Visual inspection, and use instruments for measurement.	The requirements stated in this manual are met.
		Check whether there are foreign matters, such as tools, or dangerous substances placed nearby.	Visual inspection	There are no tools or dangerous substances placed nearby.
Voltage		Check the voltage of the main circuit and control circuit.	Use multimeters or other instruments for measurement.	The requirements stated in this manual are met.
Keypad		Check the display of information.	Visual inspection	The characters are displayed properly.
		Check whether characters are not completely displayed.	Visual inspection	The requirements stated in this manual are met.
Main circuit	Common	Check whether the bolts loose or come off.	Screw them up.	No exception occurs.
		Check whether the machine is deformed, cracked, or damaged, or their color changes due to overheating and aging.	Visual inspection	No exception occurs.
		Check whether there are stains and dust attached.	Visual inspection	No exception occurs. **Note:** Discoloration of copper bars does not mean that they cannot work properly.

Check scope		Item	Method	Criterion
	Conductor and wire	Check whether conductors are deformed or color change for overheat.	Visual inspection	No exception occurs.
		Check whether the wire sheaths are cracked or their color changes.	Visual inspection	No exception occurs.
	Terminal block	Check whether there is damage.	Visual inspection	No exception occurs.
	Filter capacitor	Check whether there is electrolyte leakage, discoloration, cracks, and chassis expansion.	Visual inspection	No exception occurs.
		Check whether the safety valves are released.	Determine the service life based on the maintenance information, or measure them through electrostatic capacity.	No exception occurs.
		Check whether the electrostatic capacity is measured as required.	Use instruments to measure the capacity.	Electrostatic capacity ≥ initial value x 0.85
	Resistor	Check whether there is displacement caused due to overheat.	Olfactory and visual inspection	No exception occurs.
		Check whether the resistors are disconnected.	Visual inspection, or remove one end of the connection cable and use a multimeter for measurement.	Resistance range: ±10% (of the standard resistance)
	Transformer, Reactor	Check whether there is unusual vibration sounds or smells.	Auditory, olfactory, and visual inspection	No exception occurs.

Check scope		Item	Method	Criterion
	Electromagnetic contactor and Relay	Check whether there are vibration sounds in the workshop.	Auditory inspection	No exception occurs.
		Check whether the contacts are in good contact.	Visual inspection	No exception occurs.
Control circuit	Control PCB and connector	Check whether the screws and connectors loose.	Screw them up.	No exception occurs.
		Check whether there is unusual smell or discoloration.	Olfactory and visual inspection	No exception occurs.
		Check whether there are cracks, damage, deformation, or rust.	Visual inspection	No exception occurs.
		Check whether there is electrolyte leakage or deformation.	Visual inspection, and determine the service life based on the maintenance information.	No exception occurs.
Cooling system	Cooling fan	Check whether there are unusual sounds or vibration.	Auditory and visual inspection, and turn the fan blades with your hand.	The rotation is smooth.
		Check whether the bolts loose.	Screw them up.	No exception occurs.
		Check whether there is decoloration caused due to overheat.	Visual inspection, and determine the service life based on the maintenance information.	No exception occurs.
	Ventilation duct	Check whether there are foreign matters blocking or attached to the cooling fan, air inlets, or air outlets. Check whether there are foreign objects attached.	Visual inspection	No exception occurs.

For more details about maintenance, contact the local INVT office, or visit our website https://www.invt.com, and choose **Support** > **Services**.

8.3 Cooling fan

The service life of the cooling fan of the VFD is more than 25,000 hours. The actual service life of the cooling fan is related to the use of the VFD and the temperature in the ambient environment.

You can view the running duration of the VFD through P07.14 (Accumulated running time).

The increase of the bearing noise indicates a fan fault. If the VFD is applied in a key position, replace the fan once the fan starts to generate unusual noise. You can purchase spares of fans from INVT.

Cooling fan replacement:

⚠	Read chapter 1 “Safety precautions” carefully and follow the instructions to perform operations. Ignoring these safety precautions may lead to physical injury or death, or device damage.

1. Stop the VFD, disconnect the AC power supply, and wait for a time no shorter than the waiting time designated on the VFD.
2. Open the cable clamp to loose the fan cable (for the 380V 0011–0037 VFD models, the middle casing needs to be removed).
3. Disconnect the fan cable.
4. Remove the fan with a screwdriver.
5. Install a new fan in the VFD in the reverse steps. Assemble the VFD. Ensure that the air direction of the fan is consistent with that of the VFD, as shown in the following figure.

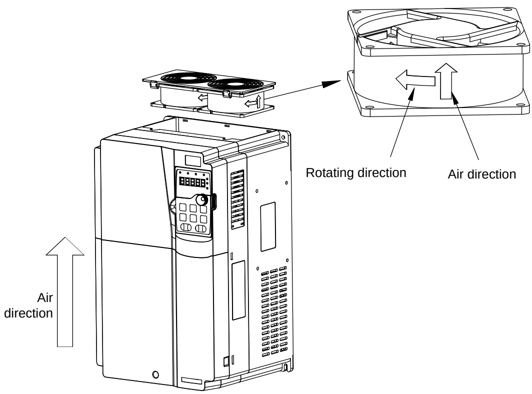


Figure 8-1 Fan maintenance for 0011–0185 VFD models

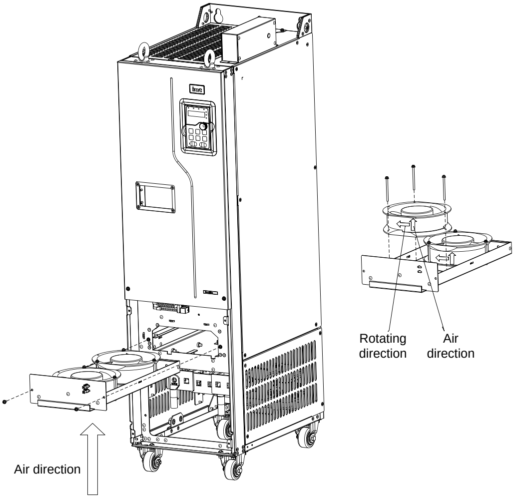


Figure 8-2 Fan maintenance for the 0200 and higher VFD models

6. Connect to the power.

8.4 Capacitor

8.4.1 Capacitor reforming

If the VFD has been left unused for a long time, you need to follow the instructions to reform the DC bus capacitor before using it. The storage time is calculated from the date the VFD is delivered.

Storage time	Operation principle
Less than 1 year	No charging operation is required.
1 to 2 years	The VFD needs to be powered on for 1 hour before the first running command.
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.

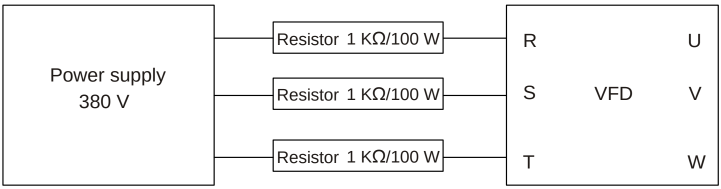


Figure 8-3 380V driving-device charging circuit example

8.4.2 Electrolytic capacitor replacement

⚠	Read chapter 1 “Safety precautions” carefully and follow the instructions to perform operations. Ignoring these safety precautions may lead to physical injury or death, or device damage.

The electrolytic capacitor of a VFD must be replaced if it has been used for more than 35,000 hours. For details about the replacement, contact the local INVT office.

8.5 VFD unit

The unit replacement procedure is as follows:

The unit replacement procedure is as follows:

1. Stop the VFD and disconnect the AC power supply.

2. Open the cabinet door and check to ensure there is no voltage in the equipment.

3. Disconnect the external connection cables of the VFD.

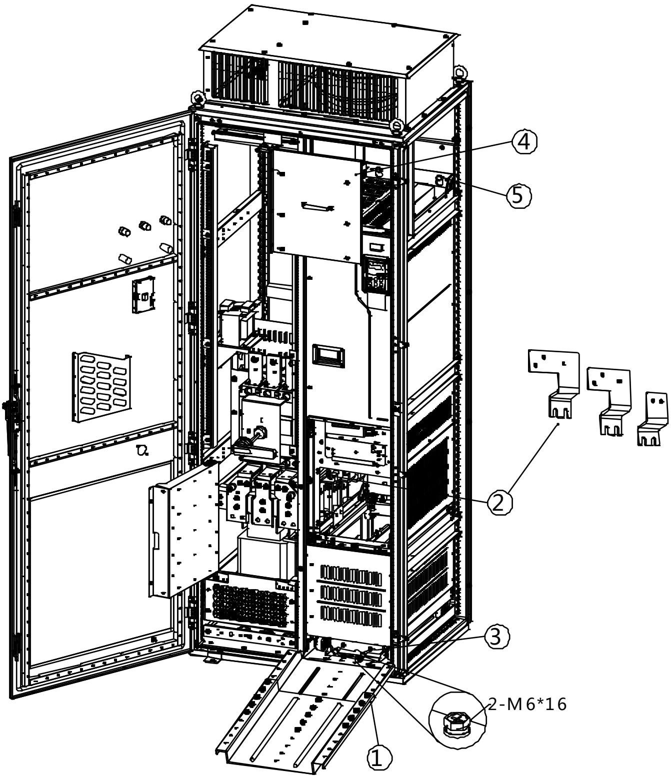
4. Install the unit rail assembly at the bottom of the cabinet, as shown in ①.

5. Remove the front cover of the unit and then the copper strip connecting the unit, as shown in ②.

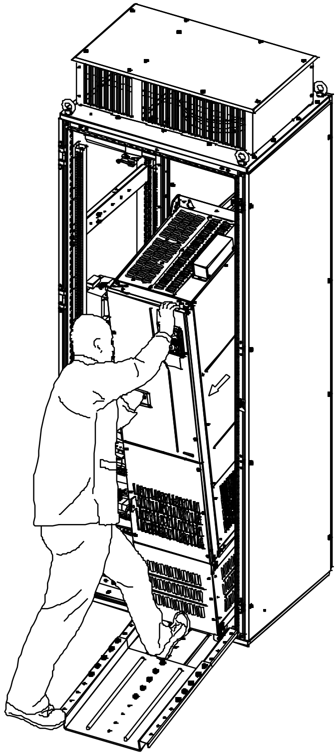
6. Remove the combination screws securing the front underside of the unit to the base plate of the cabinet, as shown in ③.

7. Remove the duct blocking plate above the unit, as shown in ④.

8. Remove the combination screws securing the rear mounting plate above the unit to the crossbeams of the cabinet, as shown in ⑤.



9. Align the VFD unit with the rail and pull the unit out from the cabinet.



10. After maintenance or replacement, install the units back into the cabinet by referring the reverse order of the procedure.

8.6 Power cable

	Read chapter 1 “Safety precautions” carefully and follow the instructions to perform operations. Ignoring these safety precautions may lead to physical injury or death, or device damage.

1. Stop the VFD, disconnect the power supply, and wait for a time no shorter than the waiting time designated on the VFD.
2. Check the connection of the power cables. Ensure that they are firmly connected.
3. Connect to the power.

9 Communication protocol

9.1 What this chapter contains

This chapter describes the communication of the VFD.

The VFD provides RS485 communication interfaces and adopts the master-slave communication based on the international standard Modbus communication protocol. You can implement centralized control (setting commands for controlling the VFD, modifying the running frequency and related function code parameters, and monitoring the working state and fault information of the VFD) through PC/PLC, upper control computer, or other devices to meet specific application requirements.

9.2 Modbus protocol introduction

Modbus is a communication protocol for use with electronic controllers. By using this protocol, a controller can communicate with other devices through transmission lines. It is a general industrial standard. With this standard, control devices produced by different manufacturers can be connected to form an industrial network and be monitored in a centralized way.

The Modbus protocol provides two transmission modes, namely American Standard Code for Information Interchange (ASCII) and remote terminal units (RTU). On one Modbus network, all the device transmission modes, baud rates, data bits, check bits, end bits, and other basic parameters must be set consistently.

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.

9.3 Application of Modbus

The VFD uses the Modbus RTU mode and communicates through RS485 interfaces.

9.3.1 RS485

RS485 interfaces work in half-duplex mode and transmit data signals in the differential transmission way, which is also referred to as balanced transmission. An RS485 interface uses a twisted pair, where one wire is defined as A (+), and the other B (-). Generally, if the positive electrical level between the transmission drives A and B ranges from +2V to +6V, the logic is "1"; and if it ranges from -2V to -6V, the logic is "0".

The 485+ terminal on the terminal block of the VFD corresponds to A, and 485- corresponds to B.

The communication baud rate (P14.01) indicates the number of bits sent in a second, and the unit is bit/s (bps). A higher baud rate indicates faster transmission and poorer anti-interference capability. When a twisted pair of 0.56mm (24 AWG) is used, the maximum transmission distance varies according to the baud rate, as described in the following table.

Baud rate	Max. transmission distance	Baud rate	Max. transmission distance
2400bps	1800m	9600bps	800m
4800bps	1200m	19200bps	600m

In long-distance RS485 communication, it is recommended that you use shielded cables, and use the shielding layer as the ground wire.

When there are fewer devices and the transmission distance is short, the whole network works well without terminal load resistors. The performance, however, degrades as the distance increases. Therefore, it is recommended that you use a 120 Ω terminal resistor when the transmission distance is long.

9.3.1.1 Application to one VFD

Figure 9-1 is the Modbus wiring diagram of one VFD and a PC. Generally, PCs do not provide RS485 interfaces, so you need to convert an RS232 or USB interface of a PC to an RS485 interface through an adapter. Connect end A of the RS485 interface to the 485+ port on the terminal block of the VFD, and connect end B to the 485- port. It is recommended that you use shielded twisted pairs. When an RS232-RS485 converter is used, the cable used to connect the RS232 interface of the PC and the converter cannot be longer than 15 m. Use a short cable when possible. It is recommended that you insert the converter directly into the PC. Similarly, when a USB-RS485 converter is used, use a short cable when possible.

After wiring, select the correct port (such as COM1 to connect the RS232-RS485 converter) on the upper computer, and set the basic parameters such as baud rate and data bit check consistent with those of the VFD.

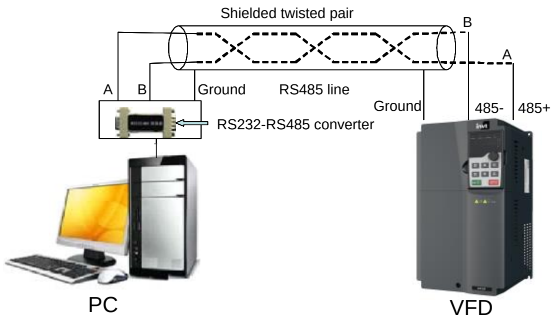


Figure 9-1 Wiring of one RS485 VFD application

9.3.1.2 Application to multiple VFDs

In practical application to multiple VFDs, chrysanthemum connection and star connection are commonly used.

According to the requirements of the RS485 industrial bus standards, all the devices need to be connected in chrysanthemum mode with one 120 Ω terminal resistor on each end, as shown in Figure 9-2. Figure 9-3 is the simplified wiring diagram, and Figure 9-4 is the practical application diagram.

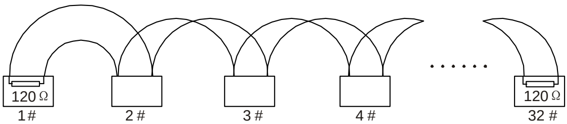


Figure 9-2 Onsite chrysanthemum connection

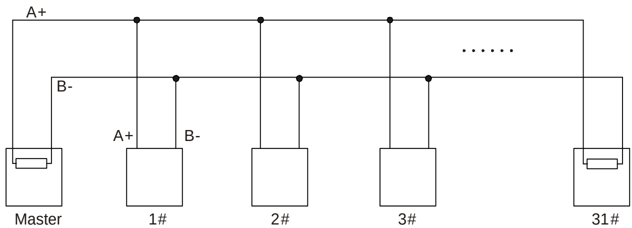


Figure 9-3 Simplified chrysanthemum connection

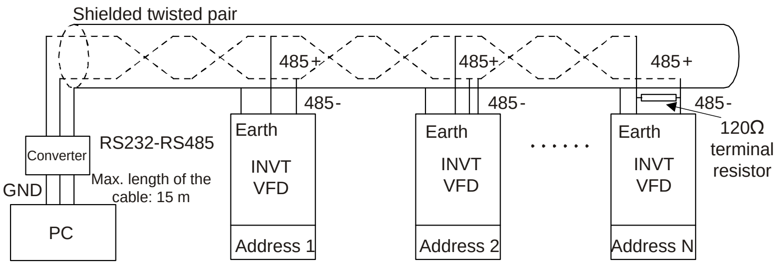


Figure 9-4 Practical chrysanthemum connection application

Figure 9-5 shows the start connection diagram. 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).

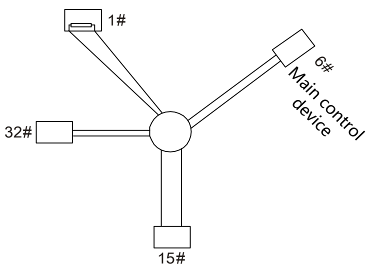


Figure 9-5 Star connection

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 repeated.

9.3.2 RTU mode

9.3.2.1 RTU communication frame structure

When a controller is set to use the RTU communication mode on a Modbus network, every byte (8 bits) in the message includes 2 hexadecimal characters (each includes 4 bits). Compared with the ASCII mode, the RTU mode can transmit more data with the same baud rate.

Code system

• 1 start bit

• 7 or 8 data bits; the minimum valid bit is transmitted first. Each frame domain of 8 bits includes 2 hexadecimal characters (0–9, A–F).

• 1 odd/even check bit; this bit is not provided if no check is needed.

• 1 end bit (with check performed), 2 bits (without check)

Error detection domain

• Cyclic redundancy check (CRC)

The following table describes the data format.

11-bit character frame (Bits 1 to 8 are data bits)

Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	BIT8	Check bit	End bit

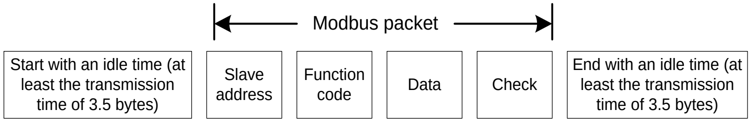
10-bit character frame (Bits 1 to 7 are data bits)

Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	Check bit	End bit

In a character frame, only the data bits carry information. The start bit, check bit, and end bit are used to facilitate the transmission of the data bits to the destination device. In practical applications, you must set the data bits, parity check bits, and stop bits consistently.

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, operation 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 transmitted, a similar transmission interval (the transmission time of 3.5 bytes) is used to indicate that the transmission of the frame 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.

The following table describes the standard structure of an RTU frame.

START (frame header)	T1-T2-T3-T4 (time gap with a min. length 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 parameters 06H: write slave parameters
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 (16 bits)
CRC CHK MSB	
END (frame tail)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

9.3.2.2 RTU communication frame error check modes

During the transmission of data, errors may occur due to various factors. Without 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 check is implemented as follows: The transmitter calculates the to-be-transmitted data based on a specific algorithm to obtain a result, adds the result to the rear of the message, and transmits them together. After receiving the message, the receiver calculates the data based on the same algorithm to obtain a result, and compares the result with that transmitted by the transmitter. If the results are the same, the message is correct. Otherwise, the message is considered incorrect.

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).

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.

CRC check mode

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, end, and check 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 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 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.

9.4 RTU command code and communication data

9.4.1 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, to read two contiguous data content pieces from 0004H from the VFD with the address of 01H (that is, to read content from data addresses 0004H and 0005H), the frame structure is as follows:

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (transmission time 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 (transmission time of 3.5 bytes)

The value in START and END is "T1-T2-T3-T4 (transmission time of 3.5 bytes)", indicating that the RS485 needs to stay 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=01H means the command message is sent to the VFD with the address of 01H and ADDR occupies one byte.

CMD=03H means the command message is sent to read data from the VFD and CMD occupies one byte.

"Start address" means reading data from the address and it 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, indicating that data is to be read from the data addresses of 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 (transmission time 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 (transmission time of 3.5 bytes)

The definition of the response information is described as follows:

"ADDR" is "01H", indicating that the message is sent by the VFD whose address is 01H. The ADDR information occupies one byte.

"CMD" is "03H", indicating that the message is a response of the VFD to the 03H command of the master for reading data. The CMD information occupies one byte.

"Number of bytes" indicates the number of bytes between a 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 piece 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.

9.4.2 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, the frame structure is as follows.

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of to-be-written data	13H
LSB of to-be-written data	88H
CRC LSB	C5H
CRC MSB	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

RTU slave response (from the VFD to the master)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	06H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of to-be-written data	13H
LSB of to-be-written data	88H
CRC LSB	C5H
CRC MSB	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

Note: The sections 9.4.1 and 9.4.2 mainly describe the command formats. For the detailed application, see the examples in section 9.4.7.

9.4.3 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, to write 5000 (1388H) and 50 (0032H) respectively to 0004H and 0005H of the VFD whose slave address is 02H, the frame structure is as follows.

RTU master command (from the master to the VFD)

START	T1-T2-T3-T4 (transmission time 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 (transmission time of 3.5 bytes)

RTU slave response (from the VFD to the master)

START	T1-T2-T3-T4 (transmission time 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 (transmission time of 3.5 bytes)

9.4.4 Data address definition

This section describes the address definition of communication data. The addresses are used for controlling the running, obtaining the state information, and setting related function parameters of the VFD.

9.4.4.1 Function code address format rules

The address of a function code consists of two bytes, with the MSB on the left and LSB on the right. The high-order byte ranges from 00 to ffH, and the low-order byte also ranges from 00 to ffH. The MSB is the hexadecimal form of the group number before the dot mark, and LSB is that of the number behind 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.

Function code	Name	Description	Setting range	Default	Modify
P10.00	Simple PLC mode	0: Stop after running once 1: Keep running with the final value after running once 2: Cyclic running	0–2	0	○
P10.01	Simple PLC memory selection	0: Do not memorize at power outage 1: With power-failure memory	0–1	0	○

Note:

1. 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.
2. The service life of the Electrically Erasable Programmable Read-Only Memory (EEPROM) may be reduced if it is frequently used for storage. 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 MSB of the corresponding function code address from 0 to 1. For example, if P00.07 is not to be stored in the EEPROM, you need only to modify the value in the RAM, that is, 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.

9.4.4.2 Addresses of other Modbus functions

In addition to modifying the parameters of the VFD, the master can also control the VFD, such as starting and stopping the VFD, and monitoring the running status of the VFD. The following table lists other function parameters.

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Run forward	R/W
		0002H: Run reversely	
		0003H: Jog forward	
		0004H: Jog reversely	

Function	Address	Data description	R/W
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Fault reset	
		0008H: Jogging stop	
Communication-based setting address	2001H	Communication-based frequency setting (0–Fmax; unit: 0.01 Hz)	R/W
	2002H	PID reference (0–1000, in which 1000 corresponds to 100.0%)	
	2003H	PID feedback (0–1000, in which 1000 corresponds to 100.0%)	R/W
	2004H	Torque setting (-3000–3000, in which 1000 corresponds to 100.0% of the motor rated current)	R/W
	2005H	Upper limit setting of forward running frequency (0–Fmax; unit: 0.01 Hz)	R/W
	2006H	Upper limit setting of reverse running frequency (0–Fmax; unit: 0.01Hz)	R/W
	2007H	Electromotive torque upper limit (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)	R/W
	2008H	Braking torque upper limit. (0–3000, in which 1000 corresponds to 100.0% of the VFD rated current)	R/W
	2009H	Special CW Bit0–1: =00: Motor 1 =01: Motor 2 Bit2: =1: Enable speed/torque control switchover =0: Disable speed/torque control 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	R/W
	200AH	Virtual input terminal command (0x000–0x3FF) Corresponding to S8/S7/S6/S5/HDIB/HDIA/S4/S3/S2/S1	R/W
	200BH	Virtual output terminal command (0x00–0x0F) Corresponding to local RO2/RO1/HDO/Y1	R/W
	200CH	Voltage setting (used when V/F separation is implemented) (0–1000, in which 1000 corresponds to 100.0% of the motor rated voltage)	R/W

Function	Address	Data description		R/W
	200DH	AO setting 1 (-1000–+1000, in which 1000 corresponds to 100.0%)		R/W
	200EH	AO setting 2 (-1000–+1000, in which 1000 corresponds to 100.0%)		R/W
VFD status word 1	2100H	0001H: Forward running 0002H: Reverse running 0003H: Stopped 0004H: Faulty 0005H: POFF 0006H: Pre-exciting		R
VFD status word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bit1–2: =00: Motor 1 =01: Motor 2 Bit3: =0: AM =1: SM Bit4: =0: No pre-alarm upon overload =1: overload pre-alarm Bit5–Bit6: =00: Keypad-based control =01: Terminal-based control =10: Communication-based control Bit7: Reserved Bit8: =0: Speed control =1: Torque control Bit9: =0: Non position control =1: Position control Bit11–Bit10: =0: Vector 0 =1: Vector 1 =2: Reserved = 3: Space voltage vector		R
VFD fault code	2102H	See the description of fault types.		R
VFD identification code	2103H	IPE300-S-----0x1400		R
Running frequency	3000H	0–Fmax (Unit: 0.01Hz)	Compatible with CHF100A and CHV100 communication addresses	R
Set frequency	3001H	0–Fmax (Unit: 0.01Hz)		R
Bus voltage	3002H	0.0–2000.0V (Unit: 0.1V)		R
Output voltage	3003H	0–1200V (Unit: 1V)		R
Output current	3004H	0.0–3000.0A (Unit: 0.1A)		R
Rotational speed	3005H	0–65535 (Unit: 1RPM)		R
Output power	3006H	-300.0–300.0% (Unit: 0.1%)		R
Output torque	3007H	-250.0–250.0% (Unit: 0.1%)		R
Closed-loop	3008H	-100.0–100.0% (Unit: 0.1%)		R

Function	Address	Data description		R/W
setting				
Closed-loop feedback	3009H	-100.0–100.0% (Unit: 0.1%)		R
Input I/O status	300AH	0x00–0x3F Corresponding to the local HDIB/ HDIA/S4/S3/S2/S1		R
Output I/O status	300BH	0x00–0x0F Corresponding to local RO2/RO1/HDO/Y1		R
Analog input 1	300CH	0.00–10.00V (Unit: 0.01V)		R
Analog input 2	300DH	0.00–10.00V (Unit: 0.01V)		R
Analog input 3	300EH	-10.00–10.00V (Unit: 0.01V)		R
Analog input 4	300FH			R
Read input of HDIA high-speed pulse	3010H	0.00–50.00kHz (Unit: 0.01Hz)		R
Read input of HDIB high-speed pulse	3011H			R
Read the actual step of multi-step speed	3012H	0–15		R
External length value	3013H	0–65535		R
External counting value	3014H	0–65535		R
Torque setting	3015H	-300.0–300.0% (Unit: 0.1%)		R
VFD identification code	3016H			R
Fault code	5000H			R

The Read/Write (R/W) characteristics indicate whether a function parameter can be read and written. For example, "Communication-based control command" can be written, and therefore the command code 06H is used to control the VFD. "R" indicates that a function code is read only, and "W" indicates that a function code is written only.

Note: Some parameters in the preceding table are valid only after they are enabled. Take the running and stop operations as examples, you need to set "Running command channel" (P00.01) to "Communication", and set "Communication mode of running commands" (P00.02) to Modbus/Modbus TCP. For another example, when modifying "PID reference", you need to set "PID reference source" (P09.00) to Modbus communication.

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	0x08	Goodrive35 vector VFD
		0x09	Goodrive35-H1 vector VFD
		0x0a	Goodrive300 vector VFD
		0xa0	IPE300 vector VFD
0x14	General engineering	0x00	IPE300-S vector VFD

9.4.5 Fieldbus scale

In practical applications, communication data is represented in the hexadecimal form, but hexadecimal values cannot represent decimals. For example, 50.12 Hz cannot be represented in the hexadecimal form. In such cases, multiply 50.12 by 100 to obtain an integer 5012, and then 50.12 can be represented as 1394H in the hexadecimal form (5012 in the decimal form).

In the process of multiplying a non-integer by a multiple to obtain an integer, the multiple is referred to 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 decimal places in the value, the fieldbus scale m is the nth-power of 10. Take the following table as an example, m is the value of 10 to the power of n. Take the following table as an example.

Function code	Name	Description	Setting range	Default	Modify
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when the ons place of P01.19 is 2)	0.0–3600.0	0.0s	○
P01.21	Power-off restart selection	0: Disable restart 1: Enable restart	0–1	0	○

If "Setting range" or "Default value" contains one decimal, the fieldbus scale is 10. If the value received by the host controller is 50, "Delay of auto fault reset" of the rectifier 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 the upper computer sends the "Wake-up-from-sleep delay" parameter read command, the master receives the following response from the VFD:

01	**03**	**02**	**00 32**	**39 91**
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). In this case, the master identifies that "Wake-up-from-sleep delay" is 5.0s.

9.4.6 Error message response

Operation errors may occur in communication-based control. For example, some parameters can only be read, but a write command is sent. In this case, the VFD returns an 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 host controller 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 faulty state when processing this request.
02H	Invalid data address	For the VFD, the data address in the request of the upper computer 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 P07.00.
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 host controller is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the host controller 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.

When returning a response, the slave uses a function code domain and fault address to indicate whether it is a normal response (no error) or exception response (an error occurs). In a normal response, the slave returns the corresponding function code and data address or sub-function code. In an exception response, the slave returns a code that is equal to a normal code, but the first bit is logic 1.

For example, if the master sends a request message to a slave for reading a group of function code address data, the following code is generated:

0 0 0 0 0 0 1 1 (03H in the hexadecimal form)

In a normal response, the slave returns the same function code. In an exception response, the slave returns:

1 0 0 0 0 0 1 1 (83H in the hexadecimal form)

In addition to the modification of the code, the slave returns a byte of exception code that describes the cause of the exception. After receiving the exception response, the typical processing of the master is to send the request message again or modify the command based on the fault information.

For example, to set the "Channel of running commands" (P00.01, the parameter address is 0000H) to 03 for the VFD whose address is 01H, the command is as follows:

01	**06**	**00 01**	**00 03**	**98 0B**
VFD address	Write command	Parameter address	Parameter data	CRC

However, the "Running command channel" ranges from 0 to 2. The value 3 is out of the setting range. In this case, the VFD returns an error message response as shown in the following:

01	**86**	**04**	**43 A3**
VFD address	Exception response code	Error code	CRC

The exception response code 86H (generated based on the highest-order bit "1" of the write command 06H) indicates that it is an exception response to the write command (06H). The error code is 04H, which indicates "Operation failure".

9.4.7 Read/Write operation examples

For the formats of the read and write commands, see section 9.4.1 and 9.4.2.

9.4.7.1 Read command 03H examples

Example 1: Read state word 1 of the VFD whose address is 01H. According to the table of other Modbus function addresses, the parameter address of state word 1 of the VFD is 2100H.

The read command transmitted to the VFD is as follows:

01	03	21 00	00 01	8E 36
VFD address	Read command	Parameter address	Data quantity	CRC

Assume that the following response is returned:

01	03	02	00 03	F8 45
VFD address	Read command	Number of bytes	Data content	CRC

The data content returned by the VFD is 0003H, which indicates that the VFD is in the stopped state.

Example 2: View information about the VFD whose address is 03H, including "Present fault type" (P07.27) to "5th-last fault type" (P07.32) of which the parameter addresses are 071BH to 0720H (contiguous 6 parameter addresses starting from 071BH).

The command transmitted to the VFD is as follows:

03	03	07 1B	00 06	B5 59
VFD address	Read command	Start address	6 parameters in total	CRC

Assume that the following response is returned:

03	03	0C	00 23	00 23	00 23	00 23	00 23	00 23	5F D2
VFD address	Read command	Number of bytes	Type of current fault	Type of last fault	Type of last but one fault	Type of last but two fault	Type of last but three fault	Type of last but four fault	CRC

From the returned data, we can see that all the fault types are 0023H, that is, 35 in the decimal form, which means the maladjustment fault (STo).

9.4.7.2 Write command 06H examples

Example 1: Set the VFD whose address is 03H to be forward running. Refer to the table of other function parameters, the address of "Communication-based control command" is 2000H, and 0001H indicates forward running, as shown in the following table.

Function	Address	Data description	R/W
Communication -based control command	2000H	0001H: Run forward	R/W
		0002H: Run reversely	
		0003H: Jog forward	
		0004H: Jog reversely	
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Fault reset	
		0008H: Jogging stop	

The command transmitted from the master is as follows:

03	06	20 00	00 01	42 28
VFD address	Write command	Parameter address	Forward running	CRC

If the operation is successful, the following response is returned (same as the command sent from the master):

03	06	20 00	00 01	42 28
VFD address	Write command	Parameter address	Forward running	CRC

Example 2: Set the max. output frequency to 100 Hz for the VFD with the address of 03H.

Function code	Name	Description	Setting range	Default	Modify
P00.03	Max. output frequency	P00.04–600.00H (400.00Hz)	100.00–600.00	50.00Hz	◎

According to the number of decimal places, the fieldbus scale of the "Max. output frequency" (P00.03) is 100. Multiply 100 Hz by 100. The value 10000 is obtained, and it is 2710H in the hexadecimal form.

The command transmitted from the master is as follows:

03	06	00 03	27 10	62 14
VFD address	Write command	Parameter address	Parameter data	CRC

If the operation is successful, the following response is returned (same as the command sent from the master):

03	06	00 03	27 10	62 14
VFD address	Write command	Parameter address	Parameter data	CRC

Note: In the preceding command description, spaces are added to a command just for explanatory purposes. In practical applications, no space is required in the commands.

9.4.7.3 Example of continuously writing command 10H

Example 1: Set the VFD whose address is 01H to be forward running at the frequency of 10Hz. Refer to the table of other function parameters, the address of "Communication-based control command" is 2000H, 0001H indicates forward running, and the address of "Communication-based value setting" is 2001H, as shown in the following figure. 10 Hz is 03E8H in the hexadecimal form.

Function	Address	Data description	R/W
Communication-	2000H	0001H: Run forward	R/W

Function	Address	Data description	R/W
based control command		0002H: Run reversely	
		0003H: Jog forward	
		0004H: Jog reversely	
		0005H: Stop	
		0006H: Coast to stop (in emergency)	
		0007H: Fault reset	
		0008H: Jogging stop	
Communication-based setting address	2001H	Communication-based frequency setting (0–Fmax; unit: 0.01 Hz)	R/W
	2002H	PID reference (0–1000, in which 1000 corresponds to 100.0%)	

In the actual operation, set P00.01 to 2 and P00.06 to 8.

The command sent from the master is as follows:

01	10	20 00	00 02	04	00 01	03 E8	3B 10
VFD address	Continuous write command	Parameter address	Parameter quantity	Number of bytes	Froward running	10 Hz	CRC

If the operation is successful, the following response is returned:

01	10	20 00	00 02	4A 08
VFD address	Continuous write command	Parameter address	Parameter quantity	CRC

Example 2: Set "Acceleration time" of the VFD whose address is 01H to 10s, and "Deceleration time" to 20s.

Function code	Name	Description	Default	Modify
P00.11	ACC time 1	P00.11 and P00.12 setting range: 0.0–3600.0s	Model depended	○
P00.12	DEC time 1		Model depended	○

The address of P00.11 is 000B, 10s is 0064H in the hexadecimal form, and 20s is 00C8H in the hexadecimal form.

The command sent from the master is as follows:

01	10	00 0B	00 02	04	00 64	00 C8	F2 55
VFD address	Continuous write command	Parameter address	Parameter quantity	Number of bytes	10s	20s	CRC

If the operation is successful, the following response is returned:

01	10	00 0B	00 02	30 0A
VFD address	Continuous write command	Parameter address	Parameter quantity	CRC

Note: In the preceding command description, spaces are added to a command just for explanatory purposes. In practical applications, no space is required in the commands.

9.4.7.4 Example of Modbus communication commissioning

A PC is used as the host, 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 Commix, 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.

First, set the serial port to **COM1**. Then, set the baud rate consistently with P14.01. The data bits, check bits, and end bits must be set consistently with P14.02. If the RTU mode is selected, you need to select the hexadecimal form **Input HEX**. To set the software to automatically execute the CRC function, you need to select **ModbusRTU**, select **CRC16 (MODBU SRTU)**, and set the start byte to **1**. After the auto CRC check function is enabled, do not enter CRC information in commands. Otherwise, command errors may occur due to repeated CRC check.

The commissioning command to set the VFD whose address is 03H to be forward running is as follows:

03	06	20 00	00 01	42 28
VFD address	Write command	Parameter address	Forward running	CRC

Note:

1. Set the address (P14.00) of the VFD to 03.
2. Set "Channel of running commands" (P00.01) to "Communication", and set "Communication

channel of running commands" (P00.02) to the Modbus/Modbus TCP channel.

3. Click Send. If the line configuration and settings are correct, a response transmitted by the VFD is received as follows:

03	06	20 00	00 01	42 28
VFD address	Write command	Parameter address	Forward running	CRC

9.5 Common communication faults

Common communication faults include the following:

• No response is returned.

• The VFD returns an exception response.

Possible causes of no response include the following:

1. The serial port is set incorrectly. For example, the adapter uses the serial port COM1, but COM2 is selected for the communication.
2. The settings of the baud rates, data bits, end bits, and check bits are inconsistent with those set on the VFD.
3. The positive pole (+) and negative pole (-) of the RS485 bus are connected reversely.
4. The resistor connected to 485 terminals on the terminal block of the VFD is set incorrectly.

Appendix A Expansion card

A.1 Model definition

EC-PC 5 02-00

① ② ③ ④ ⑤

Sign	Description	Naming example
①	Product category	EC: expansion card
②	Board card category	PC: programmable card
③	Technology version	The odd numbers 1, 3, and 5 are used to represent the 1st, 2nd, and 3rd generations of the technology version.
④	Distinguishing code	01: 10 points, with 6 inputs and 4 outputs (2 transistor outputs + 2 relay outputs)
		02: 8 points of IO, 1 point of AI, 1 point of AO, and 1 point of RS485 communication
		03: Reserved
⑤	Special requirement	Reserved

EC-TX 5 01 B

① ② ③ ④ ⑤

Sign	Description	Naming example
①	Product category	EC expansion card
②	Board card category	TX: communication expansion card
③	Technology version	The odd numbers 1, 3, and 5 are used to represent the 1st, 2nd, and 3rd generations of the technology version.
④	Distinguishing code	01: Bluetooth communication card
		02: WIFI
		03: PROFIBUS communication card
		04: Ethernet communication card
		05: CAN multi-protocol communication card

Sign	Description	Naming example
		06: DeviceNet communication card
		07: BACnet communication card
		08: EtherCAT communication card
		09: PROFINET communication card
		10: EtherNet IP communication card
⑤	Expansion card version	Empty: Version A B: Version B C: Version C

EC-IO 5 01-00

① ② ③ ④ ⑤

Sign	Description	Naming example
①	Product category	EC expansion card
②	Board card category	IO: I/O expansion card
③	Technology version	The odd numbers 1, 3, and 5 are used to represent the 1st, 2nd, and 3rd generations of the technology version.
④	Distinguishing code	01: Multiple-function I/O extension card (4 digital inputs, 1 digital output, 1 analog input, 1 analog output, and 2 relay outputs)
		02: Digital I/O card
		03: Analog I/O card
		04: Reserved 1
		05: Reserved 2
⑤	Special requirement	

The following table describes expansion cards that the VFD supports. The expansion cards are optional and need to be purchased separately.

Name	Model	Specifications
I/O 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.

Name	Model	Specifications
I/O expansion card 2	EC-IO502-00	✧Four digital inputs ✧One PT100 ✧One PT1000 ✧Two relay outputs: single-contact NO.
PROFIBUS-DP communication card	EC-TX503	✧Supporting the PROFIBUS-DP protocol
Ethernet communication card	EC-TX504	✧Supporting Ethernet communication with INVT's internal protocol ✧Can be used with INVT Workshop, the upper controller monitoring software.
CAN multi-protocol communication card	EC-TX505C	✧Based on the CAN2.0A and CAN2.0B physical layer ✧Supporting the CANopen protocol ✧Adopting INVT's master-slave control proprietary protocol
PROFINET communication card	EC-TX509	✧Supporting the PROFINET protocol

I/O expansion card 1
EC-IO501-00

I/O expansion card 2
EC-IO502-00

PROFIBUS-DP communication card
EC-TX503

Ethernet communication card
EC-TX504

CAN multi-protocol communication card EC-TX505C

PROFINET communication card EC-TX509

A.2 Dimensions and installation

All expansion cards are of the same dimensions (108x39mm) and can be installed in the same way.

Comply with the following rules when installing or removing an expansion card:

1. Ensure that no power is applied before installing the expansion card.
2. Expansion cards can be installed in any one of the SLOT1 and SLOT2 card slots.
3. If interference occurs on the external wires after expansion cards are installed, change their installation card slots flexibly to facilitate the wiring. For example, the connector of the connection cable of the DP card is large, so it is recommended to be installed in the SLOT1 card slot.

The following figure shows the installation diagram and the VFD with expansion cards installed.

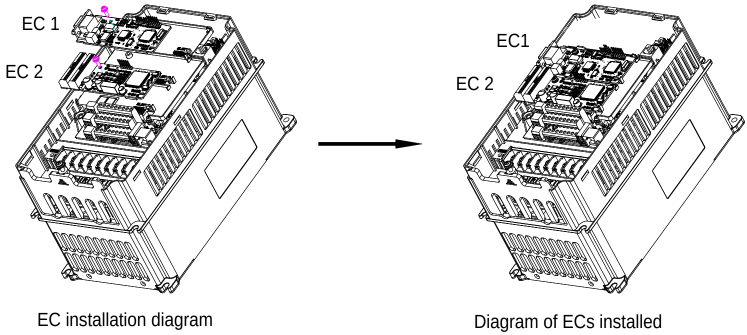


Figure A-1 0011 or lower VFD models with expansion cards installed

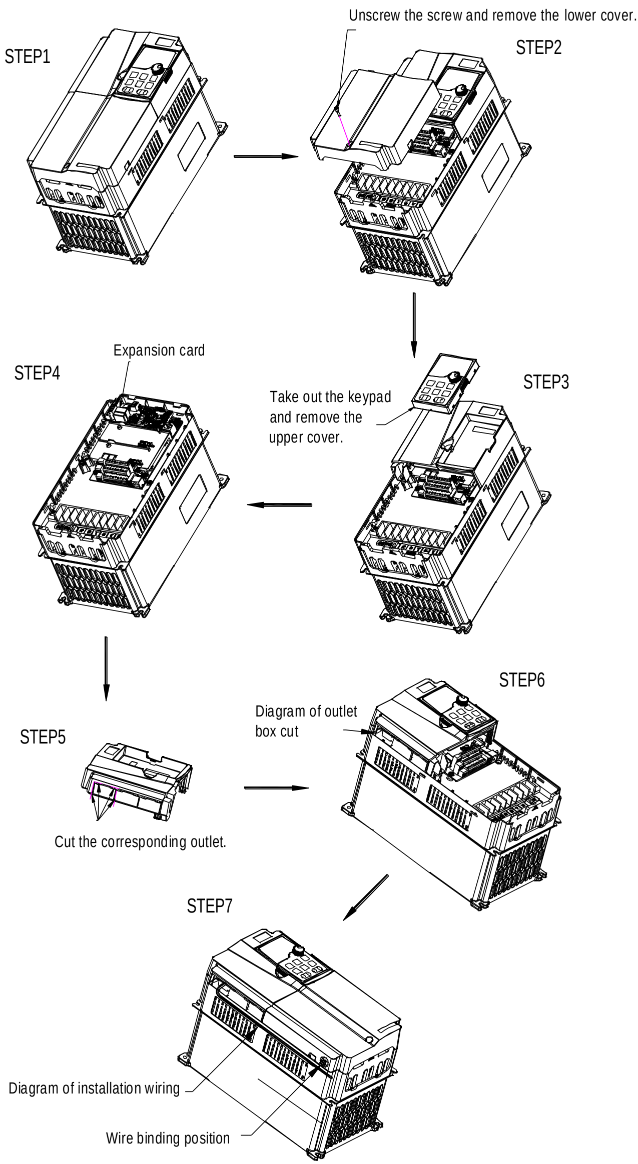


Figure A-2 Expansion card installation procedure

A.3 Wiring

Ground a shielded cable as follows:

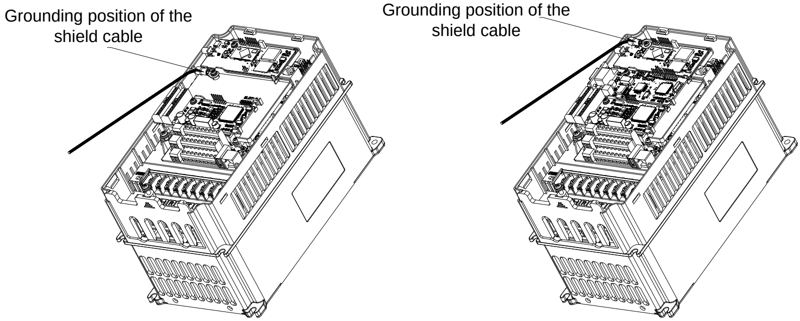
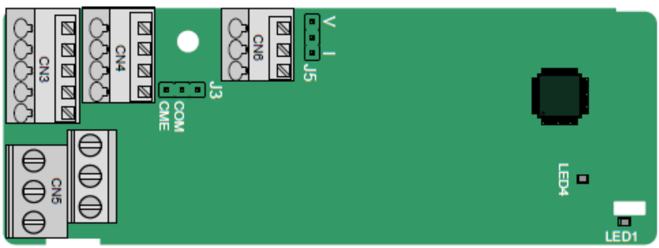


Figure A-3 Expansion card grounding cable connection

A.4 I/O expansion cards

A.4.1 I/O expansion card 1 (EC-IO501-00)



The terminals are arranged as follows:

CME and COM are shorted through J3 before delivery, and J5 is the jumper for selecting the output type (voltage or current) of AO2.

AI3	AO2	GND

COM	CME	Y2	S5	
PW	+24V	S6	S7	S8

RO3A	RO3B	RO3C	
	RO4A		RO4C

Indicator definition:

Indicator	Definition	Function
LED1	Status indicator	This indicator is on when the expansion card is establishing a connection with the control board; it blinks periodically after the expansion card is properly

Indicator	Definition	Function
		connected to the control board (the period is 1s, on for 0.5s, and off for the other 0.5s); and it is off when the expansion card is disconnected from the control board.
LED4	Power indicator	This indicator is on after the IO expansion card is powered on by the control board.

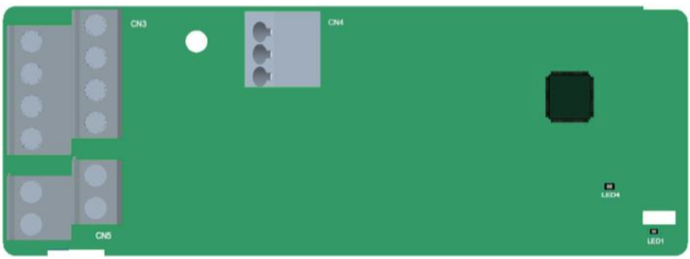
The EC-IO501-00 expansion card can be used in scenarios where the I/O interfaces of an IPE300-S VFD cannot meet the application requirements. It can provide 4 digital inputs, 1 digital output, 1 analog input, 1 analog output, and two relay outputs. It is user-friendly, providing relay outputs through European-type screw terminals and other inputs and outputs through spring terminals.

EC-IO501-00 terminal functions:

Category	Terminal symbol	Terminal name	Description
Power supply	PW	External power	Used to provide input digital working power from the external to the internal Voltage range: 12–24V PW and +24V have been short connected before delivery.
AI and AO	AI3—GND	Analog input 1	1. Input range: For AI3, 0–10V or 0–20mA 2. Input impedance: 20kΩ for voltage input or 250Ω for current input 3. Whether voltage or current is used for input is set through the corresponding function code 4. Resolution: 5mV when 10V corresponds to 50Hz 5. Deviation: ±0.5%; input of 5V or 10mA or higher at the temperature of 25°C.
	AO2—GND	Analog output 1	1. Output range: 0–10V or 0–20mA 2. Whether voltage or current is used for output is set through the jumper J5. 3. Deviation: ±0.5%; output of 5 V or 10 mA or higher at the temperature of 25°C
Digital input/output	S5—COM	Digital input 1	1. Internal impedance: 3.3kΩ 2. 12–30V voltage input is acceptable 3. Bi-direction input terminal 4. Max. input frequency: 1kHz
	S6—COM	Digital input 2	
	S7—COM	Digital input 3	
	S8—COM	Digital input 4	

Category	Terminal symbol	Terminal name	Description
	Y2—CME	Digital output	1. Switch capacity: 200mA/30V 2. Output frequency range: 0–1kHz 3. The terminals CME and COM are shorted through J3 before delivery.
Relay output	RO3A	NO contact of relay 3	1. Contact capacity: 3A/AC250V, 1A/DC30V 2. Cannot be used as high frequency digital output
	R03B	NC contact of relay 3	
	RO3C	Common contact of relay 3	
	RO4A	NO contact of relay 4	
	RO4C	Common contact of relay 4	

A.4.2 I/O expansion card 2 (EC-IO502-00)



The terminals are arranged as follows:

PT1+	PT-	PT2+

S5	S6	S7	S8
+24V	PW	COM	COM

<table>
<tr><td>RO4A</td><td colspan="2">RO4C</td><td></td></tr>
<tr><td></td><td>RO3A</td><td colspan="2">RO3C</td></tr>
</table>

Indicator definition:

Indicator	Definition	Function
LED1	Status indicator	This indicator is on when the expansion card is establishing a connection with the control board; it blinks periodically after the expansion card is properly connected to the control board (the period is 1s, on for 0.5s, and off for the other 0.5s); and it is off when the expansion card is disconnected from the control board.
LED4	Power indicator	This indicator is on after the IO expansion card is powered on by the control board.

EC-IO502-00 can be used in scenarios where the 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 is user-friendly, providing relay outputs and digital inputs through European-type screw terminals and temperature measuring inputs through spring terminals.

EC-IO502-00 terminal functions:

Category	Terminal symbol	Terminal name	Description
Power supply	PW	External power	Used to provide input digital working power from the external to the internal 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	Reference ground of +24V.
Digital input	S5—COM	Digital input 5	1. Internal impedance: 6.6kΩ 2. Supporting the voltage input of external power (-20%)24–48VDC(+10%) and (-10%)24–48VAC(+10%) 3. Supporting the internal power 24V 4. Bi-direction input terminals, supporting both NPN and PNP connection methods 5. Max. input frequency: 1kHz 6. Programmable digital input terminals, the functions of which can be set through the related parameters
	S6—COM	Digital input 6	
	S7—COM	Digital input 7	
	S8—COM	Digital input 8	
Temperature detection input	PT1+	PT100 resistor input	Independent PT100 and PT1000 inputs: PT1+ connects to PT100 resistor, while PT2+ connects to PT1000 resistor. 1. Resolution rate: 1°C 2. Range -20°C–150°C 3. Detection precision: 3°C 4. Support drop 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 outputs. RO3A: NO; RO3C: common Contact capacity: 3A/AC250V, 1A/DC30V
	RO3C	Contact C of NO	

Category	Terminal symbol	Terminal name	Description
		relay 3	
	RO4A	Contact A of NO relay 4	RO4 outputs. RO4A: NO; RO4C: common Contact capacity: 3A/AC250V, 1A/DC30V
	RO4C	Contact C of NO relay 4	

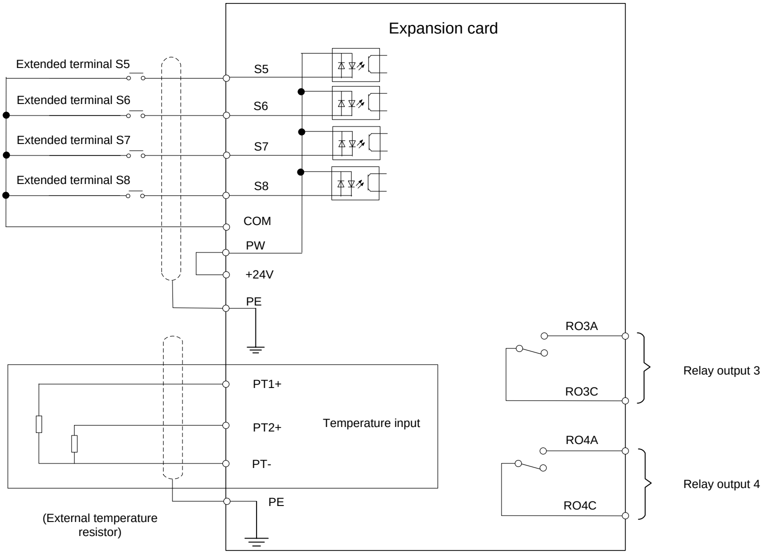
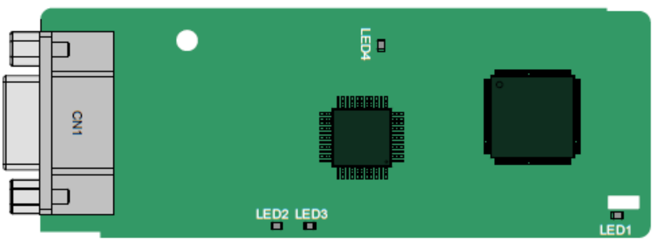


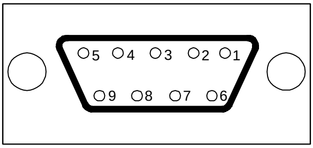
Figure A-4 Control circuit wiring of I/O expansion card 2

A.5 Communication cards

A.5.1 PROFIBUS-DP communication card (EC-TX503)



CN1 is a 9-pin D-type connector, as shown in the following figure.



Connector pin		Description
1	-	Unused
2	-	Unused
3	B-Line	Data+ (twisted pair 1)
4	RTS	Request sending
5	GND_BUS	Isolation ground
6	+5V BUS	Isolated power supply of 5 V DC
7	-	Unused
8	A-Line	Data- (twisted pair 2)
9	-	Unused
Housing	SHLD	PROFIBUS cable shielding line

+5V and GND_BUS are bus terminators. Some devices, such as the optical transceiver (RS485), may need to obtain power through these pins.

Some devices use RTS to determine the sending and receiving directions. In normal applications, only A-Line B-Line, and the shield layer need to be used.

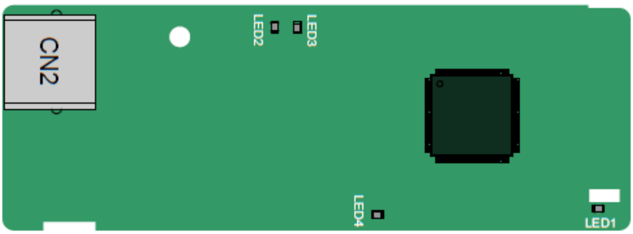
Indicator definition:

Indicator	Definition	Function
LED1	Status indicator	On: The expansion card is establishing a connection with the control board. Blinking periodically: The expansion card is properly connected to the control board (the period is 1s, on for 0.5s, and off for the other 0.5s). Off: The expansion card is disconnected from the control board.
LED2	Online indicator	On: The communication card is online and data exchange can be performed. Off: The communication card is not in the online state.
LED3	Offline/Fault indicator	On: The communication card is offline and data exchange cannot be performed. Blinks: The communication card is not in the offline state.

Indicator	Definition	Function
		Blinks at the frequency of 1 Hz: 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. Blinks at the frequency of 2 Hz: User parameter data is incorrect. The length or content of the user parameter data set during the initialization of the communication card is different from that during the network configuration. Blinks at the frequency of 4 Hz: An error occurs in the ASIC initialization of PROFIBUS communication. Off: The diagnosis function is disabled.
LED4	Power indicator	On: The control board feeds power to the communication card.

For details, see the VFD communication card manual.

A.5.2 Ethernet communication card (EC-TX504)



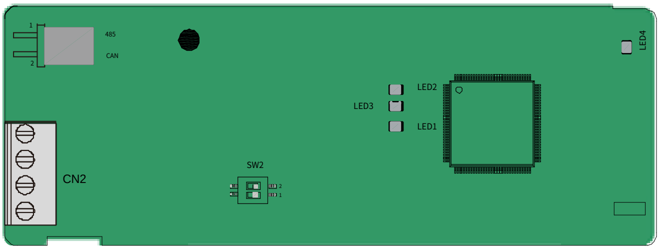
The EC-TX504 communication card adopts standard RJ45 terminals.

Indicator definition:

Indicator	Definition	Function
LED1	Status indicator	This indicator is on when the expansion card is establishing a connection with the control board; it blinks periodically after the expansion card is properly connected to the control board (the period is 1s, on for 0.5s, and off for the other 0.5s); and it is off when the expansion card is disconnected from the control board.
LED2	Network connection	This indicator is on when the physical connection to

Indicator	Definition	Function
	status indicator	the upper computer is normal; it is off when the upper computer is disconnected.
LED3	Network communication status indicator	This indicator is on when there is data exchange with the upper computer; it blinks when there is no data exchange with the upper computer.
LED4	Power indicator	This indicator is on after the control board feeds power to the communication card.

A.5.3 CAN multi-protocol communication card (EC-TX505C)



The EC-TX505C communication card is user-friendly, adopting European-type screw terminals.

Label	Description	
PGND	Isolation ground	Isolation ground
PE	Shielded	CAN bus shielding
CANH	CANopen bus high level signal	CAN bus high level signal
CANL	CANopen bus low level signal	CAN bus low level signal
485	485 terminal resistor switch	ON: RS485+ and RS485- are connected to a terminal resistor of 120 Ω.
		OFF: RS485+ and RS485- are not connected to a terminal resistor.
CAN	CAN terminal resistor switch	ON: CAN_H and CAN_L are connected to a terminal resistor of 120 Ω.
		OFF: CAN_H and CAN_L are not connected to a terminal resistor.

Note: Before power on, please select the protocol type by setting the switch SW2 as follows:

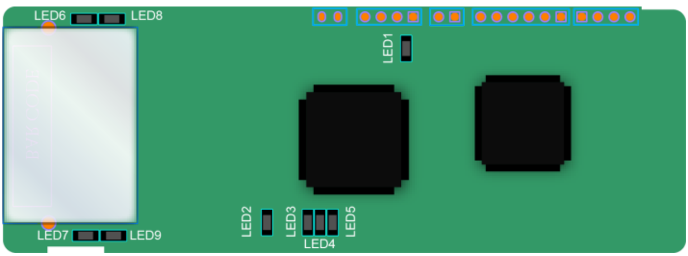
Switch SW2		
1	2	Protocol type
OFF	OFF	CANopen
ON	OFF	CAN master/slave

Indicator definition

Indicator	Name	Function
LED1	State indicator	On: The expansion card is establishing a connection with the control board. Blinking periodically: The expansion card is properly connected to the control board (the period is 1s, on for 0.5s, and off for the other 0.5s). Off: The expansion card is disconnected from the control board.
LED2	Running indicator	On: The communication card is running. Blinks: The communication card is in the pre-operation state. Off: A fault occurs. Check whether the reset pin of the communication card and the power supply are properly connected. The communication card is in the stopped state.
LED3	Error indicator	On: The CAN controller bus is off, a fault occurs on the inverter, or a received frame is missed or an error occurs during frame receiving. Off: The communication card is in the working state.
LED4	Power indicator	On: The control board feeds power to the communication card.

For details about the operation, see the *Communication Card Operation Manual*.

A.5.4 PROFINET communication card (EC-TX509)



The terminal CN2 adopts standard RJ45 interfaces, which are in the dual design, and the two RJ45 interfaces are not distinguished from each other and can be interchangeably inserted. They are arranged as follows:

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-

Pin	Name	Description
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

Indicator definition:

The PROFINET communication card has 9 indicators, among which LED1 is the power indicator, LED2–5 are the communication status indicators of the communication card, and LED6–9 are the status indicators of the network port.

LED	Color	Status	Description
LED1	Green		3.3V power indicator
LED2 (Bus status indicator)	Red	On	No network connection
		Blinking	The connection to the network cable between the PROFINET controller is OK, but the communication is not established.
		Off	Communication with the PROFINET controller has been established.
LED3 (System fault indicator)	Green	On	PROFINET diagnosis exists.
		Off	No PROFINET diagnosis.
LED4 (Slave ready indicator)	Green	On	TPS-1 protocol stack has started.
		Blinking	TPS-1 waits for MCU initialization.
		Off	TPS-1 protocol stack does not start.
LED5 (Maintenance status indicator)	Green		Manufacturer-specific, depending on the characteristics of the device
LED6/7 (Network port status indicator)	Green	On	The PROFINET communication card and PC/PLC have been connected by using a network cable.
		Off	The connection between the PROFINET communication card and PC/PLC has not been established.
LED8/9 (Network port communication indicator)	Green	On	The PROFINET communication card and PC/PLC are communicating.
		Off	The PROFINET communication card and PC/PLC have no communication yet.

Electrical connection:

The PROFINET communication card adopts standard RJ45 interfaces, which can be used in a linear network topology and a star network topology. The linear network topology electrical connection diagram is shown as follows.

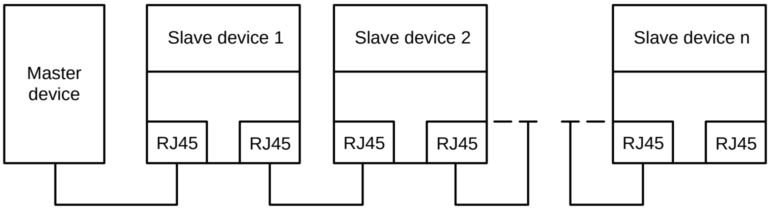


Figure A-5 Linear network topology electrical connection

Note: For the star network topology, you need to prepare PROFINET switches.

The star network topology electrical connection diagram is shown as follows.

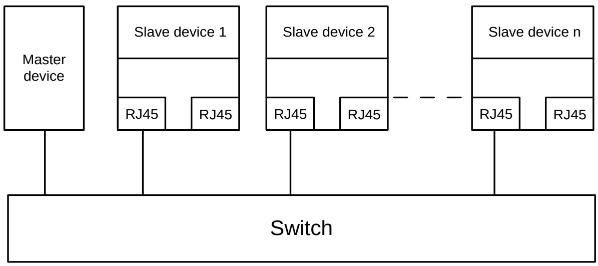


Figure A-6 Star network topology electrical connection diagram

Appendix B Technical data

B.1 What this chapter contains

This chapter describes the technical data of the VFD and its compliance to CE and other quality certification systems.

B.2 Derated application

B.2.1 Capacity

Choose a VFD model based on the rated current and power of the motor. To endure the rated power of the motor, the rated output current of the VFD must be larger or equal to the rated current of the motor. The rated power of the VFD must be higher or equal to that of the motor.

Note:

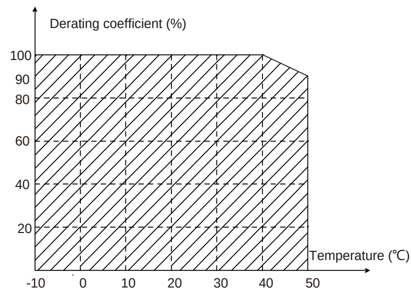
1. The maximum allowable shaft power of the motor is limited to 1.5 times the rated power of the motor. If the limit is exceeded, the VFD automatically restricts the torque and current of the motor. This function effectively protects the input shaft against overload.
2. The rated capacity is the capacity at the ambient temperature of 40°C.
3. You need to check and ensure that the power flowing through the common DC connection in the common DC system does not exceed the rated power of the motor.

B.2.2 Derating

If the ambient temperatue on the site where the inverter is installed exceeds 40°C, the altitude exceeds 1000m, or the carrier frequency is changed from 4 kHz to 8, 12, or 15 kHz, the VFD needs to be derated.

B.2.2.1. Derating due to temperature

When the temperature ranges from +40°C to +50°C, the rated output current is derated by 1% for each increased 1°C. For the actual derating, see the following figure.



Note: It is not recommended to use the VFD at an environment with the temperature higher than 50°C. If you do, you shall be held accountable for the consequences caused.

B.2.2.2. Derating due to altitude

It is recommended to use the VFD at an altitude not higher than 1000m. When the altitude exceeds 1000m, derate by 1% for every increase of 100m. When the altitude exceeds 3000m, consult the local INVT dealer or office for details.

B.2.2.3. 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 by 10% for each increased 1 kHz.

B.3 Grid specifications

Grid voltage	AC 3PH 380V(-15%) – 440V(+10%) AC 3PH 520V(-15%) – 690V(+10%)
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.
Frequency	50/60Hz±5%, with a maximum change rate of 20%/s

B.4 Motor connection data

Motor type	Asynchronous induction motor or permanent-magnet synchronous motor
Voltage	0–U1 (motor rated voltage), 3PH symmetrical, Umax (VFD rated voltage) at the field-weakening point
Short-circuit protection	The motor output short-circuit protection meets the requirements of IEC 61800-5-1.
Frequency	0–400 Hz
Frequency resolution	0.01 Hz
Current	See section 3.6 “Product ratings”.
Power limit	1.5 times of the rated power of the motor
Field-weakening point	10–400Hz
Carrier frequency	4, 8, 12, or 15kHz

B.4.1 EMC compatibility and motor cable length

The following table describes the maximum motor cable lengths that meet the requirements of the EU EMC directive (2014/30/EU).

All models (with external EMC filters)	Maximum motor cable length (m)
Environment category II (C3)	30

You can learn the maximum length of the motor cable through the running parameters of the VFD. To understand the accurate maximum cable length for using an external EMC filter, contact the local INVT office.

For details about the environment categories, see section "EMC regulations".

B.5 Application standards

The following table describes the 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+A1	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods
IEC/EN 61800-5-1+A1	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.5.1 CE marking

The CE marking on the VFD nameplate 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).

B.5.2 EMC compliance declaration

European union (EU) stipulates that the electric and electrical devices sold in Europe cannot generate electromagnetic disturbance that exceeds the limits stipulated in related standards, and can work properly in environments with certain electromagnetic interference. The EMC product standard (EN 61800-3) describes the EMC standards and specific test methods for adjustable speed electrical power drive systems. Our products have been compliant with these EMC regulations.

B.6 EMC regulations

The EMC product standard (EN 61800-3) describes the EMC requirements on VFDs.

Application environment categories:

First environment: Civilian environment, including application scenarios where VFDs are directly connected to the civil power supply low-voltage grids without intermediate transformers.

Second environment: All locations outside a residential area.

VFD categories:

C1: Rated voltage lower than 1000 V, applied to environments of Category I.

C2: Rated voltage lower than 1000 V, 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 EMC standard IEC/EN 61800-3 no longer restricts the power distribution of VFDs, but it specifies their use, installation, and commissioning. 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.

C3: Rated voltage lower than 1000 V, applied to environments of Category II. They cannot be applied to environments of Category I.

C4: Rated voltage higher than 1000 V, or rated current higher or equal to 400 A, applied to complex systems in environments of Category II.

B.6.1 VFD category of C2

The induction disturbance limit meets the following stipulations:

1. Select an optional EMC filter according to Appendix D “Optional peripheral accessories” and install it following the description in the EMC filter manual.
2. Select the motor and control cables according to the description in the manual.
3. Install the VFD according to the description in the manual.
4. For the maximum length of the motor cable, see section B.4.1 "EMC compatibility and motor cable length".

B.6.2 VFD category of C3

The anti-interference performance of the VFD meets the requirements of the second environment in the IEC/EN 61800-3 standard.

The induction disturbance limit meets the following stipulations:

1. Select an optional EMC filter according to Appendix D “Optional peripheral accessories” and install it following the description in the EMC filter manual.
2. Select the motor and control cables according to the description in the manual.
3. Install the VFD according to the description in the manual.
4. For the maximum length of the motor cable, see section B.4.1 "EMC compatibility and motor cable length".

	VFDs of category C3 cannot be applied to civilian low-voltage common grids. When applied to such grids, the VFD may generate radio frequency electromagnetic interference.

Appendix C Dimension drawings

C.1 What this chapter contains

This chapter describes the dimension drawings of the VFD. which uses millimeter (mm) as the unit.

C.2 Keypad structure

C.2.1 LED keypad structure

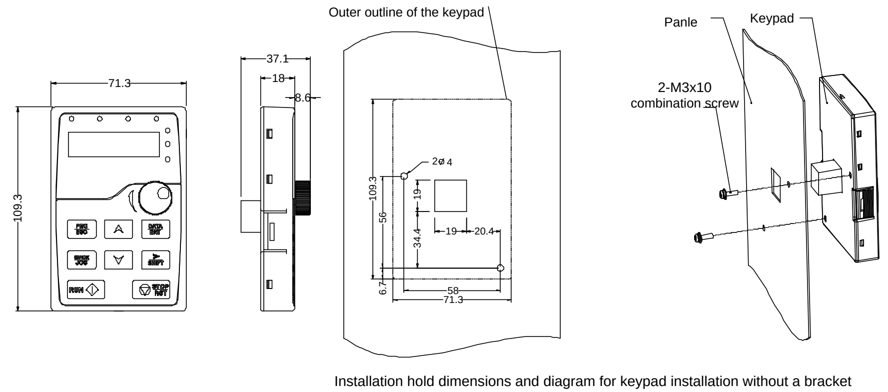


Figure C-1 LED keypad structure

C.2.2 Optional LCD keypad structure

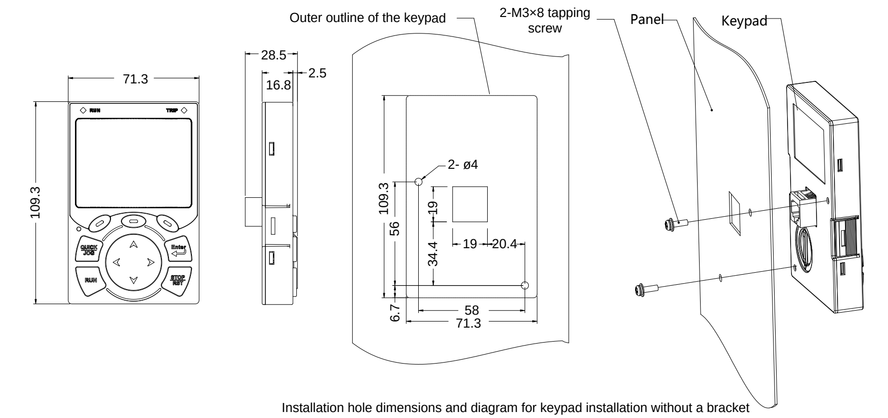
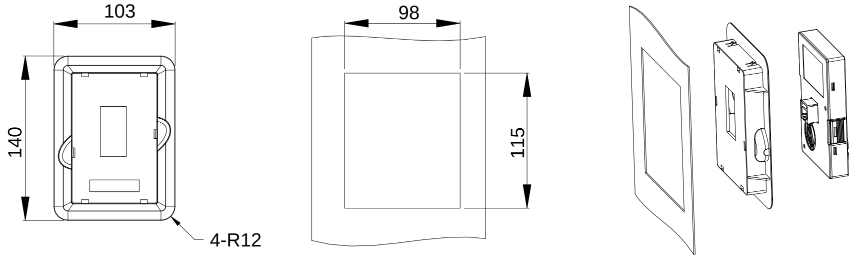


Figure C-2 Optional LCD keypad structure

C.2.3 Keypad mounting bracket

Note: The external keypad can be mounted directly with M3 threaded screws or with a keypad bracket. For 380V 0011–0090kW VFD models, the keypad mounting bracket is an optional part. For 380V 0110–0500kW VFD models, you can use optional brackets or use the standard keypad brackets externally.



Keypad adapter bracket Installation dimensions

Figure C-3 Keypad mounting bracket (optional) for 380V 0011–0500kW models

C.3 VFD unit dimensions

C.3.1 Wall-mounting dimensions

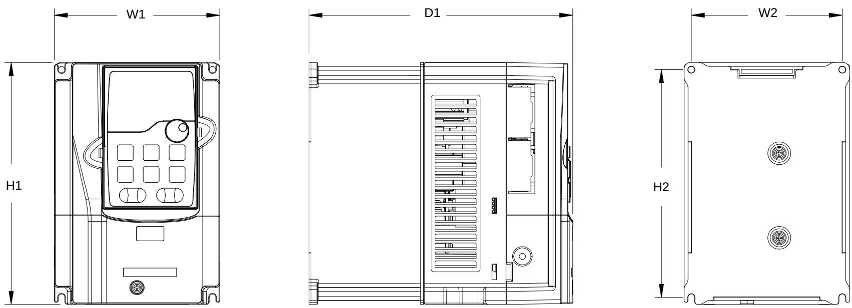


Figure C-4 Wall-mounting drawing for the 380V 0011–0045 models

VFD model	Outline dimensions (mm)			Installation dimensions (mm)		Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2		
0011	146	256	192	131	243.5	Ø 6	M5
0015–0018	170	320	220	151	303.5	Ø 6	M5
0022–0030	200	340.6	208	185	328.6	Ø 6	M5
0037–0045	250	400	223	230	380	Ø 6	M5

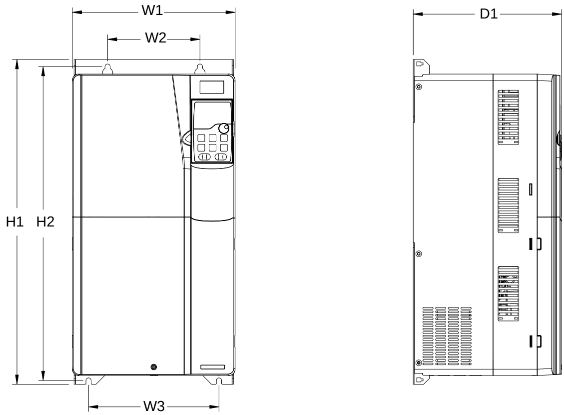


Figure C-5 Wall-mounting drawing for the 380V 0055–0090 models

VFD model	Outline dimensions (mm)			Installation dimensions (mm)			Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	W3	H2		
0055–0090	282	560	258	160	226	542	Ø 9	M8

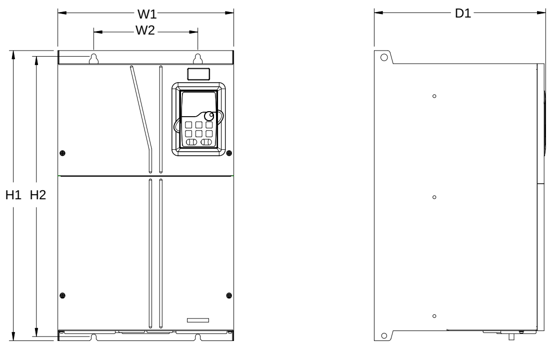


Figure C-6 Wall-mounting drawing for the 380V 0110–0132 models

VFD model	Outline dimensions (mm)			Installation dimensions (mm)		Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2		
0110–0132	338	554	330	200	535	Ø 10	M8

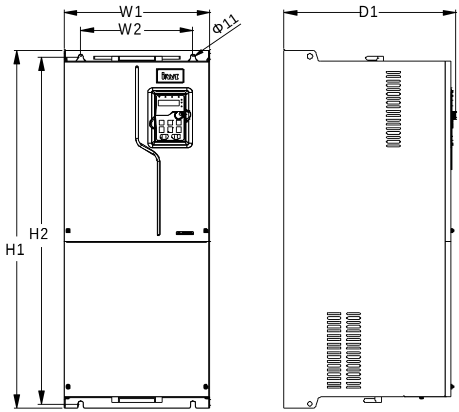


Figure C-7 Wall-mounting drawing for the 380V 0160–0185 models

VFD model	Outline dimensions (mm)			Installation dimensions (mm)		Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2		
0160–0185	303	1108	468	240	980	Ø 11	M10

C.3.2 Flange mounting dimensions

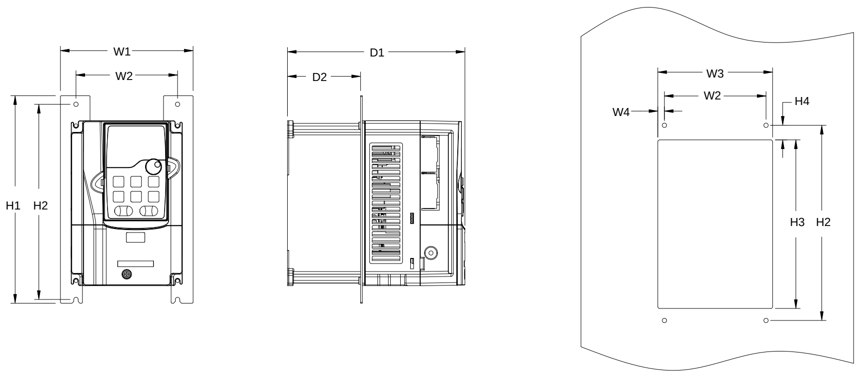


Figure C-8 Flange mounting diagram for 380V 0011–0090 models

VFD model	Outline dimensions (mm)			Installation dimensions (mm)							Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2	D2	W3	H3	W4	H4		
0011	170.2	292	192	131	276	84.5	150	260	9.5	6	Ø 6	M5
0015–0018	191.2	370	220	151	351	113	174	324	11.5	12	Ø 6	M5

VFD model	Outline dimensions (mm)			Installation dimensions (mm)							Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2	D2	W3	H3	W4	H4		
0022–0030	266	371	208	250	250	104	224	350.6	13	20.3	Ø 6	M5
0037–0045	316	430	223	300	300	118.3	274	410	13	55	Ø 6	M5
0055–0090	352	580	258	332	400	133.8	306	570	12	80	Ø 9	M8

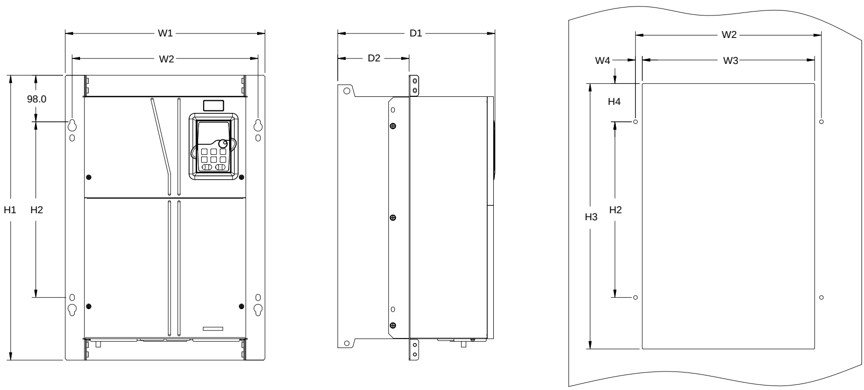


Figure C-9 Flange mounting diagram for 380V 0110–0185 models

VFD model	Outline dimensions (mm)			Installation dimensions (mm)							Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2	D2	W3	H3	W4	H4		
0110–0132	418.5	600	330	389.5	370	149.5	361	559	14.2	108.5	Ø 10	M8
0160–0185	428	868	390	394	625	183	345	830	24.5	80	Ø 10	M10

C.3.3 Floor mounting dimensions

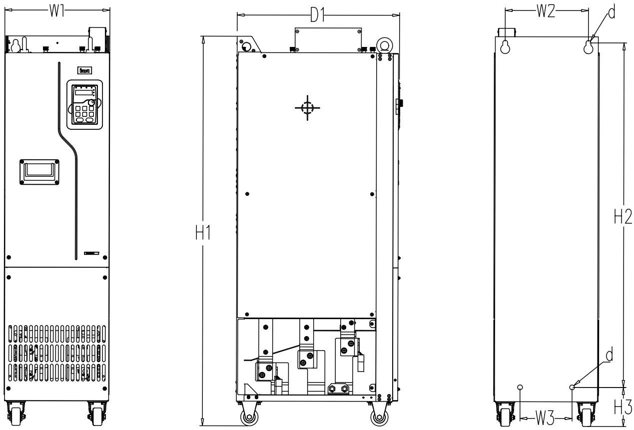


Figure C-10 Floor mounting diagram for 380V 0200–0500 models

VFD model	Outline dimensions (mm)			Mounting hole distance (mm)				Hole diameter (mm)	Fixing screw
	W1	H1	D1	H2	H3	W2	W3		
0200–0355	330	1288	544	1150	122	225	180	Ø 13	M10
0400–0500	330	1398	544	1280	101	240	200	Ø 13	M10

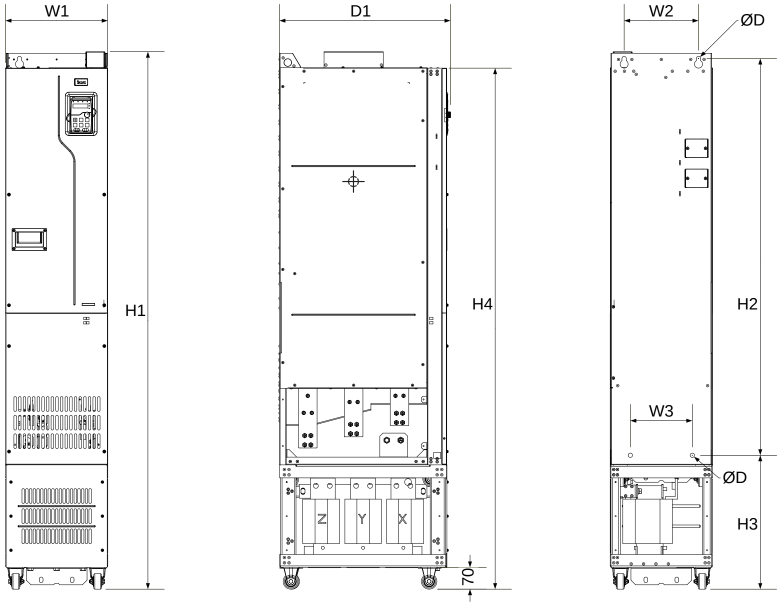
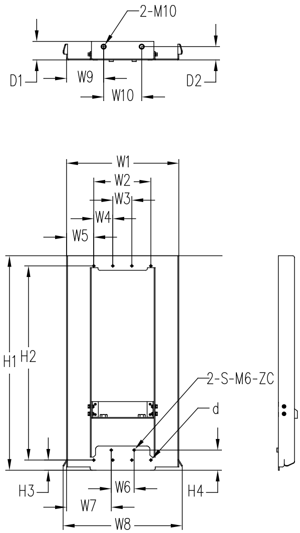


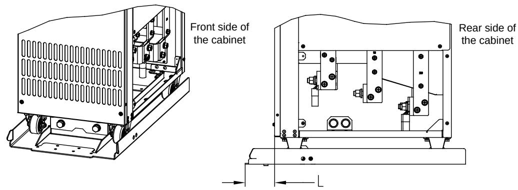
Figure C-11 Floor mounting diagram for the 380V 0220–0500-L3 models with output reactors

VFD model	Outline dimensions (mm)				Mounting hole distance (mm)					Hole diameter (mm)	Fixing screw
	W1	W4	H1	D1	H2	H3	H4	W2	W3		
0220–0355-L3	330	390	1619	544	1150	453	1571	225	180	Ø 13	M10
0400–0500-L3	330	390	1729	544	1280	432	1681	240	200	Ø 13	M10

Note: For floor mounting, optional base mounting brackets are available. See the following figure and table for its diagram and dimensions.



Dimensions diagram of the base



Layout diagram of the base and cabinet

Figure C-12 Base bracket dimensions and mounting dimensions for 380V 0200–0500 models

VFD model	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	H1	H2	H3	H4	D1	D2	d	Screw	L
0200–0500	321	150	50	50	84.5	60	130.5	338.8	110.5	100	580	525	27.5	54.5	46	33.5	6	M5 self-tapping screw	25.5

C.4 VFD cabinet dimensions

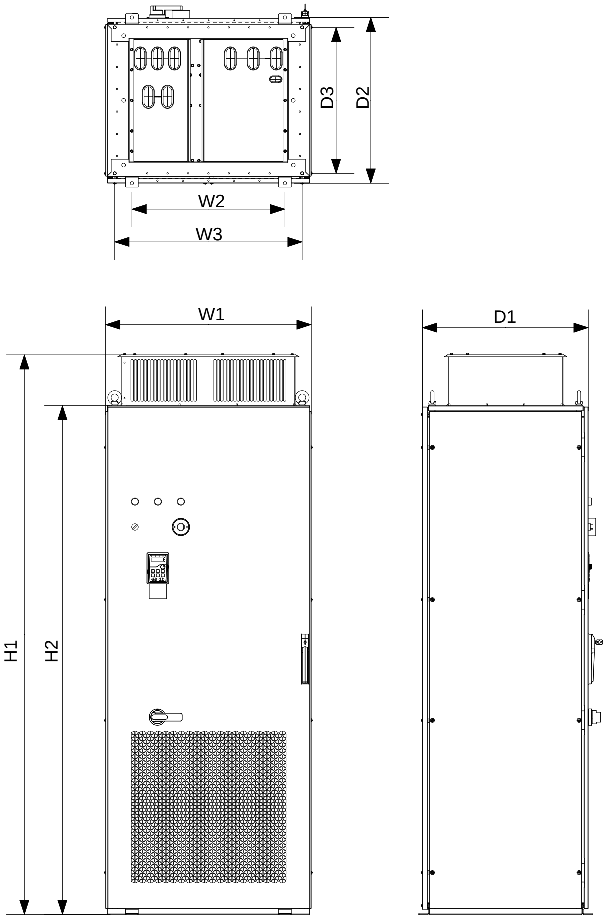


Figure C-13 Cabinet dimensions

VFD model	Outline dimensions (mm)			Mounting hole distance (mm)					Hole diameter (mm)	Fixing screw
	W1	H1	D1	W2	H2	D2	W3	D3		
0110–0132	600	2200	650	400	2000	653	535	575	Ø 13	M12
0160–0500	800	2200	650	600	2000	653	735	575	Ø 13	M12

Appendix D Optional peripheral accessories

D.1 What this chapter contains

This chapter describes how to select optional accessories of the VFD.

D.2 Wiring of peripheral accessories

The following figure shows the external wiring of the VFD.

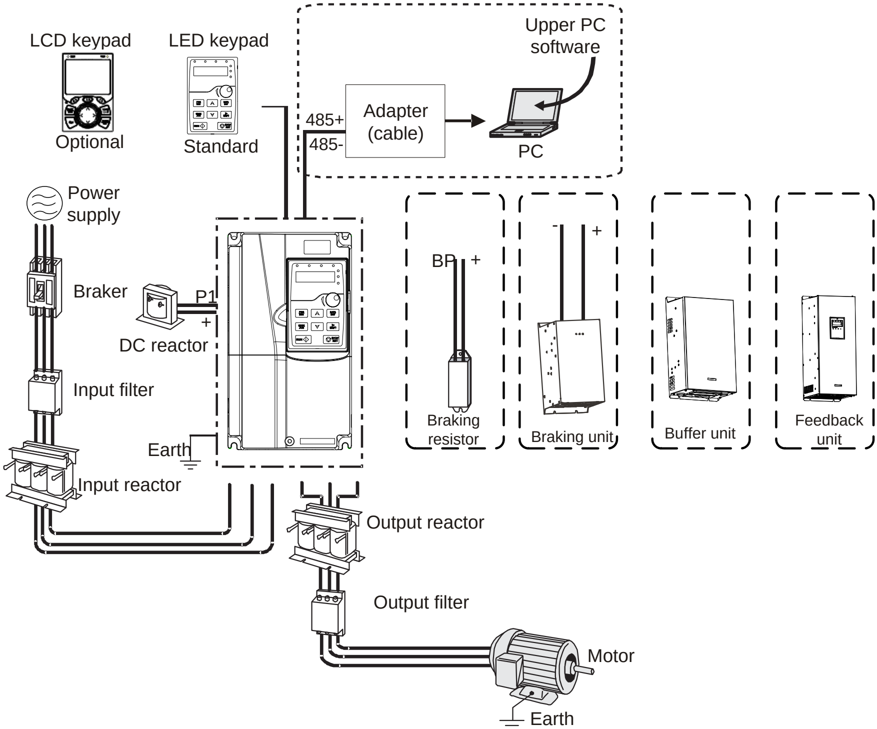
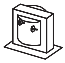
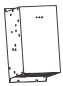
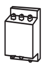


Image	Name	Description
	Cable	Accessory for signal transmission.
	Breaker	Device for electric shock prevention and protection against short-to-ground that may cause current leakage and fire. Select residual-current circuit breakers (RCCBs) that are applicable to VFDs and can restrict high-order harmonics, and of which the rated sensitive current for one VFD is larger than 30 mA.

Image	Name	Description
	Input reactor	Accessories used to improve the power factor on the input side of the VFD, and thus restrict high-order harmonic currents. DC reactors can be directly connected to VFDs of 380V 0160 or higher models.
	DC reactor	
	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.
 or 	Braking unit or braking resistor	Accessories used to consume the regenerative energy of the motor to reduce the DEC time. VFDs of 380V 0045 or lower models only need to be configured with braking resistors, those of 380V 0160 or higher models also need to be configured with braking units, and those of 380V 0055–0132 models can be configured with optional built-in braking units.
	Output filter	Accessory used to restrict interference generated in the wiring area on the output side of the VFD. Try to install the output filter near the output terminal side of the VFD.
	Output reactor	Accessory used to lengthen the valid transmission distance of the inverter, which effectively restrict the transient high voltage generated during the switch-on and switch-off of the IGBT module of the inverter.

D.3 Power supply

See chapter 4 "Installation guidelines".

	✧ Ensure that the voltage class of the VFD is consistent with that of the grid.

D.4 Cable

D.4.1 Powe cable

The sizes of the input power cables and motor cables must comply with local regulations.

✧ The input power cables and motor cables must be able to carry the corresponding load currents.

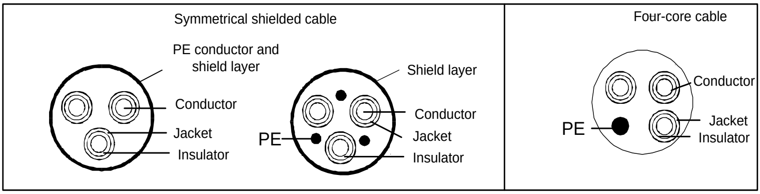
✧ The maximum temperature margin of the motor cables in continuous operation cannot be lower than 70°C.

✧ 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. (The cross-sectional area of the PE grounding conductor for 37kW and higher models can be slightly reduced.)

✧ For details about the EMC requirements, see Appendix C "Technical data".

To meet the EMC requirements stipulated in the CE standards, you must use symmetrical shielded cables as motor cables (as shown in the following figure).

Four-core cables can be used as input cables, but symmetrical shielded cables are recommended. Compared with four-core cables, symmetrical shielded cables can reduce electromagnetic radiation as well as the current and loss of the motor cables.



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

To protect the conductors, the cross-sectional area of the shielded cables must be the same as that of the phase conductors if the cable and conductor are made of materials of the same type. This reduces grounding resistance, and thus improves impedance continuity.

To effectively restrict the emission and conduction of radio frequency (RF) interference, the conductivity of the shielded cable must at least be 1/10 of the conductivity of the phase conductor. This requirement can be well met by a copper or aluminum shield layer. The following figure shows the minimum requirement on motor cables of a VFD. The cable must consist of a layer of spiral-shaped copper strips. The denser the shield layer is, the more effectively the electromagnetic interference is restricted.

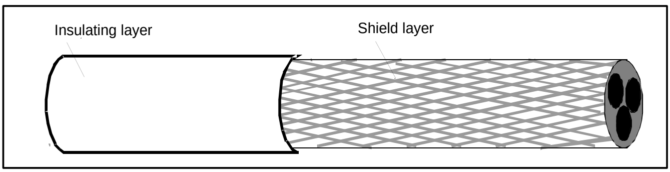


Figure D-1 Cross-section of the cable

D.4.2 Control cable

All analog control cables and cables used for frequency input must be shielded cables. Analog signal cables need to be double-shielded twisted-pair cables (as shown in figure a). Use one separate shielded twisted pair for each signal. Do not use the same ground wire for different analog signals.

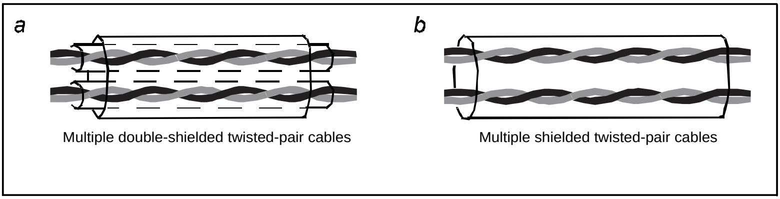


Figure D-2 Power cable arrangement

For low-voltage digital signals, double-shielded cables are recommended, but shielded or unshielded twisted pairs (as shown in figure b) also can be used. For frequency signals, however, only shielded cables can be used.

Relay cables need to be those with metal braided shield layers.

Keypads need to be connected by using network cables. In complicated electromagnetic environments, shielded network cables are recommended.

Note: Analog signals and digital signals cannot use the same cables, and their cables must be arranged separately.

Dielectric withstand tests have been performed between the main circuit and housing of each VFD before delivery. In addition, the VFD has the internal voltage limiting circuit, which can automatically cut off the test voltage. Do not perform any voltage withstand 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.

Note: Before connecting the input power cable of the VFD, check the insulation conditions of the cable according to local regulations.

D.4.3 Recommended cable size

Table D-1 AC 3PH 380V(-15%) – 440V(+10%)

VFD model	Recommended cable size (mm²)				Fixing screw	
	R, S, T U, V, W	PE	P1, (+)	PB, (+), (-)	Terminal screw	Fastening torque (Nm)
IPE300-0011-4-B-S	4/6	4/6	4/6	4/6	M5	2–2.5
IPE300-0015-4-B-S	6/10	6/10	6/10	6/10	M5	2–2.5
IPE300-0018-4-B-S	10/10	10/10	10/10	10/10	M5	2–2.5
IPE300-0022-4-B-S	10/16	10/16	10/16	10/16	M6	4–6
IPE300-0030-4-B-S	16/25	16/25	16/25	16/25	M6	4–6
IPE300-0037-4-B-S	25/25	16/16	25/25	25/25	M6	4–6
IPE300-0045-4-B-S	25/35	16/16	25/35	25/35	M8	9–11
IPE300-0055-4-S	35/50	16/25	35/50	35/50	M8	9–11
IPE300-0075-4-S	50/70	25/35	50/70	50/70	M8	9–11

VFD model	Recommended cable size (mm²)				Fixing screw	
	R, S, T U, V, W	PE	P1, (+)	PB, (+), (-)	Terminal screw	Fastening torque (Nm)
IPE300-0090-4-S	70/95	35/50	70/95	70/95	M10	18–23
IPE300-0110-4-S	95/95	50/50	95/95	95/95	M10	18–23
IPE300-0132-4-S	95/150	50/70	95/150	95/150	M12	31–40
IPE300-0160-4-S	150/185	70/95	150/185	150/185	M12	31–40
IPE300-0185-4-S	185/185	95/95	185/185	185/185	M12	31–40
IPE300-0200-4-S	185/2×95	95/95	185/2×95	185/2×95	M12	31–40
IPE300-0220-4-S	2×95/2×95	95/95	2×95/2×95	2×95/2×95	M12	31–40
IPE300-0250-4-S	2×95/2×150	95/150	2×95/2×150	2×95/2×150	M12	31–40
IPE300-0280-4-S	2×150/2×150	150/150	2×150/2×150	2×150/2×150	M12	31–40
IPE300-0315-4-S	2×150/2×185	150/185	2×150/2×185	2×150/2×185	M12	31–40
IPE300-0355-4-S	2×185/3×150	185/2×120	2×185/3×150	2×185/3×150	M12	31–40
IPE300-0400-4-S	3×150/3×185	2×120/2×150	3×150/3×185	3×150/3×185	M12	31–40
IPE300-0450-4-S	3×185/3×185	2×150/2×150	3×185/3×185	3×185/3×185	M12	31–40
IPE300-0500-4-S	3×185	2×150	3×185	3×185	M12	31–40

Note:

1. 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.
2. The terminals P1, (+), PB, and (-) are used to connect to DC reactors and braking accessories.
3. The values on the left and right sides of "/" indicate the recommended cables for heavy and light loads respectively.

D.4.4 Cable arrangement

Motor cables must be arranged away from other cables. The motor cables of several inverters can be arranged in parallel. It is recommended that you arrange the motor cables, input power cables, and control cables separately in different trays. The output dU/dt of the inverters may increase electromagnetic interference on other cables. Do not arrange other cables and the motor cables in parallel.

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. Aluminum trays can implement local equipotential.

The following figure shows the cable arrangement.

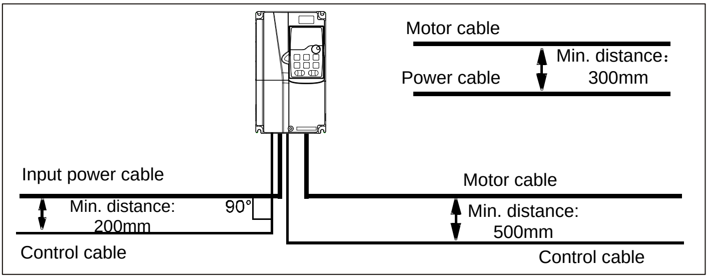


Figure D-3 Cable routing distance

D.4.5 Insulation inspection

Check the motor and the insulation conditions of the motor cable before running the motor.

1. 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.
2. 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: The insulation resistance is reduced if it is damp inside the motor. If it may be damp, you need to dry the motor and then measure the insulation resistance again.

D.5 Breaker and electromagnetic contactor

You need to add a fuse to prevent overload. You need to add a fuse to prevent overload.

You need to configure a manually manipulated molded case circuit breaker (MCCB) between the AC power supply and VFD. The breaker must be locked in the open state to facilitate installation and inspection.

⚠	According to the working principle and structure of breakers, if the manufacturer's regulation is not followed, hot ionized gases may escape from the breaker enclosure when a short-circuit occurs. To ensure safe use, exercise extra caution when installing and placing the breaker. Follow the manufacturer's instructions.

To ensure safety, you can configure an electromagnetic contactor on the input side to control the switch-on and switch-off of the main circuit power, so that the input power supply of the VFD can be effectively cut off when a system fault occurs.

Table D-2 AC 3PH 380V(-15%) – 440V(+10%)

VFD model	Breaker rated current (A)	Fast-acting fuse rated current (A)	Contactor rated current (A)
IPE300-0011-4-B-S	32/40	40/50	32
IPE300-0015-4-B-S	40/50	50/63	40

VFD model	Breaker rated current (A)	Fast-acting fuse rated current (A)	Contactor rated current (A)
IPE300-0018-4-B-S	50/63	63/80	50
IPE300-0022-4-B-S	63/63	80/80	50
IPE300-0030-4-B-S	63/80	80/100	65
IPE300-0037-4-B-S	80/100	100/125	80
IPE300-0045-4-B-S	100/125	125/160	95
IPE300-0055-4-S	125/160	160/200	150
IPE300-0075-4-S	160/200	200/250	150
IPE300-0090-4-S	180/225	200/250	185
IPE300-0110-4-S	225/250	250/315	225
IPE300-0132-4-S	250/315	315/400	265
IPE300-0160-4-S	315/350	400/450	330
IPE300-0185-4-S	350/400	450/500	330
IPE300-0200-4-S	350/400	450/500	400
IPE300-0220-4-S	400/500	500/630	400
IPE300-0250-4-S	500/630	630/800	500
IPE300-0280-4-S	630/630	800/800	500
IPE300-0315-4-S	630/800	800/1000	630
IPE300-0355-4-S	630/800	800/1000	630
IPE300-0400-4-S	800/800	1000/1000	630
IPE300-0450-4-S	1000/1000	1250/1250	800
IPE300-0500-4-S	1000/1000	1250/1250	800

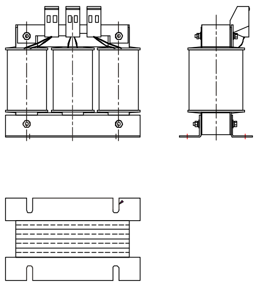
Note: The values on the left and right sides of "/" indicate the recommended components for heavy and light loads respectively.

D.6 Reactor

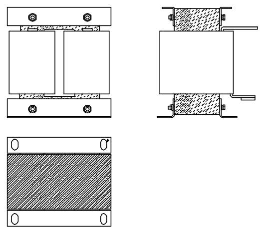
When the voltage of the grid is high, the transient large current that flows into the input power circuit may damage rectifier components. You need to configure an AC reactor on the input side, which can also improve the current adjustment coefficient on the input side.

When the distance between the VFD and motor is longer than 50 m, the parasitic capacitance between the long cable and ground may cause large leakage current, and overcurrent protection of the VFD may be frequently triggered. To prevent this from happening and avoid damage to the motor insulator, compensation must be made by adding an output reactor. When a VFD is used to drive multiple motors, take the total length of the motor cables (that is, sum of the lengths of the motor cables) into account. When the total length is longer than 50 m, an output reactor must be added on the output side of the VFD. If the distance between the VFD and motor is 50 m to 150 m, select the reactor according to the following table. If the distance is longer than 150 m, contact INVT's technical support technicians.

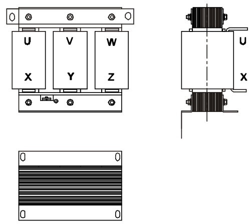
DC reactors can be directly connected to VFDs of 380V 0160 or higher. DC reactors can improve the power factor, avoid damage to bridge rectifiers caused due to large input current of the VFD when large-capacity transformers are connected, and also avoid damage to the rectification circuit caused due to harmonics generated by grid voltage transients or phase-control loads.



Input reactor



DC reactor



Output reactor

Table D-3 Reactors for AC 3PH 380V (-15%)–440V (+10%)

VFD power	Input reactor	DC reactor	Output reactor
IPE300-0011-4-B-S	ACL2-011-4	/	OCL2-011-4
IPE300-0015-4-B-S	ACL2-015-4	/	OCL2-015-4
IPE300-0018-4-B-S	ACL2-018-4	/	OCL2-018-4
IPE300-0022-4-B-S	ACL2-022-4	Built-in braking unit	OCL2-022-4
IPE300-0030-4-B-S	ACL2-037-4	Built-in braking unit	OCL2-037-4
IPE300-0037-4-B-S	ACL2-037-4	Built-in braking unit	OCL2-037-4
IPE300-0045-4-B-S	ACL2-045-4	Built-in braking unit	OCL2-045-4
IPE300-0055-4-S	ACL2-055-4	Built-in braking unit	OCL2-055-4
IPE300-0075-4-S	ACL2-075-4	Built-in braking unit	OCL2-075-4
IPE300-0090-4-S	ACL2-110-4	Built-in braking unit	OCL2-110-4
IPE300-0110-4-S	ACL2-110-4	Built-in braking unit	OCL2-110-4
IPE300-0132-4-S	ACL2-160-4	Built-in braking unit	OCL2-200-4
IPE300-0160-4-S	ACL2-160-4	Built-in braking unit	OCL2-200-4
IPE300-0185-4-S	ACL2-200-4	Built-in braking unit	OCL2-200-4
IPE300-0200-4-S	ACL2-200-4	Built-in braking unit	OCL2-200-4
IPE300-0220-4-S	ACL2-280-4	Built-in braking unit	OCL2-280-4
IPE300-0250-4-S	ACL2-280-4	Built-in braking unit	OCL2-280-4
IPE300-0280-4-S	ACL2-280-4	Built-in braking unit	OCL2-280-4
IPE300-0315-4-S	ACL2-350-4	Built-in braking unit	OCL2-350-4
IPE300-0355-4-S	ACL2-350-4	Built-in braking unit	OCL2-350-4
IPE300-0400-4-S	ACL2-400-4	Built-in braking unit	OCL2-400-4

VFD power	Input reactor	DC reactor	Output reactor
IPE300-0450-4-S	ACL2-500-4	Built-in braking unit	OCL2-500-4
IPE300-0500-4-S	ACL2-500-4	Built-in braking unit	OCL2-500-4

Note:

1. The rated input voltage drop of input reactor is designed to 2%.
2. The rated output voltage drop of output reactor is designed to 1%.
3. The preceding table lists only external accessories. You need to specify whether external or built-in accessories are needed in your purchase order.

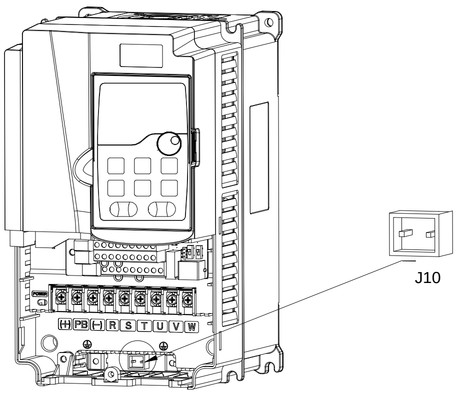
D.7 Filters

J10 is not connected in factory for the 380V 0132 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 0160 and higher VFD models, all of which meet the requirements of level C3.

Note: Disconnect J10 in the following situations:

1. 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.
2. If leakage protection occurs during configuration of a residual-current circuit breaker, disconnect J10.



Note: Do not connect C3 filters in IT power systems.

Interference filters on the input side can reduce the VFD interference on the surrounding devices.

Noise filters on the output side can decrease the radio noise caused by the cables between VFDs and motors and the leakage current of conducting wires.

INVT provides some of the filters for you to choose.

D.7.1 Filter model description

FLT – P 04 045 L – B

A B C D E F

Field	Description
A	FLT: VFD 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	Filter performance L: General H: High-performance
F	Filter application environment A: Environment Category I (IEC61800-3), C1 (EN 61800-3) B: Environment Category I (IEC61800-3), C2 (EN 61800-3) C: Environment Category II (IEC61800-3), C3 (EN 61800-3)

D.7.2 Filter model selection

Table D-4 AC 3PH 380V(-15%) – 440V(+10%)

VFD model	Input filter	Output filter
IPE300-0011-4-B-S	FLT-P04032L-B	FLT-L04032L-B
IPE300-0015-4-B-S	FLT-P04045L-B	FLT-L04045L-B
IPE300-0018-4-B-S		
IPE300-0022-4-B-S	FLT-P04065L-B	FLT-L04065L-B
IPE300-0030-4-B-S		
IPE300-0037-4-B-S	FLT-P04100L-B	FLT-L04100L-B
IPE300-0045-4-B-S		
IPE300-0055-4-S	FLT-P04150L-B	FLT-L04150L-B
IPE300-0075-4-S		
IPE300-0090-4-S	FLT-P04240L-B	FLT-L04240L-B
IPE300-0110-4-S		
IPE300-0132-4-S		
IPE300-0160-4-S	FLT-P04400L-B	FLT-L04400L-B
IPE300-0185-4-S		
IPE300-0200-4-S		

<table>
<tr><th>VFD model</th><th>Input filter</th><th>Output filter</th></tr>
<tr><td>IPE300-0220-4-S</td><td rowspan="3">FLT-P04600L-B</td><td rowspan="3">FLT-L04600L-B</td></tr>
<tr><td>IPE300-0250-4-S</td></tr>
<tr><td>IPE300-0280-4-S</td></tr>
<tr><td>IPE300-0315-4-S</td><td rowspan="3">FLT-P04800L-B</td><td rowspan="3">FLT-L04800L-B</td></tr>
<tr><td>IPE300-0355-4-S</td></tr>
<tr><td>IPE300-0400-4-S</td></tr>
<tr><td>IPE300-0450-4-S</td><td rowspan="2">FLT-P041000L-B</td><td rowspan="2">FLT-L041000L-B</td></tr>
<tr><td>IPE300-0500-4-S</td></tr>
</table>

Note:

1. The input EMI meets the C2 requirements after an input filter is configured.
2. The preceding table describes external accessories. You need to specify the ones you choose when purchasing accessories.

D.8 Braking system

D.8.1 Braking component selection

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.

	✧ The design, installation, commissioning, and operation of the device must be performed by trained and qualified professionals. ✧ Follow all the "Warning" instructions during the operation. Otherwise, major physical injuries or property loss may be caused. ✧ Only qualified electricians are allowed to perform the wiring. Otherwise, damage to the VFD or braking components may be caused. ✧ Read the braking resistor or unit instructions carefully before connecting them to the VFD. ✧ Connect braking resistors only to the terminals PB and (+), and braking units only to the terminals (+) and (-). Do not connect them to other terminals. Otherwise, damage to the braking circuit and VFD and fire may be caused.
	✧ Connect the braking components to the VFD according to the wiring diagram. If the wiring is not properly performed, damage to the VFD or other devices may be caused.

The VFD of 380V 0045 and lower models are equipped with built-in braking units. The VFD of 380V 0055–110kW models can be configured with built-in braking units, and then the VFD model will have a suffix "B", for example, IPE300-0055-4-B-S. Only external braking units can be configured for the 380V 0160 and higher models. Select braking resistors according to the specific requirements (such as the braking torque and braking usage) on site.

Table D-5 Braking units for AC 3PH 380V(-15%)–440V(+10%)

VFD model	Braking unit model	Resistance applicable for 100% braking torque (Ω)	Braking resistor dissipation power (kW)			Min. allowed braking resistance (Ω)
			10% braking usage	50% braking usage	80% braking usage	
IPE300-0011-4-B-S	Built-in braking unit	44	1.7	8.3	13.2	31
IPE300-0015-4-B-S		32	2	11	18	23
IPE300-0018-4-B-S		27	3	14	22	19
IPE300-0022-4-B-S		22	3	17	26	17
IPE300-0030-4-B-S		17	5	23	36	17
IPE300-0037-4-B-S		13	6	28	44	11.7
IPE300-0045-4-B-S		10	7	34	54	6.4
IPE300-0055-4-S	DBU100H-110-4	8	8	41	66	
IPE300-0075-4-S		6.5	11	56	90	
IPE300-0090-4-S	DBU100H-160-4	5.4	14	68	108	4.4
IPE300-0110-4-S		4.5	17	83	132	
IPE300-0132-4-S	DBU100H-220-4	3.7	20	99	158	3.2
IPE300-0160-4-S	DBU100H-320-4	3.1	24	120	192	2.2
IPE300-0185-4-S		2.8	28	139	222	
IPE300-0200-4-S		2.5	30	150	240	
IPE300-0220-4-S	DBU100H-400-4	2.2	33	165	264	1.8
IPE300-0250-4-S		2.0	38	188	300	
IPE300-0280-4-S	Quantity: Two DBU100H-320-4	3.6*2	21*2	105*2	168*2	2.2*2
IPE300-0315-4-S		3.2*2	24*2	118*2	189*2	
IPE300-0355-4-S		2.8*2	27*2	132*2	210*2	
IPE300-0400-4-S		2.4*2	30*2	150*2	240*2	
IPE300-0450-4-S	Quantity: Two DBU100H-400-4	2.2*2	34*2	168*2	270*2	1.8*2
IPE300-0500-4-S		2.0*2	38*2	186*2	300*2	

Note:

1. Select braking resistors according to the resistance and power data provided by INVT.
2. The braking resistor may increase the braking torque of the VFD. The preceding table describes the resistance and power for 100% braking torque, 10% braking usage, 50% braking usage, and 80% braking usage. You can select the braking system based on the actual operation conditions.
3. When using an external braking unit, set the brake voltage class of the braking unit properly by referring to the manual of the dynamic braking unit. If the voltage class is set incorrectly, the VFD may not run properly.

	Do not use braking resistors whose resistance is lower than the specified minimum resistance. The VFD does not provide protection against overcurrent caused by resistors with low resistance.
	In scenarios where braking is frequently implemented, that is, the braking usage is greater than 10%, you need to select a braking resistor with higher power as required by the operation conditions according to the preceding table.

D.8.2 Braking resistor cable selection

Braking resistor cables should be shielded cables.

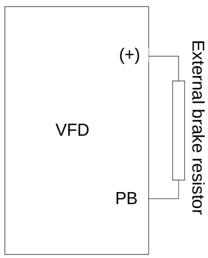
D.8.3 Braking resistor installation

All resistors must be installed in places with good cooling conditions.

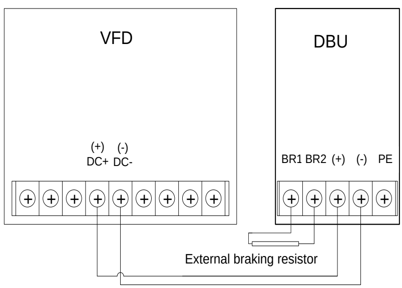
	The materials near the braking resistor or braking unit must be flame resistant. since the surface temperature of the resistor is high and air flowing from the resistor is of hundreds of degrees Celsius. Prevent any materials from coming into contact with the resistor.

Braking resistor installation

	The 380V 0045 and lower VFD models need only external braking resistors. PB and (+) are the terminals for connecting braking resistors.



The following figure shows the connection of one VFD to a dynamic brake unit.



Appendix E Ordering guildlines

You can quickly find product models and order products by 10-digit order number.

Product category	Order number	Model	Remarks
VFD	11001-02353	IPE300-0011-4-B-S	
	11001-02346	IPE300-0015-4-B-S	
	11001-02345	IPE300-0018-4-B-S	
	11001-02355	IPE300-0022-4-B-S	
	11001-02343	IPE300-0030-4-B-S	
	11001-02344	IPE300-0037-4-B-S	
	11001-02348	IPE300-0045-4-B-S	
	11001-02347	IPE300-0055-4-S	
	11001-02349	IPE300-0075-4-S	
	11001-02351	IPE300-0090-4-S	
	11001-02354	IPE300-0110-4-S	
	11001-02350	IPE300-0132-4-S	
	11001-02369	IPE300-0160-4-S	
	11001-02519	IPE300-0185-4-S	
	11001-02362	IPE300-0200-4-S	
	11001-02365	IPE300-0220-4-S	
	11001-02364	IPE300-0250-4-S	
	11001-02360	IPE300-0280-4-S	
	11001-02366	IPE300-0315-4-S	
	11001-02363	IPE300-0355-4-S	
	11001-02361	IPE300-0400-4-S	
	11001-02367	IPE300-0450-4-S	
	11001-02370	IPE300-0500-4-S	
	11001-02526	IPE300-0280-4-L3-S	
	11001-02525	IPE300-0315-4-L3-S	
	11001-02529	IPE300-0355-4-L3-S	
	11001-02528	IPE300-0400-4-L3-S	
	11001-02527	IPE300-0450-4-L3-S	
	11001-02530	IPE300-0500-4-L3-S	

Product category	Order number	Model	Remarks
Expansion card	11023-00083	EC-IO501-00	I/O expansion card 1
	11023-00119	EC-IO502-00	I/O expansion card 2
	11023-00081	EC-TX504	Ethernet communication card
	11023-00148	EC-TX505C	CANopen multi-protocol communication card
	11023-00149	EC-TX509C	PROFINET communication card
	11023-00151	EC-TX503D	PROFIBUS-DP communication card
LCD keypad	11022-00131	SOP-IPE300-01	LCD keypad

Appendix F Further information

F.1 Product and service queries

If you have any queries about the product, contact the local INVT office. Please provide the model and serial number of the product you query about. You can visit www.invt.com to find a list of INVT offices.

F.2 Feedback on INVT VFD manuals

Your comments on our manuals are welcome. Visit www.invt.com, directly contact online service personnel or choose **Contact Us** to obtain contact information.

F.3 Documents on the Internet

You can find manuals and other product documents in the PDF format on the Internet. Visit www.invt.com and choose **Support** > **Download**.

E-mail:overseas@invt.com.cn Website:www.invt.com

The products are owned by **Shenzhen INVT Electric Co.,Ltd.**
Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

Shenzhen INVT Electric Co., Ltd. (origin code: 01)
Address: INVT Guangming Technology Building, Songbai Road, Matian, Guangming District, Shenzhen, China

INVT Power Electronics (Suzhou) Co., Ltd. (origin code: 06)
Address: 1# Kunlun Mountain Road, Science&Technology Town, Gaoxin District, Suzhou, Jiangsu, China

Industrial Automation: ■HMI ■PLC ■VFD ■Servo System ■Elevator Intelligent Control System ■Rail Transit Traction System

Energy & Power: ■UPS ■DCIM ■Solar Inverter ■SVG ■New Energy Vehicle Powertrain System ■New Energy Vehicle Charging System ■New Energy Vehicle Motor

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