

## Preface

Thank you for choosing FD200 series variable-frequency drive (VFD).

Version: V1.0

FD200 series dexterous VFD is newly developed by Windsun Science & Technology Co., Ltd. It integrates torque control and speed control, and can achieve efficient driving of synchronous and asynchronous motors.

The product adopted leading vector control technology, enhanced the reliability and environmental adaptability, and fully considered the industry application needs, developed rich functional extension cards, makes the application more flexible.

To meet the diverse application needs of users, the FD200 series VFD can be configured with an extension card, it can be PG card, or communication card, or I/O expansion card.

The PG card supports various encoders such as incremental and resolver. It adopts digital filtering technology and has better electromagnetic compatibility characteristics, achieving stable reception of encoder signals over long distances; And it also has an encoder disconnection detection function to avoid the system faults caused by disconnection.

The communication cards can support different protocols, such as CAN, Profinet, Profibus-DP, Ethernet, etc., with better industrial control system compatibility;

The FD200 series frequency converters have a high power density design and adopt a book style design structure, saving users more installation space; Through the overall design of electromagnetic compatibility, meet the environmental requirements of users for low noise and low electromagnetic interference in application areas;

The FD200 product adopts an independent air duct design and thickened circuit board coating, which can adapt to harsh operating conditions such as harsh power grids, high temperatures, high humidity, and dust pollution, greatly improving product reliability, ensuring long-term reliable operation of the equipment, and reducing equipment maintenance investment.

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# 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 VFD. If these safety precautions are ignored, physical injury or death may occur, or damage may occur to the equipment.

If any physical injury or death or damage to the equipment occur due to neglect of the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

## 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 working on the VFD must have received professional electrical and safety training and obtained the certificates, and must be familiar with all steps and requirements of VFD installing, commissioning, running, and maintaining and capable to prevent any emergencies.





## 1.3 Warning symbols

Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment, and advice on how to avoid the danger. Following warning symbols are used in this manual.


Symbols	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if related requirements are not followed	
 Warning	Warning	Physical injury or damage to the equipment may occur if related requirements are not followed	
 Forbid	Electrostatic discharge	The PCBA may be damaged if related requirements are not followed	
 Hot	Hot sides	The VFD base may become hot. Do not touch.	
  5 min	Electric shock	As high voltage still presents in the bus capacitor after power off, wait for at least five minutes (or 15 min / 25	  5 min

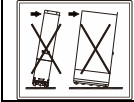
Symbols	Name	Instruction	Abbreviation
		min, depending on the warning symbols on the machine) after power off to prevent electric shock	
	Read manual	Read the operation manual before operating on the equipment	
<b>Note</b>	Note	Actions taken to ensure proper operation	<b>Note</b>

### 1.4 Safety guidelines

	<ul style="list-style-type: none"> <li>◇ Only trained and qualified electricians are allowed to carry out related operations.</li> <li>◇ Do not perform wiring, inspection or component replacement when power supply is applied. Ensure all the input power supplies are disconnected before wiring and 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 table below.</li> </ul> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>VFD model</th> <th>Minimum waiting time</th> </tr> </thead> <tbody> <tr> <td>380V 1.5kW-110kW</td> <td>5 min</td> </tr> <tr> <td>380V 132kW-315kW</td> <td>15 min</td> </tr> <tr> <td>380V 355kW and above</td> <td>25 min</td> </tr> </tbody> </table>	VFD model	Minimum waiting time	380V 1.5kW-110kW	5 min	380V 132kW-315kW	15 min	380V 355kW and above	25 min
VFD model	Minimum waiting time								
380V 1.5kW-110kW	5 min								
380V 132kW-315kW	15 min								
380V 355kW and above	25 min								
	◇ Do not refit the VFD unless authorized; otherwise, fire, electric shock or other injuries may occur.								
	◇ The base of the radiator may become hot during running. Do not touch to avoid hurt.								
	◇ The electrical parts and components inside the VFD are electrostatic. Take measures to prevent electrostatic discharge during related operation.								

#### 1.4.1 Delivery and installation

	<ul style="list-style-type: none"> <li>◇ Install the VFD on fire-retardant material and keep the VFD away from combustible materials.</li> <li>◇ Connect the optional braking parts (braking resistors, braking units or feedback units) according to the wiring diagram.</li> <li>◇ Do not operate on a damaged or incomplete VFD.</li> <li>◇ Do not touch the VFD with wet items or body parts; otherwise, electric shock may occur.</li> </ul>
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- ◇ Do not push sideways during handling.
- ◇ Prevent dumping to both sides during handling.

**Note:**

- ◇ Select appropriate tools for delivery and installation to ensure a safe and proper running of the VFD and avoid physical injury or death. To ensure physical safety, the installation staff should take mechanical protective measures like wearing safety shoes and working uniforms
- ◇ Protect the VFD against physical shock or vibration during delivery and installation.
- ◇ Do not carry the VFD by its front cover only as the cover may fall off.
- ◇ The installation site must be away from children and other public places.
- ◇ When the installation site altitude exceeds 1000m, derate by 1% for every increase of 100m; when the installation site altitude exceeds 3000m, consult local FGI dealer or office.
- ◇ Use the VFD in proper environment. (For details, refer to "4.2.1 Installation environment".)
- ◇ Prevent the screws, cables, and other conductive parts from falling into the VFD.
- ◇ 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 (with the same cross sectional area).
- ◇ R, S and T are the power input terminals, and U, V and W are 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**



- ◇ Disconnect all power sources applied to the VFD before terminal wiring, and wait for at least the time designated on the VFD after disconnecting the power sources.
- ◇ High voltage presents inside the VFD during running. Do not carry out any operation on the VFD during running except for keypad setup. For products at voltage levels of 5 or 6, the control terminals form extra-low voltage circuits. Therefore, you need to prevent the control terminals from connecting to accessible terminals of other devices.
- ◇ The VFD may start up by itself when  $F10.31=1$ . Do not get close to the VFD and motor.
- ◇ The VFD cannot be used as "Emergency-stop device".
- ◇ The VFD cannot act as an emergency brake for the motor; it is a must to install mechanical brake device.
- ◇ During driving a permanent magnet SM, besides above-mentioned items, the following work must be done before installation and maintenance:
  1. Disconnect all the input power sources including main power and control

	<p>power.</p> <ol style="list-style-type: none"><li>2. Ensure the permanent-magnet SM has been stopped, and the voltage on output end of the VFD is lower than 36V.</li><li>3. After the permanent-magnet SM is stopped, wait for at least the time designated on the VFD, and ensure the voltage between + and - is lower than 36V.</li><li>4. 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 effective external brake device or disconnect the direct electrical connection between permanent-magnet SM and the VFD.</li></ol>
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**Note:**

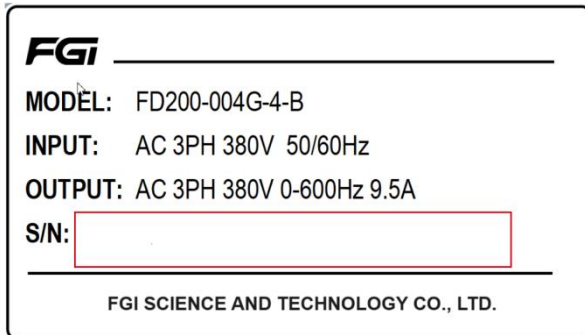
- ◇ Do not switch on or switch off input power sources of the VFD frequently.



## 2 If the VFD has been stored for a long time without being used, set the capacitance (refer to "Quality commitment")

### 8.1 Warranty period

Standard warranty: 18 months (based on product serial number)



During the warranty period, the repair or replacement of parts will not affect the overall warranty period of the original product. If the warranty period of the original product is less than 3 months, the repaired or replaced parts will still have the warranty period of 3 months.

### 8.2 After sales service instructions

Thank you very much for choosing FGI products. Fd300 series adopts the most advanced transmission technology and is manufactured under the strict and advanced production management control. In case of product failure, FGI Science & Technology Co., Ltd. and its office will wholeheartedly provide you with timely and high-quality services. Welcome to call the 365X24 hour national unified service hotline: 400-600-3199.

### 8.3 Services

We promise that, our company (hereinafter referred to as "the manufacturer") conducts free maintenance and repairing to the product that has any fault or damage under the normal operation conditions to the customers from the purchase date.

1. This product is guaranteed free of charge for 18 months from the date of purchase from the manufacturer (except the non-standard machine products).
2. This product has paid lifelong service from the date of purchase from the manufacturer.
3. Even within 18 months, maintenance should also be charged in case of the following situations:
  - (1) Damages incurred to the inverter due to mis-operations which are not in compliance with "Operation Manual";

being used, set the capacitance (refer to "Quality commitment

- (2) Damages incurred to the inverter due to the unauthorized repairing and reconstruction;
- (3) Damage incurred to the inverter due to mis-operations which are not in the standard application range;
- (4) Abnormal aging or damage incurred to the inverter due to bad usage environment;
- (5) Damage incurred to the inverter due to earthquake, fire, flood, thunder, abnormal voltage and other damage caused by the force majeure;
- (6) Damage or lost incurred to the inverter due to improper transportation (the customer can select the transportation, but our company can assist for the shipment procedures).

4. Free maintain and repairing won't be given under the following circumstance:

- (1) The brand, trademark, serial number and name plate designated in the product have been changed or destroyed and cannot be read;
- (2) The customer did not pay at the Purchase and Sales Contract signed by both parties;
- (3) The customer concealed the mis-operation in installation, configuration, operation, maintenance, and other procedures.

### 8.4 Responsibilities


No matter from the perspective of contract, warranty period, negligence, civil tort, strict liability or any other point of view, FGI and its suppliers and distributors shall not be responsible for the following special, indirect and secondary losses caused by the use of equipment. This includes but is not limited to the loss of profit and income, the loss of the use of supplied equipment and related equipment, the cost of funds, the cost of substitute equipment, tool fees and service fees, the cost of downtime, delays, and the loss of the buyer's customers or any third party. In addition, unless the user can provide strong evidence, FGI and its suppliers will not be responsible for some allegations, such as problems caused using unqualified raw materials, wrong design, or non-standard production.

If you have any questions about FGI VFDs, please contact FGI company or its office. Technical data, information and specifications are the latest materials at the time of publication. FGI reserves the right to make changes without prior notice.

✧ **Maintenance** and carry out inspection and pilot run on the VFD before use.

✧ Close the front cover before running; otherwise, electric shock may occur.

#### 1.4.3 Maintenance and component replacement



	<ul style="list-style-type: none"> <li>✧ Only trained and qualified professionals are allowed to perform maintenance, inspection, and component replacement on the VFD.</li> <li>✧ Disconnect all the power sources applied to the VFD before terminal wiring, and wait for at least the time designated on the VFD after disconnecting the power sources.</li> <li>✧ Take measures to prevent screws, cables and other conductive matters from</li> </ul>
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	falling into the VFD during maintenance and component replacement.
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**Note:**

- ✧ Use proper torque to tighten the screws.
- ✧ Keep the VFD and its parts and components away from combustible materials during maintenance and component replacement.
- ✧ Do not carry out insulation voltage-endurance test on the VFD, or measure the control circuits of the VFD with megameter.
- ✧ Take proper anti-static measures on the VFD and its internal parts during maintenance and component replacement.

**1.4.4 What to do after scrapping**

	✧ The heavy metals inside the VFD should be treated as industrial effluent.
	✧ When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point but not place it in the normal waste stream.

## 3 Quick startup

### 3.1 What this chapter contains

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

### 3.2 Unpacking inspection

Check the following after receiving the product.

● Whether the packing box is damaged or dampened.
● Whether the model identifier on the exterior surface of the packing box is consistent with the purchased model.
● 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.
● Whether the VFD nameplate is consistent with the model identifier on the exterior surface of the packing box.
● Whether the accessories (including the manual and keypad) inside the packing box are complete.

If any problems are found, contact the local dealer or FGI office.

### 3.3 Checking before applying

Check the following before applying the VFD.

● Check the load type to verify that there is no overload of the VFD during work and check whether the power class of the VFD needs to be increased.
● Check whether the actual running current of the motor is less than the rated current of the VFD.
● Check whether the control accuracy required by the load is the same of the VFD.
● Check whether the grid voltage is consistent with the rated voltage of the VFD.
● Check whether extension card is needed for selecting functions.

### 3.4 Environment

Check the following before the actual installation and use:

**Note:** For a cabinet-built VFD, the ambient temperature is the air temperature inside the cabinet.

● Check whether the ambient temperature of the VFD exceeds 40°C. If it exceeds 40°C, derate 1% for every increase of 1°C. It is not recommended to use the VFD if the ambient temperature exceeds 50°C.
● Check whether the ambient temperature of the VFD in actual use is lower than -10°C. If yes, use heating facilities.
● When the altitude exceeds 1000m, derate by 1% for every increase of 100m. When the altitude exceeds 3000m, please contact the local FGI dealer or office for details.
● Check whether the humidity of the actual usage site exceeds 90% and condensation

occurs. If yes, take additional protective measures.

- Check whether the actual use site may be exposed to direct sunlight or may have the chance of ingress of foreign objects. If yes, take additional protective measures.
- Check whether there is dust, explosive gas, or flammable gas in the actual use site. If yes, take additional protective measures.

### 3.5 Installation confirmation

Check the following after the VFD installation:

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

### 3.6 Basic commissioning

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

- According to the actual motor parameters, select the motor type, set motor parameters, and select the VFD control mode.
- Autotune. If possible, de-couple the VFD from the motor load to start dynamic autotuning. If the VFD cannot be de-coupled from the load, perform static autotuning.
- Adjust the ACC/DEC time according to the actual work condition of the load.
- 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.
- Set all control parameters and then operate.

## 4 Product overview

### 4.1 What this chapter contains

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

### 4.2 Basic principle

The VFD is used to control asynchronous AC induction motors and permanent-magnet synchronous motors. The figure below shows the main circuit diagram of the VFD. The rectifier converts 3PH AC voltage into DC voltage, and the capacitor bank of intermediate circuit stabilizes the DC voltage. The VFD converts DC voltage into the AC voltage used by 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.

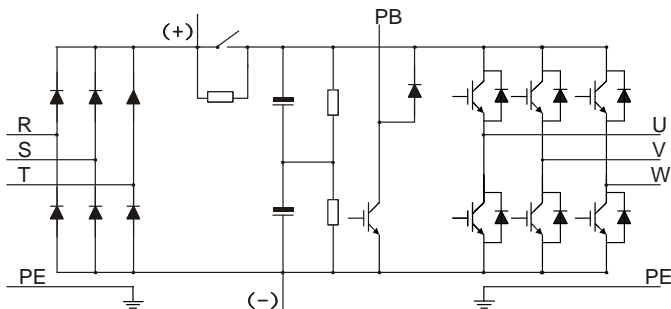


Figure 4.1 Main circuit diagram

#### Note:

- Models with built-in braking units can be equipped with external braking resistors, which are optional accessories.

### 4.3 Product specifications

Function description		Specification
Power input	Input voltage (V)	AC 1PH 220V (-15%) ~240V (+10%) AC 3PH 220V (-15%) ~240V (+10%) AC 3PH 380V (-15%) ~440V (+10%)
	Voltage tolerance	-15%~+10%
	Input current (A)	Refer to "Product ratings".
	Input frequency (Hz)	50Hz or 60Hz, allowable range: 47–63Hz
Power output	Output voltage (V)	0–Input voltage
	Output current (A)	Refer to "Product ratings".
	Output power (kW)	Refer to "Product ratings".
	Output frequency (Hz)	0–400Hz
Technical control performance	Control mode	Space voltage vector control, sensorless vector control (SVC), and vector control with sensor feedback (FVC)
	Motor type	Asynchronous motor (AM) and permanent magnetic synchronous motor (SM)
	Speed regulation ratio	For AM1: 1:200 (SVC); for SM1, 1:20 (SVC); 1:1000 (FVC)
	Speed control precision	± 0.2% (SVC); ± 0.02% (FVC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	< 20ms (SVC); < 10ms (FVC)
	Torque control precision	10% (SVC); 5% (FVC)
	Starting torque	For AMs: 0.25Hz/150% (SVC) For SMs: 2.5Hz/150% (SVC) 0Hz/200% (FVC)
	Overload capacity	150% for 1 min (every 5 mins) ; 180% for 10s; 200% for 1s
Running	Frequency setting	Settings can be implemented through digital, analog,

Function description		Specification
control performance	method	pulse frequency, multi-step speed running, simple PLC, PID communication, 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
Peripheral interface	Terminal analog input resolution	No more than 20mV
	Terminal digital input resolution	No more than 2ms
	Analog input	2 channels: AI1: 0(2)–10V/0(4)–20mA; AI2: -10–10V
	Analog output	2 channels; AO1: 0(2)–10V/0(4)–20mA; AO2: 0–10V
	Digital input	4 channels regular input; max. frequency: 1kHz; internal impedance: 3.3kΩ 1 channel high-speed input; max. frequency: 50kHz; supporting quadrature encoder input; with speed measurement function
	Digital output	1 high-speed pulse output; max. frequency: 50kHz 1 DO terminal open collector output
	Relay output	1 programmable relay outputs T1A: NO; T1B: NC; T1C: common Contact capacity: 3A/AC250V, 1A/DC30V
	Extended interfaces	1 extended interface: SLOT1 Supporting PG cards, communication cards, I/O cards and so on
Other	Mounting method	Wall mounting, Guide rail (optional below 380V/5.5KW), side mounted (optional)
	Temperature of running environment	-10 – +50°C; derating is required if the ambient temperature exceeds 40°C
	Ingress protection rating	IP20
	Pollution degree	Degree 2



Function description		Specification
	Vibration	The max. amplitude of vibration should not exceed 5.9m/s <sup>2</sup> (0.6g)
	Cooling method	Forced air cooling
	Braking unit	Standard built-in braking units.
	EMC filter	The transmission of the VFD meets the IEC/EN 61800-3 C3 requirements. When optional filters are connected externally, the transmission of the VFD can meet the IEC/EN 61800-3 C2 requirements. <b>Note:</b> Comply with the EMC requirements and the technical requirements for the motors and motor cables in the appendix in the manual.

#### 4.4 Product nameplate

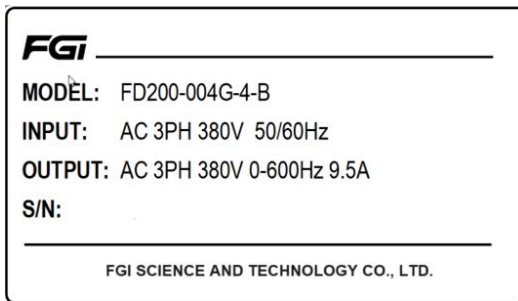


Figure 4.5 Product nameplate

**Note:**

- This is a nameplate example of a standard VFD product. The CE/TUV/IF02 marking on the top right will be marked according to actual certification conditions.

#### 4.5 Model designation code

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

FD200 - 004G - 4 - B  
 ①                      ②                      ③                      ④

Figure 4.6 Model description

Field	No.	Description	Content
Abbreviation of product series	①	Abbreviation of product series	FD200: FD200 series dexterous VFD
Rated power	②	Power range + load type	004G: Constant torque load 4kW
Voltage class	③	Voltage class	4: AC 3PH 380V (-15%) ~440V (+10%) 2: AC 3PH 220V (-15%) ~240V (+10%) S2: AC 1PH 220V (-15%) ~240V (+10%)
DBU configuration	④	Built-in DBU	B: Built-in DBU
<p><b>Note:</b> 380V 37kW and below models standard built-in DBU. 380V 45kW~110kW models are standard configuration without DBU (can optional built-in DBU, select -B model, for example, FD300-45G/55P-4-B.)</p>			

**4.6 Product ratings**

Model no.	Voltage	Output power (kW)	Input current (A)	Output current (A)
FD200-0R4G-S2-B	AC 1 PH 220V	0.4	6.5	2.4
FD200-0R7G-S2-B		0.75	9.2	4.5
FD200-1R5G-S2-B		1.5	15.5	7.0
FD200-2R2G-S2-B		2.2	24	10
FD200-0R4G-2-B	AC 3 PH 220V	0.4	3.7	2.4
FD200-0R7G-2-B		0.75	5.0	4.5
FD200-1R5G-2-B		1.5	7.8	7.0
FD200-2R2G-2-B		2.2	11	10
FD200-004G-2-B		4	17	16
FD200-5R5G-2-B		5	21	20
FD200-7R5G-2-B		7.5	31	30
FD200-1R5G-4-B	AC 3PH 380V	1.5	5.0	3.7
FD200-2R2G-4-B		2.2	5.8	5.5
FD200-004G-4-B		4	13.5	9.5
FD200-5R5G-4-B		5.5	19.5	14
FD200-7R5G-4-B		7.5	25	18.5
FD200-011G-4-B		11	32	25
FD200-015G-4-B		15	40	32

Model no.	Voltage	Output power (kW)	Input current (A)	Output current (A)
FD200-018G-4-B		18.5	47	38

**Note:**

- The rated output current is the output current corresponding to 380V output voltage.
- Within the allowable input voltage range, the output current and power cannot exceed the rated output current and power.

**4.7 Structure diagram**

The VFD structure is shown in the following figure (using the 380V 5.5kW VFD model as an example):

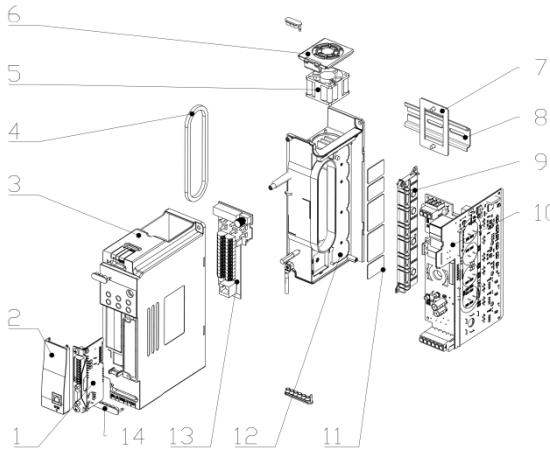



Figure 4.7 Structure diagram

No.	Item	Description
1	Extension card	Optional
2	Cover	Used to protect internal components.
3	Enclosure	Used to protect internal components.
4	Sealing ring	Air duct seal
5	Cooling fan	<b>5 For details, refer to "9 Quality commitment</b> <b>8.1 Warranty period</b>

No.	Item	Description
		<p>Standard warranty: 18 months (based on product serial number)</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;">  _____  <b>MODEL:</b> FD200-004G-4-B  <b>INPUT:</b> AC 3PH 380V 50/60Hz  <b>OUTPUT:</b> AC 3PH 380V 0-600Hz 9.5A  <b>S/N:</b> <span style="border: 1px solid red; display: inline-block; width: 150px; height: 20px; vertical-align: middle;"></span> </div> <p style="text-align: center; margin: 0;">_____  <b>FGI SCIENCE AND TECHNOLOGY CO., LTD.</b></p> <p>During the warranty period, the repair or replacement of parts will not affect the overall warranty period of the original product. If the warranty period of the original product is less than 3 months, the repaired or replaced parts will still have the warranty period of 3 months.</p> <p><b>8.2 After sales service instructions</b></p> <p>Thank you very much for choosing FGI products. Fd300 series adopts the most advanced transmission technology and is manufactured under the strict and advanced production management control. In case of product failure, FGI Science &amp; Technology Co., Ltd. and its office will wholeheartedly provide you with timely and high-quality services. Welcome to call the 365X24 hour national unified service hotline: 400-600-3199.</p> <p><b>8.3 Services</b></p> <p>We promise that, our company (hereinafter referred to as "the manufacturer") conducts free maintenance and repairing to the product that has any fault or damage under the normal operation conditions to the customers from the purchase date.</p> <ol style="list-style-type: none"> <li>1. This product is guaranteed free of charge for 18 months from the date of purchase from the manufacturer (except the non-standard machine products).</li> <li>2. This product has paid lifelong service from the date of purchase from the manufacturer.</li> <li>3. Even within 18 months, maintenance should also be charged in</li> </ol>


No.	Item	Description
		<p>case of the following situations:</p> <ol style="list-style-type: none"> <li>(1) Damages incurred to the inverter due to mis-operations which are not in compliance with "Operation Manual";</li> <li>(2) Damages incurred to the inverter due to the unauthorized repairing and reconstruction;</li> <li>(3) Damage incurred to the inverter due to mis-operations which are not in the standard application range;</li> <li>(4) Abnormal aging or damage incurred to the inverter due to bad usage environment;</li> <li>(5) Damage incurred to the inverter due to earthquake, fire, flood, thunder, abnormal voltage and other damage caused by the force majeure;</li> <li>(6) Damage or lost incurred to the inverter due to improper transportation (the customer can select the transportation, but our company can assist for the shipment procedures).</li> </ol> <p>4. Free maintain and repairing won. t be given under the following circumstance:</p> <ol style="list-style-type: none"> <li>(1) The brand, trademark, serial number and name plate designated in the product have been changed or destroyed and cannot be read;</li> <li>(2) The customer did not pay at the Purchase and Sales Contract signed by both parties;</li> <li>(3) The customer concealed the mis-operation in installation, configuration, operation, maintenance, and other procedures.</li> </ol> <p><b>8.4 Responsibilities</b></p> <p>No matter from the perspective of contract, warranty period, negligence, civil tort, strict liability or any other point of view, FGI and its suppliers and distributors shall not be responsible for the following special, indirect and secondary losses caused by the use of equipment. This includes but is not limited to the loss of profit and income, the loss of the use of supplied equipment and related equipment, the cost of funds, the cost of substitute equipment, tool fees and service fees, the cost of downtime, delays, and the loss of the buyer's customers or any third party. In addition, unless the user can provide strong evidence, FGI and its suppliers will not be</p>

No.	Item	Description
		responsible for some allegations, such as problems caused using unqualified raw materials, wrong design, or non-standard production. If you have any questions about FGI VFDs, please contact FGI company or its office. Technical data, information and specifications are the latest materials at the time of publication. FGI reserves the right to make changes without prior notice. <b>Maintenance".</b>
6	Fan cover	Protect the fan
7	Guide rail mounting bracket	For installation
8	Guide rail	For installation
9		
10	Power board	Power converter
11		
12	Heat sink	IGBT heat dispassion
13	Keypad board	Human machine interface

## 6 Installation guidelines

### 6.1 What this chapter contains

This chapter introduces the mechanical and electrical installations of the VFD.

	<ul style="list-style-type: none"> <li>✧ 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 equipment damage.</li> <li>✧ Ensure the VFD power is disconnected before installation. If the VFD has been powered on, disconnect the VFD and wait for at least the time designated on the VFD, and ensure the POWER indicator is off. Users are recommended to use a multimeter to check and ensure the VFD DC bus voltage is below 36V.</li> <li>✧ Installation must be designed and done according to applicable local laws and regulations. FGI does not assume any liability whatsoever for any installation which breaches local laws and regulations. If recommendations given by FGI are not followed, the VFD may experience problems that the warranty does not cover.</li> </ul>
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### 6.2 Mechanical installation

#### 6.2.1 Installation environment

Installation environment is essential for the VFD to operate at its best in the long run. The installation environment of the VFD should meet the following requirements.

Environment	Condition
Installation site	Indoors
Ambient temperature	<ul style="list-style-type: none"> <li>✧ -10–+50°C;</li> <li>✧ When the ambient temperature exceeds 40°C, derate 1% for every additional 1°C;</li> <li>✧ It is not recommended to use the VFD when the ambient temperature is above 50°C;</li> <li>✧ In order to improve reliability, do not use the VFD in cases where the temperature changes rapidly;</li> <li>✧ When the VFD is used in a closed space e.g., control cabinet, use cooling fan or air conditioner to prevent internal temperature from exceeding the temperature required;</li> <li>✧ When the temperature is too low, if restart an VFD which has been idled for a long time, it is required to install external heating device before use to eliminate the freeze inside the VFD, failing to do so may cause damage</li> </ul>

Environment	Condition
	to the VFD.
Humidity	<ul style="list-style-type: none"> <li>✧ The relative humidity (RH) of the air is less than 90%;</li> <li>✧ Condensation is not allowed;</li> <li>✧ The max RH cannot exceed 60% in the environment where there are corrosive gases.</li> </ul>
Storage temperature	-30~+60°C
Running environment	<p>The installation site should meet the following requirements.</p> <ul style="list-style-type: none"> <li>✧ Away from electromagnetic radiation sources;</li> <li>✧ Away from oil mist, corrosive gases, and combustible gases;</li> <li>✧ Ensure foreign object like metal powder, dust, oil, and water will not fall into the VFD (do not install the VFD onto combustible object like wood);</li> <li>✧ Away from radioactive substance and combustible objects;</li> <li>✧ Away from harmful gases and liquids;</li> <li>✧ Low salt content;</li> <li>✧ No direct sunlight</li> </ul>
Altitude	<ul style="list-style-type: none"> <li>✧ Below 1000m;</li> <li>✧ When the altitude exceeds 1000m, derate 1% for every additional 100m;</li> <li>✧ When the altitude exceeds 3000m, please contact the local FGI dealer or office for details</li> </ul>
Vibration	The max. amplitude of vibration should not exceed 5.8m/s <sup>2</sup> (0.6g)
Installation direction	Install the VFD vertically to ensure good heat dissipation effect

**Note:**

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

**6.2.2 Installation direction**

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

The VFD must be installed vertically. Check the installation position according to following requirements. Refer to 0 **Appendix B Dimension drawings**.



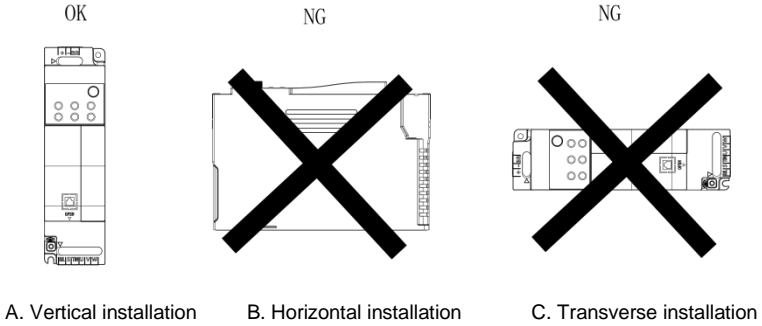


Figure 6.1 Installation direction of the VFD

### 6.2.3 Installation mode

According to the overall dimensions, it supports wall mounting, rail mounting, and side by side mounting.



Figure 6.2 Installation mode

The installation steps are as follows:

- (1) Mark the position of the installation hole. Refer to appendix for the position of installation hole;
- (2) Mount the screws or bolts onto the designated position;
- (3) Put the VFD on the wall;
- (4) Tighten the fixing screws on the wall.

### 6.2.4 Single-unit installation

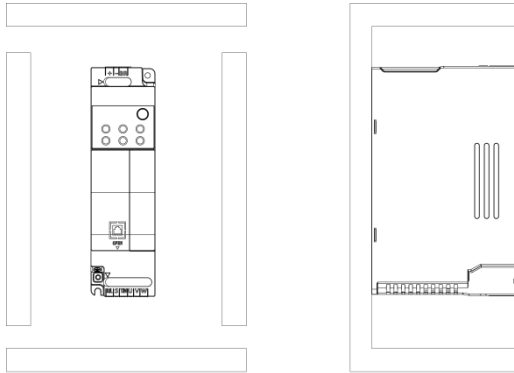


Figure 6.3 Single-unit installation

**Note:** The min. dimension of B and C is 100mm.

### 6.2.5 Multiple-unit installation

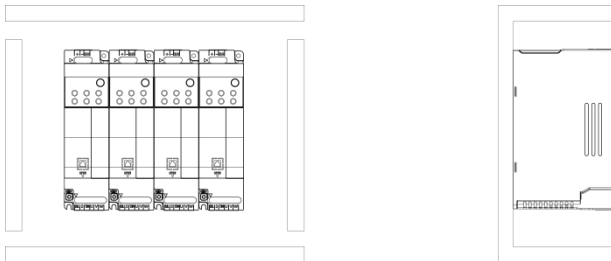


Figure 6.4 Side by side mounting

**Note:**

- When you install VFDs in different sizes, align the top of each VFD before installation for the convenience of future maintenance.
- The minimum size of the spacing baffle or wall on the upper and lower sides is 100mm.

6.2.6 Vertical installation

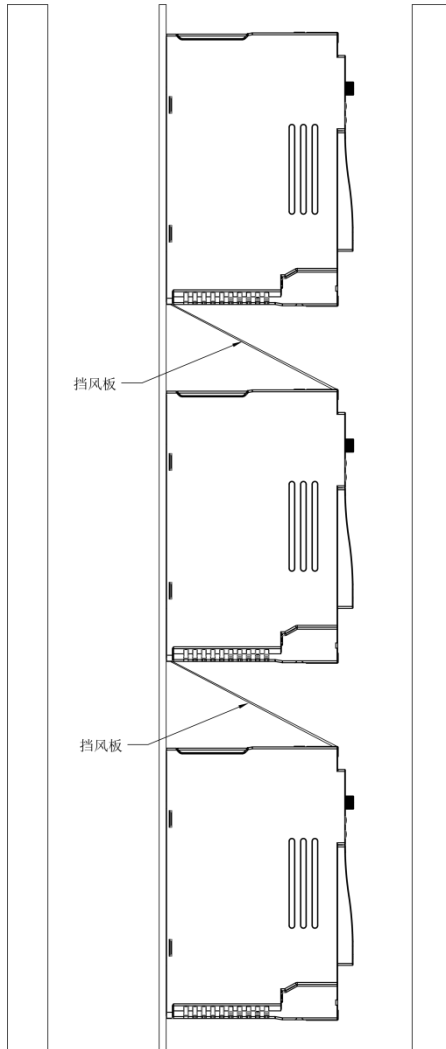


Figure 6.5 Vertical installation

**Note:** During vertical installation, the windshield must be added, otherwise it will cause the interaction between multiple VFDs and poor heat dissipation.

**6.2.7 Tilted installation**

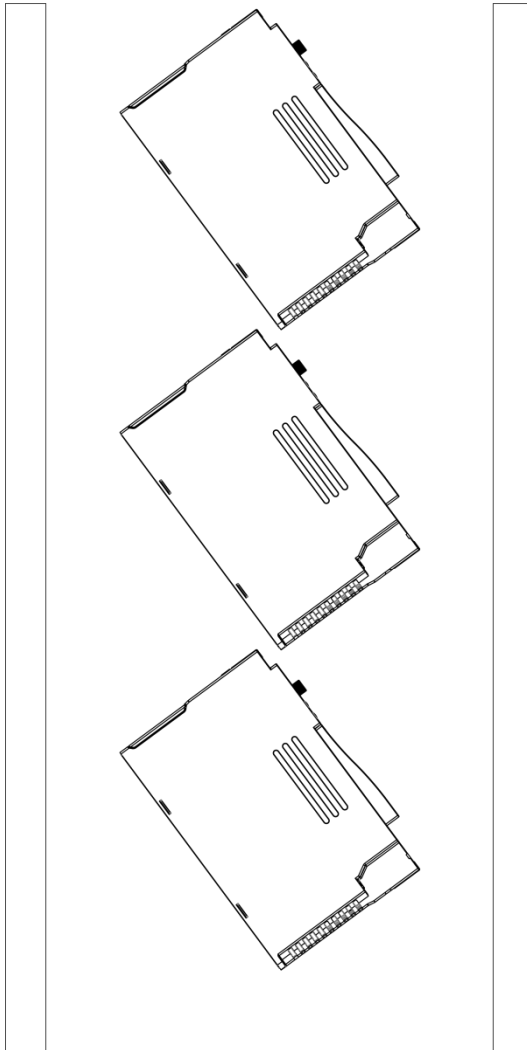


Figure 6.6 Tilted installation

**Note:** During tilted installation, it must be ensured that the air inlet duct and air outlet duct are separated from each other to avoid mutual interference.

**6.2.8 Guide rail mounting**

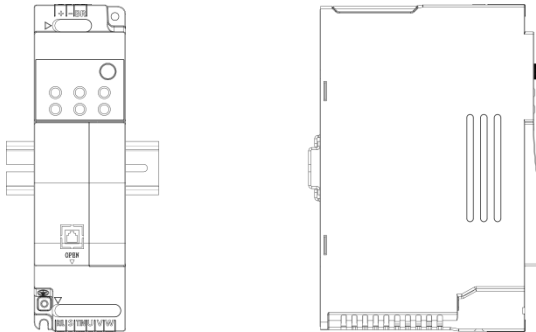


Figure 4-7 Guide rail mounting

**Note:** When installing the guide rail of the frequency converter, it is necessary to ensure that the inlet and outlet air ducts of the frequency converter are separated to avoid mutual influence.

**6.3 Main circuit standard wiring**

**6.3.1 Main circuit wiring diagram**

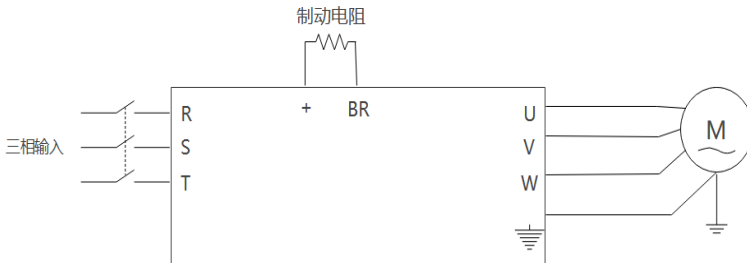


Figure 6.8 Main circuit wiring diagram (AC 3PH 380V)

**Note:** Fuses, input reactors, input filters, output reactors, and output filters are all optional accessories. Please refer to "Appendix D Peripheral Options" for details.

**6.3.2 Main circuit terminal diagram**

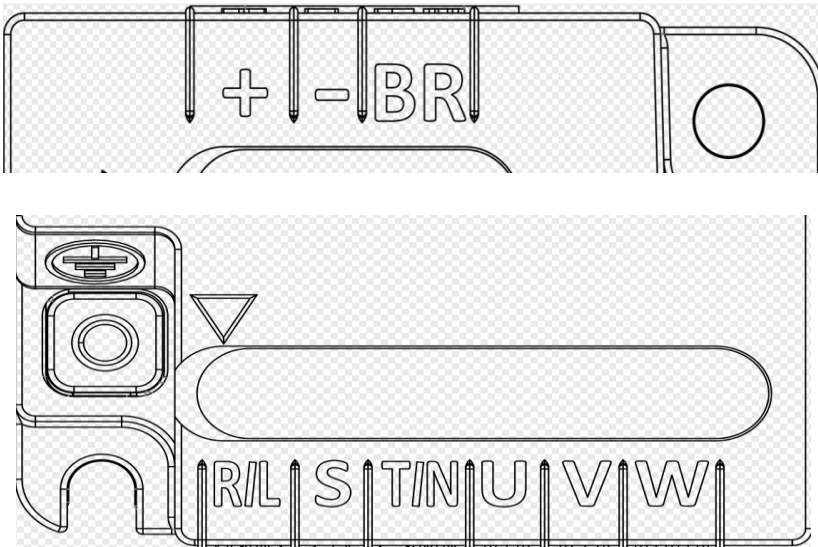


Figure 6.9 Main circuit terminal diagram

Terminals	Function description
R, S, T	3PH AC input terminal, connected to the grid.
U, V, W	3PH AC output terminal, connected to the motor in most cases.
(+)	(+) and (-) connect to external braking unit terminals. BR and (+) connect to external braking resistor terminals.
(-)	
BR	
PE	Grounding terminal for safe protection; each machine must carry two PE terminals and proper grounding is required.

**Note:**

- Do not 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.
- Route the motor cables, input power cables and control cables separately.
- (+) and (-) only used for the application of common DC bus shared by multiple VFDs, and cannot be used as DC power supply input

**6.3.3 Wiring procedure of the main circuit terminals**

1. Connect the ground wire of the input power cable to the PE terminal of the VFD, connect the 3PH input cable to the 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.

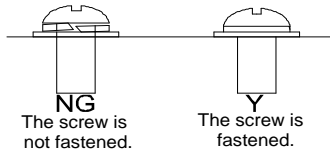


Figure 6.10 Screw installation diagram

### 6.4 Control circuit standard wiring

#### 6.4.1 Basic control circuit wiring diagram

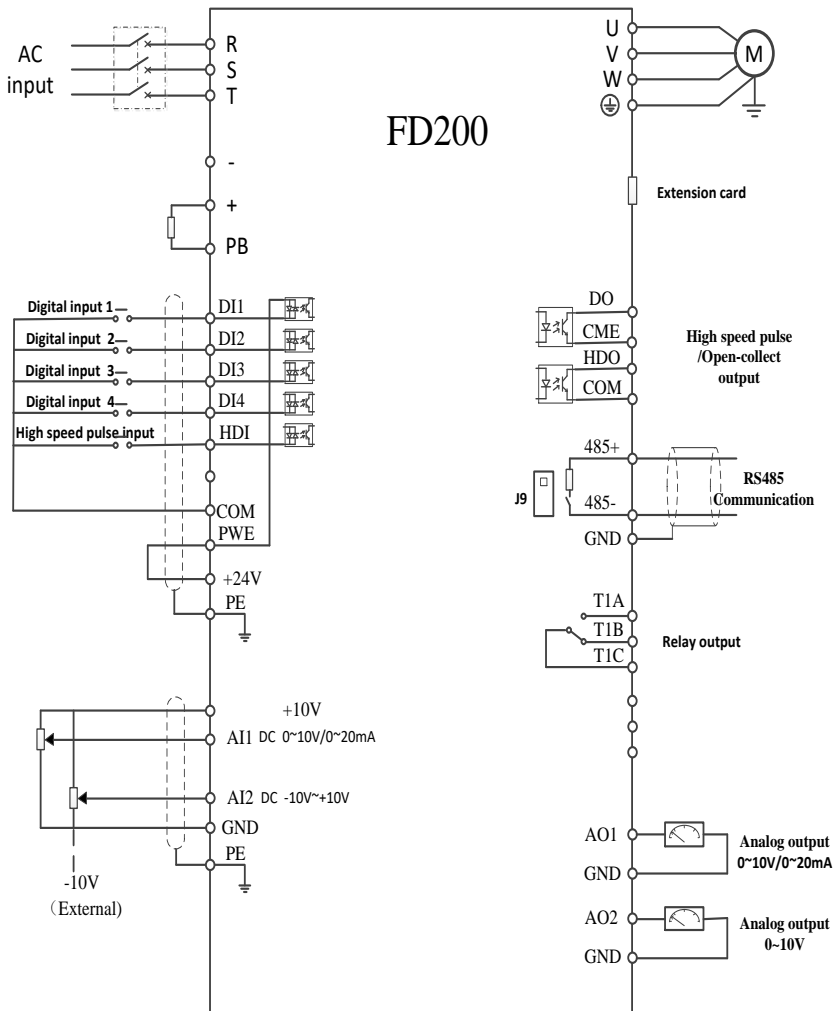


Figure 6.11 Control circuit wiring diagram

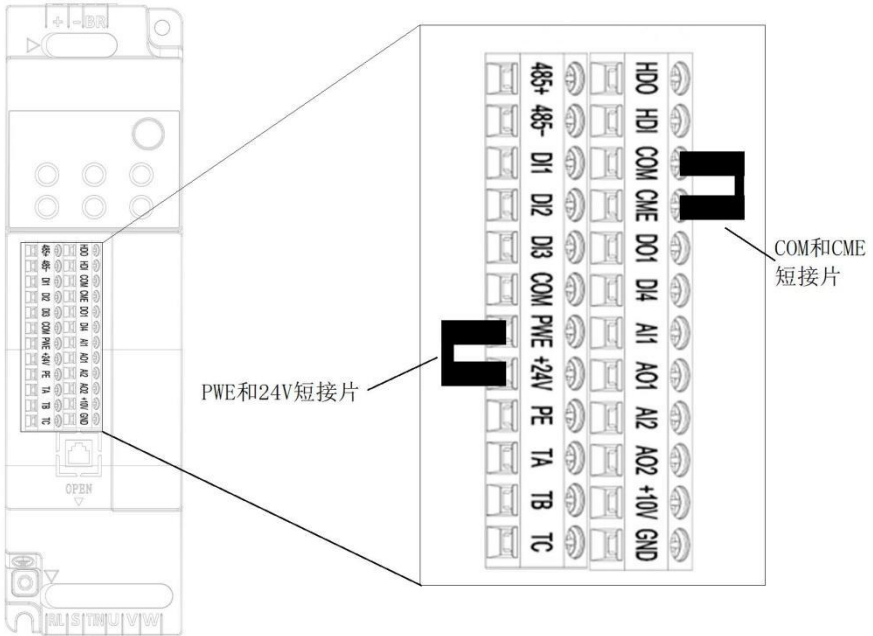
Terminal name	Description
+10V	Locally provided +10.5V power supply
AI1	● Input range: AI1 voltage/current can choose 0(2)–10V / 0(4)–20mA; AI2: -10V –



Terminal name	Description	
AI2	<ul style="list-style-type: none"> <li>● +10V;</li> <li>● Input impedance: 20kΩ during voltage input; 250Ω during current input;</li> <li>● Whether the input is voltage or current is set through F08.53;</li> <li>● Resolution ratio: When 10V corresponds to 50Hz, the min. resolution ratio is 5mV;</li> <li>● Deviation: ±0.5% at 25°C, when input is above 5V/10mA.</li> </ul>	
GND	+10.5V reference zero potential	
AO1	<ul style="list-style-type: none"> <li>● Output range: 0(2)–10V or 0(4)–20mA</li> </ul>	
AO2	<ul style="list-style-type: none"> <li>● The output voltage or current of AO1 and AO2 is set by jumper J10 and J11</li> <li>● Deviation: ±0.5% at 25°C, when input is above 5V/10mA.</li> </ul>	
T1A	<ul style="list-style-type: none"> <li>● T1 relay output; T1A is NO, T1B is NC, T1C is common terminal</li> <li>● Contact capacity: 3A/AC250V, 1A/DC30V</li> </ul>	
T1B		
T1C		
HDO	<ul style="list-style-type: none"> <li>● Switch capacity: 50mA/30V</li> <li>● Range of output frequency: 0–50kHz</li> <li>● Duty ratio: 50%</li> </ul>	
COM	Common terminal of +24V	
CME	Common terminal of DO	
DO1	Switch capacity: 50mA/30V Range of output frequency: 0–1kHz	
485+	RS485 communication port, RS485 differential signal port and standard RS485 communication port must use twisted shielded pair; the 120ohm terminal matching resistor of RS485 communication is connected by the switch J9.	
485-		
PE	Grounding terminal	
PWE	Used to provide input digital working power from the external to the internal. Voltage range: 12–30V	
24V	User power provided by the VFD, maximum output current 200mA.	
COM	Common terminal of +24V	
DI1	Digital input 1	<ul style="list-style-type: none"> <li>● Internal impedance: 3.3kΩ</li> <li>● Accept 12–30V voltage input</li> <li>● Bi-directional input terminal, supporting NPN/PNP connection modes</li> <li>● Max. input frequency: 1kHz</li> <li>● All are programmable digital input terminals, the functions of which be set through function codes</li> </ul>
DI2	Digital input 2	
DI3	Digital input 3	
DI4	Digital input 4	
HI1	<ul style="list-style-type: none"> <li>● Besides DI1-DI4 functions, the terminals can also act as high frequency pulse input channels</li> <li>● Max. input frequency: 50kHz;</li> <li>● Duty ratio: 30%–70%;</li> </ul>	

**6.4.2 Input/output signal connection diagram**

You can select the NPN/PNP mode and internal/external power through the U-type short connector. NPN internal mode is adopted by default.



短接片 short connector

Figure 6.12 Position of U-type short connector

If input signal comes from NPN transistors, set the U-type short connector between +24V and PW based on the power used according to the following figure.

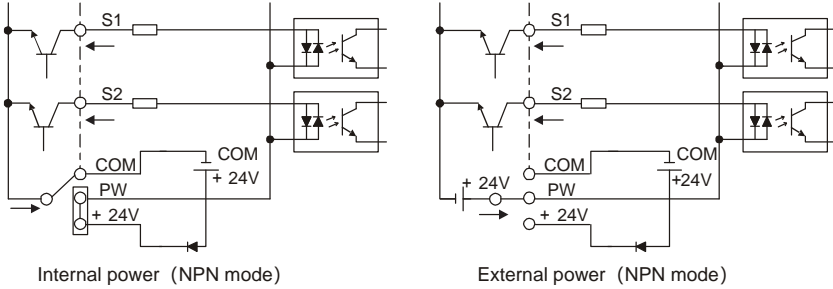


Figure 6.13 NPN mode

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

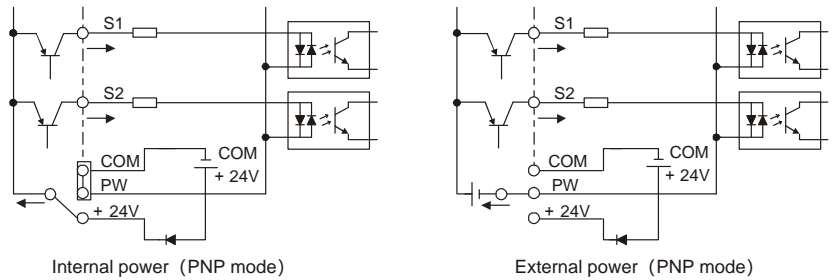


Figure 6.14 PNP mode

## 6.5 Wiring protection

### 6.5.1 Protecting the VFD and input power cable in short circuit

The VFD and input power cable can be protected during short-circuit to avoid thermal overload.

Carry out protective measures according to the following requirements.

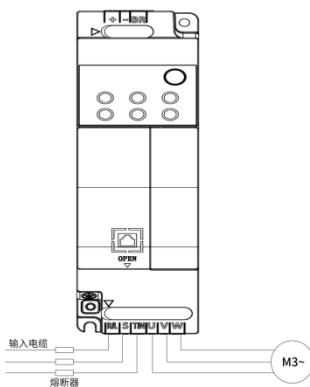



Figure 6.15 Fuse configuration

**Note:** Select the fuse according to operation manual. During short-circuit, the fuse will protect input power cables to avoid damage to the VFD; when internal short-circuit occurred to the VFD, it can protect neighboring equipment from being damaged.

**6.5.2 Protecting the motor and motor cable in short circuit**

If the motor cable is selected according to the VFD rated current, the VFD can perform short-circuit protection for the motor and motor cable, without the use of other protective devices.


	<p>◇ If the VFD is connected to multiple motors, an additional thermal overload switch or breaker must be used to protect the motor and motor cable. Such a device may use the fuse to cut off the short-circuit current.</p>
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**6.5.3 Protecting the motor from thermal overload**

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

**6.5.4 Bypass connection**

In critical occasions, power-variable frequency conversion circuit is necessary to ensure proper operation of the system when VFD fault occurs. In some special cases, for example, only soft startup is needed, it will convert to power-frequency operation directly after soft startup, corresponding bypass link is also needed.

	<p>◇ Do not connect the power supply to the VFD output terminals U, V and W. The voltage applied to the motor cable may cause permanent damage to the VFD.</p>
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If frequent switchover is needed, you can use the switch/contactors which carries mechanical interlock to ensure motor terminals are not connected to input power cables and VFD output ends simultaneously.

# 7 Basic operation guidelines

## 7.1 What this chapter contains

This chapter describes how to operate the VFD by using the keypad.

## 7.2 Keypad introduction





The VFD has been equipped with the LED keypad as a standard configuration part. You can use the keypad to control the start and stop, read status data, and set parameters of the VFD.



Figure 7.1 Keypad diagram

**Note:** When installing the keyboard externally, the keyboard mounting bracket shall be used.

SN	Name	Description	
1	Status indicator	RUN	ON: The VFD is running Blinking: The VFD is auto-tuning parameters.
		FWD	ON: The VFD is forward running Blinking: The VFD is reverse running
		LOC	ON: The VFD is in the local keypad control mode. Blinking: The VFD is in the terminal or communication control mode.
2	Unit LED	Hz	Frequency
		A	Current
		V	Voltage
		A+V=%	Percentage
		Hz+A=RPM	Rotation speed

SN	Name	Description																																																																				
3	Digital display zone	<p>5-figure LED display displays various monitoring data and alarm code,such as set frequency and output frequency.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Display</th> <th>Means</th> <th>Display</th> <th>Means</th> <th>Display</th> <th>Means</th> </tr> </thead> <tbody> <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> </tbody> </table>			Display	Means	Display	Means	Display	Means	0	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	A	A	b	b	C	C	d	d	E	E	F	F	H	H	I	I	L	L	N	N	n	n	O	O	P	P	r	r	S	S	t	t	U	U	v	v	.	.	-	-
Display	Means	Display	Means	Display	Means																																																																	
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S	S	t	t	U	U																																																																	
v	v	.	.	-	-																																																																	
4	Digital potentiometer	Adjust the frequency setting, refer to function code <a href="#">F07.39</a>																																																																				
5	Buttons		Enter/Shift button	<p>Short press - setting function: enter the menu screen step by step and confirm the setting parameters;</p> <p>Long press 1s shift function: In the shutdown display interface and operation display interface, you can move right to cycle and select display parameters; When modifying parameters, the modification bit of the parameter can be selected.</p>																																																																		
			Menu	Enter or escape from the first level menu and remove the parameter quickly																																																																		
			UP key	Increase data or function code progressively																																																																		
			DOWN key	Decrease data or function code progressively																																																																		




SN	Name	Description		
			Potentiometer	When the frequency given source is set as a potentiometer analog input, the frequency is controlled and set by the potentiometer.
			Run key	This key is used to operate on the VFD in key operation mode
			Stop/ Reset key	This key is used to stop in running state and it is limited by function code <a href="#">F17.05</a> This key is used to reset all control modes in the fault alarm state

Figure 7.2 Main interface of LED


### 7.3 Keypad display

The VFD keypad can display the stopped-state parameters, running-state parameters, function parameter editing status, and fault alarm status.

#### 7.3.1 Displaying stopped-state parameters

When the VFD is in stopped state, the keypad displays stopped-state parameters.


In the stopped state, parameters in various states can be displayed. You can determine which parameters are displayed by setting the binary bits of [F17.08](#). For definitions of the bits, refer to the description of [F17.08](#).

In stopping state, there are 15 parameters that can be selected for display, including setting frequency, bus voltage, input terminal status, output terminal status, PID reference value, PID feedback value, torque setting, AI1, AI2, AI3, high-speed pulse HDI frequency, PLC and the current step of multi-step speed, pulse counting value, length value, frequency upper limit. [F17.08](#). can select the parameter to be displayed or not by bit, and you can press  to shift the display of the selected parameters from left to right.

#### 7.3.2 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/TUN** indicator on. The on/off state of the **FWD/REV** indicator is determined by the current running direction.

In running state, there are 24 parameters that can be selected for display, including running frequency, setting 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 frequency upper limit. [F17.06](#) and [F17.07](#) can select the parameter to be displayed or not by bit, and you can press  to shift the display of the selected parameters from left to right

### 7.3.3 Displaying fault information

The VFD enters fault alarm display state once fault signal is detected, and the keypad displays fault code and fault information with **ERR** indicator on the keypad turning on. Fault reset operation can be carried out via **STOP/RST** key, control terminal or communication command.

The fault code will be kept displaying until fault is removed.

### 7.3.4 Editing function codes

You can press the **ESC** key to enter the editing mode in stopped, running, or fault alarm state (if a user password is used, refer to the description of F18.00). 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 **ENT** key to enter the function parameter display interface. On the function parameter display interface, you can press the **ENT** key to save parameter settings or press the **ESC** key to exit the parameter display interface.

## 7.4 Keypad operation

Operate the inverter via operation panel. Refer to the detailed structure description of function codes in the brief diagram of function codes.

### 7.4.1 How to modify the function codes of the inverter

The inverter has three levels menu, which are:

1. Group number of function code (first-level menu)
2. Tab of function code (second-level menu)
3. Set value of function code (third-level menu)

Remarks: Press both the **ESC** and the **ENT** can return to the second-level menu from the third-level menu. The difference is: pressing **ENT** will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing **ESC** will directly return to the second-level menu without saving the parameters, and keep staying at the current function code.

Under the third-level menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

- 1) This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;
- 2) This function code is not modifiable in running state, but modifiable in stop state.



Example: Set function code F00.01 from 0 to 1.

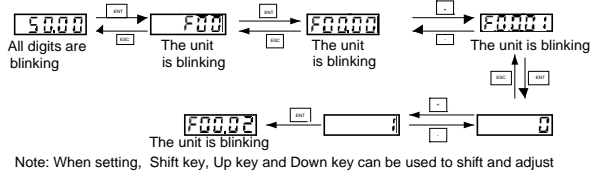


Figure 5.3 Sketch map of modifying parameters

**7.4.2 How to set the password of the VFD**

FD300 series VFD provide password protection function to users. Set F17.00 to gain the password and the password protection becomes valid instantly after quitting from the function code editing state. Press **ESC** again to the function code editing state, “0.0.0.0.0” will be displayed. Unless using the correct password, the operators cannot enter it.

Set F17.00 to 0 to cancel password protection function.

The password protection becomes effective instantly after retreating from the function code editing state. Press **ESC** again to the function code editing state, “0.0.0.0.0” will be displayed. Unless using the correct password, the operators cannot enter it.

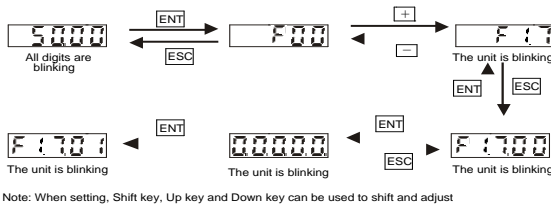


Figure 5.4 Sketch map of password setting

**7.4.3 How to watch the inverter state through function codes**

FD300 series VFD provide group F17 as the state inspection group. Users can enter into F17 directly to watch the state.

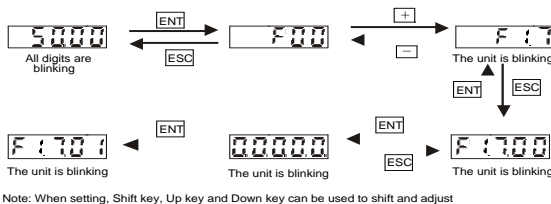


Figure 5-5 Sketch map of state watching

## 5.5 Basic operations

### 5.5.1 What this section contains

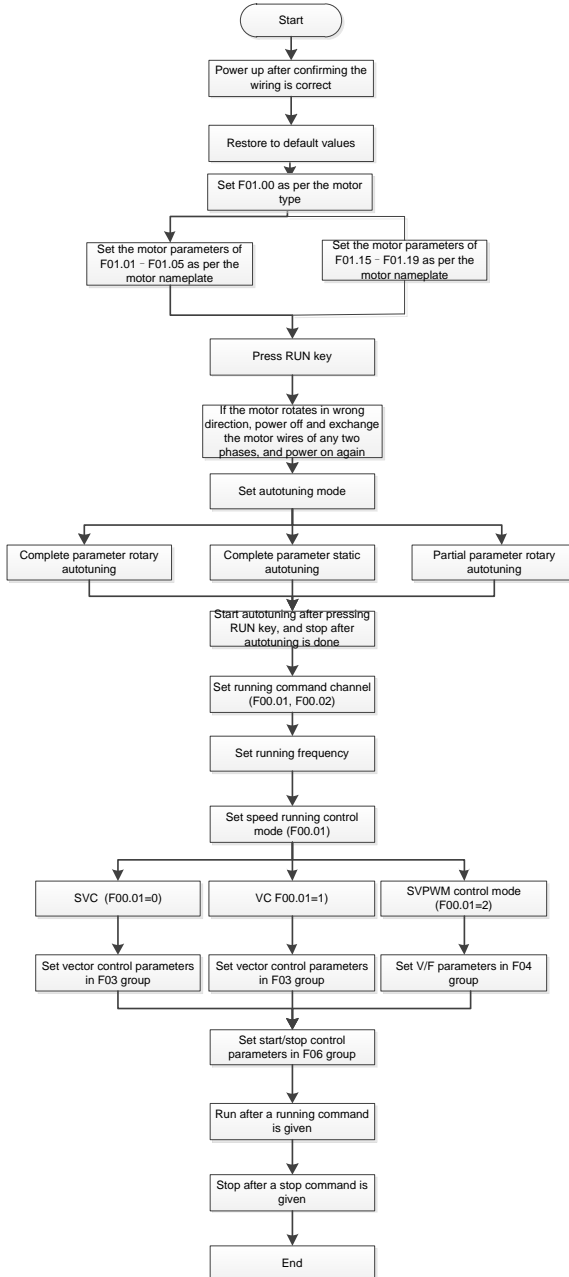
This section introduces the function modules inside the VFD.



- ◇ Ensure all the terminals are fixed and tightened firmly.
- ◇ Ensure the motor matches with the VFD power.

### 5.5.2 Common commissioning procedure

The common operation procedure is shown in the following (taking motor 1 as an example).



**Note: If fault occurred, rule out the fault cause according to "fault tracking".**

The running command channel can be set by terminal commands besides F00.02 and F00.03.

Current running command channel <b>F00.02</b>	Multi-function terminal function (36) <b>Command switches to keypad</b>	Multi-function terminal function (37) <b>Command switches to terminal</b>	Multi-function terminal function (38) <b>Command switches to communication</b>
Keypad	/	Terminal	Communication
Terminal	Keypad	/	Communication
Communication	Keypad	Terminal	/

**Note: "/"** means this multi-function terminal is valid under current reference channel.

Related parameter list:

Function code	Name	Description	Default
<u>F00.01</u>	Speed control mode	0: Sensorless vector control (SVC) mode 1: Closed-loop vector control mode 2: Space voltage vector control mode <b>Note:</b> To select 0 or 1 as the control mode, enable the VFD to perform motor parameter autotuning first.	2
<u>F00.02</u>	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
<u>F00.18</u>	Communication mode of running commands	0: Modbus 1: Profibus/CANopen 2: Reserved 3: Profinet 4: Reserved 5: Reserved Note: 1, 2, 3, 4 and 5 are extended functions, which can only be used after inserting the extension card	0
<u>F01.28</u>	Motor parameter autotuning	0: No operation 1: Rotary autotuning. Comprehensive motor parameter autotuning. It is recommended to use rotating autotuning when high control accuracy is needed. 2: Static autotuning 1 (comprehensive	0

Function code	Name	Description	Default
		<p>autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load.</p> <p>3: Static autotuning 2 (partial autotuning); when the present motor is motor 1, only <u>F01.06</u>, <u>F01.07</u> and <u>F01.08</u> are autotuned; when the present motor is motor 2, only <u>F28.06</u>, <u>F28.07</u> and <u>F28.08</u> are autotuned.</p>	
<u>F17.01</u>	Function parameter restore	<p>0: No operation            1: Restore default values            2: Clear fault records            3: Keyboard parameter locking</p> <p><b>Note:</b> 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.</p>	0
<u>F01.00</u>	Type of motor 1	<p>0: Asynchronous motor (AM)            1: Synchronous motor (SM)</p>	0
<u>F01.01</u>	Rated power of AM	0.1–3000.0kW	Model depended
<u>F01.02</u>	Rated voltage of AM	0–1200V	50.00Hz
<u>F01.03</u>	Rated current of AM	0.8–6000.0A	Model depended
<u>F01.04</u>	Rated frequency of AM	0.01Hz– <u>F00.07</u> (Max. output frequency)	Model depended
<u>F01.05</u>	Rated speed of AM	1–6000rpm	Model depended
<u>F01.15</u>	Rated power of SM	0.1–3000.0kW	Model depended
<u>F01.16</u>	Rated voltage of SM	0–1200V	50.00Hz
<u>F01.17</u>	Rated current of SM	0.8–6000.0A	2
<u>F01.18</u>	Rated frequency of SM	0.01Hz– <u>F00.07</u> (Max. output frequency)	Model depended

Function code	Name	Description	Default
<u>F01.19</u>	Number of pole pairs of SM	1–50	Model depended
<u>F08.01–F08.05</u>	Function selection of multifunction digital input terminals (DI1–DI4, HI1, HI2)	36: Switch the running command channel to keypad 37: Switch the running command channel to terminal 38: Switch the running command channel to communication	
F17.02	Parameter copy	0: No operation 1: Upload the local function parameter to the keypad 2: Download the keypad function parameter to local address(including the motor parameters) 3: Download the keypad function parameter to local address (excluding the motor parameter) 4: Download the keypad function parameters to local address (only for the motor parameter )	0
F17.03	MF Key function selection	Range: 0x00–0x27 Ones: Function of <b>MF</b> 0: No function 1: Jog 2: Reserved 3: Switch between forward and reverse rotating 4: Clear the <b>UP/DOWN</b> setting 5: Coast to stop 6: Switch command channels in sequence 7: Reserved Tens place: Reserved	0x01

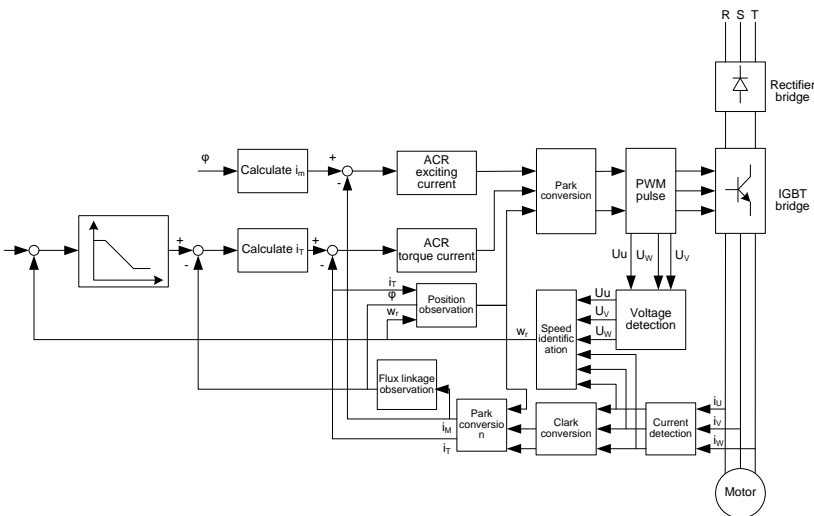
**5.5.3 Vector control**

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
F00.01	Speed control mode	0: Sensorless vector control (SVC) mode 1: Closed-loop vector control mode 2: Space voltage vector control mode <b>Note:</b> To select 0 or 1 as the control mode, enable the VFD to perform motor parameter autotuning first.	2
F01.28	Motor parameter autotuning	0: No operation 1: Rotation autotuning Comprehensive motor parameter autotune It is recommended to use rotation autotuning when high control accuracy is needed. 2: Static autotuning 1 It is suitable in the cases when the motor cannot	0

Function code	Name	Description	Default
		de-couple from the load. 3: Static autotuning 2 It is suitable in the cases when the motor cannot de-couple from the load. But only for parts of parameters.	
<u>F01.00</u>	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
F03.00	Speed-loop proportional gain 1	Setting range of <u>F03.00</u> : 0.0–200.0 Setting range of <u>F03.01</u> : 0.000–10.000s Setting range of <u>F03.02</u> : 0.00Hz– <u>F03.05</u> Setting range of <u>F03.03</u> : 0.0–200.0 Setting range of <u>F03.04</u> : 0.000–10.000s Setting range of <u>F03.05</u> : <u>F03.02</u> – <u>F00.03</u> (Max. output frequency)	20.0
F03.01	Speed-loop integral time 1		0.200s
F03.02	Low-point frequency for switching		5.00Hz
F03.03	Speed-loop proportional gain 2		20.0
F03.04	Speed-loop integral time 2		0.200s
F03.05	High-point frequency for switching		10.00Hz
F03.06	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%
F03.05	Power-genera tion slip compensation coefficient of vector control		100%



Function code	Name	Description	Default
F03.08	Speed-loop output filter	0–8 (corresponding to 0–2 <sup>8</sup> /10ms)	0
F03.09	Setting source of electromotive torque upper limit	0: Keypad ( <a href="#">F03.10</a> ) 1: AI1 (100% corresponding to three times the motor rated current) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HI1 (same as the above) 5: Modbus communication (same as the above) 6: Profibus/CANopen communication (same as the above) 7: Reserved 8: Pulse frequency HI2 (same as the above) 9: Profinet communication 10: Reserved 11: Reserved	0
F03.10	Electromotive torque upper limit set through keypad	The function codes are used to set torque limits. Setting range: 0.0–300.0% (of the motor rated current)	180.0%
F03.11	Setting source of braking torque upper limit	0: Keypad ( <a href="#">F03.10</a> ) 1: AI1 (100% corresponding to three times the motor rated current) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HI1 (same as the above) 5: Modbus communication (same as the above) 6: Profibus/CANopen communication (same as the above) 7: Reserved 8: Pulse frequency HI2 (same as the above) 9: Profinet communication 10: Reserved 11: Reserved	0
F03.12	Braking torque upper	The function codes are used to set torque limits. Setting range: 0.0–300.0% (of the motor rated current)	180.0%

Function code	Name	Description	Default
	limit set through keypad		
F03.13	Current-loop proportional coefficient P	<b>Note:</b> ● 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. ● Applicable to SVC mode 0 (F00.19=0), SVC mode 1(F00.19=1), and closed-loop vector control mode (F00.01=1). Setting range: 0–65535	1000
F03.14	Current-loop integral coefficient I		1000
F03.15	PM flux-weakening control selection	0: Disable 1: Enable	0
F03.16	Flux-weakening voltage limit (PM and AM SVC 0)	Set the max output voltage (percentage of motor rated voltage), set as per actual. Setting range: 0.0~120.0%	100.0%
F03.17	Flux-weakening proportional coefficient P	0~8000	1000
F0.18	Flux-weakening integral coefficient I	0~8000	1200
F03.19	Weakening coefficient	Setting range of F03.19: 0.1–2.0 Setting range of F03.20: 10%–100%	0.3
F03.20	Lowest weakening point (AM SVC 1)		20%
F03.21	Speed display selection in vector control	0: Display the actual value 1: Display the set value	0

Function code	Name	Description	Default
F03.22	Static friction compensation coefficient	0.0–100.0%	0.0%
F03.23	Corresponding frequency point of static friction	0.50– <u>F03.25</u>	1.00Hz
F03.24	High speed friction compensation coefficient	0.0–100.0%	0.0%
F03.25	Corresponding frequency of high-speed friction torque	<u>F03.23</u> –F00.07(Max frequency)	50.00Hz
F03.26	Enabling inertia compensation	0: Disable 1: Enable	0
F03.27	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%
F03.28	Inertia compensation filter times	Filter times of inertia compensation torque, used to smooth inertia compensation torque. Setting range: 0–10	7
F03.29	Inertia identification torque value	Due to friction force, it is required to set certain identification torque for the inertia identification to be performed properly. Setting range: 0.0–100.0% (of the motor rated torque)	10.0%
F03.30	Enabling inertia identification	0: No operation 1: Enable	0
F03.31	Control optimization setting	0–0x1111 Unit place: Torque command selection 0: Torque reference 1: Torque current reference Tens place: Reserved	0x0000

Function code	Name	Description	Default
		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	
F03.32	Speed-loop differential gain	0.00–10.00s	0.00s
F03.33	High-frequency current-loop proportional coefficient	Setting range of <a href="#">F03.33</a> : 0–65535 Setting range of <a href="#">F03.34</a> : 0–65535 Setting range of <a href="#">F03.35</a> : 0.0–100.0% (of the maximum frequency)	1000
F03.34	High-frequency current-loop integral coefficient		1000
F03.35	Current-loop high-frequency switching threshold		100.0%
F03.36	SM injection current drop rate	Setting range: 0.0%–100.0% (of the motor rated current)	80.0%
F03.37	Injection current 1	Setting range: 0.0%–100.0% (of the motor rated current)	20.0%
F03.38	Injection current 2	Setting range: 0.0%–100.0% (of the motor rated current)	10.0%
F03.39	Injection current switchover frequency	0.00Hz– <a href="#">F00.03</a> (Max. output frequency)	10.00Hz

Function code	Name	Description	Default
F03.40	Sto detection time	Setting range: 0.0–10.0s	0.5s
F03.41	High-frequency compensation coefficient of SM	Setting range: 0.0–100.0%	0.0%
F03.42	Current loop proportion coefficient obtained by auto tune	F03.42 will update after motor auto tune. This value can be set to F03.13 manually for PM VC control. Setting range: 0~65535 Note: if not perform the motor auto tune, it is 0	0
F03.43	Current loop integral coefficient obtained by auto tune	F03.43 will update after motor auto tune. This value can be set to F03.14 manually for PM VC control. Setting range: 0~65535 Note: if not perform the motor auto tune, it is 0	0

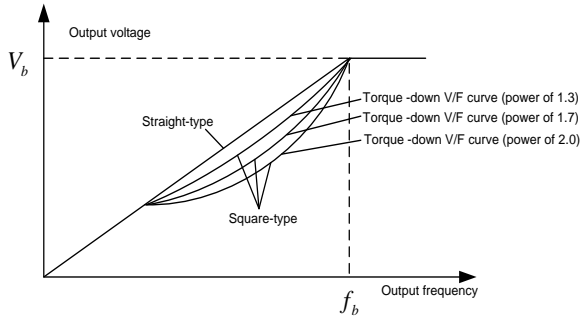
#### 5.5.4 V/F control mode

The VFD also provides the V/F control function. The V/F control mode can be used in cases where mediocre control precision is enough and in cases where the VFD needs to drive multiple motors.

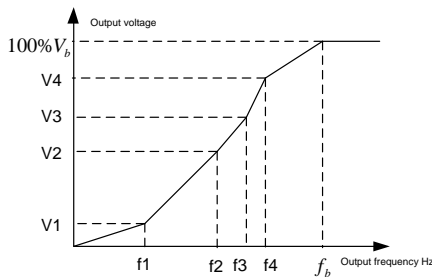
The VFD provides multiple V/F curve modes to meet different requirements. You can select V/F curves or set V/F curves as required.

#### Suggestions:

- 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.
- 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:  $0 \leq f_1 \leq f_2 \leq f_3 \leq \text{Motor fundamental frequency}$ , and,  $0 \leq V_1 \leq V_2 \leq V_3 \leq \text{Motor rated voltage}$



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

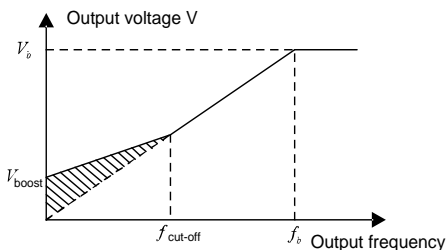
The VFD provides dedicated function codes for the space voltage control mode. You can improve the space voltage control performance by means of setting.

**(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:**

- Torque boost takes effect only at the torque boost cut-off frequency.
- 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) 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

## (3) Oscillation control

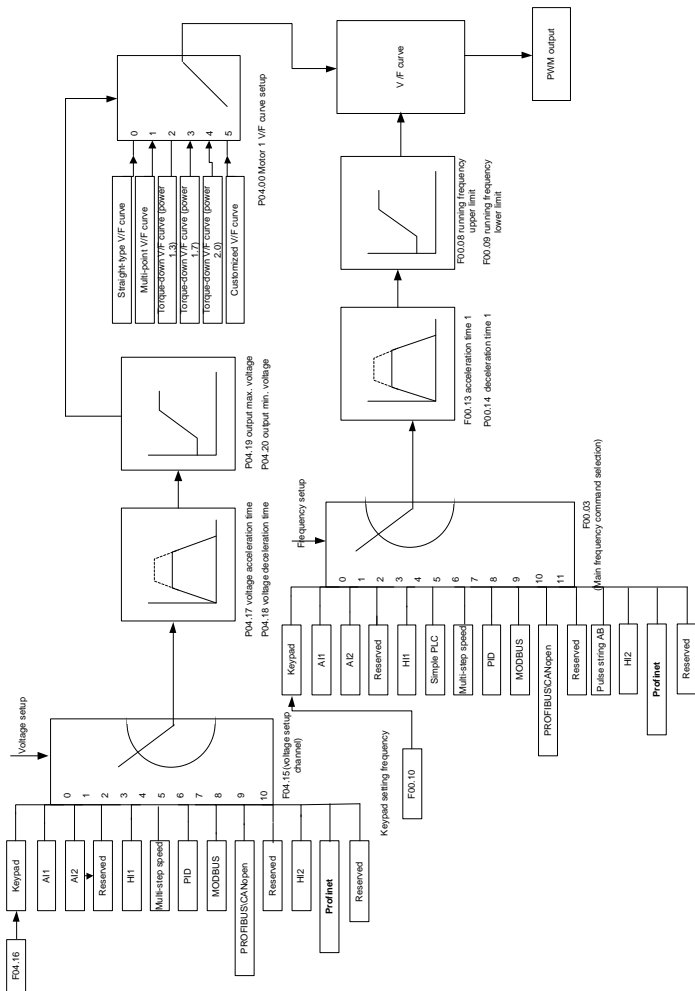
Motor oscillation often occurs in space voltage vector control in large-power driving applications. To solve this problem, the VFD provides two oscillation factor function codes. You can set the function codes based on the oscillation occurrence frequency.

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

## (4) 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
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Function code	Name	Description	Default
F00.01	Speed control mode	0: Sensorless vector control (SVC) mode 1: Closed-loop vector control mode 2: Space voltage vector control mode <b>Note:</b> To select 0 or 1 as the control mode, enable the VFD to perform motor parameter autotuning first.	2
F00.07	Max. output frequency	Max (F00.08, 10.00)–630.00Hz	50.00Hz
F00.08	Upper limit of running frequency	F00.09–F00.07 (Max. output frequency)	50.00Hz
F00.09	Lower limit of running frequency	0.00Hz– (Upper limit of running frequency)	0.00Hz
F00.13	ACC time 1	0.0–3600.0s	Model depended
F00.14	DEC time 1	0.0–3600.0s	Model depended
F01.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
F01.01	Rated frequency of AM 1	0.01Hz–F00.03 (Max. output frequency)	50.00Hz
F01.02	Rated voltage of AM 1	0–1200V	Model depended
F04.00	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
F04.01	Torque boost of motor 1	0.0%: (automatic); 0.1%–10.0%	0.0%
F04.02	Torque boost cut-off of motor 1	0.0%–50.0% (of the rated frequency of motor 1)	20.0%
F04.03	V/F frequency point 1 of motor 1	0.00Hz–F04.05	0.00Hz
F04.04	V/F voltage point 1 of motor 1	0.0%–110.0%	0.0%
F04.05	V/F frequency	F04.03–	0.00Hz

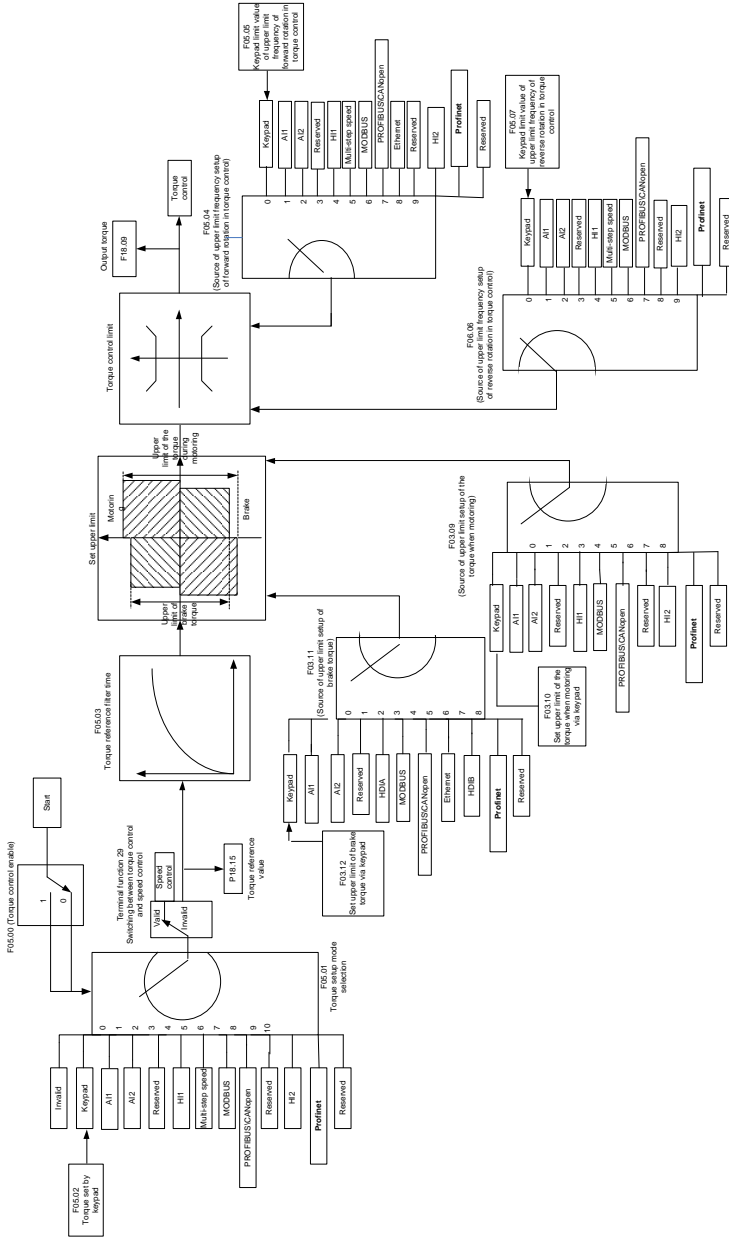
Function code	Name	Description	Default
	point 2 of motor 1		
<u>F04.06</u>	V/F voltage point 2 of motor 1	0.0%–110.0%	0.0%
<u>F04.07</u>	V/F frequency point 3 of motor 1	<u>F04.05</u> – <u>F04.09</u>	0.00Hz
<u>F04.08</u>	V/F voltage point 3 of motor 1	0.0%–110.0%	0.0%
F04.09	V/F frequency point 4	<u>F04.07</u> – <u>F01.04</u> or <u>F04.05</u> – <u>F01.18</u>	0.00Hz
F04.10	V/F voltage point 4	0.0%–110.0%	0.0%
<u>F04.11</u>	Low-frequency oscillation control factor of motor 1	0–100	10
<u>F04.12</u>	High-frequency oscillation control factor of motor 1	0–100	10
	Oscillation control threshold of motor 1	0.00Hz– <u>F00.07</u> (Max. output frequency)	30.00Hz
<u>F04.14</u>	V/F slip compensation gain of motor 1	0.0–200.0%	100.0%
F04.15	Voltage setting channel of customized V/F	0: Keypad (The output voltage is determined by <u>F04.16</u> ) 1: AI1 2: AI2 3: Reserved 4: HI1 5: Multi-step speed running (The setting is determined by group F12.) 6: PID 7: Modbus communication 8: Profibus/CANopen communication 9: Ethernet communication 10: HI2 11: Profinet communication	0

Function code	Name	Description	Default
		12: Reserved 13: Reserved	
F04.16	Voltage set through keypad	Setting range: 0.0% –100.0%	100.0%
F04.17	Voltage increase time	0.0–3600.0s	5.0s
F04.18	Voltage setting channel of customized V/F	0.0–3600.0s	0
F04.19	Max. output voltage	<u>F04.20</u> –100.0% (of the motor rated voltage)	100%
F04.20	Min. output voltage	0.0%– <u>F04.19</u>	0.00Hz
F04.21	Energy-saving run	0: Disable 1: Automatic energy-saving run	0.0%
F04.22	Weakening coefficient in constant power zone	1.00–1.30	0.00Hz
F04.23	Enabling IF mode for AM 1	0: Disable 1: Enable	0.0%
F04.24	Current setting in IF mode for AM 1	0.0–200.0%	0.00Hz
F04.25	Proportional coefficient in IF mode for AM 1	0–5000	0.0%
F04.26	Integral coefficient in IF mode for AM 1	0–5000	100.0%
F04.27	Frequency threshold for switching off IF mode for AM 1	0.00– F04.28	10
F04.28	End frequency point for switching off IF mode for AM 1	F04.27–F00.07	10
F04.29	Injection current 1	-100.0%–100.0% (of the motor rated current)	30.00Hz

Function code	Name	Description	Default
	in SM V/F control		
F04.30	Injection current 2 in SM V/F control	-100.0%–100.0% (of the motor rated current)	0
F04.31	Frequency threshold for Injection current switching in SM V/F control	0.00Hz– <u>F00.07</u> (Max. output frequency)	0
F04.32	Reactive current closed-loop proportional coefficient in SM V/F control	0–3000	100.0%
F04.33	Reactive current closed-loop integral time in SM V/F control	0–3000	5.0s
F04.34	Reactive current closed-loop output limit in SM V/F control	0–16000	5.0s

### 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
F00.01	Speed control mode	0: Sensorless vector control (SVC) mode 1: Closed-loop vector control mode 2: Space voltage vector control mode <b>Note:</b> To select 0 or 1 as the control mode, enable the VFD to perform motor parameter autotuning first.	2
<u>F05.00</u>	Enabling torque control	0: Disable 1: Enable	0
F05.00	Enabling torque control	0: Disable 1: Enable	0
F05.01	Torque setting method	0–1: Keypad ( <u>F05.02</u> ) 2: AI1 (100% corresponding to three times the motor rated current) 3: AI2 (same as the above) 4: Reserved 5: Pulse frequency HI1 (same as the above) 6: Multi-step torque (same as the above) 7: Modbus communication (same as the above) 8: Profibus/CANopen communication (same as the above) 9: Reserved 10: Pulse frequency HI2(same as the above) 11: Profinet communication 12: Reserved	0
F05.02	Torque set through keypad	-300.0%–300.0% (of the motor rated current)	20.0%
F05.03	Torque reference filter time	0.000–10.000s	0.010s
F05.04	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad ( <u>F05.05</u> ) 1: AI1 (100% corresponding to the max. frequency) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HIA1(same as the above) 5: Multi-step setting (same as the above) 6: Modbus communication(same as the above) 7: Profibus/CANopen communication (same as the above)	0


Function code	Name	Description	Default
		8: Reserved 9: Pulse frequency HI2 (same as the above) 10: Profinet communication 11: Reserved 12: Reserved	
F05.05	Forward rotation upper-limit frequency set through keypad in torque control	Setting range: 0.00Hz– <u>P00.07</u> (Max. output frequency) The function codes are used to set the frequency upper limits.	50.00Hz
F05.06	Setting source of reverse rotation upper-limit frequency in torque control	0: Keypad ( <u>F05.05</u> ) 1: AI1 (100% corresponding to the max. frequency) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HIA1(same as the above) 5: Multi-step setting (same as the above) 6: Modbus communication (same as the above) 7: Profibus/CANopen communication (same as the above) 8: Reserved 9: Pulse frequency HI2 (same as the above) 10: Profinet communication 11: Reserved 12: Reserved	0
F05.07	Reverse rotation upper-limit frequency set through keypad in torque control	Setting range: 0.00Hz– <u>P00.07</u> (Max. output frequency) The function codes are used to set the frequency upper limits.	50.00Hz
F03.09	Setting source of electromotive torque upper limit	0: Keypad ( <u>F03.10</u> ) 1: AI1 (100% corresponding to three times the motor rated current) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HI1 (same as the above) 5: Modbus communication (same as the above) 6: Profibus/CANopen communication (same as the above)	0

Function code	Name	Description	Default
		7: Reserved 8: Pulse frequency HI2 (same as the above) 9: Profinet communication 10: Reserved 11: Reserved	
F03.10	Electromotive torque upper limit set through keypad	The function codes are used to set torque limits. Setting range: 0.0–300.0% (of the motor rated current)	180.0%
<u>F03.11</u>	Setting source of braking torque upper limit	0: Keypad ( <u>F03.12</u> ) 1: AI1 (100% corresponding to three times the motor rated current) 2: AI2 (same as the above) 3: AI3 (same as the above) 4: Pulse frequency HDIA (same as the above) 5: Modbus communication (same as the above) 6: Profibus/CANopen communication (same as the above) 7: Ethernet communication (same as the above) 8: Pulse frequency HDIB (same as the above) 9: Profinet communication 10: Programmable extension card 11: Reserved	0
<u>F03.12</u>	Braking torque upper limit set through keypad	0.0–300.0% (of the motor rated current)	180.0%
<u>F18.09</u>	Output torque	-250.0–250.0%	0.0%
<u>F18.15</u>	Torque reference value	-300.0–300.0% (of the motor rated current)	0.0%

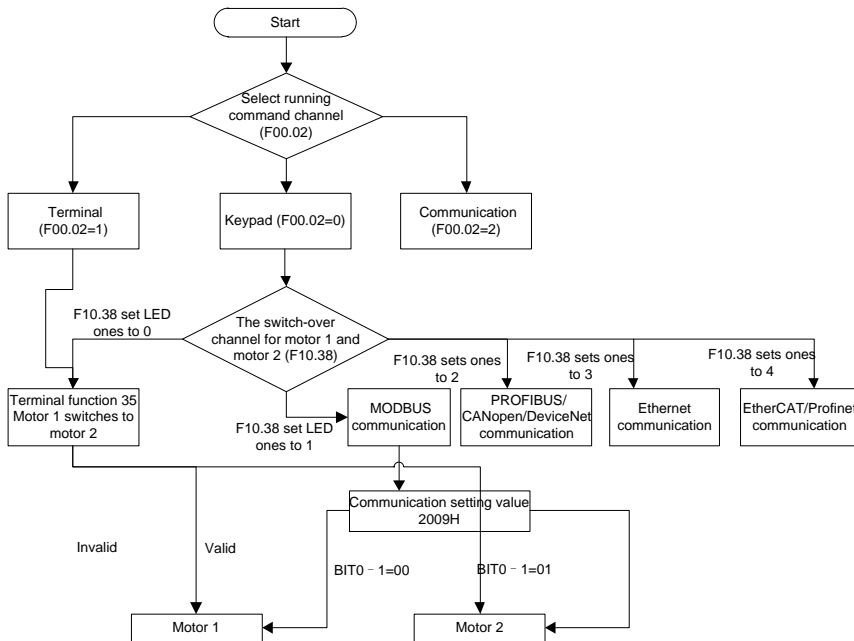
**5.5.6 Motor parameters**

	<ul style="list-style-type: none"> <li>◇ 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.</li> <li>◇ 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.</li> </ul>
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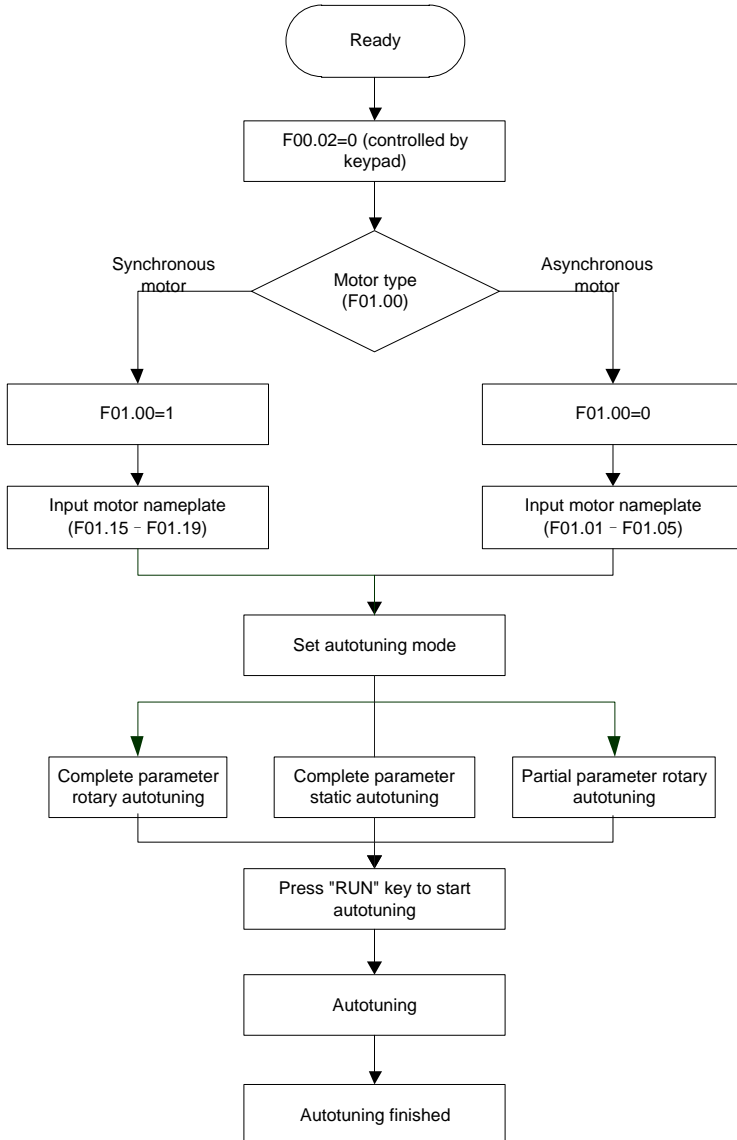


	<p>◇ If the motor has been connected to a load, do not carry out rotary autotuning. Otherwise, the VFD may malfunction or may be damaged. If rotary autotuning is carried out on a motor which has been connected to a load, incorrect motor parameter settings and motor action exceptions may occur. Disconnect from the load to carry out autotuning if necessary.</p>
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The VFD can drive both asynchronous motors and synchronous motors, 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:**

- Motor parameters must be set correctly according to the motor nameplate.
- 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 **F01.06**– for AMs and autotune **F01.20–F01.23** for SMs.

- 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 **F01.06**– for AMs and autotune **F01.20–F01.22** for SMs. **F01.23** can be obtained through calculation.
- 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 switchover channel of motor 1 and motor 2 by setting the ones place of **F10.38**.

Related parameter list:

Function code	Name	Description	Default
<b><u>F00.02</u></b>	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
<b><u>F01.28</u></b>	Motor parameter autotuning	0: No operation 1: Rotary autotuning 1. Comprehensive motor parameter autotuning. It is recommended to use rotating autotuning when high control accuracy is needed. 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load. 3: Static autotuning 2 (partial autotuning); when the present motor is motor 1, only <b><u>F02.06</u></b> , <b><u>F02.07</u></b> and <b><u>F02.08</u></b> are autotuned; when the present motor is motor 2, only <b><u>F28.06</u></b> , <b><u>F28.07</u></b> and <b><u>F28.08</u></b> are autotuned.	0
<b><u>F01.00</u></b>	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
<b><u>F01.01</u></b>	Rated power of AM 1	0.1–3000.0kW	Model depended
<b><u>F01.02</u></b>	Rated voltage of AM 1	0–1200V	Model

Function code	Name	Description	Default
			depended
F01.03	Rated current of AM 1	0.8–6000.0A	Model depended
F01.04	Rated frequency of AM 1	0.01Hz– <u>F00.03</u> (Max. output frequency)	50.00Hz
F01.05	Rated speed of AM 1	1–60000rpm	Model depended
<u>F02.06</u>	Stator resistance of AM 1	0.001–65.535Ω	Model depended
<u>F02.07</u>	Rotor resistance of AM 1	0.001–65.535Ω	Model depended
<u>F02.08</u>	Leakage inductance of AM 1	0.1–6553.5mH	Model depended
<u>F02.09</u>	Mutual inductance of AM 1	0.1–6553.5mH	Model depended
<u>F02.10</u>	No-load current of AM 1	0.1–6553.5A	Model depended
<u>F02.15</u>	Rated power of SM 1	0.1–3000.0kW	Model depended
F01.16	Rated voltage of SM 1	0–1200V	Model depended
F01.17	Rated current of SM 1	0.8–6000.0A	Model depended
F01.18	Rated frequency of SM 1	0.01Hz– <u>F00.07</u> (Max. output frequency)	50.00Hz
F01.19	Number of pole pairs of SM 1	1–128	2
<u>F02.20</u>	Stator resistance of SM 1	0.001–65.535Ω	Model depended
<u>F02.21</u>	Direct-axis inductance of SM 1	0.01–655.35mH	Model depended
<u>F02.22</u>	Quadrature-axis	0.01–655.35mH	Model depended

Function code	Name	Description	Default
	inductance of SM 1		
<u>F02.23</u>	Counter-emf constant of SM 1	0–10000	300
<u>F08.00</u> – <u>F08.05</u>	Function selection of multifunction digital input terminals (DI1–DI4, HI1, HI1)	35: Switch from motor 1 to motor 2	
<u>F10.38</u>	Switching between motor 1 and motor 2	0x00–0x14 Ones: Switchover channel 0: Terminal 1: Modbus communication 2: Profibus/CANopen communication 3: Ethernet communication 4: Profinet communication Tens: indicates whether to enable switchover during running 0: Disable 1: Enable	00
<u>F28.00</u>	Type of motor 2	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0
F28.01	Rated power of AM 2	0.1–3000.0kW	Model depended
F28.02	Rated voltage of AM 2	0–1200V	Model depended
F28.03	Rated current of AM 2	0.8–6000.0A	Model depended
F28.03	Rated frequency of AM 2	0.01Hz– <u>F00.07</u> (Max. output frequency)	50.00Hz
F28.05	Rated speed of AM 2	1–60000rpm	Model depended
<u>F28.06</u>	Stator resistance of AM 2	0.001–65.535Ω	Model depended

Function code	Name	Description	Default
<u>F28.07</u>	Rotor resistance of AM 2	0.001–65.535Ω	Model depended
<u>F28.08</u>	Leakage inductance of AM 2	0.1–6553.5mH	Model depended
<u>F28.09</u>	Mutual inductance of AM 2	0.1–6553.5mH	Model depended
<u>F28.10</u>	No-load current of AM 2	0.1–6553.5A	Model depended
F28.15	Rated power of SM 2	0.1–3000.0kW	Model depended
F28.16	Rated voltage of SM 2	0–1200V	Model depended
F28.17	Rated current of SM 2	0.8–6000.0A	Model depended
F28.18	Rated frequency of SM 2	0.01Hz– <u>F00.07</u> (Max. output frequency)	50.00Hz
F28.19	Number of pole pairs of SM 2	1–128	2
<u>F28.20</u>	Stator resistance of SM 2	0.001–65.535Ω	Model depended
<u>F28.21</u>	Direct-axis inductance of SM 2	0.01–655.35mH	Model depended
<u>F28.22</u>	Quadrature-axis inductance of SM 2	0.01–655.35mH	Model depended
<u>F28.23</u>	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.

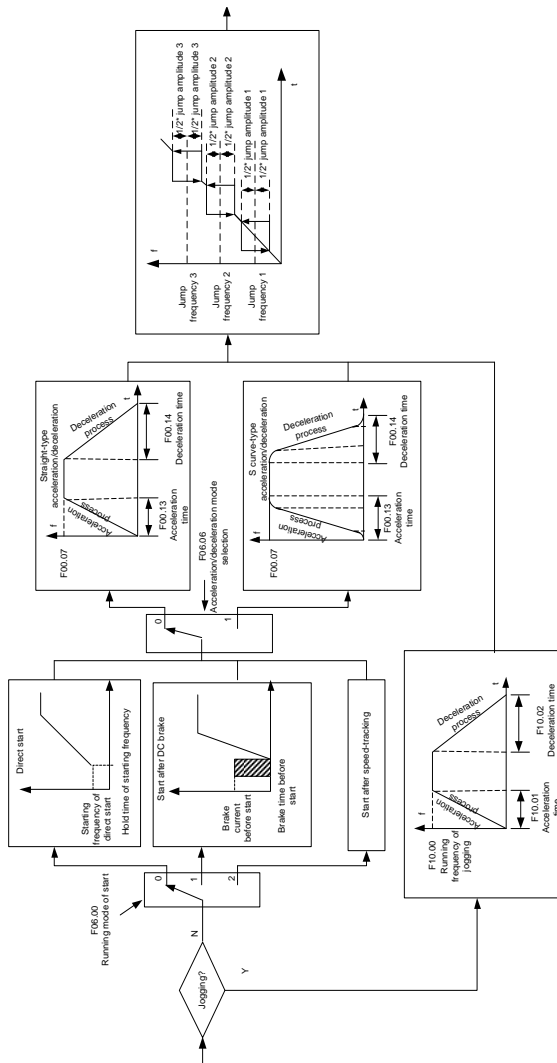
There are three start modes for the VFD, which are start at starting frequency, start after DC braking,

and start after speed tracking. You can select the proper start mode based on actual conditions.

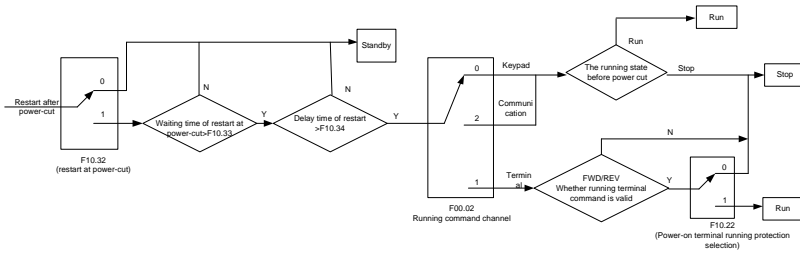
For large-inertia load, especially in cases where reversal may occur, you can choose to start after DC braking or start after speed tracking.

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

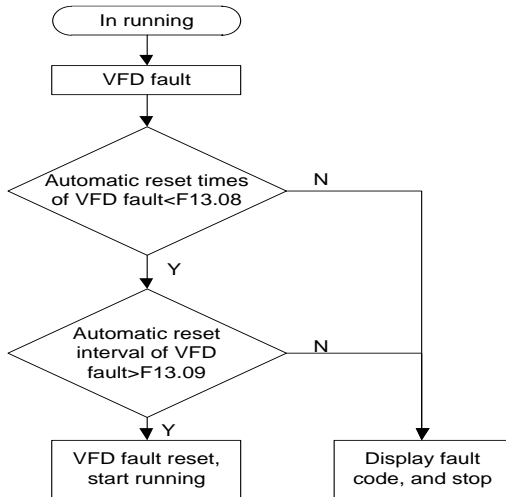
(1) Logic diagram for start after a running command is given at power-on



(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
<u>F00.02</u>	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0
<u>F00.13</u>	ACC time 1	0.0–3600.0s	Model depended
<u>F00.14</u>	DEC time 1	0.0–3600.0s	Model depended
<u>F06.00</u>	Start mode	0: Direct start 1: Start after DC braking 2: Speed tracking restart 1	0



Function code	Name	Description	Default
		3: Speed tracking restart 2	
<u>F06.01</u>	Starting frequency of direct start	0.00–50.00Hz	0.50Hz
<u>F06.02</u>	Starting frequency hold time	0.0–50.0s	0.0s
<u>F06.03</u>	Braking current before start	0.0–100.0%	0.0%
<u>F06.04</u>	DC braking time before start	0.00–50.00s	0.00s
F06.05	Pre excitation time	0.000–10.000s	0.3000s
<u>F06.06</u>	ACC and DEC mode	0: Linear 1: S curve	0
F06.07	Time of starting segment of ACC S curve	0.0–50.0s	0.1s
F06.08	Time of ending segment of ACC S curve	0.0–50.0s	0.1s
F06.09	Time of starting segment of DEC S curve	0.0–50.0s	0.1s
F06.10	Time of ending segment of DEC S curve	0.0–50.0s	0.1s
<u>F01.11</u>	Stop mode	0: Decelerate to stop 1: Coast to stop	0
F06.12	Starting frequency of DC braking for stop	0.00Hz– <u>F00.07</u> (Max. output frequency)	0.00Hz
F06.13	DC braking current for stop	0.0–100.0%	0.0%
F06.14	DC braking time for stop	0.0–50.0s	0.00s
F06.15	Demagnetization time	0.00–30.00s	0.00s
F06.16	Short-circuit braking current	0.0–100.0% (VFD)	0.0%
P06.17	Hold time of short-circuit braking for start	0.0–50.00s	0.00s
F06.18	Hold time of short-circuit braking for stop	0.0–50.00s	0.00s

Function code	Name	Description	Default
F06.19	Magnetic flux braking	0: Invalid 100–150: A greater coefficient indicates greater braking strength.	0
F06.20	Stop speed	0.00–100.00Hz	0.50Hz
F06.21	Stop speed detection mode	0: Detect by the set speed (unique in space voltage vector control mode) 1: Detect by the feedback speed	0
F06.22	Stop speed detection time	0.00–100.00s	0.50s
F06.23	Pre-exciting time of jog	0–10.000s	0.000s
F06.24	Starting frequency of braking for jogging to stop	0–F00.03	0.00Hz
F06.25	Delay to enter sleep	0–3600.0s	0.0s
<u>F08.00</u> – <u>F08.05</u>	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 22: ACC/DEC time selection 2 30: Disable ACC/DEC	
F10.00	Running frequency of jog	0.00Hz– <u>F00.07</u> (Max. output frequency)	5.00Hz
F10.01	ACC time for jog	0.0–3600.0s	Model depended
F10.02	DEC time for jog	0.0–3600.0s	Model depended
F10.03	ACC time 2	0.0–3600.0s	Model depended
F10.04	DEC time 2	0.0–3600.0s	Model depended
F10.05	ACC time 3	0.0–3600.0s	Model depended
F10.06	DEC time 3	0.0–3600.0s	Model depended
F10.07	ACC time 4	0.0–3600.0s	Model depended

Function code	Name	Description	Default
F10.08	DEC time 4	0.0–3600.0s	Model depended
<u>F10.28</u>	Switching frequency of ACC/DEC time	0.00– <u>F00.03</u> (Max. output frequency) 0.00Hz: No switchover If the running frequency is greater than <u>F10.28</u> , switch to ACC/DEC time 2.	0
<u>F00.17</u>	Reference frequency of ACC/DEC time	0: Max. output frequency 1: Set frequency 2: 100Hz <b>Note:</b> Valid only for straight-line ACC/DEC	0
<u>F10.32</u>	Auto fault reset count	0–10	0
<u>F10.33</u>	Auto fault reset interval	0.1–3600.0s	1.0s

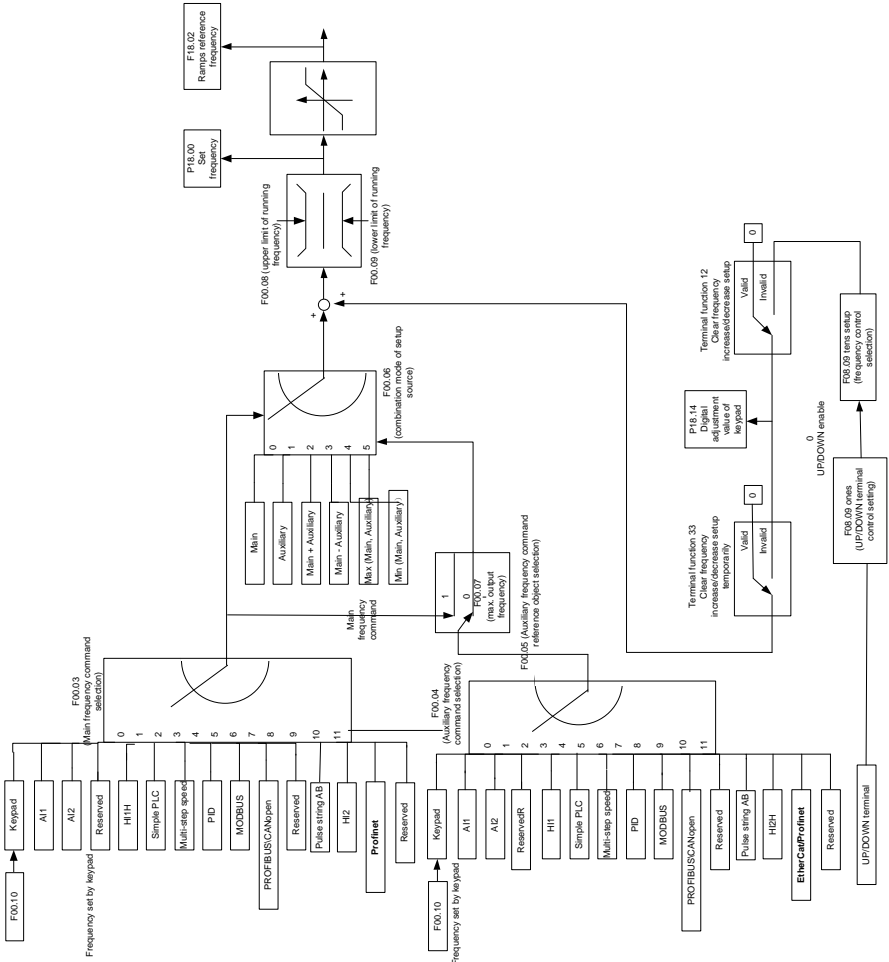
### 5.5.8 Frequency setting

The VFD supports multiple frequency setting methods, which can be divided 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 multi-function 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 actual reference of VFD is comprised of the main reference channel and auxiliary reference channel.



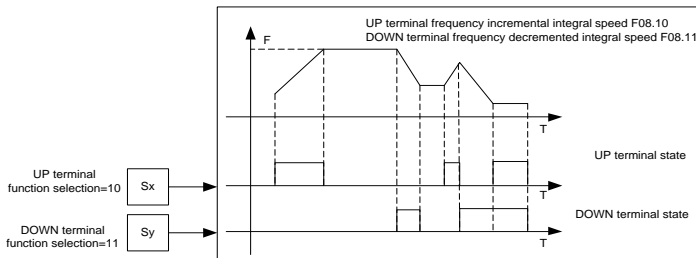
The VFD supports switchover between different reference channels, and the rules for channel switchover are shown in the following.

Present reference channel <b>F00.06</b>	Multifunction terminal function 13 <b>Main switched to Auxiliary</b>	Multifunction terminal function 14 <b>Combination setting switched to Main</b>	Multifunction terminal function 15 <b>Combination setting switched to Auxiliary</b>
Main	Auxiliary	/	/

Present reference channel <b>F00.06</b>	Multifunction terminal function 13 <b>Main switched to Auxiliary</b>	Multifunction terminal function 14 <b>Combination setting switched to Main</b>	Multifunction terminal function 15 <b>Combination setting switched to Auxiliary</b>
Auxiliary	Main	/	/
Main + Auxiliary	/	Main	Auxiliary
Main + Auxiliary	/	Main	Auxiliary
Max(Main, Auxiliary)	/	Main	Auxiliary
Min(Main, Auxiliary)	/	Main	Auxiliary

**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 **F08.10** (UP terminal frequency incremental change rate) and **F08.11** (DOWN terminal frequency decrement change rate).



Related parameter list:

Function code	Name	Description	Default
<b>F00.07</b>	Max. output frequency	Max(F00.08, 10.00)–630.00Hz	50.00Hz
<b>F00.08</b>	Upper limit of running frequency	F00.09–F00.07	50.00Hz
<b>F00.09</b>	Lower limit of running frequency	0.00Hz–F00.08	0.00Hz
F00.03	Main frequency source setting	0: Keypad 1: AI1	0
F00.04	Auxiliary frequency source setting	2: AI2 3: Reserved 4: High-speed pulse HI1	15

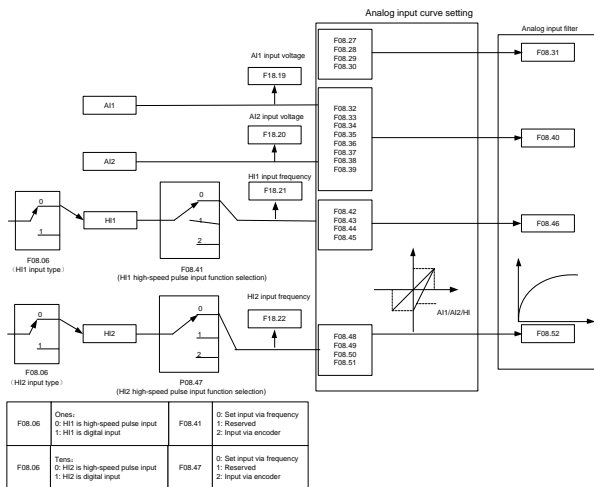
Function code	Name	Description	Default
		5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus communication 9: Profibus/CANopen communication 10: Reserved 11: High-speed pulse HI2 12: Pulse train AB 13: Profinet communication 14: Reserved 15: Reserved	
F00.05	Reference object of Auxiliary frequency	0: Max. output frequency 1: Main frequency command	0
F00.06	Combination mode of setting source	0: Main frequency 1: Auxiliary frequency 2: (Main + Auxiliary) 3: (Main - Auxiliary) 4: Max(Main, Auxiliary) 5: Min. (Main, Auxiliary)	0
<u>F08.00</u> – <u>F08.05</u>	Function selection of multifunction digital input terminals (DI1–DI4, HI1, HI2)	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 main setting 15: Switch between combination setting and auxiliary setting	
F07.39	Keypad control setting	0x0000–0x1223 LED ones: frequency enable selection 0: Both $\wedge/\vee$ keys and analog potentiometer adjustments are valid 1: Only $\wedge/\vee$ keys adjustment is valid 2: Only analog potentiometer adjustments is valid 3: Neither $\wedge/\vee$ keys nor digital potentiometer adjustments are valid	0x0000

Function code	Name	Description	Default
		<p>LED tens: frequency control selection</p> <p>0: Only valid when P00.03=0 or P00.04=0</p> <p>1: Valid for all frequency setting manner</p> <p>2: Invalid for multi-step speed when multi-step speed has the priority</p> <p>LED hundreds: action selection during stopping</p> <p>0: Setting is valid</p> <p>1: Valid during running, cleared after stopping</p> <p>2: Valid during running, cleared after receiving the stop command</p> <p>LED thousands: <math>\wedge/\vee</math> keys and analog potentiometer integral function</p> <p>0: The Integral function is valid</p> <p>1: The Integral function is invalid</p>	
F07.40	Integral ratio of the keypad potentiometer	0.01~10.00s	0.10s
F08.09	<u>UP/DOWN</u> terminal control setting	<p>0x000~0x221</p> <p>Ones place: Frequency setting selection</p> <p>0: The setting made through <u>UP/DOWN</u> is valid.</p> <p>1: The setting made through <u>UP/DOWN</u> is invalid.</p> <p>Ones place: Frequency control selection</p> <p>0: Valid only when F00.03=0 or F00.04=0</p> <p>1: Valid for all frequency setting methods</p> <p>2: Invalid for multi-step speed running when multi-step speed running has the priority</p> <p>Hundreds place: Action selection for stop</p> <p>0: Setting is valid.</p> <p>1: Valid during running, cleared after stop</p> <p>2: Valid during running, cleared after a stop command is received</p>	0x000
F08.10	Frequency increment change rate of the UP	0.01~50.00 Hz/s	0.50 Hz/s

Function code	Name	Description	Default
	terminal		
<u>F08.11</u>	Frequency decrement change rate of the DOWN terminal	0.01–50.00 Hz/s	0.50 Hz/s
<u>F18.00</u>	Set frequency	0.00Hz– <u>F00.07</u> (Max. output frequency)	0.00Hz
<u>F18.02</u>	Ramp reference frequency	0.00Hz– <u>F00.07</u> (Max. output frequency)	0.00Hz
<u>F18.14</u>	Digital adjustment value	0.00Hz– <u>F00.07</u>	0.00Hz

**5.5.9 Analog input**

The VFD provides two analog input terminals, which are AI1 supporting 0–10V/0–20mA, (whether the input is voltage or current can be set by F08.53), and AI2 supporting -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.



Related parameter list:

Function code	Name	Description	Default
F08.06	HI input type	0x00–0x11 Ones place: HI1 input type 0: High-speed pulse input	0



Function code	Name	Description	Default
		1: Digital input Tens place: HI2 input type 0: High-speed pulse input 1: Digital input	
F08.27	AI1 lower limit	0.00V– <u>F08.29</u>	0.00V
F08.28	Corresponding setting of AI1 lower limit	-300.0%–300.0%	0.0%
F08.29	AI1 upper limit	<u>F08.27</u> –10.00V	10.00V
F08.30	Corresponding setting of AI1 upper limit	-300.0%–300.0%	100.0%
F08.31	AI1 input filter time	0.000s–10.000s	0.030s
F08.32	AI2 lower limit	-10.00V– <u>F08.34</u>	-10.00V
F08.33	Corresponding setting of AI2 lower limit	-300.0%–300.0%	-100.0%
F08.34	AI2 middle value 1	<u>F08.32</u> – <u>F08.36</u>	0.00V
F08.35	Corresponding setting of AI2 middle value 1	-300.0%–300.0%	0.0%
F08.36	AI2 middle value 2	<u>F08.34</u> – <u>F08.38</u>	0.00V
F08.37	Corresponding setting of AI2 middle value 2	-300.0%–300.0%	0.0%
F08.38	AI2 upper limit	<u>F08.36</u> –10.00V	10.00V
F08.39	Corresponding setting of AI2 upper limit	-300.0%–300.0%	100.0%
F08.40	AI2 input filter time	0.000s–10.000s	0.030s
F08.41	HI1 high-speed pulse input function selection	0: Input set through frequency 1: Reserved 2: Input set through encoder, used together with HI2	0

Function code	Name	Description	Default
F08.42	HI1 lower limit frequency	0.000 kHz – <u>F08.44</u>	0.000 kHz
F08.43	Corresponding setting of HI1 lower limit frequency	-300.0%–300.0%	0.0%
F08.44	HI1 upper limit frequency	<u>F08.42</u> –50.000kHz	50.000 kHz
F08.45	Corresponding setting of HI1 upper limit frequency	-300.0%–300.0%	100.0%
F08.46	HI1 frequency input filter time	0.000s–10.000s	0.030s
F08.47	HI2 high-speed pulse input function selection	0: Input set through frequency 1: Reserved 2: Input set through encoder, used together with HI1	0
F08.48	HI2 lower limit frequency	0.000 kHz – <u>F08.50</u>	0.000 kHz
F08.49	Corresponding setting of HI2 lower limit frequency	-100.0%–100.0%	0.0%
F08.50	HI2 upper limit frequency	<u>F08.48</u> –50.000kHz	50.000 kHz
F08.51	Corresponding setting of HI2 upper limit frequency	-300.0%–300.0%	100.0%
F08.52	HI2 frequency input filter time	0.000s–10.000s	0.030s
F08.53	AI1 input signal type	0: Voltage 1: Current <b>Note:</b> You can set the AI1 input signal type through the corresponding function code.	0

### 5.5.10 Analog output

The VFD provides one analog output terminal (supporting 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 signals can output the motor speed, output frequency, output current, motor torque and



Setting	Function	Description
	communication	
17	Value 2 set through PROFIBUS/CANopen communication	0–1000
18	Reserved	\
19	Reserved	\
20	High-speed pulse HI2 input	0.00–50.00kHz
21	Value 1 set through Profinet communication	0–1000. A negative value corresponds to 0.0% by default.
22	Torque current (bipolar)	0–Three times the motor rated current. A negative value corresponds to 0.0% by default.
23	Exciting current	0–Three times the motor rated current. A negative value corresponds to 0.0% by default.
24	Set frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
25	Ramp reference frequency (bipolar)	0–Max. output frequency. A negative value corresponds to 0.0% by default.
26	Rotational speed (bipolar)	0–Synchronous speed corresponding to max. output frequency A negative value corresponds to 0.0% by default.
27	Value 2 set through Profinet communication	0–1000
28	Reserved	\
29	Reserved	\
30	Rotational speed	0–Twice the motor rated synchronous speed
31–47	Reserved	\

Related parameter list:

Function code	Name	Description	Default
<u>F09.00</u>	HO output type	0: Open collector high-speed pulse output 1: Open collector output	0
F09.05	AO1 output	0: Running frequency (0–Max. output frequency) 1: Set frequency (0–Max. output frequency)	0
F09.06	AO2 output		0
F09.07	HO high-speed pulse output		0

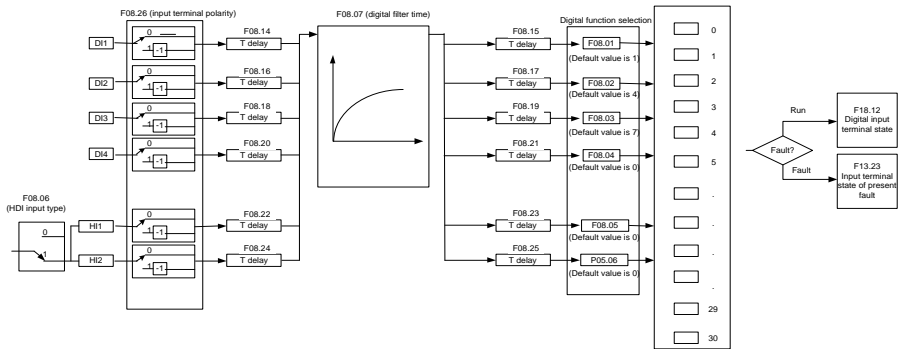
Function code	Name	Description	Default
		2: Ramp reference frequency (0–Max. output frequency) 3: Rotational speed (0–Speed corresponding to max. output frequency) 4: Output current (0–Twice the VFD rated current) 5: Output current (0–Twice the motor rated current) 6: Output voltage (0–1.5 times the VFD rated voltage) 7: Output power (0–Twice the motor rated power) 8: Set torque (0–Twice the motor rated current) 9: Output torque (Absolute value, 0–+/- Twice the motor rated torque) 10: AI1 input (0–10V/0–20mA) 11: AI2 input (0–10V) 12: Resvered 13: HI1 input(0.00–50.00kHz) 14: Value 1 set through Modbus (0–1000) 15: Value 2 set through Modbus (0–1000) 16: Value 1 set through PROFIBUS/CANopen (0–1000) 17: Value 2 set through PROFIBUS/CANopen (0–1000) 18: Resvered 19: Resvered 20: HI2 input (0.00–50.00kHz) 21: Value 1 set through Profinet (0–1000) 22: Torque current (bipolar, 0–Triple the motor rated current) 23: Exciting current (bipolar, 0–Triple the motor rated current)	

Function code	Name	Description	Default
		24: Set frequency (bipolar, 0–Max. output frequency) 25: Ramp reference frequency (bipolar, 0–Max. output frequency) 26: Rotational speed (bipolar, 0–Speed corresponding to max. output frequency) 27: Value 2 set through Profinet (0–1000) 28~29: Reserved 30: Rotational speed (0–Twice the motor rated synchronous speed) 31~47: Reserved	
F09.08	HO output lower limit	-300.0%– <u>F09.10</u>	0.0%
F09.09	HO output corresponding to lower limit	0.00–50.00kHz	0.00kHz
F09.10	HO output upper limit	<u>F09.08</u> –300.0%	100.0%
F09.11	HO output corresponding to upper limit	0.00–50.00kHz	50.00 kHz
F09.12	HO output filter time	0.000s–10.000s	0.000s
F09.13	AO1 output lower limit	-300.0%– <u>F09.15</u>	0.0%
F09.14	AO1 output corresponding to lower limit	0.00V–10.00V	0.00V
F09.15	AO1 output upper limit	<u>F09.13</u> –300.0%	100.0%
F09.16	AO1 output corresponding to upper limit	0.00V–10.00V	10.00V
F09.17	AO1 output filter time	0.000s–10.000s	0.000s
F09.18	AO2 output lower limit	-300.0%– <u>F09.20</u>	0.0%
F09.19	AO2 output corresponding to lower limit	0.00V–10.00V	0.00V
F09.20	AO2 output upper limit	<u>F09.18</u> –300.0%	100.0%
F09.21	AO2 output corresponding to	0.00V–10.00V	10.00V

Function code	Name	Description	Default
	upper limit		
F09.22	AO2 output filter time	0.000s–10.000s	0.000s

5.5.11 Digital input

The VFD provides four programmable digital input terminals and two HI input terminals. All the digital input terminal functions can be programmed by function codes. HI 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 HI1 or HI2 high-speed pulse input to serve as the frequency reference and encoder signal input.



**Note:** Two different multifunction input terminals cannot be set as the same function.

Setting	Function	Description
0	No function	The VFD does not act even if there is signal input. Set unused terminals without functions to avoid misaction.
1	Run forward (FWD)	Control the forward/reverse running of the VFD by external terminals.
2	Run reversely (REV)	
3	Three-wire running control	Set the VFD running mode to 3-wire control mode by this terminal.
4	Jog forward	For details about the frequency and ACC/DEC time at jogging, refer to <a href="#">F10.00</a> , <a href="#">F10.01</a> and <a href="#">F10.02</a> .
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 cases of

Setting	Function	Description
		large-inertia load and free stop time; its definition is the same as <u>F06.11</u> , and it is mainly used in remote control.
7	Fault reset	External fault reset function, same as the reset function of the <b>STOP/RST</b> key on the keypad. You can use this function to reset faults remotely.
8	Pause running	When the VFD decelerates to stop, however, all the running parameters are in memory state, including PLC parameter, wobbling frequency, and PID parameter. After this signal disappears, the VFD restores to the state before stop.
9	External fault input	When an external fault signal is transmitted to the VFD, the VFD releases a fault alarm and stops.
10	Increase frequency setting (UP)	Used to change the frequency increase/decrease command when the frequency is given by external terminals. <div style="text-align: center; margin: 10px 0;"> <pre>                     graph TD                     K1 --- T1[UP terminal]                     K2 --- T2[DOWN terminal]                     K3 --- T3[UP/DOWN clearing terminal]                     T1 --- COM[COM]                     T2 --- COM                     T3 --- COM                     </pre> </div>
12	Decrease frequency setting (DOWN)	
12	Clear the frequency increase/decrease setting	
13	Switch between main setting and auxiliary setting	Used to switch between the frequency setting channels.
14	Switch between combination setting and main setting	A frequency reference channel and B frequency reference channel can be switched by no. 13 function; the combination channel set by <u>F00.06</u> and the A frequency reference channel can be switched by no. 14 function; the combination channel set by <u>F00.06</u> and the B frequency reference channel can be switched by no. 15 function.
15	Switch between combination setting and auxiliary setting	
16	Multi-step speed terminal	A total of 16-step speeds can be set by combining digital



Setting	Function	Description																				
	1	states of these four terminals.																				
17	Multi-step speed terminal 2	<p><b>Note:</b> Multi-step speed 1 is the low-order bit, multi-step speed 4 is the high-order bit.</p> <table border="1"> <thead> <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> </thead> <tbody> <tr> <td><u>BIT3</u></td> <td><u>BIT2</u></td> <td><u>BIT1</u></td> <td><u>BIT0</u></td> </tr> </tbody> </table>	Multi-step speed 4	Multi-step speed 3	Multi-step speed 2	Multi-step speed 1	<u>BIT3</u>	<u>BIT2</u>	<u>BIT1</u>	<u>BIT0</u>												
Multi-step speed 4	Multi-step speed 3		Multi-step speed 2	Multi-step speed 1																		
<u>BIT3</u>	<u>BIT2</u>		<u>BIT1</u>	<u>BIT0</u>																		
18	Multi-step speed terminal 3																					
19	Multi-step speed terminal 4																					
20	Pause multi-step speed running	Used to pause multi-step speed selection function to keep the set value in present state.																				
21	ACC/DEC time selection 1	<p>The two terminals are used to select four groups of acceleration/decoration time. (T indicates Terminal in the following table.)</p> <table border="1"> <thead> <tr> <th>T1</th> <th>T2</th> <th>ACC/DEC time</th> <th>Parameter</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>OFF</td> <td>ACC/DEC time 1</td> <td><u>F00.13/F00.14</u></td> </tr> <tr> <td>ON</td> <td>OFF</td> <td>ACC/DEC time 2</td> <td><u>F10.03/F10.04</u></td> </tr> <tr> <td>OFF</td> <td>ON</td> <td>ACC/DEC time 3</td> <td><u>F10.05/F10.06</u></td> </tr> <tr> <td>ON</td> <td>ON</td> <td>ACC/DEC time 4</td> <td><u>F10.07/F10.08</u></td> </tr> </tbody> </table>	T1	T2	ACC/DEC time	Parameter	OFF	OFF	ACC/DEC time 1	<u>F00.13/F00.14</u>	ON	OFF	ACC/DEC time 2	<u>F10.03/F10.04</u>	OFF	ON	ACC/DEC time 3	<u>F10.05/F10.06</u>	ON	ON	ACC/DEC time 4	<u>F10.07/F10.08</u>
T1	T2		ACC/DEC time	Parameter																		
OFF	OFF		ACC/DEC time 1	<u>F00.13/F00.14</u>																		
ON	OFF		ACC/DEC time 2	<u>F10.03/F10.04</u>																		
OFF	ON	ACC/DEC time 3	<u>F10.05/F10.06</u>																			
ON	ON	ACC/DEC time 4	<u>F10.07/F10.08</u>																			
22	ACC/DEC time selection 2																					
23	Simple PLC stop reset	Used to restart simple PLC process and clear previous PLC state information.																				
24	Pause simple PLC	The program pauses during PLC execution, and keeps running in present speed step. After this function is cancelled, simple PLC keeps running.																				
25	Pause PID control	PID is ineffective temporarily, and the VFD maintains present frequency output.																				
26	Pause wobbling frequency (stopped at the 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 the central frequency)	The set frequency of VFD returns to the center frequency.																				
28	Counter reset	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 be impacted by external signals (except for stop command), and the VFD maintains the present output frequency.																				

Setting	Function	Description
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 <b>UP/DOWN</b> can be cleared to restore the reference frequency to the frequency given by frequency command channel; when terminal is disconnected, it will revert to the frequency value after frequency increase/decrease setting.
34	DC braking	The VFD immediately starts DC braking once after the command is valid.
35	Switch between motor 1 and motor 2	When the function is valid, the switchover between the two motors can be controlled.
36	Switch the running command channel to keypad	When the function is enabled, the running command channel is switched to keypad. When the function is disabled, the running command channel is restored to the previous setting.
37	Switch the running command channel to terminal	When the function is enabled, the running command channel is switched to terminal. When the function is disabled, the running command channel is restored to the previous setting.
38	Switch the running command channel to communication	When the function is enabled, the running command channel is switched to communication. When the function is disabled, the running command channel is restored to the previous setting.
39	Pre-exciting command	When this terminal is valid, motor pre-exciting is started and continues until this terminal becomes invalid.
40	Clear electricity consumption	When this command becomes valid, the electricity consumption quantity of the VFD is cleared.
41	Keep electricity consumption	When this command is valid, the present running of the VFD has no impact on the electricity consumption quantity.
42	Switch the setting source of braking torque upper limit to keypad	When this command is valid, the upper limit of the torque is set through the keypad.
43–72	Reserved	

Related parameter list:

Function code	Name	Description	Default
F08.00	Function of DI1 terminal	0: No function	1
F08.01	Function of DI2 terminal	1: Forward running	4

Function code	Name	Description	Default
F08.02	Function of DI3 terminal	2: Reverse running	7
F08.03	Function of DI4 terminal	3: 3-wire control/Sin 4: Forward jogging	0
F08.04	Function of HI1 terminal	5: Reverse jogging 6: Coast to stop	0
F08.05	Function of HI2 terminal	7: Fault reset 8: Running pause 9: External fault input 10: Frequency increase (UP) 11: Frequency decrease (DOWN) 12: Clear frequency increase/decrease setting 13: Switch-over between setup main and setup auxiliary 14: Switch-over between combination setting and main setting 15: Switch-over between combination setting and setup auxiliary 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: Multi-step speed pause 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Wobbling frequency pause 27: Wobbling frequency reset 28: Counter reset 29: Switching between speed control and torque control 30: ACC/DEC disabled 31: Counter trigger 32: Reserved 33: Clear frequency increase/decrease setting temporarily	0

Function code	Name	Description	Default
		34: DC brake 35: Switching between motor 1 and motor 2 36: Command switches to keypad 37: Command switches to terminal 38: Command switches to communication 39: Pre-exciting command 40: Zero out power consumption quantity 41: Maintain power consumption quantity 42: Source of upper torque limit switches to keypad 43: Position reference point input (valid only for DI~DI3 are valid) 44: Spindle orientation disabled 45: Spindle zeroing/local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zero position selection 2 48: Spindle scale division selection 1 49: Spindle scale division selection 2 50: Spindle scale division selection 3 51: Terminal for switching between position control and speed control 52: Pulse input disabled 53: Clear position deviation cleared 54: Switch over position proportional gain 55: Enable cyclic positioning of digital positioning 56: Emergency stop 57: Motor over-temperature fault input 59: Switch to V/F control 60: Switch to FVC control 61: PID polarity switch-over 66: Zero out encoder counting 67: Pulse increase 68: Enable pulse superimposition 69: Pulse decrease 70: Electronic gear selection 71~79: Reserved	

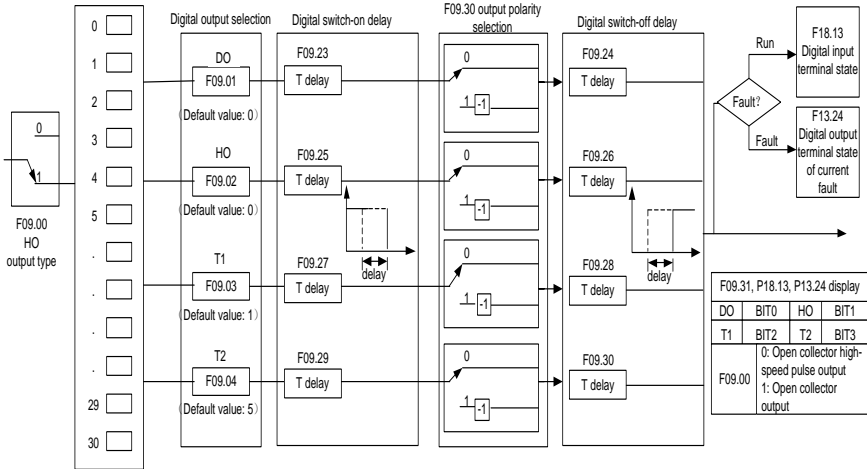
Function code	Name	Description	Default
F08.06	HI input type	0x00–0x11 Ones place: HI1 input type 0: High-speed pulse input 1: Digital input Tens place: HI2 input type 0: High-speed pulse input 1: Digital input	0
F08.07	Digital input filter time	0.000~1.000s	0.010s
F08.08	Terminal control mode	0: Two-wire control 1 1: Two-wire control 2 2: Three-wire control 1 3: Three-wire control 2	0
F08.09	<u>UP/DOWN</u> terminal control setting	0x000–0x221 Ones place: Frequency setting selection 0: The setting made through <u>UP/DOWN</u> is valid. 1: The setting made through <u>UP/DOWN</u> is invalid. Ones place: Frequency control selection 0: Valid only when P00.03=0 or P00.04=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
F08.10	Frequency increment integral rate of the UP terminal	0.01–50.00Hz/s	0.50Hz/s
F08.11	Frequency integral rate of the DOWN terminal	0.01–50.00Hz/s	0.50Hz/s

Function code	Name	Description	Default
F08.12	Virtual terminal setting	0x000–0x3F (0: disable, 1: enable) BIT0: DI1 virtual terminal BIT1: DI2 virtual terminal BIT2: DI3 virtual terminal BIT3: DI4 virtual terminal BIT4: HI1 virtual terminal BIT5: HI2 virtual terminal	0x00
F08.13	Reserved	0–65535	0
F08.14	DI1 switch-on delay	0.000–50.000s	0.000s
F08.15	DI1 switch-off delay	0.000–50.000s	0.000s
F08.16	DI2 switch-on delay	0.000–50.000s	0.000s
F08.17	DI2 switch-off delay	0.000–50.000s	0.000s
F08.18	DI3 switch-on delay	0.000–50.000s	0.000s
F08.19	DI3 switch-off delay	0.000–50.000s	0.000s
F08.20	DI4 switch-on delay	0.000–50.000s	0.000s
F08.21	DI4 switch-off delay	0.000–50.000s	0.000s
F08.22	HI1 switch-on delay	0.000–50.000s	0.000s
F08.23	HI1 switch-off delay	0.000–50.000s	0.000s
F08.24	HI2 switch-on delay	0.000–50.000s	0.000s
F08.25	HI2 switch-off delay	0.000–50.000s	0.000s
F08.26	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. 0x000–0x3F	0x000
F08.41	HI1 high-speed pulse input function selection	0: Input set through frequency 1: Reserved 2: Input set through encoder, used together with HI2	0

Function code	Name	Description	Default
F08.42	HI1 lower limit frequency	0.000 kHz – <u>F08.44</u>	0.000 kHz
F08.43	Corresponding setting of HI1 lower limit frequency	-300.0%–300.0%	0.0%
F08.44	HI1 upper limit frequency	<u>F08.42</u> –50.000kHz	50.000 kHz
F08.45	Corresponding setting of HI1 upper limit frequency	-300.0%–300.0%	100.0%
F08.46	HI1 frequency input filter time	0.000s–10.000s	0.030s
F08.47	HI2 high-speed pulse input function selection	0: Input set through frequency 1: Reserved 2: Input set through encoder, used together with HI1	0
F08.48	HI2 lower limit frequency	0.000 kHz – <u>F08.50</u>	0.000 kHz
F08.49	Corresponding setting of HI2 lower limit frequency	-100.0%–100.0%	0.0%
F08.50	HI2 upper limit frequency	<u>F08.48</u> –50.000kHz	50.000 kHz
F08.51	Corresponding setting of HI2 upper limit frequency	-300.0%–300.0%	100.0%
F08.52	HI2 frequency input filter time	0.000s–10.000s	0.030s
<u>F13.23</u>	Input terminal state of present fault	0x0000~0xFFFF	0
<u>F18.12</u>	Digital input terminal state	0000~03F	0

### 5.5.12 Digital output

The VFD provides two groups of relay output terminals, one open collector DO output terminal and one high-speed pulse output (HO) terminal. All the digital output terminal functions can be programmed by function codes, of which the high-speed pulse output terminal HO 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.

Setting	Function	Description
0	Invalid	Output terminal has no function
1	In running	Output ON signal when there is frequency output during running
2	In forward running	Output ON signal when there is frequency output during forward running
3	In reverse running	Output ON signal when there is frequency output during reverse running
4	In jogging	Output ON signal when there is frequency output during jogging
5	VFD fault	Output ON signal when VFD fault occurred
6	Frequency level detection FDT1	Refer to <a href="#">F10.23</a> and <a href="#">F10.24</a> .
7	Frequency level detection FDT2	Refer to <a href="#">F10.25</a> and <a href="#">F10.26</a> .
8	Frequency reached	Refer to <a href="#">F10.27</a> .
9	Running in zero speed	Output ON signal when the VFD output frequency and reference frequency are both zero.
10	Reach upper limit frequency	Output ON signal when the running frequency reaches upper limit frequency
11	Reach lower limit frequency	Output ON signal when the running frequency reached lower limit frequency
12	Ready to run	Main circuit and control circuit powers are



Setting	Function	Description
		established, the protection functions do not act; when the VFD is ready to run, output ON signal.
13	In pre-exciting	Output ON signal during pre-exciting of the VFD
14	Overload pre-alarm	Output ON signal after the pre-alarm time elapsed based on the pre-alarm threshold; refer to <a href="#">F13.45–F13.48</a> for details.
15	Underload pre-alarm	Output ON signal after the pre-alarm time elapsed based on the pre-alarm threshold; refer to <a href="#">F13.49–F13.50</a> for details.
16	Simple PLC state completed	Output signal when current stage of simple PLC is completed
17	Simple PLC cycle completed	Output signal when a single cycle of simple PLC operation is completed
23	Virtual terminal output of Modbus communication	Output corresponding signal based on the set value of Modbus; output ON signal when it is set to 1, output OFF signal when it is set to 0
24	Virtual terminal output of PROFIBUS/CANopen communication	Output corresponding signal based on the set value of PROFIBUS\CANopen; output ON signal when it is set to 1, output OFF signal when it is set to 0
25	Reserved	\
26	DC bus voltage established	Output is valid when the bus voltage is above the undervoltage threshold of the inverter
27	Z pulse output	Output is valid when the encoder Z pulse is arrived, and is invalid after 10 ms.
28	During pulse superposition	Output is valid when the pulse superposition terminal input function is valid
29	Reserved	\
30	Positioning completed	Output is valid when position control positioning is completed
31	Spindle zeroing completed	Output is valid when spindle zeroing is completed
32	Spindle scale-division completed	Output is valid when spindle scale-division is completed
33	In speed limit	Output is valid when the frequency is limited
34	Virtual terminal output of Profinet communication	The corresponding signal is output according to the set value of Profinet communication. When it is set to 1, the ON signal is output, and when it is

Setting	Function	Description
		set to 0, the OFF signal is output.
35	Reserved	\
36	Speed/position control switch-over completed	Output is valid when the mode switch-over is completed
37-63	Reserved	\

Related parameter list:

Function code	Name	Description	Default
F09.00	HO output type	0: Open collector high-speed pulse output. 1: Open collector output.	0
F09.01	DO output	0: Invalid	0
F09.02	HO output	1: Running	0
F09.03	T1 output	2: Running forward	1
F09.04	T2 output	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 communication virtual terminal output 24: PROFIBUS/CANopen communication	5

Function code	Name	Description	Default
		virtual terminal output 25: Reserved 26: DC bus voltage established 27: Z pulse output 28: Superposing pulses 29: STO action 30: Positioning completed 31: Spindle zeroing completed 32: Spindle scale division completed 33: In speed limit 34: Profinet communication virtual terminal output 35: Reserved 36: Speed/position control switchover completed 37–63: Reserved	
F09.08	HO output lower limit	-300.0%– <u>F09.10</u>	0.0%
F09.09	HO output corresponding to lower limit	0.00–50.00kHz	0.00kHz
F09.10	HO output upper limit	<u>F09.08</u> –300.0%	100.0%
F09.11	HO output corresponding to upper limit	0.00–50.00kHz	50.00 kHz
F09.12	HO output filter time	0.000s–10.000s	0.000s
<u>F09.13</u>	RO2 switch-off delay	0.000–50.000s	0.000s
F09.23	DO switch-on delay	0.000–50.000s	0.000s
F09.24	DO switch-off delay	0.000–50.000s	0.000s
F09.25	HO switch-on delay	0.000–50.000s (valid only when <u>F09.00</u> =1)	0.000s
F09.26	HO switch-off delay	0.000–50.000s (valid only when <u>F09.00</u> =1)	0.000s
F09.27	T1 switch-on delay	0.000–50.000s	0.000s
F09.28	T1 switch-off delay	0.000–50.000s	0.000s
F09.29	T2 switch-on delay	0.000–50.000s	0.000s
F09.30	T2 switch-off delay	0.000–50.000s	0.000s
F09.31	Output terminal polarity	0x0–0xF	00

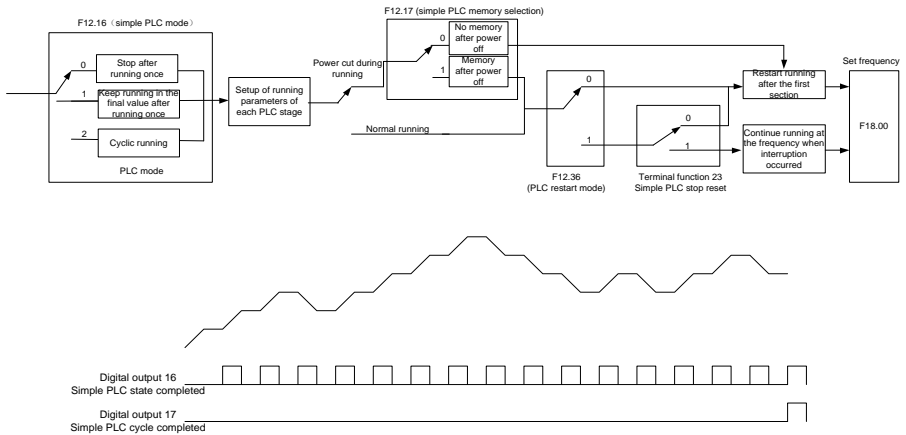
Function code	Name	Description	Default
	selection		
F09.32	Reserved	0-65535	0
F09.33	Frequency reach detection value	0-F00.07	1.00Hz
F09.34	Frequency reach detection time	0-3600.0s	0.5s
<u>F13.24</u>	Output terminal status at present fault		0
<u>F18.13</u>	Digital output terminal status		0

### 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 you to choose.

After the set PLC completes one cycle (or one segment), one ON signal can be output by the multifunction relay.



Related parameter list:

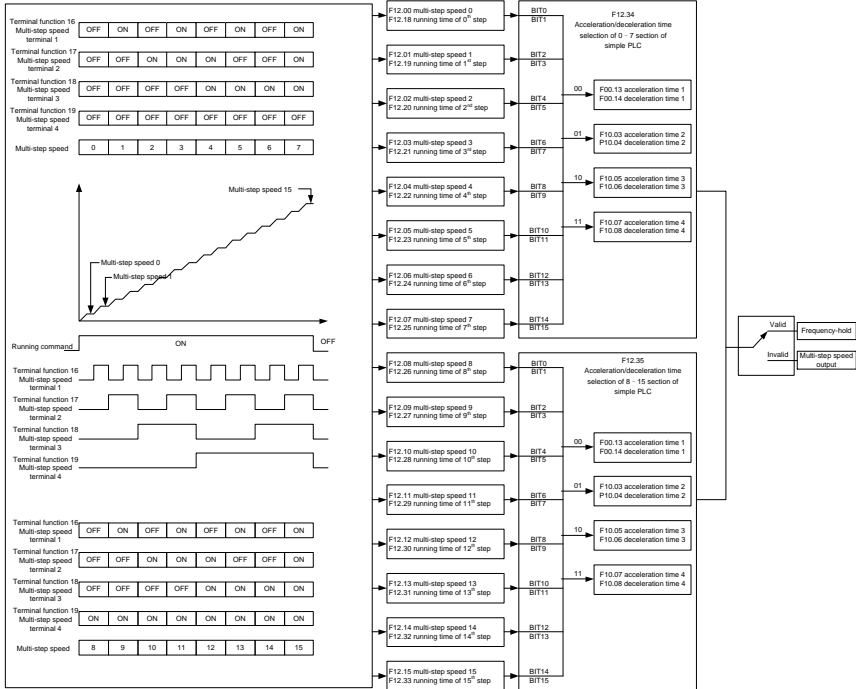
Function code	Name	Description	Default
<u>F08.00</u> – <u>F08.05</u>	Digital input function selection	23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control	
<u>F09.00</u> – <u>F09.04</u>	Digital output function selection	16: Simple PLC stage reached 17: Simple PLC cycle reached	
F12.00	Multi-step speed 0	-100.0~100.0%	0.0%
F12.01	Multi-step speed 1	-100.0~100.0%	0.0%
F12.02	Multi-step speed 2	-100.0~100.0%	0.0%
F12.03	Multi-step speed 3	-100.0~100.0%	0.0%
F12.04	Multi-step speed 4	-100.0~100.0%	0.0%
F12.05	Multi-step speed 5	-100.0~100.0%	0.0%
F12.06	Multi-step speed 6	-100.0~100.0%	0.0%
F12.07	Multi-step speed 7	-100.0~100.0%	0.0%
F12.08	Multi-step speed 8	-100.0~100.0%	0.0%
F12.09	Multi-step speed 9	-100.0~100.0%	0.0%
F12.10	Multi-step speed 10	-100.0~100.0%	0.0%
F12.11	Multi-step speed 11	-100.0~100.0%	0.0%
F12.12	Multi-step speed 12	-100.0~100.0%	0.0%
F12.13	Multi-step speed 13	-100.0~100.0%	0.0%
F12.14	Multi-step speed 14	-100.0~100.0%	0.0%
F12.15	Multi-step speed 15	-100.0~100.0%	0.0%
F12.16	Simple PLC mode	0: Stop after running once; 1: Keep running in the final value after running once; 2: Cyclic running;.	0
F12.17	Simple PLC memory selection	0: No memory after power-off 1: Memory after power-off; PLC memories its running stage and	0

Function code	Name	Description	Default
		frequency before power-off.	
F12.18	Running time of step 0	0.0–6553.5s(min)	0.0s(min)
F12.19	Running time of step 1	0.0–6553.5s(min)	0.0s(min)
F12.20	Running time of step 2	0.0–6553.5s(min)	0.0s(min)
F12.21	Running time of step 3	0.0–6553.5s(min)	0.0s(min)
F12.22	Running time of step 4	0.0–6553.5s(min)	0.0s(min)
F12.23	Running time of step 5	0.0–6553.5s(min)	0.0s(min)
F12.24	Running time of step 6	0.0–6553.5s(min)	0.0s(min)
F12.25	Running time of step 7	0.0–6553.5s(min)	0.0s(min)
F12.26	Running time of step 8	0.0–6553.5s(min)	0.0s(min)
F12.27	Running time of step 9	0.0–6553.5s(min)	0.0s(min)
F12.28	Running time of step 10	0.0–6553.5s(min)	0.0s(min)
F12.29	Running time of step 11	0.0–6553.5s(min)	0.0s(min)
F12.30	Running time of step 12	0.0–6553.5s(min)	0.0s(min)
F12.31	Running time of step 13	0.0–6553.5s(min)	0.0s(min)
F12.32	Running time of step 14	0.0–6553.5s(min)	0.0s(min)
F12.33	Running time of step 15	0.0–6553.5s(min)	0.0s(min)
F12.34	ACC/DEC time of steps 0–7 of simple PLC	:0x0000–0xFFFF	0x0000
F12.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000~0xFFFF	0x0000
F12.36	PLC restart mode	0: Restart from the first step 1: Continue running from the step frequency when interruption occurred,	0
F12.37	Multi-step time unit	0: second; the running time of each step is counted in seconds; 1: minute; the running time of each step	0

Function code	Name	Description	Default
		is counted in minutes	
<u>F18.00</u>	Set frequency	0.00Hz– <u>F00.07</u> (Max. output frequency)	0.00Hz
<u>F18.27</u>	Simple PLC and present stage number of multi-step speed	Displays the present stage of the simple PLC function.	0

### 5.5.14 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
<u>F08.00–F08.03</u>	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	
F12.00	Multi-step speed 0	-100.0~100.0%	0.0%
F12.01	Multi-step speed 1	-100.0~100.0%	0.0%
F12.02	Multi-step speed 2	-100.0~100.0%	0.0%
F12.03	Multi-step speed 3	-100.0~100.0%	0.0%

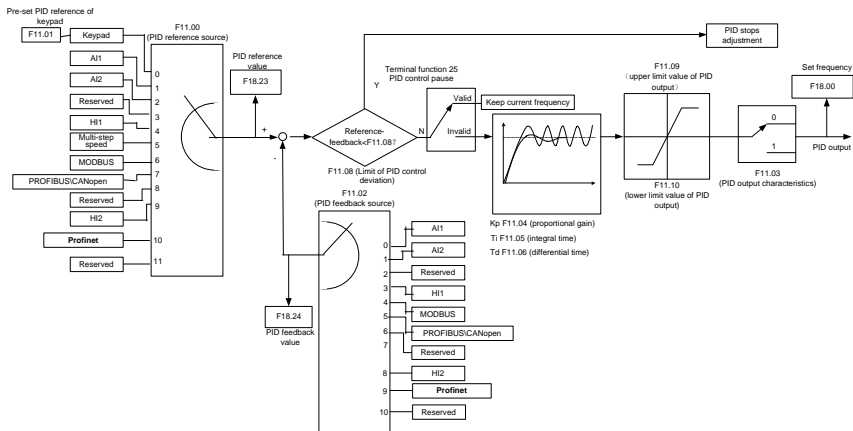


Function code	Name	Description	Default
F12.04	Multi-step speed 4	-100.0~100.0%	0.0%
F12.05	Multi-step speed 5	-100.0~100.0%	0.0%
F12.06	Multi-step speed 6	-100.0~100.0%	0.0%
F12.07	Multi-step speed 7	-100.0~100.0%	0.0%
F12.08	Multi-step speed 8	-100.0~100.0%	0.0%
F12.09	Multi-step speed 9	-100.0~100.0%	0.0%
F12.10	Multi-step speed 10	-100.0~100.0%	0.0%
F12.11	Multi-step speed 11	-100.0~100.0%	0.0%
F12.12	Multi-step speed 12	-100.0~100.0%	0.0%
F12.13	Multi-step speed 13	-100.0~100.0%	0.0%
F12.14	Multi-step speed 14	-100.0~100.0%	0.0%
F12.15	Multi-step speed 15	-100.0~100.0%	0.0%
F12.18	Running time of step 0	0.0~6553.5s(min)	0.0s(min)
F12.19	Running time of step 1	0.0~6553.5s(min)	0.0s(min)
F12.20	Running time of step 2	0.0~6553.5s(min)	0.0s(min)
F12.21	Running time of step 3	0.0~6553.5s(min)	0.0s(min)
F12.22	Running time of step 4	0.0~6553.5s(min)	0.0s(min)
F12.23	Running time of step 5	0.0~6553.5s(min)	0.0s(min)
F12.24	Running time of step 6	0.0~6553.5s(min)	0.0s(min)
F12.25	Running time of step 7	0.0~6553.5s(min)	0.0s(min)
F12.26	Running time of step 8	0.0~6553.5s(min)	0.0s(min)
F12.27	Running time of step 9	0.0~6553.5s(min)	0.0s(min)
F12.28	Running time of step 10	0.0~6553.5s(min)	0.0s(min)
F12.29	Running time of step 11	0.0~6553.5s(min)	0.0s(min)

Function code	Name	Description	Default
F12.30	Running time of step 12	0.0–6553.5s(min)	0.0s(min)
F12.31	Running time of step 13	0.0–6553.5s(min)	0.0s(min)
F12.32	Running time of step 14	0.0–6553.5s(min)	0.0s(min)
F12.33	Running time of step 15	0.0–6553.5s(min)	0.0s(min)
F12.34	ACC/DEC time of steps 0–7 of simple PLC	:0x0000–0xFFFF	0x0000
F12.35	ACC/DEC time of steps 8–15 of simple PLC	0x0000~0xFFFF	0x0000
<u>F18.27</u>	Simple PLC and present stage number of multi-step speed	Displays the present stage of the simple PLC function.	0

**5.5.15 PID control**

PID control, a common mode for process control, is mainly used to adjust the VFD output frequency or output voltage through performing scale-division, integral and differential operations on the difference between feedback signal of controlled variables and signal of the target, thus forming a negative feedback system to keep the controlled variables above the target. It is suitable for flow control, pressure control, temperature control, etc. Diagram of basic principles for output frequency regulation is shown in the figure below.



Introduction to the working principles and control methods for PID control

Proportional control ( $K_p$ ): When the feedback deviates from the reference, the output will be proportional to the deviation, if such deviation is constant, the regulating variable will also be constant. Proportional control can respond to feedback changes rapidly, however, it cannot eliminate the error by itself. The larger the proportional gain, the faster the regulating speed, but too large gain will result in oscillation. To solve this problem, first, set the integral time to a large value and the derivative time to 0, and run the system by proportional control, and then change the reference to observe the deviation between feedback signal and the reference (static difference), if the static difference is (e.g., increase the reference, and the feedback variable is always less than the reference after system stabilizes), continue increasing the proportional gain, otherwise, decrease the proportional gain; repeat such process until the static error becomes small.

Integral time ( $T_i$ ): When feedback deviates from reference, the output regulating variable accumulates continuously, if the deviation persists, the regulating variable will increase continuously until deviation disappears. Integral regulator can be used to eliminate static difference; however, too large regulation may lead to repetitive overshoot, which will cause system instability and oscillation. The feature of oscillation caused by strong integral effect is that the feedback signal fluctuates up and down based on the reference variable, and fluctuation range increases gradually until oscillation occurred. Integral time parameter is generally regulated gradually from large to small until the stabilized system speed fulfills the requirement.

Derivative time ( $T_d$ ): When the deviation between feedback and reference changes, output the regulating variable which is proportional to the deviation variation rate, and this regulating variable is only related to the direction and magnitude of the deviation variation rather than the direction and magnitude of the deviation itself. Differential control is used to control the feedback signal variation based on the variation trend. Differential regulator should be used with caution as it may easily enlarge the system interferences, especially those with high variation frequency.

When the frequency command selection (F00.03, F00.04) is 7 or the voltage setting channel selection (F04.15) is 6, the VFD is process PID controlled.

#### **5.5.15.1 General procedures for PID parameter settings**

##### a. Determining proportional gain P

When determining proportional gain P, first, remove the integral term and derivative term of PID by making  $T_i=0$  and  $T_d=0$  (refer to PID parameter setup for details), thus turning PID into pure proportional control. Set the input to 60%–70% of the max. allowable value, and increase proportional gain P gradually from 0 until system oscillation occurred, and then in turn, decrease proportional gain P gradually from current value until system oscillation disappears, record the proportional gain P at this point and set the proportional gain P of PID to 60%–70% of current value. This is whole commissioning process of proportional gain P.

##### b. Determine integral time $T_i$

After proportional gain P is determined, set the initial value of a larger integral time  $T_i$ , and decrease  $T_i$  gradually until system oscillation occurred, and then in turn, increase  $T_i$  until system oscillation

disappears, record the  $T_i$  at this point, and set the integral time constant  $T_i$  of PID to 150%–180% of current value. This is the commissioning process of integral time constant  $T_i$ .

#### c. Determining derivative time $T_d$

The derivative time  $T_d$  is generally set to 0.

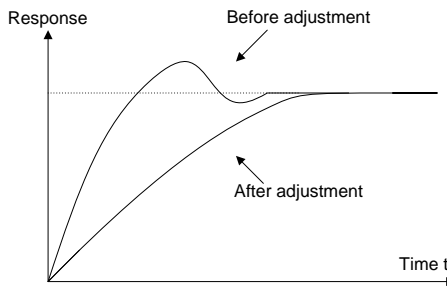
If you need to set  $T_d$  to another value, set in the same way with P and  $T_i$ , namely set  $T_d$  to 30% of the value when there is no oscillation.

d. Empty system load, perform load-carrying joint debugging, and then fine-tune PID parameter until fulfilling the requirement.

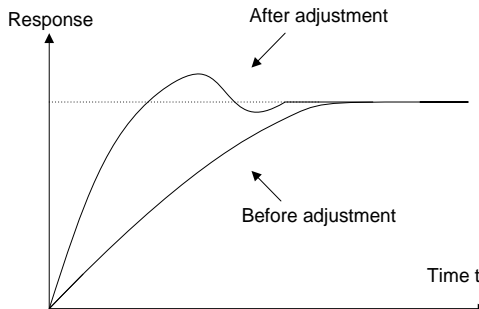
#### 5.5.15.2 PID adjusting methods

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

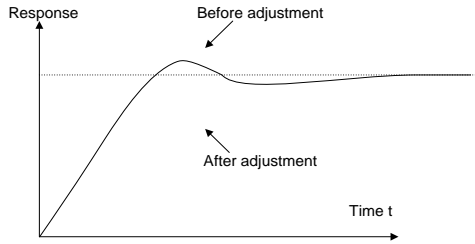
**Control overshoot: When overshoot occurred, shorten the derivative time ( $T_d$ ) and prolong integral time ( $T_i$ ).**



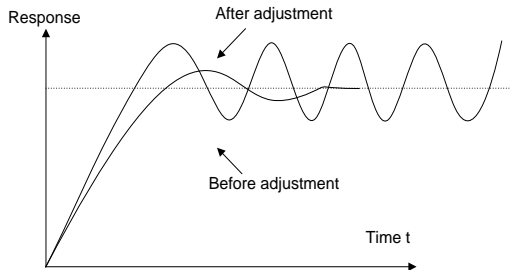
**Stabilize the feedback value as fast as possible:** when overshoot occurred, shorten integral time ( $T_i$ ) and prolong derivative time ( $T_d$ ) to stabilize control as fast as possible.



**Control long-term vibration:** If the cycle of periodic vibration is longer than the set value of integral time ( $T_i$ ), it indicates the integral action is too strong, prolong the integral time ( $T_i$ ) to control vibration.



**Control short-term vibration:** If the vibration cycle is short is almost the same with the set value of derivative time (Td), it indicates derivative action is too strong, shorten the derivative time (Td) to control vibration. When derivative time (Td) is set to 0.00 (namely no derivative control), and there is no way to control vibration, decrease the proportional gain.



Related parameter list:

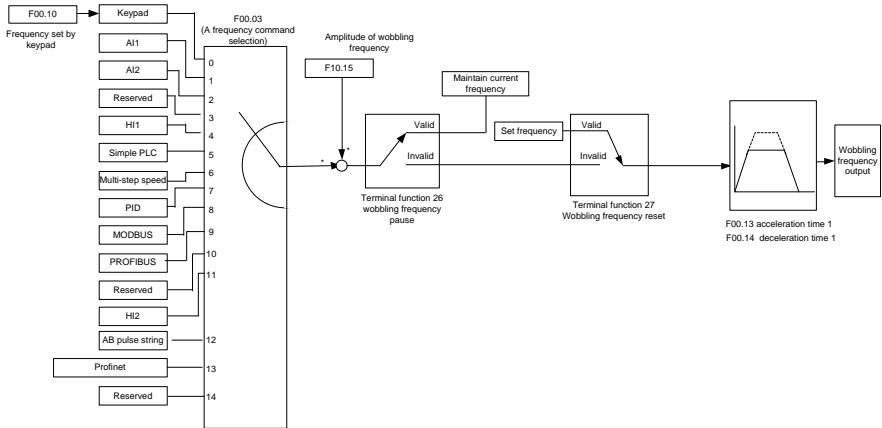
Function code	Name	Description	Default
F11.00	PID reference source	0: Keypad (F011.01) 1: AI1 2: AI2 3: Reserved 4: High-speed pulse HI1 5: Multi-step running 6: Modbus communication 7: Profibus/CANopen communication 8: Reserved 9: High-speed pulse HDIB 10: Profinet communication 11: Reserved 12: Reserved	0

Function code	Name	Description	Default
<u>F11.01</u>	PID reference preset through keypad	-100.0%–100.0%	0.0%
<u>F11.02</u>	PID feedback source	0: AI1 1: AI2 2: Reserved 3: HI2 4: Modbus communication 5: PROFIBUS/CANopen communication 6: Reserved 7: HI2 8: Profinet communication 9: Reserved 10: Reserved.	0
<u>F11.03</u>	PID output characteristics selection	0: PID output is positive characteristic 1: PID output is negative characteristic	0
<u>F11.04</u>	Proportional gain (Kp)	0.00–100.00	1.80
<u>F11.05</u>	Integral time (Ti)	0.01–10.00s	0.90s
<u>F11.06</u>	Differential time (Td)	0.00–10.00s	0.00s
<u>F11.07</u>	Sampling period (T)	0.000–10.000s	0.100s
<u>F11.08</u>	PID control deviation limit	0.0–100.0%	0.0%
<u>F11.09</u>	PID output upper limit	<u>F11.10</u> –100.0% (max. frequency or voltage)	100.0%
<u>F11.10</u>	PID output lower limit	-100.0%– <u>F11.09</u> (max. frequency or voltage)	0.0%
<u>F11.11</u>	Feedback offline detection value	0.0–100.0%	0.0%
<u>F11.12</u>	Feedback offline detection time	0.0–3600.0s	1.0s
<u>F11.13</u>	PID control selection	0x0000–0x1111 Ones: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency	0x0001

Function code	Name	Description	Default
		reaches upper/lower limit Tens: 0: The same with the main reference direction 1: Contrary to the main reference direction Hundreds: 0: Limit based on the max. frequency 1: Limit based on A frequency Thousands: 0: Main+ Auxiliary frequency, acceleration /DEC of main reference frequency source buffering is invalid 1: Main+ Auxiliary frequency, acceleration/ DEC of main reference frequency source buffering is valid, acceleration and DEC are determined by <a href="#">F11.07</a> (acceleration time 4).	
F11.14	Low frequency proportional gain (Kp)	0.00–100.00	1.00
F11.15	ACC/DEC time of PID command	0.0–1000.0s	0.0s
F11.16	PID output filter time	0.000–10.000s	0.000s
F11.17	Reserved	-100.0–100.0%	0.0%
F11.18	Low frequency integral time (Ti)	0.00–10.00s	0.90s
F11.19	Low frequency differential time (Td)	0.00–10.00s	0.00s
F11.20	Low frequency point for PID parameter switching	0.00–F11.21	5.00Hz
F11.21	High frequency point for PID parameter switching	F11.20–F00.04	10.00Hz
<a href="#">F18.00</a>	Set frequency	0.00Hz– (Max. output frequency)	0.00Hz
<a href="#">F18.23</a>	PID reference value	-100.0–100.0%	0.0%
<a href="#">F18.24</a>	PID feedback value	-100.0–100.0%	0.0%

**5.5.16 Running at wobbling frequency**

Wobbling frequency is mainly applied in cases where transverse movement and winding functions are needed like textile and chemical fiber industries. The typical working process is shown as below.



Function code	Name	Description	Default
<u>F00.07</u>	Max. output frequency	-630.00Hz	50.00Hz
F00.03	Main frequency source setting	0: Keypad 1: AI1 2: AI2 3: Reserved 4: High-speed pulse HI1 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus communication 9: Profibus/CANopen communication 10: Reserved 11: High-speed pulse HI2 12: Pulse train AB 13: Profinet communication 14: Reserved 15: Reserved	0
<u>F00.13</u>	ACC time 1	0.0–3600.0s	Model depended
<u>F00.14</u>	DEC time 1	0.0–3600.0s	Model



Function code	Name	Description	Default
			depended
<u>F08.00</u> – <u>F08.05</u>	Digital input function selection	26: Wobbling frequency pause (stop at current frequency) 27: Wobbling frequency reset (revert to center frequency)	
<u>F10.15</u>	Amplitude of wobbling frequency	0.0–100.0% (relative to set frequency)	0.0%
<u>F10.16</u>	Amplitude of jump frequency	0.0–50.0% (relative to amplitude of wobbling frequency)	0.0%
<u>F10.17</u>	Wobbling frequency rise time	0.1–3600.0s	5.0s
<u>F10.18</u>	Wobbling frequency fall time	0.1–3600.0s	5.0s

### 5.5.17 Local encoder input

The VFD supports pulse count function by inputting the count pulse from HI 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
F08.06	HI input type	0x00–0x11 Unit place: HI1 input type 0: High-speed pulse input 1: Digital input Tens place: HI2 input type 0: High-speed pulse input 1: Digital input	0
F08.41	HI1 high-speed pulse input function selection	0: Input set through frequency 1: Reserved 2: Input set through encoder, used together with HI2	0
F08.47	HI2 high-speed pulse input function selection	0: Input set through frequency 1: Reserved 2: Input set through encoder, used	0

Function code	Name	Description	Default
		together with HI1	
<u>F19.00</u>	Actual frequency of encoder	-999.9–3276.7Hz	0.0Hz
<u>F22.22</u>	Speed measurement mode	0: PG card 1: Local; realized by HI1 and HI2; supports incremental 24V encoder only	0

### 5.5.18 Commissioning procedures for closed-loop control

#### 1. Commissioning procedures for closed-loop vector control of asynchronous motor

Step 1: Restore to default value via keypad

Step 2: Set , F00.08 and F01 group motor nameplate parameters

Step 3: Motor parameter autotuning

Carry out rotary parameter autotuning or static parameter autotuning via keypad, if the motor can be disconnected from load, then it is users can carry out rotary parameter autotuning; otherwise, carry out static parameter autotuning, the parameter obtained from autotuning will be saved in F02 motor parameter group automatically.

Step 4: Verify whether the encoder is installed and set properly

a) Confirm the encoder direction and parameter setup

Set F02.01 (encoder pulse-per-revolution), set F00.01=2 and F00.10=20Hz, and run the VFD, at this point, the motor rotates at 20Hz, observe whether the speed measurement value of F19.00 is correct, if the value is negative, it indicates the encoder direction is reversed, under such situation, set F02.02 to 1; if the speed measurement value deviates greatly, it indicates F02.01 is set improperly. Observe whether F19.02 (encoder Z pulse count value) fluctuates, if yes, it indicates the encoder suffers interference or F02.01 is set improperly, requiring users to check the wiring and the shielding layer.

b) Determine Z pulse direction

Set F00.10=20Hz, and set F00.11 (running direction) to forward and reverse direction respectively to observe whether the difference value of F19.01 is less than 5, if the difference value remains to be larger than 5 after setting Z pulse reversal function of F02.02, power off and exchange phase A and phase B of the encoder, and then observe the difference between the value of F19.02 during forward and reverse rotation. Z pulse direction only affects the forward/reverse positioning precision of the spindle positioning carried out with Z pulse.

Step 5: Closed-loop vector pilot-run

Set F00.01=1, and carry out closed-loop vector control, adjust F00.10 and speed loop and current loop PI parameter in F03 group to make it run stably in the whole range.

Step 6: Flux-weakening control

Set flux-weakening regulator gain F03.17=0–8000, and observe the flux-weakening control effect. F03.19–F03.20 can be adjusted as needed.

## 2. Commissioning procedures for closed-loop vector control of synchronous motor

Step 1: Set F17.01=1, restore to default value

Step 2: Set F00.011=1 (FVC), set F00.07, F00.07, and motor nameplate parameters in F01 group.

Step 3: Set F02.01 encoder parameter.

When the encoder is resolver-type encoder, set the encoder pulse count value to (resolver pole pair number × 1024), e.g., if pole pair number is 4, set F02.01 to 4096.

Step 4: Ensure the encoder is installed and set correctly

When motor stops, observe whether F19.21 (resolver angle) fluctuates, if it fluctuates sharply, check the wiring and grounding. Rotates the motor slowly, observe whether F19.21 changes accordingly. If yes, it indicates motor is connected correctly; if the value of F19.02 keeps constant at a non-zero value after rotating for multiple circles, it indicates encoder Z signal is correct.

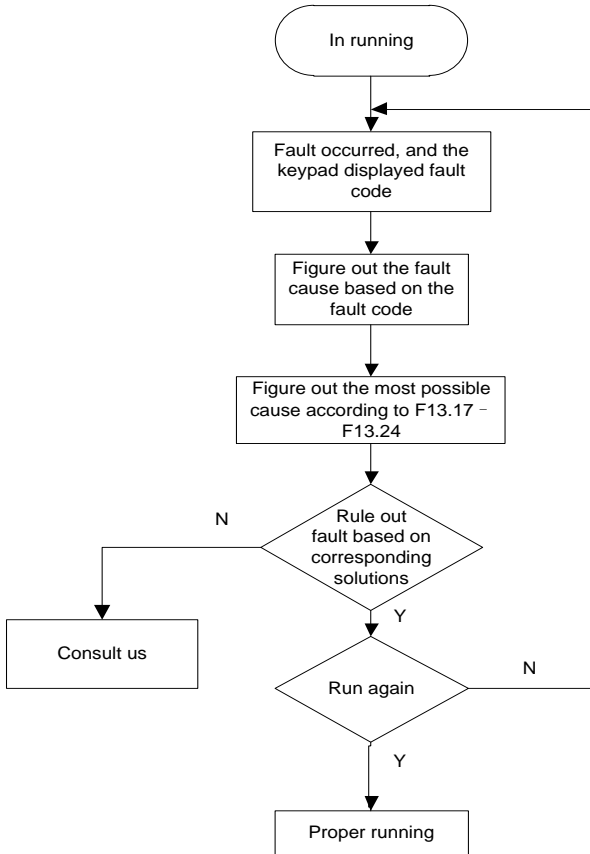
Step 5: Closed-loop vector pilot-run

Adjust F00.10 and speed loop and current loop PI parameter in F03 group to make it run stably in the whole range. If oscillation occurred, reduce the value of F03.00, F03.03, F03.13 and F03.14. If current oscillation noise occurred during low speed, adjust F29.05.

**Note:** It is necessary to re-determine F02.02 (encoder direction) and carry out magnetic pole position autotuning again if the wiring of motor or encoder is changed.

**5.5.19 Fault handling**

The following provides fault handling information.



Related parameter list:

Function code	Name	Description	Default
F13.11	Present fault type	0: No fault	
F13.12	Last fault type	1: Inverter unit U-phase protection	
F13.13	2nd-last fault type	2: Inverter unit V-phase protection	
F13.14	3rd-last fault type	3: Inverter unit W-phase protection	
F13.15	4th-last fault type	4: Overcurrent during acceleration	
F13.16	5th-last fault type	5: Overcurrent during deceleration	

Function code	Name	Description	Default
		6: Overcurrent during constant speed running 7: Overvoltage during acceleration 8: Overvoltage during deceleration 9: Overvoltage during constant speed running 10: Bus undervoltage fault 11: Motor overload 12: VFD overload 13: Phase loss on input side 14: Phase loss on output side 15: Rectifier module overheat 16: Inverter module overheat 17: External fault 18: Modbus communication fault 19: Current detection fault 20: Motor autotuning fault 21: EEPROM operation error 22: PID feedback offline fault 23: Braking unit fault 24: Running time reached 25: Electronic overload 26: Keypad communication error 27: Parameter upload error 28: Parameter download error 29: Profibus communication fault 30: Reserved 31: CANopen communication fault 32: To-ground short-circuit fault 1 33: To-ground short-circuit fault 2 34: Speed deviation fault 35: Mal-adjustment fault 36: Underload fault 37: Encoder disconnection fault 38: Encoder direction reversal fault 39: Encoder Z-pulse disconnection fault 40~43: Reserved 44: Safety code FLASH CRC fault	

Function code	Name	Description	Default
		45~54: Reserved 55: Duplicate extension card type 56: Encoder UVW lost 57: Profinet communication fault 58: CAN communication fault 59: Motor overtemperature fault 60: Failure to identify the card at slot 1 61: Failure to identify the card at slot 2 62: Failure to identify the card at slot 3 63: Communication timeout of the card at slot 1 64: Communication timeout of the card at slot 2 65: Communication timeout of the card at slot 3 66: Reserved 67: Bacnet communication fault 68: Reserved 69: CAN slave fault in master/slave synchronization	
F13.17	Running frequency at present fault	0.00Hz~ <a href="#">F00.07</a>	0.00Hz
F13.18	Ramp reference frequency at present fault	0.00Hz~ <a href="#">F00.07</a>	0.00Hz
F13.19	Output voltage at present fault	0~1200V	0V
F13.20	Output current at present fault	0.0~6300.0A	0.0A
F13.21	Bus voltage at present fault	0.0~2000.0V	0.0V
F13.22	Max. temperature at present fault	-20.0~120.0℃	0.0℃
F13.23	Input terminal status at present fault	0x0000~0xFFFF	0
F13.24	Output current status at present fault	0x0000~0xFFFF	0

Function code	Name	Description	Default
F13.25	Running frequency at last fault	0.00Hz~ <a href="#">F00.07</a>	0.00Hz
F13.26	Ramp reference frequency at last fault	0.00Hz~ <a href="#">F00.07</a>	0.00Hz
F13.27	Output voltage at last fault	0~1200V	0V
F13.28	Output current at last fault	0.0~6300.0A	0.0A
F13.29	Bus voltage at last fault	0.0~2000.0V	0.0V
F13.30	Max. temperature at last fault	-20.0~120.0℃	0.0° C
F13.31	Input terminal status at last fault	0x0000~0xFFFF	0
F13.32	Output terminal status at last fault	0x0000~0xFFFF	0
F13.33	Running frequency at 2nd-last fault	0.00Hz~ <a href="#">F00.07</a>	0.00Hz
F13.34	Ramp reference frequency at 2nd-last fault	0.00Hz~ <a href="#">F00.07</a>	0.00Hz
F13.35	Output voltage at 2nd-last fault	0~1200V	0V
F13.36	Output current at 2nd-last fault	0.0~6300.0A	0.0A
F13.37	Bus voltage at 2nd-last fault	0.0~2000.0V	0.0V
F13.38	Max. temperature at 2nd-last fault	-20.0~120.0℃	0.0° C
F13.39	Input terminal status at 2nd-last fault	0x0000~0xFFFF	0
F13.40	Output terminal status at 2nd-last fault	0x0000~0xFFFF	0
F13.41	Fault output terminal action upon fault occurring	0x00~0x11 Ones: 0: Act at undervoltage 1: Do not act at undervoltage	0x00

Function code	Name	Description	Default
		Tens: 0: Act at fault reset 1: Do not act at fault reset	
F13.42	Frequency drop at transient power-off	0: Disable 1: Enable	0
F13.43	Reserved	0–65535	0
F13.44	Automatic frequency reduction during voltage drop	0–1 0: Invalid 1: Valid	0
F13.45	Pre-alarm selection for VFD/motor OL/UL	0x000–0x1132 Ones: 0: Motor overload/underload pre-alarm, relative to rated motor current; 1: VFD overload/underload pre-alarm, relative to rated VFD current. Tens: 0: The VFD continues running after overload/underload alarm; 1: The VFD continues running after underload alarm, and stops running after overload fault; 2: The VFD continues running after overload alarm, and stops running after underload fault; 3: The VFD stops running after overload/underload fault. Hundreds: 0: Always detect 1: Detect during constant-speed running Thousands: VFD overload current reference selection 0: Related to current calibration coefficient 1: Irrelated to current calibration coefficient	0x000
F13.46	Enabling VFD overload integral	0: Disable 1: Enable	0
F13.47	Overload pre-alarm	<u>F13.49</u> –200%	G type:



Function code	Name	Description	Default
	detection level		150% P type: 120%
F13.48	Overload pre-alarm detection time	0.1~3600.0s	1.0s
F13.49	Underload pre-alarm detection level	0-F13.47	50%
F13.50	Underload pre-alarm detection time	0.1~3600.0s	1.0s
F13.51	Speed deviation detection value	0.0~50.0%	10.0%
F13.52	Speed deviation detection time	0.0~10.0s	2.0s
F13.53	Energy braking for stop	0: Enable 1: Disable	0

## 8 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 F98 group is the analog input and output calibration group, while the F99 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, "F08.08" indicates the 8th function code in the F08 group.

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 function 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, F17.00 is set to a non-zero value), "0.0.0.0.0" is displayed when you press the **ENT** 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 F17.00 to 0 to cancel the user password. When F17.00 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.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F00 group—Basic functions</b>						
F00.00	VFD type	0: G type 1: P type	0~1	0	☉	0.
F00.01	Speed control mode	0: Sensorless vector control (SVC) mode 1: Closed-loop vector control mode 2: Space voltage vector control mode <b>Note:</b> To select 0 or 1 as the control mode, enable the VFD to perform motor parameter autotuning first.	0~2	2	☉	1.
F00.02	Channel of running commands	0: Keypad 1: Terminal 2: Communication	0~2	0	○	2.
F00.03	Main frequency source setting	0: Keypad 1: AI1	0~15	0	○	3.
F00.04	Auxiliary frequency source setting	2: AI2 3: Reserved 4: High-speed pulse HI1 5: Simple PLC program 6: Multi-step speed running 7: PID control 8: Modbus communication 9: Profibus/CANopen communication 10: Reserved 11: High-speed pulse HI2 12: Pulse train AB 13: Profinet communication 14: Reserved 15: Reserved	0~15	15	○	4.
F00.05	Reference object of	0: Max. output frequency	0~1	0	○	5.

Function code	Name	Description	Setting range	Default	Modify	SN
	Auxiliary frequency	1: Main frequency command				
F00.06	Combination mode of setting source	0: Main frequency 1: Auxiliary frequency 2: (Main + Auxiliary) 3: (Main - Auxiliary) 4: Max(Main, Auxiliary) 5: Min. (Main, Auxiliary)	0~5	0	○	6.
F00.07	Max. output frequency	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 (F00.08, 10.00)~630.00Hz	Max (F00.08, 10.00) ~ 630.00	50.00Hz	◎	7.
F00.08	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 the running frequency is used for running. Setting range: F00.09~F00.07 (Max. output frequency)	F00.09~F00.07	50.00Hz	◎	8.
F00.09	Lower limit of running frequency	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. <b>Note:</b> Max. output frequency ≥ Upper limit of frequency ≥ Lower limit of frequency Setting range: 0.00Hz~ (Upper limit of running frequency)	0.00~F00.08	0.00Hz	◎	9.
F00.10	Frequency set through keypad	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: 0.00 Hz~F00.07 (Max. output	0.00~F00.07	50.00Hz	○	10.

Function code	Name	Description	Setting range	Default	Modify	SN																							
		frequency)																											
F00.11	Running direction	0: Run at the default direction. 1: Run at the opposite direction. 2: Disable reverse running	0~2	0	○	11.																							
F00.12	Carrier frequency	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Carrier frequency</th> <th>Electro magnetic noise</th> <th>Noise and leakage current</th> <th>Cooling level</th> </tr> </thead> <tbody> <tr> <td>1kHz</td> <td rowspan="2" style="text-align: center;">↑ High</td> <td rowspan="2" style="text-align: center;">↑ Low</td> <td rowspan="2" style="text-align: center;">↑ Low</td> </tr> <tr> <td>10kHz</td> </tr> <tr> <td>15kHz</td> <td style="text-align: center;">↓ Low</td> <td style="text-align: center;">↓ High</td> <td style="text-align: center;">↓ High</td> </tr> </tbody> </table> <p>The relationship between models and carrier frequencies is as follows:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Model</th> <th>Default carrier frequency</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">380 V</td> <td style="text-align: center;">1.5~11kW</td> <td style="text-align: center;">8kHz</td> </tr> <tr> <td style="text-align: center;">15~55kW</td> <td style="text-align: center;">4kHz</td> </tr> <tr> <td style="text-align: center;">Higher than 75kW</td> <td style="text-align: center;">2kHz</td> </tr> </tbody> </table> <p>Advantage of high carrier frequency: ideal current waveform, little current harmonic wave 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 a 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</p>	Carrier frequency	Electro magnetic noise	Noise and leakage current	Cooling level	1kHz	↑ High	↑ Low	↑ Low	10kHz	15kHz	↓ Low	↓ High	↓ High	Model		Default carrier frequency	380 V	1.5~11kW	8kHz	15~55kW	4kHz	Higher than 75kW	2kHz	1.0~15.0	Model depended	○	12.
Carrier frequency	Electro magnetic noise	Noise and leakage current	Cooling level																										
1kHz	↑ High	↑ Low	↑ Low																										
10kHz																													
15kHz	↓ Low	↓ High	↓ High																										
Model		Default carrier frequency																											
380 V	1.5~11kW	8kHz																											
	15~55kW	4kHz																											
	Higher than 75kW	2kHz																											

Function code	Name	Description	Setting range	Default	Modify	SN
		10% for each increase of 1k carrier frequency. Setting range: 1.2–15.0kHz				
F00.13	ACC time 1	ACC time means the time needed if the VFD speeds up from 0Hz to the max. output frequency (F00.17).	0.0~3600.0	Model depended	○	13.
F00.14	DEC time 1	DEC time means the time needed if the VFD speeds down from the max. output frequency (F00.17) to 0Hz. The VFD has four groups of ACC/DEC time, which can be selected by F10 group. The factory default ACC/DEC time of the VFD is the first group. Setting range of F00.13 and F00.14: 0.0–3600.0s	0.0~3600.0	Model depended	○	14.
F00.15	Frequency resolution	0~1 0: 0.01HZ 1: 0.1HZ	0~1	0	○	15.
F00.16	Setting frequency action selection in case of power failure	0x000~0x111 Ones: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off. 1: Clear the setting at power-off. Tens: 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: 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..	0x000~0x111	0x000	○	16.
F00.17	Acceleration and deceleration time reference frequency	0: Max. output frequency 1: Setting frequency 2: 100Hz Note: only valid for linear acceleration and deceleration	0~2	0	◎	17.

Function code	Name	Description	Setting range	Default	Modify	SN
<u>F00.18</u>	Communication mode of running commands	0: Modbus 1: Profibus/CANopen 2: Reserved 3: Profinet 4: Reserved 5: Reserved Note: 1, 2, 3, 4 and 5 are extended functions, which can only be used after inserting the extension card	0~5	0	○	18.
F00.19	SVC mode selction	0: Mode 0 1: Mode 1	0~1	0	○	19.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F01 group—Parameters of motor 1</b>						
F01.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0~1	0	◎	20.
F01.01	Rated power of AM 1	0.1~3000.0kW	0.1~3000.0	Model depended	◎	21.
F01.02	Rated voltage of AM 1	0~1200V	0~1200	Model depended	◎	22.
F01.03	Rated current of AM 1	0.8~6000.0A	0.8~6000.0	Model depended	◎	23.
F01.04	Rated frequency of AM 1	0.01Hz~ <u>F00.03</u> (Max. output frequency)	0.01~F00.07	50.00Hz	◎	24.
F01.05	Rated speed of AM 1	1~60000rpm	1~60000	Model depended	◎	25.
F01.06	Stator resistance of AM 1	0.001~65.535Ω	0.001~65.535	Model depended	○	26.
F01.07	Rotor resistance of AM 1	0.001~65.535Ω	0.001~65.535	Model depended	○	27.
F01.08	Leakage inductance of AM 1	0.1~6553.5mH	0.1~6553.5	Model depended	○	28.
F01.09	Mutual inductance of AM 1	0.1~6553.5mH	0.1~6553.5	Model depended	○	29.
F01.10	No-load current of	0.1~6553.5A	0.1~6553.5	Model	○	30.

Function code	Name	Description	Setting range	Default	Modify	SN
	AM 1			depended		
F01.11	Magnetic saturation coefficient 1 of iron core of AM 1	0.0~100.0%	0.0~100.0	80.0%	○	31.
F01.12	Magnetic saturation coefficient 2 of iron core of AM 1	0.0~100.0%	0.0~100.0	68.0%	○	32.
F01.13	Magnetic saturation coefficient 3 of iron core of AM 1	0.0~100.0%	0.0~100.0	57.0%	○	33.
F01.14	Magnetic saturation coefficient 4 of iron core of AM 1	0.0~100.0%	0.0~100.0	40.0%	○	34.
F01.15	Rated power of SM 1	0.1~3000.0kW	0.1~3000.0	Model depended	◎	35.
F01.16	Rated voltage of SM 1	0~1200V	1~1200	Model depended	◎	36.
F01.17	Rated current of SM 1	0.8~6000.0A	0.8~6000.0	Model depended	◎	37.
F01.18	Rated frequency of SM 1	0.01Hz~ <u>F00.07</u> (Max. output frequency)	0.00~F00.07	50.00Hz	◎	38.
F01.19	Number of pole pairs of SM 1	1~128	1~128	2	◎	39.
F01.20	Stator resistance of SM	0.001~65.535Ω	0.001~65.535	Model depended	○	40.
F01.21	Direct-axis inductance of SM	0.01~655.35mH	0.01~655.35	Model depended	○	41.
F01.22	Quadrature-axis inductance of SM	0.01~655.35mH	0.01~655.35	Model depended	○	42.
F01.23	Counter-emf of SM	0~10000 0909	0~10000	300	○	43.
F01.24	Reserved	0~65535	0~65535	0	●	44.
F01.25	Identification current of synchronous motor	0%~50% (of the motor rated current)	0~50	10%	●	45.
F01.26	Motor parameter	0: Displayed by motor type	0~1	0	○	46.



Function code	Name	Description	Setting range	Default	Modify	SN
	display selection	1: Display all				
F01.27	Inertia of motor system	0~30.000kgm <sup>2</sup>	0~30.000	0.000	○	47.
F01.28	Motor parameter autotuning	0: No operation 1: Rotation autotuning Comprehensive motor parameter autotune It is recommended to use rotation autotuning when high control accuracy is needed. 2: Static autotuning 1 It is suitable in the cases when the motor cannot de-couple from the load. 3: Static autotuning 2 It is suitable in the cases when the motor cannot de-couple form the load. But only for parts of parameters.	0~3	0	◎	48.
F01.29	Reserved	0~65535	0~65535	0	○	49.
F01.30	Reserved	0~65535	0~65535	0	○	50.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F02 group—Encoder of motor 1</b>						
F02.00	Encoder type display	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder	0~65535	0	●	51.
F02.01	Encoder pulse number	Number of pulses generated when the encoder revolves for one circle. Setting range: 0~60000	0~60000	1024	◎	52.
F02.02	Encoder direction	Ones place: AB direction 0: Forward 1: Reverse Tens place: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds: CD/UVW pole signal direction	0~0x111	0x000	◎	53.

Function code	Name	Description	Setting range	Default	Modify	SN
		0: Forward 1: Reverse				
F02.03	Detection time of encoder offline fault	Detection time of encoder offline fault. Setting range: 0.0–10.0s	0.0~10.0	2.0s	○	54.
F02.04	Detection time of encoder reversal fault	Detection time of encoder reversal fault. Setting range: 0.0–100.0s	0.0~100.0	0.8s	○	55.
F02.05	Filter times of encoder detection	Setting range: 0x00–0x99 Ones place: Low-speed filter time, corresponds to $2^{(0-9)} \times 125\mu\text{s}$ . Tens place: High-speed filter times, corresponds to $2^{(0-9)} \times 125\mu\text{s}$ .	0~0x99	0x33	○	56.
F02.06	Speed ratio between encoder mounting shaft and motor	You need to set the function code when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.001–65.535	0~65.535	1.000	○	57.
F02.07	Control parameters of SM	Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Reserved Bit4: Reserved Bit5: Reserved Bit6: Enable CD signal calibration Bit7: Reserved Bit8: Do not detect encoder fault during autotuning Bit9: Enable Z pulse detection optimization Bit10: Enable initial Z pulse calibration optimization Bit12: Clear Z pulse arrival signal after stop	0x0000–0xFFFF	0x0003	○	58.
F02.08	Enabling Z pulse offline detection	0x00–0x11 Ones place: Z pulse 0: Do not detect 1: Enable Tens place: UVW pulse (for SM) 0: Do not detect 1: Enable	0x00~0x11	0x10	○	59.

Function code	Name	Description	Setting range	Default	Modify	SN
F02.09	Initial angle of Z pulse	Relative electric angle of encoder Z pulse and motor pole position. Setting range: 0.00–359.99	0~359.99	0.00	○	60.
F02.10	Initial angle of the pole	Relative electric angle of encoder position and motor pole position. Setting range: 0.00–359.99	0~359.99	0.00	○	61.
F02.11	Autotuning of initial angle of pole	0–3 1: Rotary autotuning (DC brake) 2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning (initial angle identification)	0~3	0	◎	62.
F02.12	Speed measurement optimization selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	0~2	1	◎	63.
F02.13	CD signal zero offset gain	0–65535	0~65535	0	○	64.
F02.14	Encoder type selection	Ones place: Incremental encoder 0: without UVW 1: with UVW Tens place: Sin/Cos encoder 0: without CD signal 1: with CD signal	0x00~0x11	0x00	◎	65.
F02.15	Speed measurement mode	0: PG card 1: local; realized by HI1 and HI2; supports incremental 24V encoder only	0~1	0	◎	66.
F02.16	Frequency division coefficient	0–255 When the function code is set to 0 or 1, frequency division of 1:1 is implemented.	0~255	0	○	67.
F02.17	Pulse filter handling selection	0x0000–0xffff Bit0: Enable/disable encoder input filter 0: No filter 1: Filter Bit1: Encoder signal filter mode 0: Self-adaptive filter 1: Use <u>F02.18</u> filter parameter	0x0000~0xFFFF	0x0033	○	68.

Function code	Name	Description	Setting range	Default	Modify	SN
		Bit2: Enable/disable encoder frequency-division output filter 0: No filter 1: Filter Bit3: Reserved Bit4: Enable/disable pulse reference filter 0: No filter 1: Filter Bit5: Pulse reference filter mode (valid when Bit4 is set to 1) 0: Self-adaptive filter 1: Use <u>F02.19</u> filter parameter Bit6: Frequency-divided output source setting 0: Encoder signals 1: Pulse reference signals Bits7–15: Reserved				
F02.18	Encoder pulse filter width	0–63 The filtering time is <u>F02.18</u> *0.25μs. The value 0 or 1 indicates 0.25μs.	0~63	2	○	69.
F02.19	Pulse reference filter width	0–63 The filtering time is <u>F02.19</u> *0.25 μs. The value 0 or 1 indicates 0.25 μs.	0~63	2	○	70.
F02.20	Pulse number of pulse reference	0–65535	0~65535	1024	◎	71.
F02.21	Enable angle compensation of SM 1	0–1	0~1	0	○	72.
F02.22	Switchover frequency threshold of speed measurement mode	0–630.00Hz <b>Note:</b> Valid only when <u>F02.12</u> =0	0~630.00	1.00Hz	○	73.
F02.23	SM 1 angle compensation coefficient	-200.0–200.0%	-200.0~200.0	100.0	○	74.
F02.24	SM 1 pole pairs of initial angle auto tune	0~128	0~128	2	◎	75.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F03 group—Vector control of motor 1</b>						
F03.00	Speed-loop proportional gain 1	<p>The parameters <u>F03.00</u>–<u>F03.05</u> are applicable only to vector control mode. Below the switching frequency 1 (<u>F03.02</u>), the speed-loop PI parameters are: <u>F03.00</u> and <u>F03.01</u>. Above the switching frequency 2 (<u>F03.05</u>), the speed-loop PI parameters are: <u>F03.03</u> and <u>F03.04</u>. PI parameters are obtained according to the linear change of two groups of parameters. Refer to the following figure:</p> <p>▲ PI parameter  <u>F03.00</u>, <u>F03.01</u>  <u>F03.03</u>, <u>F03.04</u>                      Output frequency f  <u>F03.02</u> <u>F03.05</u></p> <p>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.</p> <p>PI parameters have a close relationship with the inertia of the system. Adjust PI parameters depending on different loads to meet various demands.</p> <p>Setting range of <u>F03.00</u>: 0.0–200.0                      Setting range of <u>F03.01</u>: 0.000–10.000s                      Setting range of <u>F03.02</u>: 0.00Hz–<u>F03.05</u></p>	0~200.0	20.0	○	76.
F03.01	Speed-loop integral time 1		0.000~10.000	0.200s	○	77.
F03.02	Low-point frequency for switching		0.00~ <u>F03.05</u>	5.00Hz	○	78.
F03.03	Speed-loop proportional gain 2		0~200.0	20.0	○	79.
F03.04	Speed-loop integral time 2		0.000~10.000	0.200s	○	80.
F03.05	High-point frequency for switching	<p>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.</p> <p>PI parameters have a close relationship with the inertia of the system. Adjust PI parameters depending on different loads to meet various demands.</p> <p>Setting range of <u>F03.00</u>: 0.0–200.0                      Setting range of <u>F03.01</u>: 0.000–10.000s                      Setting range of <u>F03.02</u>: 0.00Hz–<u>F03.05</u></p>	<u>F03.02</u> ~ <u>F03.07</u>	10.00Hz	○	81.

Function code	Name	Description	Setting range	Default	Modify	SN
		Setting range of <u>F03.03</u> : 0.0–200.0 Setting range of <u>F03.04</u> : 0.000–10.000s Setting range of <u>F03.05</u> : <u>F03.02</u> – <u>F00.03</u> (Max. output frequency)				
F03.06	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.	50~200	100%	<input type="radio"/>	82.
F03.05	Power-generation slip compensation coefficient of vector control	Setting range: 50–200%	50~200	100%	<input type="radio"/>	83.
F03.08	Speed-loop output filter	0–8 (corresponding to 0–2 <sup>8</sup> /10ms)	0~8	0	<input type="radio"/>	84.
F03.09	Setting source of electromotive torque upper limit	0: Keypad ( <u>F03.10</u> ) 1: AI1 (100% corresponding to three times the motor rated current) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HI1 (same as the above) 5: Modbus communication (same as the above) 6: Profibus/CANopen communication (same as the above) 7: Reserved 8: Pulse frequency HI2 (same as the above) 9: Profinet communication 10: Reserved 11: Reserved	0~11	0	<input type="radio"/>	85.
F03.10	Electromotive torque upper limit set through keypad	The function codes are used to set torque limits. Setting range: 0.0–300.0% (of the motor rated current)	0.0~300.0	180.0%	<input type="radio"/>	86.
F03.11	Setting source of braking torque upper limit	0: Keypad ( <u>F03.10</u> ) 1: AI1 (100% corresponding to three times the motor rated current) 2: AI2 (same as the above)	0~11	0	<input type="radio"/>	87.

Function code	Name	Description	Setting range	Default	Modify	SN
		3: Reserved 4: Pulse frequency HI1 (same as the above) 5: Modbus communication (same as the above) 6: Profibus/CANopen communication (same as the above) 7: Reserved 8: Pulse frequency HI2 (same as the above) 9: Profinet communication 10: Reserved 11: Reserved				
F03.12	Braking torque upper limit set through keypad	The function codes are used to set torque limits. Setting range: 0.0~300.0% (of the motor rated current)	0.0~300.0	180.0%	<input type="radio"/>	88.
F03.13	Current-loop proportional coefficient P	<b>Note:</b> ● 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. ● Applicable to SVC mode 0 (F00.19=0), SVC mode 1( F00.19=1), and closed-loop vector control mode (F00.01=1). Setting range: 0~65535	0~65535	1000	<input type="radio"/>	89.
F03.14	Current-loop integral coefficient I	● Applicable to SVC mode 0 (F00.19=0), SVC mode 1( F00.19=1), and closed-loop vector control mode (F00.01=1). Setting range: 0~65535	0~65535	1000	<input type="radio"/>	90.
F03.15	PM flux-weakening control selection	0: Disable 1: Enable	0~1	0	<input type="radio"/>	91.
F03.16	Flux-weakening voltage limit(PM and AM SVC 0)	Set the max output voltage(percentage of motor rated voltage), set as per actual. Setting range: 0.0~120.0%	0.0~120.0	100.0%	<input type="radio"/>	92.
F03.17	Flux-weakening proportional coefficient P		0~8000	1000	<input type="radio"/>	93.
F0.18	Flux-weakening integral coefficient I		0~8000	1200	<input type="radio"/>	94.
F03.19	Weakening coefficient	Used when the AM is in flux-weakening control.	0.1~2.0	0.3	<input type="radio"/>	95.

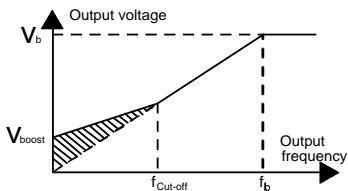
Function code	Name	Description	Setting range	Default	Modify	SN
F03.20	Lowest weakening point (AM SVC 1)	<p>The function codes <u>F03.19</u> and <u>F03.20</u> are valid at constant power. The motor enters the flux-weakening state when the motor runs above the rated speed. Change the flux-weakening curvature by modifying the flux-weakening control coefficient. The larger the coefficient, the steeper the curve, the smaller the coefficient, the smoother the curve.</p> <p>Setting range of <u>F03.19</u>: 0.1–2.0 Setting range of <u>F03.20</u>: 10%–100%</p>	10~100	20%	<input type="radio"/>	96.
F03.21	Speed display selection in vector control	0: Display the actual value 1: Display the set value	0~1	0	<input type="radio"/>	97.
F03.22	Static friction compensation coefficient	0.0~100.0%	0.0~100.0	0.0%	<input type="radio"/>	98.
F03.23	Corresponding frequency point of static friction	0.50~ <u>F03.25</u>	0.50~ <u>F03.25</u>	1.00Hz	<input type="radio"/>	99.
F03.24	High speed friction compensation coefficient	0.0~100.0%	0.0~100.0	0.0%	<input type="radio"/>	100.
F03.25	Corresponding frequency of high speed friction torque	<u>F03.23</u> ~ <u>F00.07</u> (Max frequency)	<u>F03.23</u> ~Ma x frequency( <u>F00.07</u> )	50.00Hz	<input type="radio"/>	101.
F03.26	Enabling inertia compensation	0: Disable 1: Enable	0~1	0	<input type="radio"/>	102.



Function code	Name	Description	Setting range	Default	Modify	SN
F03.27	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)	0~150.0%	10.0%	○	103.
F03.28	Inertia compensation filter times	Filter times of inertia compensation torque, used to smooth inertia compensation torque. Setting range: 0–10	0~10	7	○	104.
F03.29	Inertia identification torque value	Due to friction force, it is required to set certain identification torque for the inertia identification to be performed properly. Setting range: 0.0–100.0% (of the motor rated torque)	0~100.0%	10.0%	○	105.
F03.30	Enabling inertia identification	0: No operation 1: Enable	0~1	0	◎	106.
F03.31	Control optimization setting	0–0x1111 Ones place: Torque command selection 0: Torque reference 1: Torque current reference 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	0x0000–0x1111	0x0000	○	107.
F03.32	Speed-loop differential gain	0.00–10.00s	0.00~10.00	0.00s	○	108.
F03.33	High-frequency current-loop proportional coefficient	In the closed-loop vector control mode ( <u>F00.01</u> =1), when the frequency is lower than the current-loop high-frequency switching threshold ( <u>F03.35</u> ), the current-loop PI	0~65535	1000	○	109.
F03.34	High-frequency	parameters are <u>F03.13</u> and <u>F03.14</u> ; and	0~65535	1000	○	110.

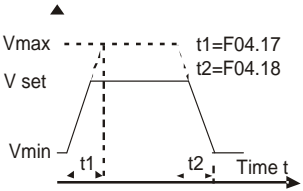
Function code	Name	Description	Setting range	Default	Modify	SN
	current-loop integral coefficient	when the frequency is higher than the current-loop high-frequency switching threshold (F03.35), the current-loop PI parameters are F03.33 and F03.34.				
F03.35	Current-loop high-frequency switching threshold	Setting range of F03.33: 0~65535 Setting range of F03.34: 0~65535 Setting range of F03.35: 0.0~100.0% (of the maximum frequency)	0~100.0%	100.0%	○	111.
F03.36	SM injection current drop rate	Setting range: 0.0%~100.0% (of the motor rated current)	0.0%~100.0%	80.0%	○	112.
F03.37	Injection current 1	Setting range: 0.0%~100.0% (of the motor rated current)	-100.0%~100.0%	20.0%	○	113.
F03.38	Injection current 2	Setting range: 0.0%~100.0% (of the motor rated current)	-100.0%~100.0%	10.0%	○	114.
F03.39	Injection current switchover frequency	0.00Hz~F00.03 (Max. output frequency)	0.00Hz~F00.07	10.00 Hz	○	115.
F03.40	Sto detection time	Setting range: 0.0~10.0s	0.0~10.0	0.5s	○	116.
F03.41	High-frequency compensation coefficient of SM	Setting range: 0.0~100.0%	0~100.0%	0.0	○	117.
F03.42	Current loop proportion coefficient obtained by auto tune	F03.42 will update after motor auto tune. This value can be set to F03.13 manually for PM VC control. Setting range: 0~65535 Note: if not perform the motor auto tune, it is 0	0~65535	0	○	118.
F03.43	Current loop integral coefficient obtained by auto tune	F03.43 will update after motor auto tune. This value can be set to F03.14 manually for PM VC control. Setting range: 0~65535 Note: if not perform the motor auto tune, it is 0	0~65535	0	○	119.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F04 group—V/F control</b>						
F04.00	V/F curve setting	<p>This group of function code defines the V/F curve to meet the needs of different loads.</p> <p>0: Straight-line V/F curve, applicable to constant torque loads</p> <p>1: Multi-point V/F curve</p> <p>2: Torque-down V/F curve (power of 1.3)</p> <p>3: Torque-down V/F curve (power of 1.7)</p> <p>4: Torque-down V/F curve (power of 2.0)</p> <p>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.</p> <p>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 <u>F00.03</u> or the voltage setting channel set by <u>F04.15</u> to change the characteristics of the curve.</p> <p><b>Note: In the following figure, <math>V_b</math> is the motor rated voltage and <math>f_b</math> is the motor rated frequency.</b></p>	0~5	0	Ⓢ	120.
F04.01	Torque boost	In order to compensate for low-frequency torque characteristics, you can make some boost compensation for the output voltage.	0.0~10.0	0.0%	○	121.
F04.02	Torque boost cut-off	<p><u>F04.01</u> is relative to the maximum output voltage <math>V_b</math>.</p> <p><u>F04.02</u> defines the percentage of cut-off frequency of manual torque boost to the rated</p>	0.0~50.0	20.0%	○	122.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>motor frequency <math>f_b</math>. Torque boost can improve the low-frequency torque characteristics of V/F.</p> <p>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.</p> <p>When torque boost is set to 0.0%, the VFD uses automatic torque boost.</p> <p>Torque boost cut-off threshold: Below this frequency threshold, torque boost is valid; exceeding this threshold will invalidate torque boost.</p>  <p>Setting range of <u>F04.01</u>: 0.0%: (automatic); 0.1%–10.0%                      Setting range of <u>F04.02</u>: 0.0%–50.0%</p>				
F04.03	V/F frequency point 1	When <u>F04.00</u> =1 (multi-dot V/F curve), you can set the V/F curve through <u>F04.03</u> – <u>F04.10</u> .	0.00~F04.05	0.00Hz	○	123.
F04.04	V/F voltage point 1		0.0~110.0	00.0%	○	124.
F04.05	V/F frequency point 2	The V/F curve is generally set according to the load characteristics of the motor. <b>Note:</b> $V_1 < V_2 < V_3 < V_4$ , $f_1 < f_2 < f_3 < f_4$ . Too high voltage for low frequency will cause motor overheat or damage and cause VFD overcurrent stall or overcurrent protection.	F04.03~F04.07	0.00Hz	○	125.
F04.06	V/F voltage point 2		0.0~110.0	0.0%	○	126.
F04.07	V/F frequency point		F04.05~F04.09	0.00Hz	○	127.

Function code	Name	Description	Setting range	Default	Modify	SN
	3	 <p>Setting range of <u>F04.03</u>: 0.00Hz–<u>F04.05</u>                      Setting range of <u>F04.04</u>: 0.0%–110.0% (of the rated voltage of motor 1)                      Setting range of <u>F04.05</u>: <u>F04.03</u>–<u>F04.07</u>                      Setting range of <u>F04.06</u>: 0.0%–110.0% (of the rated voltage of motor 1)                      Setting range of <u>F04.07</u>: <u>F04.05</u>–<u>F02.02</u> (rated frequency of AM 1) or <u>F04.05</u>–<u>F02.16</u> (rated frequency of SM 1)                      Setting range of <u>F04.08</u>: 0.0%–110.0% (of the motor rated voltage of motor 1)</p>				
F04.08	V/F voltage point 3		0.0~110.0	00.0%	○	128.
F04.09	V/F frequency point 4		F04.05~Motor 1 rated frequency	0.00Hz	○	129.
F04.10	V/F voltage point 4		0.0~110.0	00.0%	○	130.
F04.11	Low-frequency oscillation control factor 1	In space voltage vector control mode, the motor, especially the large-power motor, may experience current oscillation at certain frequencies, which may cause unstable motor running, or even VFD overcurrent. You can adjust the two function codes properly to eliminate such phenomenon.	0~100	10	○	131.
F04.12	High-frequency oscillation control factor 2		0~100	10	○	132.
F04.13	Oscillation control threshold	Setting range of <u>F04.10</u> : 0~100 Setting range of : 0~100 Setting range of <u>F04.12</u> : 0.00Hz– <u>F00.03</u> (Max. output frequency)	0.00Hz~F0.07	30.00 Hz	○	133.
F04.14	V/F slip compensation gain	The function code is used to compensate for the motor rotating speed change caused by load change in the space voltage vector mode, and thus improve the rigidity of the mechanical characteristics of the motor. You need to calculate the rated slip frequency of the motor as follows: $\Delta f = f_b - n \cdot p / 60$	0.0~200.0	100.0%	○	134.

Function code	Name	Description	Setting range	Default	Modify	SN
		Of which, $f_b$ is the rated frequency of motor 1, corresponding to function code <u>F01.04</u> . $n$ is the rated rotating speed of motor 1, corresponding to function code <u>F01.05</u> . $p$ is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency $\Delta f$ of motor 1. Setting range: 0.0–200.0%				
F04.15	Voltage setting channel of customized V/F	0: Keypad (The output voltage is determined by <u>F04.16</u> ) 1: AI1 2: AI2 3: Reserved 4: HI1 5: Multi-step speed running (The setting is determined by group F12.) 6: PID 7: Modbus communication 8: Profibus/CANopen communication 9: Ethernet communication 10: HI2 11: Profinet communication 12: Reserved 13: Reserved	0~13	0	○	135.
F04.16	Voltage set through keypad	Setting range: 0.0% –100.0%	0.0~100.0	100.0%	○	136.
F04.17	Voltage increase time	Voltage increase time means the time needed for the VFD to accelerate from min. output voltage to the max. output frequency.	0.0~3600.0	5.0s	○	137.
F04.18	Voltage decrease time	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	0.0~3600.0	5.0s	○	138.
F04.19	Max. output voltage	The function codes are used to set the upper and lower limits of output voltage.	F04.20~10 0.0	100.0%	◎	139.
F04.20	Min. output voltage		0.0~ F04.19	0.0%	◎	140.

Function code	Name	Description	Setting range	Default	Modify	SN
		 <p>Setting range of <u>F04.19</u>: <u>F04.20</u>–100.0% (of the motor rated voltage) Setting range of <u>F04.20</u>: 0.0%–<u>F04.19</u></p>				
F04.21	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.	0~1	0	☉	141.
F04.22	Weakening coefficient in constant power zone	1.00~1.30	1.00~1.30	1.00	○	142.
F04.23	Enabling IF mode for AM 1	0: Disable 1: Enable	0~1	0	☉	143.
F04.24	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%	0.0~200.0%	120.0%	○	144.
F04.25	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	0~5000	350	○	145.
F04.26	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	0~5000	150	○	146.
F04.27	Frequency threshold for	0.00~ F04.28	0.00~F04.28	10.00Hz	○	147.

Function code	Name	Description	Setting range	Default	Modify	SN
	switching off IF mode for AM 1					
F04.28	End frequency point for switching off IF mode for AM 1	F04.27–F00.07	F04.27–Max frequency (F00.07)	25.00Hz	○	148.
F04.29	Injection current 1 in SM V/F control	When the SM V/F 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 <u>F04.31</u> . Setting range: -100.0%–100.0% (of the motor rated current)	-100.0%~100.0%	20.0%	○	149.
F04.30	Injection current 2 in SM V/F control	When the SM V/F 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 <u>F04.31</u> . Setting range: -100.0%–100.0% (of the motor rated current)	-100.0%~100.0%	10.0%	○	150.
F04.31	Frequency threshold for Injection 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– <u>F00.07</u> (Max. output frequency)	0.00Hz~F00.07	50.00 Hz	○	151.
F04.32	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	0~3000	50	○	152.
F04.33	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	0~3000	30	○	153.
F04.34	Reactive current closed-loop output	When the SM V/F control mode is enabled, the function code is used to set the output	0~16000	8000	○	154.

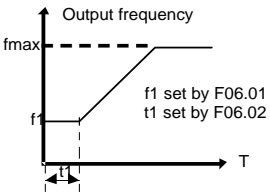


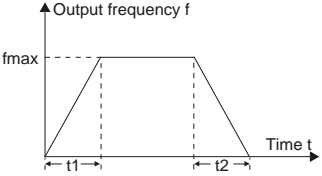
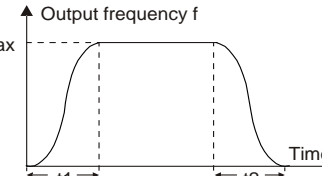
Function code	Name	Description	Setting range	Default	Modify	SN
	limit in SM V/F control	limit of the reactive current closed-loop control. A greater value indicates a higher reactive closed-loop compensation voltage and higher output power of the motor. In general, you do not need to modify the function code. Setting range: 0~16000				

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F05 group—Torque control</b>						
F05.00	Enabling torque control	0: Disable 1: Enable	0~1	0	☉	155.
F05.01	Torque setting method	0~1: Keypad (F05.02) 2: AI1 (100% corresponding to three times the motor rated current) 3: AI2 (same as the above) 4: Reserved 5: Pulse frequency HI1 (same as the above) 6: Multi-step torque (same as the above) 7: Modbus communication (same as the above) 8: Profibus/CANopen communication (same as the above) 9: Reserved 10: Pulse frequency HI2(same as the above) 11: Profinet communication 12: Reserved	0~12	0	○	156.
F05.02	Torque set through keypad	-300.0%~300.0% (of the motor rated current)	-300.0~300.0	20.0%	○	157.
F05.03	Torque reference filter time	0.000~10.000s	0.000~10.000s	0.010s	○	158.
F05.04	Setting source of forward rotation upper-limit frequency in torque	0: Keypad (F05.05) 1: AI1 (100% corresponding to the max. frequency) 2: AI2 (same as the above)	0~12	0	○	159.

Function code	Name	Description	Setting range	Default	Modify	SN
	control	3: Reserved 4: Pulse frequency HIA1(same as the above) 5: Multi-step setting (same as the above) 6: Modbus communication(same as the above) 7: Profibus/CANopen communication (same as the above) 8: Reserved 9: Pulse frequency HI2 (same as the above) 10: Profinet communication 11: Reserved 12: Reserved				
F05.05	Forward rotation upper-limit frequency set through keypad in torque control	Setting range: 0.00Hz- <u>P00.07</u> (Max. output frequency) The function codes are used to set the frequency upper limits.	0.00-F00.0 7	50.00 Hz	○	160.
F05.06	Setting source of reverse rotation upper-limit frequency in torque control	0: Keypad ( <u>F05.05</u> ) 1: AI1 (100% corresponding to the max. frequency) 2: AI2 (same as the above) 3: Reserved 4: Pulse frequency HIA1(same as the above) 5: Multi-step setting (same as the above) 6: Modbus communication(same as the above) 7: Profibus/CANopen communication (same as the above) 8: Reserved 9: Pulse frequency HI2 (same as the above) 10: Profinet communication 11: Reserved	0~12	0	○	161.
F05.07	Reverse rotation upper-limit frequency set through keypad in torque control	Setting range: 0.00Hz- <u>P00.07</u> (Max. output frequency) The function codes are used to set the frequency upper limits.	0.00-F00.0 7	50.00Hz	○	162.

Function code	Name	Description	Setting range	Default	Modify	SN
F05.08	Upper limit frequency bias value in torque control	0.00 Hz~P00.07(Max. output frequency) <b>Note:</b> Valid only for torque control.	0.00~F00.07	0.00Hz	○	163.
F05.09	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	0~4	0	○	164.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F06 group—Start and stop control</b>						
F06.00	Start mode	0: Direct start 1: Start after DC braking 2: Speed tracking restart 1	0~2	0	◎	165.
F06.01	Starting frequency of direct start	The function code indicates the initial frequency during VFD start. Refer to <a href="#">F06.02</a> (Starting frequency hold time) for detailed information. Setting range: 0.00~50.00Hz	0.00~50.00	0.50Hz	◎	166.
F06.02	Starting frequency hold time	 <p>Setting a proper starting frequency can increase the torque during VFD start. During the hold time of the starting frequency, the output frequency of the VFD is the starting frequency. And then, the VFD runs from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the VFD stops running and keeps in the standby state. The starting frequency is</p>	0.0~50.0	0.0s	◎	167.

Function code	Name	Description	Setting range	Default	Modify	SN
		not limited in the lower limit frequency. Setting range: 0.0–50.0s				
F06.03	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.	0.0~100.0	0.0%	☉	168.
F06.04	Braking time before start	Stronger braking current indicates larger braking power. The DC braking current before start is a percentage of the VFD rated current. Setting range of <u>F06.03</u> : 0.0–100.0% Setting range of <u>F06.04</u> : 0.00–50.00s	0.00~50.00	0.00s	☉	169.
F06.05	Pre excitation time	0.000~10.000s	0.000~10.000s	0.300s	○	170.
F06.06	ACC and DEC mode	<p>The function code indicates the changing mode of the frequency during start and running.</p> <p>0: Linear type. The output frequency increases or decreases linearly.</p>  <p>1: S curve. The output frequency increases or decreases according to the S curve.</p> <p>The S curve is generally applied to elevators, conveyors, and other application scenarios where smoother start or stop is required.</p>  <p><b>Note:</b> If mode 1 is selected, set <u>F06.07</u>,</p>	0~1	0	☉	171.

Function code	Name	Description	Setting range	Default	Modify	SN
		F06.08, F06.09, and F06.10 accordingly.				
F06.07	Time of starting segment of ACC S curve	<p>The curvature of S curve is determined by the ACC range and ACC/DEC time.</p> <p>t1=F06.07 t2=F06.08 t3=F06.09 t4=F06.10</p>	0.0~50.0s	0.1s	☉	172.
F06.08	Time of ending segment of ACC S curve		0.0~50.0s	0.1s	☉	173.
F06.09	Time of starting segment of DEC S curve		0.0~50.0s	0.1s	☉	174.
F06.10	Time of ending segment of DEC S curve		Setting range: 0.0~50.0s	0.0~50.0s	0.1s	☉
F06.11	Stop mode	<p>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 (F06.20), the VFD stops.</p> <p>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.</p>	0~1	0	○	176.
F06.12	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	0.00~F00.07	0.00Hz	○	177.
F06.13	DC braking current for stop	determined by F06.09.	0.0~100.0	0.0%	○	178.
F06.14	DC braking time for stop	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.	0.0~50.00	0.00s	○	179.
F06.15	Demagnetization time	DC braking current for stop: The value of F06.11 is the percentage of rated current of VFD. Stronger current indicates greater DC braking effect.	0.00~30.00	0.00s	○	180.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>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.</p> <p>Setting range of <b>F06.12</b>: 0.00Hz–<b>F00.07</b> (Max. output frequency) Setting range of <b>F06.15</b>: 0.00–30.00s Setting range of <b>F06.13</b>: 0.0–100.0% Setting range of <b>F06.14</b>: 0.0–50.0s</p>				
F06.16	Short-circuit braking current	When the VFD starts in direct start mode ( <b>F06.00</b> =0), set <b>P06.17</b> to a non-zero value to	0.0~150.0	0.0%	○	181.
P06.17	Hold time of short-circuit braking for start	enter short-circuit braking. During stop, if the running frequency of VFD is lower than the starting frequency <b>F06.12</b> of	0.0~50.00	0.00s	○	182.
F06.18	Hold time of short-circuit braking for stop	brake for stop, set <b>P06.18</b> to a non-zero value to enter short-circuit braking for stop, and then carry out DC braking in the time set by <b>F06.14</b> . (Refer to the descriptions for <b>F06.12</b> – <b>F06.14</b> .) Setting range of <b>P06.16</b> : 0.0–100.0% (VFD) Setting range of <b>P06.17</b> : 0.0–50.00s Setting range of <b>P06.18</b> : 0.0–50.00s	0.0~50.00	0.00s	○	183.
F06.19	Magnetic flux braking	The function code is used to enable magnetic flux braking. 0: Invalid 100–150: A greater coefficient indicates greater braking strength. 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	0~150	0	○	184.

Function code	Name	Description	Setting range	Default	Modify	SN
		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.				
F06.20	Stop speed	0.00–100.00Hz	0.00–F00.07	0.50 Hz	☉	185.
F06.21	Stop speed detection mode	0: Detect by the set speed (unique in space voltage vector control mode) 1: Detect by the feedback speed	0~1	0	☉	186.
F06.22	Stop speed detection time	0.00–100.00s	0.00–100.00s	0.50s	☉	187.
F06.23	Pre-exciting time of jog	0–10.000s	0.000–10.000s	0.000s	○	188.
F06.24	Starting frequency of braking for jogging to stop	0–F00.03	0.00–F00.07	0.00Hz	○	189.
F06.25	Delay to enter sleep	0–3600.0s	0.0–3600.0s	0.0s	○	190.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F07 group—Control optimization</b>						
F07.00	PWM selection	0x0000–0x1121 Ones place: PWM mode selection 0: PWM mode 1, 3PH modulation and 2PH modulation	0x0000–0x1121	0x1101	☉	191.

Function code	Name	Description	Setting range	Default	Modify	SN
		1: PWM mode 2, 3PH modulation Tens place: PWM low-speed carrier limit 0: Low-speed carrier limit mode 1 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				
F07.01	Overmodulation selection	0x00–0x1111 Ones: 0: Disable overmodulation 1: Enable overmodulation Tens: 0: Mild overmodulation 1: Deepened overmodulation	0x0000–0x1111	0x01	☉	192.
F07.02	Open-loop 0Hz output selection	0: Output without voltage 1: Output with voltage 2: Output with the DC braking current for stop	0~2	0	○	193.
F07.03	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.	0~1	1	○	194.
F07.04	Frequency decrease ratio in drop control	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	0.00–50.00	0.00Hz	○	195.
F07.05	Frequency threshold of the start of droop control	0.00–50.00Hz	0.00–50.00	2.00Hz	○	196.



Function code	Name	Description	Setting range	Default	Modify	SN
F07.06	Initial pole detection method	0: Invalid 1: Pulse detection method 2: Pulse detection method	0~2	0	☉	197.
F07.07	Initial position high frequency injection	200Hz~1000Hz	200~1000	500Hz	☉	198.
F07.08	High-frequency superposition voltage	0.0~300.0% (motor rated voltage)	0.0~300.0%	100.0%	☉	199.
F07.09	Reserved			0.0	○	200.
F07.10	Control optimization parameter 1	0~0xFFFF	0~0xFFFF	0	○	201.
F07.11	PLL switch frequency	SVC mode, back EMF PLL(phase lock loop) works at this frequency point. If running frequency is less then this point, PLL disabled, otherwise, PLL enabled. Setting range: 0.00~655.35Hz	0~655.35	2.00Hz	○	202.
F07.12	Angle compensation	0.0~359.9°	0.0~359.9	0.0°	○	203.
F07.13	Initial pole detection injection current	0.0~300.0% (motor rated voltage)	0.0~300.0	20.0	☉	204.
F07.14	Undervoltage stall voltage regulator proportional gain P	Set the proportional gain of bus voltage regulator during undervoltage stall Setting range: 0 ~ 1000	0~1000	100	○	205.
F07.15	Undervoltage stall voltage regulator integral coefficient I	Set the integral coefficient of bus voltage regulator during undervoltage stall Setting range: 0 ~ 1000	0~1000	40	○	206.
F07.16	Undervoltage stall current regulator proportional gain P	Set the proportional gain of active current regulator during undervoltage stall Setting range: 0 ~ 1000	0~1000	25	○	207.
F07.17	Undervoltage stall current regulator integral coefficient I	Set the integral coefficient of active current regulator during undervoltage stall Setting range: 0 ~ 2000	0~2000	150	○	208.

Function code	Name	Description	Setting range	Default	Modify	SN
F07.18	Overvoltage stall voltage regulator proportional gain P	Set the proportional gain of bus voltage regulator during overvoltage stall Setting range: 0 ~ 1000	0~1000	60	○	209.
F07.19	Overvoltage stall voltage regulator integral coefficient I	Set the integral coefficient of bus voltage regulator during overvoltage stall Setting range: 0 ~ 1000	0~1000	10	○	210.
F07.20	Overvoltage stall current regulator proportional gain P	Set the proportional gain of active current regulator during overvoltage stall Setting range: 0 ~ 1000	0~1000	60	○	211.
F07.21	Overvoltage stall current regulator integral coefficient I	Set the integral coefficient of active current regulator during overvoltage stall Setting range: 0 ~ 2000	0~2000	250	○	212.
F07.22	Current limit selection	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. 0x00–0x11 Ones place: Current limit action selection 0: Invalid 1: Always valid Tens place: Hardware current limit overload alarm selection 0: Valid 1: Invalid	0x00~0x21	01	◎	213.
F07.23	Automatic current limit level	Current limit protection function detects output current during running, and compares it with the current-limit level defined by <a href="#">F07.23</a> , if it exceeds the current-limit level, the VFD will run at stable frequency during	50.0~200.0	G type: 160.0% P type: 120.0%	◎	214.
F07.24	Frequency drop rate during current limit	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	0~50.00	10.00Hz/s	◎	215.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>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.</p> <p>Setting range of F07.23: 50.0–200.0% Setting range of F07.24: 0.00–50.00Hz/s</p>				
F07.25	Automatic current limiting regulation proportional gain P	0~65535	0~65535	0	○	216.
F07.26	Automatic current limiting regulation integral coefficient I	0~65535	0~65535	0		217.
F07.27	Output power correction factor for Motor 1	0.00~3.00	0.00~3.00	1.00	○	218.
F07.28	Output power correction factor for Motor 2	0.00~3.00	0.00~3.00	1.00	○	219.
F07.29	Over voltage threshold	0.0V~2500.0V	0.0~2500.0	Model depended	◎	220.
F07.30	Under voltage threshold	0.0V~2000.0V	0.0~2000.0	Model depended	◎	221.
F07.31	Over current threshold	10.0%~250.0%	10.0~250.0	220.0%	◎	222.
F07.32	Voltage correction factor	10.0%~250.0%	10.0~250.0	100.0%	◎	223.
F07.33	Current correction	10.0%~250.0%	10.0~250.0	100.0%	◎	224.

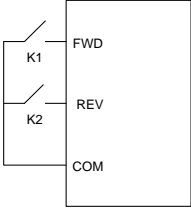
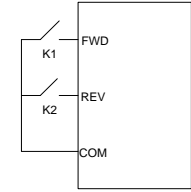
Function code	Name	Description	Setting range	Default	Modify	SN
	factor					
F07.34	Auto tune dead zone time compensation mode	0~1	0~1	0	○	225.
F07.35	Dead zone time compensation correction coefficient	0~300%	0~300	70%	◎	226.
F07.36	AM SVC1 low frequency no-load current amplification factor	80~300%	80~300	100%	○	227.
F07.37	Vector control output torque calculation mode	0~1 0: Calculate torque according to torque current 1: Calculate torque according to power	0~1	0	○	228.
F07.38	VFCControl flag	0x00~0x11 Ones: processing of oscillation suppression coefficient 0: The oscillation suppression coefficient of synchronous motor is related to carrier frequency 1: The oscillation suppression coefficient of asynchronous motor is related to carrier frequency and given frequency Tens: external reactive current oscillation suppression 0: External reactive current oscillation suppression is not 0 1: The external reactive current oscillation suppression is 0	0x00~0x11	00	◎	229.

Function code	Name	Description	Setting range	Default	Modify	SN
F07.39	Keypad control setting	0x0000~0x1223 LED ones: frequency enable selection 0: Both $\wedge/\vee$ keys and analog potentiometer adjustments are valid 1: Only $\wedge/\vee$ keys adjustment is valid 2: Only analog potentiometer adjustments is valid 3: Neither $\wedge/\vee$ keys nor digital potentiometer adjustments are valid LED tens: frequency control selection 0: Only valid when P00.03=0 or P00.04=0 1: Valid for all frequency setting manner 2: Invalid for multi-step speed when multi-step speed has the priority LED hundreds: action selection during stopping 0: Setting is valid 1: Valid during running, cleared after stopping 2: Valid during running, cleared after receiving the stop command LED thousands: $\wedge/\vee$ keys and analog potentiometer integral function 0: The Integral function is valid 1: The Integral function is invalid	0x0000~0x1223	0003	○	230.
F07.40	Integral ratio of the keypad potentiometer	0.01~10.00s	0.01~10.00	0.10s	○	231.
F07.41	Reserved	0-65535	0~65535	0	●	232.
F07.42	Reserved	0-65535	0~65535	0	●	233.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F08 group—Input terminals</b>						
F08.00	Function of DI1 terminal	0: No function 1: Forward running	0~79	1	◎	234.
F08.01	Function of DI2	2: Reverse running	0~79	4	◎	235.

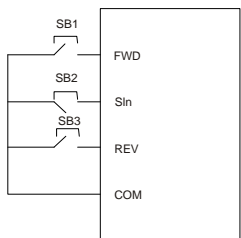
Function code	Name	Description	Setting range	Default	Modify	SN
	terminal	3: 3-wire control/Sin				
F08.02	Function of DI3 terminal	4: Forward jogging 5: Reverse jogging	0~79	7	☉	236.
F08.03	Function of DI4 terminal	6: Coast to stop 7: Fault reset	0~79	0	☉	237.
F08.04	Function of HI1 terminal	8: Running pause 9: External fault input	0~79	0	☉	238.
F08.05	Reserved	10: Frequency increase (UP) 11: Frequency decrease (DOWN) 12: Clear frequency increase/decrease setting 13: Switch-over between setup main and setup auxiliary 14: Switch-over between combination setting and main setting 15: Switch-over between combination setting and setup auxiliary 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: Multi-step speed pause 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Wobbling frequency pause 27: Wobbling frequency reset 28: Counter reset 29: Switching between speed control and torque control 30: ACC/DEC disabled 31: Counter trigger 32: Reserved 33: Clear frequency increase/decrease setting temporarily 34: DC brake				239.

Function code	Name	Description	Setting range	Default	Modify	SN
		35: Switching between motor 1 and motor 2 36: Command switches to keypad 37: Command switches to terminal 38: Command switches to communication 39: Pre-exciting command 40: Zero out power consumption quantity 41: Maintain power consumption quantity 42: Source of upper torque limit switches to keypad 43: Position reference point input (valid only for DI~DI3 are valid) 44: Spindle orientation disabled 45: Spindle zeroing/local positioning zeroing 46: Spindle zero position selection 1 47: Spindle zero position selection 2 48: Spindle scale division selection 1 49: Spindle scale division selection 2 50: Spindle scale division selection 3 51: Terminal for switching between position control and speed control 52: Pulse input disabled 53: Clear position deviation cleared 54: Switch over position proportional gain 55: Enable cyclic positioning of digital position positioning 56: Emergency stop 57: Motor over-temperature fault input 59: Switch to V/F control 60: Switch to FVC control 61: PID polarity switch-over 66: Zero out encoder counting 67: Pulse increase 68: Enable pulse superimposition 69: Pulse decrease 70: Electronic gear selection 71~79: Reserved				
F08.06	HDI input type	0x00~0x11	0x00~0x11	0	◎	240.

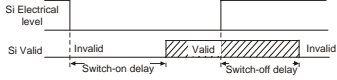
Function code	Name	Description	Setting range	Default	Modify	SN																														
		<p>Ones place: HI1 input type</p> <p>0: High-speed pulse input</p> <p>1: Digital input</p> <p>Tens place: HI2 input type</p> <p>0: High-speed pulse input</p> <p>1: Digital input</p>																																		
F08.07	Digital input filter time	<p>The function code is used to set the filter time for DI1–DI4, HI1, and HI2. In strong interference cases, increase the value to avoid maloperation.</p> <p>0.000–1.000s</p>	0.000~1.000	0.010s	○	241.																														
F08.08	Terminal control mode	<p>The function code is used to set the mode of terminal control.</p> <p>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.</p> <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>FWD</th> <th>REV</th> <th>Running command</th> </tr> </thead> <tbody> <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> </tbody> </table> </div> <p>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.</p> <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>FWD</th> <th>REV</th> <th>Running command</th> </tr> </thead> <tbody> <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> </tbody> </table> </div>	FWD	REV	Running command	OFF	OFF	Stop	ON	OFF	Forward running	OFF	ON	Reverse running	ON	ON	Hold	FWD	REV	Running command	OFF	OFF	Stop	ON	OFF	Forward running	OFF	ON	Stop	ON	ON	Reverse running	0~3	0	◎	242.
FWD	REV	Running command																																		
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Function code	Name	Description	Setting range	Default	Modify	SN																								
		<p>2: Three-wire control 1. This mode defines Sin as the enabling terminal, and the running command is generated by FWD, while the 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.</p> <div style="text-align: center;"> </div> <p>The direction control is as follows during running:</p> <table border="1"> <thead> <tr> <th>Sin</th> <th>REV</th> <th>Previous direction</th> <th>Present direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">ON</td> <td>OFF</td> <td>Run forward</td> <td>Run reversely</td> </tr> <tr> <td>→ ON</td> <td>Run reversely</td> <td>Run forward</td> </tr> <tr> <td rowspan="2">ON</td> <td>ON→</td> <td>Run reversely</td> <td>Run forward</td> </tr> <tr> <td>OFF</td> <td>Run forward</td> <td>Run reversely</td> </tr> <tr> <td>ON→</td> <td>ON</td> <td colspan="2" rowspan="2">Decelerate to stop</td> </tr> <tr> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table> <p>Sin: Three-wire control; FWD: Forward running; REV: Reverse running</p> <p>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</p>	Sin	REV	Previous direction	Present direction	ON	OFF	Run forward	Run reversely	→ ON	Run reversely	Run forward	ON	ON→	Run reversely	Run forward	OFF	Run forward	Run reversely	ON→	ON	Decelerate to stop		OFF	OFF				
Sin	REV	Previous direction	Present direction																											
ON	OFF	Run forward	Run reversely																											
	→ ON	Run reversely	Run forward																											
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	OFF	Run forward	Run reversely																											
ON→	ON	Decelerate to stop																												
OFF	OFF																													

Function code	Name	Description	Setting range	Default	Modify	SN																				
		<p>generates a rising edge signal to control the running and direction of the VFD; the VFD needs to be stopped by disconnecting terminal Sin.</p>  <table border="1"> <thead> <tr> <th>Sin</th> <th>FWD</th> <th>REV</th> <th>Running direction</th> </tr> </thead> <tbody> <tr> <td rowspan="2">ON</td> <td rowspan="2">OFF→ON</td> <td>ON</td> <td>Run forward</td> </tr> <tr> <td>OFF</td> <td>Run forward</td> </tr> <tr> <td rowspan="2">ON</td> <td>ON</td> <td rowspan="2">OFF→ON</td> <td>Run reversely</td> </tr> <tr> <td>OFF</td> <td>Run reversely</td> </tr> <tr> <td>ON→OFF</td> <td></td> <td></td> <td>Decelerate to stop</td> </tr> </tbody> </table> <p>Sin: Three-wire control; FWD: Forward running; REV: Reverse running</p> <p><b>Note:</b> 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</p>	Sin	FWD	REV	Running direction	ON	OFF→ON	ON	Run forward	OFF	Run forward	ON	ON	OFF→ON	Run reversely	OFF	Run reversely	ON→OFF			Decelerate to stop				
Sin	FWD	REV	Running direction																							
ON	OFF→ON	ON	Run forward																							
		OFF	Run forward																							
ON	ON	OFF→ON	Run reversely																							
	OFF		Run reversely																							
ON→OFF			Decelerate to stop																							

Function code	Name	Description	Setting range	Default	Modify	SN
		FWD/REV again, for example, PLC single-cycle stop, fixed-length stop, and valid STOP/RST stop during terminal control.				
F08.09	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. Ones place: Frequency control selection 0: Valid only when P00.03=0 or P00.04=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	0x000–0x221	0x000	○	243.
F08.10	Frequency increment integral rate of the UP terminal	0.01–50.00Hz/s	0.01–50.00	0.50Hz/s	○	244.
F08.11	Frequency integral rate of the DOWN terminal	0.01–50.00Hz/s	0.01–50.00	0.50Hz/s	○	245.
F08.12	Virtual terminal setting	0x000–0x3F (0: disable, 1: enable) BIT0: DI1 virtual terminal BIT1: DI2 virtual terminal BIT2: DI3 virtual terminal BIT3: DI4 virtual terminal BIT4: HI1 virtual terminal BIT5: HI2 virtual terminal	0x000–0x3F	0x00	◎	246.
F08.13	Reserved	0–65535	0–65535	0	●	247.
F08.14	DI1 switch-on delay	The function codes specify the delay time	0.000–50.000	0.000s	○	248.

Function code	Name	Description	Setting range	Default	Modify	SN
F08.15	DI1 switch-off delay	 <p>Setting range: 0.000–50.000s</p> <p><b>Note:</b> After a virtual terminal is enabled, the state of the terminal can be changed only in communication mode. The communication address is 0x200A.</p>	0.000–50.000	0.000s	○	249.
F08.16	DI2 switch-on delay		0.000–50.000	0.000s	○	250.
F08.17	DI2 switch-off delay		0.000–50.000	0.000s	○	251.
F08.18	DI3 switch-on delay		0.000–50.000	0.000s	○	252.
F08.19	DI3 switch-off delay		0.000–50.000	0.000s	○	253.
F08.20	DI4 switch-on delay		0.000–50.000	0.000s	○	254.
F08.21	DI4 switch-off delay		0.000–50.000	0.000s	○	255.
F08.22	HI1 switch-on delay		0.000–50.000	0.000s	○	256.
F08.23	HI1 switch-off delay		0.000–50.000	0.000s	○	257.
F08.24	Reserved					○
F08.25	Reserved				○	259.
F08.26	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. 0x000–0x3F	0x000–0x3F	0x000	○	260.
F08.27	AI1 lower limit	The function codes 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.	0.00–F08.29	0.00V	○	261.
F08.28	Corresponding setting of AI1 lower limit		-300.0~300.0	0.0%	○	262.
F08.29	AI1 upper limit		F08.27~10.00	10.00V	○	263.
F08.30	Corresponding setting of AI1 upper limit	When the analog input is current input, 0mA–20mA current corresponds to 0V–10V voltage.	-300.0~300.0	100.0%	○	264.
F08.31	AI1 input filter time	In different applications, 100.0% of the analog setting corresponds to different nominal values. Refer to the descriptions of each application section for details.	0.000–10.000	0.030s	○	265.
F08.32	AI2 lower limit		-10.00–F08.34	-10.00V	○	266.

Function code	Name	Description	Setting range	Default	Modify	SN
F08.33	Corresponding setting of AI2 lower limit	<p>The following figure illustrates the cases of several settings:</p>	-300.0~300.0	-100.0%	○	267.
F08.34	AI2 middle value 1		F08.32~F08.36	0.00V	○	268.
F08.35	Corresponding setting of AI2 middle value 1		-300.0~300.0	0.0%	○	269.
F08.36	AI2 middle value 2		F08.34~F08.38	0.00V	○	270.
F08.37	Corresponding setting of AI2 middle value 2	<p>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.  <b>Note:</b> AI1 supports the 0~10V/0~20mA input.</p>	-300.0~300.0	0.0%	○	271.
F08.38	AI2 upper limit		F08.36~10.00	10.00V	○	272.
F08.39	Corresponding setting of AI2 upper limit	<p>When AI1 selects the 0~20mA input, the corresponding voltage of 20mA is 10V. AI2 supports the -10~+10V input.</p>	-300.0~300.0	100.0%	○	273.
F08.40	AI2 input filter time	<p>Setting range of <a href="#">F08.27</a>: 0.00V~<a href="#">F08.29</a>                      Setting range of <a href="#">F08.28</a>: -300.0%~300.0%                      Setting range of <a href="#">F08.29</a>: <a href="#">F08.27</a>~10.00V                      Setting range of <a href="#">F08.30</a>: -300.0%~300.0%                      Setting range of <a href="#">F08.31</a>: 0.000s~10.000s                      Setting range of <a href="#">F08.32</a>: -10.00V~<a href="#">F08.34</a>                      Setting range of <a href="#">F08.33</a>: -300.0%~300.0%                      Setting range of <a href="#">F08.34</a>: <a href="#">F08.32</a>~<a href="#">F08.36</a>                      Setting range of <a href="#">F08.35</a>: -300.0%~300.0%                      Setting range of <a href="#">F08.36</a>: <a href="#">F08.34</a>~<a href="#">F08.38</a>                      Setting range of <a href="#">F08.37</a>: -300.0%~300.0%                      Setting range of <a href="#">F08.38</a>: <a href="#">F08.36</a>~10.00V                      Setting range of <a href="#">F08.39</a>: -300.0%~300.0%                      Setting range of <a href="#">F08.40</a>: 0.000s~10.000s</p>	0.000~10.000	0.030s	○	274.
F08.41	HDI high-speed pulse input function selection	<p>0: Input set through frequency                      1: Reserved                      2: Input set through encoder, used together with HI2</p>	0~2	0	◎	275.
F08.42	HDI lower limit	0.000 kHz ~ <a href="#">F08.44</a>	0.000 KHz	0.000KHz	○	276.

Function code	Name	Description	Setting range	Default	Modify	SN
	frequency		~F08.44			
F08.43	Corresponding setting of HI1 lower limit frequency	-300.0%~300.0%	-300.0~300.0	0.0%	○	277.
F08.44	HI1 upper limit frequency	<u>F08.42</u> ~50.000kHz	F08.42~50.000kHz	50.000kHz	○	278.
F08.45	Corresponding setting of HDI upper limit frequency	-300.0%~300.0%	-300.0~300.0	100.0%	○	279.
F08.46	HDI frequency input filter time	0.000s~10.000s	0.000~10.000	0.030s	○	280.
F08.47	Reserved				◎	281.
F08.48	Reserved				○	282.
F08.49	Reserved				○	283.
F08.50	Reserved				○	284.
F08.51	Reserved				○	285.
F08.52	Reserved				○	286.
F08.53	AI1 input signal type	0: Voltage 1: Current <b>Note:</b> You can set the AI1 input signal type through the corresponding function code.	0~1	0	◎	287.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F09 group—Output terminals</b>						
F09.00	HDO output type	0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, Refer to <u>F09.08~F09.11</u> . 1: Open collector output. For details about the related functions, Refer to <u>F09.02</u> .	0~1	0	◎	288.
F09.01	DO output	0: Invalid	0~63	0	○	289.

Function code	Name	Description	Setting range	Default	Modify	SN
F09.02	HO output	1: Running	0~63	0	○	290.
F09.03	T1 output	2: Running forward 3: Running reversely	0~63	1	○	291.
F09.04	Reserved	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 communication virtual terminal output 24: PROFIBUS/CANopen communication virtual terminal output 25: Reserved 26: DC bus voltage established 27: Z pulse output 28: Superposing pulses 29: STO action 30: Positioning completed 31: Spindle zeroing completed 32: Spindle scale division completed 33: In speed limit 34: Profinet communication virtual terminal output 35: Reserved	0~63	5	○	292.

Function code	Name	Description	Setting range	Default	Modify	SN
		36: Speed/position control switchover completed 37-63: Reserved				
F09.05	AO1 output	0: Running frequency (0-Max. output frequency)	0~47	0	○	293.
F09.06	AO2 output	1: Set frequency (0-Max. output frequency)	0~47	0	○	294.
F09.07	HDO high-speed pulse output	2: Ramp reference frequency (0-Max. output frequency) 3: Rotational speed (0-Speed corresponding to max. output frequency) 4: Output current (0-Twice the VFD rated current) 5: Output current (0-Twice the motor rated current) 6: Output voltage (0-1.5 times the VFD rated voltage) 7: Output power (0-Twice the motor rated power) 8: Set torque (0-Twice the motor rated current) 9: Output torque (Absolute value, 0-+/- Twice the motor rated torque) 10: AI1 input (0-10V/0-20mA) 11: AI2 input (0-10V) 12: Resvered 13: HI1 input(0.00-50.00kHz) 14: Value 1 set through Modbus (0-1000) 15: Value 2 set through Modbus (0-1000) 16: Value 1 set through PROFIBUS/CANopen (0-1000) 17: Value 2 set through PROFIBUS/CANopen (0-1000) 18: Resvered 19: Resvered 20: HI2 input (0.00-50.00kHz) 21: Value 1 set through Profinet (0-1000) 22: Torque current (bipolar, 0-Triple the motor rated current)	0~47	0	○	295.

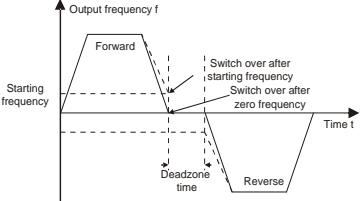


Function code	Name	Description	Setting range	Default	Modify	SN
		23: Exciting current (bipolar, 0–Triple the motor rated current) 24: Set frequency (bipolar, 0–Max. output frequency) 25: Ramp reference frequency (bipolar, 0–Max. output frequency) 26: Rotational speed (bipolar, 0–Speed corresponding to max. output frequency) 27: Value 2 set through Profinet (0–1000) 28~29: Reserved 30: Rotational speed (0–Twice the motor rated synchronous speed) 31~47: Reserved				
F09.08	HDO output lower limit	-300.0%– <u>F09.10</u>	-300.0–F09.10	0.0%	○	296.
F09.09	HDO output corresponding to lower limit	0.00–50.00kHz	0.00–50.00	0.00kHz	○	297.
F09.10	HDO output upper limit	<u>F09.08</u> –300.0%	F09.08–100.0	100.0%	○	298.
F09.11	HDO output corresponding to upper limit	0.00–50.00kHz	0.00–50.00	50.00kHz	○	299.
F09.12	HDO output filter time	0.000s–10.000s	0.000–10.000	0.000s	○	300.
F09.13	AO1 output lower limit		-300.0–F09.15	0.0%	○	301.
F09.14	AO1 output corresponding to lower limit	Setting range of <u>F09.13</u> : -300.0%– <u>F09.15</u> Setting range of <u>F09.14</u> : 0.00V–10.00V	0.00–10.00	0.00V	○	302.
F09.15	AO1 output upper limit	Setting range of <u>F09.15</u> : <u>F09.13</u> –300.0% Setting range of <u>F09.16</u> : 0.00V–10.00V	F09.13–300.0	100.0%	○	303.
F09.16	AO1 output corresponding to upper limit	Setting range of <u>F09.17</u> : 0.000s–10.000s	0.00–10.00	10.00V	○	304.

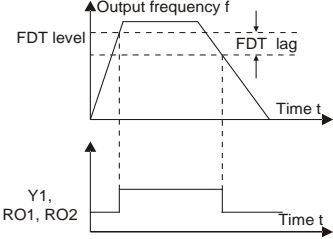
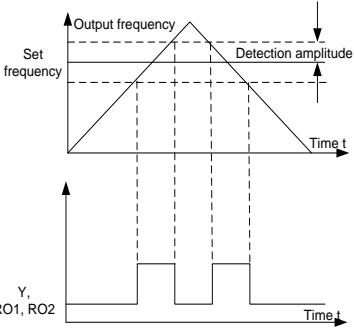
Function code	Name	Description	Setting range	Default	Modify	SN
F09.17	AO1 output filter time		0.000~10.000	0.000s	○	305.
F09.18	AO2 output lower limit	Setting range of <u>F09.18</u> : -300.0%~ <u>F09.20</u> Setting range of <u>F09.19</u> : 0.00V~10.00V Setting range of <u>F09.20</u> : <u>F09.18</u> ~300.0% Setting range of <u>F09.21</u> : 0.00V~10.00V Setting range of <u>F09.22</u> : 0.000s~10.000s	-300.0~ <u>F09.20</u>	0.0%	○	306.
F09.19	AO2 output corresponding to lower limit		0.00~10.00	0.00V	○	307.
F09.20	AO2 output upper limit		<u>F09.18</u> ~300.0	100.0%	○	308.
F09.21	AO2 output corresponding to upper limit		0.00~10.00	10.00V	○	309.
F09.22	AO2 output filter time		0.000~10.000	0.000s	○	310.
F09.23	DO 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.	0.000~50.000	0.000s	○
F09.24	DO switch-off delay	0.000~50.000		0.000s	○	312.
F09.25	HDO switch-on delay		0.000~50.000	0.000s	○	313.
F09.26	HDO switch-off delay		0.000~50.000	0.000s	○	314.
F09.27	T1 switch-on delay	Setting range: 0.000~50.000s	0.000~50.000	0.000s	○	315.
F09.28	T1 switch-off delay	<b>Note:</b> <u>F09.08</u> and <u>F09.09</u> are valid only when <u>F09.00</u> =1.	0.000~50.000	0.000s	○	316.
F09.29	Reserved				○	317.
F09.30	Reserved				○	318.
F09.31	Output terminal polarity selection	The function code is used to set the polarity of output terminals. When a bit is 0, the input terminal is positive;	0x00~0x0F	00	○	319.

Function code	Name	Description	Setting range	Default	Modify	SN								
		When a bit is 1, the input terminal is negative. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>BIT3</td> <td>BIT2</td> <td>BIT1</td> <td>BIT0</td> </tr> <tr> <td>T2</td> <td>T1</td> <td>HO</td> <td>DO</td> </tr> </table> Setting range: 0x0–0xF	BIT3	BIT2	BIT1	BIT0	T2	T1	HO	DO				
BIT3	BIT2	BIT1	BIT0											
T2	T1	HO	DO											
F09.32	Reserved	0–65535	0~1	0	⊙	320.								
F09.33	Frequency reach detection value	0–F00.07	0–F00.07	1.00	○	321.								
F09.34	Frequency reach detection time	0–3600.0s	0–3600.0s	0.5s	○	322.								

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F10 group—Auxiliary functions</b>						
F10.00	Running frequency of jog	The function code is used to define the reference frequency during jogging. Setting range: 0.00Hz– <u>F00.07</u> (Max. output frequency)	0.00~F00.07	5.00Hz	○	323.
F10.01	ACC time for jog	ACC time for jogging means the time needed for the VFD to accelerate from 0Hz to the max. output frequency ( <u>F00.07</u> ).	0.0~3600.0	Model depended	○	324.
F10.02	DEC time for jog	DEC time for jogging means the time needed for the VFD to decelerate from the max. output frequency ( <u>F00.07</u> ) to 0Hz. Setting range: 0.0–3600.0s	0.0~3600.0	Model depended	○	325.
F10.03	ACC time 2	For details, Refer to <u>F00.13</u> and <u>F00.14</u> . The VFD has four groups of ACC/DEC time, which can be selected by F08. The factory default ACC/DEC time of the VFD is the first group. Setting range: 0.0–3600.0s	0.0~3600.0	Model depended	○	326.
F10.04	DEC time 2		0.0~3600.0	Model depended	○	327.
F10.05	ACC time 3		0.0~3600.0	Model depended	○	328.
F10.06	DEC time 3		0.0~3600.0	Model depended	○	329.
F10.07	ACC time 4		0.0~3600.0	Model depended	○	330.

Function code	Name	Description	Setting range	Default	Modify	SN
F10.08	DEC time 4		0.0~3600.0	Model depended	○	331.
F10.09	Jump frequency 1	When the set frequency is within the range of jump frequency, the VFD runs at the boundary of jump frequency.	0.00~F00.07	0.00Hz	○	332.
F10.10	Jump frequency amplitude 1	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.	0.00~F00.07	0.00Hz	○	333.
F10.11	Jump frequency 2		0.00~F00.07	0.00Hz	○	334.
F10.12	Jump frequency amplitude 2		0.00~F00.07	0.00Hz	○	335.
F10.13	Jump frequency 3		0.00~F00.07	0.00Hz	○	336.
F10.14	Jump frequency amplitude 3	Setting range: 0.00Hz~ <u>F00.07</u> (Max. output frequency)	0.00~F00.07	0.00Hz	○	337.
F10.15	Amplitude of wobbling frequency	0.0~100.0% (of the set frequency)	0.0~100.0	0.0%	○	338.
F10.16	Amplitude of sudden jump frequency	0.0~50.0% (of the amplitude of wobbling frequency)	0.0~50.0	0.0%	○	339.
F10.17	Rise time of wobbling frequency	0.1~3600.0s	0.1~3600.0	5.0s	○	340.
F10.18	Fall time of wobbling frequency	0.1~3600.0s	0.1~3600.0	5.0s	○	341.
F10.19	FWD/REV running deadzone time	This function code indicates the transition time specified in P01.14 during FWD/REV rotation switching. See the figure. 	0.0~3600.0	0.0s	○	342.

Function code	Name	Description	Setting range	Default	Modify	SN
		Setting range: 0.0~3600.0s				
F10.20	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	0~2	1	☉	343.
F10.21	Setting running time	0~65535min	0~65535	0min	○	344.
F10.22	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 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. <b>Note:</b> Exercise caution before using this function. Otherwise, serious result may follow.	0~1	0	○	345.
F10.23	FDT1 electrical level detection value	When the output frequency exceeds the corresponding frequency of FDT electrical level, the multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value).	0.00~F00.07	50.00Hz	○	346.
F10.24	FDT1 lagging detection value		0.0~100.0	5.0%	○	347.
F10.25	FDT2 electrical level detection value		0.00~F00.07	50.00Hz	○	348.
F10.26	FDT2 lagging detection value		0.0~100.0	5.0%	○	349.

Function code	Name	Description	Setting range	Default	Modify	SN
		 <p>Setting range of <u>F10.32</u>: 0.00Hz–<u>F00.03</u> (Max. output frequency)                      Setting range of <u>F10.33</u>: 0.0–100.0% (FDT1 electrical level)                      Setting range of <u>F10.34</u>: 0.00Hz–<u>F00.03</u> (Max. output frequency)                      Setting range of <u>F10.35</u>: 0.0–100.0% (FDT2 electrical level)</p>				
F10.27	Detection value for frequency being reached	<p>When the output frequency is within the detection range, the multifunction digital output terminal outputs the signal of "Frequency reached".</p>  <p>Setting range: 0.00Hz–<u>F00.03</u> (Max. output frequency)</p>	0.0– <u>F00.07</u>	0.00Hz	○	350.
F10.28	Switching frequency of ACC/DEC time	<p>0.00–<u>F00.07</u> (Max. output frequency)                      0.00Hz: No switchover                      If the running frequency is greater than <u>F10.28</u>, switch to ACC/DEC time 2.</p>	0.00– <u>F00.07</u>	0.00Hz	○	351.

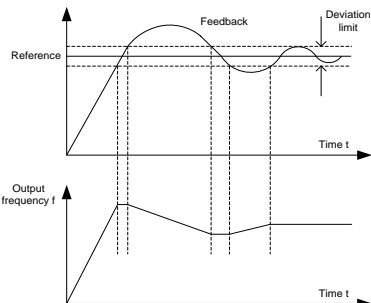
Function code	Name	Description	Setting range	Default	Modify	SN
F10.29	Cooling-fan running mode	0: Normal mode 1: Permanent running after power-on	0~1	0	○	352.
F10.30	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	0: Run at the frequency lower limit 1: Stop 2: Sleep	0~2	0	◎	353.
F10.31	Wake-up-from-sleep delay	<p>The function code determines the wake-up-from-sleep delay time. When the running frequency of the VFD is lower than the lower limit, the VFD becomes standby.</p> <p>When the set frequency exceeds the lower limit one again and it lasts for the time set by F10.31, the VFD runs automatically.</p> <p>Setting range: 0.0~3600.0s (valid when F01.30=2)</p>	0.0~3600.0	0.0s	○	354.
F10.32	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	0~1	0	○	355.
F10.33	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.	0.0~3600.0	1.0s	○	356.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>Setting range: 0.0–3600.0s (valid when <u>F12.32=1</u>)</p>				
F10.34	Start delay	After a VFD running command is given, the VFD is in standby state and restarts with the delay defined by <u>F12.24</u> to implement brake release. Setting range: 0.0–600.0s	0.0~600.0	0.0s	○	357.
F10.35	Stop speed delay	0.0–600.0s	0.0~600.0	0.0s	○	358.
F10.36	DEC time for emergency stop	0.0–60.0s	0.0~60.0	2.0s	○	359.
F10.37	Reserved	0–65535	0~65535	0	●	360.
F10.38	Channel for switching between motor 1 and motor 2	0x00–0x14 Ones: Switchover channel 0: Terminal 1: Modbus communication 2: PROFIBUS/CANopen communication 3: Reserved 4: Profinet communication Tens: indicates whether to enable switchover during running 0: Disable 1: Enable	0x00~0x14	0x00	◎	361.
F10.39	Initial electricity consumption high-order bits	Used to set the initial electricity consumption. Initial electricity consumption = <u>F10.39</u> *1000+ <u>F10.40</u>	0~59999	0°	○	362.
F10.40	Initial electricity consumption low-order bits	Setting range of <u>F10.39</u> : 0–59999 kWh (k) Setting range of <u>F10.40</u> : 0.0–999.9 kWh	0~999.9	0.0°	○	363.
F10.41	VFD input power factor	The function code is used to adjust the display value on the AC input side. 0.00–1.00	0.00~1.00	0.56	○	364.



Function code	Name	Description	Setting range	Default	Modify	SN
F10.42	STO lock selection	0: Lock upon STO alarm Lock upon STO alarm indicates resetting is required after state restoration if STO occurs. 1: No lock on STO alarm No lock on STO alarm indicates STO alarm disappears automatically after state restoration if STO occurs.	0~1	0	○	365.
F10.43	Number of decimal places of linear speed	0: No decimal place 1: One 2: Two 3: Three	0~3	0	○	366.
F10.44	Set counting value	<u>F10.45</u> ~65535	F10.45~65535	0	○	367.
F10.45	Designated counting value	0~ <u>F10.44</u>	0~F10.44	0	○	368.
Function code	Name	Description	Setting range	Default	Modify	SN
<b>F11 group— PID control</b>						
F11.00	PID reference source	0: Keypad ( <u>F11.01</u> ) 1: AI1 2: AI2 3: Reserved 4: High-speed pulse HI1 5: Multi-step running 6: Modbus communication 7: Profibus/CANopen communication 8: Reserved 9: High-speed pulse HDIB 10: Profinet communication 11: Reserved 12: Reserved	0~12	0	○	369.
F11.01	PID reference preset through keypad	The function code is mandatory when <u>F11.00</u> =0. The base value of The function code is the feedback of the system. Setting range: -100.0%~100.0%	-100.0~100.0	0.0%	○	370.
F11.02	PID feedback source	0: AI1 1: AI2	0~10	0	○	371.

Function code	Name	Description	Setting range	Default	Modify	SN
		2: Reserved 3: HI2 4: Modbus communication 5: PROFIBUS/CANopen communication 6: Reserved 7: HI2 8: Profinet communication 9: Reserved 10: Reserved.				
F11.03	PID output characteristics selection	0: PID output is positive. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will decrease to balance the PID. Example: PID control on strain during 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.	0~1	0	○	372.
F11.04	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 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	0.00~100.00	1.80	○	373.
F11.05	Integral time (TI)	It determines the speed of integral regulation made on the deviation between PID feedback and reference by PID regulator. When the deviation between PID feedback and reference is 100%, the regulation of integral regulator (ignoring integral and differential actions), after undergoing continuous regulation during this time period, can reach	0.00~10.00	0.90s	○	374.

Function code	Name	Description	Setting range	Default	Modify	SN
		max. output frequency (F00.07) or max. voltage (F04.19). The shorter the integral time, the stronger the regulation intensity. Setting range: 0.00–10.00s				
F11.06	Differential time (Td)	It determines the intensity of the regulation made on the change rate of deviation between PID feedback and reference by PID regulator. If feedback changes by 100% during this period, the regulation of differential regulator (ignoring integral and differential actions) is max. output frequency (F00.07) or max. voltage (F04.19). The longer the derivative time, the stronger the regulation intensity. Setting range: 0.00–10.00s	0.00–10.00	0.00s	○	375.
F11.07	Sampling cycle (T)	It means the sampling cycle of feedback. The regulator operates once during each sampling cycle. The larger the sampling cycle, the slower the response. Setting range: 0.001–10.000s	0.001–10.000	0.001s	○	376.
F11.08	Limit of PID control deviation	It is the max. allowable deviation of PID system output value relative to closed-loop reference value. Within this limit, PID regulator stops regulation. Set this function code properly to regulate the precision and stability of PID system. 	0.0–100.0	0.0%	○	377.

Function code	Name	Description	Setting range	Default	Modify	SN
		Setting range: 0.0~100.0%				
F11.09	Upper limit value of PID output	The two function codes are used to set the upper/lower limit value of PID regulator.	F11.10~100.0	100.0%	○	378.
F11.10	Lower limit value of PID output	100.0% corresponds to Max. output frequency (F00.07) or max. voltage (F04.19). Setting range of F11.09: <u>F11.10</u> ~100.0% Setting range of F11.10: <u>-100.0%~F11.09</u>	-100.0~F11.09	0.0%	○	379.
F11.11	Feedback offline detection value	Set PID feedback offline detection value, when the detection value is no more than the feedback offline detection value, and the duration exceeds the value set in F11.12, the VFD will report "PID feedback offline fault", and keypad displays PIDE.	0.0~100.0%	0.0%	○	380.
F11.12	Feedback offline detection time	<p>Setting range of F11.11: 0.0~100.0% Setting range of F11.12: 0.0~3600.0s</p>	0.0~3600.0	1.0s	○	381.
F11.13	PID control selection	0x0000~0x1111 Ones: 0: Continue integral control after the frequency reaches upper/lower limit 1: Stop integral control after the frequency reaches upper/lower limit Tens: 0: The same with the main reference direction 1: Contrary to the main reference direction Hundreds: 0: Limit based on the max. frequency 1: Limit based on A frequency Thousands: 0: Main+ Auxiliary frequency, acceleration /DEC of main reference frequency source	0x0000~0x1111	0x0001	○	382.

Function code	Name	Description	Setting range	Default	Modify	SN
		buffering is invalid 1: Main+ Auxiliary frequency, acceleration/DEC of main reference frequency source buffering is valid, acceleration and DEC are determined by <a href="#">F11.07</a> (acceleration time 4).				
F11.14	Low-frequency proportional gain (Kp)	0.00~100.00 Low-frequency switching point: 5.00Hz, high-frequency switching point: 10.00Hz ( <a href="#">F11.04</a> corresponds to high-frequency parameter), and the middle is the linear interpolation between these two points.	0.00~100.00	1.00	○	383.
F11.15	ACC/DEC time of PID command	0.0~1000.0s	0.0~1000.0s	0.0s	○	384.
F11.16	PID output filter time	0.000~10.000s	0.000~10.000s	0.000s	○	385.
F11.17	Reserved	-100.0~100.0%	-100.0~100.0%	0.0%	○	386.
F11.18	Low-frequency integral time (Ti)	0.00~10.00s	0.00~10.00s	0.90s	○	387.
F11.19	Low-frequency differential time (Td)	0.00~10.00s	0.00~10.00s	0.00s	○	388.
F11.20	Low-frequency point of PID parameter switching	0.00~ <a href="#">F11.21</a>	0.00~ <a href="#">F11.21</a>	5.00	○	389.
F11.21	High-frequency point of PID parameter switching	<a href="#">F11.20</a> ~ <a href="#">F00.08</a>	<a href="#">F11.20</a> ~ <a href="#">F00.08</a>	10.00	○	390.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F12 group—Simple PLC and multi-step speed control</b>						
F12.00	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	-100.0~100.0	0.0%	○	391.
F12.01	Multi-step speed 1		-100.0~100	0.0%	○	392.

Function code	Name	Description	Setting range	Default	Modify	SN
		<u>F00.07</u> .	.0			
F12.02	Multi-step speed 2	Running time setting range for steps from step 0 to step 15: 0.0~6553.5s(min). The time unit is specified by <u>F12.37</u> .	-100.0~100.0	0.0%	○	393.
F12.03	Multi-step speed 3	When simple PLC operation is selected, it is required to set <u>F12.00~F12.33</u> to determine the running frequency and running time of each step.	-100.0~100.0	0.0%	○	394.
F12.04	Multi-step speed 4		-100.0~100.0	0.0%	○	395.
F12.05	Multi-step speed 5	<b>Note:</b> The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running.	-100.0~100.0	0.0%	○	396.
F12.06	Multi-step speed 6		-100.0~100.0	0.0%	○	397.
F12.07	Multi-step speed 7	<p>The diagram illustrates the timing for two steps. For the first step, the speed starts at F12.00, accelerates to F12.01, and then decelerates to F12.02. For the second step, the speed starts at F12.13, accelerates to F12.14, and then decelerates to F12.15. The acceleration and deceleration times are labeled as 'Acceleration time (two steps)' and 'Deceleration time (two steps)' respectively.</p>	-100.0~100.0	0.0%	○	398.
F12.08	Multi-step speed 8		-100.0~100.0	0.0%	○	399.
F12.09	Multi-step speed 9		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 <u>F00.02</u> .	-100.0~100.0	0.0%	○
F12.10	Multi-step speed 10		-100.0~100.0	0.0%	○	401.
F12.11	Multi-step speed 11	The VFD supports the setting of speeds of 16 steps, which are set by combined codes of multi-step terminals 1~4 (set by S terminals, corresponding to function code <u>F08.00~F08.03</u> ) and correspond to multi-step speed 0 to multi-step speed 15.	-100.0~100.0	0.0%	○	402.
F12.12	Multi-step speed 12		-100.0~100.0	0.0%	○	403.
F12.13	Multi-step speed 13		-100.0~100.0	0.0%	○	404.
F12.14	Multi-step speed 14		-100.0~100.0	0.0%	○	405.
F12.15	Multi-step speed 15		-100.0~100.0	0.0%	○	406.

Function code	Name	Description	Setting range	Default	Modify	SN																																																																																										
		<p>When terminal 1, terminal 2, terminal 3 and terminal 4 are OFF, the frequency input mode is set by <u>F00.03</u> or <u>F00.04</u>. When terminal 1, terminal 2, terminal 3 and terminal 4 are not all OFF, the frequency set by multi-step speed will prevail, and the priority of multi-step setting is higher than that of the keypad, analog, high-speed pulse, PID, and communication settings.</p> <p>The relation between terminal 1, terminal 2, terminal 3 and terminal 4 are shown in the following (T indicates terminal):</p> <table border="1"> <tbody> <tr><td>T1</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>T2</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>T3</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>T4</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>T1</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>T2</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>T3</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>T4</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> </tbody> </table>	T1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	T2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	T3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	T4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Step	0	1	2	3	4	5	6	7	T1	OFF	ON	OFF	ON	OFF	ON	OFF	ON	T2	OFF	OFF	ON	ON	OFF	OFF	ON	ON	T3	OFF	OFF	OFF	OFF	ON	ON	ON	ON	T4	ON	ON	ON	ON	ON	ON	ON	ON	Step	8	9	10	11	12	13	14	15				
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F12.16	Simple PLC mode	<p>0: Stop after running once; the VFD stops automatically after running for one cycle, and it can be started only after receiving running command.</p> <p>1: Keep running in the final value after running once; The VFD keeps the running frequency and direction of the last section after a single cycle.</p>	0~2	0	○	407.																																																																																										

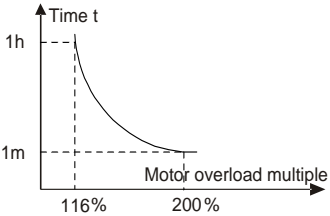
Function code	Name	Description	Setting range	Default	Modify	SN
		2: Cyclic running; the VFD enters the next cycle after completing one cycle until receiving stop command and stops.				
F12.17	Simple PLC memory selection	0: No memory after power-off 1: Memory after power-off; PLC memories its running stage and frequency before power-off.	0~1	0	○	408.
F12.18	Running time of step 0	0.0~6553.5s(min)	0.0~6553.5	0.0 s(min)	○	409.
F12.19	Running time of step 1		0.0~6553.5	0.0 s(min)	○	410.
F12.20	Running time of step 2		0.0~6553.5	0.0 s(min)	○	411.
F12.21	Running time of step 3		0.0~6553.5	0.0 s(min)	○	412.
F12.22	Running time of step 4		0.0~6553.5	0.0 s(min)	○	413.
F12.23	Running time of step 5		0.0~6553.5	0.0 s(min)	○	414.
F12.24	Running time of step 6		0.0~6553.5	0.0 s(min)	○	415.
F12.25	Running time of step 7		0.0~6553.5	0.0 s(min)	○	416.
F12.26	Running time of step 8		0.0~6553.5	0.0 s(min)	○	417.
F12.27	Running time of step 9		0.0~6553.5	0.0 s(min)	○	418.
F12.28	Running time of step 10		0.0~6553.5	0.0 s(min)	○	419.
F12.29	Running time of step 11		0.0~6553.5	0.0 s(min)	○	420.
F12.30	Running time of step 12		0.0~6553.5	0.0 s(min)	○	421.
F12.31	Running time of step 13		0.0~6553.5	0.0 s(min)	○	422.
F12.32	Running time of step 14	0.0~6553.5	0.0 s(min)	○	423.	

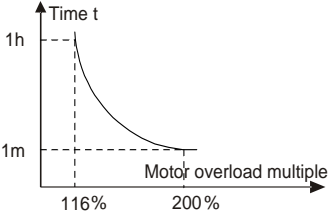


Function code	Name	Description	Setting range	Default	Modify	SN																																																																																																																										
F12.33	Running time of step 15		0.0~6553.5	0.0 s(min)	○	424.																																																																																																																										
F12.34	ACC/DEC time of steps 0~7 of simple PLC	The description is as follows (St indicates step):	0x0000~0xFFFF	0x0000	○	425.																																																																																																																										
F12.35	ACC/DEC time of steps 8~15 of simple PLC	<table border="1"> <thead> <tr> <th>Code</th> <th colspan="2">Binary</th> <th>St</th> <th>ACC/DEC T1</th> <th>ACC/DEC T2</th> <th>ACC/DEC T3</th> <th>ACC/DEC T4</th> </tr> </thead> <tbody> <tr> <td rowspan="8">F12.34</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">F12.35</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> </tbody> </table>	Code	Binary		St	ACC/DEC T1	ACC/DEC T2	ACC/DEC T3	ACC/DEC T4	F12.34	BIT1	BIT0	0	00	01	10	11	BIT3	BIT2	1	00	01	10	11	BIT5	BIT4	2	00	01	10	11	BIT7	BIT6	3	00	01	10	11	BIT9	BIT8	4	00	01	10	11	BIT11	BIT10	5	00	01	10	11	BIT13	BIT12	6	00	01	10	11	BIT15	BIT14	7	00	01	10	11	F12.35	BIT1	BIT0	8	00	01	10	11	BIT3	BIT2	9	00	01	10	11	BIT5	BIT4	10	00	01	10	11	BIT7	BIT6	11	00	01	10	11	BIT9	BIT8	12	00	01	10	11	BIT11	BIT10	13	00	01	10	11	BIT13	BIT12	14	00	01	10	11	BIT15	BIT14	15	00	01	10	11	0x0000~0xFFFF	0x0000	○	426.
		Code	Binary		St	ACC/DEC T1	ACC/DEC T2	ACC/DEC T3	ACC/DEC T4																																																																																																																							
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		<p>Select corresponding acceleration/deceleration time, and then convert 16-bit binary number into hexadecimal number, finally, and then set corresponding function codes.</p> <p>ACC/DEC time 1 is set by <u>F00.13</u> and <u>F00.14</u>; ACC/DEC time 2 is set by <u>F10.03</u> and <u>F10.04</u>; ACC/DEC time 3 is set by <u>F10.05</u> and <u>F10.06</u>; Acceleration /deceleration time 4 is set by <u>F10.07</u> and <u>F10.08</u>.</p> <p>Setting range:0x0000~0xFFFF</p>																																																																																																																														

Function code	Name	Description	Setting range	Default	Modify	SN
F12.36	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.	0~1	0	◎	427.
F12.37	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	0~1	0	◎	428.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F13 group—Protection parameters and fault records</b>						
F13.00	Overload protection selection 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.	0~2	2	◎	429.

Function code	Name	Description	Setting range	Default	Modify	SN
F13.01	Overload protection coefficient of motor 1	<p>Motor overload multiples <math>M = I_{out} / (I_n * K)</math></p> <p><math>I_n</math> is rated motor current, <math>I_{out}</math> is VFD output current, and <math>K</math> is motor overload protection coefficient.</p> <p>A smaller value of <math>K</math> indicates a bigger value of <math>M</math>.</p> <p>When <math>M=116\%</math>, protection is performed after motor overload lasts for 1 hour;</p> <p>when <math>M=150\%</math>, protection is performed after motor overload lasts for 12 minutes;</p> <p>when <math>M=180\%</math>, protection is performed after motor overload lasts for 5 minutes;</p> <p>when <math>M=200\%</math>, protection is performed after motor overload lasts for 60 seconds;</p> <p>when <math>M \geq 400\%</math>, protection is performed immediately.</p>  <p>Setting range: 20.0% – 150.0%</p>	20.0~150.0	100.0%	○	430.
F13.02	Overload protection selection of motor 2	<p>0: No protection</p> <p>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.</p>	0~2	2	◎	431.

Function code	Name	Description	Setting range	Default	Modify	SN
		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.				
F13.03	Overload protection coefficient of motor 2	<p>Motor overload multiples <math>M = I_{out} / (I_n * K)</math></p> <p><math>I_n</math> is rated motor current, <math>I_{out}</math> is VFD output current, and <math>K</math> is motor overload protection coefficient.</p> <p>A smaller value of <math>K</math> indicates a bigger value of <math>M</math>.</p> <p>When <math>M=116\%</math>, protection is performed after motor overload lasts for 1 hour;</p> <p>when <math>M=150\%</math>, protection is performed after motor overload lasts for 12 minutes;</p> <p>when <math>M=180\%</math>, protection is performed after motor overload lasts for 5 minutes;</p> <p>when <math>M=200\%</math>, protection is performed after motor overload lasts for 60 seconds;</p> <p>when <math>M \geq 400\%</math>, protection is performed immediately.</p>  <p>Setting range: 20.0% – 150.0%</p>	20.0~150.0	100.0%	○	432.
F13.04	Overvoltage stall protection	<p>0: Disable</p> <p>1: Enable</p>	0~1	1	○	433.

Function code	Name	Description	Setting range	Default	Modify	SN
F13.05	Overvoltage stall protection voltage	120–150% (standard bus voltage) (380V) 120–150% (standard bus voltage) (220V)	120~145% 120~145%	136% 120%	○	434.
F13.06	Enabling energy consumption braking	0: Disable 1: Enable	0~1	1	○	435.
F13.07	Energy consumption 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	200.0~2000.0	220V class: 380.0V 380V class: 700.0V	○	436.
F13.08	Auto fault reset count	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.	0~10	0	○	437.
F13.09	Auto fault reset interval	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 <u>P08.28</u> : 0~10 Setting range of <u>P08.29</u> : 0.1~3600.0s	0.1~3600.0	1.0s	○	438.
F13.10	Phase-loss protection	0x000~0x111 Ones place: 0: Disable software input phase loss protection	0x000~0x111	0x110	○	439.

Function code	Name	Description	Setting range	Default	Modify	SN
		1: Enable software input phase loss protection Tens place: 0: Disable output phase loss protection 1: Enable output phase loss protection Hundreds place: 0: Disable hardware input phase loss protection 1: Enable hardware input phase loss protection				
F13.11	Present fault type	0: No fault	0~70		•	440.
F13.12	Last fault type	1: Inverter unit U-phase protection 2: Inverter unit V-phase protection	0~70		•	441.
F13.13	2nd-last fault type	3: Inverter unit W-phase protection 4: Overcurrent during acceleration	0~70		•	442.
F13.14	3rd-last fault type	5: Overcurrent during deceleration	0~70		•	443.
F13.15	4th-last fault type	6: Overcurrent during constant speed running 7: Overvoltage during acceleration	0~70		•	444.
F13.16	5th-last fault type	8: Overvoltage during deceleration 9: Overvoltage during constant speed running 10: Bus undervoltage fault 11: Motor overload 12: VFD overload 13: Phase loss on input side 14: Phase loss on output side 15: Rectifier module overheat 16: Inverter module overheat 17: External fault 18: Modbus communication fault 19: Current detection fault 20: Motor autotuning fault 21: EEPROM operation error 22: PID feedback offline fault 23: Braking unit fault 24: Running time reached 25: Electronic overload 26: Keypad communication error 27: Parameter upload error	0~70		•	445.

Function code	Name	Description	Setting range	Default	Modify	SN
		28: Parameter download error 29: Profibus communication fault 30: Reserved 31: CANopen communication fault 32: To-ground short-circuit fault 1 33: To-ground short-circuit fault 2 34: Speed deviation fault 35: Mal-adjustment fault 36: Underload fault 37: Encoder disconnection fault 38: Encoder direction reversal fault 39: Encoder Z-pulse disconnection fault 40~43: Reserved 44: Safety code FLASH CRC fault 45~54: Reserved 55: Duplicate extension card type 56: Encoder UVW lost 57: Profinet communication fault 58: CAN communication fault 59: Motor overtemperature fault 60: Failure to identify the card at slot 1 61: Failure to identify the card at slot 2 62: Failure to identify the card at slot 3 63: Communication timeout of the card at slot 1 64: Communication timeout of the card at slot 2 65: Communication timeout of the card at slot 3 66: Reserved 67: Bacnet communication fault 68: Reserved 69: CAN slave fault in master/slave synchronization				
F13.17	Running frequency at present fault	0.00Hz~ <a href="#">F00.07</a>	0.00~F00.07	0.00Hz	●	446.
F13.18	Ramp reference	0.00Hz~ <a href="#">F00.07</a>	0.00~F00.0	0.00Hz	●	447.

Function code	Name	Description	Setting range	Default	Modify	SN
	frequency at present fault		7			
F13.19	Output voltage at present fault	0~1200V	0~1200	0V	•	448.
F13.20	Output current at present fault	0.0~6300.0A	0.0~6300.0	0.0A	•	449.
F13.21	Bus voltage at present fault	0.0~2000.0V	0.0~2000.0	0.0V	•	450.
F13.22	Max. temperature at present fault	-20.0~120.0℃	-20.0~120.0	0.0℃	•	451.
F13.23	Input terminal status at present fault	0x0000~0xFFFF	0x0000~0xFFFF	0	•	452.
F13.24	Output current status at present fault	0x0000~0xFFFF	0x0000~0xFFFF	0	•	453.
F13.25	Running frequency at last fault	0.00Hz~ <a href="#">F00.07</a>	0.00~F00.07	0.00Hz	•	454.
F13.26	Ramp reference frequency at last fault	0.00Hz~ <a href="#">F00.07</a>	0.00~F00.07	0.00Hz	•	455.
F13.27	Output voltage at last fault	0~1200V	0~1200	0V	•	456.
F13.28	Output current at last fault	0.0~6300.0A	0.0~6300.0	0.0A	•	457.
F13.29	Bus voltage at last fault	0.0~2000.0V	0.0~2000.0	0.0V	•	458.
F13.30	Max. temperature at last fault	-20.0~120.0℃	-20.0~120.0	0.0℃	•	459.
F13.31	Input terminal status at last fault	0x0000~0xFFFF	0x0000~0xFFFF	0	•	460.
F13.32	Output terminal status at last fault	0x0000~0xFFFF	0x0000~0xFFFF	0	•	461.
F13.33	Running frequency at 2nd-last fault	0.00Hz~ <a href="#">F00.07</a>	0.00~F00.07	0.00Hz	•	462.



Function code	Name	Description	Setting range	Default	Modify	SN
F13.34	Ramp reference frequency at 2nd-last fault	0.00Hz~ <a href="#">F00.07</a>	0.00~F00.07	0.00Hz	●	463.
F13.35	Output voltage at 2nd-last fault	0~1200V	0~1200	0V	●	464.
F13.36	Output current at 2nd-last fault	0.0~6300.0A	0.0~6300.0	0.0A	●	465.
F13.37	Bus voltage at 2nd-last fault	0.0~2000.0V	0.0~2000.0	0.0V	●	466.
F13.38	Max. temperature at 2nd-last fault	-20.0~120.0°C	-20.0~120.0	0.0°C	●	467.
F13.39	Input terminal status at 2nd-last fault	0x0000~0xFFFF	0x0000~0xFFFF	0	●	468.
F13.40	Output terminal status at 2nd-last fault	0x0000~0xFFFF	0x0000~0xFFFF	0	●	469.
F13.41	Fault output terminal action upon fault occurring	The function code is used to set the action of fault output terminals at undervoltage and fault reset. 0x00~0x11 Ones: 0: Act at undervoltage 1: Do not act at undervoltage Tens: 0: Act at fault reset 1: Do not act at fault reset	0x00~0x11	0x00	○	470.
F13.42	Frequency drop at transient power-off	0: Disable 1: Enable	0~1	0	○	471.
F13.43	Reserved	0~65535	0~65535	0	●	472.
F13.44	Automatic frequency reduction during voltage drop	0~1 0: Invalid 1: Valid	0~1	0	○	473.
F13.45	Pre-alarm selection for VFD/motor	0x000~0x1132 Ones:	0x0000~0x1132	0x0000	○	474.

Function code	Name	Description	Setting range	Default	Modify	SN
	OL/UL	<p>0: Motor overload/underload pre-alarm, relative to rated motor current; 1: VFD overload/underload pre-alarm, relative to rated VFD current.</p> <p>Tens: 0: The VFD continues running after overload/underload alarm; 1: The VFD continues running after underload alarm, and stops running after overload fault; 2: The VFD continues running after overload alarm, and stops running after underload fault; 3: The VFD stops running after overload/underload fault.</p> <p>Hundreds: 0: Always detect 1: Detect during constant-speed running</p> <p>Thousands: VFD overload current reference selection 0: Related to current calibration coefficient 1: Irrelated to current calibration coefficient</p>				
F13.46	Enabling VFD overload integral	<p>0: Disable 1: Enable</p> <p>When the function code 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.</p> <p>When the function code 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.</p>	0~1	0	◎	475.
F13.47	Overload pre-alarm detection level	If the VFD or motor output current is larger than the overload pre-alarm detection level	F13.49~20 0	G type: 150%	○	476.

Function code	Name	Description	Setting range	Default	Modify	SN
		(F13.47), and the duration exceeds the overload pre-alarm detection time (F13.48), overload pre-alarm signal will be outputted.		P type: 120%		
F13.48	Overload pre-alarm detection time	<p>Setting range of F13.47: F13.49–200% Setting range of F13.48: 0.1–3600.0s</p>	0.1~3600.0	1.0s	<input type="radio"/>	477.
F13.49	Underload pre-alarm detection level	Underload pre-alarm signal will be outputted if the output current of the VFD or motor is lower than underload pre-alarm detection level (F13.49), and the duration exceeds underload pre-alarm detection time (F13.50).	0~F13.47	50%	<input type="radio"/>	478.
F13.50	Underload pre-alarm detection time	Setting range of F13.49: 0~F13.47 Setting range of F13.50: 0.1–3600.0s	0.1~3600.0	1.0s	<input type="radio"/>	479.
F13.51	Speed deviation detection value	0.0~50.0% Used to set the speed deviation detection value.	0.0~50.0	10.0%	<input type="radio"/>	480.
F13.52	Speed deviation detection time	0.0~10.0s Used to set the speed deviation detection time. <b>Note:</b> Speed deviation protection is invalid when F13.52 is set to 0.0.	0.0~10.0	2.0s	<input type="radio"/>	481.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>Setting range: 0.0–10.0s</p>				
F13.53	Energy braking for stop	0: Enable 1: Disable	0~1	0	☉	482.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F14 group—Serial communication</b>						
F14.00	Communication baud rate	The function code is used to set the data transmission speed between upper computer and the VFD. 0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS 7: 115200BPS <b>Note:</b> The baud rate set on the VFD must be consistent with that on the upper computer. Otherwise, the communication fails. A greater baud rate indicates faster communication.	0~7	4	○	483.
F14.01	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	0~5	1	○	484.

Function code	Name	Description	Setting range	Default	Modify	SN
		4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU				
F14.02	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 slaves on the Modbus bus receive the frame but do not respond to it. Local communication address is unique in the communication network, which is the basis for point-to-point communication between the upper computer and the VFD. <b>Note:</b> The communication address of a slave cannot be set to 0.	1~247	1	○	485.
F14.03	Communication response delay	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 VFD processing time, the VFD sends response data to the upper computer after processing data. If the delay is longer than the VFD processing time, the VFD does not send response data to the upper computer until the delay is reached although data has been processed.	0~200	5	○	486.
F14.04	Communication timeout time	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 a non-zero value, the rectifier reports the " Modbus 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.	0.0~60.0	0.0s	○	487.

Function code	Name	Description	Setting range	Default	Modify	SN
F14.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting an alarm (applicable to any mode)	0~3	0	○	488.
F14.06	Communication processing action	0x00~0x11 Ones place: 0: Respond to write operations 1: Not respond to write operations Tens place: 0: Password protection for communication is invalid. 1: Password protection for communication is valid.	0x00~0x11	0x00	○	489.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F15 group—Functions of communication extension card 1</b>						
F15.00	Extension card type	0: Profibus_DP 1: CANopen 2: Reserved 3: BACnet 4:Reserved	0~4	0	●	490.
F15.01	Communication address	0~127	0~127	2	◎	491.
F15.02	Received PZD2	0~31	0~31	0	○	492.
F15.03	Received PZD3	0: Invalid 1: Set frequency (0~Fmax. Unit: 0.01Hz)	0~31	0	○	493.
F15.04	Received PZD4	2: PID reference (-1000~1000, in which 1000 corresponds to 100.0%)	0~31	0	○	494.
F15.05	Received PZD5	3: PID feedback (-1000~1000, in which 1000 corresponds to 100.0%)	0~31	0	○	495.
F15.06	Received PZD6	4: Torque setting (-3000~+3000, in which	0~31	0	○	496.

Function code	Name	Description	Setting range	Default	Modify	SN
F15.07	Received PZD7	1000 corresponds to 100.0% of the motor rated current)	0~31	0	○	497.
F15.08	Received PZD8	5: Setting of the upper limit of forward running frequency (0–Fmax. Unit: 0.01 Hz)	0~31	0	○	498.
F15.09	Received PZD9	6: Setting of the upper limit of reverse running frequency (0–Fmax. Unit: 0.01 Hz)	0~31	0	○	499.
F15.10	Received PZD10	7: Upper limit of electromotive torque (0–3000, in which 1000 corresponds to 100.0%	0~31	0	○	500.
F15.11	Received PZD11	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, corresponding to DI8/DI7/DI6/DI5/HI1/HI2/DI4/DI3/DI2/DI1) 10: Virtual output terminal command (Range: 0x00–0x0F, corresponding to RO2/RO1/HDO/Y1) 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: High-order bit of position reference (signed) 15: Low-order bit of position reference (unsigned) 16: High-order bit of position feedback (signed) 17: Low-order bit of position feedback (unsigned) 18: Position feedback setting flag (position feedback can be set only after this flag is set to 1 and then to 0) 19: Electronic gear molecule	0~31	0	○	501.
F15.12	Received PZD12		0~31	0	○	502.

Function code	Name	Description	Setting range	Default	Modify	SN
		20: Electronic gear denominator 21~31: Reserved				
F15.13	Sent PZD2	0~31 0: Invalid	0~31	0	○	503.
F15.14	Sent PZD3	1: Running frequency (x100, Hz)	0~31	0	○	504.
F15.15	Sent PZD4	2: Set frequency (x100, Hz) 3: Bus voltage (x10, V)	0~31	0	○	505.
F15.16	Sent PZD5	4: Output voltage (x1, V) 5: Output current (x10, A)	0~31	0	○	506.
F15.17	Sent PZD6	6: Actual output torque (x10, %)	0~31	0	○	507.
F15.18	Sent PZD7	7: Actual output power (x10, %) 8: Rotation speed of running (x1, RPM)	0~31	0	○	508.
F15.19	Sent PZD8	9: Linear speed of running (x1, m/s)	0~31	0	○	509.
F15.20	Sent PZD9	10: Ramp reference frequency 11: Fault code	0~31	0	○	510.
F15.21	Sent PZD10	12: AI1 input (x100, V) 13: AI2 input (x100, V)	0~31	0	○	511.
F15.22	Sent PZD11	14: Reserved	0~31	0	○	512.
F15.23	Sent PZD12	15: HI1 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: High-order bit of position reference (signed) 22: Low-order bit of position reference (unsigned) 23: High-order bit of position feedback (signed) 24: Low-order bit of position feedback (unsigned) 25: Status word 26: HI2 frequency value (x100, kHz) 27~31: Reserved	0~31	0	○	513.
F15.24	Sent PZD temporary value 1	0~65535	0~65535	0	○	514.



Function code	Name	Description	Setting range	Default	Modify	SN
F15.25	DP communication timeout time	0.0 (invalid)–60.0s	0.0~60.0	1.0s	○	515.
F15.26	CANopen communication timeout time	0.0 (invalid)–60.0s	0.0~60.0	1.0s	○	516.
F15.27	CANopen communication baud rate	0–7 0: 1000kbps 1: 800kbps 2: 500kbps 3: 250kbps 4: 125kbps 5: 100kbps 6: 50kbps 7: 20kbps	0~7	3	◎	517.
F15.28	Master/slave CAN communication address	0–127	0~127	1	◎	518.
F15.29	Master/slave CAN communication baud rate selection	0: 50Kbps 1: 100 Kbps 2: 125Kbps 3: 250Kbps 4: 500Kbps 5: 1M bps	0~5	2	◎	519.
F15.30	Master/slave CAN communication timeout time	0.0 (invalid)–60.0s	0.0~60.0	0.0s	○	520.
F15.41	BACnet communication mode selection		0~1	0	◎	521.
F15.42	BACnet_MSTP baud rate	0~5	0~5	0	◎	522.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>P16 group—Functions of communication extension card 2</b>						
F16.00	Extension card type selection	0: Reserved 1: EtherCat 2: Profinet 3: BACnet_I_M 4: Reserved	0~4	0	●	523.
F16.01	Ethernet communication speed setting	0: Self-adaption 1: 100M full duplex 2: 100M half duplex 3: 10M full duplex 4: 10M half duplex	0~4	0	◎	524.
F16.02	IP address 1	0~255	0~255	192	◎	525.
F16.03	IP address 2	0~255	0~255	168	◎	526.
F16.04	IP address 3	0~255	0~255	0	◎	527.
F16.05	IP address 4	0~255	0~255	1	◎	528.
F16.06	Subnet mask 1	0~255	0~255	255	◎	529.
F16.07	Subnet mask 2	0~255	0~255	255	◎	530.
F16.08	Subnet mask 3	0~255	0~255	255	◎	531.
F16.09	Subnet mask 4	0~255	0~255	0	◎	532.
F16.10	Gateway 1	0~255	0~255	192	◎	533.
F16.11	Gateway 2	0~255	0~255	168	◎	534.
F16.12	Gateway 3	0~255	0~255	1	◎	535.
F16.13	Gateway 4	0~255	0~255	1	◎	536.
F16.14	Ethernet monitoring variable address 1	0~FFFF	0~FFFF	0	○	537.
F16.15	Ethernet	0~FFFF	0~FFFF	0	○	538.

Function code	Name	Description	Setting range	Default	Modify	SN
	monitoring variable address 2					
F16.16	Ethernet monitoring variable address 3	0~FFFF	0~FFFF	0	○	539.
F16.17	Ethernet monitoring variable address 4	0~FFFF	0~FFFF	0	○	540.
F16.18	Reserved	0~10000ms	0~10000ms	0	○	541.
F16.19	EtherCAT Synchronization cycle	0~4 (0:250us, 1:500us, 2:1ms, 3:2ms)	0~4	2	○	542.
F16.20	BACnet equipment number high bit	BACnet设备的独立编码 (0~4194303)	0~4194	0	◎	543.
F16.21	BACnet equipment number low bit		0~999	1	◎	544.
F16.22	BACnet“l-Am” service selection	0: Sent when powered on 1: : Continuously sending	0~1	0	○	545.
F16.23	BACnet Communication timeout	0.0(invalid)~60.0s	0.0~60.0	1.0s	○	546.
P16.24	Time for identifying extension card at slot 1	0.0~600.0s If it is set to 0.0, identifying faults are not detected.	0.0~600.0	0.0	○	547.
P16.25	Time for identifying extension card at slot 2	0.0~600.0s If it is set to 0.0, identifying faults are not detected.	0.0~600.0	0.0	○	548.
P16.26	Time for identifying extension card at slot 3	0.0~600.0s If it is set to 0.0, identifying faults are not detected.	0.0~600.0	0.0	○	549.
P16.27	Communication timeout time for extension card at slot 1	0.0~600.0s If it is set to 0.0, identifying faults are not detected.	0.0~600.0	0.0	○	550.
P16.28	Communication	0.0~600.0s	0.0~600.0	0.0	○	551.

Function code	Name	Description	Setting range	Default	Modify	SN
	timeout time for extension card at slot 2	If it is set to 0.0, identifying faults are not detected.				
P16.29	Communication timeout time for extension card at slot 3	0.0–600.0s If it is set to 0.0, identifying faults are not detected.	0.0–600.0	0.0	○	552.
F16.30	EtherCat Communication timeout	0.0(invalid)–60.0s	0.0–60.0	0.0s	○	553.
F16.31	Profinet Communication timeout	0.0(invalid)–60.0s	0.0–60.0	1.0s	○	554.
F16.32	Received PZD2	0–31	0~31	0	○	555.
F16.33	Received PZD3	0: Invalid 1: Set frequency (0–Fmax. Unit: 0.01Hz)	0~31	0	○	556.
F16.34	Received PZD4	2: PID reference (-1000–1000, in which 1000 corresponds to 100.0%)	0~31	0	○	557.
F16.35	Received PZD5	3: PID feedback (-1000–1000, in which 1000 corresponds to 100.0%)	0~31	0	○	558.
F16.36	Received PZD6	4: Torque setting (-3000–+3000, in which 1000 corresponds to 100.0% of the motor rated current)	0~31	0	○	559.
F16.37	Received PZD7	5: Setting of the upper limit of forward running frequency (0–Fmax. Unit: 0.01 Hz)	0~31	0	○	560.
F16.38	Received PZD8	6: Setting of the upper limit of reverse running frequency (0–Fmax. Unit: 0.01 Hz)	0~31	0	○	561.
F16.39	Received PZD9	7: Upper limit of electromotive torque (0–3000, in which 1000 corresponds to 100.0% of the motor rated current)	0~31	0	○	562.
F16.40	Received PZD10	8: Upper limit of braking torque (0–3000, in which 1000 corresponds to 100% of the motor rated current)	0~31	0	○	563.
F16.41	Received PZD11	9: Virtual input terminal command (Range: 0x000–0x3FF, corresponding to DI8/DI7/DI6/DI5/HI1/HI2/DI4/DI3/DI2/DI1)	0~31	0	○	564.
F16.42	Received PZD12	10: Virtual output terminal command (Range: 0x00–0x0F, corresponding to	0~31	0	○	565.

Function code	Name	Description	Setting range	Default	Modify	SN
		RO2/RO1/HDO/Y1) 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: High-order bit of position reference (signed) 15: Low-order bit of position reference (unsigned) 16: High-order bit of position feedback (signed) 17: Low-order bit of position feedback (unsigned) 18: Position feedback setting flag (position feedback can be set only after this flag is set to 1 and then to 0) 19: Electronic gear molecule 20: Electronic gear denominator 21~31: Reserved				
F16.43	Sent PZD2	0–31	0~31	0	○	566.
F16.44	Sent PZD3	0: Invalid 1: Running frequency (x100, Hz)	0~31	0	○	567.
F16.45	Sent PZD4	2: Set frequency (x100, Hz)	0~31	0	○	568.
F16.46	Sent PZD5	3: Bus voltage (x10, V) 4: Output voltage (x1, V)	0~31	0	○	569.
F16.47	Sent PZD6	5: Output current (x10, A)	0~31	0	○	570.
F16.48	Sent PZD7	6: Actual output torque (x10, %) 7: Actual output power (x10, %)	0~31	0	○	571.
F16.49	Sent PZD8	8: Rotation speed of running (x1, RPM)	0~31	0	○	572.
F16.50	Sent PZD9	9: Linear speed of running (x1, m/s)	0~31	0	○	573.
F16.51	Sent PZD10	10: Ramp reference frequency 11: Fault code	0~31	0	○	574.
F16.52	Sent PZD11	12: AI1 input (x100, V) 13: AI2 input (x100, V)	0~31	0	○	575.
F16.53	Sent PZD12	14: Reserved	0~31	0	○	576.

Function code	Name	Description	Setting range	Default	Modify	SN
		15: HI1 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: High-order bit of position reference (signed) 22: Low-order bit of position reference (unsigned) 23: High-order bit of position feedback (signed) 24: Low-order bit of position feedback (unsigned) 25: Status word 26~31: Reserved				

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F17 group—Human-machine interface</b>						
F17.00	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 <b>ENT</b> key again to enter the function code editing interface. You need	0~65535	0	○	577.

Function code	Name	Description	Setting range	Default	Modify	SN
		to enter the correct user password to enter the interface. <b>Note:</b> Restoring the default values may delete the user password. Exercise caution when using this function.				
F17.01	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records 3: Keyboard parameter locking <b>Note:</b> 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.	0~3	0	◎	578.
F17.02	Parameter copy	0: No operation 1: Upload the local function parameter to the keypad 2: Download the keypad function parameter to local address(including the motor parameters) 3: Download the keypad function parameter to local address (excluding the motor parameter) 4: Download the keypad function parameters to local address (only for the motor parameter ) <b>Note:</b> After completing the 1~4 operations, the parameter will come back to 0 automatically. Thefunction of upload and download excludes the factory parameters.	0~4	0	◎	579.
F17.03	MF Key function selection	Range: 0x00~0x27 Ones: Function of <b>MF</b> 0: No function 1: Jog 2: Reserved 3: Switch between forward and reverse rotating 4: Clear the <b>UP/DOWN</b> setting	0x00~0x27	0x01	◎	580.

Function code	Name	Description	Setting range	Default	Modify	SN
		5: Coast to stop 6: Switch command channels in sequence 7: Reserved Tens place: Reserved				
F17.04	Sequence of switching running-command channels by pressing <b>MF</b>	When <u>F17.03</u> =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	0~3	0	○	581.
F17.05	Stop function validity of <b>STOP/RST</b>	The function code specifies the stop function validity of <b>STOP/RST</b> . For fault reset, <b>STOP/RST</b> 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	0~3	0	○	582.
F17.06	Running parameters state 1	0x0000~0xFFFF BIT0: running frequency (Hz on) BIT1: set frequency (Hz flickering) BIT2: bus voltage (Hz on) BIT3: output voltage (V on) BIT4: output current (A on) BIT5: running rotation speed (rpm on) BIT6: output power (% on) BIT7: output torque (% on) BIT8: PID reference (% flickering) BIT9: PID feedback value (% on) BIT10: input terminals state BIT11: output terminals state BIT12: torque set value (% on) BIT13: pulse counter value BIT14: length value BIT15: PLC and the current stage in	0x0000~0xFFFF	0x03FF	○	583.



Function code	Name	Description	Setting range	Default	Modify	SN
		multi-stepspeed				
F17.07	Running parameters state 2	0x0000~0xFFFF BIT0: AI1 (V on) (implemented through the analog potentiometer on the keypad for the 0150G/018P and lower models; not available for the 018G/022P and higher models.) BIT1: AI2 (V on) BIT2: Reserved BIT3: HI1 frequency BIT4: motor overload percentage (% on) BIT5: the VFD overload percentage (% on) BIT6: ramp frequency given value (Hz on) BIT7: linear speed BIT8: AC inlet current (A on) BIT9: upper limit frequency (Hz on) BIT10~BIT15: Reserved	0000~FFFF	0x0000	○	584.
F17.08	Stopping parameters state	0x0000~0xFFFF BIT0: set frequency(Hz on) BIT1: bus voltage (V on) BIT2: input terminals state BIT3: output terminals state BIT4: PID reference (% flickering) BIT5: PID feedback value (% on) BIT6: torque setting value (% on) BIT7: analog AI1 value (V on) BIT8: analog AI2 value (V on) BIT9: Reserved BIT10: high speed pulse HI frequency BIT11: PLC and the current step in multi-step speed BIT12: pulse counters BIT13: length value BIT14: upper limit frequency (Hz on) BIT15: Reserved	0x0000~0xFFFF	0x00FF	○	585.
F17.09	Frequency display coefficient	0.01~10.00 Display frequency = Running frequency *	0.01~10.00	1.00	○	586.

Function code	Name	Description	Setting range	Default	Modify	SN
		<u>F17.09</u>				
F17.10	Rotational speed display coefficient	0.1~999.9% Mechanical rotation speed = 120 * (Displayed running frequency) * <u>F17.10</u> / (Number of motor pole pairs)	0.1~999.9%	100.0%	○	587.
F17.11	Linear speed display coefficient	0.1~999.9% Linear speed = (Mechanical rotation speed) * <u>F17.11</u>	0.1~999.9%	1.0%	○	588.
F17.12	Rectifier bridge temperature	-20.0~120.0°C		0.0	●	589.
F17.13	Inverter temperature	-20.0~120.0°C		0.0	●	590.
F17.14	Control board software version	1.00~655.35		0.0000	●	591.
F17.15	Local accumulative running time	0~65535h		0	●	592.
F17.16	VFD electricity consumption high-order bits	Used to display the electricity consumption of the VFD. VFD electricity consumption = <u>F17.16</u> *1000+ <u>F17.17</u>		0	●	593.
F17.17	VFD electricity consumption low-order bits	Setting range of <u>F17.16</u> : 0~65535 kWh (*1000) Setting range of <u>F17.17</u> : 0.0~999.9 kWh		0.0	●	594.
F17.18	VFD type	0: G type 1: P type		0	●	595.
F17.19	VFD rated power	0.4~3000.0kW		0.0	●	596.
F17.20	VFD rated voltage	50~1200V		0	●	597.
F17.21	VFD rated current	0.1~6000.0A		0.0	●	598.
F17.22	Factory bar code 1	0x0000~0xFFFF		0	●	599.
F17.23	Factory bar code 2	0x0000~0xFFFF		0	●	600.
F17.24	Factory bar code 3	0x0000~0xFFFF		0	●	601.
F17.25	Factory bar code 4	0x0000~0xFFFF		0	●	602.
F17.26	Factory bar code 3	0x0000~0xFFFF		0	●	603.

Function code	Name	Description	Setting range	Default	Modify	SN
F17.27	Factory bar code 4	0x0000–0xFFFF		0	•	604.
F17.27	Software version	1.0000–6.5535		0.0000	•	605.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F18 group—Status viewing</b>						
F18.00	Set frequency	Displays current set frequency of the VFD. Range: 0.00Hz– <u>F00.03</u>	0.00–F00.0 7	0.00Hz	•	606.
F18.01	Output frequency	Displays current output frequency of the VFD. Range: 0.00Hz– <u>F00.03</u>	0.00–F00.0 7	0.00Hz	•	607.
F18.02	Ramp reference frequency	Displays current ramp reference frequency of the VFD. Range: 0.00Hz– <u>F00.03</u>	0.00–F00.0 7	0.00Hz	•	608.
F18.03	Output voltage	Displays current output voltage of the VFD. Range: 0–1200V	0~1200	0V	•	609.
F18.04	Output current	Displays the valid value of current output current of the VFD. Range: 0.0–5000.0A	0.0~5000.0	0.0A	•	610.
F18.05	Motor speed	Displays current motor speed. Range: 0–65535RPM	0~65535	0 RPM	•	611.
F18.06	Torque current	Displays current torque current of the VFD. Range: -3000.0–3000.0A	-3000.0~3000.0	0.0A	•	612.
F18.07	Exciting current	Displays current exciting current of the VFD. Range: -3000.0–3000.0A	-3000.0~3000.0	0.0A	•	613.
F18.08	Motor power	Displays current motor power; 100% relative to rated motor power, positive value is motoring state, negative value is generating state. Range: -300.0–300.0% (relative to rated motor power)	-300.0~300.0	0.0%	•	614.
F18.09	Motor output torque	Displays current output torque of the VFD; 100% relative to rated motor torque, during forward running, positive value is motoring state, negative value is generating state,	-250.0~250.0	0.0%	•	615.

Function code	Name	Description	Setting range	Default	Modify	SN
		during reverse running, positive value is generating state, negative value is motoring state. Range: -250.0~250.0%				
F18.10	Estimated motor frequency	Displays the estimated motor rotor frequency under open-loop vector condition. Range: 0.00~F00.03	0.00~F00.07	0.00Hz	●	616.
F18.11	DC bus voltage	Displays current DC bus voltage of the VFD. Range: 0.0~2000.0V	0.0~2000.0	0.0V	●	617.
F18.12	Digital input terminal state	Displays current digital input terminal state of the VFD. 0000~03F Corresponds to HDIB, HDIA, S4, S3, S2 and S1 respectively	0000~03F	0	●	618.
F18.13	Digital output terminal state	Displays current digital output terminal state of the VFD. 0000~000F Corresponds to RO2, RO1, HDO and Y1 respectively	0000~000F	0	●	619.
F18.14	Digital adjustment value	Displays the regulating variable of <u>UP/DOWN</u> . Range: 0.00Hz~F00.03	0.00~F00.07	0.00Hz	●	620.
F18.15	Torque reference value	Relative to percentage of the rated torque of current motor, display torque reference. Range: -300.0%~300.0% (motor rated current)	-300.0~300.0	0.0%	●	621.
F18.16	Linear speed	0~65535	0~65535	0	●	622.
F18.17	Reserved	0~65535	0~65535	0	●	623.
F18.18	Counting value	0~65535	0~65535	0	●	624.
F18.19	AI1 input voltage	Displays input signal of AI1 Range: 0.00~10.00V	0.00~10.00	0.00V	●	625.
F18.20	AI2 input voltage	Displays input signal of AI2 Range: -10.00V~10.00V	-10.00~10.00	0.00V	●	626.
F18.21	HDI input frequency	Displays input frequency of HDI Range: 0.000~50.000kHz	0.000~50.000	0.000 kHz	●	627.

Function code	Name	Description	Setting range	Default	Modify	SN
F18.22					●	628.
F18.23	PID reference value	Displays PID reference value Range: -100.0~100.0%	-100.0~100.0	0.0%	●	629.
F18.24	PID feedback value	Displays PID feedback value Range: -100.0~100.0%	-100.0~100.0	0.0%	●	630.
F18.25	Motor power factor	Displays the power factor of current motor. Range: -1.00~1.00	-1.00~1.00	1.00	●	631.
F18.26	Time elapsed of this run	Displays the time elapsed of this run. Range: 0~65535min	0~65535	0m	●	632.
F18.27	Simple PLC and current step number of multi-step speed	Displays simple PLC and current step number of multi-step speed Range: 0~15	0~15	0	●	633.
F18.28	Motor ASR controller output	Displays the speed loop ASR controller output value under vector control mode, relative to the percentage of rated torque of the motor. Range: -300.0%~300.0% (rated motor current)	-300.0~300.0	0.0%	●	634.
F18.29	Pole angle of open-loop SM	Displays initial identification angle of SM Range: 0.0~360.0	0.0~360.0	0.0	●	635.
F18.30	Phase compensation of SM	Displays phase compensation of SM Range: -180.0~180.0	-180.0~180.0	0.0	●	636.
F18.31	High-frequency superposition current of SM	0.0%~200.0% (rated motor current)	0.0~200.0	0.0	●	637.
F18.32	Motor flux linkage	0.0%~200.0%	0.0~200.0	0.0%	●	638.
F18.33	Exciting current reference	Displays the exciting current reference value under vector control mode Range: -3000.0~3000.0A	-3000.0~3000.0	0.0A	●	639.
F18.34	Torque current reference	Displays torque current reference value under vector control mode Range: -3000.0~3000.0A	-3000.0~3000.0	0.0A	●	640.
F18.35	AC incoming current	Displays the valid value of incoming current on AC side Range: 0.0~5000.0A	0.0~5000.0	0.0A	●	641.

Function code	Name	Description	Setting range	Default	Modify	SN
F18.36	Output torque	Displays output torque value, during forward running, positive value is motoring state, negative value is generating state; during reverse running, positive value is generating state, negative value is motoring state. Range: -3000.0Nm–3000.0Nm	-3000.0~3000.0	0.0Nm	●	642.
F18.37	Motor overload count value	0~65535	0~65535	0	●	643.
F18.38	Process PID output	-100.0%~100.0%	-100.0~100.0	0.0%	●	644.
F18.39	Function code in parameter download error	0.00~99.00	0.00~99.99	0.00	●	645.
F18.40	Motor control mode	Ones place: Control mode 0: Vector control 0 1: Vector control 1 2: Space voltage vector control 3: Closed-loop vector control Tens place: Control status 0: Speed control 1: Torque control 2: Position control Hundreds place: Motor number 0: Motor 1 1: Motor 2	0x000~0x123	0x002	●	646.
F18.41	Electromotive torque upper limit	0.0%~300.0% (of the motor rated current)	0.0~300.0	180.0%	●	647.
F18.42	Braking torque upper limit	0.0%~300.0% (of the motor rated current)	0.0~300.0	180.0%	●	648.
F18.43	Forward rotation upper-limit frequency in torque control	0.00~ <u>F00.03</u>	0.00~F00.07	50.00Hz	●	649.
F18.44	Reverse rotation upper-limit frequency in torque control	0.00~ <u>F00.03</u>	0.00~F00.07	50.00Hz	●	650.

Function code	Name	Description	Setting range	Default	Modify	SN
F18.45	Inertia compensation torque	-100.0%~100.0%	-100.0~100.0	0.0%	●	651.
F18.46	Friction compensation torque	-100.0%~100.0%	-100.0~100.0	0.0%	●	652.
F18.47	Motor pole pairs	0~65535	0~65535	0	●	653.
F18.48	VFD overload count value	0~65535	0~65535	0	●	654.
F18.49	Frequency set by A source	0.00~ <u>F00.03</u>	0.00~F00.07	0.00Hz	●	655.
F18.50	Frequency set by B source	0.00~ <u>F00.03</u>	0.00~F00.07	0.00Hz	●	656.
F18.51	PID proportional output	-100.0%~100.0%	-100.0~100.0	0.0%	●	657.
F18.52	PID integral output	-100.0%~100.0%	-100.0~100.0	0.0%	●	658.
F18.53	PID differential output	-100.0%~100.0%	-100.0~100.0	0.0%	●	659.
F18.54	PID present proportional gain	0.00~100.00	0.00~100.00	0.00	●	660.
F18.55	PID present integral gain	0.00~10.00s	0.00~10.00	0.00	●	661.
F18.56	PID present differential time	0.00~10.00s	0.00~10.00	0.00	●	662.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F19 group—Status viewing in closed-loop control</b>						
F19.00	Actual frequency of encoder	The actual-measured encoder frequency; the value of forward running is positive; the value of reverse running is negative. Range: -999.9~3276.7Hz	-999.9~3276.7	0.0Hz	●	663.

Function code	Name	Description	Setting range	Default	Modify	SN
F19.01	Encoder position count value	Encoder count value, quadruple frequency, Range: 0–65535	0–65535	0	●	664.
F19.02	Encoder Z pulse count value	Corresponding count value of encoder Z pulse. Range: 0–65535	0–65535	0	●	665.
F19.03	High-order bit of position reference value	High-order bit of position reference value, zero out after stop. Range: 0–30000	0~30000	0	●	666.
F19.04	Low-order bit of position reference value	Low-order bit of position reference value, zero out after stop. Range: 0–65535	0~65535	0	●	667.
F19.05	High-order bit of position feedback value	High-order bit of position feedback value, zero out after stop. Range: 0–30000	0~30000	0	●	668.
F19.06	Low-order bit of position feedback value	Low-order bit of position feedback value, zero out after stop. Range: 0–65535	0~65535	0	●	669.
F19.07	Position deviation	Deviation between current reference position and actual running position. Range: -32768–32767	-32768~32767	0	●	670.
F19.08	Position of position reference point	Position of reference point of Z pulse when the spindle stops accurately. Range: 0–65535	0~65535	0	●	671.
F19.09	Present position setting of spindle	Current position setup when the spindle stops accurately. Range: 0–359.99	0~359.99	0.00	●	672.
F19.10	Present position when spindle stops accurately	Current position when spindle stops accurately. Range: 0–65535	0~65535	0	●	673.
F19.11	Encoder Z pulse direction	Z pulse direction display. When the spindle stops accurately, there may be a couple of pulses' error between the position of forward and reverse orientation, which can be eliminated by adjusting Z pulse direction of <u>F02.02</u> or exchanging phase AB of encoder. 0: Forward 1: Reverse	0~1	0	●	674.



Function code	Name	Description	Setting range	Default	Modify	SN
F19.12	Encoder Z pulse angle	Reserved. Range: 0.00–359.99	0–359.99	0.00	●	675.
F19.13	Encoder Z pulse error times	Reserved. Range: 0–65535	0–65535	0	●	676.
F19.14	High-order bit of encoder pulse count value	Encoder pulse count value. The count value is accumulated only if the VFD is powered on. 0–65535	0–65535	0	●	677.
F19.15	Low-order bit of encoder pulse count value	Encoder pulse count value. The count value is accumulated only if the VFD is powered on. 0–65535	0–65535	0	●	678.
F19.16	Reserved	-3276.8–3276.7Hz	-3276.8–3276.7	0.0	●	679.
F19.17	Pulse command frequency	Pulse command (A2, B2 terminal) is converted to the set frequency, and it is valid under pulse position mode and pulse speed mode. Range: -3276.8–3276.7Hz	-3276.8–3276.7	0.0Hz	●	680.
F19.18	Pulse command feedforward	Pulse command (A2, B2 terminal) is converted to the set frequency, and it is valid under pulse position mode and pulse speed mode. Range: -3276.8–3276.7Hz	-3276.8–3276.7	0.0Hz	●	681.
F19.19	Position regulator output	-327.68–327.67Hz	-327.68–327.67	0.00	●	682.
F19.20	Count value of resolver	Count value of resolver. Range: 0–65535	0–65535	0	●	683.
F19.21	Resolver angle	The pole position angle read according to the resolver-type encoder. Range: 0.00–359.99	0–359.99	0.00	●	684.
F19.22	Pole angle of closed-loop SM	Current pole position. Range: 0.00–359.99	0–359.99	0.00	●	685.
F19.23	Status control word 3	0–65535	0–65535	0	●	686.
F19.24	High-order bit of count value of pulse reference	Pulse command (A2,B2) count value. The count value is accumulated only if the VFD is powered on. 0–65535	0–65535	0	●	687.

Function code	Name	Description	Setting range	Default	Modify	SN
F19.25	Low-order bit of count value of pulse reference	Pulse command (A2,B2) count value. The count value is accumulated only if the VFD is powered on. 0~65535	0~65535	0	●	688.
F19.26	Main gear ratio	-3276.8~3276.7Hz	-3276.8~3276.7	0.0	●	689.
F19.27	Encoder UVW sector	0~7	0~7	0	●	690.
F19.28	Encoder PPR (pulse-per-revolution) display	0~65535	0~65535	0	●	691.
F19.29	Angle compensation value of SM	-180.0~180.0	-180.0~180.0	0.0	●	692.
F19.30	Reserved	0~65535	0.00~359.99	0.00	●	693.
F19.31	F Pulse reference Z pulse value	0~65535	0~65535	0	●	694.
F19.32	Reserved	-3276.8~3276.7Hz	-3276.8~3276.7	0.0	●	695.
F19.33	Reserved	-3276.8~3276.7Hz	-3276.8~3276.7	0.0	●	696.
F19.34	Reserved	0~63	0~63	0	●	697.
F19.35	Reserved	0~65535	0~65535	0	●	698.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F20 group—Extension card status viewing</b>						
F20.00	Type of card at slot 1	0~65535 0: No card	0~65535	0	●	699.
F20.01	Type of card at slot 2	1: Reserved 2: I/O card	0~65535	0	●	700.
F20.02	Type of card at slot 3	3: Incremental PG card 4: Incremental PG card with UVW	0~65535	0	●	701.

Function code	Name	Description	Setting range	Default	Modify	SN
		5: Ethernet communication card 6: DP communication card 7: Reserved 8: Resolver PG card 9: CANopen communication card 10: Reserved 11: Profinet communication card 12: Sine/Cosine PG card without CD signal 13: Sine/Cosine PG card with CD signal 14: Absolute encoder PG card 15: CAN master/slave communication card 16~19: Reserved				
F20.03	Software version of extension card at slot 1	0.00~655.35	0~655.35	0.00	●	702.
F20.04	Software version of extension card at slot 2	0.00~655.35	0~655.35	0.00	●	703.
F20.05	Software version of extension card at slot 3	0.00~655.35	0~655.35	0.00	●	704.
F20.06	Terminal input status of extension I/O card	0~0xFFFF	0~0xFFFF	0	●	705.
F20.07	Terminal output status of extension I/O card	0~0xFFFF	0~0xFFFF	0	●	706.
F20.08	HI3 input frequency of extension I/O card	0.000~50.000kHz	0.000~65.535	0.000kHz	●	707.
F20.09	AI3 input voltage of extension I/O card	0.00~10.00V	0.00~10.00	0.00V	●	708.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F21 group—Position control</b>						

Function code	Name	Description	Setting range	Default	Modify	SN
F21.00	Positioning mode	<p>Ones place: Control mode selection (only for closed-loop vector control)</p> <p>0: Speed control 1: Position control</p> <p>Tens place: Position command source</p> <p>0: Pulse string, using PG card terminal (A2, B2) pulse giving signal for position control 1: Digital position, using the setting of <a href="#">F21.17</a> for position control, while the positioning mode can be set through <a href="#">F21.16</a> 2: Positioning of photoelectric switch during stop. When a terminal receives a photoelectric switch signal (selection terminal function 43), the VFD starts positioning for stop, and the stop distance can be set through <a href="#">F21.17</a>.</p> <p>Hundred place: Position feedback source</p> <p>0: Encoder signal 1: Reserved</p> <p>Thousands: servo mode</p> <p>Bit0: Position deviation mode</p> <p>0: No deviation 1: With deviation</p> <p>Bit1: Enable/disable servo</p> <p>0: Disable (The servo can be enabled by terminals.) 1: Enable</p> <p>Bit2: Reserved</p> <p><b>Note:</b> In the pulse string or spindle positioning mode, the VFD enters the servo operation mode when there is a valid servo enabling signal. If there is no servo enabling signal, the VFD enter the servo operation mode only after it receives a forward running or reverse running command.</p>	0~0x7121	00	○	709.
F21.01	Pulse command mode	<p>Ones place: Pulse mode</p> <p>0: A/B quadrature pulse; A leads B 1: A: PULSE; B: SIGN</p>	0~0x3133	0x000	◎	710.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>If channel B is of low electric level, the edge counts up; if channel B is of high electric level, the edge counts down.</p> <p>2: A: Positive pulse Channel A is positive pulse; channel B needs no wiring</p> <p>3: A/B dual-channel pulse; channel A pulse edge counts up, channel B pulse edge counts down</p> <p>Tens place: Pulse direction Bit0: Set pulse direction 0: Forward 1: Reverse Bit1: Set pulse direction by running direction 0: Disable, and BIT0 is valid; 1: Enable</p> <p>Hundreds place: Pulse/direction frequency-multiplication selection (reserved) 0: No frequency- multiplication 1: Frequency- multiplication</p> <p>Thousands place: Pulse control selection Bit0: Pulse filter selection 0: Inertia filter 1: Average moving filter Bit1: Overspeed control 0: No control 1: Control</p>				
F21.02	APR gain 1	<p>The two automatic position regulator (APR) gains are switched based on the switching mode set in <u>F21.04</u>. When the spindle orientation function is used, the gains are switched automatically, regardless of the setting of <u>F21.04</u>. <u>F21.03</u> is used for dynamic running, and <u>F21.02</u> is used for maintaining the locked state.</p> <p>Setting range: 0.0–400.0</p>	0~400.0	20.0	○	711.
F21.03	APR gain 2		0~400.0	30.0	○	712.
F21.04	Switching mode of position loop gain	The function code is used to set the APR gain switching mode. To use torque	0~5	0	○	713.

Function code	Name	Description	Setting range	Default	Modify	SN
		command-based switching, you need to set <u>F21.05</u> ; and to use speed command-based switching, you need to set <u>F21.06</u> . 0: No switching 2: Torque command 3: Speed command 3-5: Reserved				
F21.05	Torque command level during position gain switchover	Setting range: 0.0-100.0% (of the motor rated torque)	0~100.0	10.0%	○	714.
F21.06	Speed command level during position gain switchover	0.0-100.0% (of the motor rated speed)	0~100.0	10.0%	○	715.
F21.07	Smooth filter coefficient during gain switchover	Smooth filter coefficient during position gain switchover. Setting range: 0-15	0~15	5	○	716.
F21.08	Output limit of position controller	The output limit of position regulator, if the limit value is 0, position regulator will be invalid, and no position control can be performed, however, speed control is available. Setting range: 0.0-100.0% (of the max. output frequency F00.03)	0~100.0	20.0%	○	717.
F21.09	Completion range of positioning	When the position deviation is less than <u>F21.09</u> , and the duration is larger than <u>F21.10</u> , positioning completion signal will be outputted. Setting range: 0-1000	0~1000	10	○	718.
F21.10	Detection time for positioning completion	0.0-1000.0ms	0~1000.0	10.0ms	○	719.
F21.11	Numerator of position command ratio	Electronic gear ratio, used to adjust the corresponding relation between position command and actual running displacement. Setting range: 1-65535	1~65535	1000	○	720.
F21.12	Denominator of position command	Setting range: 1-65535	1~65535	1000	○	721.

Function code	Name	Description	Setting range	Default	Modify	SN
	ratio					
F21.13	Position feedforward gain	0.00–120.00% For pulse string reference only (position control)	0~120.00	100.00	○	722.
F21.14	Position feedforward filter time constant	0.0–3200.0ms For pulse string reference only (position control)	0~3200.0	3.0ms	○	723.
F21.15	Position command filter time constant	The position feedforward filter time constant during pulse string positioning. 0.0–3200.0ms	0~3200.0	0.0ms	◎	724.
F21.16	Digital positioning mode	Bit0: Positioning mode selection 0: Relative position 1: Absolute position (home) (reserved) Bit1: Positioning cycle selection 0: Cyclic positioning by terminals 1: Automatic cyclic positioning Bit2: Cycle mode 0: Continuous 1: Repetitive (supported by automatic cyclic positioning only) Bit3: <u>F21.17</u> digital setting mode 0: Incremental 1: Position type (do not support continuous mode) Bit4: Home searching mode 0: Search for the home just once 1: Search for the home during each run Bit5: Home calibration mode 0: Calibrate in real time 1: Single calibration Bit6: Positioning completion signal selection 0: Valid during the time set by <u>F21.25</u> (Hold time of positioning completion signal) 1: Always valid Bit7: Initial positioning selection (for cyclic positioning by terminals) 0: Invalid (do not rotate) 1: Valid	0~0xFFFF	0	○	725.

Function code	Name	Description	Setting range	Default	Modify	SN
		Bit8: Positioning enable signal selection (for cyclic positioning by terminals only; positioning function is always enabled for automatic cyclic positioning) 0: Pulse signal 1: Level signal Bit9: Position source 0: <u>F21.17</u> setting 1: PROFIBUS/CANopen setting Bit10: Whether to save encoder pulse counting value at power failure 0: Not save 1: Save Bit11: Reserved Bit12: Positioning curve selection (reserved) 0: Straight line 1: S curve				
F21.17	Position digital reference	Set digital positioning position. Actual position = $F21.17 * F21.11 / F21.12$ 0–65535	0–65535	0	○	726.
F21.18	Positioning speed setting selection	0: F21.19 1: A11 2: A12 3: A13 4: High-speed pulse HDIA 5: High-speed pulse HDIB	0–5	0	○	727.
F21.19	Positioning speed digits	0–100.0% (of the max. frequency)	0–100.0	20.0%	○	728.
F21.20	ACC time of positioning	Set the ACC/DEC time of positioning process. ACC time of positioning means the time needed for the VFD to accelerate from 0Hz to Max. output frequency ( <u>F00.07</u> ).	0–300.00	3.00s	○	729.
F21.21	DEC time of positioning	DEC time of positioning means the time needed for the VFD to decelerate from Max. output frequency ( <u>F00.07</u> ) to 0hz. Setting range of <u>F21.20</u> : 0.01–300.00s Setting range of <u>F21.21</u> : 0.01–300.00s	0–300.00	3.00s	○	730.



Function code	Name	Description	Setting range	Default	Modify	SN
F21.22	Hold time of positioning arrival	Set the hold time of waiting when target positioning position is reached. Setting range: 0.000–60.000s	0~60.000	0.100s	○	731.
F21.23	Home search speed	0.00–50.00Hz	0~50.00	2.00Hz	○	732.
F21.24	Home position offset	0–65535	0~65535	0	○	733.
F21.25	Hold time of positioning completion signal	The hold time of positioning completion signal, the function code is also valid for positioning completion signal of spindle orientation. Setting range: 0.000–60.000s	0~60.000	0.200s	○	734.
F21.26	Pulse superposition value	F21.26: -9999–32767 F21.27: 0–3000.0/ms	0~65535	0	○	735.
F21.27	Pulse superposition speed	The function is valid only when <u>F00.03</u> =12 or <u>F21.00</u> =1:	0~6553.5	8.0	○	736.
F21.28	ACC/DEC time after pulse disabling	1: Input terminal function 68 When the terminal rise edge is detected, the pulse setting is increased by <u>F21.26</u> , and the pulse given channel is compensated at the rate specified by <u>F21.27</u> . 2: Input terminal function 67 When the terminal is valid, the pulse value is superposed to the pulse given channel at the rate specified by <u>F21.27</u> . <b>Note:</b> <u>F08.07</u> may have slight impact on the actual superposition value. Example: <u>F21.27</u> = 1.0/ms <u>F08.04</u> = 67 When the S5 terminal input signal is 0.5s, the actual number of pulses superposed is 500. 3: Input terminal function 69 The timing sequence of this value is the same as that of the previous value, with the only difference that the number is negative. <b>Note:</b> The pulses are superposed to the pulse given channels (A2 and B2), and the	0~3000.0	5.0s	○	737.

Function code	Name	Description	Setting range	Default	Modify	SN
		functions such as the filter and electric cam for pulses are valid for superposed pulses. 4: Input terminal function 28 The output terminal is valid during pulse superposition, but it is invalid after pulse superposition.				
F21.29	Speed feedforward filter time constant (pulse string speed mode)	It is the filter time constant detected by pulse string when the speed reference source is set to pulse string (when <u>F00.03</u> =12 or <u>F00.04</u> =12 Setting range: 0~3200.0ms	0~3200.0	10.0ms	○	738.
F21.30	Numerator of the 2nd command ratio	1~65535	1~65535	1000	○	739.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F22 group—Spindle positioning</b>						
F22.00	Spindle positioning mode selection	Bit0: Enable spindle positioning 0: Disable 1: Enable Bit1: Select spindle positioning reference point 0: Z pulse input 1: S2/S3/S4 terminal input Bit2: Search for reference point 0: Search the reference point only once 1: Search the reference point every time Bit3: Enable reference point calibration 0: Disable 1: Enable Bit4: Positioning mode selection 1 0: Set direction positioning 1: Near-by direction positioning Bit5: Positioning mode selection 2 0: Forward positioning 1: Reverse positioning Bit6: Zeroing command selection	0~0x0FFFF	0	○	740.

Function code	Name	Description	Setting range	Default	Modify	SN
		0: Electric level mode 1: Pulse mode Bit7: Reference point calibration mode 0: Calibrate at the first time 1: Calibrate in real time Bit8: Action selection after zeroing signal cancellation (electric level type) 0: Switch to speed mode 1: Position lock mode Bit9: Positioning completion signal selection 0: Electric level signal 1: Pulse signal Bit10: Z pulse signal source 0: Motor 1: Spindle Bit11–15: Reserved				
F22.01	Speed of spindle orientation	During spindle orientation, the speed of the position point of orientation will be searched, and then it will switch over to position control orientation. Setting range: 0.00–100.00Hz	0~100.00	10.00Hz	○	741.
F22.02	DEC time of spindle orientation	DEC time of spindle orientation. Spindle orientation DEC time means the time needed for the VFD to decelerate from Max. output frequency (F00.07) to 0Hz. Setting range: 0.0–100.0s	0.1~100.0	3.0s	○	742.
F22.03	Spindle zeroing position 0	You can select the zeroing positions of four spindles by terminals (function code 46, 47). Setting range: 0–65535	0~39999	0	○	743.
F22.04	Spindle zeroing position 1	Setting range: 0–65535	0~39999	0	○	744.
F22.05	Spindle zeroing position 2	Setting range: 0–65535	0~39999	0	○	745.
F22.06	Spindle zeroing position 3	Setting range: 0–65535	0~39999	0	○	746.
F22.07	Spindle scale-division angle	You can select seven spindle scale-division values by terminals (function code 48, 49 and	0~359.99	15.00	○	747.

Function code	Name	Description	Setting range	Default	Modify	SN
	1	50). Setting range: 0.00–359.99				
F22.08	Spindle scale-division angle 2	Setting range: 0.00–359.99	0~359.99	30.00	○	748.
F22.09	Spindle scale-division angle 3	Setting range: 0.00–359.99	0~359.99	45.00	○	749.
F22.10	Spindle scale-division angle 4	Setting range: 0.00–359.99	0~359.99	60.00	○	750.
F22.11	Spindle scale-division angle 5	Setting range: 0.00–359.99	0~359.99	90.00	○	751.
F22.12	Spindle scale-division angle 6	Setting range: 0.00–359.99	0~359.99	120.00	○	752.
F22.13	Spindle scale-division angle 7	Setting range: 0.00–359.99	0~359.99	180.00	○	753.
F22.14	Spindle drive ratio	This function code sets the reduction ratio of the spindle and the mounting shaft of the encoder. Setting range: 0.000–30.000	0.001~30.000	1.000	○	754.
F22.15	Zero-point communication setup of spindle	<u>F22.15</u> sets spindle zero-point offset, if the selected spindle zero point is <u>F22.03</u> , the final spindle zero point will be the sum of <u>F22.03</u> and <u>F22.15</u> . Setting range: 0–39999	0~39999	0	○	755.
F22.16	Reserved	0–65535	0~65535	0	○	756.
F22.17	Reserved	0–65535	0~65535	0	○	757.
F22.18	Rigid tapping selection	Ones place: Whether to enable 0: Disable (but can be enabled through terminal, using function 58) 1: Enable (internally enabled) Tens place: Analog port selection	0~0x31	0x00	◎	758.

Function code	Name	Description	Setting range	Default	Modify	SN
		0: Invalid 1: AI1 2: AI2 3: AI3				
F22.19	Analog filter time of rigid tapping	0.0ms–1000.0ms	0.0~1000.0	1.0ms	○	759.
F22.20	Max. frequency of rigid tapping	0.00–400.00Hz	0.00~400.00	50.00Hz	○	760.
F22.21	Corresponding frequency of analog zero drift of rigid tapping	0.00–10.00Hz	0.00~10.00	0.00Hz	○	761.
F22.22	Pulse-given speed measure method	0: Main control board 1: PG card 2: Hybrid	0~2	0	○	762.
F22.23	Pulse setting feedforward source selection	0x00~0x11 Ones: Main frequency Tens: Pulse string speed setting	00~11	0	◎	763.
F22.24	Encoder count reset setting value	0–65535	0~65535	0	◎	764.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F23 group—Extension I/O card input functions</b>						
F23.00	Function of DI5	The same as those in F08	0~79	0	◎	765.
F23.01	Function of DI6		0~79	0	◎	766.
F23.02	Function of DI7		0~79	0	◎	767.
F23.03	Function of DI8		0~79	0	◎	768.
F23.08	Extension card input terminal polarity selection	0x00–0x7F	0x000~0x7F	0x00	◎	769.
F23.09	DI5 switch-on delay	Setting range: 0.000–50.000s	0.000~50.000	0.000s	○	770.

Function code	Name	Description	Setting range	Default	Modify	SN
F23.10	DI5 switch-off delay		0.000~50.000	0.000s	○	771.
F23.11	DI 6 switch-on delay		0.000~50.000	0.000s	○	772.
F23.12	DI 6 switch-off delay		0.000~50.000	0.000s	○	773.
F23.13	DI 7 switch-on delay		0.000~50.000	0.000s	○	774.
F23.14	DI 7 switch-off delay		0.000~50.000	0.000s	○	775.
F23.15	DI 8 switch-on delay		0.000~50.000	0.000s	○	776.
F23.16	DI 8 switch-off delay		0.000~50.000	0.000s	○	777.
F23.23	Virtual terminal setting of extension card		0x000~0x7F (0: Disable, 1: Enable) BIT0: S5 virtual terminal BIT1: S6 virtual terminal BIT2: S7 virtual terminal BIT3: S8 virtual terminal BIT4: S9 virtual terminal BIT5: S10 virtual terminal BIT6: HDI3 virtual terminal	0x000~0x7F	0x00	○
F23.24	AI3 lower limit	<b>Note:</b> AI3 can support 0~10V/0~20mA input, when AI3 select 0~20mA input, the corresponding voltage of 20mA is 10V. Setting range of <u>F23.24</u> : 0.00V~ <u>F23.26</u> Setting range of <u>F23.25</u> : -300.0%~300.0% Setting range of <u>F23.26</u> : <u>F23.24</u> ~10.00V Setting range of <u>F23.27</u> : -300.0%~300.0% Setting range of <u>F23.28</u> : 0.000s~10.000s	0.00V~F23.26	0.00V	○	779.
F23.25	Corresponding setting of AI3 lower limit		-300.0~300.0	0.0%	○	780.
F23.26	AI3 upper limit		F23.24~10.00	10.00V	○	781.
F23.27	Corresponding setting of AI3 upper limit		-300.0~300.0	100.0%	○	782.
F23.28	AI3 input filter time		0.000~10.000	0.030s	○	783.
F23.40	AI3 input signal type	Range: 0~1 0: Voltage 1: Current	0~1	0	◎	784.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F24 group—Extension I/O card output functions</b>						
F24.02	DO2 output	Same as those in <u>F09.01</u>	0~63	0	○	785.
F24.04	T3 output		0~63	0	○	786.
F24.05	T4 output		0~63	0	○	787.
F24.12	Extension card output terminal polarity	0x0000~0x7FFF T10, T9...T3, HO2, DO3, DO2 in sequence	000~1FFF	0x000	○	788.
F24.15	DO2 switch-on delay	Setting range: 0.000~50.000s	0.000~50.000	0.000s	○	789.
F24.16	DO2 switch-off delay		0.000~50.000	0.000s	○	790.
F24.19	T3 switch-on delay		0.000~50.000	0.000s	○	791.
F24.20	T3 switch-off delay		0.000~50.000	0.000s	○	792.
F24.21	T4 switch-on delay		0.000~50.000	0.000s	○	793.
F24.22	T4 switch-off delay		0.000~50.000	0.000s	○	794.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F25 group—Master/slave control</b>						
F25.00	Master/slave mode	0: Master/slave control is invalid 1: The local machine is a master 2: The local machine is a slave	0~2	0	◎	795.
F25.01	Master/slave communication data selection	0: CAN 1: Reserved	0~1	0	◎	796.
F25.02	Master/slave control mode	Ones place: Master/slave running mode selection 0: Master/slave mode 0	0~0x112	0x001	◎	797.

Function code	Name	Description	Setting range	Default	Modify	SN
		<p>(The master and slave adopt speed control and maintain the power balance by droop control)</p> <p>1: Master/slave mode 1 (The master and slave must be in the same type of vector control mode. The master is speed control, and the slave will be forced to be in the torque control mode.)</p> <p>2: Master/slave mode 2 Start in the slave first speed mode (master/slave mode 0) and then switch to torque mode at a certain frequency point (master/slave mode 1)</p> <p>Tens place: Slave start command source selection 0: Follow the master to start 1: Determined by <u>F00.02</u></p> <p>Hundreds place: Slave transmitting/master receiving data enable 0: Enable 1: Disable</p>				
F25.03	Slave speed gain	0.0~500.0%	0.0~500.0	100.0%	○	798.
F25.04	Slave torque gain	0.0~500.0%	0.0~500.0	100.0%	○	799.
F25.05	Speed/torque mode switching frequency point in master/slave mode 2	0.00~10.00Hz	0.00~10.00	5.00	○	800.
F25.06	Slave count	0~15	0~15	1	◎	801.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F26 group—Extension card reservation function group</b>						
F26.00	Reserved monitoring variables	0~1	0~1	0	◎	802.



Function code	Name	Description	Setting range	Default	Modify	SN
F26.01	Reserved monitoring variables	0~65535	0~65535	0	○	803.
F26.02	Reserved monitoring variables	0~65535	0~65535	0	○	804.
F26.03	Reserved monitoring variables	0~65535	0~65535	0	○	805.
F26.04	Reserved monitoring variables	0~65535	0~65535	0	○	806.
F26.05	Reserved monitoring variables	0~65535	0~65535	0	○	807.
F26.06	Reserved monitoring variables	0~65535	0~65535	0	○	808.
F26.07	Reserved monitoring variables	0~65535	0~65535	0	○	809.
F26.08	Reserved monitoring variables	0~65535	0~65535	0	○	810.
F26.09	Reserved monitoring variables	-32768~32767	-32768~32767	0	○	811.
F26.10	Reserved monitoring variables	-32768~32767	-32768~32767	0	○	812.
F26.11	Reserved monitoring variables	0~1	0~1	0	●	813.
F26.12	Reserved monitoring variables	0~65535	0~65535	0	●	814.
F26.13	Reserved monitoring variables	0~65535	0~65535	0	●	815.
F26.14	Reserved monitoring variables	0~65535	0~65535	0	●	816.
F26.15	Reserved monitoring variables	0~65535	0~65535	0	●	817.
F26.16	Reserved monitoring variables	0~65535	0~65535	0	●	818.
F26.17	Reserved monitoring variables	0~65535	0~65535	0	●	819.
F26.18	Reserved monitoring variables	0~65535	0~65535	0	●	820.

Function code	Name	Description	Setting range	Default	Modify	SN
F26.19	Reserved monitoring variables	0~65535	0~65535	0	●	821.
F26.20	Reserved monitoring variables	-32768~32767	-32768~32767	0	●	822.
F26.21	Reserved monitoring variables	-32768~32767	-32768~32767	0	●	823.
F26.22	Reserved monitoring variables	0~65535	0~65535	0	●	824.
F26.23	Reserved monitoring variables	0~65535	0~65535	0	●	825.
F26.24	Reserved monitoring variables	0~65535	0~65535	0	●	826.
F26.25	Reserved monitoring variables	0~65535	0~65535	0	●	827.
F26.26	Reserved monitoring variables	0~65535	0~65535	0	●	828.
F26.27	Reserved monitoring variables	0~65535	0~65535	0	●	829.
F26.28	Reserved monitoring variables	0~65535	0~65535	0	●	830.
F26.29	Reserved monitoring variables	0~65535	0~65535	0	●	831.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F28 group—Parameters of motor 2</b>						
F28.00	Type of motor 2	0: Asynchronous motor (AM) 1: Synchronous motor (SM)	0~1	0	◎	832.
F28.01	Rated power of AM 2	0.1~3000.0kW	0.1~3000.0	Model depended	◎	833.
F28.02	Rated voltage of AM 2	0~1200V	0~1200	Model depended	◎	834.
F28.03	Rated current of AM 2	0.8~6000.0A	0.8~6000.0	Model depended	◎	835.

Function code	Name	Description	Setting range	Default	Modify	SN
F28.03	Rated frequency of AM 2	0.01Hz~ <u>F00.07</u> (Max. output frequency)	0.01~F00.07	50.00Hz	☉	836.
F28.05	Rated speed of AM 2	1~60000rpm	1~60000	Model depended	☉	837.
F28.06	Stator resistance of AM 2	0.001~65.535Ω	0.001~65.535	Model depended	○	838.
F28.07	Rotor resistance of AM 2	0.001~65.535Ω	0.001~65.535	Model depended	○	839.
F28.08	Leakage inductance of AM 2	0.1~6553.5mH	0.1~6553.5	Model depended	○	840.
F28.09	Mutual inductance of AM 2	0.1~6553.5mH	0.1~6553.5	Model depended	○	841.
F28.10	No-load current of AM 2	0.1~6553.5A	0.1~6553.5	Model depended	○	842.
F28.11	Magnetic saturation coefficient 1 of iron core of AM 2	0.0~100.0%	0.0~100.0	80.0%	○	843.
F28.12	Magnetic saturation coefficient 2 of iron core of AM 2	0.0~100.0%	0.0~100.0	68.0%	○	844.
F28.13	Magnetic saturation coefficient 3 of iron core of AM 2	0.0~100.0%	0.0~100.0	57.0%	○	845.
F28.14	Magnetic saturation coefficient 4 of iron core of AM 2	0.0~100.0%	0.0~100.0	40.0%	○	846.
F28.15	Rated power of SM 2	0.1~3000.0kW	0.1~3000.0	Model depended	☉	847.
F28.16	Rated voltage of SM 2	0~1200V	0~1200	Model depended	☉	848.
F28.17	Rated current of SM 2	0.8~6000.0A	0.8~6000.0	Model depended	☉	849.
F28.18	Rated frequency of SM 2	0.01Hz~ <u>F00.07</u> (Max. output frequency)	0.01~F00.07	50.00Hz	☉	850.
F28.19	Number of pole pairs of SM 2	1~128	1~128	2	☉	851.

Function code	Name	Description	Setting range	Default	Modify	SN
F28.20	Stator resistance of SM 2	0.001–65.535Ω	0.001–65.535	Model depended	○	852.
F28.21	Direct-axis inductance of SM 2	0.01–655.35mH	0.01–655.35	Model depended	○	853.
F28.22	Quadrature-axis inductance of SM 2	0.01–655.35mH	0.01–655.35	Model depended	○	854.
F28.23	Counter-emf constant of SM 2	0–10000V	0~10000	300	○	855.
F28.24	Reserved	0–0xFFFF	0~0xFFFF	0x0000	●	856.
F28.25	Reserved	0%–50% (of the motor rated current)	0~50	10%	●	857.
F28.26	Parameter display selection 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.	0~1	0	○	858.
F28.27	System inertia of motor 2	0–30.000kgm <sup>2</sup>	0~30.000	0.000	○	859.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F29 group—Encoder of motor 2</b>						
F29.00	Encoder type display	0: Incremental encoder 1: Resolver-type encoder 2: Sin/Cos encoder 3: Endat absolute encoder	0–65535	0	●	860.
F29.01	Encoder pulse number	Number of pulses generated when the encoder revolves for one circle. Setting range: 0–60000	0~60000	1024	◎	861.
F29.02	Encoder direction	Ones: AB direction 0: Forward 1: Reverse Tens: Z pulse direction (reserved) 0: Forward 1: Reverse Hundreds: CD/UVW pole signal direction 0: Forward	0~0x111	0x000	◎	862.

Function code	Name	Description	Setting range	Default	Modify	SN
		1: Reverse				
F29.03	Detection time of encoder offline fault	0.0–10.0s	0.0~10.0	2.0s	○	863.
F29.04	Detection time of encoder reversal fault	0.0–100.0s	0.0~100.0	0.8s	○	864.
F29.05	Filter times of encoder detection	Setting range: 0x00–0x99 Ones place: Low-speed filter time, corresponds to $2^{(0-9)} \times 125\mu\text{s}$ . Tens place: High-speed filter times, corresponds to $2^{(0-9)} \times 125\mu\text{s}$ .	0~0x99	0x33	○	865.
F29.06	Speed ratio between encoder mounting shaft and motor	You need to set the function code when the encoder is not installed on the motor shaft and the drive ratio is not 1. Setting range: 0.001–65.535	0~65.535	1.000	○	866.
F29.07	Control parameters of SM 2	Bit0: Enable Z pulse calibration Bit1: Enable encoder angle calibration Bit2: Enable SVC speed measurement Bit3: Reserved Bit4: Reserved Bit5: Reserved Bit6: Enable CD signal calibration Bit7: Reserved Bit8: Do not detect encoder fault during autotuning Bit9: Enable Z pulse detection optimization Bit10: Enable initial Z pulse calibration optimization Bit12: Clear Z pulse arrival signal after stop	0x0000–0xFFFF	0x0003	○	867.
F29.08	Enabling Z pulse offline detection	0x00–0x11 Ones place: Z pulse 0: Do not detect 1: Enable Tens place: UVW pulse (for SM) 0: Do not detect 1: Enable	00~11	0x10	○	868.
F29.09	Initial angle of Z	Relative electric angle of encoder Z pulse and	0~359.99	0.00	○	869.

Function code	Name	Description	Setting range	Default	Modify	SN
	pulse	motor pole position. Setting range: 0.00–359.99				
F29.10	Initial angle of the pole	Relative electric angle of encoder position and motor pole position. Setting range: 0.00–359.99	0–359.99	0.00	○	870.
F29.11	Autotuning of initial angle of pole	0–3 1: Rotary autotuning (DC brake) 2: Static autotuning (suitable for resolver-type encoder, sin/cos with CD signal feedback) 3: Rotary autotuning (initial angle identification)	0–3	0	◎	871.
F29.12	Speed measurement optimization selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	0–2	1	◎	872.
F29.13	CD signal zero offset gain	0–65535	0–65535	0	○	873.
F29.14	Encoder type selection	Ones place: Incremental encoder 0: without UVW 1: with UVW Tens place: Sin/Cos encoder 0: without CD signal 1: with CD signal	0x00–0x11	0x00	◎	874.
F29.15	Speed measurement mode	0: PG card 1: local; realized by HI1 and HI2; supports incremental 24V encoder only	0–1	0	◎	875.
F29.16	Frequency division coefficient	0–255 When the function code is set to 0 or 1, frequency division of 1:1 is implemented.	0–255	0	○	876.
F29.17	Pulse filter handling selection	0x0000–0xFFFF Bit0: Enable/disable encoder input filter 0: No filter 1: Filter Bit1: Encoder signal filter mode (set Bit0 or Bit2 to 1) 0: Self-adaptive filter 1: Use <a href="#">F29.18</a> filter parameters	0–ffff	0x0033	○	877.

Function code	Name	Description	Setting range	Default	Modify	SN
		Bit2: Enable/disable encoder frequency-division output filter 0: No filter 1: Filter Bit3: Reserved Bit4: Enable/disable pulse reference filter 0: No filter 1: Filter Bit5: Pulse reference filter mode (valid when Bit4 is set to 1) 0: Self-adaptive filter 1: Use <u>F29.19</u> filter parameters Bit6: Frequency-divided output source setting 0: Encoder signals 1: Pulse reference signals Bits7–15: Reserved				
F29.18	Encoder pulse filter width	0–63 The filtering time is <u>F29.18</u> *0.25us. The value 0 or 1 indicates 0.25μs.	0~63	2	○	878.
F29.19	Pulse reference filter width	0–63 The filtering time is <u>F29.19</u> *0.25us. The value 0 or 1 indicates 0.25μs.	0~63	2	○	879.
F29.20	Pulse number of pulse reference	0–65535	0~65535	1024	◎	880.
F29.21	Enable angle compensation of SM 2	0–1	0~1	0	○	881.
F29.22	Switchover frequency threshold of speed measurement mode	0–630.00Hz	0~630.00	1.00Hz	○	882.
F29.23	SM 2 angle compensation coefficient	-200.0–200.0%	-200.0~200.0	100.0%	○	883.
F29.24	SM 2 pole pairs of initial angle auto tune	0–65535	0~128	2	◎	884.

Function code	Name	Description	Setting range	Default	Modify	SN	
<b>F30 group—Vector control of motor 2</b>							
F30.00	Speed-loop proportional gain 1	Setting range of <u>F30.00</u> : 0.0–200.0 Setting range of <u>F30.01</u> : 0.000–10.000s Setting range of <u>F30.02</u> : 0.00Hz– <u>F30.05</u> Setting range of <u>F30.03</u> : 0.0–200.0 Setting range of <u>F30.04</u> : 0.000–10.000s Setting range of <u>F30.05</u> : <u>F30.02</u> – <u>F00.07</u> (Max. output frequency)	0–200.0	20.0	○	885.	
F30.01	Speed-loop integral time 1		0.000–10.000	0.200s	○	886.	
F30.02	Low-point frequency for switching		0.00–F30.05	5.00Hz	○	887.	
F30.03	Speed-loop proportional gain 2		0–200.0	20.0	○	888.	
F30.04	Speed-loop integral time 2		0.000–10.000	0.200s	○	889.	
F30.05	High-point frequency for switching		F30.02–F00.07	10.00Hz	○	890.	
F30.06	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%	50–200	100%	○	891.
F30.07	Power-generation slip compensation coefficient of vector control			50–200	100%	○	892.
F30.08	Speed-loop output filter		0–8 (corresponding to 0–2 <sup>8</sup> /10ms)	0–8	0	○	893.
F30.09	Current-loop proportional coefficient P		Setting range: 0–65535	0–65535	1000	○	894.
F30.10	Current-loop integral coefficient I			0–65535	1000	○	895.
F30.11	Speed-loop differential gain	0.00–10.00s	0.00–10.00	0.00s	○	896.	



Function code	Name	Description	Setting range	Default	Modify	SN
F30.12	High-frequency current-loop proportional coefficient	Setting range of <u>F30.12</u> : 0–65535 Setting range of <u>F30.13</u> : 0–65535 Setting range of <u>F30.14</u> : 0.0–100.0% (of the max. frequency)	0–65535	1000	○	897.
F30.13	High-frequency current-loop integral coefficient		0–65535	1000	○	898.
F30.14	Current-loop high-frequency switching threshold		0–100.0%	100.0%	○	899.

Function code	Name	Description	Setting range	Default	Modify	SN
<b>F31 group—V/F control for AM 2</b>						
F31.00	V/F curve setting	0: Straight-line V/F curve, applicable to constant torque loads 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) 5: Customized V/F (V/F separation);	0~5	0	◎	900.
F31.01	Torque boost	Setting range of <u>F31.01</u> : 0.0%: (automatic); 0.1%–10.0%	0.0~10.0	0.0%	○	901.
F31.02	Torque boost cut-off		0.0~50.0	20.0%	◎	902.
F31.03	V/F frequency point 1	Setting range of <u>F31.03</u> : 0.00Hz– <u>F31.05</u> Setting range of <u>F31.04</u> : 0.0%–110.0% (of the rated voltage of motor 1)	0.00~F31.05	0.00Hz	○	903.
F31.04	V/F voltage point 1	Setting range of <u>F31.05</u> : <u>F31.03</u> – <u>F31.07</u>	0.0~110.0	00.0%	○	904.
F31.05	V/F frequency point 2	Setting range of <u>F31.06</u> : 0.0%–110.0% (of the rated voltage of motor 1)	F31.03~F31.07	0.00Hz	○	905.
F31.06	V/F voltage point 2	Setting range of <u>F31.07</u> : <u>F31.05</u> – <u>F28.02</u> (rated frequency of AM 1) or <u>F31.05</u> – <u>F28.16</u> (rated frequency of SM 1)	0.0~110.0	0.0%	○	906.
F31.07	V/F frequency point	Setting range of <u>F31.08</u> : 0.0%–110.0% (of the	F31.05~F31.09	0.00Hz	○	907.

Function code	Name	Description	Setting range	Default	Modify	SN
	3	motor rated voltage of motor 1)				
F31.08	V/F voltage point 3		0.0~110.0	00.0%	○	908.
F31.09	V/F frequency point 4		F31.05~Motor 2 rated frequency	0.00Hz	○	909.
F31.10	V/F voltage point 4		0.0~110.0	00.0%	○	910.
F31.11	Low-frequency oscillation control factor 1	Setting range of F31.11: 0~100 Setting range of : 0~100 Setting range of F31.13: 0.00Hz~F00.07 (Max. output frequency)	0~100	10	○	911.
F31.12	High-frequency oscillation control factor 2		0~100	10	○	912.
F31.13	Oscillation control threshold		0.00Hz~F0 0.07	30.00 Hz	○	913.
F31.14	V/F slip compensation gain	Setting range: 0.0~200.0%	0.0~200.0	0.0%	○	914.
F31.15	Enabling IF mode for AM 2	0: Disable 1: Enable	0~1	0	◎	915.
F31.16	Current setting in IF mode for AM 2	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%	0.0~200.0 %	120.0%	○	916.
F31.17	Proportional coefficient in IF mode for AM 2	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	0~5000	350	○	917.
F31.18	Integral coefficient in IF mode for AM 2	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	0~5000	150	○	918.
F31.19	Frequency	0.00~ F31.20	0.00~F31.2	10.00Hz	○	919.

Function code	Name	Description	Setting range	Default	Modify	SN
	threshold for switching off IF mode for AM 2		0			
F31.20	End frequency point for switching off IF mode for AM 2	F31.19–F00.07	F31.19~F00.07	25.00	○	920.

## 9 Troubleshooting

### 7.1 What this chapter contains

The chapter instructs 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 work described in this chapter. Operations should be carried out according to the instructions presented in Safety precautions.

### 7.2 Indications of alarms and faults

The fault is indicated by indicators (Refer to "5.4 Keypad operation "). When **ERR** indicator is on, the alarm or fault code displayed in the keypad indicates the VFD is in exception state. This chapter covers most of the alarms and faults, and their possible causes and corrective measures, if users cannot figure out the alarm or fault causes, contact local FGI office.

### 7.3 Fault reset

You can reset the VFD through the  key on the keypad, digital inputs, or by cutting off the VFD power. After faults are removed, the motor can be start again.

### 7.4 Fault history

F13.11–F13.42 record the six latest fault types; F13.17–F13.24, F13.25–F13.32, and F13.33–F13.40 record the running data of the VFD when the latest three faults occurred.

### 7.5 VFD faults and solutions

When a fault occurred, handle the fault as follows.

1. When a VFD fault occurred, confirm whether keypad display is improper? If yes, contact FGI;
2. If keypad works properly, check the function codes in F13 group to confirm the corresponding fault record parameters, and determine the real state when current fault occurred through parameters;
3. Check the table below to Refer to whether corresponding exception states exist based on the corresponding corrective measures;
4. Rule out the faults or ask for help from professionals;
5. After confirming faults are removed, reset the fault and start running.

#### 7.5.1 Details of faults and solutions

Fault code	Fault type	Possible cause	Solution
Err-01	Inverter unit Phase-U protection	Acceleration is too fast; IGBT module is damaged; Misacts caused by interference;	Increase acceleration time; Replace the power unit; Check drive wires;

<b>Fault code</b>	<b>Fault type</b>	<b>Possible cause</b>	<b>Solution</b>
Err-02	Inverter unit Phase-V protection	drive wires are poorly connected ; To-ground short circuit occurs	Check whether there is strong interference surrounds the peripheral equipment
Err-03	Inverter unit Phase-W protection		
Err-04	Over-voltage during acceleration	Exception occurred to input voltage; Large energy feedback; Lack of braking units; Dynamic brake is not enabled	Check input power; Check whether load deceleration time is too short; or the motor starts during rotating; Install dynamic braking units; Check the setup of related function codes
Err-05	Over-voltage during deceleration		
Err-06	Over-voltage during constant speed running		
Err-07	Over-current during acceleration	Acceleration is too fast; Grid voltage is too low; Inverter power is too small; Load transient or exception occurred; To-ground short circuit or output phase loss occur; Strong external interference sources; Overvoltage stall protection is not enabled	Increase acceleration /deceleration time; Check input power; Select the VFD with larger power; Check if 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 if there is strong interference; Check the setup of related function codes.
Err-08	Over-current during deceleration		
Err-09	Over-current during constant speed running		
Err-10	Bus undervoltage fault	Grid voltage is too low; Overvoltage stall protection is not enabled	Check grid input power; Check the setup of related function codes
Err-11	Motor overload	Grid voltage is too low; Rated motor current is set improperly; Motor stall or load jumps violently	Check grid voltage; Reset rated motor current; Check the load and adjust torque boost
Err-12	Inverter overload	Acceleration is too fast;	Increase acceleration time;

<b>Fault code</b>	<b>Fault type</b>	<b>Possible cause</b>	<b>Solution</b>
		The motor in rotating is restarted; Grid voltage is too low; Load is too large; Power is too small;	Avoid restart after stop; Check grid voltage; Select the VFD with larger power; Select proper motor
Err-13	Phase loss on input side	Phase loss or violent fluctuation occurred to R, S and T input	Check the input power; Check installation wiring
Err-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 cable
Err-15	Overheat of rectifier module	Air duct is blocked or fan is damaged;	Ventilate the air duct or replace the fan;
Err-16	Overheat of VFD module	Ambient temperature is too high; Long-time overload running	Lower the ambient temperature
Err-17	External fault	DI external fault input terminal acts	Check external device input
Err-18	Modbus communication fault	Baud rate is set improperly; Communication line fault; Communication address error; Communication suffers from strong interference	Set proper baud rate; Check the wiring of communication interfaces; Set proper communication address; Replace or change the wiring to enhance anti-interference capacity
Err-19	Current detection fault	Poor contact of the connector of control board; Hall component is damaged; Exception occurred to amplification circuit	Check the connector and re-plug; Replace the hall component; Replace the main control board
Err-20	Motor autotuning fault	Motor capacity does not match with the VFD capacity, this fault may occur easily if the difference between them is exceeds five power classes; Motor parameter is set improperly; The parameters gained from autotuning deviate sharply from	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 motor wiring and parameter setup;

Fault code	Fault type	Possible cause	Solution
		the standard parameters; Autotuning timeout	Check whether upper limit frequency is larger than 2/3 of the rated frequency
Err-21	EEPROM fault	R/W error occurred to the control parameters; EEPROM is damaged	Press <b>STOP/RST</b> to reset; Replace the main control board
Err-22	PID feedback offline fault	PID feedback offline; PID feedback source disappears;	Check PID feedback signal wires; Check PID feedback source
Err-23	Braking unit fault	Brake circuit fault or brake tube is damaged; The resistance of external braking resistor is too small	Check the braking unit, replace with new brake tubes; Increase brake resistance
Err-24	Running time is up	The actual running time of the VFD is larger than the set running time	Ask help from the supplier, adjust the set running time
Err-25	Electronic overload fault	The VFD releases overload pre-alarm based on the set value	Check the load and overload pre-alarm threshold
Err-26	Keypad communication fault	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Circuit fault occurred to the keypad or communication part of the main board	Check the keypad wires to confirm whether fault exists; Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service
Err-27	Parameter upload error	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Circuit fault occurred to the keypad or communication part of the main board	Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service; Replace the hardware and ask for maintenance service
Err-28	Parameter download error	The keypad wire is poorly contacted or disconnected; The keypad wire is too long and suffers strong interference; Data storage error occurred to the	Check the surroundings to rule out interference source; Replace the hardware and ask for maintenance service; Re-backup keypad data

<b>Fault code</b>	<b>Fault type</b>	<b>Possible cause</b>	<b>Solution</b>
		keypad	
Err-32	To-ground short circuit fault 1	Inverter output is short connected to the ground; Current detection circuit is faulty; Actual motor power setup deviates sharply from the VFD power	Check whether motor wiring is proper; Replace the hall component; Replace the main control board; Reset the motor parameters properly
Err-33	To-ground short circuit fault 1	Inverter output is short connected to ground; Current detection circuit is faulty; Actual motor power setup deviates sharply from the VFD power	Check whether motor wiring is proper; Replace the hall component; Replace the main control board; Reset the motor parameters properly
Err-34	Speed deviation fault	Load is too heavy, or stall occurred	Check the load to ensure it is proper, increase the detection time; Check whether control parameters are set properly
Err-35	Maladjustment fault	Control parameters of synchronous motor is set improperly; The parameter gained from autotuning is inaccurate; The VFD is not connected to motor	Check the load to ensure it is proper, Check whether load is proper; Check whether control parameters are set correctly; Increase maladjustment detection time
Err-36	Electronic underload fault	The VFD performs underload pre-alarm based on the set value	Check the load and overload pre-alarm threshold
Err-59	Motor over-temperature fault	Motor over-temperature input terminal is valid; Exception occurred to temperature detection Exception occurred to resistor; Long-time overload running or exception occurred	Check the wiring of motor over-temperature input terminal (terminal function 57); Check whether temperature sensor is proper; Check the motor and perform maintenance on the motor
Err-55	Repetitive extension card type	The two inserted extension cards are of the same type	Users should not insert two cards with the same type; check the type of extension card, and



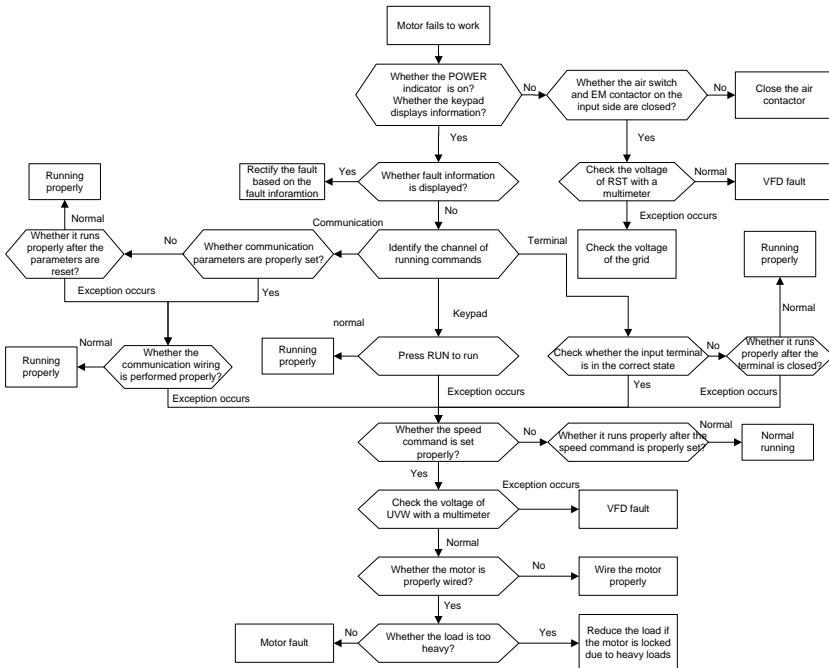
Fault code	Fault type	Possible cause	Solution
			remove one card after power down
Err-60	Failed to identify the extension card in card slot 1	There is data transmission in interfaces of card slot 1, however, it cannot read the card type	Confirm whether the extension card inserted can be supported; Stabilize the extension card interfaces after power down, and confirm whether fault still occurs at next power-on; Check whether the insertion port is damaged, if yes, replace the insertion port after power down

### 7.5.2 Other states

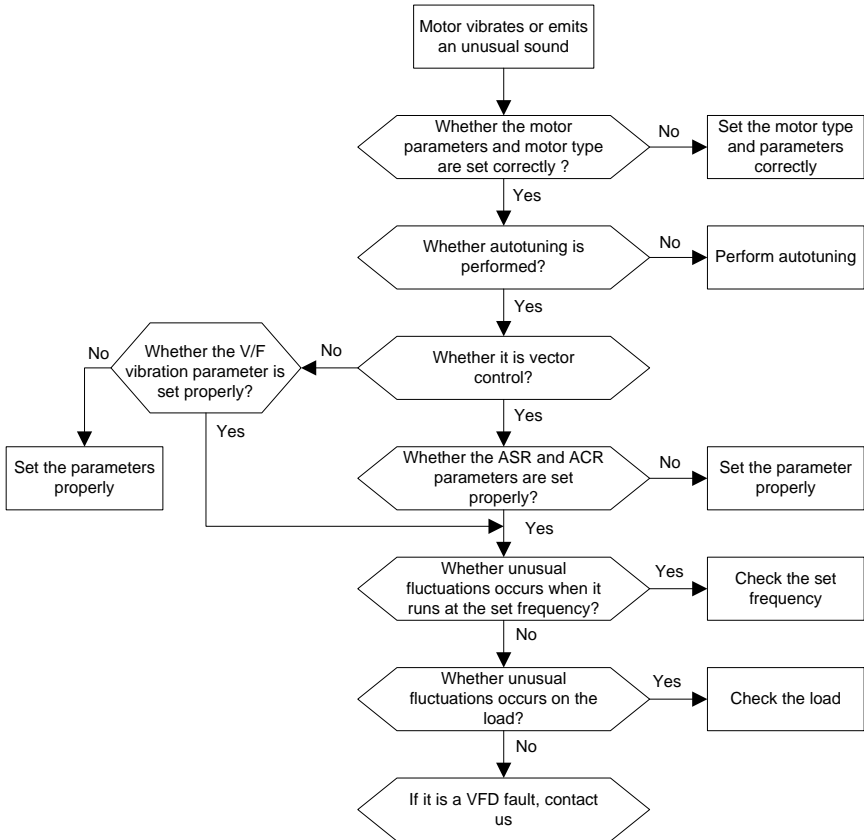
Displayed code	State type	Possible cause	Solution
PLoSS	System power failure	The system is powered off or the bus voltage is too low.	Check the grid conditions.

## 7.6 Analysis on common faults

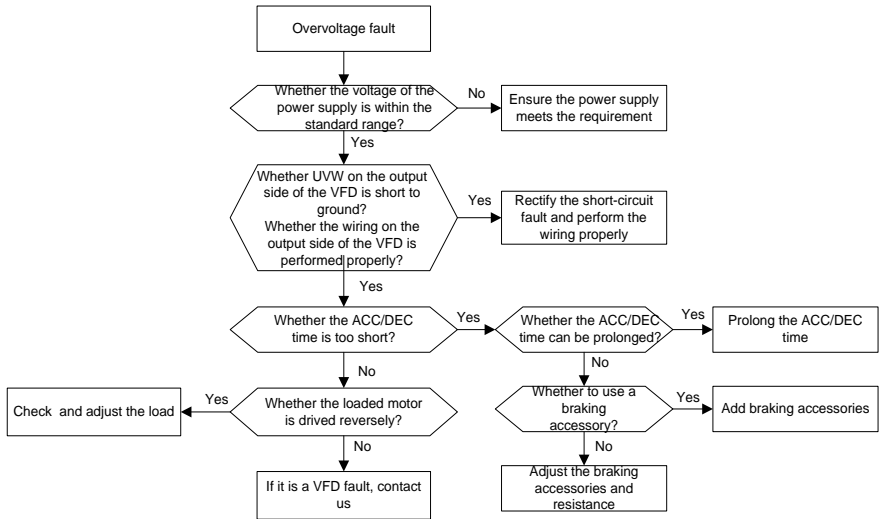
### 7.6.1 Motor fails to work



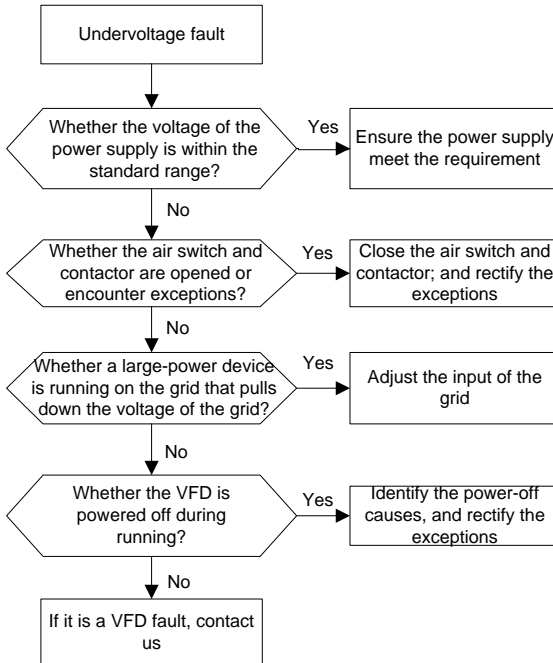
7.6.2 Motor vibrates



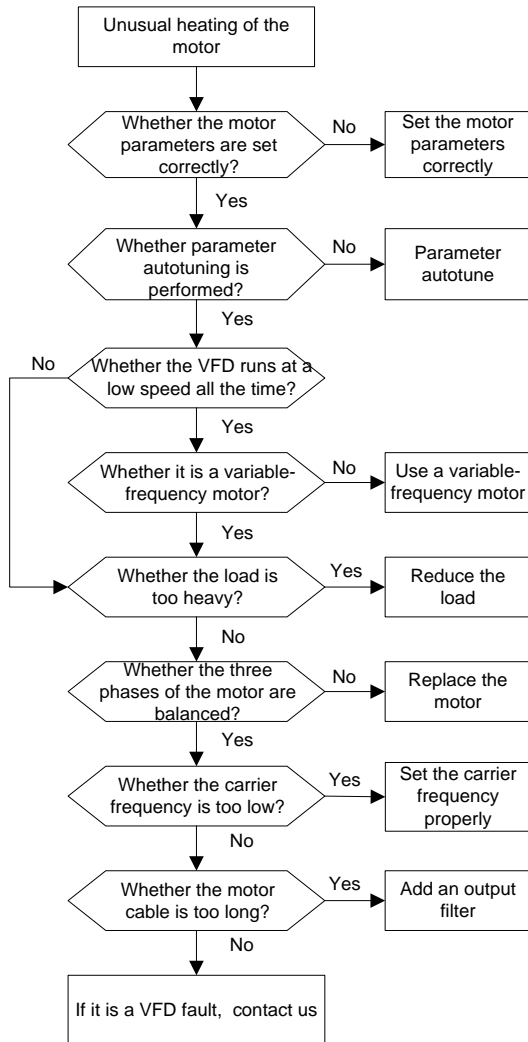
**7.6.3 Overvoltage**



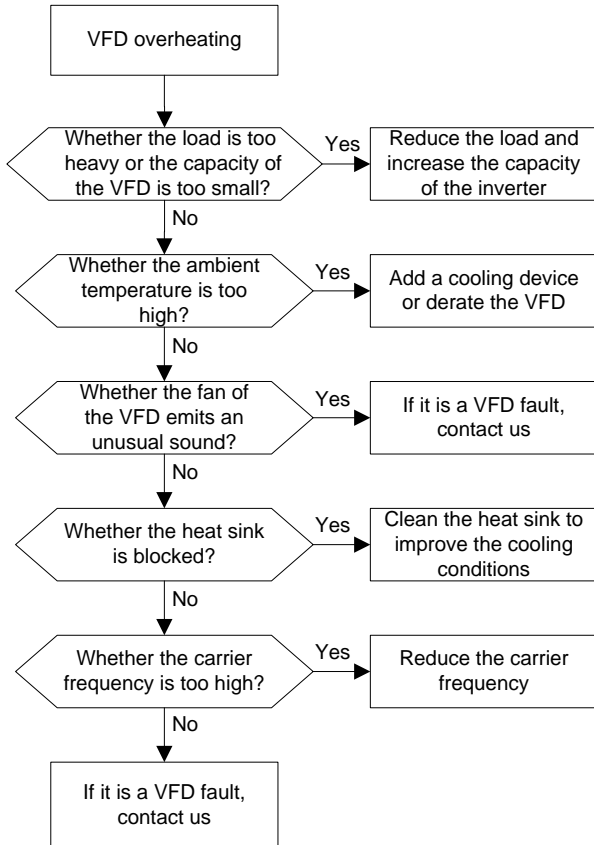
**7.6.4 Undervoltage**



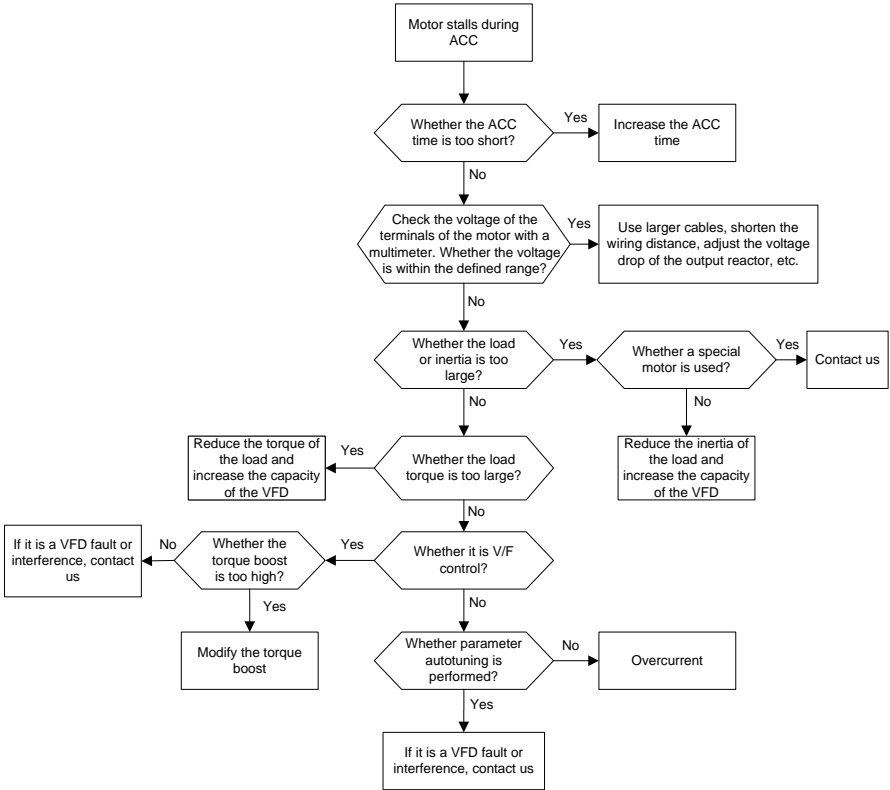
7.6.5 Unusual heating of motor



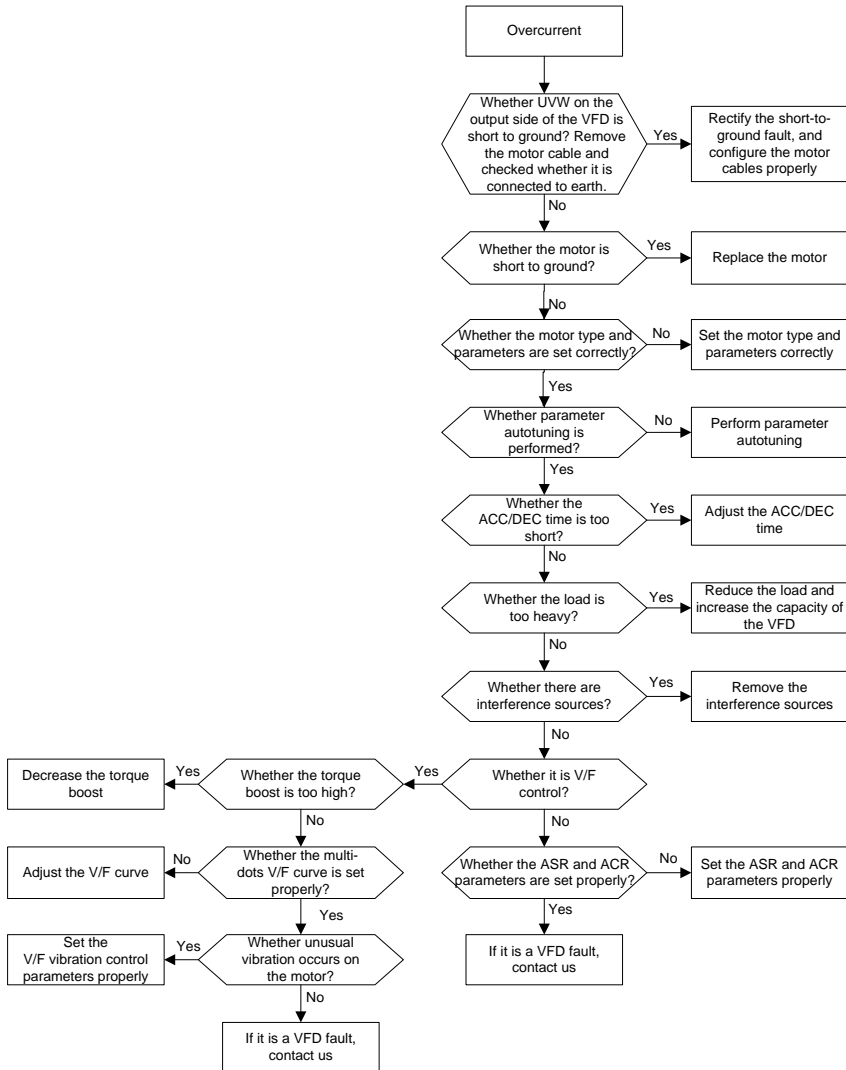
7.6.6 VFD overheating



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. 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  $\Omega$ ).
3. Try to add a safety capacitor of 0.1  $\mu\text{F}$  to the signal end of the feedback signal terminal of the sensor.
4. Try to add a safety capacitor of 0.1  $\mu\text{F}$  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 a VFD, if AO uses current signals of 0 to 20 mA, add a capacitor of 0.47  $\mu\text{F}$  between the AO and GND terminals; and if AO uses voltage signals of 0 to 10 V, add a capacitor of 0.1  $\mu\text{F}$  between the AO and GND terminals.

#### **Note:**

- When a decoupling capacitor is required, add it to the terminal of the device connected to the sensor. For example, if a thermocouple is to transmit signals of 0 to 20 mA to a temperature meter, the capacitor needs to be added on the terminal of the temperature meter; if an electronic ruler is to transmit signals of 0 to 30 V to a PLC signal terminal, the capacitor needs to be added on the terminal of the PLC.
- If a large number of meters or sensors are disturbed. It is recommended that you configure an

external C2 filter on the input power end of the VFD. For models of filters, Refer to the filter model selection section D.7.2 Filter model selection.

### 7.7.2 Interference on RS485 communication

#### Interference phenomenon

The interference described in this section on 485 communication mainly includes communication delay, synchronization failure, 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 485 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 (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  $\Omega$  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  $\Omega$ ).
2. Do not connect the VFD and motor to the same ground terminal as the upper computer. It is recommended that you connect the VFD and motor to the power ground, and connect the upper computer separately to a ground stud.
3. Try to short the signal reference ground terminal (GND) of the VFD with that of the upper computer controller to ensure that ground potential of the communication chip on the control board of the VFD is consistent with that of the communication chip of the upper computer.
4. Try to short GND of the VFD to its ground terminal (PE).

Try to add a safety capacitor of 0.1  $\mu\text{F}$  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 Stop failure and indicator shimmering due to motor cable coupling

#### Interference phenomenon

##### 1. Stop failure

In a VFD system where an DI 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 DI terminal cannot be used to stop the VFD.

##### 2. Indicator shimmering

After a VFD is started, the relay indicator, power distribution box indicator, PLC indicator, and indication buzzer shimmers, blinks, or emits 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 0.1  $\mu\text{F}$  between the digital input terminal (S) and the COM terminal.
3. Connect the digital input terminal (DI) that controls the start and stop to other idle digital input terminals in parallel. For example, if DI1 is used to control the start and stop and DI4 is idle, you can try to connect DI1 to DI4 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 (DI), this scheme is not applicable.

### 7.7.4 Leakage current and interference on RCD

The VFD outputs high-frequency PWM voltage to drive motors. In this process, the distributed capacitance between the internal IGBT of the 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 the VFD may cause misoperation of a RCD.

##### 1. Rules for selecting RCDs

- (1) VFD 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 20 ms. 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, 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" on the middle casing of the VFD.
  - 2. Try to reduce the carrier frequency to 1.5 kHz (F00.12=1.5).
  - 3. Try to modify the modulation mode to "3PH modulation and 2PH modulation" (F07.00=0000).
- 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 spliced.
  - (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 lines are used as neutral wires by these devices.

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 drive system through the power ground or stud.

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 " on the middle casing of the VFD is shorted.

# 10 Quality commitment

## 8.1 Warranty period

Standard warranty: 18 months (based on product serial number)

<b>FGI</b> _____
<b>MODEL:</b> FD200-004G-4-B
<b>INPUT:</b> AC 3PH 380V 50/60Hz
<b>OUTPUT:</b> AC 3PH 380V 0-600Hz 9.5A
<b>S/N:</b> <input type="text"/>
_____
<b>FGI SCIENCE AND TECHNOLOGY CO., LTD.</b>

During the warranty period, the repair or replacement of parts will not affect the overall warranty period of the original product. If the warranty period of the original product is less than 3 months, the repaired or replaced parts will still have the warranty period of 3 months.

## 8.2 After sales service instructions

Thank you very much for choosing FGI products. Fd300 series adopts the most advanced transmission technology and is manufactured under the strict and advanced production management control. In case of product failure, FGI Science & Technology Co., Ltd. and its office will wholeheartedly provide you with timely and high-quality services. Welcome to call the 365X24 hour national unified service hotline: 400-600-3199.

## 8.3 Services

We promise that, our company (hereinafter referred to as “the manufacturer”) conducts free maintenance and repairing to the product that has any fault or damage under the normal operation conditions to the customers from the purchase date.

1. This product is guaranteed free of charge for 18 months from the date of purchase from the manufacturer (except the non-standard machine products).
2. This product has paid lifelong service from the date of purchase from the manufacturer.
3. Even within 18 months, maintenance should also be charged in case of the following situations:
  - (1) Damages incurred to the inverter due to mis-operations which are not in compliance with “Operation Manual”;
  - (2) Damages incurred to the inverter due to the unauthorized repairing and reconstruction;
  - (3) Damage incurred to the inverter due to mis-operations which are not in the standard application

range;

- (4) Abnormal aging or damage incurred to the inverter due to bad usage environment;
  - (5) Damage incurred to the inverter due to earthquake, fire, flood, thunder, abnormal voltage and other damage caused by the force majeure;
  - (6) Damage or lost incurred to the inverter due to improper transportation (the customer can select the transportation, but our company can assist for the shipment procedures).
4. Free maintain and repairing won, t be given under the following circumstance:
- (1) The brand, trademark, serial number and name plate designated in the product have been changed or destroyed and cannot be read;
  - (2) The customer did not pay at the Purchase and Sales Contract signed by both parties;
  - (3) The customer concealed the mis-operation in installation, configuration, operation, maintenance, and other procedures.

#### **8.4 Responsibilities**

No matter from the perspective of contract, warranty period, negligence, civil tort, strict liability or any other point of view, FGI and its suppliers and distributors shall not be responsible for the following special, indirect and secondary losses caused by the use of equipment. This includes but is not limited to the loss of profit and income, the loss of the use of supplied equipment and related equipment, the cost of funds, the cost of substitute equipment, tool fees and service fees, the cost of downtime, delays, and the loss of the buyer's customers or any third party. In addition, unless the user can provide strong evidence, FGI and its suppliers will not be responsible for some allegations, such as problems caused using unqualified raw materials, wrong design, or non-standard production.

If you have any questions about FGI VFDs, please contact FGI company or its office. Technical data, information and specifications are the latest materials at the time of publication. FGI reserves the right to make changes without prior notice.

# 11 Maintenance

## 9.1 What this chapter contains

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

## 9.2 Periodical inspection

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

Subject		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. <b>Note:</b> Discoloration of copper bars does not mean that they

Subject	Item	Method	Criterion	
			cannot work properly.	
	Conductor and wire	Check whether the conductors are deformed or their color change due to 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 extension.	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 $\geq$ initial value $\times$ 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: $\pm 10\%$ (of the standard resistance)
	Transformer and reactor	Check whether there is unusual vibration sounds or smells.	Auditory, olfactory, and visual inspection	No exception occurs.
	Electromagnetic	Check whether there are	Auditory inspection	No exception



Subject		Item	Method	Criterion
	contactor and relay	vibration sounds in the workshop.		occurs.
		Check whether the contacts are in good contact.	Visual inspection	No exception occurs.
Control circuit	Control PCB, 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 discoloration 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.	Visual inspection	No exception occurs.

For more details about maintenance, contact the local FGI office, or visit our website <https://www.fgi-energyrouter.com/>, and choose **Service and Support > Online Service**.

### 9.3 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 [F10.21](#) (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 spare parts of fans from FGI.

### Cooling fan replacement



⚠ Read the safety precautions carefully and follow the instructions to perform operations. Otherwise, physical injuries or damage to the device may be caused.

1. Stop the device, 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 loosen the fan cable
3. Remove 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.

## 9.4 Capacitor

### 9.4.1 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 instruction
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 charging 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 k $\Omega$ /100W. If the voltage of the power supply is no higher than 380 V, you can also use an incandescent lamp of 100W. If an incandescent lamp is used, it may go off or the light may become very weak.

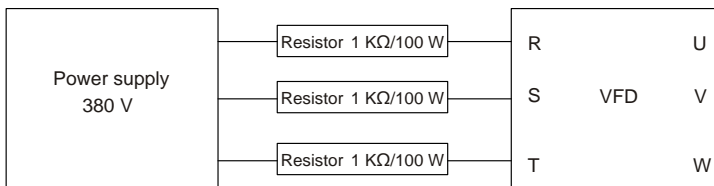


Figure 9.3 Charging circuit example of driving devices

#### 9.4.2 Electrolytic capacitor replacement



⚠ Read the safety precautions carefully and follow the instructions to perform operations. Otherwise, physical injuries or damage to the device may be caused.

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

#### 9.5 Power cable



⚠ Read the safety precautions carefully and follow the instructions to perform operations. Otherwise, physical injuries or device damage may be caused.

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. Power on the VFD.

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# 12 Communication

## 10.1 What this chapter contains

This chapter describes the communication protocols supported by 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 parameters, and monitoring the running status and fault information of the VFD) through PC/PLC, upper control computers, or other devices to meet specific application requirements.

## 10.2 Modbus protocol introduction

Modbus is a software protocol, a common language used in 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 Unit (RTU). On one Modbus network, all the devices must be consistent in transmission modes, baud rates, data bits, check bits, stop bits, and other basic parameters.

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 one slave or all the slaves by sending broadcast messages. For separate access commands, a slave needs to return a response. For broadcast messages, slaves do not need to return responses.

## 10.3 Application

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

### 10.3.1 RS485

RS485 interfaces work in half-duplex mode and send data signals in the differential transmission way, which is also referred to as balanced transmission. An RS485 interface uses a twisted pair, in which 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 +2 V to +6 V, the logic is "1"; and if it ranges from -2 V to -6 V, the logic is "0". On the VFD terminal block, the 485+ terminal corresponds to A, and 485- corresponds to B.

The communication baud rate (F14.00) 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 (bps)	Max. transmission distance (meter)	Baud rate (bps)	Max. transmission distance (meter)
2400BPS	1800m	9600BPS	800m
4800BPS	1200m	19200BPS	600m

When RS485 interfaces are used for long-distance communication, it is recommended that you use shielded cables, and use the shielding layer as the ground wires.

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 120Ω terminal resistor when the transmission distance is long.

**10.3.1.1 When one VFD is used**

Figure 10.1 is the Modbus wiring diagram for the network with one VFD and PC. Generally, PCs do not provide RS485 interfaces, and therefore you need to convert an RS232 or USB interface of a PC to an RS485 interface through a converter. Then, 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.

When the wiring is completed, select the correct port (for example, COM1 to connect to the RS232-RS485 converter) for the upper computer of the PC, and keep the settings of basic parameters such as communication baud rate and data check bit consistent with those of the VFD.

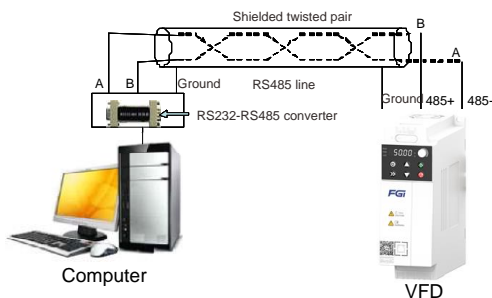


Figure 10.1 RS485 wiring diagram for the network with one VFD

**10.3.1.2 When multiple VFDs are used**

In the network with 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 10.2. Figure 10.3 is the simplified wiring diagram, and Figure 10.4 is the practical application diagram.

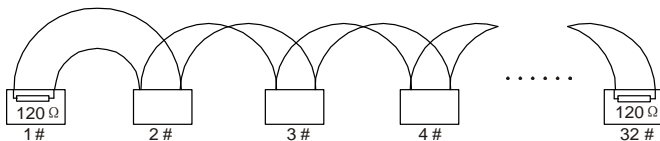


Figure 10.2 Onsite chrysanthemum connection diagram

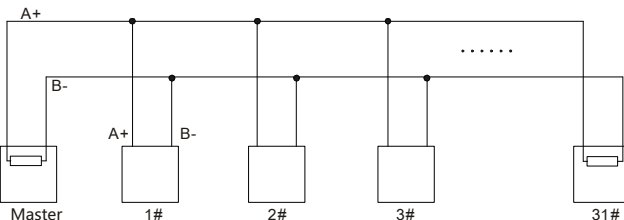


Figure 10.3 Simplified chrysanthemum connection diagram

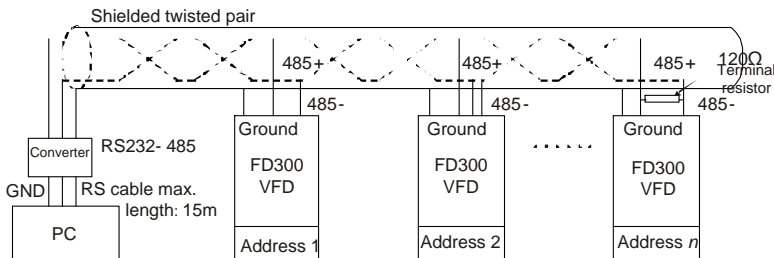


Figure 10.4 Practical application diagram of chrysanthemum connection

Figure 10.5 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 (in this figure, the two devices are devices 1# and 15#).

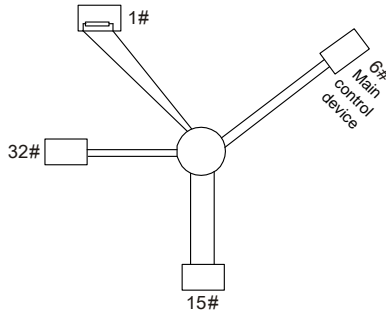


Figure 10.5 Star connection

Use shielded cables, if possible, in multi-VFD 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.

**10.3.2 RTU**

**10.3.2.1 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 help to send more data at the same baud rate.

**Code system**

- 1 start bit
- 7 or 8 data bits; the minimum valid bit is sent 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 stop bit (with check performed), or 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	Stop bit
-----------	------	------	------	------	------	------	------	------	-----------	----------

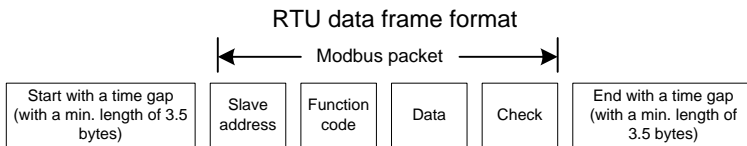
10-bit character frame (Bits 1 to 7 are data bits)

Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	Check bit	Stop bit
-----------	------	------	------	------	------	------	------	-----------	----------

In a character frame, only the data bits carry information. The start bit, check bit, and stop 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, a new frame always must be preceded by a time gap with a minimum length 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 sent in the following sequence: slave address, operation command code, data, and CRC check character. Each byte sent in each domain includes hexadecimal characters (0–9, A–F). The network devices always monitor the communication bus. After receiving the first domain (address information), each network device identifies the byte. After the last byte is sent, a similar transmission interval (with a minimum length of 3.5 bytes) is used to indicate that the frame transmission ends. Then, the transmission of a new frame starts.



The information of a frame must be sent 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(transmission time of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (in decimal system) (0 indicates 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 low-order bits	Detection value: CRC (16 bits)
CRC CHK high-order bits	
END (frame tail)	T1-T2-T3-T4 (transmission time of 3.5 bytes)

**10.3.2.2 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 a wrong response. The wrong 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 wrong.

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 transmitted 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.

#### **Cyclical Redundancy Check (CRC) method**

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 low-order bit to the high-order bit, and 0 is placed in the high-order bit. Then, the low-order bit is detected. If the low-order bit is 1, the XOR operation is performed on the current value in the register and the preset

value. If low-order bit 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 example is a simple CRC calculation function for your reference (using the C programming language):

```
unsigned int  crc_cal_value(unsigned char*data_value,unsigned char
data_length)
{
    int i;
    unsigned int crc_value=0xffff;
    while(data_length--)
    {
        crc_value^=*data_value++;
        for(i=0;i<8;i++)
        {
            if(crc_value&0x0001)
                crc_value=(crc_value>>1)^0xa001;
            else
                crc_value=crc_value>>1;
        }
    }
    return(crc_value);
}
```

In the ladder logic, CKSM uses the table look-up method to calculate the CRC value according to the content in the frame. The program of this method is simple, and the calculation is fast, but the ROM space occupied is large. Use this program with caution in scenarios where there are space occupation requirements on programs.

## 10.4 RTU command code and communication data

### 10.4.1 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.

For example, starting from the data address of 0004H, to read two contiguous pieces of data (that is,

to read content from the data addresses 0004H and 0005H) of the VFD whose address is 01H, the frame structures are described in the following.

RTU master command (sent from the master to the VFD):

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR (address)	01H
CMD (command code)	03H
Start address high-order bit	00H
Start address low-order bit	04H
Data count high-order bit	00H
Data count low-order bit	02H
CRC low-order bit	85H
CRC high-order bit	CAH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

"START" and "END" are "T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)", indicating that a time gap with a minimum length of 3.5 bytes must be kept before RS485 communication is executed. The time gap is used to distinguish one message from another so that the two messages are not regarded as one message.

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

"CMD" is "03H", indicating that the command is used to read data from the VFD. The CMD information occupies one byte.

"Start address" indicates that data reading is started from this address. It occupies two bytes, with the high-order bit on the left and low-order bit 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 low-order bit on the left and high-order bit on the right.

RTU slave response (sent from the VFD to the master):

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	01H
CMD	03H
High-order bit of data in 0004H	04H
Low-order bit of data in 0004H	13H
High-order bit of data in 0005H	88H
Low-order bit of data in 0005H	00H
CRC low-order bits	00H

CRC high-order bits	7EH
High-order bit of data in 0004H	9DH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

The definition of the response information is described as follows:

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

"CMD" is "03H", indicating that the message is a VFD response to the 03H command from 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 low-order bit", that is, "High-order bit of data in 0004H", "Low-order bit of data in 0004H", "High-order bit of data in 0005H", and "Low-order of data in 0005H".

A piece of data is two bytes, with the high-order bits on the left and low-order bit 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 low-order bit on the left and high-order bit on the right.

#### 10.4.2 Command word 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, to write 5000 (1388H) to 0004H of the VFD whose address is 02H, the frame structures are described in the following.

RTU master command (sent from the master to the VFD):

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	06H
High-order bit of data writing address	00H
Low-order bit of data writing address	04H
Data content high-order bit	13H
Data content low-order bit	88H
CRC low-order bit	C5H
CRC high-order bit	6EH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

RTU slave response (sent from the VFD to the master):

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	06H
High-order bit of data writing address	00H
Low-order bit of data writing address	04H
Data content high-order bit	13H
Data content low-order bit	88H
CRC low-order bit	C5H
CRC high-order bit	6EH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

Note: Sections 10.4.1 and 10.4.2 mainly describe the command formats. For the detailed application, Refer to section 10.4.8.

#### 10.4.3 Command code 08H, diagnosis

Sub-function code description:

Sub-function code	Description
0000	Return data based on query requests

For example, to query about the circuit detection information about the VFD whose address is 01H, the query and return strings are the same, and the formats are described in the following tables.

RTU master command:

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	01H
CMD	08H
Sub-function code high-order bit	00H
Sub-function code low-order bit	00H
Data content high-order bit	12H
Data content low-order bit	ABH
CRC CHK low-order bit	ADH
CRC CHK high-order bit	14H
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

RTU slave response:

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	01H
CMD	08H
Sub-function code high-order bit	00H
Sub-function code low-order bit	00H
Data content high-order bit	12H
Data content low-order bit	ABH
CRC CHK low-order bit	ADH
CRC CHK high-order bit	14H
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

#### 10.4.4 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 count", 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 structures are described in the following.

RTU master command (sent from the master to the VFD):

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	10H
High-order bit of data writing address	00H
Low-order bit of data writing address	04H
Data count high-order bit	00H
Data count low-order bit	02H
Number of bytes	04H
Content high-order bit of 0004H	13H
Content low-order bit of 0004H	88H
Content high-order bit of 0005H	00H
Content low-order bit of 0005H	32H
CRC low-order bit	C5H
CRC high-order bit	6EH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

RTU slave response (sent from the VFD to the master)

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H
CMD	10H
High-order bit of data writing address	00H
Low-order bit of data writing address	04H
Data count high-order bit	00H
Data count low-order bit	02H
CRC low-order bit	C5H
CRC high-order bit	6EH
END	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

**10.4.5 Data address definition**

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

**10.4.5.1 Function code address format rules**

The address of a function code consists of two bytes, with the high-order bit on the left and low-order bit on the right. The high-order bit ranges from 00 to ffH, and the low-order bit also ranges from 00 to ffH. The high-order bit is the hexadecimal form of the group number before the dot mark, and low-order bit is that of the number behind the dot mark. Take F05.06 as an example: The group number is 05, that is, the high-order bit of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 06, that is, the low-order bit is the hexadecimal form of 06. Therefore, the function code address is 0506H in the hexadecimal form. For example, the parameter address of F10.01 is 0A01H.

Function code	Name	Description	Setting range	Default	Modify
<u>F12.16</u>	Simple PLC mode	0: Stop after running once 1: Keep running with the final value after running once 2: Cyclic running	0-2	0	<input type="radio"/>
<u>F12.17</u>	Simple PLC memory selection	0: Without memory after power-off 1: With memory after power-off	0-1	0	<input type="radio"/>

**Note:**

- The parameters in the F99 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.

- 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 F00.07 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.

#### 10.4.5.2 Description of other function addresses

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

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	R/W
	2003H	PID feedback, range (0–1000, 1000 corresponding to 100.0%)	R/W
	2004H	Torque setting (-3000 – +3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2005H	Setting of the upper limit of the forward running	R/W



Function	Address	Data description	R/W
		frequency (0–Fmax, unit: 0.01 Hz)	
	2006H	Setting of the upper limit of the reverse running frequency (0–Fmax, unit: 0.01 Hz)	R/W
	2007H	Upper limit of the electromotion torque (0–3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2008H	Upper limit of the brake torque (0–3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2009H	Special control command word: 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 =0: Not clear electricity consumption Bit4: =1 Pre-excitation; =0: Disable pre-excitation Bit5: =1 DC brake =0: Disable DC brake	R/W
	200AH	Virtual input terminal command, range: 0x000–0x3FF Corresponding to S8/S7/S6/S5/HDIB/HDIA/S4/S3/ S2/S1	R/W
	200BH	Virtual output terminal command, range: 0x00–0x0F Corresponding to local RO2/RO1/HDO/Y1	R/W
	200CH	Voltage setting (used for V/F separation) (0–1000, 1000 corresponding to 100.0% of the motor rated voltage)	R/W
	200DH	AO output setting 1 (-1000–+1000, 1000 corresponding to 100.0%)	R/W
	200EH	AO output setting 2 (-1000–+1000, 1000 corresponding to 100.0%)	R/W
VFD status word 1	2100H	0001H: Forward running 0002H: Reverse running	R

Function	Address	Data description	R/W
		0003H: Stopped	
		0004H: Faulty	
		0005H: POFF	
		0006H: Pre-excited	
VFD status word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1-2: =00: Motor 1 =01: Motor 2 Bit3: =0: Asynchronous motor =1: Synchronous motor Bit4: =0: No overload alarm =1: Overload 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: Closed-loop vector =3: Space voltage vector	R
VFD fault code	2102H	Refer to the description of fault types.	R
VFD identification code	2103H	FD300----0x01A2	R
Running frequency	3000H	0-Fmax (Unit: 0.01Hz)	R
Set frequency	3001H	0-Fmax (Unit: 0.01Hz)	
Bus voltage	3002H	0.0-2000.0V (Unit: 0.1V)	
Output voltage	3003H	0-1200V (Unit: 1V)	
Output current	3004H	0.0-3000.0A (Unit: 0.1A)	
Rotating speed	3005H	0-65535 (Unit: 1RPM)	
Output power	3006H	-300.0-300.0% (Unit: 0.1%)	

Function	Address	Data description	R/W
Output torque	3007H	-250.0–250.0% (Unit: 0.1%)	R
Closed-loop setting	3008H	-100.0–100.0% (Unit: 0.1%)	R
Closed-loop feedback	3009H	-100.0–100.0% (Unit: 0.1%)	R
Input state	300AH	000–3F Corresponding to the local HDIB/ HDIA/S4/S3/S2/S1	R
Output state	300BH	000–0F Corresponding to the 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 current step of multi-step speed	3012H	0–15	R
External length	3013H	0–65535	R
External count value	3014H	0–65535	R
Torque setting	3015H	-300.0–300.0% (Unit: 0.1%)	R
Identification code	3016H		R
Fault code	5000H		R

The Read/Write (R/W) characteristics indicate whether a function can be read and written. For example, "Communication-based control command" can be written, and therefore the command code 6H is used to control the VFD. The R characteristic indicates that a function can only be read, and W indicates that a function can only be written.

**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" ([F00.02](#)) to

"Communication", and set "Communication running command channel" ([F00.02](#)) to the Modbus communication channel. For another example, when modifying "PID setting", you need to set "PID reference source" ([F11.00](#)) to Modbus communication.

The following table describes the encoding rules of device codes (corresponding to the identification code 2103H of the VFD).

Eight high-order bits of code	Meaning	Eight low-order bits of code	Meaning
01	FD	0x08	FD380 vector VFD
		0x09	FD250 vector VFD
		0x0a	FD20 vector VFD
		0xa0	FD300 vector VFD

#### 10.4.6 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, we can multiply 50.12 by 100 to obtain an integer 5012, and then 50.12 can be represented as 1394H (5012 in the decimal form) in the hexadecimal 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 decimals in the value specified in "Detailed parameter description" or "Default value". If there are  $n$  decimals in the value, the fieldbus scale  $m$  is the  $n^{\text{th}}$ -power of 10. Take the following table as an example,  $m$  is 10.

Function code	Name	Description	Setting range	Default	Modify
<a href="#">F10.31</a>	Wake-up-from-sleep delay	0.0–3600.0s (valid when <a href="#">F06.20</a> is 2)	0.00–3600.0	0.0s	<input type="radio"/>
<a href="#">F10.32</a>	Restart after power failure	0: Disable 1: Enable	0–1	0	<input type="radio"/>

The value specified in "Setting range" or "Default" contains one decimal, so the fieldbus scale is 10. If the value received by the upper computer is 50, the value of "Wake-up-from-sleep delay" of the VFD is 5.0 (5.0=50/10).

To set the "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 transmit the following write command:

01      06      01 14      00 32      49 E7  
 VFD      Write      Parameter      Parameter      CRC  
 address      command      address      data

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 transmits 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      Write      2-byte      Parameter      CRC  
 address      command      data      data

The parameter data is 0032H, that is, 50, so 5.0 is obtained based on the fieldbus scale (50/10=5.0). In this case, the master identifies that the "Wake-up-from-sleep delay" is 5.0s.

**10.4.7 Error message response**

Operation errors may occur in communication-based control. For example, some parameters can only be read, but a write command is transmitted. In this case, the VFD returns an error message response.

Error message responses are sent from the VFD to the master. The following table describes the codes and definitions of the error message responses.

Code	Name	Description
01H	Invalid command	The command code received by the upper computer is not allowed to be executed. The possible causes are as follows: <ul style="list-style-type: none"> <li>• The function code is applicable only on new devices and is not implemented on this device.</li> <li>• The slave is in the faulty state when processing this request.</li> </ul>
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-transmitted 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. <p><b>Note:</b> It does not mean that the data item submitted for storage in the register includes a value unexpected by the program.</p>

Code	Name	Description
04H	Operation failure	The parameter is set to an invalid value in the write operation. For example, a function input terminal cannot be set repeatedly.
05H	Password error	The password entered in the password verification address is different from that set in <u>F17.00</u> .
06H	Data frame error	The length of the data frame transmitted by the upper computer is incorrect, or in the RTU format, the value of the CRC check bit is inconsistent with the CRC value calculated by the lower computer.
07H	Parameter read-only	The parameter to be modified in the write operation of the upper computer is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the upper computer cannot be modified during the running of the VFD.
09H	Password protection	A user password is set, and the upper computer does not provide the password to unlock the system when performing a read or write operation. The error of "system locked" is reported.

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

For example, if the master device transmits a request message to a slave device for reading a group of function code address data, the code is generated as follows:

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

For an exception response, the following code is returned:

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

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

For example, to set the "Channel of running commands" (F00.02, the parameter address is 0001H) of the VFD whose address is 01H to 03, the command is as follows:

<b><u>01</u></b>	<b><u>06</u></b>	<b><u>00 01</u></b>	<b><u>00 03</u></b>	<b><u>98 0B</u></b>
VFD address	Read command	Parameter address	Parameter data	CRC

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

<b><u>01</u></b>	<b><u>86</u></b>	<b><u>04</u></b>	<b><u>43 A3</u></b>
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. From the preceding table, we can refer to that it indicates the error "Operation failure", which means "The parameter is set to an invalid value in the write operation".

#### 10.4.8 Read/Write operation example

For details about the formats of the read and write commands, refer to sections 10.4.1 and 10.4.2.

##### 10.4.8.1 Examples of read command 03H

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

The read command transmitted to the VFD is as follows:

<b><u>01</u></b>	<b><u>03</u></b>	<b><u>21 00</u></b>	<b><u>00 01</u></b>	<b><u>8E 36</u></b>
VFD address	Read command	Parameter address	Data quantity	CRC

Assume that the following response is returned:

<b><u>01</u></b>	<b><u>03</u></b>	<b><u>02</u></b>	<b><u>00 03</u></b>	<b><u>F8 45</u></b>
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" (F13.11) to "5th-last fault type" (F13.16) of which the parameter addresses are 0D0BH to 0D10H (contiguous 6 parameter addresses starting from 0D0BH).

The command transmitted to the VFD is as follows:

<b><u>03</u></b>	<b><u>03</u></b>	<b><u>07 1B</u></b>	<b><u>00 06</u></b>	<b><u>B5 59</u></b>
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 00 23 5F D2**  
 VFD Read Number of Present Last fault 2nd-last fault 3rd-last fault 4th-last fault 5th-last fault CRC  
 address command bytes fault type type type type type type type

According to the returned data, all the fault types are 0023H, that is, 35 in the decimal form, which means the maladjustment fault (STo)

**10.4.8.2 Examples of write command 06H**

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.

Function	Address	Data description	R/W
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	

The command transmitted by the master is as follows:

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

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

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

Example 2: Set the "Max. output frequency" of the VFD whose address is 03H to 100 Hz.



Function code	Name	Description	Setting range	Default	Modify
F00.07	Max. output frequency	F00.08–630.00H (400.00Hz)	100.00–630.00	50.00Hz	☉

According to the number of decimals, the fieldbus scale of the "Max. output frequency" (F00.07) is 100. Multiply 100 Hz by 100. The value 10000 is obtained, and it is 2710H in the hexadecimal form.

The command transmitted by the master is as follows:

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

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

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

**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.

**10.4.8.3 Examples of continuously write command 10H**

Example 1: Set the VFD whose address is 01H to be forward running at the frequency of 10 Hz. 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-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	

Function	Address	Data description	R/W
		0007H: Fault reset	
		0008H: Jogging to stop	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	

In the actual operation, set F00.02 to 2 and F00.03 to 8.

The command transmitted by 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    Forward 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 "ACC time" of the VFD whose address is 01H to 10s, and "DEC time" to 20s.

<u>F00.13</u>	ACC time 1	Setting range of <u>F00.13</u> and <u>F00.14</u> : 0.0–3600.0s	Model depended	<input type="radio"/>
<u>F00.14</u>	DEC time 1		Model depended	<input type="radio"/>

The address of F00.13 is 000D, 10s is 0064H in the hexadecimal form, and 20s is 00C8H in the hexadecimal form.

The command transmitted by 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:

<b><u>01</u></b>	<b><u>10</u></b>	<b><u>00 0B</u></b>	<b><u>00 02</u></b>	<b><u>30 0A</u></b>
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.

#### 10.4.8.4 Modbus communication commissioning example

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 upper computer 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 **F14.00**. The data bits, check bits, and end bits must be set consistently with **F14.01**. 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:

<b><u>03</u></b>	<b><u>06</u></b>	<b><u>20 00</u></b>	<b><u>00 01</u></b>	<b><u>42 28</u></b>
VFD address	Write command	Parameter address	Forward running	CRC

**Note:**

Set the address (F14.02) of the VFD to 03.

Set "Channel of running commands" (F00.02) to "Communication", and set "Communication channel of running commands" (F00.18) to the Modbus communication channel.

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

<b><u>03</u></b>	<b><u>06</u></b>	<b><u>20 00</u></b>	<b><u>00 01</u></b>	<b><u>42 28</u></b>
VFD address	Write command	Parameter address	Forward running	CRC

### 10.5 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:

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

# Appendix A Technical data

## A.1 What this chapter contains

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

## A.2 Derated application

### A.2.1 Capacity

Choose a VFD model based on the rated current and power of the motor. To ensure the rated power of the motor, the rated output current of the VFD must be greater 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:

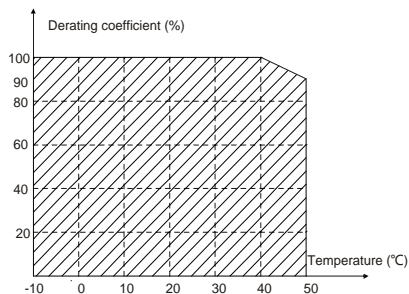
- The rated capacity is the capacity at the ambient temperature of 40°C.
- You need to check and ensure that the power flowing through the common DC connection in the common DC system does not exceed the rated power of the motor.

### A.2.2 Derating

If the ambient temperature on the site where the VFD is installed exceeds 40°C, the altitude exceeds 1000 m, a cover with heat dissipation vents is used, or the carrier frequency is higher than the recommended (F00.14), the VFD needs to be derated.

#### A.2.2.1. Derating due to temperature

When the temperature ranges from +40°C to +50°C, the rated output current is derated by 2% for each increased 1°C. For the actual derating, refer to the following figure.



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

#### A.2.2.2. Derating due to altitude

When the altitude of the site where the VFD is installed is lower than 1000 m, the VFD can run at the rated power. When the altitude exceeds 1000m, derate by 1% for every increase of 100m. When the altitude exceeds 3000m, consult the local FGI dealer or local FGI office for details.

### A.2.2.3. Derating due to carrier frequency

The power of the VFD varies according to carrier frequencies. The VFD rated power is defined based on the carrier frequency set in factory. If the carrier frequency exceeds the factory setting, the power of the VFD is derated by 10% for each increased 1 kHz.

## A.3 Grid specifications

<b>Grid voltage</b>	AC 3PH 380V~480V
<b>Short-circuit capacity</b>	According to the definition of IEC 60439-1, the VFDs are suitable for the use on the grid with maximum expected short-circuit current no more than 100kA at the maximum rated voltage.
<b>Frequency</b>	50/60 Hz±5%, with a maximum change rate of 20%/s

## A.4 Motor connection data

<b>Motor type</b>	Asynchronous induction motor or permanent magnetic synchronous motor
<b>Voltage</b>	0–U1 (rated voltage of the motor), 3PH symmetrical, Umax (rated voltage of the VFD) at the field-weakening point
<b>Short-circuit protection</b>	The short-circuit protection for the motor output meets the requirements of IEC 61800-5-1.
<b>Frequency</b>	0–400 Hz
<b>Frequency resolution</b>	0.01 Hz
<b>Current</b>	Refer to 4.6 Product ratings.
<b>Power limit</b>	1.5 times of the rated power of the motor
<b>Field-weakening point</b>	10–400 Hz
<b>Carrier frequency</b>	4, 8, 12, or 15 kHz

### A.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)
Second environment (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 FGI office.

For description about the environments category II (C3), see section A.6 EMC regulations.

## A.5 Application standards

The following table describes the standards that the VFD complies with.

EN/ISO 13849-1	Safety of machinery—Safety-related parts of control systems—Part 1: General principles for design
IEC/EN 60204-1	Safety of machinery—Electrical equipment of machines. Part 1: General requirements
IEC/EN 62061	Safety of machinery—Safety-related functional safety of electrical, electronic, and programmable electronic control systems
IEC/EN 61800-3	Adjustable speed electrical power drive systems—Part 3:EMC requirements and specific test methods
IEC/EN 61800-5-1	Adjustable speed electrical power drive systems—Part 5-1: Safety requirements—Electrical, thermal and energy

### A.5.1 CE marking

The CE marking on the name plate of the VFD indicates that the VFD is CE-compliant, meeting the regulations of the European low-voltage directive (2014/35/EU) and EMC directive (2014/30/EU).

### A.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. FGI products have strictly followed these EMC regulations.

## A.6 EMC regulations

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

Application environment categories

Category I: Civilian environments, including application scenarios where VFDs are directly connected to the civil power supply low-voltage grids without intermediate transformers

Category II: All environments except those in Category I.

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.

### A.6.1 VFD category of C2

The induction disturbance limit meets the following stipulations:

1. Select an optional EMC filter according to "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.



◇ Currently in environments in China, the VFD may generate radio interference, you need to take measures to reduce the interference.

### B.6.2 VFD category of C3

The anti-interference performance of the VFD meets the requirements of environments Category II in the IEC/EN 61800-3 standard.

The induction disturbance limit meets the following stipulations:

1. Select an optional EMC filter according to "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.



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





### B.3 VFD dimension

#### B.3.1 Wall-mounting dimensions

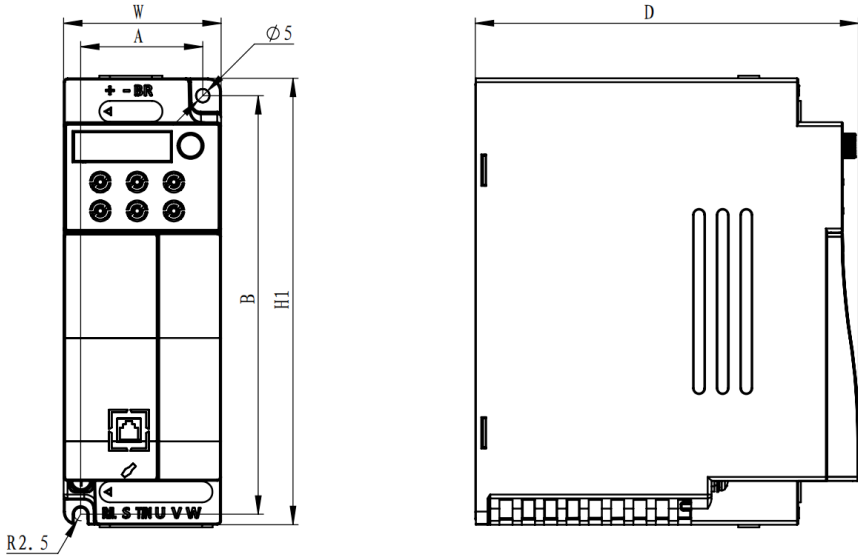


Figure B.3 2.2kW and below VFDs wall-mounting diagram

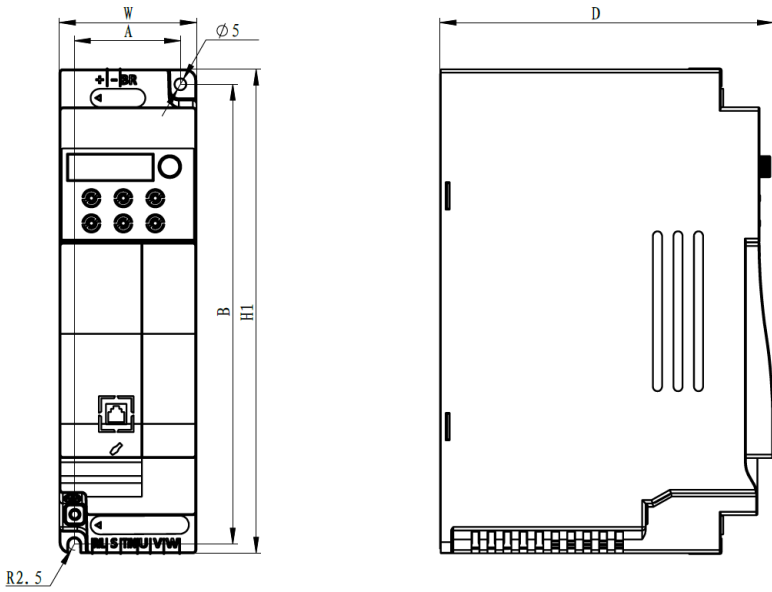


Figure B.4 4~5.5kW VFDs wall-mounting diagram

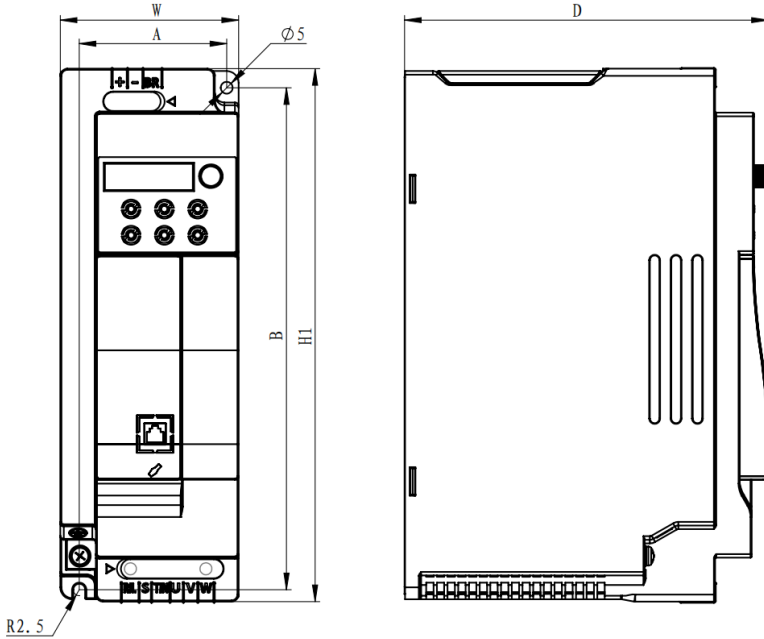


Figure B.5 7.5~11kW VFDs wall-mounting diagram

Table B.1 Wall-mounting dimensions (unit: mm)

VFD models	Dimension(mm)			Installation size(mm)			Installation hole	Screw
	W	H1	D	A1	A2	B1		
2.2kW and below	60	170	146	46.5		160	Φ5	M4
4~5.5kW	60	212	146	46.5		202	Φ5	M4
7.5~11kW	75	224	153	62		224	Φ5	M4

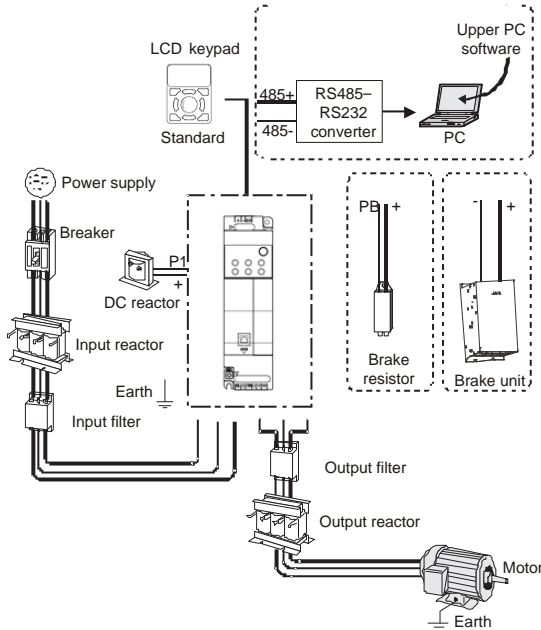
# Appendix C Optional peripheral accessories

## C.1 What this chapter contains

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



## C.2 Wiring of peripheral accessories




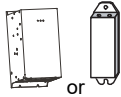


The following figure shows the external wiring of the VFD.



**Note:**


- The DC reactor can be optionally equipped with built-in, which can be delivered after being installed by the manufacturer

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.
	Input reactor	Accessories used to improve the current adjustment coefficient on the input side of the VFD, and thus restrict high-order harmonic currents.
	DC reactor	The VFD models of 132G/160P and higher can be directly connected to external DC reactors.
	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.
	Braking unit or braking resistor	Accessories used to consume the regenerative energy of the motor to reduce the DEC time.  The VFD models of 037G/045P and lower need only to be configured with braking resistors, those of 132G/160P and higher also need to be configured with braking units, and those of 045G/055P-055G/075P 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 VFD, which effectively restrict the transient high voltage generated during the switch-on and switch-off of the IGBT module of the VFD.

**C.3 Power supply**

Refer to **Installation guidelines**.

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

**C.4 Cables**

**C.4.1 Power cables**

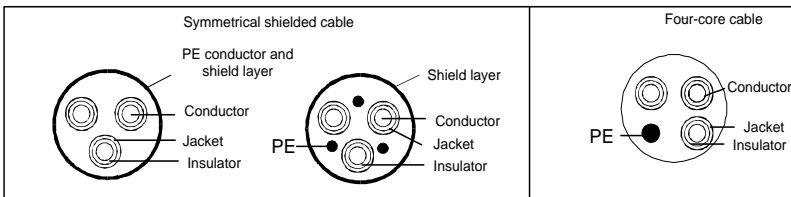
The sizes of the input power cables and motor cables must meet the local regulation.

- The input power cables and motor cables must be able to carry the corresponding load currents.
- The maximum temperature margin of the motor cables in continuous operation cannot be lower than 70°C.

- The conductivity of the PE grounding conductor is the same as that of the phase conductor, that is, the cross-sectional areas are the same.
- For details about the EMC requirements, refer to [Appendix A 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).

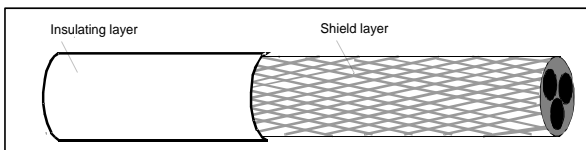
Four-core cables can be used as input cables, but symmetrical shielded cables are recommended. Compared with four-core cables, symmetrical shielded cables can reduce electromagnetic radiation as well as the current and loss of the motor cables.



**Note:** If the conductivity of the shield layer of the motor cables cannot meet the requirements, separate PE conductors 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.

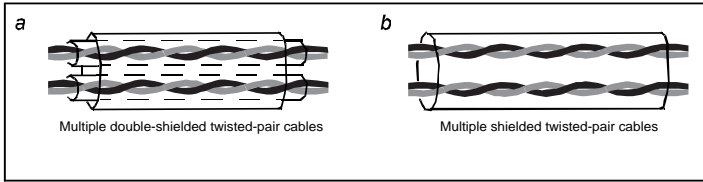
To effectively restrict the emission and conduction of radio frequency (RF) interference, the conductivity of the shielded cable must at least be 1/10 of the conductivity of the phase conductor. This requirement can be well met by a copper or aluminum shield layer. The following figure shows the minimum 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.



Cross-section of the cable

#### C.4.2 Control cables

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.



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.

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

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

**C.4.3 Recommended cable sizes**

Table C.1 AC 3PH 380V (-15%)–440V (+10%) Recommended cable size

VFD models	R, S, T U,V,W (+) (-)		PE		Tightening torque (N.m)
	Recommended cable size mm <sup>2</sup>	Recommended connector	Recommended cable size mm <sup>2</sup>	Recommended connector	
FD200-0R4G-S2-B	1.5	E1508	1.5	GTNR1.5-4	1.3~1.5
FD200-0R7G-S2-B	1.5	E1508	1.5	GTNR1.5-4	1.3~1.5
FD200-1R5G-S2-B	2.5	E2508	2.5	GTNR2.5-4	1.3~1.5
FD200-2R2G-S2-B	2.5	E2508	2.5	GTNR2.5-4	1.3~1.5
FD200-0R4G-2-B	1.5	E1508	1.5	GTNR1.5-4	1.3~1.5
FD200-0R7G-2-B	1.5	E1508	1.5	GTNR1.5-4	1.3~1.5



VFD models	R, S, T U,V,W (+) (-)		PE		Tightening torque (N.m)
	Recommended cable size mm <sup>2</sup>	Recommended connector	Recommended cable size mm <sup>2</sup>	Recommended connector	
FD200-1R5G-2-B	2.5	<b>E2508</b>	2.5	<b>GTNR2.5-4</b>	1.3~1.5
FD200-2R2G-2-B	2.5	<b>E2508</b>	2.5	<b>GTNR2.5-4</b>	1.3~1.5
FD200-004G-2-B	2.5	<b>E2508</b>	2.5	<b>GTNR2.5-4</b>	1.3~1.5
FD200-5R5G-2-B	4	<b>E4009</b>	4	<b>GTNR4-4</b>	1.3~1.5
FD200-7R5G-2-B	4	<b>E4009</b>	6	<b>GTNR6-4</b>	1.3~1.5
FD200-1R5G-4-B	1.5	<b>E1508</b>	1.5	<b>GTNR1.5-4</b>	1.3~1.5
FD200-2R2G-4-B	1.5	<b>E1508</b>	1.5	<b>GTNR1.5-4</b>	1.3~1.5
FD200-004G-4-B	2.5	<b>E2508</b>	2.5	<b>GTNR2.5-4</b>	1.3~1.5
FD200-5R5G-4-B	2.5	<b>E2508</b>	2.5	<b>GTNR2.5-4</b>	1.3~1.5
FD200-7R5G-4-B	4	<b>E4009</b>	4	<b>GTNR4-4</b>	1.3~1.5
FD200-011G-4-B	4	<b>E4009</b>	4	<b>GTNR4-4</b>	1.3~1.5
FD200-015G-4-B	6	<b>E6012</b>	6	<b>GTNR6-6</b>	4~6
FD200-018G-4-B	10	<b>E10-12</b>	10	<b>GTNR10-6</b>	4~6

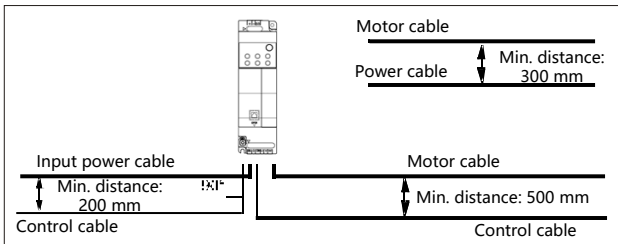
#### C.4.4 Cable arrangement

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

The cable trays must be connected properly and well grounded. Aluminum trays can implement local equipotential.

The following figure shows the cable arrangement distance requirements.



Cable arrangement distances

### C.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 megameter of 500 V DC to measure the insulation resistance between each phase conductor and the protection grounding conductor. For details about the insulation resistance of the motor, refer to 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.

### C.5 Breaker and electromagnetic contactor

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. The capacity of the breaker needs to be 1.5 to 2 times the rated current of the VFD.

	<p>◇ 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.</p>
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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 C.2 AC 3PH 380V(-15%)–440V(+10%) Breaker, Fuse and Contactor ratings

VFD models	Breaker rated current (A)	Fuse rated current (A)	Contactor rated current (A)
FD200-0R4G-S2-B	10	10	9
FD200-0R7G-S2-B	16	16	12
FD200-1R5G-S2-B	25	25	25

VFD models	Breaker rated current (A)	Fuse rated current (A)	Contactora rated current (A)
FD200-2R2G-S2-B	50	40	32
FD200-0R4G-2-B	6	6	9
FD200-0R7G-2-B	10	10	9
FD200-1R5G-2-B	16	16	12
FD200-2R2G-2-B	25	25	18
FD200-004G-2-B	35	32	25
FD200-5R5G-2-B	35	32	32
FD200-7R5G-2-B	50	63	50
FD200-1R5G-4-B	6	10	9
FD200-2R2G-4-B	10	10	9
FD200-004G-4-B	20	20	18
FD200-5R5G-4-B	25	35	25
FD200-7R5G-4-B	32	40	32
FD200-011G-4-B	50	50	38
FD200-015G-4-B	63	60	50
FD200-018G-4-B	63	70	65

**Note:** The accessory specifications described in the preceding table are ideal values. You can select accessories based on the actual market conditions, but try not to use those with lower values.

## C.6 Reactors

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 100 m, select the reactor according to the following table. If the distance is longer than 100 m, contact FGI's technical support technicians.

VFDs 30kW and above can optional built-in DC reactor. 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.

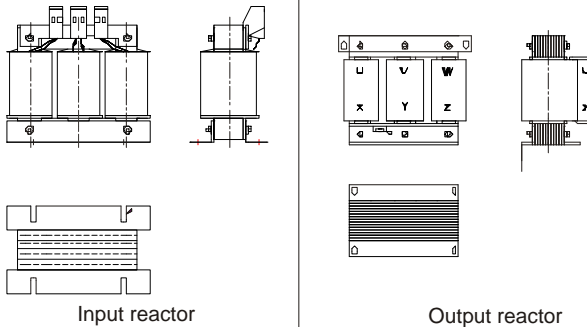


Table C.3 Reactors list

VFD models	Input reactor	Output reactor
FD200-0R4G-S2-B	/	/
FD200-0R7G-S2-B	/	/
FD200-1R5G-S2-B	/	/
FD200-2R2G-S2-B	/	/
FD200-0R4G-2-B	ACR-1.5K-0.4SC-4/2.8M	OCR-1.5K-0.4SC-4/1.4M
FD200-0R7G-2-B	ACR-1.5K-0.4SC-4/2.8M	OCR-1.5K-0.4SC-4/1.4M
FD200-1R5G-2-B	ACR-3.7K-0.4SC-10/1.4M	OCR-3.7K-0.4SC-10/0.7M
FD200-2R2G-2-B	ACR-3.7K-0.4SC-10/1.4M	OCR-3.7K-0.4SC-10/0.7M
FD200-004G-2-B	ACR-5.5K-0.4SC-15/0.94M	OCR-5.5K-0.4SC-15/0.47M
FD200-5R5G-2-B	ACR-7.5K-0.4SC-20/0.7M	OCR-7.5K-0.4SC-20/0.35M
FD200-7R5G-2-B	ACR-15K-0.4SAL-35/0.36M	OCR-15K-0.4SAL-35/0.23M
FD200-1R5G-4-B	ACR-1.5K-0.4SC-4/2.8M	OCR-1.5K-0.4SC-4/1.4M
FD200-2R2G-4-B	ACR-2.2K-0.4SC-5/2.0M	OCR-2.2K-0.4SC-5/1.0M
FD200-004G-4-B	ACR-3.7K-0.4SC-10/1.4M	OCR-3.7K-0.4SC-10/0.7M
FD200-5R5G-4-B	ACR-5.5K-0.4SC-15/0.94M	OCR-5.5K-0.4SC-15/0.47M

VFD models	Input reactor	Output reactor
FD200-7R5G-4-B	ACR-7.5K-0.4SC-20/0.7M	OCR-7.5K-0.4SC-20/0.35M
FD200-011G-4-B	ACR-11K-0.4SAL-25/0.47M	OCR-11K-0.4SAL-25/0.28M
FD200-015G-4-B	ACR-15K-0.4SAL-35/0.36M	OCR-15K-0.4SAL-35/0.23M
FD200-018G-4-B	ACR-18.5K-0.4SAL-40/0.28M	OCR-18.5K-0.4SAL-40/0.19M

**Note:**

- The rated input voltage drop of input reactors is 2%±15%.
- The rated output voltage drop of output reactors is 1%±15%.
- The preceding table describes external accessories. You need to specify the ones you choose when purchasing accessories.

**C.7 Filters**

**C.7.1 Filter model description**

FLT - P 04 045 L - B

Field identifier	Field description
A	FLT: Name of the VFD filter series
B	Filter type P: Power input filter L: Output filter
C	Voltage class 04: AC 3PH 380V(-15%)–440V(+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) category C1 (EN 61800-3) B: Environment Category I (IEC61800-3) category C2 (EN 61800-3) C: Environment Category II (IEC61800-3) category C3 (EN 61800-3)

**C.7.2 Filter model selection**

Table C.4 Filters list

VFD models	Input filter	Output filter
FD200-0R4G-S2-B	FLT-PS2010H-B	FLT-L04006L-B
FD200-0R7G-S2-B		
FD200-1R5G-S2-B	FLT-PS2025L-B	FLT-L04016L-B
FD200-2R2G-S2-B		
FD200-0R4G-2-B	FLT-P04006L-B	FLT-L04006L-B
FD200-0R7G-2-B		
FD200-1R5G-2-B	FLT-P04016L-B	FLT-L04016L-B
FD200-2R2G-2-B		
FD200-004G-2-B	FLT-P04032L-B	FLT-L04032L-B
FD200-5R5G-2-B		
FD200-7R5G-2-B	FLT-P04045L-B	FLT-L04045L-B
FD200-1R5G-4-B	FLT-P04006L-B	FLT-L04006L-B
FD200-2R2G-4-B		
FD200-004G-4-B	FLT-P04016L-B	FLT-L04016L-B
FD200-5R5G-4-B		
FD200-7R5G-4-B	FLT-P04032L-B	FLT-L04032L-B
FD200-011G-4-B		
FD200-015G-4-B	FLT-P04045L-B	FLT-L04045L-B
FD200-018G-4-B		

**Note:**

- The input EMI meets the C2 requirements after an input filter is configured.
- The preceding table describes external accessories. You need to specify the ones you choose when purchasing accessories.

**C.8 Braking system**

Table C.5 Braking units and resistors

VFD models	Braking unit model	Resistance for 100% brake torque (Ω)	Braking resistor power rating (kW)			Min. allowable brake resistance (Ω)
			10% braking ratio	50% braking ratio	80% braking ratio	
FD200-0R2G-S2-B	Built-in DBU	361	0.06	0.30	0.48	42
FD200-0R7G-S2-B		192	0.11	0.56	0.9	42
FD200-1R5G-S2-B		96	0.23	1.1	1.8	30
FD200-2R2G-S2-B		65	0.33	1.7	2.6	21
FD200-0R2G-2-B		361	0.06	0.3	0.5	131
FD200-0R7G-2-B		192	0.11	0.56	0.9	93
FD200-1R5G-2-B		96	0.23	1.1	1.8	44
FD200-2R2G-2-B		65	0.33	1.7	2.64	40
FD200-004G-2-B		36	0.6	3	4.8	33
FD200-5R5G-2-B		26	0.75	4.13	6.6	25
FD200-7R5G-2-B		19	1.13	5.6	9	13
FD200-2R2G-4-B		222	0.33	1.7	2.6	130
FD200-004G-4-B		122	0.6	3	4.8	80
FD200-5R5G-4-B		89	0.75	4.1	6.6	60
FD200-7R5G-4-B		65	1.1	5.6	9	47
FD200-011G-4-B		44	1.7	8.3	13.2	31
FD200-015G-4-B		32	2.25	11.3	18	23
FD200-018G-4-B		27	3	14	22	19