Operation Manual

Goodrive300-02 Series
Through-the-Wall VFD

SHENZHEN INVT ELECTRIC CO., LTD.

Preface

Thanks for choosing Goodrive300-02 VFDs.

Goodrive300-02 high performance open loop vector VFDs can be used to control asynchronous AC induction motors and PMS motors. The products adopt world-leading synchronous speed sensorless vector control technology, use DSP control system and enhance the reliability, adaptability and customized and industry-oriented design, so the functions are optimized, the applications are more flexible and the performance is more stable.

Based on the hardware platform of Goodrive300 VFDs, Goodrive300-02 series through-the-wall VFDs are high performance vector VFDs developed for avoiding cotton fiber, dust and oil causing secondary pollution, improving the reliability and adaptability. By the design of large radiator size and wide teeth space as well as through-the-wall installation manner, Goodrive300-02 VFDs separate the cooling system and electrical system relatively, get the radiator fit outside the electric cabinet and reduce the temperature of the VFD via the external air duct of the radiator.

With the same excellent control performance as international high-end VFDs, Goodrive300-02 VFDs realize the integration of synchronous and asynchronous motor drives, torque control and speed control, so the products become the rare integrated drives in the industry and meet the requirements of high performance applications. Simultaneously, Goodrive300-02 VFDs have the anti-trip performance beyond other products in the same category and the adaptability to harsh grid, temperature, humidity and dust, greatly improving the reliability.

The VFDs adopt modular design. On the premise of meeting general requirements, the VFDs can flexibly satisfy individual and industrial needs by extension design, which adapts to the application tends. The speed control, torque control, simple PLC, I/O terminals, pulse frequency reference and frequency control can meet the requirements of various complicated high accuracy drives and also provide high integrated solutions for equipment manufacturers, which are of great value for the system to reduce the cost and improve the reliability.

By EMC overall design, Goodrive300-02 VFDs meet the environmental demand of low noise and electromagnetic interference.

This manual provides installation and configuration, parameters setting, fault diagnoses and daily maintenance and relative precautions for customers. Please read this manual carefully before the installation to ensure a proper installation and operation and high performance of Goodrive300-02 VFDs.

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

Our company reserves the right to update the information of our products.

Contents

1 Safety precautions

1.1 What this chapter contains

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the VFD. If ignored, physical injury or death may occur, or damage may occur to the devices.

If any physical injury or death or damage to the devices occurs for ignoring to 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:	Serious physical injury or even death may occur if not follow relevant requirements
Warning:	Physical injury or damage to the devices may occur if not follow relevant requirements
Note:	Physical hurt may occur if not follow relevant requirements
Qualified electricians:	People working on the device should take part in professional electrical and safety training, receive the certification and be familiar with all steps and requirements of installing, commissioning, operating and maintaining the device to avoid any emergency.

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	Electrical Danger	Serious physical injury or even death may occur if not follow the relative requirements	
 Warning	General danger	Physical injury or damage to the devices may occur if not follow the relative requirements	
 Do not	Electrostatic discharge	Damage to the PCBA board may occur if not follow the relative requirements	
 Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	
Note	Note	Physical hurt may occur if not follow the relative requirements	Note

1.4 Safety guidelines

✧ Only qualified electricians are allowed to operate the VFD.

✧ Do not carry out any wiring and inspection or changing components when the power supply is applied. Ensure all input power supply is disconnected before wiring and checking and always wait for at least the time designated on the VFD or until the DC bus voltage is less than 36V. Below is the table of the waiting time:

VFD module		Min. waiting time
380V	7.5kW-55kW	5 minutes

✧ Do not refit the VFD unauthorizedly; otherwise fire, electric shock or other injury 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 measurements to avoid electrostatic discharge during relevant operation.

1.4.1 Delivery and installation

✧ Please install the VFD on fire-retardant material and keep the VFD away from combustible materials.

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

✧ Do not operate the VFD if there is any damage or components loss to the VFD.

✧ Do not touch the VFD with wet items or body, otherwise electric shock may occur.

Note:

✧ Select appropriate moving and installing tools to ensure a safe and normal running of the VFD and avoid physical injury or death. For physical safety, the erector should take some mechanical protective measurements, such as wearing smash-proof shoes and working uniforms.

✧ Ensure to avoid physical shock or vibration during delivery and installation.

✧ Do not carry the VFD by its cover. The cover may fall off.

✧ Install away from children and other public places.

✧ VFDPlease use the VFD on appropriate condition (See chapter 4.2.1 "Installation environment").

✧ Do not allow screws, cables or other conductive items to fall inside the VFD.

✧ The leakage current of the VFD may be above 3.5mA during operation. Ground with proper techniques and ensure the grounding resistor 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 input terminals of the power supply, while U, V and W are the output terminals of the motor. Please connect the input power cables and motor cables with proper techniques; otherwise the damage to the VFD may occur.

1.4.2 Commissioning and running

✧ Disconnect all power supplies applied to the VFD before the terminal wiring and wait for at least the designated time on the VFD after disconnecting the power supply.

✧ High voltage is present inside the VFD during running. Do not carry out any operation except for the keypad setting.

✧ The VFD may start up by itself when P01.21=1. Do not get close to the VFD and motor.

✧ The VFD cannot be used as “Emergency-stop device”.

✧ The VFD cannot be used to break the motor suddenly. A mechanical braking device should be provided.

✧ When the PMS motor is running, except above precautions before installation and maintenance, confirm as followings:

1. All input power supplies including main power and control power are disconnected.
2. The PMS motor stops running and the voltage at the output side of the VFD is less than 36V.
3. The waiting time is not lower than the designated time on the VFD after PMS motor stops running and the voltage between + and - is less than 36V.
4. During operation, ensure it is impossible for PMS motor to run again due to external loads. Suggest installing effective external braking devices or disconnecting the electrical connection between PMS motor and the VFD.

Note:

✧ Do not switch on or off the input power supply of the VFD frequently.

✧ For VFDs that have been stored for a long time, check and fix the capacitance and try to run it again before utilization (see chapter 9 "Maintenance and hardware diagnosis").

✧ Cover the front board before running, otherwise electric shock may occur.

1.4.3 Maintenance and replacement of components

✧ Only qualified electricians are allowed to perform the maintenance, inspection, and components replacement of the VFD.

✧ Disconnect all power supplies to the VFD before the terminal wiring. Wait for at least the time designated on the VFD after disconnection.

✧ Take measures to avoid screws, cables or other conductive items to fall into the VFD during maintenance and component replacement.

Note:

- ✧ Please select proper torque to tighten screws.
- ✧ Keep the VFD and components away from combustible materials during maintenance and component replacement.
- ✧ Do not carry out any isolation and pressure test on the VFD and do not measure the control circuit of the VFD by megameter.
- ✧ Carry out a sound anti-electrostatic protection to the VFD and its internal components during maintenance and component replacement.

1.4.4 What to do after scrapping

	✧ There are heavy metals in the VFD. Deal with it as industrial effluent.
	✧ When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point instead of placing it in the normal waste stream.

2 Quick start-up

2.1 What this chapter contains

This chapter mainly describes the basic guidelines during the installation and commission procedures on the VFD, which you may follow to install and commission the VFD quickly.

2.2 Unpacking inspection

Check as followings after receiving products:

1. Check that there are no damage and humidification to the package. If not, please contact with local agents or company offices.
2. Check the information on the type designation label on the outside of the package to verify that the drive is the correct type. If not, please contact with local dealers or company offices.
3. Check that there are no signs of water in the package and no signs of damage or breach to the VFD. If not, please contact with local dealers or company offices.
4. Check the information on the type designation label on the outside of the package to verify that the name plate is the correct type. If not, please contact with local dealers or company offices.
5. Check to ensure the accessories (including user's manual, control keypad and extension card) inside the device are complete. If not, please contact with local dealers or company offices.

2.3 Application confirmation

Check the machine before beginning to use the VFD:

1. Check the load type to verify that there is no overload of the VFD during work and check that whether the drive needs to modify the power degree.
2. Check that the actual current of the motor is less than the rated current of the VFD.
3. Check that the control accuracy of the load is the same of the VFD.
4. Check that the grid voltage is consistent with the rated voltage of the VFD.
5. Check that the communication needs optional card or not.

2.4 Environment confirmation

Check as followings before the actual installation and usage:

1. Check that the ambient temperature of the VFD is below 40°C. If exceeds, derate 1% for every additional 1°C. Additionally, the VFD cannot be used if the ambient temperature is above 50°C. **Note:** For the cabinet VFD, the ambient temperature means the air temperature inside the cabinet.

2. Check that the ambient temperature of the VFD in actual usage is above -10°C. If not, add heating facilities. **Note:** For the cabinet VFD, the ambient temperature means the air temperature inside the cabinet.
3. Check that the altitude of the actual usage site is below 1000m. If exceeds, derate 1% for every additional 100m.
4. Check that the humidity of the actual usage site is below 90% and condensation is not allowed. If not, add additional protection VFDs.
5. Check that the actual usage site is away from direct sunlight and foreign objects cannot enter the VFD. If not, add additional protective measures.
6. Check that there is no conductive dust or flammable gas in the actual usage site. If not, add additional protection to VFDs.

2.5 Installation confirmation

Check as followings after the installation:

1. Check that the load range of the input power cables and motor cables meet the need of actual load.
2. Check that the accessories of the VFD are correctly and properly installed. The installation cables should meet the needs of every component (including reactors, input filters, output reactors, output filters, DC reactors, braking units and braking resistors).
3. Check that the VFD is installed on non-flammable materials and the calorific accessories (reactors and brake resistors) are away from flammable materials.
4. Check that all control cables and power cables run separately and the routing complies with EMC requirement.
5. Check that all grounding systems are properly grounded according to the requirements of the VFD.
6. Check that the free space during installation is sufficient according to the instructions in user's manual.
7. Check that the installation conforms to the instructions in user's manual. The drive must be installed in an upright position.
8. Check that the external connection terminals are tightly fastened and the torque is appropriate.
9. Check that there are no screws, cables and other conductive items left in the VFD. If not, get them out.

2.6 Basic commissioning

Complete the basic commissioning as followings before actual utilization:

1. Select the motor type, set correct motor parameters and select control mode of the VFD according to the actual motor parameters.
2. Autotuning. If possible, de-coupled from the motor load to start dynamic autotuning. Or if not, static autotuning is available.
3. Adjust the ACC/DEC time according to the actual running of the load.
4. Commission the device via jogging and check that the rotation direction is as required. If not, change the rotation direction by changing the wiring of motor.
5. Set all control parameters and then operate.

3 Product overview

3.1 What this chapter contains

The chapter briefly describes the operation principle, product characteristics, layout, name plate and type designation information.

3.2 Basic principles

Goodrive300-02 VFDs are through-the-wall mounting devices for controlling asynchronous AC induction motors and PMS motors.

The diagram below shows the simplified main circuit diagram of the VFD. The rectifier converts three-phase AC voltage to DC voltage. The capacitor bank of the intermediate circuit stabilizes the DC voltage. The converter transforms the DC voltage back to AC voltage for the AC motor. The brake pipe connects the external braking resistor to the intermediate DC circuit to consume the feedback energy when the voltage in the circuit exceeds its maximum limit.

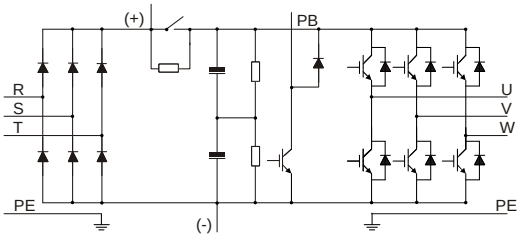


Figure 3-1 The simplified main circuit diagram (VFDs of 380V <30kW)

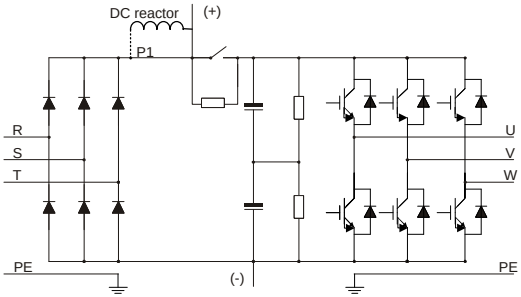


Figure 3-2 The simplified main circuit diagram (VFDs of 380V >37kW)

Note:

1. The VFDs of 380V (≥37kW) supports external DC reactors, but it is necessary to remove the copper tag between P1 and (+) before connecting. The VFDs of 380V (≥22kW) supports external braking units. DC reactors and braking units are optional.

2. The VFDs of 380V (≤18.5kW) supports external braking resistors which are optional.

3.3 Product specification

Function		Specification
Power input	Input voltage (V)	AC 3PH 380V(-15%)–440V(+10%) Rated voltage: 380V
	Input current (A)	Refer to the Rated value
	Input frequency (Hz)	50Hz or 60Hz Allowed range: 47–63Hz
Power output	Output voltage (V)	0–input voltage
	Output current (A)	Refer to the Rated value
	Output power (kW)	Refer to the Rated value
	Output frequency (Hz)	0–400Hz
Technical control feature	Control mode	SVPWM, SVC
	Motor type	Asynchronous motor, PMS motor
	Adjustable-speed ratio	Asynchronous motor 1:200 (SVC), synchronous motor 1:20 (SVC)
	Speed control accuracy	±0.2% (SVC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	<20ms (SVC)
	Torque control accuracy	10% (SVC)
	Starting torque	Asynchronous motor: 0.25Hz/150% (SVC) Synchronous motor: 2.5Hz/150% (SVC)
	Overload capability	150% of rated current: 1 minute 180% of rated current: 10 seconds 200% of rated current: 1 second
Running control feature	Frequency setting method	Digital setting, analog setting, pulse frequency setting, multi-step speed running setting, simple PLC setting, PID setting, Modbus communication setting, PROFIBUS communication setting, etc. Switch between the combination and the set channel.
	Auto-adjustment of the voltage	Keep constant voltage automatically when the grid voltage transients
	Fault protection	Provide more than 30 fault protection functions: overcurrent, overvoltage, undervoltage, overheating, phase loss and overload, etc.
	Restart after rotating speed tracking	Smooth starting of the rotating motor

Function		Specification
Peripheral interface	Terminal analog input resolution	≤ 20mV
	Terminal switch input resolution	≤ 2ms
	Analog input	2 (AI1, AI2) 0–10V/0–20mA and 1 (AI3) -10–10V
	Analog output	2 (AO1, AO2) 0–10V/0–20mA
	Digital input	8 common inputs, the Max. frequency: 1kHz, internal impedance: 3.3kΩ; 1 high-speed input, the Max. frequency: 50kHz
	Digital output	1 high-speed pulse output, the Max. frequency: 50kHz; 1 Y terminal open collector output
	Relay output	2 programmable relay outputs RO1A NO, RO1B NC, RO1C common terminal RO2A NO, RO2B NC, RO2C common terminal Contact capacity: 3A/AC250V, 1A/DC30V
Others	Mountable method	Through-the-wall (flange) mounting
	Temperature of the running environment	-10–50°C, derate above 40°C
	Average non-fault time	2 years (25°C ambient temperature)
	Protective degree	IP20
	Pollution degree	Degree 2
	Cooling	Forced air cooling (external air duct cooling, air speed>2m/s)
	Braking unit	Built-in for VFDs (≤18.5kW) Optional and external for VFDs (≥22kW)
	EMC filter	The whole series of 380V VFDs can meet the requirements of level C3 stipulated in IEC61800-3. Optional external filters: meet the requirements of level C2 stipulated in IEC61800-3.

3.4 Name plate

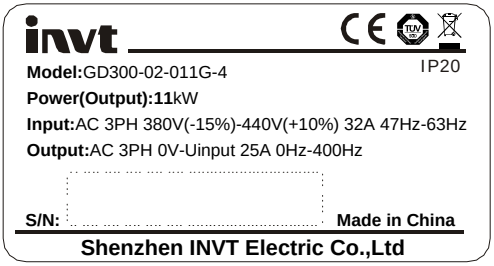


Figure 3-3 Name plate

Note: The name plate above is an example of Goodrive300-02 standard products. CE/TUV/IP20 will be identified on basis of actual certification.

3.5 Model code

The type designation contains information on the VFD. The user can find the type designation on the type designation label attached to the VFD or the simple name plate.

GD300-02-022G-4

① ② ③

Figure 3-4 Product model

Key	No.	Detailed description	Detailed content
Abbreviation	①	Product abbreviation	Goodrive300-02: through-the-wall VFD GD300-02 is short for Goodrive300-02.
Rated power	②	Power range + Load type	022: 22kW G: Constant torque load
Voltage degree	③	Voltage degree	4: AC 3PH 380V(-15%)–440V(+10%) Rated voltage: 380V

3.6 Rated value

Model	Output power (kW)	Input current (A)	Output current (A)	Carrier frequency (kHz)
GD300-02-7R5G-4	7.5	25	18.5	1–15 (8)
GD300-02-011G-4	11	32	25	1–15 (8)
GD300-02-015G-4	15	40	32	1–15 (4)
GD300-02-018G-4	18.5	47	38	1–15 (4)
GD300-02-022G-4	22	56	45	1–15 (4)
GD300-02-030G-4	30	70	60	1–15 (4)
GD300-02-037G-4	37	80	75	1–15 (4)
GD300-02-045G-4	45	94	92	1–15 (4)
GD300-02-055G-4	55	128	115	1–15 (4)

Note:

1. The input current of VFDs 7.5–55kW is detected when the input voltage is 380V and there is no DC reactors and input/output reactors.

2. The output current cannot exceed the rated output current and the output power cannot exceed the rated output power in the voltage range.

3.7 Structure diagram

Below is the layout figure of the VFD (take the VFD of 380V 18.5kW as the example).

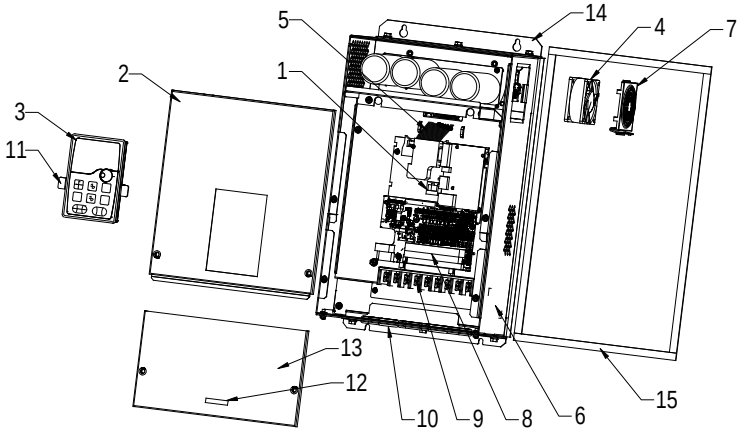


Figure 3-5 Product structure

Serial No.	Name	Illustration
1	Keypad port	Connect the keypad
2	Upper cover	Protect the internal parts and components
3	Keypad	See 5 Keypad operation procedure for detailed information
4	Cooling fan	See 9 Maintenance and hardware diagnosis for detailed information
5	Wiring port	Connect to the control board and the drive board
6	Name plate	See 3.4 Name platefor detailed information
7	Fan cover	Protect the fans
8	Control terminals	See 4 Installation guidelines for detailed information
9	Main circuit terminals	See 4 Installation guidelines for detailed information
10	Main circuit cable port	Fix the main circuit cable
11	Fixed strip of keypad	Fix the keypad
12	Simple name plate	See 3.5 Model code for detailed information
13	Lower cover	Protect the internal parts and components
14	Upper and lower mounting support	Fix the VFD
15	EPDM foaming rubber strip	Seal the VFD and belong to accessories. Users can paste it for sealing on their own.

4 Installation guidelines

4.1 What this chapter contains

The chapter describes the mechanical installation and electric installation.

	✧Only qualified electricians are allowed to carry out what described in this chapter. Please operate as the instructions in 1 "Safety precautions". Ignoring these may cause physical injury or death or damage to the devices. ✧Ensure the power supply of the VFD is disconnected during the operation. Wait for at least the time designated until the POWER indicator is off after the disconnection if the power supply is applied. It is recommended to use the multimeter to monitor that the DC bus voltage of the drive is under 36V. ✧The installation and design of the VFD should comply with the requirement of the local laws and regulations in the installation site. If the installation infringes the requirement, our company will exempt from any responsibility. Additionally, if users do not comply with the suggestions, some damage beyond the assured maintenance range may occur.

4.2 Mechanical installation

4.2.1 Installation environment

The installation environment is the safeguard for a full performance and long-term stable functions of the VFD. Check the installation environment as followings:

Environment	Conditions
Installation site	Indoor
Environment temperature	-10–+50°C If the ambient temperature of the VFD is above 40°C, derate 3% for every additional 1°C. It is not recommended to use the VFD if the ambient temperature is above 50°C. **Note:** Ensure the air speed of the radiator is above 2m/s. In order to improve the reliability of the device, do not use the VFD if the ambient temperature changes frequently. When the VFD is used in a closed space such as control cabinet, use cooling fan or air conditioner to prevent internal temperature from exceeding the temperature required. When the temperature is too low, if restart a 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 to the VFD.

Environment	Conditions
Humidity	RH<90% Condensation is not allowed. The max RH cannot exceed 60% in the environment where there are corrosive gases.
Storage temperature	-30–+60°C
Running environment condition	The installation site should meet the following requirements. ✧ Away from electromagnetic radiation sources. ✧ Away from oil mist, corrosive gases and combustible gases. ✧ 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). ✧ Away from radioactive substance and combustible objects ✧ Away from harmful gases and liquids ✧ Low salt content ✧ No direct sunlight
Altitude	<1000m If the sea level is above 1000m, please derate 1% for every additional 100m. When the installation site altitude exceeds 3000m, consult the local INVT dealer or office.
Vibration	≤5.8m/s^2(0.6g)
Installation direction	You are recommended to install the VFD vertically to ensure good heat dissipation effect.

4.2.2 Installation direction

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

The VFD must be installed in an upright position. Check the installation site according to the requirements below. Refer to chapter Appendix C "Dimension drawings" in the appendix for frame details.

4.2.3 Installation manner

Through-the-wall (flange) mounting

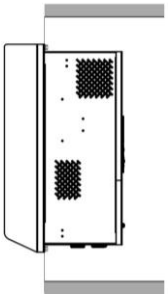


Figure 4-1 Installation manner

(1) Mark the hole location. The location of the holes is shown in the dimension drawings in the appendix.

(2) To ensure sealing without gap, paste the EPDM foaming rubber strip onto the VFD or installation board.

(3) Put the VFD through the wall.

(4) Fix the screws or bolts to the marked locations and tighten the mounting screws in the wall.

(5) External independent air duct, air speed>2m/s.

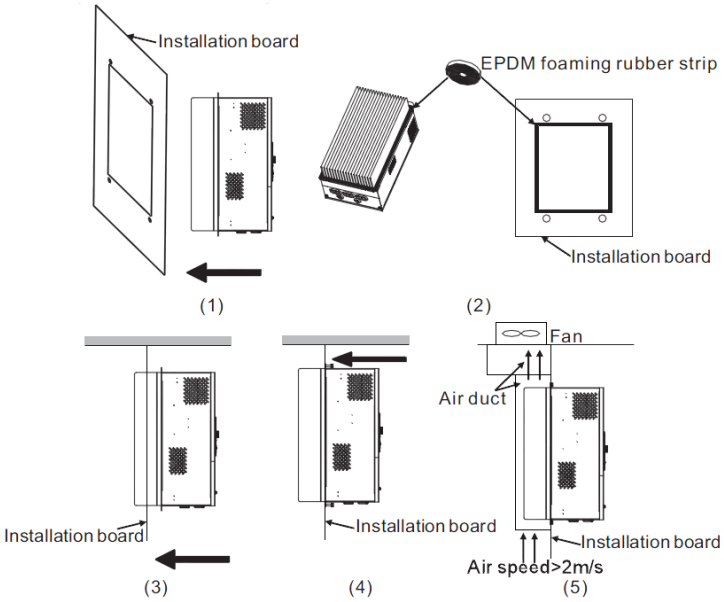


Figure 4-2 Installation diagram

4.3 Standard wiring

4.3.1 Wiring of main circuit

Wiring of main circuit for the VFDs of AC 3PH 380V(-15%)–440V(+10%)

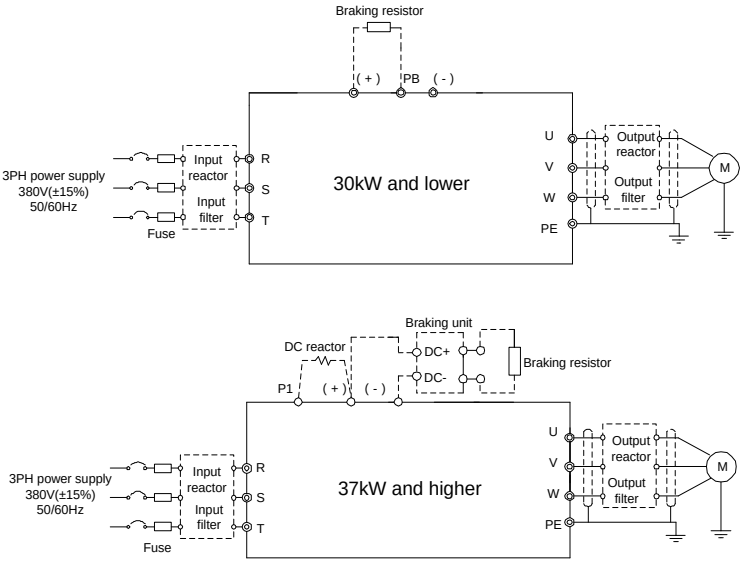


Figure 4-3 Wiring of main circuit for the VFDs of 380V

Note:

1. The fuse, DC reactor, braking unit, braking resistor, input reactor, input filter, output reactor, output filter are optional parts. Please refer to Optional peripheral accessories for detailed information.

2. P1 and (+) are short circuited in factory for the VFDs of 380V (≥37kW), if need to connect with the DC reactor, please remove the contact tag between P1 and (+).

3. Before connecting the braking resistor cable, remove the yellow labels of PB, (+), and (-) from the terminal blocks. Otherwise, poor connection may occur.

The VFDs of 22–30kW need to connect with external braking units.

4.3.2 Terminals of main circuit

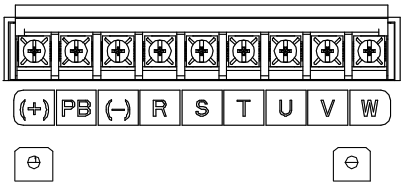


Figure 4-4 Terminals of main circuit for the VFDs of 380V 7.5–18kW

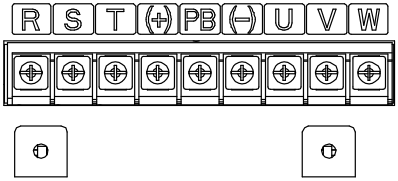


Figure 4-5 Terminals of main circuit for the VFDs of 380V 22–30kW

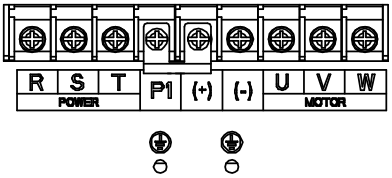


Figure 4-6 Terminals of main circuit for the VFDs of 380V 37–55kW

Terminal	Terminal name		Function
	380V ≤30kW	380V ≥37kW	
R,S,T	Power input of the main circuit		3-phase AC input terminals which are generally connected with the power supply.
U,V,W	The VFD output		3-phase AC output terminals which are generally connected with the motor.
P1	/	DC reactor terminal 1	P1 and (+) are connected with the terminals of DC reactor. (+) and (-) are connected with the terminals of braking unit. PB and (+) are connected with the terminals of braking resistor.
(+)	Braking resistor 1	DC reactor terminal 2, braking unit terminal 1	
(-)	/	Braking unit terminal 2	
PB	Braking resistor 2	/	

Terminal	Terminal name		Function
	380V ≤30kW	380V ≥37kW	
PE	Protective grounding terminal		380V: the grounding resistor is less than 10Ω, every machine is provided 2 PE terminals as the standard configuration. These terminals should be grounded reliably.

Note:

- Do not use an asymmetrically constructed motor cable. If there is a symmetrically constructed grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the VFD and motor ends.
- Braking resistor, braking unit and DC reactor are optional parts.
- Route the motor cable, input power cable and control cables separately.
- If the terminal description is "/", the machine does not provide the terminal as the external terminal.
- GD series VFDs cannot share the DC bus with CH series VFDs.
- When sharing the DC bus, the VFDs must be the same in power and must be simultaneously powered on or off.
- In shared DC bus running mode, current balance on the VFD input side must be considered during wiring, and equalizing reactors are recommended to be configured.

4.3.3 Wiring of terminals in main circuit

1. Fasten the grounding conductor of the input power cable with the grounding terminal of the VFD (PE) by 360 degree grounding technique. Connect the phase conductors to R, S and T terminals and fasten.

2. Strip the motor cable and connect the shield to the grounding terminal of the VFD by 360 degree grounding technique. Connect the phase conductors to U, V and W terminals and fasten.

3. Connect the optional brake resistor with a shielded cable to the designated position by the same procedures in the previous step.

4. Secure the cables outside the VFD mechanically.

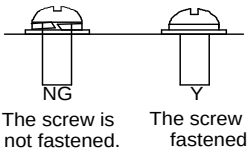


Figure 4-7 Correct installation of the screw

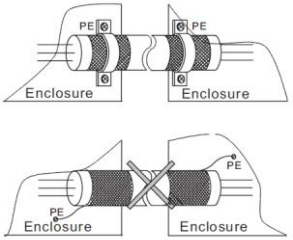


Figure 4-8 360 degree grounding technique

4.3.4 Wiring of control circuit

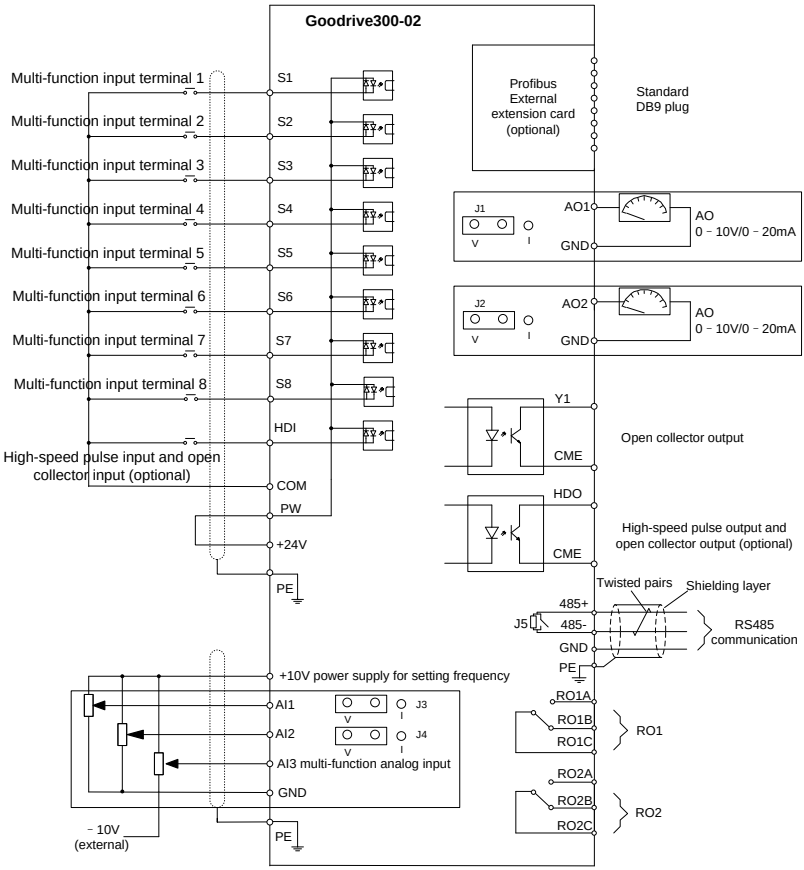


Figure 4-9 Wiring of control circuit

4.3.5 Terminals of control circuit

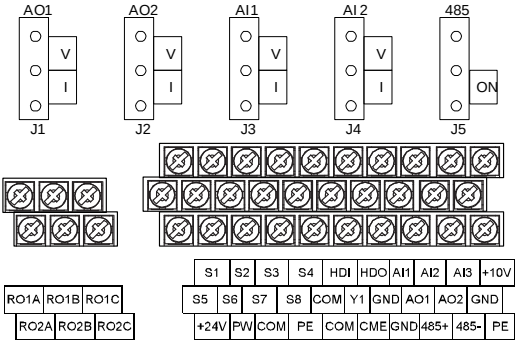
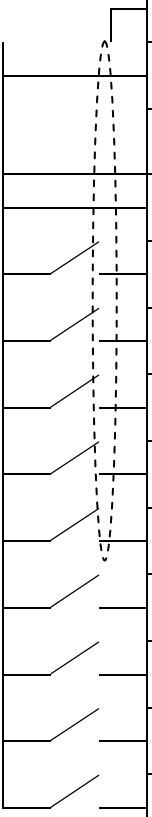


Figure 4-10 Terminals of control circuit

Terminal name	Description
RO1A	RO1 relay output, RO1A NO, RO1B NC, RO1C common terminal Contact capacity: 3A/AC250V, 1A/DC30V
RO1B	
RO1C	
RO2A	RO2 relay output, RO2A NO, RO2B NC, RO2C common terminal Contact capacity: 3A/AC250V, 1A/DC30V
RO2B	
RO2C	

Terminal name	Description
HDO	1. Switch capacity: 50mA/30V 2. Output frequency range: 0–50kHz
COM	+24V common terminal
CME	Common terminal of open collector output
Y1	1. Switch capacity: 50mA/30V 2. Output frequency range: 0–1kHz

Terminal name	Description
485+	485 communication interface and 485 differential signal interface If it is the standard 485 communication interface, please use twisted pairs or shield cable.
485-	



Terminal name	Description	
PE	Grounding terminal	
PW	Provide the input switch working power supply from external to internal. Voltage range: 12–30V	
24V	The VFD provides the power supply for users with a maximum output current of 200mA	
COM	+24V common terminal	
S1	Switch input 1	1. Internal impedance: 3.3kΩ 2. 12–30V voltage input is available 3. The terminal is the dual-direction input terminal supporting both NPN and PNP 4. Max. input frequency: 1kHz 5. All are programmable digital input terminals. User can set the terminal functions through function codes.
S2	Switch input 2	
S3	Switch input 3	
S4	Switch input 4	
S5	Switch input 5	
S6	Switch input 6	
S7	Switch input 7	
S8	Switch input 8	
HDI	Except for S1–S8, the terminal can be used as high frequency input channel. Max. input frequency: 50kHz	

Terminal name	Description
+10V	Local power supply +10V
AI1	1. Input range: AI1/AI2 voltage and current can be chosen: 0–10V/0–20mA; AI1 can be shifted by J3, AI2 can be shifted by J4. AI3: -10V–+10V 2. Input impedance: voltage input: 20kΩ, current input: 500Ω 4. Resolution: the minimum one is 5mV when 10V corresponds to 50Hz 5. Deviation±1%, 25°C
AI2	
AI3	
GND	+10V reference null potential
AO1	1. Output range: 0–10V or 0–20mA; voltage or current output is set by jumpers; AO1 can be shifted by J1, AO2 can be shifted by J2. 2. Deviation±1%, 25°C
AO2	

4.3.6 Input/output signal connection figure

Please use U-shaped contact tag to set NPN mode or PNP mode and the internal or external power supply. The default setting is NPN internal mode.

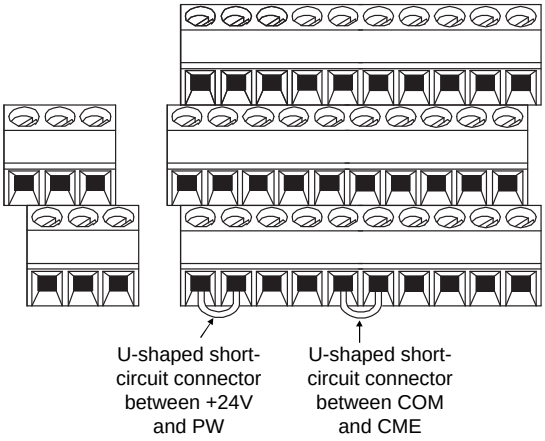


Figure 4-11 U-shaped contact tag

If the signal is from NPN transistor, please set the U-shaped contact tag between +24V and PW as below according to the used power supply.

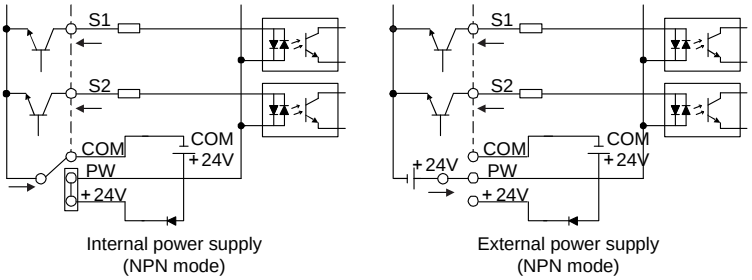


Figure 4-12 NPN modes

If the signal is from PNP transistor, please set the U-shaped contact tag as below according to the used power supply.

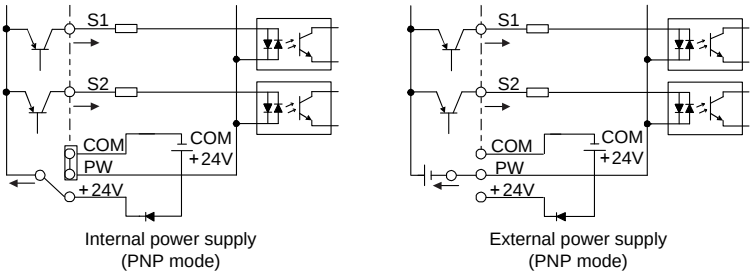


Figure 4-13 PNP modes

4.4 Layout protection

4.4.1 Protecting the VFD and input power cable in short-circuit situations

Protect the VFD and input power cable in short circuit situations and against thermal overload.

Arrange the protection according to the following guidelines.

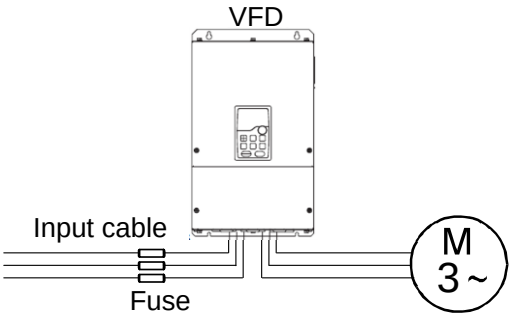


Figure 4-14 Fuse configuration

Note: Select the fuse as the manual indicated. The fuse will protect the input power cable from damage in short-circuit situations. It will protect the surrounding devices when the internal of the VFD is short circuited.

4.4.2 Protecting the motor and motor cable in short-circuit situations

The VFD protects the motor and motor cable in a short-circuit situation when the motor cable is dimensioned according to the rated current of the VFD. No additional protection devices are needed.

	If the VFD is connected to multiple motors, a separate thermal overload switch or a circuit breaker must be used for protecting each cable and motor. These devices may require a separate fuse to cut off the short-circuit current.

4.4.3 Protecting the motor against thermal overload

According to regulations, the motor must be protected against thermal overload and the current must be switched off when overload is detected. The VFD includes a motor thermal protection function that protects the motor and closes the output to switch off the current when necessary.

4.4.4 Implementing a bypass connection

It is necessary to set power frequency and variable frequency conversion circuits for the assurance of continuous normal work of the VFD if faults occur in some significant situations.

In some special situations, for example, if it is only used in soft start, the VFD can be converted into power frequency running after starting and some corresponding bypass should be added.

	Never connect the power supply to the output terminals U, V and W of the VFD. Voltage applied to the motor cable may result in permanent damage to the VFD.

If frequent shifting is required, employ mechanically connected switches or contactors to ensure that the motor terminals are not connected to the input power cable and VFD output terminals simultaneously.

5 Keypad operation procedure

5.1 What this chapter contains

This chapter contains following operation:

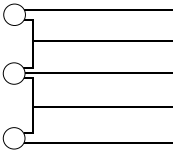
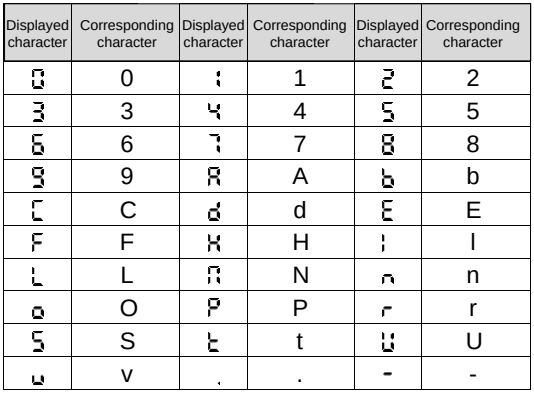
• Buttons, indicating lights and the screen as well as the methods to inspect, modify and set function codes by keypad

5.2 Keypad

The keypad is used to control Goodrive300-02 VFDs, read the state data and adjust parameters.

Figure 5-1 Keypad

No.	Name	Description	
1	State LED	RUN/TUNE	LED off means that the VFD is in the stopping state; LED blinking means the VFD is in the parameter autotune state; LED on means the VFD is in the running state.
		FWD/REV	FWD/REV LED LED off means the VFD is in the forward rotation state; LED on means the VFD is in the reverse rotation state.
		LOCAL/REMOT	LED for keypad operation, terminals operation and remote communication control LED off means that the VFD is in the keypad operation state; LED blinking means the VFD is in the terminals operation state; LED on means the VFD is in the remote communication control state.

<table>
<tr><th>No.</th><th>Name</th><th colspan="4">Description</th></tr>
<tr><td></td><td></td><td colspan="2">TRIP</td><td colspan="2">LED for faults
LED on when the VFD is in the fault state; LED off in normal state; LED blinking means the VFD is in the pre-alarm state.</td></tr>
<tr><td>2</td><td>Unit LED</td><td colspan="4">Mean the unit displayed currently
 
Hz Frequency unit
RPM Rotating speed unit
A Current unit
% Percentage
V Voltage unit</td></tr>
<tr><td>3</td><td>Code displaying zone</td><td colspan="4">5-figure LED display displays various monitoring data and alarm code such as set frequency and output frequency.
 
Displayed character / Corresponding character / Displayed character / Corresponding character / Displayed character / Corresponding character
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 . . - -</td></tr>
<tr><td>4</td><td>Digital potentio-meter</td><td colspan="4">Tuning frequency. Please refer to P08.42.</td></tr>
<tr><td>5</td><td>Buttons</td><td> 
</td><td>Programming key</td><td colspan="2">Enter or escape from the first level menu and remove the parameter quickly</td></tr>
<tr><td></td><td></td><td> 
</td><td>Entry key</td><td colspan="2">Enter the menu step-by-step
Confirm parameters</td></tr>
<tr><td></td><td></td><td>  </td><td>UP key</td><td colspan="2">Increase data or function code progressively</td></tr>
<tr><td></td><td></td><td>  </td><td>DOWN key</td><td colspan="2">Decrease data or function code progressively</td></tr>
<tr><td></td><td></td><td> 
</td><td>Right-shift key</td><td colspan="2">Move right to select the displaying parameter circularly in stopping and running mode.
Select the parameter modifying digit during the parameter modification</td></tr>
</table>

No.	Name	Description		
			Run key	This key is used to operate 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 P07.04 This key is used to reset all control modes in the fault alarm state
			Quick key	The function of this key is confirmed by function code P07.02.

5.3 Keypad displaying

The keypad displaying state of Goodrive300-02 series VFDs is divided into stopping state parameter, running state parameter, function code parameter editing state and fault alarm state and so on.

5.3.1 Displayed state of stopping parameter

When the VFD is in the stopping state, the keypad will display stopping parameters which is shown in figure 5-2.

In the stopping state, various kinds of parameters can be displayed. Select the parameters to be displayed or not by P07.07. See the instructions of P07.07 for the detailed definition of each bit.

In the stopping state, there are 14 stopping parameters can be selected to be displayed or not. They are: set frequency, bus voltage, input terminals state, output terminals state, PID reference, PID feedback, torque set value, AI1, AI2, AI3, HDI, PLC and the current step of multi-step speed, pulse count value, length value. P07.07 can select the parameter to be displayed or not by bit and 》/SHIFT can shift the parameters from left to right, QUICK/JOG (P07.02=2) can shift the parameters from right to left.

5.3.2 Displayed state of running parameters

After the VFD receives valid running commands, the VFD will enter into the running state and the keypad will display the running parameters. RUN/TUNE LED on the keypad is on, while the FWD/REV is determined by the current running direction which is shown as Figure 5-2.

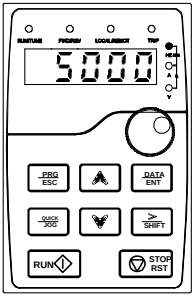
In the running state, there are 24 parameters can be selected to be displayed or not. They are: running frequency, set frequency, bus voltage, output voltage, output current, running rotating speed, output power, output torque, PID reference, PID feedback, input terminals state, output terminals state, torque set value, length value, PLC and the current step of multi-step speed, AI1, AI2, AI3, HDI, percentage of motor overload, percentage of VFD overload, ramp reference value, linear speed, AC input current. P07.05 and P07.06 can select the parameter to be displayed or not by bit and 》/SHIFT can shift the parameters from left to right, QUICK/JOG (P07.02=2) can shift the parameters from right to left.

5.3.3 Displayed state of fault

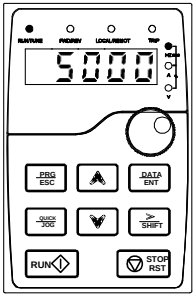
If the VFD detects the fault signal, it will enter into the fault alarm displaying state. The keypad will display the fault code by flickering. The TRIP LED on the keypad is on, and the fault reset can be operated by the STOP/RST on the keypad, control terminals or communication commands.

5.3.4 Displayed state of function codes editing

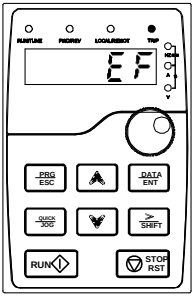
In the state of stopping, running or fault, press PRG/ESC to enter into the editing state (if there is a password, see P07.00).The editing state is displayed on two classes of menu, and the order is: function code group/function code number→function code parameter, press DATA/ENT into the displayed state of function parameter. On this state, you can press DATA/ENT to save the parameters or press PRG/ESC to retreat.



Stop parameters display



Running parameters display



Fault display

Figure 5-2 Displayed state

5.4 Keypad operation

Operate the VFD via operation panel. See the detailed structure description of function codes in the brief diagram of function codes.

5.4.1 How to modify the function codes of the VFD

The VFD has the menu of three levels, 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)

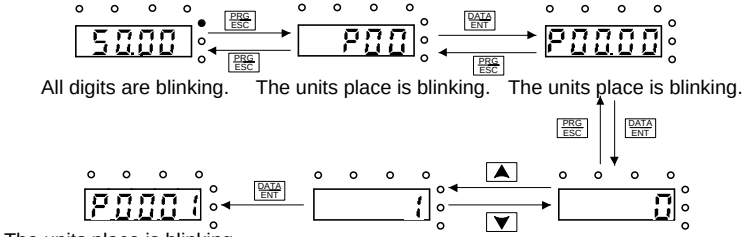
Remarks: Press both the PRG/ESC and the DATA/ENT can return to the second-level menu from the third-level menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-level menu with shifting to the next function code automatically; while pressing PRG/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 P00.01 from 0 to 1.



Note: When setting the value, you can press SHIFT and ▲+▼ to modify the value.

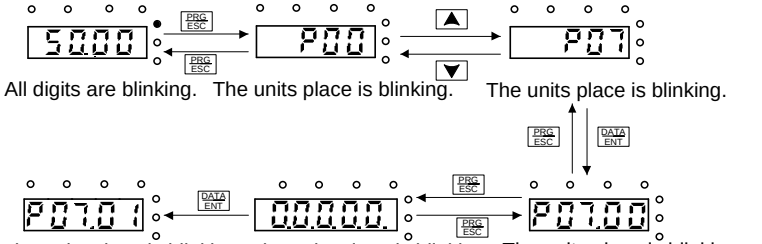
Figure 5-3 Sketch map of modifying parameters

5.4.2 How to set the password of the VFD

Goodrive300-02 series VFDs provide password protection function to users. Set P07.00 to gain the password and the password protection becomes valid instantly after quitting from the function code editing state. Press PRG/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 P07.00 to 0 to cancel password protection function.

The password protection becomes effective instantly after retreating from the function code editing state. Press PRG/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.

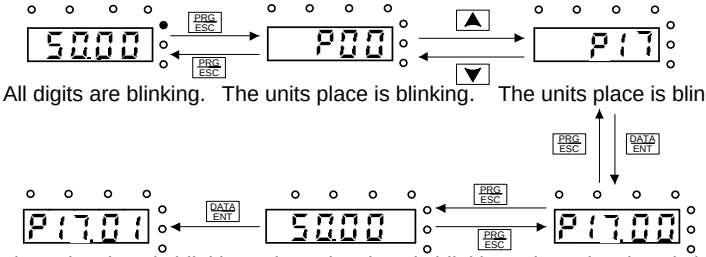


Note: When setting the value, you can press SHIFT and ▲+▼ to modify the value.

Figure 5-4 Sketch map of password setting

5.4.3 How to watch the VFD state through function codes

Goodrive300-02 series VFDs provide group P17 as the state inspection group. Users can enter into P17 directly to watch the state.



Note: When setting the value, you can press SHIFT and ▲ + ▼ to modify the value.

Figure 5-5 Sketch map of state watching

6 Function parameters

6.1 What this chapter contains

This chapter lists and describes the function parameters.

6.2 List of function parameters

The function parameters of Goodrive300-02 VFDs have been divided into 30 groups (P00–P29) according to the function, of which P18–P28 are reserved. Each function group contains certain function codes applying 3-level menus. For example, “P08.08” means the eighth function code in the P8 group function, P29 group is factory reserved, and users are forbidden to access these parameters.

For the convenience of function codes setting, the function group number corresponds to the first level menu, the function code corresponds to the second level menu and the function code corresponds to the third level menu.

1. Below is the instruction of the function lists:

The first line “Function code”: codes of function parameter group and parameters;

The second line “Name”: full name of function parameters;

The third line “Description”: detailed instruction of the function parameters;

The fourth line “Default value”: the original factory values of the function parameter;

The fifth line “Modify”: the modifying character of function codes (the parameters can be modified or not and the modifying conditions), below is the instruction:

“○”: means the set value of the parameter can be modified on stop and running state;

“◎”: means the set value of the parameter cannot be modified on the running state;

“●”: means the value of the parameter is the real detection value which cannot be modified.

(The VFD has limited the automatic inspection of the modifying character of the parameters to help users avoid mismodifying)

2. “Parameter radix” is decimal (DEC), if the parameter is expressed by hex, then the parameter is separated from each other when editing. The setting range of certain bits are 0–F (hex).

3. “Default value” means the function parameter will restore to the default value during default parameters restoring. But the detected parameter or recorded value will not be restored.

4. For a better parameter protection, the VFD provides password protection to the parameters. After setting the password (set P07.00 to any non-zero number), the system will come into the state of password verification firstly after the user press PRG/ESC to come into the function code editing state. And then “0.0.0.0.0.” will be displayed. Unless the user input right password, they cannot enter into the system. For the factory setting parameter zone, it needs correct factory password (remind that the

users cannot modify the factory parameters by themselves, otherwise, if the parameter setting is incorrect, damage to the VFD may occur). If the password protection is unlocked, the user can modify the password freely and the VFD will work as the last setting one. When P07.00 is set to 0, the password can be canceled. If P07.00 is not 0 during powering on, then the parameter is protected by the password. When modify the parameters by serial communication, the function of the password follows the above rules, too.

P00 Group—Basic function group

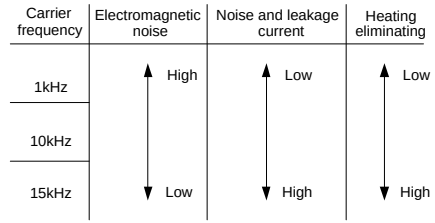
Function code	Name	Description	Default value	Modify
P00.00	Speed control mode	0: Sensorless vector control mode(SVC) 0 (apply to AM, SM) No need to install encoders. It is suitable in cases with low-frequency large torque and high speed control accuracy for accurate speed and torque control at medium and small power. 1: SVC 1 (apply to AM) No need to install encoders. It is suitable in cases with high speed control accuracy for accurate speed and torque control at all power ratings. 2: SVPWM control mode No need to install encoders. It can improve the control accuracy with the advantages of stable operation, valid low-frequency torque boost and current vibration suppression and the functions of slip compensation and voltage adjustment. **Note:** AM-asynchronous motor SM-synchronous motor Motor parameter autotuning must be performed on the VFD first when the vector mode is used.	1	◎
P00.01	Running command channel	Select the running command channel of the VFD. The control command of the VFD includes: start-up, stop, forward, reverse, jogging and fault reset. 0: Keypad running command channel (“LOCAL/REMOT” light off) Carry out the command control by RUN, STOP/RST on the keypad. Set the multi-function key QUICK/JOG to FWD/REV shifting function (P07.02=3) to change the running direction; press RUN and STOP/RST	0	○

Function code	Name	Description	Default value	Modify
		simultaneously in running state to make the VFD coast to stop. 1: Terminal running command channel ("LOCAL/REMOT" flickering) Carry out the running command control by the forward rotation, reverse rotation and forward jogging and reverse jogging of the multi-function terminals 2: Communication running command channel ("LOCAL/REMOT" on); The running command is controlled by the upper computer via communication.		
P00.02	Communication running commands	Select the controlling communication command channel of the VFD. 0: Modbus communication channel 1: PROFIBUS/CANopen communication channel 2: Ethernet communication channel 3: Reserved **Note:** 1, 2 and 3 are extension functions which need corresponding extension cards.	0	○
P00.03	Max. output frequency	This parameter is used to set the maximum output frequency of the VFD. Users should pay attention to this parameter because it is the foundation of the frequency setting and the speed of acceleration and deceleration. Setting range: P00.04–400.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	The upper limit of running frequency is the upper limit of output frequency of the VFD which is lower than or equal to the maximum frequency. Setting range: P00.05–P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of running frequency	The lower limit of running frequency is that of output frequency of the VFD. The VFD runs at the lower limit frequency if the set frequency is lower than the lower limit one. **Note:** Max. output frequency ≥ Upper limit frequency ≥ Lower limit frequency	0.00Hz	◎

Function code	Name	Description	Default value	Modify
		Setting range: 0.00Hz–P00.04 (Upper limit of running frequency)		
P00.06	A frequency command	**Note:** Frequency A and frequency B cannot use the same frequency setting mode. The frequency source can be set by P00.09. 0:Keypad Modify the value P00.10 (set the frequency by keypad) to modify the frequency by the keypad. 1: AI1 2: AI2 3: AI3 Set the frequency by analog input terminals. Goodrive300-02 series VFDs provide 3 analog input terminals as the standard configuration, of which AI1/AI2 are the voltage/current option (0–10V/0–20mA) which can be shifted by jumpers; while AI3 is voltage input (-10V–+10V). **Note:** When analog AI1/AI2 select 0–20mA input, the corresponding voltage of 20mA is 10V. 100.0% of the analog input setting corresponds to the maximum frequency (P00.03) in forward direction and -100.0% corresponds to the maximum frequency in reverse direction (P00.03) 4: High-speed pulse HDI setting The frequency is set by high-speed pulse terminals. Goodrive300-02 series VFDs provide 1 high speed pulse input as the standard configuration. The pulse frequency range is 0.0–50.00kHz. 100.0% of the high-speed pulse input setting corresponds to the maximum frequency in forward direction (P00.03) and -100.0% corresponds to the maximum frequency in reverse direction (P00.03). **Note:** The pulse setting can only be input by multi-function terminals HDI. Set P05.00 (HDI input selection) to high speed pulse input, and set P05.49 (HDI high speed pulse input function selection) to frequency setting input. 5: Simple PLC program setting	0	○
P00.07	B frequency command		2	○

Function code	Name	Description	Default value	Modify
		The VFD runs at simple PLC program mode when P00.06=5 or P00.07=5. Set P10 (simple PLC and multi-step speed control) to select the running frequency, running direction, ACC/DEC time and the keeping time of corresponding stage. See the function description of P10 for detailed information. 6: Multi-step speed running setting The VFD runs at multi-step speed mode when P00.06=6 or P00.07=6. Set P05 to select the current running stage, and set P10 to select the current running frequency. The multi-step speed has the priority when P00.06 or P00.07 does not equal to 6, but the setting stage can only be the 1–15 stage. The setting stage is 0–15 if P00.06 or P00.07 equals to 6. 7: PID control setting The running mode of the VFD is process PID control when P00.06=7 or P00.07=7. It is necessary to set P09. The running frequency of the VFD is the value after PID effect. See P09 for the detailed information of the reference source, reference value, feedback source of PID. 8: Modbus communication setting The frequency is set by Modbus communication. See P14 for detailed information. 9: PROFIBUS/CANopen communication setting The frequency is set by PROFIBUS/CANopen communication. See P15 for the detailed information. 10: Ethernet communication setting The frequency is set by Ethernet communication. See P16 for the detailed information. 11:Reserved		
P00.08	B frequency command reference	0: Maximum output frequency, 100% of B frequency setting corresponds to the maximum output frequency 1: A frequency command, 100% of B frequency setting corresponds to the maximum output	0	○

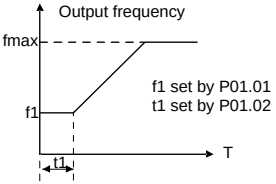
Function code	Name	Description	Default value	Modify
		frequency. Select this setting if it needs to adjust on the base of A frequency command.		
P00.09	Combination of setting source	0: A, the current frequency setting is A frequency command 1: B, the current frequency setting is B frequency command 2: A+B, the current frequency setting is A frequency command + B frequency command 3: A-B, the current frequency setting is A frequency command - B frequency command 4: Max (A, B): The bigger one between A frequency command and B frequency is the set frequency. 5: Min (A, B): The lower one between A frequency command and B frequency is the set frequency. **Note:** The combination manner can be shifted by P5 (terminal function)	0	○
P00.10	Keypad set frequency	When A and B frequency commands are selected as “keypad setting”, the value of the function code is the original setting one of the frequency data of the VFD. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P00.11	ACC time 1	ACC time means the time needed if the VFD speeds up from 0Hz to the Max. One (P00.03). DEC time means the time needed if the VFD speeds down from the Max. Output frequency (P00.03) to 0Hz. Goodrive300-02 series VFDs define four groups of ACC/DEC time which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group. Setting range of P00.11 and P00.12: 0.0–3600.0s	Depend on model	○
P00.12	DEC time 1		Depend on model	○
P00.13	Running direction	0: Runs at the default direction, the VFD runs in the forward direction. FWD/REV indicator is off. 1: Runs at the reverse direction, the VFD runs in the reverse direction. FWD/REV indicator is on. Modify the function code to shift the rotation	0	○

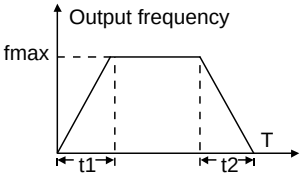
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>direction of the motor. This effect equals to the shifting the rotation direction by adjusting either two of the motor lines (U, V and W). The motor rotation direction can be changed by QUICK/JOG on the keypad. Refer to parameter P07.02.
Note: When the function parameter restores to the default value, the motor’s running direction will restore to the factory default state, too. In some cases it should be used with caution after commissioning if the change of rotation direction is disabled.
2: Forbid to run in reverse direction: It can be used in some special cases if the reverse running is disabled.</td><td></td><td></td></tr>
<tr><td>P00.14</td><td>Carrier frequency setting</td><td> 

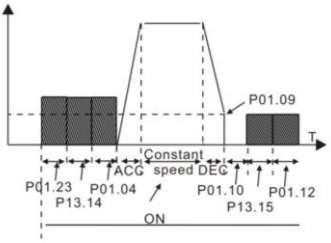
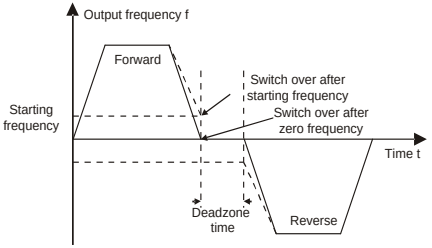
The relationship table of the motor type and carrier frequency:
<table>
<tr><th colspan="2">Model</th><th>The factory value of carrier frequency</th></tr>
<tr><td rowspan="3">380V</td><td>1.5–11kW</td><td>8kHz</td></tr>
<tr><td>15–55kW</td><td>4kHz</td></tr>
<tr><td>Above 75kW</td><td>2kHz</td></tr>
<tr><td rowspan="3">500V</td><td>4–11kW</td><td>8kHz</td></tr>
<tr><td>15–55kW</td><td>4kHz</td></tr>
<tr><td>75kW</td><td>2kHz</td></tr>
<tr><td rowspan="2">660V</td><td>22–55kW</td><td>4kHz</td></tr>
<tr><td>75kW</td><td>2kHz</td></tr>
</table>
The advantage of high carrier frequency: ideal current waveform, little current harmonic and motor noise.
The disadvantage of high carrier frequency: increasing switch loss, increasing VFD temperature</td><td>Depend on model</td><td>○</td></tr>
</table>

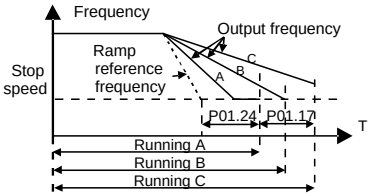
Function code	Name	Description	Default value	Modify
		and the impact to the output capacity. The VFD needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase. Applying low carrier frequency is contrary to the above, too low carrier frequency will cause unstable running, torque decreasing and surge. The manufacturer has set a reasonable carrier frequency when the VFD is in factory. In general, users do not need to change the parameter. When the used frequency exceeds the default carrier frequency, the VFD needs to derate 10% for each additional 1k carrier frequency. Setting range: 1.0–15.0kHz		
P00.15	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 (autotune totally); It is suitable in the cases when the motor cannot de-couple from the load. 3: Static autotuning 2 (autotune partially); when the current motor is motor 1, autotune P02.06, P02.07, P02.08; and when the current motor is motor 2, autotune P12.06, P12.07, P12.08.	0	◎
P00.16	AVR function selection	0: Invalid 1: Valid during the whole procedure The auto-adjusting function of the VFD can cancel the impact on the output voltage of the VFD because of the bus voltage fluctuation.	1	○
P00.17	Reserved			
P00.18	Function restore parameter	0: No operation 1: Restore the default value 2: Cancel the fault record **Note:** The function code will restore to 0 after finishing the operation of the selected function code. Restoring to the default value will cancel the user password, please use this function with caution.	0	◎

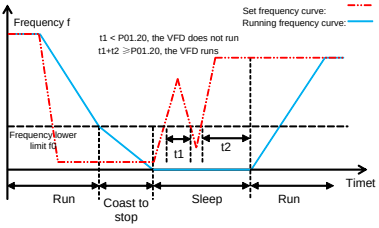
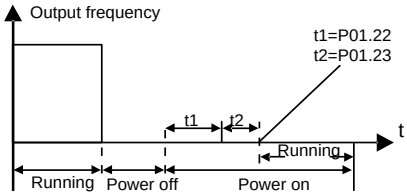
P01 Group—Start-up and stop control

Function code	Name	Detailed description	Default value	Modify
P01.00	Start mode	0: Start-up directly: start from the starting frequency P01.01. 1: Start-up after DC braking: start the motor from the starting frequency after DC braking (set the parameter P01.03 and P01.04). It is suitable in the cases where reverse rotation may occur to the low inertia load during starting. 2: Start-up after speed tracing: start the rotating motor smoothly after tracking the rotation speed and direction automatically. It is suitable in the cases where reverse rotation may occur to the big inertia load during starting. **Note:** ≥4kW, the function is available.	0	◎
P01.01	Starting frequency of direct start	Starting frequency of direct start-up means the original frequency during the VFD starting. See P01.02 for detailed information. Setting range: 0.00–50.00Hz	0.50Hz	◎
P01.02	Retention time of starting frequency	Set a proper starting frequency to increase the torque of the VFD during starting. During the retention time of starting frequency, the output frequency of the VFD is the starting frequency. And then, the VFD will run from the starting frequency to the set frequency. If the set frequency is lower than the starting frequency, the VFD will stop running and keep in the stand-by state. The starting frequency is not limited in the lower limit frequency.  Setting range: 0.0–50.0s	0.0s	◎
P01.03	The braking current before starting	The VFD will carry out DC braking at the braking current set before starting and it will speed up after the DC braking time. If the DC braking time is set to	0.0%	◎

Function code	Name	Detailed description	Default value	Modify
P01.04	The braking time before starting	0, the DC braking is invalid. The stronger the braking current, the bigger the braking power. The DC braking current before starting means the percentage of the rated output current of the VFD. The setting range of P01.03: 0.0–100.0% The setting range of P01.04: 0.00–50.00s	0.00s	◎
P01.05	ACC/DEC selection	The changing mode of the frequency during start-up and running. 0: Linear type The output frequency increases or decreases linearly.  1: Reserved	0	◎
P01.06	Reserved			
P01.07	Reserved			
P01.08	Stop mode	0: Decelerate to stop: after the stop command becomes valid, the VFD decelerates to decrease the output frequency during the set time. When the frequency decreases to stopping speed (P01.15), the VFD stops. 1: Coast to stop: after the stop command becomes valid, the VFD ceases the output immediately. And the load coasts to stop at the mechanical inertia.	0	○
P01.09	Starting frequency of DC braking	The starting frequency of stop braking: the VFD will carry on stop DC braking when the frequency arrives during the procedure of decelerating to stop.	0.00Hz	○
P01.10	Waiting time of DC braking	The waiting time of stop braking: before the stop DC braking, the VFD will close output and begin to carry on the DC braking after the waiting time. This function is used to avoid the overcurrent fault caused by DC braking when the speed is too high.	0.00s	○
P01.11	DC braking current	Stop DC braking current: the DC brake added. The	0.0%	○
P01.12	DC braking time		0.00s	○

Function code	Name	Detailed description	Default value	Modify
		stronger the current, the bigger the DC braking effect. The braking time of stop braking: the retention time of DC brake. If the time is 0, the DC brake is invalid. The VFD will stop at the set deceleration time.  Setting range of P01.09: 0.00Hz–P00.03 Setting range of P01.10: 0.00–50.00s Setting range of P01.11: 0.0–100.0% (corresponding to the rated output current of the VFD) Setting range of P01.12: 0.00–50.00s		
P01.13	Dead time of FWD/REV rotation	During the procedure of switching FWD/REV rotation, set the threshold by P01.14, which is as the table below:  Setting range: 0.0–3600.0s	0.0s	○
P01.14	Shifting between FWD/REV rotation	Set the threshold point of the VFD: 0: Switch after zero frequency 1: Switch after the starting frequency 2: Switch after the speed reaches P01.15 and delays for P01.24	0	◎
P01.15	Stopping speed	0.00–100.00Hz	0.50Hz	◎

Function code	Name	Detailed description	Default value	Modify
P01.16	Detection of stopping speed	0: Detect according to speed setting (no stopping delay) 1: Detect according to speed feedback (only valid for vector control)	1	◎
P01.17	Detection time of feedback speed	If set P01.16 to 1, the feedback frequency is less than or equal to P01.15 and detect in the set time of P01.17, the VFD will stop; otherwise, the VFD will stop after the set time of P01.17.  Setting range: 0.00–100.00s (only valid when P01.16=1)	0. 50s	◎
P01.18	Terminal running protection when powering on	When the running commands are controlled by the terminal, the system will detect the state of the running terminal during powering on. 0: The terminal running command is invalid when powering on. Even the running command is detected to be valid during powering on, the VFD will not run and the system keeps in the protection state until the running command is canceled and enabled again. 1: The terminal running command is valid when powering on. If the running command is detected to be valid during powering on, the system will start the VFD automatically after the initialization. **Note:** This function should be selected with cautions, or serious result may follow.	0	○
P01.19	Action if running frequency< lower limit frequency (valid>0)	This function code determines the running state of the VFD when the set frequency is lower than the lower-limit one. 0: Run at the lower-limit frequency 1: Stop 2: Hibernation	0	◎

Function code	Name	Detailed description	Default value	Modify
		The VFD will coast to stop when the set frequency is lower than the lower-limit one. If the set frequency is above the lower limit one again and it lasts for the time set by P01.20, the VFD will restore to the running state automatically.		
P01.20	Hibernation restore delay time	This function code determines the hibernation delay time. When the running frequency of the VFD is lower than the lower limit one, the VFD will pause to stand by. When the set frequency is above the lower limit one again and it lasts for the time set by P01.20, the VFD will run automatically. **Note:** The time is the total value when the set frequency is above the lower limit one.  Setting range: 0.0–3600.0s (valid when P01.19=2)	0.0s	○
P01.21	Restart after power off	This function can enable the VFD to start or not after power off and then power on. 0: Disable 1: Enable, if the starting need is met, the VFD will run automatically after waiting for the time defined by P01.22.	0	○
P01.22	The waiting time of restart after power off	The function determines the waiting time before the automatic running of the VFD when powering off and then powering on.  Setting range: 0.0–3600.0s (valid when P01.21=1)	1.0s	○

Function code	Name	Detailed description	Default value	Modify
P01.23	Start delay time	The function determines the brake release after the running command is given, and the VFD is in a stand-by state and waits for the delay time set by P01.23. Setting range: 0.0–60.0s	0.0s	○
P01.24	Delay time of stop speed	Setting range: 0.0–100.0s	0.0s	○
P01.25	0Hz output selection	Select the output mode at 0Hz. 0: Output without voltage 1: Output with voltage 2: Output at DC braking current at stopping	0	○

P02 Group—Motor 1

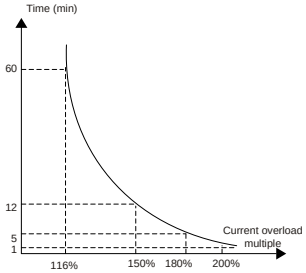
Function code	Name	Detailed description		Default value	Modify
P02.00	Motor type 1	0: Asynchronous motor 1: Synchronous motor **Note:** Switch the current motor by the switching channel of P08.31.	0	◎	Motor type 1
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Set the parameters of the controlled asynchronous motor. To ensure control performance, set P02.01– P02.05 correctly according to AM name plate. Goodrive300-02 VFDs provide parameter autotuning function. Accurate parameter autotuning results from correct parameters setting. To ensure control performance, configure the motor according to standard adaptive motor. If the motor power and standard adaptive motor have a great gap, control performance will	Depend on model	◎
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P02.03	Rated speed of asynchronous motor 1	1–36000rpm		Depend on model	◎
P02.04	Rated voltage of asynchronous motor 1	0–1200V		Depend on model	◎
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A		Depend on model	◎

Function code	Name	Detailed description		Default value	Modify
			decrease obviously. **Note:** Resetting P02.01 can initialize P02.02–P02.10.		
P02.06	Stator resistor of asynchronous motor 1	0.001–65.535Ω	After completing parameters autotuning, P02.06–P02.10 will update automatically. As the basic parameters of high performance vector control, the parameters have a direct impact on control performance. **Note:** Users cannot modify the parameters freely.	Depend on model	○
P02.07	Rotor resistor of asynchronous motor 1	0.001–65.535Ω		Depend on model	○
P02.08	Leakage inductance of asynchronous motor 1	0.1–6553.5mH		Depend on model	○
P02.09	Mutual inductance of asynchronous motor 1	0.1–6553.5mH		Depend on model	○
P02.10	Non-load current of asynchronous motor 1	0.1–6553.5A		Depend on model	○
P02.11	Magnetic saturation coefficient 1 for the iron core of AM1	0.0–100.0%		80.0%	◎
P02.12	Magnetic saturation coefficient 2 for the iron core of AM1	0.0–100.0%		68.0%	◎
P02.13	Magnetic saturation coefficient 3 for the iron core of AM1	0.0–100.0%		57.0%	◎
P02.14	Magnetic saturation coefficient 4 for the iron core of AM1	0.0–100.0%		40.0%	◎

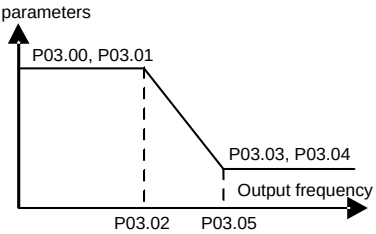
Function code	Name	Detailed description		Default value	Modify
P02.15	Rated power of synchronous motor 1	0.1–3000.0kW	Set the parameters of the controlled synchronous motor. To ensure control performance, set P02.15–P02.19 correctly according to SM name plate. Goodrive300-02 VFDs provide parameter autotuning function. Accurate parameter autotuning results from correct parameters setting. To ensure control performance, configure the motor according to standard adaptive motor. If the motor power and standard adaptive motor have a great gap, control performance will decrease obviously. **Note:** Resetting P02.15 can initialize P02.16–P02.19.	Depend on model	◎
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P02.17	Number of poles pairs for synchronous motor 1	1–50		2	◎
P02.18	Rated voltage of synchronous motor 1	0–1200V		Depend on model	◎
P02.19	Rated current of synchronous motor 1	0.8–6000.0A		Depend on model	◎
P02.20	Stator resistor of synchronous motor 1	0.001–65.535Ω	After completing parameters autotuning, P02.20–P02.22 will update automatically. As the basic parameters of high performance vector control, the parameters have a direct impact on control performance. When P00.15=1, P02.23	Depend on model	○
P02.21	Direct axis inductance of synchronous motor 1	0.01–655.35mH		Depend on model	○
P02.22	Quadrature axis inductance of synchronous motor 1	0.01–655.35mH		Depend on model	○

Function code	Name	Detailed description		Default value	Modify
P02.23	Back EMF constant of synchronous motor 1	When P00.15=2, the set value of P02.23 cannot be updated by autotuning, please count according to the following method. The counter-electromotive force constant can be counted according to the parameters on the name plate of the motor. There are three ways to count: 1. If the name plate designates the counter-electromotive force constant Ke, then: $E=(Ke*n_N*2\pi)/60$ 2. If the name plate designates the counter-electromotive force constant E'(V/1000r/min), then: $E=E'*n_N/1000$ 3. If the name plate does not designate the above parameters, then: $E=P/\sqrt{3}*I$ In the above formulas: n_N is the rated rotation speed, P is the rated power and I is the rated current. Setting range: 0–10000	will be updated by autotuning and it does not need modification; When P00.15=2, P02.23 cannot be updated by autotuning, so count P02.23 and update the value by manual.	300	○

Function code	Name	Detailed description	Default value	Modify
P02.24	Initial pole position of synchronous motor 1 (reserved)	0x0000–0xFFFF	0	●
P02.25	Identification current of synchronous motor 1 (reserved)	0%–50% (rated current of the motor)	10%	●
P02.26	Motor 1 overload protection	0: No protection 1: Common motor (with low speed compensation). Because the heat-releasing effect of the common motors will be weakened, the corresponding electric heat protection will be adjusted properly. The low speed compensation characteristic mentioned here means reducing the threshold of the overload protection of the motor whose running frequency is below 30Hz. 2: Variable frequency motor (without low speed compensation) Because the heat-releasing effect of the specific motors will not be impacted by the rotation speed, it is not necessary to adjust the protection value during low-speed running.	2	◎
P02.27	Motor 1 overload protection coefficient	Times of motor overload M= Iout/(In*K) In is the rated current of the motor, Iout is the output current of the VFD and K is the motor overload protection coefficient. So, the bigger the value of K is, the smaller the value of M is. When M=116%, protection is performed after motor overload lasts for 1 hour; when M=150%, protection is performed after motor overload lasts for 12 minutes; when M=180%, protection is performed after motor overload lasts for 5 minutes; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M≥400%, protection is performed immediately.	100.0%	○

Function code	Name	Detailed description	Default value	Modify
		 Setting range: 20.0%–120.0%		
P02.28	Correction coefficient of motor 1 power	Correct the power displaying of motor 1. Only impact the displaying value other than the control performance of the VFD. Setting range: 0.00–3.00	1.00	○
P02.29	Parameter display of motor 1	0: Display according to the motor type 1: Display all	0	○

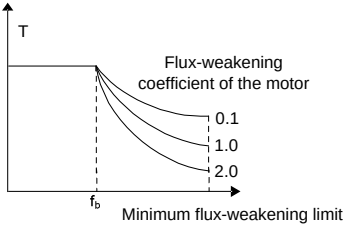
P03 Group—Vector control

Function code	Name	Detailed description	Default value	Modify
P03.00	Speed loop proportional gain1	The parameters P03.00–P03.05 only apply to vector control mode. Below the switching frequency 1 (P03.02), the speed loop PI parameters are: P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed loop PI parameters are: P03.03 and P03.04. PI parameters are gained according to the linear change of two groups of parameters. It is shown as below:  Setting the proportional coefficient and integral time	20.0	○
P03.01	Speed loop integral time1		0.200s	○
P03.02	Low switching frequency		5.00Hz	○
P03.03	Speed loop proportional gain 2		20.0	○
P03.04	Speed loop integral time 2		0.200s	○
P03.05	High switching frequency		10.00Hz	○

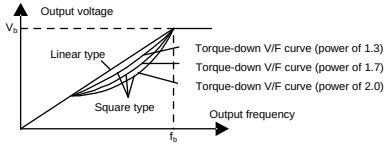
Function code	Name	Detailed description	Default value	Modify
		of the adjustor can change the dynamic response performance of vector control speed loop. Increasing the proportional gain and decreasing the integral time can speed up the dynamic response of the speed loop. But too high proportional gain and too low integral time may cause system vibration and overshoot. Too low proportional gain may cause system vibration and speed static deviation. PI has a close relationship with the inertia of the system. Adjust on the base of PI according to different loads to meet various demands. The setting range of P03.00: 0–200.0 The setting range of P03.01: 0.000–10.000s The setting range of P03.02: 0.00Hz–P03.05 The setting range of P03.03: 0–200.0 The setting range of P03.04: 0.000–10.000s The setting range of P03.05: P03.02–P00.03 (Max. output frequency)		
P03.06	Speed loop output filter	0–8 (corresponding to 0–2^8/10ms)	0	○
P03.07	Compensation coefficient of electromotion slip	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 static error. Setting range: 50%–200%	100%	○
P03.08	Compensation coefficient of braking slip		100%	○
P03.09	Current loop proportional coefficient P	**Note:** 1. These two parameters adjust the PI adjustment parameter of the current loop which affects the dynamic response speed and control accuracy directly. Generally, users do not need to change the default value. 2. Only apply to the sensorless vector control mode 0 (P00.00=0). Setting range: 0–65535	1000	○
P03.10	Current loop integral coefficient I		1000	○

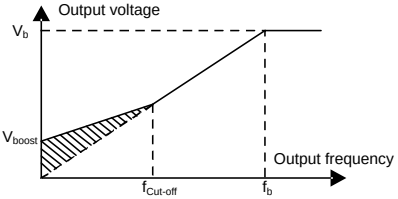
Function code	Name	Detailed description	Default value	Modify
P03.11	Torque setting method	This parameter is used to enable the torque control mode, and set the torque. 0: Torque control is invalid 1: Keypad setting torque (P03.12) 2: Analog AI1 setting torque 3: Analog AI2 setting torque 4: Analog AI3 setting torque 5: Pulse frequency HDI setting torque 6: Multi-step torque setting 7: Modbus communication setting torque 8: PROFIBUS/CANopen communication setting torque 9: Ethernet communication setting torque 10: Reserved **Note:** Setting modes 2–6, 100% corresponds to three times of the rated current of the motor.	0	○
P03.12	Keypad setting torque	Setting range: -300.0%–300.0% (rated current of the motor)	50.0%	○
P03.13	Torque reference filter time	0.000–10.000s	0.010s	○
P03.14	Upper frequency of forward rotation in torque control	0: Keypad (P03.16 sets P03.14, P03.17 sets P03.15) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI setting upper-limit frequency 5: Multi-step setting upper-limit frequency 6: Modbus communication setting upper-limit frequency 7: PROFIBUS/CANopen communication setting upper-limit frequency 8: Ethernet communication setting upper-limit frequency 9: Reserved **Note:** Setting modes 1–9, 100% corresponds to the maximum frequency.	0	○
P03.15	Upper frequency of reverse rotation in torque control		0	○

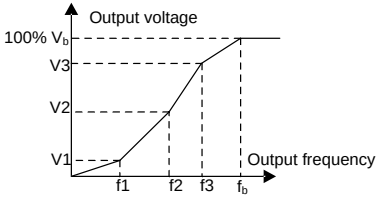
Function code	Name	Detailed description	Default value	Modify
P03.16	Keypad setting for upper frequency of forward rotation	This function is used to set the upper limit of the frequency. P03.16 sets the value of P03.14; P03.17 sets the value of P03.15. Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz	○
P03.17	Keypad setting for upper frequency of reverse rotation		50.00Hz	○
P03.18	Upper electromotion torque source	This function code is used to select the electromotion and braking torque upper-limit setting source. 0: Keypad setting upper-limit frequency (P03.20 sets P03.18, P03.21 sets P03.19) 1: AI1 2: AI2 3: AI3 4: HDI 5: Modbus communication 6: PROFIBUS/CANopen communication 7: Ethernet communication 8: Reserved **Note:** Setting modes 1–4,100% corresponds to three times of the motor current.	0	○
P03.19	Upper braking torque source		0	○
P03.20	Keypad setting of electromotion torque	The function code is used to set the limit of the torque. Setting range: 0.0–300.0% (motor rated current)	180.0%	○
P03.21	Keypad setting of braking torque		180.0%	○
P03.22	Weakening coefficient in constant power zone	The function code is used when the motor is under weakening control.	0.3	○

Function code	Name	Detailed description	Default value	Modify
P03.23	Lowest weakening point in constant power zone	 P03.22 and P03.23 are valid at constant power. The motor will enter into the weakening state when the motor runs at rated speed. Change the weakening curve by modifying the weakening control coefficient. The bigger the weakening control coefficient is, the steeper the weak curve is. P03.22 is only valid for vector mode 1. The setting range of P03.22: 0.1–2.0 The setting range of P03.23: 10%–100%	20%	○
P03.24	Max. voltage limit	P03.24 set the Max. voltage of the VFD, which is dependent on the site situation. The setting range: 0.0–120.0%	100.0%	◎
P03.25	Pre-exciting time	Preactivate the motor when the VFD starts up. Build up a magnetic field inside the VFD to improve the torque performance during the starting process. The setting time: 0.000–10.000s	0.300s	○
P03.26	Weak magnetic proportional gain	0–4000 **Note:** P03.24–P03.26 are invalid for vector mode 1.	1000	○
P03.27	Vector control speed	0: Display the actual value 1: Display the setting value	0	○
P03.28	Compensation coefficient of static friction	0.0–100.0% Adjust P03.28 to compensate the coefficient of static friction. Only valid when the running frequency is below 1Hz.	0.0%	○
P03.29	Compensation coefficient of dynamic friction	0.0–100.0% Adjust P03.29 to compensate the coefficient of static friction. Only valid when the running frequency is above 1Hz.	0.0%	○

P04 Group—SVPWM control

Function code	Name	Detailed description	Default value	Modify
P04.00	Motor 1 V/F curve setting	The function code defines the V/F curve of Goodrive300-02 motor 1 to meet the need of different loads. 0: Straight line V/F curve; applying to the constant torque load 1: Multi-dots V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) Curves 2–4 apply to the torque loads such as fans and water pumps. Users can adjust according to the features of the loads to achieve a best energy-consuming effect. 5: Customized V/F (V/F separation); on this mode, V and f can be separated and f can be adjusted through the frequency reference channel set by P00.06 or the voltage reference channel set by P04.27 to change the feature of the curve. **Note:** V_b in the below picture is the motor rated voltage and f_b is the motor rated frequency. 	0	◎
P04.01	Torque boost of motor 1	Torque boost to the output voltage for the features of low frequency torque. P04.01 is for the Max. Output voltage V_b. P04.02 defines the percentage of close frequency of manual torque to f_b. Torque boost should be selected according to the load. The bigger the load is, the bigger the boost is. Too big torque boost is inappropriate because the motor will run with over-magnetic, and the current of the VFD will increase to raise the temperature of the VFD and decrease the efficiency. When the torque boost is set to 0.0%, the VFD is automatic torque boost.	0.0%	○
P04.02	Torque boost close of motor 1		20.0%	○

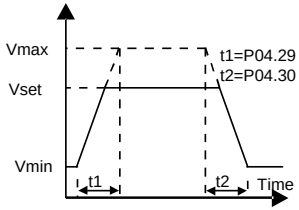
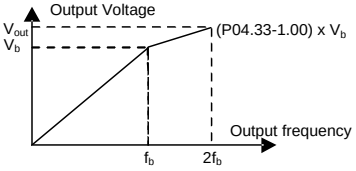
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>Torque boost threshold: under the threshold, the torque boost is valid, but over the threshold, the torque boost is invalid.
 

The setting range of P04.01: 0.0%: (automatic) 0.1%–10.0%
The setting range of P04.02: 0.0%–50.0%</td><td></td><td></td></tr>
<tr><td>P04.03</td><td>V/F frequency 1 of motor 1</td><td rowspan="5">When P04.00=1, the user can set V/F curve through P04.03–P04.08.
V/F is generally set according to the load of the motor.
Note: V1<V2<V3, f1<f2<f3. Too high low frequency voltage will heat the motor excessively or cause damage. The VFD may stall when overcurrent or overcurrent protection.
 

The setting range of P04.03: 0.00Hz–P04.05</td><td>0.00Hz</td><td>○</td></tr>
<tr><td>P04.04</td><td>V/F voltage 1 of motor 1</td><td>00.0%</td><td>○</td></tr>
<tr><td>P04.05</td><td>V/F frequency 2 of motor 1</td><td>00.00Hz</td><td>○</td></tr>
<tr><td>P04.06</td><td>V/F voltage 2 of motor 1</td><td>00.0%</td><td>○</td></tr>
<tr><td>P04.07</td><td>V/F frequency 3 of motor 1</td><td>00.00Hz</td><td>○</td></tr>
<tr><td>P04.08</td><td>V/F voltage 3 of motor 1</td><td>The setting range of P04.04: 0.0%–110.0% (the rated voltage of motor 1)
The setting range of P04.05: P04.03–P04.07
The setting range of P04.06: 0.0%–110.0% (the rated voltage of motor 1)
The setting range of P04.07: P04.05–P02.02 (the rated frequency of motor 1) or P04.05–P02.16 (the rated frequency of motor 1)
The setting range of P04.08: 0.0%–110.0% (the rated voltage of motor 1)</td><td>00.0%</td><td>○</td></tr>
</table>

Function code	Name	Detailed description	Default value	Modify
P04.09	V/F slip compensation gain of motor 1	This function code is used to compensate the change of the rotation speed caused by load during compensation SVPWM control to improve the rigidity of the motor. It can be set to the rated slip frequency of the motor which is counted as below: △f=f_b-n*p/60 Of which, f_b is the rated frequency of the motor, its function code is P02.02; n is the rated rotating speed of the motor and its function code is P02.03; p is the pole pair of the motor. 100.0% corresponds to the rated slip frequency△f. Setting range: 0.0–200.0%	100.0%	○
P04.10	Vibration control factor at low frequency of motor 1	In SVPWM control mode, current fluctuation may occur to the motor at some frequency, especially the motor with big power. The motor cannot run stably or overcurrent may occur. These phenomena can be canceled by adjusting this parameter. The setting range of P04.10: 0–100 The setting range of P04.11: 0–100 The setting range of P04.12: 0.00Hz–P00.03 (Max. output frequency)	10	○
P04.11	Vibration control factor at high frequency of motor 1		10	○
P04.12	Vibration control threshold of motor 1		30.00Hz	○
P04.13	Motor 2 V/F curve setting	The group of parameters defines the V/F setting means of Goodrive300-02 motor 2 to meet various requirements of different loads. See P04.00–P04.12 for the detailed function code instruction. **Note:** P04 group includes two sets of V/F parameters of the motor which cannot display simultaneously and are only valid for the selected motor. The motor selection can be selected by defined channels in P08.31 or terminal function 35 “the shift between motor 1 and motor 2”.	0	◎
P04.14	Torque boost of motor 2		0.0%	○
P04.15	Torque boost close of motor 2		20.0%	○
P04.16	V/F frequency 1 of motor 2		0.00Hz	○
P04.17	V/F voltage 1 of motor 2		00.0%	○

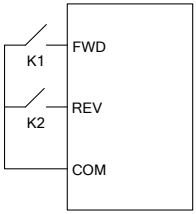
Function code	Name	Detailed description	Default value	Modify
P04.18	V/F frequency 2 of motor 2		00.00Hz	○
P04.19	V/F voltage 2 of motor 2		00.0%	○
P04.20	V/F frequency 3 of motor 2		00.00Hz	○
P04.21	V/F voltage 3 of motor 2		00.0%	○
P04.22	V/F slip compensation gain of motor 2		100.0%	○
P04.23	Vibration control factor at low frequency of motor 2	In SVPWM control mode, current fluctuation may occur to the motor at some frequency, especially the motor with big power. The motor cannot run stably or overcurrent may occur. These phenomena can be canceled by adjusting this parameter. The setting range of P04.23: 0–100 The setting range of P04.24: 0–100 The setting range of P04.25: 0.00Hz–P00.03 (Max. output frequency)	10	○
P04.24	Vibration control factor at high frequency of motor 2		10	○
P04.25	Vibration control threshold of motor 2		30.00Hz	○
P04.26	Energy-saving operation	0: No operation 1: Automatic energy-saving operation Motors will automatically adjust the output voltage to save energy at light loads.	0	◎
P04.27	Voltage setting	Select the output setting channel at V/F curve separation. 0: Keypad: the output voltage is determined by P04.28. 1: AI1 2: AI2 3: AI3 4: HDI	0	○

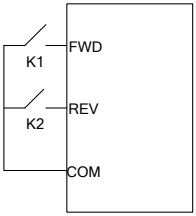
Function code	Name	Detailed description	Default value	Modify
		5: Multi-step speed 6: PID 7: Modbus communication 8: PROFIBUS/CANopen communication 9: Ethernet communication 10: Reserved **Note:** 100% corresponds to the rated voltage of the motor.		
P04.28	Keypad setting voltage	The function code is the voltage displaying when the voltage is set through keypad. The setting range: 0.0%–100.0%	100.0%	○
P04.29	Voltage increasing time	Voltage increasing time is the time when the VFD accelerates from the minimum output voltage to the maximum output voltage.	5.0s	○
P04.30	Voltage decreasing time	Voltage decreasing time is the time when the VFD decelerates from the maximum output voltage to the minimum output voltage. The setting range: 0.0–3600.0s	5.0s	○
P04.31	Maximum output voltage	Set the upper and low limit of the output voltage.  The setting range of P04.31: P04.32–100.0% (the rated voltage of the motor) The setting range of P04.32: 0.0%–P04.31	100.0%	◎
P04.32	Minimum output voltage		0.0%	◎
P04.33	Weakening coefficient in constant power zone	The function is used to adjust the output voltage of VFD in SVPWM mode in weak magnetic. **Note:** Invalid in constant-torque mode  The setting range of P04.33: 1.00–1.30	1.00	○

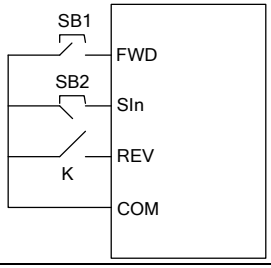
P05 Group—Input terminals

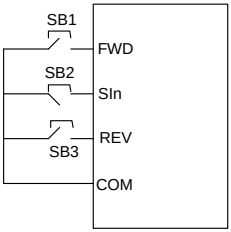
Function code	Name	Detailed description	Default value	Modify
P05.00	HDI input selection	0: High-speed pulse input. See P05.49–P05.54 1: Digital input. See P05.09	0	◎
P05.01	S1 terminal function selection	0: No function 1: Forward rotation operation 2: Reverse rotation operation 3: 3-wire control operation (SIn) 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Operation pause 9: External fault input 10: Frequency setting increasing (UP) 11: Frequency setting decreasing (DOWN) 12: Frequency setting clear 13: Shift between A setting and B setting 14: Shift between combination setting and A setting 15: Shift between combination setting and B setting 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Multi-step speed pause 21: ACC/DEC time 1 22: ACC/DEC time 2 23: Simple PLC stop reset 24: Simple PLC pause 25: PID control pause 26: Traverse pause(stop at the current frequency) 27: Traverse reset(return to the center frequency) 28: Counter reset 29: Torque control disabling 30: ACC/DEC disabling 31: Counter trigging 32: Length reset 33: Cancel the frequency change setting temporarily 34: DC brake	1	◎
P05.02	S2 terminal function selection		4	◎
P05.03	S3 terminal function selection		7	◎
P05.04	S4 terminal function selection		0	◎
P05.05	S5 terminal function selection		0	◎
P05.06	S6 terminal function selection		0	◎
P05.07	S7 terminal function selection		0	◎
P05.08	S8 terminal function selection		0	◎
P05.09	HDI terminal function selection		0	◎

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>35: Shift the motor 1 to motor 2
36: Shift the command to the keypad
37: Shift the command to the terminal
38: Shift the command to the communication
39: Pre-magnetized command
40: Consumption power clear
41: Consumption power holding
42–60: Reserved
61: PID polarity shifting
62–63: Reserved</td><td></td><td></td></tr>
<tr><td>P05.10</td><td>Polarity selection of input terminals</td><td>The function code is used to set the polarity of input terminals.
Set the bit to 0, the input terminal is anode.
Set the bit to 1, the input terminal is cathode.
<table>
<tr><td></td><td>BIT8</td><td>BIT7</td><td>BIT6</td><td>BIT5</td></tr>
<tr><td></td><td>HDI</td><td>S8</td><td>S7</td><td>S6</td></tr>
<tr><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr>
<tr><td>S5</td><td>S4</td><td>S3</td><td>S2</td><td>S1</td></tr>
</table>
The setting range: 0x000–0x1FF</td><td>0x000</td><td>○</td></tr>
<tr><td>P05.11</td><td>ON-OFF filter time</td><td>Set the sampling filter time of S1–S8 and HDI terminals. If the interference is strong, increase the parameter to avoid the disoperation.
The setting range: 0.000–1.000s</td><td>0.010s</td><td>○</td></tr>
<tr><td>P05.12</td><td>Virtual terminals setting</td><td>0x000–0x1FF (0: disabling, 1: enabling)
BIT0: S1 virtual terminal
BIT1: S2 virtual terminal
BIT2: S3 virtual terminal
BIT3: S4 virtual terminal
BIT4: S5 virtual terminal
BIT5: S6 virtual terminal
BIT6: S7 virtual terminal
BIT7: S8 virtual terminal
BIT8: HDI virtual terminal
Note: After a virtual terminal is enabled, the state of the terminal can only be modified through communication, and the communication address is 0x200A.</td><td>0x000</td><td>◎</td></tr>
</table>

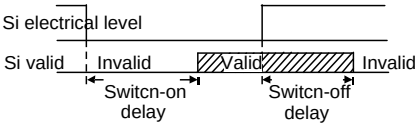
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P05.13</td><td>Terminals control running mode</td><td>Set the operation mode of the terminals control
0: 2-wire control 1; the enabling and the direction combine into one. This mode is widely used. It determines the rotation direction by the defined FWD and REV terminals command.
 

<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>FWD running</td></tr>
<tr><td>OFF</td><td>ON</td><td>REV running</td></tr>
<tr><td>ON</td><td>ON</td><td>Hold</td></tr>
</table>
1: 2-wire control 2; the enabling and the direction separate. The defined FWD by this mode is the enabling terminal. The direction depends on the state of the defined REV.
 

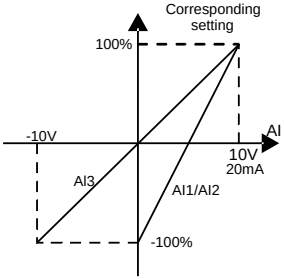
<table>
<tr><th>FWD</th><th>REV</th><th>Running command</th></tr>
<tr><td>OFF</td><td>OFF</td><td>Stop</td></tr>
<tr><td>ON</td><td>OFF</td><td>FWD running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Hold</td></tr>
<tr><td>ON</td><td>ON</td><td>REV running</td></tr>
</table>
2: 3-wire control 1; SIn is the enabling terminal on this mode, and the running command is caused by FWD and the direction is controlled by REV. When the VFD runs, SIn needs to be in closed state, a rising edge signal is caused by FWD and the running direction is controlled by REV; when the VFD stops, SIn needs to be disconnected.
 
</td><td>0</td><td>◎</td></tr>
</table>

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>
In operation, the direction is:
<table>
<tr><th>SIn</th><th>REV</th><th>Previous direction</th><th>Current direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>FWD</td><td>REV</td></tr>
<tr><td>REV</td><td>FWD</td></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">ON→OFF</td><td>REV</td><td>FWD</td></tr>
<tr><td>FWD</td><td>REV</td></tr>
<tr><td rowspan="2">ON→OFF</td><td>ON</td><td colspan="2" rowspan="2">Decelerate to stop</td></tr>
<tr><td>OFF</td></tr>
</table>
3: 3-wire control 2; SIn is the enabling terminal on this mode, and the running command is caused by FWD or REV and both of them control the running direction. When the VFD runs, SIn needs to be in closed state, a rising edge signal is caused by FWD or REV and the running direction is controlled by FWD or REV; when the VFD stops, SIn needs to be disconnected.


<table>
<tr><th>SIn</th><th>FWD</th><th>REV</th><th>Running direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ON</td><td>ON</td><td>FWD</td></tr>
<tr><td>OFF</td><td>FWD</td></tr>
<tr><td rowspan="2">ON</td><td>ON</td><td rowspan="2">OFF→ON</td><td>REV</td></tr>
<tr><td>OFF</td><td>REV</td></tr>
<tr><td rowspan="2">ON→OFF</td><td></td><td></td><td rowspan="2">Decelerate to stop</td></tr>
<tr><td></td><td></td></tr>
</table>
SIn: 3-wire running control, FWD: forward running, REV: reverse running
Note: For the 2-wire running mode, when FWD/REV terminal is valid, the VFD stops because
</td><td></td><td></td></tr>
</table>

Function code	Name	Detailed description	Default value	Modify
		of the stopping command from other sources, even the control terminal FWD/REV keeps valid; the VFD will not work when the stopping command is canceled. Only when FWD/REV is relaunched, the VFD can start again. For example, the valid STOP/RST stop at PLC single-cycle stop, fixed length and terminal control (see P07.04).		
P05.14	Switch-on delay of S1 terminal	The function code defines the corresponding delay time of electrical level of the programmable input terminals from switching on to switching off.  Setting range: 0.000–50.000s	0.000s	○
P05.15	Switch-off delay of S1 terminal		0.000s	○
P05.16	Switch-on delay of S2 terminal		0.000s	○
P05.17	Switch-off delay of S2 terminal		0.000s	○
P05.18	Switch-on delay of S3 terminal		0.000s	○
P05.19	Switch-off delay of S3 terminal		0.000s	○
P05.20	Switch-on delay of S4 terminal		0.000s	○
P05.21	Switch-off delay of S4 terminal		0.000s	○
P05.22	Switch-on delay of S5 terminal		0.000s	○
P05.23	Switch-off delay of S5 terminal		0.000s	○
P05.24	Switch-on delay of S6 terminal		0.000s	○

Function code	Name	Detailed description	Default value	Modify
P05.25	Switch-off delay of S6 terminal		0.000s	○
P05.26	Switch-on delay of S7 terminal		0.000s	○
P05.27	Switch-off delay of S7 terminal		0.000s	○
P05.28	Switch-on delay of S8 terminal		0.000s	○
P05.29	Switch-off delay of S8 terminal		0.000s	○
P05.30	Switch-on delay of HDI terminal		0.000s	○
P05.31	Switch-off delay of HDI terminal		0.000s	○
P05.32	Lower limit of AI1	The function code defines the relationship between the analog input voltage and its corresponding set value. If the analog input voltage beyond the set minimum or maximum input value, the VFD will count at the minimum or maximum one. When the analog input is the current input, the corresponding voltage of 0–20mA is 0–10V. In different cases, the corresponding rated value of 100.0% is different. See the application for detailed information. The figure below illustrates different applications:	0.00V	○
P05.33	Corresponding setting of the lower limit of AI1		0.0%	○
P05.34	Upper limit of AI1		10.00V	○
P05.35	Corresponding setting of the upper limit of AI1		100.0%	○
P05.36	AI1 input filter time		0.100s	○
P05.37	Lower limit of AI2		0.00V	○
P05.38	Corresponding setting of the		0.0%	○

Function code	Name	Detailed description	Default value	Modify
	lower limit of AI2			
P05.39	Upper limit of AI2		10.00V	○
P05.40	Corresponding setting of the upper limit of AI2		100.0%	○
P05.41	AI2 input filter time		0.100s	○
P05.42	Lower limit of AI3		-10.00V	○
P05.43	Corresponding setting of the lower limit of AI3		-100.0%	○
P05.44	Middle value of AI3		0.00V	○
P05.45	Corresponding middle setting of AI3		0.0%	○
P05.46	Upper limit of AI3		10.00V	○
P05.47	Corresponding setting of the upper limit of AI3		100.0%	○
P05.48	AI3 input filter time		0.100s	○
P05.49	HDI high-speed pulse input function selection	The function selection when HDI terminals is high-speed pulse input 0: Frequency setting input, frequency setting source	0	◎

Input filter time: This parameter is used to adjust the sensitivity of the analog input. Increasing the value properly can enhance the anti-interference of the analog, but weaken the sensitivity of the analog input.

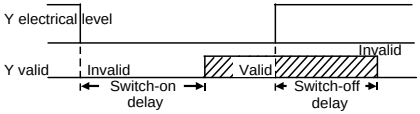
Note: Analog AI1 and AI2 can support 0–10V or 0–20mA input. When AI1 and AI2 select 0–20mA input, the corresponding voltage of 20mA is 10V. AI3 can support -10V–+10V input.

The setting range of P05.32: 0.00V–P05.34
The setting range of P05.33: -100.0%–100.0%
The setting range of P05.34: P05.32–10.00V
The setting range of P05.35: -100.0%–100.0%
The setting range of P05.36: 0.000s–10.000s
The setting range of P05.37: 0.00V–P05.39
The setting range of P05.38: -100.0%–100.0%
The setting range of P05.39: P05.37–10.00V
The setting range of P05.40: -100.0%–100.0%
The setting range of P05.41: 0.000s–10.000s
The setting range of P05.42: -10.00V–P05.44
The setting range of P05.43: -100.0%–100.0%
The setting range of P05.44: P05.42–P05.46
The setting range of P05.45: -100.0%–100.0%
The setting range of P05.46: P05.44–10.00V
The setting range of P05.47: -100.0%–100.0%
The setting range of P05.48: 0.000s–10.000s

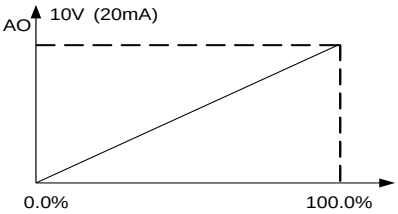
Function code	Name	Detailed description	Default value	Modify
		1: Counter input, high-speed pulse counter input terminals 2: Length counting input, length counter input terminals		
P05.50	Lower limit frequency of HDI	0.000kHz–P05.52	0.000 kHz	○
P05.51	Corresponding setting of HDI lower limit frequency	-100.0%–100.0%	0.0%	○
P05.52	Upper limit frequency of HDI	P05.50–50.000kHz	50.000 kHz	○
P05.53	Corresponding setting of HDI upper limit frequency	-100.0%–100.0%	100.0%	○
P05.54	HDI frequency input filter time	0.000s–10.000s	0. 010s	○

P06 Group—Output terminals

Function code	Name	Detailed description	Default value	Modify
P06.00	HDO output	The function is used to select the high-speed pulse output terminals function. 0: Open collector high-speed pulse output: The Max. pulse frequency is 50.0kHz. See P06.27–P06.31 for detailed information of the related functions. 1: Open collector output. See P06.02 for detailed information of the related functions.	0	◎
P06.01	Y1 output	0: Invalid 1: In operation 2: Forward rotation operation 3: Reverse rotation operation 4: Jogging operation 5: VFD fault 6: Frequency degree test FDT1	0	○
P06.02	HDO output		0	○
P06.03	Relay RO1 output		1	○
P06.04	Relay RO2 output		5	○

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>7: Frequency degree test FDT2
8: Frequency arrival
9: Zero speed running
10: Upper limit frequency arrival
11: Lower limit frequency arrival
12: Ready for operation
13: Pre-magnetizing
14: Overload pre-alarm
15: Underload pre-alarm
16: Completion of simple PLC stage
17: Completion of simple PLC cycle
18: Setting count value arrival
19: Reference count value arrival
20: External fault valid
21: Length arrival
22: Running time arrival
23: Modbus communication virtual terminals output
24: PROFIBUS/CANopen communication virtual terminals output
25: Ethernet communication virtual terminals output
26: Completion of DC bus voltage setting
27–30: Reserved</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Polarity of output terminals</td><td>The function code is used to set the pole of the output terminal.
When the current bit is set to 0, input terminal is positive.
When the current bit is set to 1, input terminal is negative.
<table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO2</td><td>RO1</td><td>HDO</td><td>Y</td></tr></table>Setting range: 00–0F</td><td>00</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y1 switch-on delay time</td><td rowspan="3">The function code defines the corresponding delay time of the electrical level change during the programmable terminal switching on and off.
 
</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y1 switch-off delay time</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.08</td><td>HDO switch-on delay time</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Detailed description	Default value	Modify
P06.09	HDO switch-off delay time	The setting range: 0.000–50.000s **Note:** P06.08 and P06.08 are valid only when P06.00=1.	0.000s	○
P06.10	RO1 switch-on delay time		0.000s	○
P06.11	RO1 switch-off delay time		0.000s	○
P06.12	RO2 switch-on delay time		0.000s	○
P06.13	RO2 switch-off delay time		0.000s	○
P06.14	AO1 output	0: Running frequency	0	○
P06.15	AO2 output	1: Set frequency	0	○
P06.16	HDO high-speed pulse output	2: Ramp reference frequency 3: Running rotation speed 4: Output current (relative to twice the VFD rated current) 5: Output current (relative to twice the motor rated current) 6: Output voltage 7: Output power 8: Set torque value 9: Output torque 10: AI1 input value 11: AI2 input value 12: AI3 input value 13: High-speed pulse HDI input value 14: Modbus communication set value 1 15: Modbus communication set value 2 16: PROFIBUS/CANopen communication set value 1 17: PROFIBUS/CANopen communication set value 2 18: Ethernet communication set value 1	0	○

Function code	Name	Detailed description	Default value	Modify
		19: Ethernet communication set value 2 20–21: Reserved 22:Torque current (relative to triple the motor rated current) 23: Ramp reference frequency (with sign) 24–30: Reserved		
P06.17	Lower output limit of AO1	The above function codes define the relative relationship between the output value and analog output. When the output value exceeds the range of set maximum or minimum output, it will count according to the low-limit or upper-limit output. When the analog output is current output, 1mA equals to 0.5V. In different cases, the corresponding analog output of 100% of the output value is different. See each application for detailed information.  Setting range of P06.17: -100.0%–P06.19 Setting range of P06.18: 0.00V–10.00V Setting range of P06.19: P06.17–100.0% Setting range of P06.20: 0.00V–10.00V Setting range of P06.21: 0.000–10.000s Setting range of P06.22: -100.0%–P06.24 Setting range of P06.23: 0.00–10.00V Setting range of P06.24: P06.22–100.0% Setting range of P06.25: 0.00V–10.00V Setting range of P06.26: 0.000–10.000s Setting range of P06.27: -100.0%–P06.29 Setting range of P06.28: 0.00–50.00kHz Setting range of P06.29: P06.27–100.0% Setting range of P06.30: 0.00–50.00kHz	0.0%	○
P06.18	Corresponding AO1 output of lower limit		0.00V	○
P06.19	Upper output limit of AO1		100.0%	○
P06.20	Corresponding AO1 output of upper limit		10.00V	○
P06.21	AO1 output filter time		0.000s	○
P06.22	Lower output limit of AO2		0.0%	○
P06.23	Corresponding AO2 output of lower limit		0.00V	○
P06.24	Upper output limit of AO2		100.0%	○
P06.25	Corresponding AO2 output of upper limit		10.00V	○
P06.26	AO2 output filter time		0.000s	○
P06.27	Lower output limit of HDO		0.0%	○
P06.28	Corresponding HDO output of lower limit		0.00kHz	○
P06.29	Upper output limit of HDO		100.0%	○
P06.30	Corresponding HDO output of upper limit		50.00kHz	○

Function code	Name	Detailed description	Default value	Modify
P06.31	HDO output filter time	Setting range of P06.31: 0.000–10.000s	0.000s	○

P07 Group—Human machine interface

Function code	Name	Detailed description	Default value	Modify
P07.00	User's password	0–65535 The password protection will be valid when setting any non-zero number. 00000: Clear the previous user's password, and make the password protection invalid. After the set user's password becomes valid, if the password is incorrect, users cannot enter the parameter menu. Only correct password can make the user check or modify the parameters. Please remember all users' passwords. Retreat editing state of the function codes and the password protection will become valid in a minute. If the valid password is available, press PRG/ESC to enter into the editing state of the function codes, and then "0.0.0.0.0" will be displayed. Unless input right password, the operator cannot enter into it. **Note:** Restoring to the default value can clear the password, please use it with caution.	0	○
P07.01	Parameter copy	The function code determines the manner of parameters 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 of P02 and P12 group) 4: Download the keypad function parameters to	0	◎

Function code	Name	Detailed description	Default value	Modify
		local address (only for the motor parameter of P02 and P12 group) **Note:** After completing the 1–4 operations, the parameter will restore to 0 automatically; the function of upload and download excludes the factory parameters of P29.		
P07.02	QUICK/JOG function selection	0: No function 1: Jogging. Press QUICK/JOG to begin the jogging running. 2: Shift the display state by the shifting key. Press QUICK/JOG to shift the displayed function code from right to left. 3: Shift between forward rotations and reverse rotations. Press QUICK/JOG to shift the direction of the frequency commands. This function is only valid in the keypad commands channels. 4: Clear UP/DOWN settings. Press QUICK/JOG to clear the set value of UP/DOWN. 5: Coast to stop. Press QUICK/JOG to coast to stop. 6: Shift the reference manner of running commands. Press QUICK/JOG to shift the reference manner of running commands. 7: Quick commission mode (commission according to the non-factory parameter) **Note:** Press QUICK/JOG to shift between forward rotation and reverse rotation, the VFD does not remember the state after shifting during powering off. The VFD will run in the running direction set according to parameter P00.13 during next powering on.	1	◎
P07.03	Shifting sequence selection of QUICK/JOG commands	When P07.02=6, set the shifting sequence of running command channels. 0: Keypad control→ terminals control→ communication control 1: Keypad control←→terminals control 2: Keypad control←→communication control 3: Terminals control←→communication control	0	○

Function code	Name	Detailed description	Default value	Modify
P07.04	STOP/RST stop function	STOP/RST is valid for stop function. STOP/RST is valid in any state for the fault reset. 0: Only valid for the keypad control 1: Both valid for keypad and terminals control 2: Both valid for keypad and communication control 3: Valid for all control modes	0	○
P07.05	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 step in multi-step speed	0x03FF	○
P07.06	Parameters state 2	0x0000–0xFFFF BIT0: AI1 (V on) BIT1: AI2 (V on) BIT2: AI3 (V on) BIT3: HDI frequency BIT4: motor overload percentage (% on) BIT5: VFD overload percentage (% on) BIT6: ramp frequency reference value (Hz on) BIT7: linear speed BIT8: AC inlet current (A on) BIT9: upper limit frequency (Hz on) BIT10–15: reserved	0x0000	○

Function code	Name	Detailed description	Default value	Modify
P07.07	Parameters for stopping state	0x0000–0xFFFF BIT0: set frequency (Hz on, frequency flickering slowly) BIT1: bus voltage (V on) BIT2: input terminals state BIT3: output terminals state BIT4: PID reference (% flickering) BIT5: PID feedback value (% on) BIT6: torque set value (% on) BIT7: AI1 (V on) BIT8: AI2 (V on) BIT9: AI3 (V on) BIT10: HDI frequency BIT11: PLC and the current step in multi-step speed BIT12: pulse count value BIT13: length value BIT14: upper limit frequency (Hz on) BIT15: reserved	0x00FF	○
P07.08	Frequency coefficient	0.01–10.00 Displayed frequency=running frequency* P07.08	1.00	○
P07.09	Rotation speed coefficient	0.1–999.9% Mechanical rotation speed=120*displayed running frequency×P07.09/motor pole pairs	100.0%	○
P07.10	Linear speed coefficient	0.1–999.9% Linear speed=mechanical rotation speed×P07.10	1.0%	○
P07.11	Rectifier bridge module temperature	-20.0–120.0°C		●
P07.12	Converter module temperature	-20.0–120.0°C		●
P07.13	Software version	1.00–655.35		●
P07.14	Local accumulative running time	0–65535h		●

Function code	Name	Detailed description	Default value	Modify
P07.15	High bit of power consumption	Display the power used by the VFD. Power consumption of the VFD =P07.15*1000+P07.16 Setting range of P07.15: 0–65535 kWh (*1000) Setting range of P07.16: 0.0–999.9 kWh		●
P07.16	Low bit of power consumption			●
P07.17	Reserved	Reserved		●
P07.18	Rated power of the VFD	0.4–3000.0kW		●
P07.19	Rated voltage of the VFD	50–1200V		●
P07.20	Rated current of the VFD	0.1–6000.0A		●
P07.21	Factory bar code 1	0x0000–0xFFFF		●
P07.22	Factory bar code 2	0x0000–0xFFFF		●
P07.23	Factory bar code 3	0x0000–0xFFFF		●
P07.24	Factory bar code 4	0x0000–0xFFFF		●
P07.25	Factory bar code 5	0x0000–0xFFFF		●
P07.26	Factory bar code 6	0x0000–0xFFFF		●
P07.27	Current fault type	0: No fault 1: IGBT U phase protection (OUt1) 2: IGBT V phase protection (OUt2) 3: IGBT W phase protection (OUt3) 4: ACC overcurrent (OC1) 5: DEC overcurrent (OC2) 6: Constant speed overcurrent (OC3) 7: ACC overvoltage (OV1) 8: DEC overvoltage (OV2) 9: Constant speed overvoltage (OV3) 10: Bus undervoltage UV 11: Motor overload (OL1)		●
P07.28	Previous fault type			●
P07.29	Previous 2 fault type			●
P07.30	Previous 3 fault type			●
P07.31	Previous 4 fault type			●
P07.32	Previous 5 fault type			●

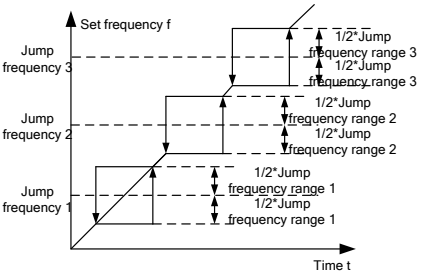
Function code	Name	Detailed description	Default value	Modify
		12: VFD overload (OL2) 13: Input side phase loss (SPI) 14: Output side phase loss (SPO) 15: Overheat of the rectifier module (OH1) 16: Overheat fault of the converter module (OH2) 17: External fault (EF) 18: 485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor antotuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID response offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time arrival (END) 25: Electrical overload (OL3) 26: Panel communication fault (PCE) 27: Parameter uploading fault (UPE) 28: Parameter downloading fault (DNE) 29: PROFIBUS communication fault (E-DP) 30: Ethernet communication fault (E-NET) 31: CANopen communication fault (E-CAN) 32: Grounding short circuit fault 1 (ETH1) 33: Grounding short circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Maladjustment (STo) 36: Underload fault (LL)		
P07.33	Running frequency at current fault		0.00Hz	●
P07.34	Ramp reference frequency at current fault		0.00Hz	
P07.35	Output voltage at current fault		0V	
P07.36	Output current at current fault		0.0A	
P07.37	Bus voltage at current fault		0.0V	

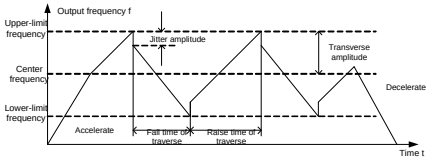
Function code	Name	Detailed description	Default value	Modify
P07.38	Max. temperature at current fault		0.0°C	
P07.39	Input terminals state at current fault		0	●
P07.40	Output terminals state at current fault		0	●
P07.41	Running frequency at previous fault		0.00Hz	●
P07.42	Ramp reference frequency at previous fault		0.00Hz	●
P07.43	Output voltage at previous fault		0V	●
P07.44	Output current at previous fault		0.0A	●
P07.45	Bus voltage at previous fault		0.0V	●
P07.46	Max. temperature at previous fault		0.0°C	●
P07.47	Input terminals state at previous fault		0	●
P07.48	Output terminals state at previous fault		0	●
P07.49	Running frequency at		0.00Hz	●

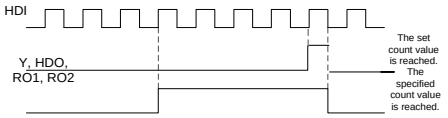
Function code	Name	Detailed description	Default value	Modify
	previous 2 fault			
P07.50	Ramp reference frequency at previous 2 fault		0.00Hz	●
P07.51	Output voltage at previous 2 fault		0V	●
P07.52	Output current at previous 2 fault		0.0A	●
P07.53	Bus voltage at previous 2 fault		0.0V	●
P07.54	Max. temperature at previous 2 fault		0.0°C	●
P07.55	Input terminals state at previous 2 fault		0	●
P07.56	Output terminals state at previous 2 fault		0	●

P08 Group—Enhanced function

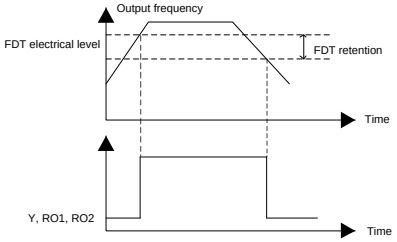
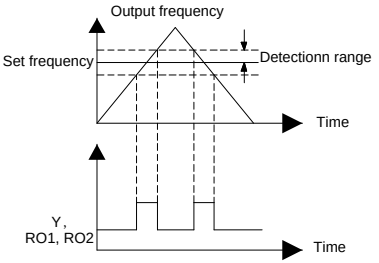
Function code	Name	Detailed description	Default value	Modify
P08.00	ACC time 2	See P00.11 and P00.12 for detailed definition. Goodrive300-02 series define four groups of ACC/DEC time which can be selected by P5 group.	Depend on model	○
P08.01	DEC time 2	The first group of ACC/DEC time is the factory default one. Setting range: 0.0–3600.0s	Depend on model	○

Function code	Name	Detailed description	Default value	Modify
P08.02	ACC time 3		Depend on model	○
P08.03	DEC time 3		Depend on model	○
P08.04	ACC time 4		Depend on model	○
P08.05	DEC time 4		Depend on model	○
P08.06	Jogging frequency	This parameter is used to define the reference frequency during jogging. Setting range: 0.00Hz –P00.03	5.00Hz	○
P08.07	Jogging ACC time	The jogging ACC time means the time needed if the VFD runs from 0Hz to the Max. frequency. The jogging DEC time means the time needed if the VFD goes from the Max. frequency (P0.03) to 0Hz. Setting range: 0.0–3600.0s	Depend on model	○
P08.08	Jogging DEC time		Depend on model	○
P08.09	Jumping frequency 1	When the set frequency is in the range of jumping frequency, the VFD will run at the edge of the jumping frequency. The VFD can avoid the mechanical resonance point by setting the jumping frequency. The VFD can set three jumping frequency. But this function will be invalid if all jumping points are 0.  Setting range: 0.00Hz–P00.03	0.00Hz	○
P08.10	Jumping frequency range 1		0.00Hz	○
P08.11	Jumping frequency 2		0.00Hz	○
P08.12	Jumping frequency range 2		0.00Hz	○
P08.13	Jumping frequency 3		0.00Hz	○
P08.14	Jumping frequency range 3		0.00Hz	○

Function code	Name	Detailed description	Default value	Modify
P08.15	Traverse range	This function applies to the industries where traverse and convolution function are required such as textile and chemical fiber. The traverse function means that the output frequency of the VFD is fluctuated with the set frequency as its center. The route of the running frequency is illustrated as below, of which the traverse is set by P08.15 and when P08.15 is set as 0, the traverse is 0 with no function.  Traverse range: The traverse running is limited by upper and low frequency. The traverse range relative to the center frequency: traverse range AW=center frequency x traverse range P08.15. Sudden jumping frequency=traverse range AW x sudden jumping frequency range P08.16. When run at the traverse frequency, the value which is relative to the sudden jumping frequency. The raising time of the traverse frequency: The time from the lowest point to the highest one. The declining time of the traverse frequency: The time from the highest point to the lowest one. The setting range of P08.15: 0.0–100.0%(relative to the set frequency) The setting range of P08.16: 0.0–50.0%(relative to the traverse range) The setting range of P08.17: 0.1–3600.0s The setting range of P08.18: 0.1–3600.0s	0.0%	○
P08.16	Sudden jumping frequency range		0.0%	○
P08.17	Traverse boost time		5.0s	○
P08.18	Traverse declining time		5.0s	○
P08.19	Setting length	The function codes of setting length, actual length and unit pulse are mainly used to control the fixed length. The length is counted by the pulse signal of HDI	0m	○
P08.20	Actual length		0m	●
P08.21	Pulse per rotation		1	○

Function code	Name	Detailed description	Default value	Modify
P08.22	Axle perimeter	terminals input and the HDI terminals are needed to set as the length counting input. Actual length=the length counting input pulse/unit pulse When the actual length P08.20 exceeds the setting length P08.19, the multi-function digital output terminals will output ON. Setting range of P08.19: 0–65535m Setting range of P08.20: 0–65535m Setting range of P08.21: 1–10000 Setting range of P08.22: 0.01–100.00cm Setting range of P08.23: 0.001–10.000 Setting range of P08.24: 0.001–1.000	10.00cm	○
P08.23	Length ratio		1.000	○
P08.24	Length correcting coefficient		1.000	○
P08.25	Setting count value	The counter works by the input pulse signals of the HDI terminals. When the counter achieves a fixed number, the multi-function output terminals will output the signal of “fixed counting number arrival” and the counter go on working; when the counter achieves a setting number, the multi-function output terminals will output the signal of “setting counting number arrival”, the counter will clear all numbers and stop to recount before the next pulse. The setting count value P08.26 should be no more than the setting count value P08.25. The function is illustrated as below:  Setting range of P08.25: P08.26–65535 Setting range of P08.26: 0–P08.25	0	○
P08.26	Reference count value		0	○
P08.27	Set running time	Pre-set running time of the VFD. When the accumulative running time achieves the set time, the multi-function digital output terminals will output the signal of “running time arrival”. Setting range: 0–65535min	0min	○

Function code	Name	Detailed description	Default value	Modify
P08.28	Fault reset times	Fault reset times: set the automatic fault reset times. If the reset time exceeds this set value, the VFD will stop to wait maintenance. Interval time of automatic fault reset: the interval between the time when the fault occurs and the time when the reset action occurs. After the VFD runs, if no fault in 60s, P08.28 will clear. Setting range of P08.28: 0–10 Setting range of P08.29: 0.1–3600.0s	0	○
P08.29	Interval time of automatic fault reset		1.0s	○
P08.30	Frequency decreasing ratio of dropping control	The output frequency of the VFD changes as the load. And it is mainly used to balance the power when several VFDs drive one load. Setting range: 0.00–50.00Hz	0.00Hz	○
P08.31	Motor shifting	Goodrive300-02 series supports the shift between two motors. This function is used to select the shifting channel. LED ones: shifting channel 0: terminal shifting; digital terminal is 35 1: Modbus communication shifting 2: PROFIBUS/CANopen communication shifting 3: Ethernet communication shifting 4: Reserved LED tens: shifting enabling in operation 0: Disabled 1: Enabled 0x00–0x14	0x00	◎
P08.32	FDT1 electrical level detection value	When the output frequency exceeds the corresponding frequency of FDT electrical level, the multi-function digital output terminals will output the signal of “frequency level detect FDT” until the output frequency decreases to a value lower than (FDT electrical level-FDT retention detection value) the corresponding frequency, the signal is invalid. Below is the waveform diagram:	50.00Hz	○
P08.33	FDT1 retention detection value		5.0%	○
P08.34	FDT2 electrical level detection value		50.00Hz	○

Function code	Name	Detailed description	Default value	Modify
P08.35	FDT2 retention detection value	 Setting range of P08.32: 0.00Hz–P00.03 (Max. output frequency) Setting range of P08.33: 0.0–100.0% (FDT1 electrical level) Setting range of P08.34: 0.00Hz–P00.03 (Max. output frequency) Setting range of P08.35: 0.0–100.0% (FDT2 electrical level)	5.0%	○
P08.36	Frequency arrival detection range	When the output frequency is among the positive or negative detection range of the set frequency, the multi-function digital output terminal will output the signal of “frequency arrival”, see the diagram below for detailed information:  The setting range: 0.00Hz–P00.03 (Max. output frequency)	0.00Hz	○
P08.37	Energy braking enable	This parameter is used to control the internal braking pipe inside the VFD. 0: Disable 1: Enable **Note:** Only apply to internal braking pipe.	0	○
P08.38	Threshold voltage	After setting the original bus voltage to brake the energy, adjust the voltage appropriately to brake the load. The factory changes with the voltage	380V voltage: 700.0V	○

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td></td><td>level.
The setting range: 200.0–2000.0V
In order to prevent customers set the value is too large, it is recommended setting range:
<table>
<tr><td>voltage</td><td>380V</td><td>500V</td><td>660</td></tr>
<tr><td>range</td><td>685–750V</td><td>860–950V</td><td>1080–1180V</td></tr>
</table></td><td>500V voltage: 900.0V
660V voltage: 1120.0V</td><td></td></tr>
<tr><td>P08.39</td><td>Cooling fan running mode</td><td>0: Normal mode
1: The fan keeps running after power on</td><td>0</td><td>○</td></tr>
<tr><td>P08.40</td><td>PWM selection</td><td>0x00–0x21
LED ones: PWM mode selection
0: PWM mode 1, three-phase modulation and two-phase modulation
1: PWM mode 2, three-phase modulation
LED tens: low-speed carrier frequency limit mode
0: Low-speed carrier frequency limit mode 1, the carrier frequency will limit to 2k if it exceeds 2k at low speed
1: Low-speed carrier frequency limit mode 2, the carrier frequency will limit to 4k if it exceeds 4k at low speed
2: No limit</td><td>01</td><td>◎</td></tr>
<tr><td>P08.41</td><td>Overmodulation selection</td><td>LED ones
0: Invalid
1: Valid
LED tens
0: Light overcommission; in zone 1
1: Heavy overcommission; in zone 2</td><td>01</td><td>◎</td></tr>
<tr><td>P08.42</td><td>Keypad data control</td><td>0x000–0x1223
LED ones: frequency enable selection
0: Both ∧/∨ key and digital potentiometer adjustment are valid
1: Only ∧/∨ key adjustment is valid
2: Only digital potentiometer adjustment is valid
3: Neither ∧/∨ key nor digital potentiometer adjustment is valid
LED tens: frequency control selection
0: Only valid when P00.06=0 or P00.07=0</td><td>0x0000</td><td>○</td></tr>
</table>

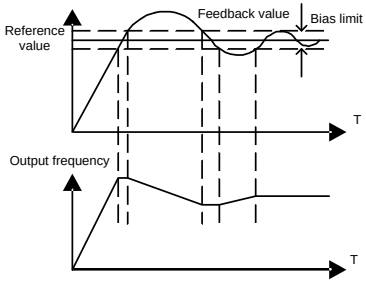
Function code	Name	Detailed description	Default value	Modify
		1: Valid for all frequency setting manner 2: Invalid for multi-step speed when multi-step speed has the priority LED hundreds: action selection during stopping 0: Setting is valid 1: Valid during running, clear after stopping 2: Valid during running, clear after receiving the stop command LED thousands: ∧/∨ key and digital potentiometer integral function 0: The integral function is valid 1: The integral function is invalid		
P08.43	Integral ratio of keypad potentiometer	0.01–10.00s	0.10s	○
P08.44	UP/DOWN terminals control	0x000–0x221 LED ones: frequency enable selection 0: UP/DOWN terminals setting is valid 1: UP/DOWN terminals setting is invalid LED tens: frequency control selection 0: Only valid when P00.06=0 or P00.07=0 1: All frequency means are valid 2: When the multi-step speed has the priority, it is invalid to the multi-step speed LED hundreds: action selection during stopping 0: Setting is valid 1: Valid during running, clear after stop 2: Valid during running, clear after receiving the stop command	0x000	○
P08.45	UP terminals frequency changing ratio	0.01–50.00Hz/s	0.50Hz/s	○
P08.46	DOWN terminals frequency changing ratio	0.01–50.00Hz/s	0.50Hz/s	○
P08.47	Frequency setting at power loss	0x000–0x111 LED ones: Action selection when power off. 0: Save when power off	0x000	○

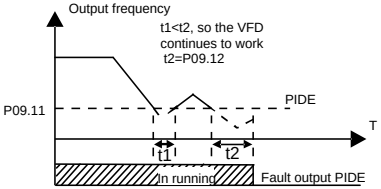
Function code	Name	Detailed description	Default value	Modify
		1: Clear when power off LED tens: Action selection when Modbus set frequency off 0: Save when power off 1: Clear when power off LED hundreds: The action selection when other communication set frequency off 0: Save when power off 1: Clear when power off		
P08.48	High bit of initial power consumption	This parameter is used to set the original value of the power consumption. Original value of power consumption =P08.48*1000+P08.49 (kWh) Setting range of P08.48: 0–59999 kWh (k) Setting range of P08.49: 0.0–999.9 kWh	0 kWh	○
P08.49	Low bit of initial power consumption		0.0 kWh	○
P08.50	Magnetic flux braking	This function code is used to enable magnetic flux. 0: Invalid. 100–150: The bigger the coefficient, the stronger the braking is. This VFD is used to increase the magnetic flux to decelerate the motor. The energy generated by the motor during braking can be converted into heat energy by increasing the magnetic flux. The VFD monitors the state of the motor continuously even during the magnetic flux period. So the magnetic flux can be used in the motor stop, as well as to change the rotation speed of the motor. Its other advantages are: Brake immediately after the stop command. It does not need to wait the magnetic flux weaken. Better cooling for motors. The current of the stator other than the rotor increases during magnetic flux braking, while the cooling of the stator is more effective than the rotor.	0	○
P08.51	Current adjustment coefficient on the input side	This function code is used to adjust the displayed current of the AC input side. Setting range: 0.00–1.00	0.56	○

P09 Group—PID control

Function code	Name	Detailed description	Default value	Modify
P09.00	PID reference source	When the frequency command selection (P00.06, P00. 07) is 7 or the voltage setting channel selection (P04.27) is 6, the running mode of the VFD is procedure PID controlled. The parameter determines the target reference channel during the PID procedures. 0: Set by P09.01 1: AI1 2: AI2 3: AI3 4: HDI 5: Multi-step speed set 6:Modbus communication set 7: PROFIBUS/CANopen communication set 8: Ethernet communication set 9: Reserved The setting target of procedure PID is a relative one, 100% of the setting equals to 100% of the response of the controlled system. The system is calculated according to the relative value (0–100.0%). **Note:** Multi-step speed reference, it is realized by setting P10 group parameters. PROFIBUS, Ethernet and CANopen communication setting need corresponding extension cards.	0	○
P09.01	PID value reference	When P09.00=0, set the parameter whose basic value is the response value of the system. The setting range: -100.0%–100.0%	0.0%	○
P09.02	PID feedback source	Select the PID channel by the parameter. 0: AI1 1: AI2 2: AI3 3: HDI 4: Modbus communication feedback 5: PROFIBUS/CANopen communication feedback 6: Ethernet communication feedback	0	○

Function code	Name	Detailed description	Default value	Modify
		7: Reserved **Note:** The reference and feedback channel cannot coincide, otherwise, PID cannot control effectively.		
P09.03	PID output feature	0: PID output is positive: when the feedback signal exceeds the PID reference, the output frequency of the VFD will decrease to balance the PID. For example, the strain PID control during wrapup 1: PID output is negative:When the feedback signal is stronger than the PID reference, the output frequency of the VFD will increase to balance the PID. For example, the strain PID control during wrapdown	0	○
P09.04	Proportional gain (Kp)	The function is applied to the proportional gain P of PID input. P determines the strength of the whole PID adjuster. The parameter of 100 means that when the offset of PID feedback and reference value is 100%, the adjusting range of PID adjustor is the Max. frequency (ignoring integral and differential function). The setting range: 0.00–100.00	1.00	○
P09.05	Integral time(Ti)	This parameter determines the speed of PID adjustor to carry out integral adjustment on the deviation of PID feedback and reference. When the deviation of PID feedback and reference is 100%, the integral adjustor works continuously after the time (ignoring the proportional effect and differential effect) to achieve the Max. Frequency (P00.03) or the Max. Voltage (P04.31). Shorter the integral time, stronger is the adjustment Setting range: 0.00–10.00s	0.10s	○
P09.06	Differential time(Td)	This parameter determines the strength of the change ratio when PID adjustor carries out integral adjustment on the deviation of PID feedback and reference. If the PID feedback changes 100% during the time, the adjustment of integral adjustor (ignoring the	0.00s	○

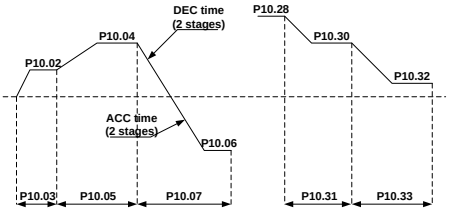
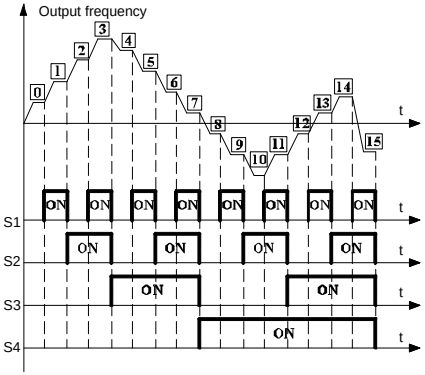
Function code	Name	Detailed description	Default value	Modify
		proportional effect and differential effect) is the Max. Frequency (P00.03) or the Max. Voltage (P04.31). Longer the integral time, stronger is the adjusting. Setting range: 0.00–10.00s		
P09.07	Sampling cycle(T)	This parameter means the sampling cycle of the feedback. The adjustor operates each sampling cycle. The longer the sapling cycle is, the slower the response is. Setting range: 0.000–10.000s	0.100s	○
P09.08	PID control deviation limit	The output of PID system is the maximum deviation relative to close loop reference. As shown in the diagram below, PID adjustor stops to work during the deviation limit. Set the function properly to adjust the accuracy and stability of the system.  Setting range: 0.0–100.0%	0.0%	○
P09.09	Output upper limit of PID	This parameter is used to set the upper and lower limit of the PID adjustor output. 100.0 % corresponds to max. frequency or the max. voltage of (P04.31) Setting range of P09.09: P09.10–100.0% Setting range of P09.10: -100.0%–P09.09	100.0%	○
P09.10	Output lower limit of PID		0.0%	○
P09.11	Detection value of feedback offline	Set the detection value of feedback offline, when the feedback detection value is smaller than or equals to the detected value, and the lasting time exceeds the set value in P09.12, the VFD will report “PID feedback offline fault” and the keypad will display PIDE.	0.0%	○
P09.12	Detection time of feedback offline		1.0s	○

Function code	Name	Detailed description	Default value	Modify
		 Setting range of P09.11: 0.0–100.0% Setting range of P09.12: 0.0–3600.0s		
P09.13	PID adjustment	0x0000–0x1111 LED ones: 0: Keep on integral adjustment when the frequency achieves the upper and low limit; the integration shows the change between the reference and the feedback unless it reaches the internal integral limit. When the trend between the reference and the feedback changes, it needs more time to offset the impact of continuous working and the integration will change with the trend. 1: Stop integral adjustment when the frequency achieves the upper and low limit. If the integration keeps stable, and the trend between the reference and the feedback changes, the integration will change with the trend quickly. LED tens: 0: The same with the setting direction; if the output of PID adjustment is different from the current running direction, the internal will output 0 forcedly. 1: Opposite to the setting direction; if the output of PID adjustment is different from the current running direction, carry out close loop adjustment output which is opposite to the current setting direction. LED hundreds: 0: According to the Max. frequency limiting 1: According to A frequency limiting LED thousands: 0: A+B frequency, buffer ACC/DEC for main reference A frequency source is invalid	0x0001	○

Function code	Name	Detailed description	Default value	Modify
		1: A+B frequency, buffer ACC/DEC for main reference A frequency source is valid and ACC/DEC is decided by P08.04.		
P09.14	Low frequency proportional gain (Kp)	0.00–100.00	1.00	○
P09.15	PID command ACC/DEC time	0.0–1000.0s	0.0s	○
P09.16	PID output filter time	0.000–10.000s	0.000s	○

P10 Group—Multi-step speed control

Function code	Name	Detailed description	Default value	Modify
P10.00	Simple PLC	0: Stop after running once. The VFD has to be commanded again after finishing a cycle. 1: Run at the final value after running once. After finish a signal, the VFD will keep the running frequency and direction of the last run. 2: Cycle running. The VFD will keep on running until receiving a stop command d. And then, the system will stop.	0	○
P10.01	Simple PLC memory	0: Power loss without memory 1: Power loss memory; PLC record the running stage and frequency when power loss.	0	○
P10.02	Multi-step speed 0	The frequency setting range of stage 0–15: -100.0–100.0%, 100.0% of the frequency setting corresponds to the max. frequency P00.03. The operation time setting of stage 0–15: 0.0–6553.5s(min), the time unit is determined by P10.37. When selecting simple PLC running, set P10.02–P10.33 to define the running frequency and time of all stages. **Note:** The symbol of multi-step determines the running direction of simple PLC. The negative value	0.0%	○
P10.03	The running time of step 0		0.0s	○
P10.04	Multi-step speed 1		0.0%	○
P10.05	The running time of step 1		0.0s	○
P10.06	Multi-step speed 2		0.0%	○

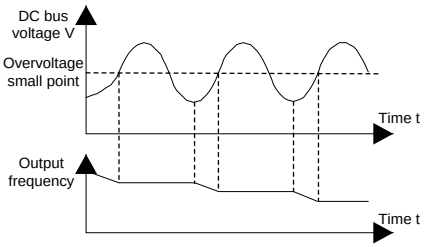
Function code	Name	Detailed description	Default value	Modify
P10.07	The running time of step 2	means reverse rotation.  If multi-step speed operation is selected, multi-step speeds are in the range of $-f_{max}$–f_{max} and it can be set continuously. The start-up and stop during multi-step speed is decided by P00.01. Goodrive300-02 series VFDs can set 16 stages speed, selected by the combination of multi-step terminals 1–4 (select the setting by S terminals, the corresponding function codes are P05.01–P05.09), corresponding to the speed 0 to speed 15.  When terminal 1, terminal 2, terminal 3, terminal 4=OFF, the frequency input manner is selected via code P00.06 or P00.07. When not all terminal 1, terminal 2, terminal 3, terminal 4 are off, it runs at multi-step which takes precedence of keypad, analog value, high-speed pulse, PID, communication frequency setting.	0.0s	○
P10.08	Multi-step speed 3		0.0%	○
P10.09	The running time of step 3		0.0s	○
P10.10	Multi-step speed 4		0.0%	○
P10.11	The running time of step 4		0.0s	○
P10.12	Multi-step speed 5		0.0%	○
P10.13	The running time of step 5		0.0s	○
P10.14	Multi-step speed 6		0.0%	○
P10.15	The running time of step 6		0.0s	○
P10.16	Multi-step speed 7		0.0%	○
P10.17	The running time of step 7		0.0s	○
P10.18	Multi-step speed 8		0.0%	○
P10.19	The running time of step 8		0.0s	○
P10.20	Multi-step speed 9		0.0%	○
P10.21	The running time of step 9		0.0s	○
P10.22	Multi-step speed 10		0.0%	○
P10.23	The running time of step 10		0.0s	○
P10.24	Multi-step speed 11		0.0%	○
P10.25	The running time of step 11		0.0s	○

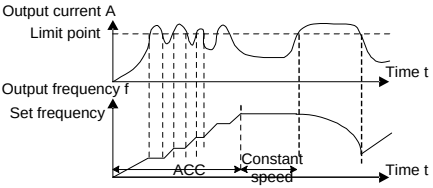
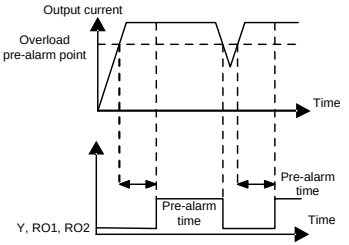
<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P10.26</td><td>Multi-step speed 12</td><td rowspan="9">The relationship between terminal 1, terminal 2, terminal 3, terminal 4 and multi-step speed is as following:
<table><tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr><tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td>Terminal 4</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td></tr><tr><td>Step</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>Terminal 1</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr><tr><td>Terminal 2</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr><tr><td>Terminal 3</td><td>OFF</td><td>OFF</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td>Terminal 4</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td>Step</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr></table></td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.27</td><td>The running time of step 12</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.28</td><td>Multi-step speed 13</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.29</td><td>The running time of step 13</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.30</td><td>Multi-step speed 14</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.31</td><td>The running time of step 14</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.32</td><td>Multi-step speed 15</td><td>0.0%</td><td>○</td></tr>
<tr><td>P10.33</td><td>The running time of step 15</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.34</td><td>Simple PLC 0 –7 step ACC/DEC time</td><td>Below is the detailed instruction:
<table><tr><th>Function code</th><th colspan="2">Binary bit</th><th>Step</th><th>ACC/DEC 1</th><th>ACC/DEC 2</th><th>ACC/DEC 3</th><th>ACC/DEC 4</th></tr><tr><td rowspan="8">P10.34</td><td>BIT1</td><td>BIT0</td><td>0</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT3</td><td>BIT2</td><td>1</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT5</td><td>BIT4</td><td>2</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT7</td><td>BIT6</td><td>3</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT9</td><td>BIT8</td><td>4</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT11</td><td>BIT10</td><td>5</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT13</td><td>BIT12</td><td>6</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT15</td><td>BIT14</td><td>7</td><td>00</td><td>01</td><td>10</td><td>11</td></tr></table></td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.35</td><td>Simple PLC 8 –15 step ACC/DEC time</td><td><table><tr><td rowspan="8">P10.35</td><td>BIT1</td><td>BIT0</td><td>8</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT3</td><td>BIT2</td><td>9</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT5</td><td>BIT4</td><td>10</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT7</td><td>BIT6</td><td>11</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT9</td><td>BIT8</td><td>12</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT11</td><td>BIT10</td><td>13</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT13</td><td>BIT12</td><td>14</td><td>00</td><td>01</td><td>10</td><td>11</td></tr><tr><td>BIT15</td><td>BIT14</td><td>15</td><td>00</td><td>01</td><td>10</td><td>11</td></tr></table></td><td>0x0000</td><td>○</td></tr>
</table>

Function code	Name	Detailed description	Default value	Modify
		After users select the corresponding ACC/DEC time, the combining 16 binary bit can be changed into hexadecimal bit, and then set the corresponding function codes. ACC/DEC time 1 is set by P00.11 and P00.12; ACC/DEC time 2 is set by P08.00 and P08.01; ACC/DEC time 3 is set by P08.02 and P08.03; ACC/DEC time 4 is set by P08.04 and P08.05. Setting range: -0x0000–0xFFFF		
P10.36	PLC restart	0: Restart from the first step; stop during running (cause by the stop command, fault or power loss), run from the first stage after restart. 1: Continue to run from the stop frequency; stop during running(cause by stop command and fault), the VFD will record the running time automatically, enter into the stage after restart and keep the remaining running at the setting frequency.	0	◎
P10.37	Multi-step time unit	0: Seconds; the running time of all steps is counted by second 1: Minutes; the running time of all steps is counted by minute	0	◎

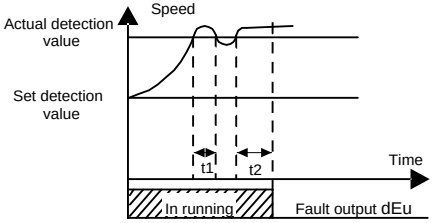
P11 Group—Protective parameters

Function code	Name	Detailed description	Default value	Modify
P11.00	Phase loss protection	0x00–0x11 LED ones: 0: Input phase loss protection disable 1: Input phase loss protection enable LED tens: 0: Output phase loss protection disable 1: Output phase loss protection enable	11	○
P11.01	Frequency decreasing at sudden power loss	0: Disable 1: Enable	0	○
P11.02	Frequency decreasing	Setting range: 0.00Hz/s–P00.03 After the power loss of the grid, the bus voltage drops to the sudden frequency decreasing point,	10.00Hz/s	○

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td></td><td>ratio at sudden power loss</td><td>the VFD begins to decrease the running frequency at P11.02 to make the VFD generate power again. The returning power can maintain the bus voltage to ensure a rated running of the VFD until the recovery of power.
<table><tr><td>Voltage degree</td><td>380V</td><td>500V</td><td>660V</td></tr><tr><td>Frequency decreasing threshold</td><td>460V</td><td>580V</td><td>800V</td></tr></table>Note:
1. Adjust the parameter properly to avoid the stopping caused by VFD protection during the switching of the grid.
2. Disable input phase loss protection to enable this function.</td><td></td><td></td></tr>
<tr><td>P11.03</td><td>Overvoltage stall protection</td><td>0: Disable
1: Enable
 
</td><td>1</td><td>○</td></tr>
<tr><td rowspan="3">P11.04</td><td rowspan="3">Voltage protection of overvoltage stall</td><td>120–150% (standard bus voltage) (380V)</td><td>136%</td><td rowspan="3">○</td></tr>
<tr><td>120–150% (standard bus voltage) (500V)</td><td>132%</td></tr>
<tr><td>120–150% (standard bus voltage) (660V)</td><td>120%</td></tr>
<tr><td>P11.05</td><td>Current limit action selection</td><td>The actual increasing ratio of motor speed is lower than the ratio of output frequency because of the big load during ACC running. It is necessary to take measures to avoid overcurrent fault and the VFD trips.
Ones: current limit
0: Invalid
1: Valid
Tens: overload alarm of hardware current limit
0: Valid
1: Invalid</td><td>01</td><td>◎</td></tr>
</table>

Function code	Name	Detailed description	Default value	Modify
P11.06	Automatic current limit	During the running of the VFD, it will detect the output current and compare it with the limit level defined in P11.06. If it exceeds the level, the VFD will run at stable frequency in ACC running, or the VFD will derate to run during the constant running. If it exceeds the level continuously, the output frequency will keep on decreasing to the lower limit. If the output current is detected to be lower than the limit level, the VFD will accelerate to run.  Setting range of P11.06: 50.0–200.0% (corresponding to the rated output current of the VFD) Setting range of P11.07: 0.00–50.00Hz/s	160.0%	◎
P11.07	Frequency decreasing ratio during current limit		10.00Hz/s	◎
P11.08	Overload pre-alarm of motor/VFD	The output current of the VFD or the motor is above P11.09 and the lasting time is beyond P11.10, overload pre-alarm will be output.  Setting range of P11.08: Enable and define the overload pre-alarm of the VFD or the motor. Setting range: 0x000–0x131 LED ones: 0: Overload pre-alarm of the motor, relative to the rated current of the motor 1: Overload pre-alarm of the VFD, relative to the rated output current of the VFD	0x000	○
P11.09	Overload pre-alarm detection		150%	○
P11.10	Overload pre-alarm detection time		1.0s	○

Function code	Name	Detailed description	Default value	Modify
		LED tens: 0: The VFD continues to work after underload pre-alarm 1: The VFD continues to work after underload pre-alarm and the VFD stops running after overload fault 2: The VFD continues to work after overload pre-alarm and the VFD stops running after underload fault 3: The VFD stops running after overload/underload fault LED hundreds : 0: Detection all the time 1: Detection in constant running Setting range of P11.09: P11.11–200% (relative value determined by the ones place of P11.08) Setting range of P11.10: 0.1–3600.0s		
P11.11	Underload pre-alarm detection	If the VFD current or the output current is lower than P11.11, and its lasting time is beyond P11.12, the VFD will output underload pre-alarm. Setting range of P11.11: 0–P11.09 (relative value determined by the ones place of P11.08) Setting range of P11.12: 0.1–3600.0s	50%	○
P11.12	Underload pre-alarm detection time		1.0s	○
P11.13	Output terminal action during fault	Select the action of fault output terminals on undervoltage and fault reset. 0x00–0x11 LED ones: 0: Action under fault undervoltage 1: No action under fault undervoltage LED tens: 0: Action during the automatic reset 1: No action during the automatic reset	0x00	○
P11.14	Speed deviation detection	0.0–50.0% Set the speed deviation detection time.	10.0%	○
P11.15	Speed deviation detection time	This parameter is used to set the speed deviation detection time.	0.5s	○

Function code	Name	Detailed description	Default value	Modify
		 t1<t2, so the VFD continues to work t2=P11.15 Setting range of P11.15: 0.0–10.0s		
P11.16	Automatic frequency decreasing at voltage drop	0: Invalid 1: Valid; ensure rated output torque when voltage drop	0	○

P12 Group—Motor 2

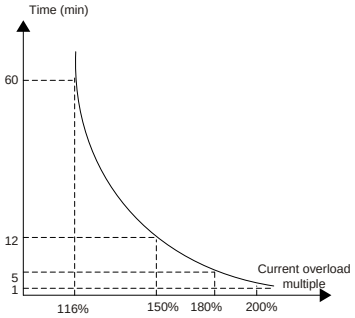
Function code	Name	Detailed description		Default value	Modify
P12.00	Motor type 2	0: Asynchronous motor 1: Synchronous motor **Note:** Switch the current motor by the switching channel of P08.31.		0	◎
P12.01	Rated power of asynchronous motor 2	0.1–3000.0kW	Set the parameter of the controlled asynchronous motor. In order to ensure the control performance, set the P12.01–P12.05 according to the name plate of asynchronous motor. Goodrive300-02 series VFDs provide the function of parameter autotuning. Correct parameter autotuning comes from the correct setting of the motor name plate. In order to ensure the control performance, please configure the motor according to the standard principles, if the gap	Depend on model	◎
P12.02	Rated frequency of asynchronous motor 2	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P12.03	Rated speed of asynchronous motor 2	1–36000rpm		Depend on model	◎
P12.04	Rated voltage of asynchronous motor 2	0–1200V		Depend on model	◎
P12.05	Rated current of asynchronous motor 2	0.8–6000.0A		Depend on model	◎

Function code	Name	Detailed description		Default value	Modify
			between the motor and the standard one is huge, the control performance of the VFD will decrease. **Note:** Resetting P12.01 can initialize P12.02–P12.05		
P12.06	Stator resistor of asynchronous motor 2	0.001–65.535Ω	After completing the motor parameter autotuning, the set value of P12.06–P12.10 will update automatically. As the basic parameters of high performance vector control, the parameters have a direct impact on control performance. **Note:** Users cannot modify the parameters freely.	Depend on model	○
P12.07	Rotor resistor of asynchronous motor 2	0.001–65.535Ω		Depend on model	○
P12.08	Leakage inductance of asynchronous motor 2	0.1–6553.5mH		Depend on model	○
P12.09	Mutual inductance of asynchronous motor 2	0.1–6553.5mH		Depend on model	○
P12.10	Non-load current of asynchronous motor 2	0.1–6553.5A		Depend on model	○
P12.11	Magnetic saturation coefficient 1 for the iron core of AM2	0.0–100.0%		80.0%	○
P12.12	Magnetic saturation coefficient 2 for the iron core of AM2	0.0–100.0%		68.0%	○
P12.13	Magnetic saturation coefficient 3 for the iron core of AM2	0.0–100.0%		57.0%	○

Function code	Name	Detailed description		Default value	Modify
P12.14	Magnetic saturation coefficient 4 for the iron core of AM2	0.0–100.0%		40.0%	○
P12.15	Rated power of synchronous motor 2	0.1–3000.0kW	Set the parameter of the controlled asynchronous motor. In order to ensure the controlling performance, set the P12.15–P12.19 according to the name plate of the asynchronous motor. The VFDs provide the function of parameter autotuning. Correct parameter autotuning comes from the correct setting of the motor name plate. In order to ensure the controlling performance, please configure the motor according to the standard principles, if the gap between the motor and the standard one is huge, the features of the VFD will decrease. **Note:** Reset the rated power of the motor(P12.15), initialize the motor parameter of P12.16– P12.19.	Depend on model	◎
P12.16	Rated frequency of synchronous motor 2	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P12.17	Number of poles pairs for synchronous motor 2	1–50		2	◎
P12.18	Rated voltage of synchronous motor 2	0–1200V		Depend on model	◎
P12.19	Rated current of synchronous motor 2	0.8–6000.0A		Depend on model	◎
P12.20	Stator resistor of synchronous motor 2	0.001–65.535Ω	After finish the motor parameter autotuning, the set value of	Depend on model	○

Function code	Name	Detailed description		Default value	Modify
P12.21	Direct axis inductance of synchronous motor 2	0.01–655.35mH	P12.20–P12.22 will renew automatically. These parameters are basic parameters controlled by vectors which directly impact the features. When P00.15=1, the set value of P12.23 can be updated through autotuning automatically, and there is no need to change the value of P12.23; when P00.15=2, the set value of P12.23 cannot be updated through autotuning, please account and update the value of P12.23. **Note:** Users cannot modify the parameters freely.	Depend on model	○
P12.22	Quadrature axis inductance of synchronous motor 2	0.01–655.35mH		Depend on model	○
P12.23	Back EMF constant of synchronous motor 2	When P00.15=2, the set value of P12.23 cannot be updated by autotuning, please count according to the following method. The counter-electromotive force constant can be counted according to the parameters on the name plate of the motor. There are three ways to count: 1. If the name plate designates the counter-electromotive force constant Ke, then: $E=(Ke*n_N*2\pi)/60$ 2. If the name plate designates the counter-electromotive force constant E'(V/1000r/min), then: $E=E'*n_N/1000$ 3. If the name plate does not designate the above parameters, then: $E=P/\sqrt{3}*I$ In the above formulas:		300	○

Function code	Name	Detailed description	Default value	Modify
		n_N is the rated rotation speed, P is the rated power and I is the rated current. Setting range: 0–10000		
P12.24	Initial pole position of synchronous motor 2 (reserved)	0–FFFFH (reserved)	0x0000	●
P12.25	Identification current of synchronous motor 2 (reserved)	0%–50%(the rated current of the motor)(reserved)	10%	●
P12.26	Motor 2 overload protection	0: No protection 1: Common motor (with low speed compensation) 2: Variable frequency motor (without low speed compensation)	2	◎
P12.27	Motor 2 overload protection coefficient	Times of motor overload M=Iout/(In*K) In is the rated current of the motor, Iout is the output current of the VFD and K is the motor protection coefficient. So, the bigger the value of K is, the smaller the value of M is. When M=116%, protection is performed after motor overload lasts for 1 hour; when M=150%, protection is performed after motor overload lasts for 12 minutes; when M=180%, protection is performed after motor overload lasts for 5 minutes; when M=200%, protection is performed after motor overload lasts for 60 seconds; and when M≥400%, protection is performed immediately.	100.0%	○

Function code	Name	Detailed description	Default value	Modify
		 Setting range: 20.0%–120.0%		
P12.28	Correction coefficient of motor 2 power	Correct the power displaying of motor 2. Only impact the displaying value other than the control performance of the VFD. Setting range: 0.00–3.00	1.00	○
P12.29	Parameter display of motor 2	0: Display according to the motor type: only the parameters relative to the current motor type are displayed for the convenient for the customers in this mode. 1: All parameters are displayed: all parameters are displayed in this mode.	0	○

P13 Group—Synchronous motor control

Function code	Name	Detailed description	Default value	Modify
P13.00	Reduction coefficient of source current	0.0–100.0%	80.0%	○
P13.01	Original pole test mode	0: No test 1: High-frequency superposition (reserved) 2: Pulse superposition	0	◎
P13.02	Source current 1	Source current is the positioning current of the magnetic pole position. Source current 1 is valid under the frequency point of current shifting. Increasing the value can raise the starting torque. Setting range: 0.0%–100.0% (rated current of the motor)	20.0%	○

Function code	Name	Detailed description	Default value	Modify
P13.03	Source current 2	Source current is directional current of the magnetic pole position. Source current 2 is valid under the frequency point of current shifting. There is no need to modify the value generally. Setting range: 0.0%–100.0% (rated current of the motor)	10.0%	○
P13.04	Shift frequency of source current	Valid frequency shifting point between source current 1 and current 2. Setting range: 0.00Hz–P00.03	10.00Hz	○
P13.05	Superposing frequency (reserved)	200–1000Hz	500Hz	◎
P13.06	Pulse superposing voltage	0.0–300.0% (rated voltage of the motor)	40.0%	◎
P13.07	Reserved	0–65535	0	○
P13.08	Control parameter 1	0–65535	0	○
P13.09	Control parameter 2	0–655.35	2.00	○
P13.10	Reserved			
P13.11	Maladjust -ment detection time	Adjust the response of anti-maladjustment. Bigger load inertia may increase the value, but the response will be slower. Setting range: 0.0–10.0s	0.5s	○
P13.12	High frequency compensation coefficient	When the motor speed is faster than the rated speed, the parameter is valid, if vibration occurs to the motor, please adjust the parameter. Setting range: 0–100.0%	0.0%	○
P13.13	Braking current of short-circuit	When P01.00=0 during the starting of the VFD, set P13.14 to a non-zero value to enter the short circuit braking. When the running frequency is lower than P01.09 during the stopping of the VFD, set 13.15 to a non-zero value to enter into stopping short circuited	0.0%	○
P13.14	Braking retention time before starting		0.00s	○

Function code	Name	Detailed description	Default value	Modify
P13.15	Braking retention time when stopping	braking and then carry out the DC braking at the time set by P01.12 (refer to the instruction of P01.09 –P01.12) . Setting range of P13.13: 0.0–150.0% (of the rated output current of the VFD) Setting range of P13.14: 0.00–50.00s Setting range of P13.15: 0.00–50.00s	0.00s	○

P14 Group—Serial communication

Function code	Name	Detailed description	Default value	Modify
P14.00	Local communication address	The setting range: 1–247 When the master is writing the frame, the communication address of the slave is set to 0; the address is the communication address. All slaves on the Modbus fieldbus can receive the frame, but the salve does not answer. The communication of the drive is unique in the communication net. This is the fundamental for the point to point communication between the upper computer and the drive. **Note:** The address of the slave cannot be set to 0.	1	○
P14.01	Communication baud ratio	Set the digital transmission speed between the upper computer and the VFD. 0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS 7: 115200BPS **Note:** The baud rate between the upper computer and the VFD must be the same. Otherwise, the communication is not applied. The bigger the baud rate, the quicker the communication speed.	4	○

Function code	Name	Detailed description	Default value	Modify
P14.02	Digital bit checkout	The data format between the upper computer and the VFD must be the same. Otherwise, the communication is not applied. 0: No check (N,8,1) for RTU 1: Odd check (E,8,1) for RTU 2: Even check (O,8,1) for RTU 3: No check (N,8,2) for RTU 4: Odd check (E,8,2) for RTU 5: Even check(O,8,2) for RTU	1	○
P14.03	Answer delay	0–200ms The interval time when the drive receives the data and sends it to the upper computer. If the answer delay is shorter than the system processing time, then the answer delay time is the system processing time; if the answer delay is longer than the system processing time, then after the system deals with the data, wait until achieving the answer delay time to send the data to the upper computer.	5	○
P14.04	Fault time of communication overtime	0.0 (invalid), 0.1–60.0s When the function code is set as 0.0, the communication overtime parameter is invalid. When the function code is set as non-zero, if the interval time between two communications exceeds the communication overtime, the system will report “485 communication faults” (CE). Generally, set it as invalid; set the parameter in the continuous communication to monitor the communication state.	0.0s	○
P14.05	Transmission fault processing	0: Alarm and stop freely 1: No alarm and continue to run 2: No alarm and stop according to the stop mode (only under the communication control) 3: No alarm and stop according to the stop mode (under all control modes)	0	○
P14.06	Communication processing	0x00–0x11 LED ones: Write action 0: Write with response: the VFD will respond to all	0x00	○

Function code	Name	Detailed description	Default value	Modify
		reading and writing commands of upper computer. 1: Write without response: the VFD only responds to the reading command other than the writing command of upper computer. The communication efficiency can be increased by this method. LED tens: Communication encryption processing 0: Communication encrypting is invalid 1: Communication encrypting is valid		

P15 Group—PROFIBUS function

Function code	Name	Detailed description	Default value	Modify
P15.00	Module type	0: PROFIBUS 1: CANopen Select communication protocol	0	◎
P15.01	Module address	0–127 This function code is used to designate the address of the VFD. **Note:** 0 is the broadcast address, when set it as broadcast address, only receive the radio command of the upper computer other than answering the upper computer.	2	◎
P15.02	PZD2 receiving	0: Invalid 1: Setting frequency (0–Fmax(unit: 0.01Hz)) 2: PID reference, range(0–1000, 1000 corresponds to 100.0%) 3: PID feedback, range(0–1000, 1000 corresponds to 100.0%) 4: Torque setting (-3000–3000, 1000 corresponds to 100.0% the rated current of the motor) 5: Upper frequency of forward rotation (0–Fmax (unit: 0.01Hz)) 6: Upper frequency of reverse rotation (0–Fmax (unit: 0.01Hz)) 7: Electromotion torque upper limit (0–3000,1000 corresponds to 100.0%of the rated current of the	0	○
P15.03	PZD3 receiving		0	○
P15.04	PZD4 receiving		0	○
P15.05	PZD5 receiving		0	○
P15.06	PZD6 receiving		0	○
P15.07	PZD7 receiving		0	○
P15.08	PZD8 receiving		0	○
P15.09	PZD9 receiving		0	○
P15.10	PZD10 receiving		0	○
P15.11	PZD11 receiving		0	○

Function code	Name	Detailed description	Default value	Modify
P15.12	PZD12 receiving	motor) 8: Braking torque upper limit (0–2000, 1000 corresponds to 100.0% of the rated current of the motor) 9: Virtual input terminals command Range: 0x000–0x1FF 10: Virtual output terminals command Range: 0x00–0x0F 11: Voltage setting value (special for V/F separation)(0–1000, 1000 corresponds to 100.0% the rated voltage of the motor) 12: AO output set value 1 (-1000–1000,1000 corresponds to 100.0%) 13: AO output set value 2 (-1000–1000,1000 corresponds to 100.0%) 14–20: Reserved	0	○
P15.13	PZD2 sending	0: Invalid 1: Running frequency (*100, Hz) 2: Setting frequency (*100, Hz) 3: Bus voltage (*10, V) 4: Output voltage (*1, V) 5: Output current (*10, A) 6: Output torque actual value (*10, %) 7: Output power actual value (*10, %) 8: Running rotating speed(*1, RPM) 9: Running linear speed (*1, m/s) 10: Ramp reference frequency 11: Fault code 12: AI1 value (*100, V) 13: AI2 value (*100, V) 14: AI3 value (*100, V) 15: PULSE frequency value (*100, kHz) 16: Terminals input state 17: Terminals output state 18: PID reference (*100, %) 19: PID feedback (*100, %) 20: Motor rated torque 21: Control word	0	○
P15.14	PZD3 sending		0	○
P15.15	PZD4 sending		0	○
P15.16	PZD5 sending		0	○
P15.17	PZD6 sending		0	○
P15.18	PZD7 sending		0	○
P15.19	PZD8 sending		0	○
P15.20	PZD9 sending		0	○
P15.21	PZD10 sending		0	○
P15.22	PZD11 sending		0	○
P15.23	PZD12 sending		0	○

Function code	Name	Detailed description	Default value	Modify
P15.24	Temporarily variable 1 for PZD sending	0–65535	0	○
P15.25	Fault time of DP communication overtime	0.0 (invalid), 0.1–60.0s When this function code is set as 0.0, this function is invalid. When the function code is set as nonzero value, if the interval time between two adjacent communications exceeds the communication overtime, the system will report "PROFIBUS/CANopen communication fault" (E-DP).	0.0s	○
P15.26	Fault time of CANopen communication overtime	0.0 (invalid), 0.1–60.0s When this function code is set as 0.0, this function is invalid. When the function code is set as nonzero value, if the interval time between two adjacent communication exceeds the communication overtime, the system will report "CANopen communication fault" (E-CAN)	0.0s	
P15.27	CANopen baud rate	0: 1000k 1: 800k 2: 500k 3: 250k 4: 125k 5: 100k 6: 50k 7: 20k	0	●

P16 Group—Ethernet function

Function code	Name	Detailed description	Default value	Modify
P16.00	Speed setting of the Ethernet communication	0: Self-adapting 1: 100M full duplex 2: 100M semiduplex 3: 10M full duplex 4: 10M semiduplex	0	◎

Function code	Name	Detailed description	Default value	Modify
		The function code is used to set the Ethernet communication speed.		
P16.01	IP address 1	0–255 Set the IP address of Ethernet communication The format of IP address: P16.09.P16.10.P16.11.P16.12 For example: IP address is 192.168.0.1.	192	◎
P16.02	IP address 2		168	◎
P16.03	IP address 3		0	◎
P16.04	IP address 4		1	◎
P16.05	Subnet mask 1	0–255 Set the subnet mask of Ethernet communication. The format of IP subnet mask: P16.13.P16.14.P16.15.P16.16. For example: The mask is 255.255.255.0.	255	◎
P16.06	Subnet mask 2		255	◎
P16.07	Subnet mask 3		255	◎
P16.08	Subnet mask 4		0	◎
P16.09	Gateway 1	0–255 Set the gateway of Ethernet communication	192	◎
P16.10	Gateway 2		168	◎
P16.11	Gateway 3		1	◎
P16.12	Gateway 4		1	◎

P17 Group—Monitoring function

Function code	Name	Detailed description	Default value	Modify
P17.00	Setting frequency	Display current set frequency of the VFD Range: 0.00Hz–P00.03	0.00Hz	●
P17.01	Output frequency	Display current output frequency of the VFD Range: 0.00Hz–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	Display current ramp reference frequency of the VFD Range: 0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	Display current output voltage of the VFD Range: 0–1200V	0V	●
P17.04	Output current	Display current output current of the VFD Range: 0.0–3000.0A	0.0A	●
P17.05	Motor speed	Display the rotation speed of the motor. Range: 0–65535RPM	0RPM	●
P17.06	Torque current	Display current torque current of the VFD Range: -3000.0–3000.0A	0.0A	●

<table>
<tr><th>Function code</th><th>Name</th><th>Detailed description</th><th>Default value</th><th>Modify</th></tr>
<tr><td>P17.07</td><td>Exciting current</td><td>Display current exciting current of the VFD
Range: -3000.0–3000.0A</td><td>0.0A</td><td>●</td></tr>
<tr><td>P17.08</td><td>Motor power</td><td>Display current power of the motor. 100.0% corresponds to motor rated power, positive in electromotion state and negative in power generation.
Setting range: -300.0%–300.0% (relative to the rated power of the motor)</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.09</td><td>Output torque</td><td>Display the current output torque of the VFD. 100.0% corresponds to motor rated torque, positive in electromotion state and negative in power generation.
Range: -250.0–250.0%</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.10</td><td>Evaluated motor frequency</td><td>Evaluate the motor rotor frequency on open loop vector.
Range: 0.00–P00.03</td><td>0.00Hz</td><td>●</td></tr>
<tr><td>P17.11</td><td>DC bus voltage</td><td>Display current DC bus voltage of the VFD.
Range: 0.0–2000.0V</td><td>0.0V</td><td>●</td></tr>
<tr><td>P17.12</td><td>Digital input terminals state</td><td>Display current switch input terminals state of the VFD.<table><tr><td></td><td>BIT8</td><td>BIT7</td><td>BIT6</td><td>BIT5</td></tr><tr><td></td><td>HDI</td><td>S8</td><td>S7</td><td>S6</td></tr><tr><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>S5</td><td>S4</td><td>S3</td><td>S2</td><td>S1</td></tr></table>Range: 0000–01FF</td><td>0</td><td>●</td></tr>
<tr><td>P17.13</td><td>Digital output terminals state</td><td>Display current switch output terminals state of the VFD.<table><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RO2</td><td>RO1</td><td>HDO</td><td>Y</td></tr></table>Range: 0000–000F</td><td>0</td><td>●</td></tr>
<tr><td>P17.14</td><td>Digital adjustment</td><td>Display the adjustment through the keypad of the VFD.
Range : 0.00Hz–P00.03</td><td>0.00Hz</td><td>●</td></tr>
<tr><td>P17.15</td><td>Torque reference</td><td>Display the torque reference, the percentage to the current rated torque of the motor.
Setting range: -300.0%–300.0% (the rated current of the motor)</td><td>0.0%</td><td>●</td></tr>
</table>

Function code	Name	Detailed description	Default value	Modify
P17.16	Linear speed	Display the current linear speed of the VFD. Range: 0–65535	0	●
P17.17	Length value	Display the current length of the VFD. Range: 0–65535	0	●
P17.18	Count value	Display the current count value of the VFD. Range: 0–65535	0	●
P17.19	AI1 input voltage	Display analog AI1 input signal. Range: 0.00–10.00V	0.00V	●
P17.20	AI2 input voltage	Display analog AI2 input signal. Range: 0.00–10.00V	0.00V	●
P17.21	AI3 input voltage	Display analog AI2 input signal. Range: -10.00–10.00V	0.00V	●
P17.22	HDI input frequency	Display HDI input frequency. Range: 0.000–50.000kHz	0.000 kHz	●
P17.23	PID reference	Display PID reference value. Range: -100.0–100.0%	0.0%	●
P17.24	PID feedback	Display PID response value. Range: -100.0–100.0%	0.0%	●
P17.25	Power factor of the motor	Display the current power factor of the motor. Range: -1.00–1.00	0.00	●
P17.26	Current running time	Display the current running time of the VFD. Range: 0–65535min	0min	●
P17.27	Current step of the multi-step speed	Display the current step of the multi-step speed Range: 0–15	0	●
P17.28	ASR controller output	The percentage of the rated torque of the relative motor, display ASR controller output Range: -300.0%–300.0% (the rated current of the motor)	0.0%	●
P17.29	Magnetic pole angle of SM	Display synchronous motor Magnetic pole angle Range: 0.0–360.0	0.0	●
P17.30	Phase compensation of SM	Display synchronous motor phase compensation Range: -180.0–180.0	0.0	●
P17.31	High-frequency superimposed current of SM	Display synchronous motor high-frequency Superimposed current Range: 0.0–200.0% (the rated current of the motor)	0.0%	●

Function code	Name	Detailed description	Default value	Modify
P17.32	Magnetic flux linkage	Display the magnetic flux linkage of the motor. Range: 0.0–200.0%	0.0%	●
P17.33	Exciting current reference	Display the exciting current reference in the vector control mode. Range: -3000.0–3000.0A	0.0A	●
P17.34	Torque current reference	Display the torque current reference in the vector control mode. Range: -3000.0–3000.0A	0.0A	●
P17.35	AC current	Display the value of inlet current in AC side. Range: 0.0–5000.0A	0.0A	●
P17.36	Output torque	Display the output torque, positive in electromotion state and negative in power generation. Range: -3000.0Nm–3000.0Nm	0.0Nm	●
P17.37	Count value of motor overload	0–100 (100 reports OL1 fault)	0	●
P17.38	PID output	-100.00–100.00%	0.00%	●
P17.39	Wrong download of parameters	0.00–99.99	0.00	●

7 Basic operation instruction

7.1 What this chapter contains

This chapter describes the internal function modules of the VFD in details.

	✧ Check all terminals are connected properly and tightly. ✧ Check that the power of the motor corresponds to that of the VFD.

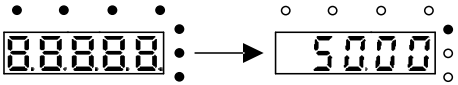
7.2 First powering on

Check before powering on

Please check according to the installation list in Chapter 2 "Quick start-up".

Original powering operation

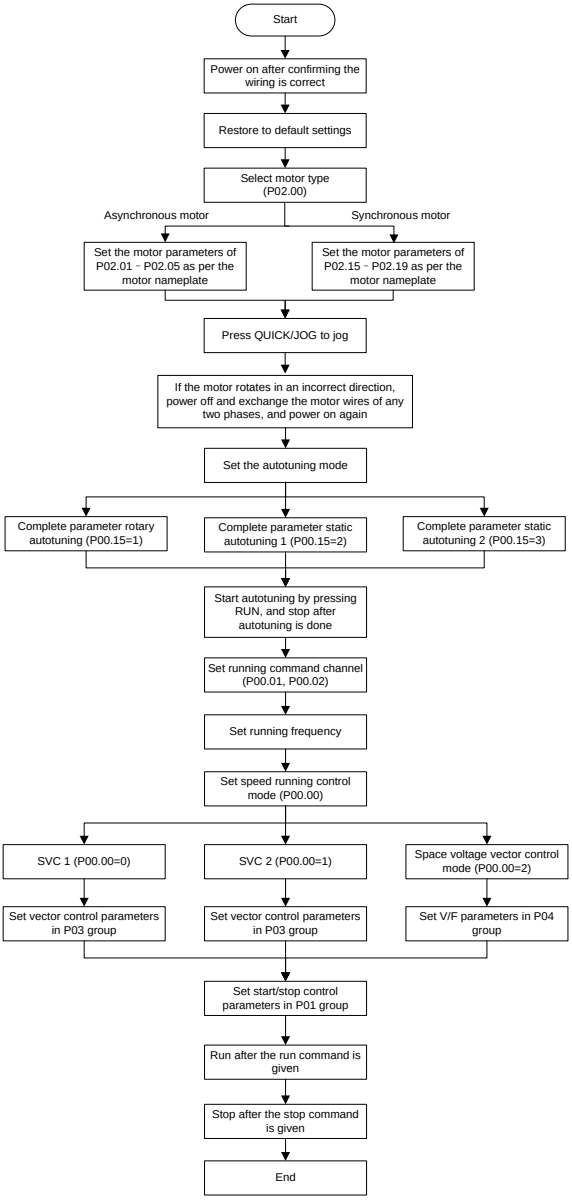
Check to ensure there is no mistake in wiring and power supply, switch on the air switch of the AC power supply on the input side of the VFD to power on the VFD. 8.8.8.8.8. will be displayed on the keypad, and the contactor closes normally. When the character on the nixie tubs changes to the set frequency, the VFD has finished the initialization and it is in the stand-by state.



"88888" is displayed and all the seven indicators are on.

Standby state

Below diagram shows the first operation: (take motor 1 as the example)



Note: If a fault occurs, please do as 8 “Fault tracking” to judge the reason and settle the issue.

Besides P00.01 and P00.02, terminal command setting can also be used to set the running command channel.

Current running command channel P00.01	Multi-function terminal 36 Switch to keypad	Multi-function terminal 37 Switch to terminal	Multi-function terminal 38 Switch to communication
Keypad	/	Terminal	Communication
Terminal	Keypad	/	Communication
Communication	Keypad	Terminal	/

Note: "/" means the multi-function terminal is invalid on the current reference channel.

Relative parameters table:

Function code	Name	Detailed description	Default value
P00.00	Speed control mode	0: SVC 0 1: SVC 1 2: SVPWM control mode (apply to AM, SM)	1
P00.01	Running command channel	0: Keypad running command channel (LED off) 1: Terminal running command channel (LED flickering) 2: Communication running command channel (LED on)	0
P00.02	Communication running commands	0: Modbus communication channel 1: PROFIBUS/CANopen communication channel 2: Ethernet communication channel 3: Reserved	0
P00.15	Motor parameter autotuning	0: No operation 1: Rotation autotuning 2: Static autotuning 1 (autotune totally) 3: Static autotuning 2 (autotune partially)	0
P00.18	Function restore parameter	0: No operation 1: Restore the default value 2: Cancel the fault record	0
P02.00	Motor type 1	0: Asynchronous motor 1: Synchronous motor	0
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Depend on model
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz

Function code	Name	Detailed description	Default value
P02.03	Rated speed of asynchronous motor 1	1–36000rpm	Depend on model
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Depend on model
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A	Depend on model
P02.15	Rated power of synchronous motor 1	0.1–3000.0kW	Depend on model
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.17	Number of poles pairs for synchronous motor 1	1–50	2
P02.18	Rated voltage of synchronous motor 1	0–1200V	Depend on model
P02.19	Rated current of synchronous motor 1	0.8–6000.0A	Depend on model
P05.01–P05.09	Multi-function digital input terminals (S1–S8, HDI)	36: Shift the command to the keypad 37: Shift the command to the terminal 38: Shift the command to the communication	
P07.01	Parameter copy	The function code determines the manner of parameters 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	0

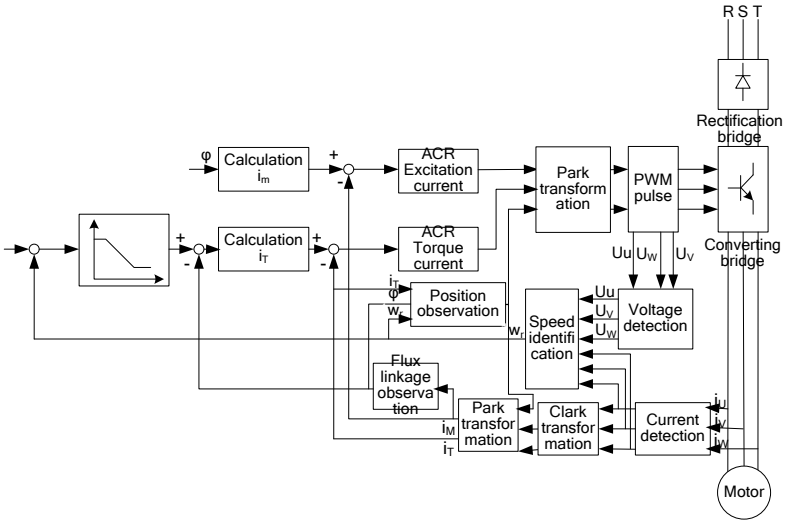
Function code	Name	Detailed description	Default value
		address (excluding the motor parameter of P02 and P12 group) 4: Download the keypad function parameters to local address (only for the motor parameter of P02 and P12 group)	
P07.02	QUICK/JOG function selection	0: No function 1: Jogging 2: Shift the display state by the shifting key 3: Shift between forward rotations and reverse rotations 4: Clear UP/DOWN settings 5: Coast to stop 6: Shift the reference manner of running commands 7: Quick commission mode (commission according to the non-factory parameter)	1

7.3 Vector control

Because asynchronous motors have the characteristics of high stage, nonlinear, strong coupling and various variables, the actual control of the asynchronous motor is very difficult. Vector control is mainly used to settle this problem with the theme of that divide the stator current vector into exciting current (the current heft generating internal magnetic field of the motor) and torque current (the current heft generating torque) by controlling and measuring the stator current vector according to the principles of beamed magnetic field to control the range and phase of these two hefts. This method can realize the decoupling of exciting current and torque current to adjust the high performance of asynchronous motors.

The VFDs are embedded speedless sensor vector control calculation. Because the core calculation of vector control is based on exact motor parameter models, the accuracy of motor parameter will impact on the performance of vector control. It is recommended to input the motor parameters and carry out autotune before vector running.

Because the vector control calculation is very complicated, high technical theory is needed for the user during internal autotune. It is recommended to use the specific function parameters in vector control with cautions.



Function code	Name	Detailed description	Default value
P00.00	Speed control mode	0: SVC 0 (apply to AM, SM) 1: SVC 1 (apply to AM) 2: SVPWM control mode (apply to AM, SM)	1
P00.15	Motor parameter autotuning	0: No operation 1: Rotation autotuning 2: Static autotuning 1 (autotune totally) 3: Static autotuning 2 (autotune partially)	0
P02.00	Motor type 1	0: Asynchronous motor 1: Synchronous motor	0
P03.00	Speed loop proportional gain 1	0–200.0	20.0
P03.01	Speed loop integral time 1	0.000–10.000s	0.200s
P03.02	Low switching frequency	0.00Hz–P03.05	5.00Hz
P03.03	Speed loop proportional gain 2	0–200.0	20.0

Function code	Name	Detailed description	Default value
P03.04	Speed loop integral time 2	0.000–10.000s	0.200s
P03.05	High switching frequency	P03.02–P00.03 (Max. output frequency)	10.00Hz
P03.06	Speed loop output filter	0–8 (corresponding to 0–2^8/10ms)	0
P03.07	Compensation coefficient of electromotion slip	50%–200%	100%
P03.08	Compensation coefficient of braking slip	50%–200%	100%
P03.09	Current loop proportional coefficient P	0–65535	1000
P03.10	Current loop integral coefficient I	0–65535	1000
P03.11	Torque setting method	0: Torque control is invalid 1: Keypad setting torque (P03.12) 2: Analog AI1 setting torque 3: Analog AI2 setting torque 4: Analog AI3 setting torque 5: Pulse frequency HDI setting torque 6: Multi-step torque setting 7: Modbus communication setting torque 8: PROFIBUS/CANopen communication setting torque 9: Ethernet communication setting torque 10: Reserved **Note:** Setting modes 2–6, 100% corresponds to three times of the rated current of the motor.	0
P03.12	Keypad setting torque	-300.0%–300.0% (rated current of the motor)	50.0%
P03.13	Torque reference filter time	0.000–10.000s	0.010s

Function code	Name	Detailed description	Default value
P03.14	Upper frequency of forward rotation in torque control	0: Keypad (P03.16 sets P03.14, P03.17 sets P03.15) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI setting upper-limit frequency 5: Multi-step setting upper-limit frequency 6: Modbus communication setting upper-limit frequency 7: PROFIBUS/CANopen communication setting upper-limit frequency 8: Ethernet communication setting upper-limit frequency 9: Reserved **Note:** Setting modes 1–9, 100% corresponds to the maximum frequency.	0
P03.15	Upper frequency of reverse rotation in torque control	0: Keypad (set by P03.17) 1–9: The same as P03.14	0
P03.16	Keypad setting for upper frequency of forward rotation	Setting range: 0.00Hz–P00.03 (Max. output frequency)	50.00Hz
P03.17	Keypad setting for upper frequency of reverse rotation		50.00Hz
P03.18	Upper electromotion torque source	0: Keypad setting upper-limit frequency (set by P03.20) 1: AI1 2: AI2 3: AI3 4: HDI 5: Modbus communication 6: PROFIBUS/CANopen communication 7: Ethernet communication 8: Reserved **Note:** Setting modes 1–4, 100% corresponds to three times of the motor current.	0

Function code	Name	Detailed description	Default value
P03.19	Upper braking torque source	0: Keypad setting upper-limit frequency (set by P03.21) 1–8: The same as P03.18	0
P03.20	Keypad setting of electromotion torque	0.0–300.0% (motor rated current)	180.0%
P03.21	Keypad setting of braking torque		180.0%
P03.22	Weakening coefficient in constant power zone	0.1–2.0	0.3
P03.23	Lowest weakening point in constant power zone	10%–100%	20%
P03.24	Max. voltage limit	0.0–120.0%	100.0%
P03.25	Pre-exciting time	0.000–10.000s	0.300s
P17.32	Magnetic flux linkage	0.0%–200.0%	0.0%

7.4 SVPWM control

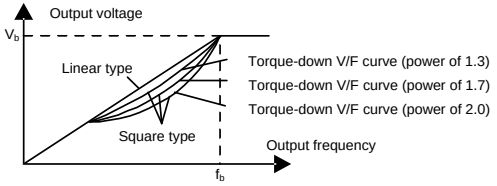
Goodrive300-02 series VFDs provide internal SVPWM control which can be used in the cases where it does not need high control accuracy. It is also recommended to use SVPWM control when one VFD drives multiple motors.

Goodrive300-02 series VFDs provide multiple V/F curve modes. The user can select the corresponding V/F curve to the site needs. Or they can set the corresponding V/F curve to their own needs.

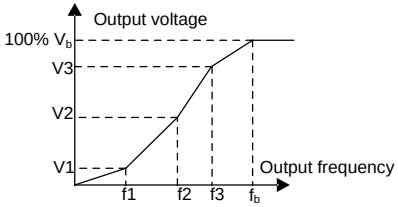
Recommendations:

For the load of constant torque, such as the conveyor belt which runs linearly, it is properly to select linear V/F curve because it needs constant torque.

For the load featuring decreasing moment, such as fan and water pump, as the relation between its actual torque and speed is squared or cubed, it is recommended to adopt the V/F curve corresponds to power 1.3, 1.7 or 2.0.



Goodrive300-02 series VFDs provide multi-dots V/F curve, the user can change the output V/F curve by setting the voltage and frequency of three middle dots. The whole curve consists of 5 dots. The starting dot is (0Hz, 0V), and the ending dot is (the basic frequency of the motor, the rated voltage of the motor). During the setting processing: $0 \le f_1 \le f_2 \le f_3 \le$ the basic frequency of the motor; $0 \le V_1 \le V_2 \le V_3 \le$ the rated voltage of the motor.



Goodrive300-02 series VFDs provide special function code for SVPWM control mode which can improve the performance of SVPWM control by means of setting.

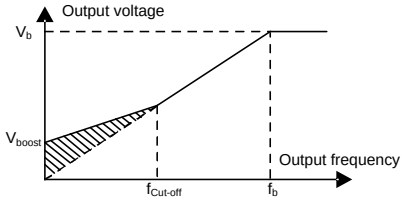
1. Torque boost

Torque boost function can compensate the performance of low speed torque during SVPWM control. The VFD will adjust the torque boost according to the actual load.

Note:

The torque boost takes effect only when the frequency is under the frequency of torque boost.

If the torque boost is too big, low frequency vibration or overcurrent fault may occur. Please lower the torque boost.



2. Energy-saving running

In the actual operation, the VFD can search by itself to achieve a better effect point. The VFD can work with high effect to save energy.

Note:

This function is usually used in the cases where the load is light or empty.

If the load transients frequently, this function is not appropriate to be selected.

3. V/F slips compensation gain

SVPWM control belongs to the open loop mode. If the load of the motor transients suddenly, the fluctuation of the rotation speed may occur. In the cases where the high accuracy speed is needed, slip compensation gain (internal output adjustment) can be set to compensate the speed change caused by load fluctuation.

Setting range of slip compensation gain: 0–200%, of which 100% corresponds to the rated slip frequency.

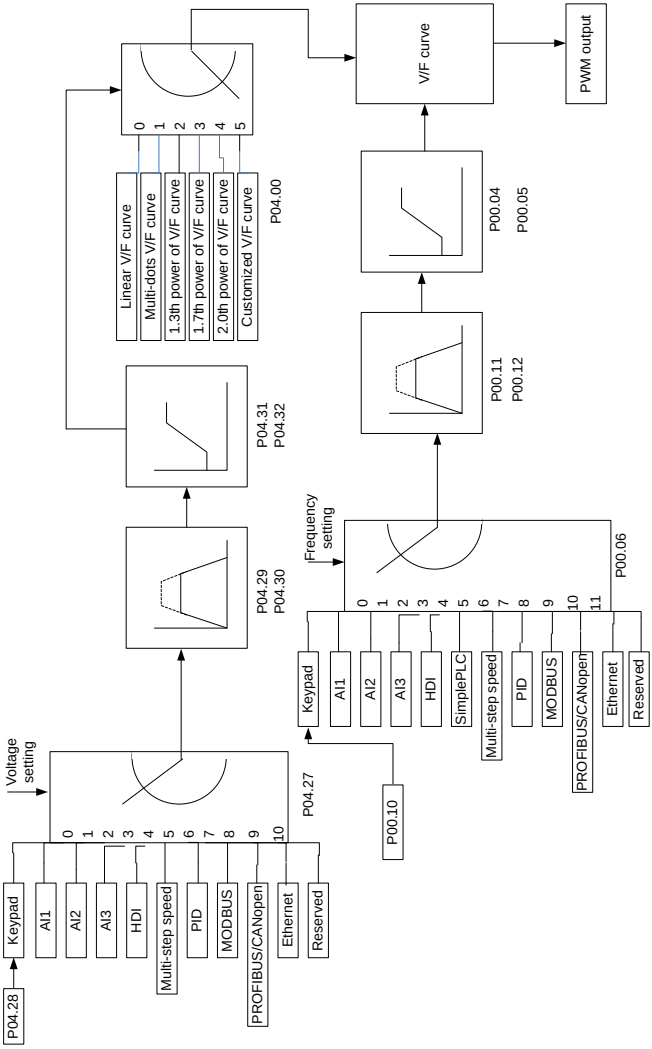
Note: Rated slip frequency=(rated synchronous rotation speed of the motor-rated rotation speed of the motor)*number of pole pairs/60.

4. Vibration control

Motor vibration occurs frequently when applying SVPWM control mode in the cases where high power is needed. In order to settle this problem, Goodrive300-02 series VFDs add two function codes which are set to control the vibration factors. The user can set the corresponding function code according to the vibration frequency.

Note: Bigger the set value, more effective is the control. If the set value is too big, overcurrent may occur to the motor.

5. User-defined V/F curve (V/F separation) function



When the user selects the user-defined V/F curve function in Goodrive300-02 series VFDs, they can set the reference channel of voltage and frequency and the corresponding ACC/DEC time, or the two can combine to form a real-time curve.

Note: The application of V/F curve separation can be used in many cases with various kinds of power supply of the VFD. But the users should set and adjust the parameters with caution. Incorrect parameters may cause damage to the VFD.

Function code	Name	Detailed description	Default value
P00.00	Speed control mode	0: SVC 0 (apply to AM, SM) 1: SVC 1 (apply to AM) 2: SVPWM control mode (apply to AM, SM)	1
P00.03	Max. output frequency	P00.04–400.00Hz	50.00Hz
P00.04	Upper limit of running frequency	P00.05–P00.03	50.00Hz
P00.05	Lower limit of running frequency	0.00Hz–P00.04	0.00Hz
P00.11	ACC time 1	0.0–3600.0s	Depend on model
P00.12	DEC time 1	0.0–3600.0s	Depend on model
P02.00	Motor type 1	0: Asynchronous motor 1: Synchronous motor	0
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Depend on model
P04.00	Motor 1 V/F curve setting	0: Straight line V/F curve 1: Multi-dots 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
P04.01	Torque boost of motor 1	0.0%: (automatic) 0.1%–10.0%	0.0%
P04.02	Torque boost close of motor 1	0.0%–50.0% (rated frequency of motor 1)	20.0%
P04.03	V/F frequency 1 of motor 1	0.00Hz–P04.05	0.00Hz

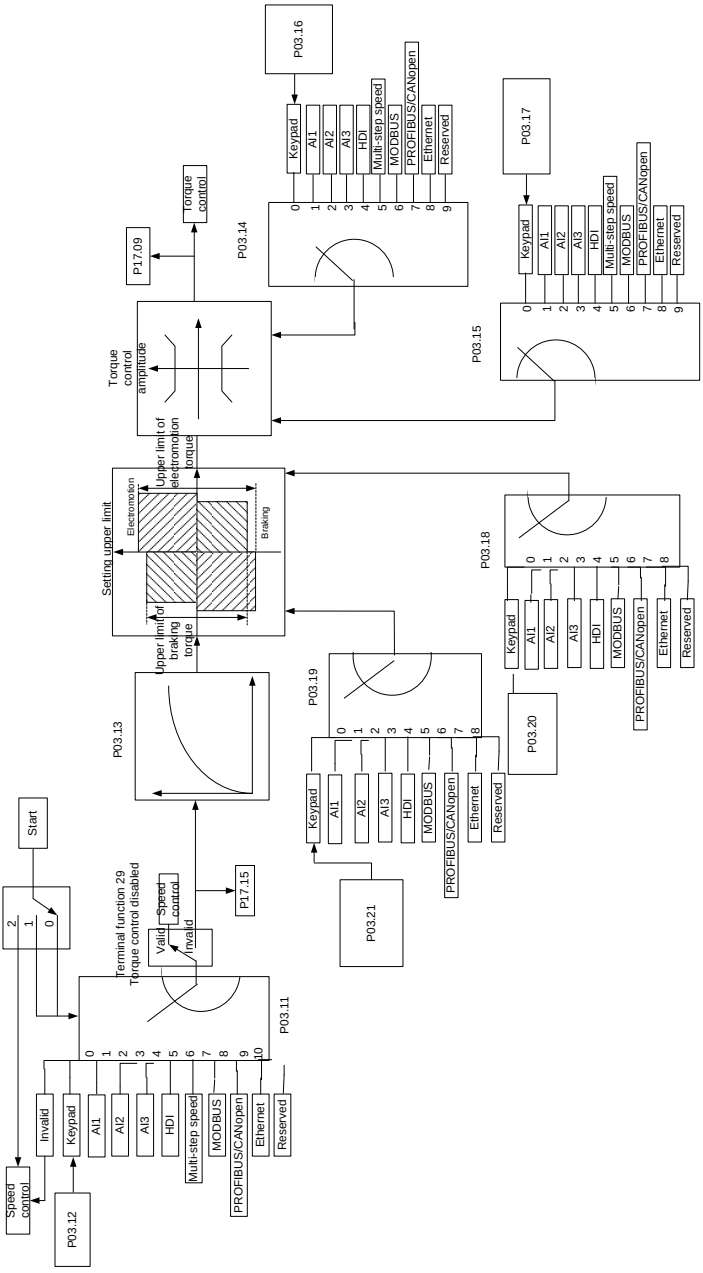
Function code	Name	Detailed description	Default value
P04.04	V/F voltage 1 of motor 1	0.0%–110.0%	0.0%
P04.05	V/F frequency 2 of motor 1	P04.03–P04.07	0.00Hz
P04.06	V/F voltage 2 of motor 1	0.0%–110.0%	0.0%
P04.07	V/F frequency 3 of motor 1	P04.05–P02.02 or P04.05–P02.16	0.00Hz
P04.08	V/F voltage 3 of motor 1	0.0%–110.0%	0.0%
P04.09	V/F slip compensation gain of motor 1	0.0–200.0%	100.0%
P04.10	Vibration control factor at low frequency of motor 1	0–100	10
P04.11	Vibration control factor at high frequency of motor 1	0–100	10
P04.12	Vibration control threshold of motor 1	0.00Hz–P00.03 (Max. output frequency)	30.00Hz
P04.13	Motor 2 V/F curve setting	0: Straight line V/F curve 1: Multi-dots 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

Function code	Name	Detailed description	Default value
P04.14	Torque boost of motor 2	0.0%: (automatic) 0.1%–10.0%	0.0%
P04.15	Torque boost close of motor 2	0.0%–50.0% (rated frequency of motor 1)	20.0%
P04.16	V/F frequency 1 of motor 2	0.00Hz–P04.18	0.00Hz
P04.17	V/F voltage 1 of motor 2	0.0%–110.0%	0.0%
P04.18	V/F frequency 2 of motor 2	P04.16– P04.20	0.00Hz
P04.19	V/F voltage 2 of motor 2	0.0%–110.0%	0.0%
P04.20	V/F frequency 3 of motor 2	P04.18–P02.02 or P04.18–P02.16	0.00Hz
P04.21	V/F voltage 3 of motor 2	0.0%–110.0%	0.0%
P04.22	V/F slip compensation gain of motor 2	0.0–200.0%	100.0%
P04.23	Vibration control factor at low frequency of motor 2	0–100	10
P04.24	Vibration control factor at high frequency of motor 2	0–100	10
P04.25	Vibration control threshold of motor 2	0.00Hz–P00.03 (Max. output frequency)	30.00Hz

Function code	Name	Detailed description	Default value
P04.26	Energy-saving operation	0: No operation 1: Automatic energy-saving operation	0
P04.27	Voltage setting	0: Keypad: the output voltage is determined by P04.28. 1: AI1 2: AI2 3: AI3 4: HDI1 5: Multi-step speed 6: PID 7: Modbus communication 8: PROFIBUS/CANopen communication 9: Ethernet communication 10: Reserved	0
P04.28	Keypad setting voltage	0.0%–100.0% (the rated voltage of the motor)	100.0%
P04.29	Voltage increasing time	0.0–3600.0s	5.0s
P04.30	Voltage decreasing time	0.0–3600.0s	5.0s
P04.31	Maximum output voltage	P04.32–100.0% (the rated voltage of the motor)	100.0%
P04.32	Minimum output voltage	0.0%–P04.31	0.0%

7.5 Torque control

Goodrive300-02 series VFDs support two kinds of control mode: torque control and rotation speed control. The core of rotation speed is that the whole control focuses on the stable speed and ensures the setting speed is the same as the actual running speed. The max. load should be in the range of the torque limit. The core of torque control is that the whole control focuses on the stable torque and ensures the setting torque is the same as the actual output torque. At the same time, the output frequency is among the upper limit or the lower limit.


P03.16
Keypad
AI1
AI2
AI3
HDI
Multi-step speed
MODBUS
PROFIBUS/CANopen
Ethernet
Reserved
P03.14
Torque control
P17.09
P03.17
P03.15
Torque control amplitude
Upper limit of electromotion torque
Setting upper limit
Electromotion
Braking
Upper limit of braking torque
P03.18
P03.13
P03.19
P03.20
P03.21
P00.00
Start
Terminal function 29 Torque control disabled
Valid
Invalid
Speed control
P17.15
P03.11
P03.12

Function code	Name	Detailed description	Default value
P00.00	Speed control mode	0: SVC 0 (apply to AM, SM) 1: SVC 1 (apply to AM) 2: SVPWM control mode (apply to AM, SM)	1
P03.11	Torque setting method	0: Torque control is invalid 1: Keypad setting torque (P03.12) 2: Analog AI1 setting torque 3: Analog AI2 setting torque 4: Analog AI3 setting torque 5: Pulse frequency HDI setting torque 6: Multi-step torque setting 7: Modbus communication setting torque 8: PROFIBUS/CANopen communication setting torque 9: Ethernet communication setting torque 10: Reserved **Note:** Setting modes 2–6, 100% corresponds to three times of the rated current of the motor.	0
P03.12	Keypad setting torque	-300.0%–300.0% (rated current of the motor)	50.0%
P03.13	Torque reference filter time	0.000–10.000s	0.010s
P03.14	Upper frequency of forward rotation in torque control	0: Keypad (P03.16) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI setting upper-limit frequency 5: Multi-step setting upper-limit frequenc 6: Modbus communication setting upper-limit frequency 7: PROFIBUS/CANopen communication setting upper-limit frequency 8: Ethernet communication setting upper-limit frequency 9: Reserved **Note:** Setting modes 1‐9, 100% corresponds to the maximum frequency.	0
P03.15	Upper frequency of reverse rotation in	0: Keypad (P03.17) 1: AI1 2: AI2	0

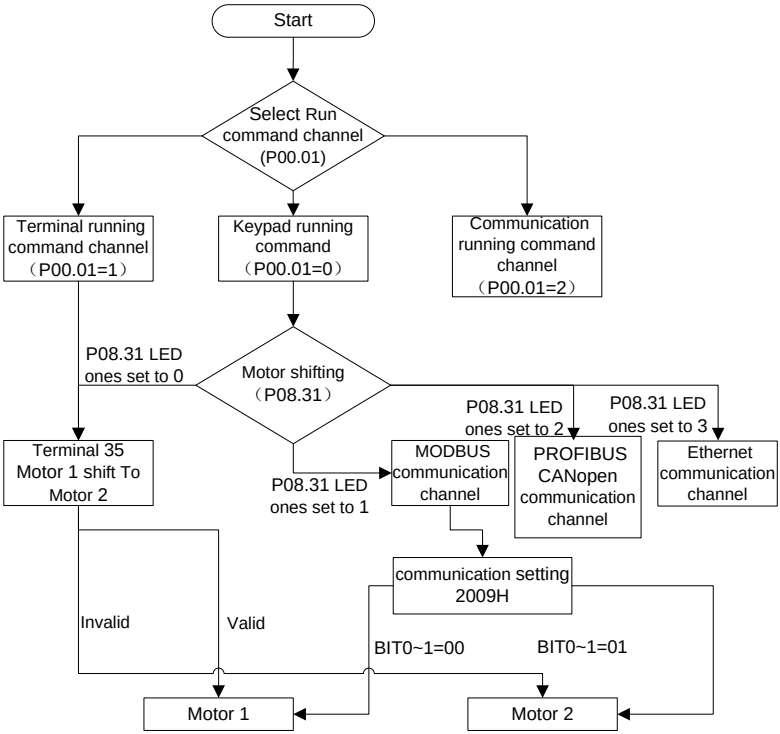
Function code	Name	Detailed description	Default value
	torque control	3: AI3 4: Pulse frequency HDI setting upper-limit frequency 5: Multi-step setting upper-limit frequency 6: Modbus communication setting upper-limit frequency 7: PROFIBUS/CANopen communication setting upper-limit frequency 8: Ethernet communication setting upper-limit frequency 9: Reserved **Note:** Setting modes 1–9, 100% corresponds to the maximum frequency.	
P03.16	Keypad setting for upper frequency of forward rotation	0.00Hz–P00.03 (Max. output frequency)	50.00Hz
P03.17	Keypad setting for upper frequency of reverse rotation	0.00 Hz–P00.03 (Max. output frequency)	50.00Hz
P03.18	Upper electromotion torque source	0: Keypad setting upper-limit frequency (P03.20) 1: AI1 2: AI2 3: AI3 4: HDI 5: Modbus communication 6: PROFIBUS/CANopen communication 7: Ethernet communication 8: Reserved **Note:** Setting modes 1–4, 100% corresponds to three times of the motor current.	0
P03.19	Upper braking torque source	0: Keypad setting upper-limit frequency (P03.21) 1: AI1 2: AI2 3: AI3 4: HDI	0

Function code	Name	Detailed description	Default value
		5: Modbus communication 6: PROFIBUS/CANopen communication 7: Ethernet communication 8: Reserved **Note:** Setting modes 1–4, 100% corresponds to three times of the motor current.	
P03.20	Keypad setting of electromotion torque	0.0–300.0% (motor rated current)	180.0%
P03.21	Keypad setting of braking torque	0.0–300.0% (motor rated current)	180.0%
P17.09	Output torque	-250.0–250.0%	0.0%
P17.15	Torque reference	-300.0%–300.0% (the rated current of the motor)	0.0%

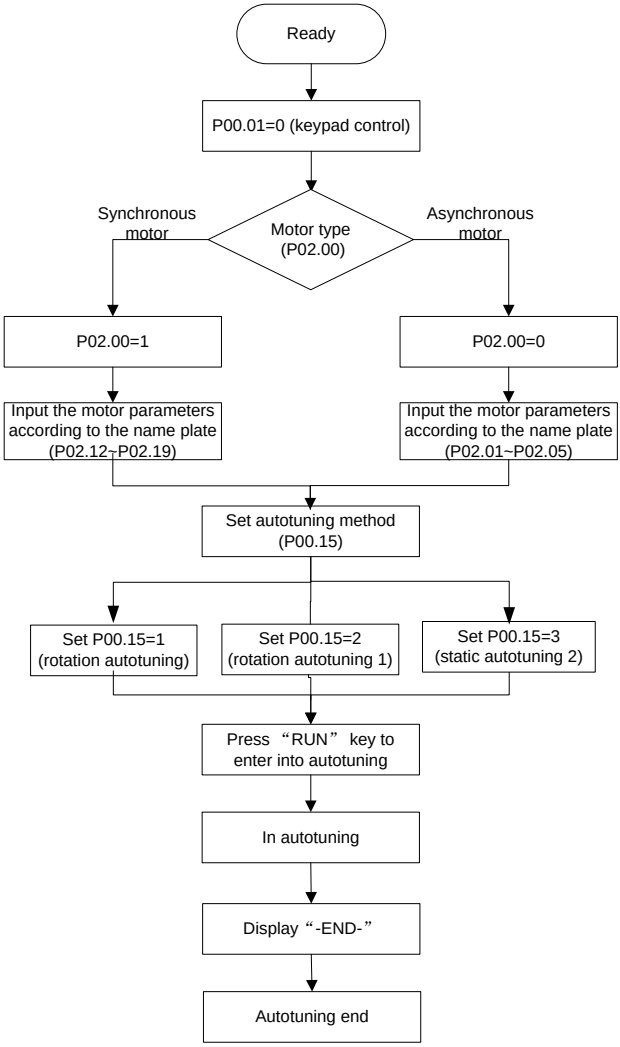
7.6 Parameters of the motor

	✧ Physical accident may occur if the motor starts up suddenly during autotune. Please check the safety of surrounding environment of the motor and the load before autotune. ✧ The power is still applied even when the motor stops running during static autotune. Please do not touch the motor until the autotune is completed, otherwise there would be electric shock.
	✧ Do not carry out the rotation autotune if the motor is coupled with the load. Otherwise, misaction or damage may occur to the VFD or the mechanical devices. During rotation autotune on the motor which is coupled with load, the motor parameter may not be counted correctly and misaction may occur. If necessary, de-couple the motor from the load during autotune.

Goodrive300-02 series VFDs can drive asynchronous and synchronous motors and support two sets of motor parameters which can shift between two motors through multi-function digital input terminal or communication.



The control performance of the VFD is based on the established accurate motor model. The user has to carry out the motor autotune before first running (take motor 1 as the example).



Note:

1. Set the motor parameters according to the name plate of the motor.

2. During the motor autotune, if rotation autotune is selected, de-couple the motor from the load to make the motor in a static and empty state; otherwise, the result of autotune is incorrect. The asynchronous motors can autotune the parameters of P02.06–P02.10 and the synchronous motors can autotune the parameters of P02.20–P02.23.

3. During the motor autotune, if static autotune is selected, do not de-couple the motor from the load. Because only some parameters of the motor are involved, the control performance is not as better as the rotation autotune. The asynchronous motors can autotune the parameters of P02.06–P02.10; the synchronous motors can autotune the parameters of P02.20–P02.22, P02.23 can be counted.

4. Motor autotune only involves the current motor. Switch the motor through P08.31 to carry out the autotune on the other motor.

Relative parameters list:

Function code	Name	Detailed description	Default value
P00.01	Running command channel	0: Keypad running command 1: Terminal running command channel (“LOCAL/REMOT” flickering) 2: Communication running command channel (“LOCAL/REMOT” on);	0
P00.15	Motor parameter autotuning	0: No operation 1: Rotation autotuning 2: Static autotuning 1 (autotune totally) 3: Static autotuning 2 (autotune partially)	0
P02.00	Motor type 1	0: Asynchronous motor 1: Synchronous motor	0
P02.01	Rated power of asynchronous motor 1	0.1–3000.0kW	Depend on model
P02.02	Rated frequency of asynchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.03	Rated speed of asynchronous motor 1	1–36000rpm	Depend on model
P02.04	Rated voltage of asynchronous motor 1	0–1200V	Depend on model
P02.05	Rated current of asynchronous motor 1	0.8–6000.0A	Depend on model
P02.06	Stator resistor of asynchronous motor 1	0.001–65.535Ω	Depend on model
P02.07	Rotor resistor of asynchronous motor 1	0.001–65.535Ω	Depend on model
P02.08	Leakage inductance of asynchronous motor 1	0.1–6553.5mH	Depend on model
P02.09	Mutual inductance of asynchronous motor 1	0.1–6553.5mH	Depend on model

Function code	Name	Detailed description	Default value
P02.10	Non-load current of asynchronous motor 1	0.1–6553.5A	Depend on model
P02.15	Rated power of synchronous motor 1	0.1–3000.0kW	Depend on model
P02.16	Rated frequency of synchronous motor 1	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P02.17	Number of poles pairs for synchronous motor 1	1–50	2
P02.18	Rated voltage of synchronous motor 1	0–1200V	Depend on model
P02.19	Rated current of synchronous motor 1	0.8–6000.0A	Depend on model
P02.20	Stator resistor of synchronous motor 1	0.001–65.535Ω	Depend on model
P02.21	Direct axis inductance of synchronous motor 1	0.01–655.35mH	Depend on model
P02.22	Quadrature axis inductance of synchronous motor 1	0.01–655.35mH	Depend on model
P02.23	Back EMF constant of synchronous motor 1	0–10000	300
P05.01–P05.09	Multi-function digital input terminals (S1–S8, HDI) function selection	35: Shift from motor 1 to motor 2	
P08.31	Motor shifting	LED ones: shifting channel 0: terminal shifting 1: Modbus communication shifting 2: PROFIBUS/CANopen communication shifting 3: Ethernet communication shifting 4: Reserved LED tens: shifting enabling in operation 0: Disabled 1: Enabled 0x00–0x14	00
P12.00	Motor type 2	0:Asynchronous motor 1:Synchronous motor	0

Function code	Name	Detailed description	Default value
P12.01	Rated power of asynchronous motor 2	0.1–3000.0kW	Depend on model
P12.02	Rated frequency of asynchronous motor 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P12.03	Rated speed of asynchronous motor 2	1–36000rpm	Depend on model
P12.04	Rated voltage of asynchronous motor 2	0–1200V	Depend on model
P12.05	Rated current of asynchronous motor 2	0.8–6000.0A	Depend on model
P12.06	Stator resistor of asynchronous motor 2	0.001–65.535Ω	Depend on model
P12.07	Rotor resistor of asynchronous motor 2	0.001–65.535Ω	Depend on model
P12.08	Leakage inductance of asynchronous motor 2	0.1–6553.5mH	Depend on model
P12.09	Mutual inductance of asynchronous motor 2	0.1–6553.5mH	Depend on model
P12.10	Non-load current of asynchronous motor 2	0.1–6553.5A	Depend on model
P12.15	Rated power of synchronous motor 2	0.1–3000.0kW	Depend on model
P12.16	Rated frequency of synchronous motor 2	0.01Hz–P00.03 (Max. output frequency)	50.00Hz
P12.17	Number of poles pairs for synchronous motor 2	1–50	2
P12.18	Rated voltage of synchronous motor 2	0–1200V	Depend on model
P12.19	Rated current of synchronous motor 2	0.8–6000.0A	Depend on model
P12.20	Stator resistor of synchronous motor 2	0.001–65.535Ω	Depend on model
P12.21	Direct axis inductance of synchronous motor 2	0.01–655.35mH	Depend on model
P12.22	Quadrature axis inductance of synchronous motor 2	0.01–655.35mH	Depend on model

Function code	Name	Detailed description	Default value
P12.23	Back EMF constant of synchronous motor 2	0–10000	300

7.7 Start-up and stop control

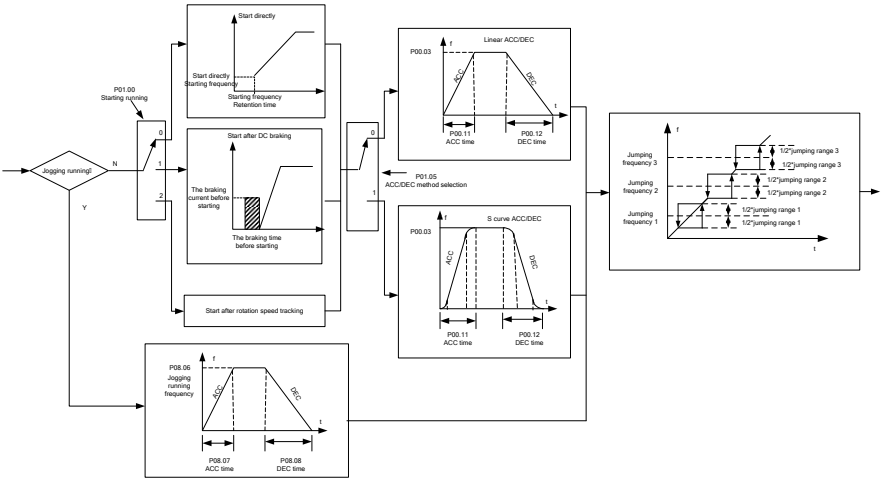
The start-up and stop control of the VFD includes three states: start after the running command during normal powering on, start after the restarting function becomes valid during normal powering on and start after the automatic fault reset. Below is the detailed instruction for three starting methods.

There are three starting methods for the VFD: start from the starting frequency directly, start after the AC braking and start after the rotation speed tracking. The user can select according to different situations to meet their needs.

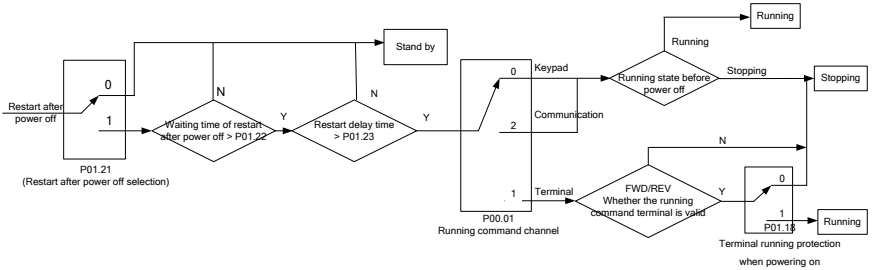
For the load with big inertia, especially in the cases where the reverse rotation may occur, it is better to select starting after DC braking and then starting after rotation speed tracking.

Note: Users are suggested to adopt the direct starting method to drive synchronous motors.

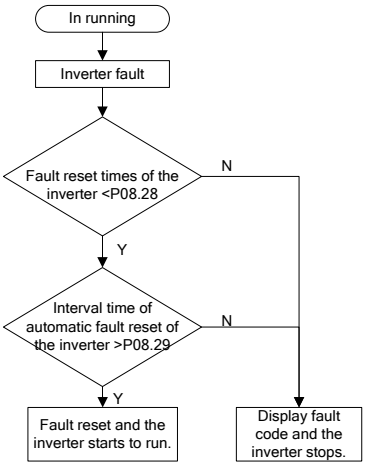
1. The starting logic figure of starting after the running command during the normal powering on



2. The starting logic figure of starting after the restarting function becomes valid during the normal powering on



3. The starting logic figure of starting after the automatic fault reset



Relative parameters list:

Function code	Name	Detailed description	Default value
P00.01	Running command channel	0:Keypad running command 1:Terminal running command channel (“LOCAL/REMOT” flickering) 2:Communication running command channel (“LOCAL/REMOT” on);	0
P00.11	ACC time 1	0.0–3600.0s	Depend on model
P00.12	DEC time 1	0.0–3600.0s	Depend on model

Function code	Name	Detailed description	Default value
P01.00	Start mode	0:Start-up directly 1:Start-up after DC braking 2: Start-up after speed tracing	0
P01.01	Starting frequency of direct start	0.00–50.00Hz	0.50Hz
P01.02	Retention time of starting frequency	0.0–50.0s	0.0s
P01.03	The braking current before starting	0.0–100.0%	0.0%
P01.04	The braking time before starting	0.00–50.00s	0.00s
P01.05	ACC/DEC selection	0: Linear type 1: Reserved	0
P01.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0
P01.09	Starting frequency of DC braking	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P01.10	Waiting time of DC braking	0.00–50.00s	0.00s
P01.11	DC braking current	0.0–100.0%	0.0%
P01.12	DC braking time	0.00–50.00s	0.00s
P01.13	Dead time of FWD/REV rotation	0.0–3600.0s	0.0s
P01.14	Shifting between FWD/REV rotation	Set the threshold point of the VFD: 0:Switch after 0 frequency 1:Switch after the starting frequency 2:Switch after the speed reaches P01.15 and delays for P01.24	0
P01.15	Stopping speed	0.00–100.00Hz	0.50 Hz
P01.16	Detection of stopping speed	0: Speed setting (the only detection method in SVPWM mode) 1: Speed detecting value	1
P01.18	Terminal running protection when powering on	0:The terminal running command is invalid when powering on 1: The terminal running command is valid when powering on	0
P01.19	Action if running frequency<lower limit frequency (valid>0)	0: Run at the lower-limit frequency 1: Stop 2: Hibernation	0

Function code	Name	Detailed description	Default value
P01.20	Hibernation restore delay time	0.0–3600.0s(valid when P01.19=2)	0.0s
P01.21	Restart after power off	0: Disable 1: Enable	0
P01.22	The waiting time of restart after power off	0.0–3600.0s(valid when P01.21=1)	1.0s
P01.23	Start delay time	0.0–60.0s	0.0s
P01.24	Delay time of stop speed	0.0–100.0s	0.0s
P05.01–P05.09	Digital input function selection	1: Forward rotation operation 2: Reverse rotation operation 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Operation pause 21:ACC/DEC time 1 22:ACC/DEC time 2 30:ACC/DEC disabling	
P08.06	Jogging frequency	0.00Hz–P00.03 (Max. output frequency)	5.00Hz
P08.07	Jogging ACC time	0.0–3600.0s	Depend on model
P08.08	Jogging DEC time	0.0–3600.0s	Depend on model
P08.00	ACC time 2	0.0–3600.0s	Depend on model
P08.01	DEC time 2	0.0–3600.0s	Depend on model
P08.02	ACC time 3	0.0–3600.0s	Depend on model
P08.03	DEC time 3	0.0–3600.0s	Depend on model
P08.04	ACC time 4	0.0–3600.0s	Depend on model
P08.05	DEC time 4	0.0–3600.0s	Depend on model
P08.28	Fault reset times	0–10	0
P08.29	Interval time of automatic fault reset	0.1–3600.0s	1.0s

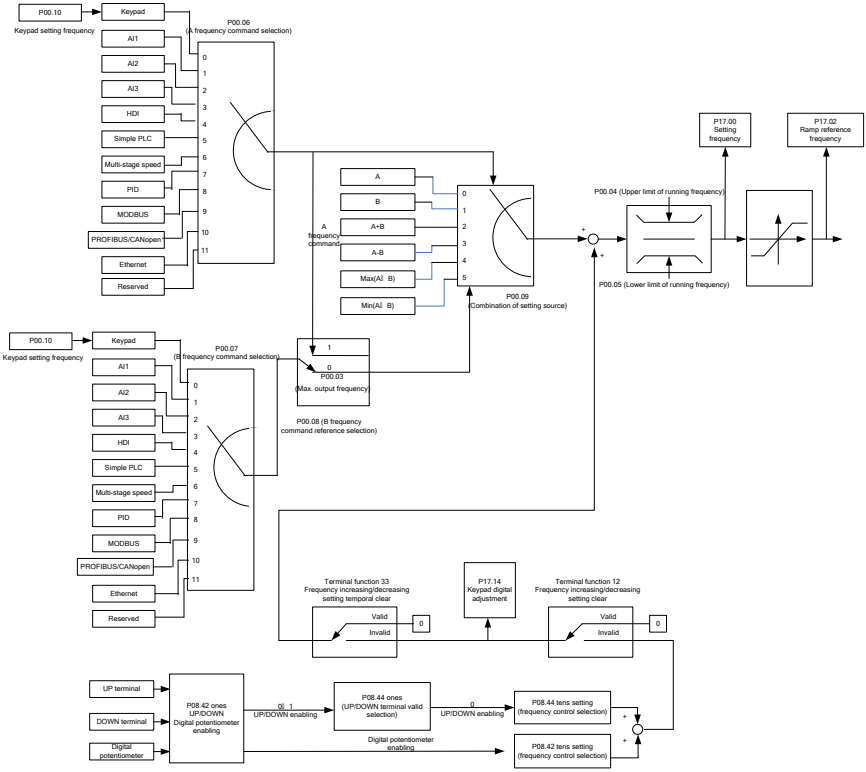
7.8 Frequency setting

Goodrive300-02 series VFDs can set the frequency by various means. The reference channel can be divided into main reference channel and assistant reference channel.

There are two main reference channels: A frequency reference channel and B frequency reference channel. These two reference channels can carry out mutual simple math calculation between each other. And the reference channels can be shifted dynamically through set multi-function terminals.

There are three assistant reference channels: keypad UP/DOWN input, terminals UP/DOWN switch input and digital potentiometer input. The three ways equal to the effect of input UP/DOWN reference in internal assistant reference of the VFD. The user can enable the reference method and the effect of the method to the frequency reference by setting function codes.

The actual reference of the VFD consists of main reference channel and assistant reference channel.

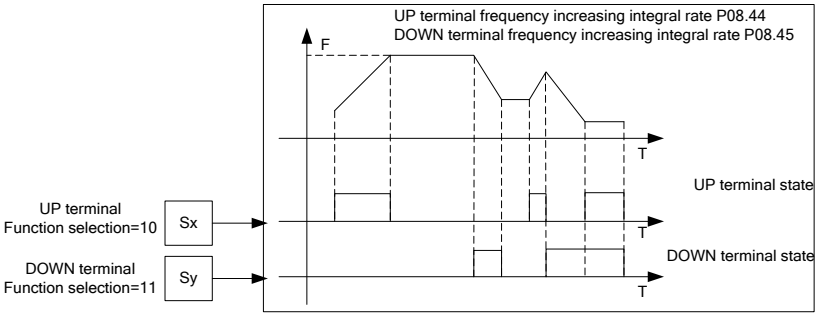


Goodrive300-02 series VFDs support the shifting between different reference channels, and the detailed shifting rules is as below:

Current reference channel P00.09	Multi-function terminal function 13 Switch from A channel to B channel	Multi-function terminal function 14 Switch from combination setting to A channel	Multi-function terminal function 15 Switch from combination setting to B channel
A	B	/	/
B	/	/	/
A+B	/	A	B
A-B	/	A	B
Max(A, B)	/	A	B
Min(A, B)	/	A	B

Note: "/" means the multi-function terminal is invalid under the current reference channel.

When select multi-function terminal UP (10) and DOWN (11) to set the internal assistant frequency, P08.44 and P08.45 can be set to increase or decrease the set frequency quickly.



Relative parameters list:

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

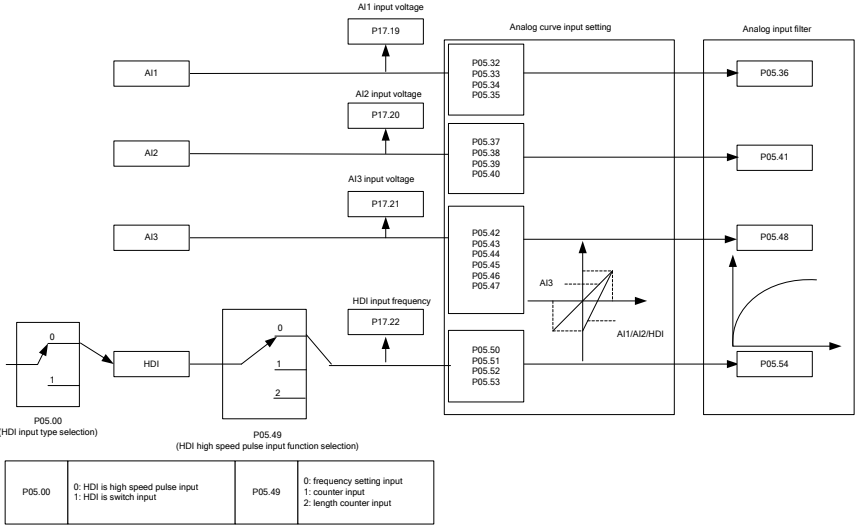
Function code	Name	Detailed description	Default value
		5:Simple PLC program setting 6: Multi-step speed running setting 7: PID control setting 8:Modbus communication setting 9:PROFIBUS/CANopen communication setting 10:Ethernet communication setting(reserved) 11:Reserved	
P00.08	B frequency command reference	0: Maximum output frequency 1: A frequency command	0
P00.09	Combination of setting source	0:A 1:B 2:(A+B)combination 3:(A-B)combination 4:Max(A,B)combination 5:Min(A,B)combination	0
P05.01–P05.09	Multi-function digital input terminals (S1–S8,HDI) function selection	10: Frequency setting increasing (UP) 11: Frequency setting decreasing (DOWN) 12: Frequency setting clear 13: Shift between A setting and B setting 14: Shift between combination setting and A setting 15: Shift between combination setting and B setting	
P08.42	Keypad data control	0x000–0x1223 LED ones: frequency enable selection 0:Both ∧/∨ keys and digital potentiometer adjustments are valid 1:Only ∧/∨ keys adjustment is valid 2:Only digital potentiometer adjustments is valid 3:Neither ∧/∨ keys nor digital potentiometer adjustments are valid LED tens: frequency control selection 0:Only valid when P00.06=0 or P00.07=0 1:Valid for all frequency setting manner	0x0000

Function code	Name	Detailed description	Default value
		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: ∧/∨ keys and digital potentiometer Integral function 0:The Integral function is valid 1:The Integral function is invalid	
P08.43	Integral ratio of keypad potentiometer	0.01–10.00s	0.10s
P08.44	UP/DOWN terminals control	0x000–0x221 LED ones: frequency enable selection 0: UP/DOWN terminals setting is valid 1: UP/DOWN terminals setting is invalid LED tens: frequency control selection 0: Only valid when P00.06=0 or P00.07=0 1: All frequency means are valid 2: When the multi-step speed has the priority, it is invalid to the multi-step speed LED hundreds: action selection during stopping 0: Setting is valid 1: Valid during running, clear after stop 2: Valid during running, clear after receiving the stop command	0x000
P08.45	UP terminals frequency changing ratio	0.01–50.00Hz/s	0.50Hz/s
P08.46	DOWN terminals frequency changing ratio	0.01–50.00Hz/s	0.50Hz/s
P17.00	Setting frequency	Display current set frequency of the VFD Range: 0.00Hz–P00.03	0.00Hz

Function code	Name	Detailed description	Default value
P17.02	Ramp reference frequency	Display current ramp reference frequency of the VFD Range: 0.00Hz–P00.03	0.00Hz
P17.14	Digital adjustment	Display the adjustment through the keypad of the VFD. Range : 0.00Hz–P00.03	0.00Hz

7.9 Analog input

Goodrive300-02 series VFDs have three analog input terminals and 1 high-speed pulse input terminal (of which, AI1 and AI2 are 0–10V/0–20mA and AI can select voltage input or current input by J3, AI2 can select voltage input or current input by J4 and AI3 is for -10–10V) as the standard configuration. The inputs can be filtered and the maximum and minimum values can be adjusted.



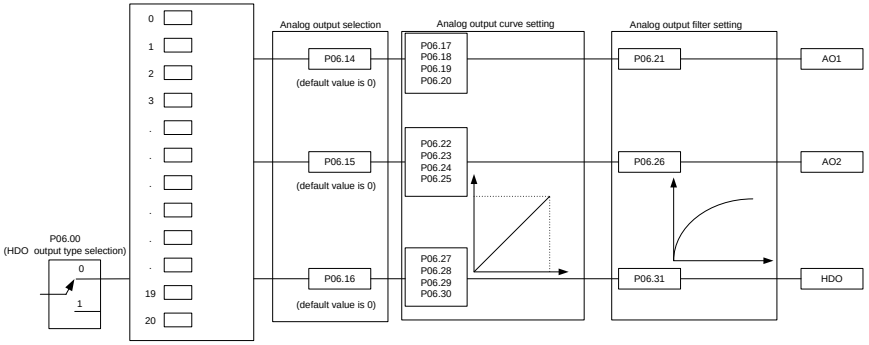
Relative parameters list:

Function code	Name	Detailed description	Default value
P05.00	HDI input selection	0: High-speed pulse input 1: Digital input	0
P05.32	Lower limit of AI1	0.00V–P05.34	0.00V
P05.33	Corresponding setting of the lower limit of AI1	-100.0%–100.0%	0.0%

Function code	Name	Detailed description	Default value
P05.34	Upper limit of AI1	P05.32–10.00V	10.00V
P05.35	Corresponding setting of the upper limit of AI1	-100.0%–100.0%	100.0%
P05.36	AI1 input filter time	0.000s–10.000s	0.100s
P05.37	Lower limit of AI2	0.00V–P05.39	0.00V
P05.38	Corresponding setting of the lower limit of AI2	-100.0%–100.0%	0.0%
P05.39	Upper limit of AI2	P05.37–10.00V	10.00V
P05.40	Corresponding setting of the upper limit of AI2	-100.0%–100.0%	100.0%
P05.41	AI2 input filter time	0.000s–10.000s	0.100s
P05.42	Lower limit of AI3	-10.00V–P05.44	-10.00V
P05.43	Corresponding setting of the lower limit of AI3	-100.0%–100.0%	-100.0%
P05.44	Middle value of AI3	P05.42–P05.46	0.00V
P05.45	Corresponding middle setting of AI3	-100.0%–100.0%	0.0%
P05.46	Upper limit of AI3	P05.44–10.00V	10.00V
P05.47	Corresponding setting of the upper limit of AI3	-100.0%–100.0%	100.0%
P05.48	AI3 input filter time	0.000s–10.000s	0.100s
P05.49	HDI high-speed pulse input function selection	0:Frequency setting input, frequency setting source 1:Counter input, high-speed pulse counter input terminals 2:Length counting input, length counter input terminals	0
P05.50	Lower limit frequency of HDI	0.000kHz–P05.52	0.000kHz
P05.51	Corresponding setting of HDI low frequency setting	-100.0%–100.0%	0.0%
P05.52	Upper limit frequency of HDI	P05.50–50.000kHz	50.000 kHz
P05.53	Corresponding setting of HDI upper limit frequency	-100.0%–100.0%	100.0%
P05.54	HDI frequency input filter time	0.000s–10.000s	0.100s

7.10 Analog output

Goodrive300-02 series VFDs have 2 analog output terminals (0–10V or 0–20mA) and 1 high speed pulse output terminal. Analog output signal can be filtered and the maximum and minimum values can be adjusted. The analog output signals can be proportional to motor speed, output frequency, output current, motor torque, motor power, etc.



P06.00	0: open collector high speed pulse output 1: open collector output

P06.01, P06.02, P06.03, P06.04 output selection

0	Running frequency	1	Set frequency	2	Ramp reference frequency
3	Running rotation speed	4	Output current (relative to the VFD)	5	Output current (relative to the motor)
6	Output voltage	7	Output power	8	Set torque
9	Output torque	10	Analog AI1 input value	11	Analog AI2 input value
12	Analog AI3 input value	13	HDI input value	14	MODBUS communication setting 1
15	MODBUS communication setting 2	16	PROFIBUS communication setting 1	17	PROFIBUS communication setting 1
18	Torque current (relative to the nominal current of the motor)	19	Exciting current (relative to the nominal current of the motor)	20	Reserved

Output instructions:

Set value	Function	Instructions
0	Running frequency	0–the Max. output frequency
1	Set frequency	0– the Max. output frequency
2	Ramp reference frequency	0– the Max. output frequency
3	Running speed	0–2 times of the rated synchronous rotation speed of the motor
4	Output current (relative to the VFD)	0–2 times of the rated current of the VFD
5	Output current (relative to the motor)	0–2 times of the rated current of the VFD
6	Output voltage	0–1.5 times of the rated voltage of the VFD
7	Output power	0–2 times of the rated power
8	Setting torque value	0–2 times of the rated current of the motor
9	Output torque	0–2 times of the rated current of the motor

Set value	Function	Instructions
10	AI1	0–10V/0–20mA
11	AI2	0–10V/0–20mA
12	AI3	-10V–10V
13	HDI	0.00–50.00kHz
14	Setting value 1 of Modbus communication	-1000–1000,1000 corresponds to 100.0%
15	Setting value 2 of Modbus communication	-1000–1000,1000 corresponds to 100.0%
16	Setting value 1 of PROFIBUS/CANopen communication	-1000–1000,1000 corresponds to 100.0%
17	Setting value 2 of PROFIBUS/CANopen communication	-1000–1000,1000 corresponds to 100.0%
18	Setting value 1 of Ethernet communication	-1000–1000,1000 corresponds to 100.0%
19	Setting value 2 of Ethernet communication	-1000–1000,1000 corresponds to 100.0%
20–21	Reserved	
22	Torque current(relative to the rated current of the motor)	0–2 times of the rated current of the motor
23	Ramp reference frequency (with sign)	0– the Max. output frequency
24–30	Reserved	

Relative parameters list:

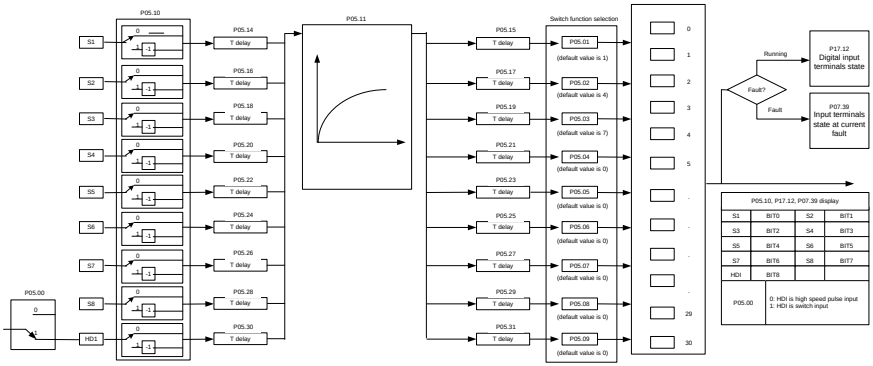
Function code	Name	Detailed description	Default value
P06.00	HDO output	0: Open collector pole high speed pulse output 1: Open collector pole output.	0
P06.14	AO1 output	0:Running frequency 1:Set frequency 2:Ramp reference frequency 3:Running rotation speed 4:Output current (relative to the rated current of the VFD) 5:Output current	0
P06.15	AO2 output		0
P06.16	HDO high-speed pulse output		0

Function code	Name	Detailed description	Default value
		(relative to the rated current of the motor) 6:Output voltage 7:Output power 8:Set torque value 9:Output torque 10:Analog AI1 input value 11:Analog AI2 input value 12:Analog AI3 input value 13:High speed pulse HDI input value 14:Modbus communication set value 1 15:Modbus communication set value 2 16:PROFIBUS/CANopen communication set value 1 17:PROFIBUS/CANopen communication set value 2 18: Ethernet communication set value 1 19: Ethernet communication set value 2 20–21: Reserved 22:Torque current(relative to the rated current of the motor) 23: Ramp reference frequency (with sign) 24–30:Reserved	
P06.17	Lower output limit of AO1	-100.0%–P06.19	0.0%
P06.18	Corresponding AO1 output of lower limit	0.00V–10.00V	0.00V
P06.19	Upper output limit of AO1	P06.17–100.0%	100.0%
P06.20	Corresponding AO1 output of upper limit	0.00V–10.00V	10.00V
P06.21	AO1 output filter time	0.000s–10.000s	0.000s
P06.22	Lower output limit of AO2	-100.0%–P06.24	0.0%
P06.23	Corresponding AO2 output of lower limit	0.00V–10.00V	0.00V
P06.24	Upper output limit of AO2	P06.22–100.0%	100.0%
P06.25	Corresponding AO2 output of upper limit	0.00V–10.00V	10.00V
P06.26	AO2 output filter time	0.000s–10.000s	0.000s
P06.27	Lower output limit of HDO	-100.0%–P06.29	0.00%

Function code	Name	Detailed description	Default value
P06.28	Corresponding HDO output of lower limit	0.00–50.00kHz	0.0kHz
P06.29	Upper output limit of HDO	P06.27–100.0%	100.0%
P06.30	Corresponding HDO output of upper limit	0.00–50.00kHz	50.00kHz
P06.31	HDO output filter time	0.000s–10.000s	0.000s

7.11 Digital input

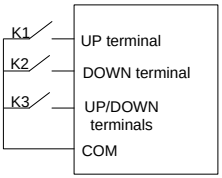
Goodrive300-02 series VFDs have 8 programmable digital input terminals and 1 open collector input terminal in the standard configuration. All functions of the digital input terminals are programmable by the function codes. Open collector input terminal can be selected into high-speed pulse input terminal or common switch input terminal by function code. When selected into HDI, the user can select HDI high speed pulse input as frequency reference, counting input or length pulse input by setting.



0	No function	1	Forward running	2	Reverse running	3	3-wire running control
4	Forward jogging	5	Reverse jogging	6	Coast to stop	7	Fault reset
8	Running pause	9	External fault input	10	Frequency setting increasing (UP)	11	Frequency setting decreasing (DOWN)
12	Frequency increasing/decreasing setting clear	13	Shifting between A frequency and B frequency	14	Shifting between the combination setting and A frequency	15	Shifting between the combination setting and B frequency
16	Multi-stage speed terminal 1	17	Multi-stage speed terminal 2	18	Multi-stage speed terminal 3	19	Multi-stage speed terminal 4
20	Multi-stage speed pause	21	ACC/DEC time selection 1	22	ACC/DEC time selection 2	23	Simple PLC stopping reset
23	Simple PLC pause	25	PID control pause	26	Traverse pause (stop at the current frequency)	27	Traverse reset (stop at the middle frequency)
28	Counter reset	29	Torque control disabling	30	ACC/DEC disabling	31	Counter trigging
32	Length reset	33	Frequency increasing/decreasing setting clear	34	DC braking	35	Shift from motor 1 to motor 2
36	Shift the command to the keypad	37	Shift the command to the terminal	38	Shift the command to the communication	39	Pre-exciting command
40	Power consumption clear	41	Power consumption keeping	42~63	Reserved		

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

Note: Two different multi-function terminals cannot be set as one function.

Set value	Function	Instructions
0	No function	The VFD does not work even there is input signal. It is necessary to set the terminal which cannot be used to non-function to avoid misacting.
1	Forward running(FWD)	The forward or reverse rotation of the VFD can be controlled by the external terminals.
2	Reverse running(REV)	
3	3-wire running control	The terminal can determine the running mode of the VFD is 3-wire control mode. Refer to P05.13 for detailed instruction of 3-wire control mode.
4	Forward jogging	See P08.06, P08.07 and P08.08 for jogging frequency, jogging ACC/DEC time.
5	Reverse jogging	
6	Coast to stop	The VFD closes off the output. The motor is not controlled by the VFD during the stopping. This method is usually to be used when the load inertia is big and it has no requirement to the stopping time. It has the same meaning with the “coast to stop” in P01.08 and usually used in remote control.
7	Fault reset	External fault reset. It has the same function with the reset function of STOP/RST on the keypad. This function can realize remote fault reset.
8	Operation pause	The VFD decelerates to stop. But all running parameters are in the memory state. For example, PLC parameters, traverse parameters and PID parameters. After the signal disappears, the VFD will come back to the state before stopping.
9	External fault input	When the external fault signal is sent to the VFD, the VFD will report the fault and stop.
10	Frequency setting up(UP)	This parameter is used to modify the increasing and decreasing command during the external terminal reference frequency.
11	Frequency setting down(DOWN)	
12	Frequency increasing/decreasing setting clear	 Frequency increasing/decreasing setting clear terminal can cancel the assistant channel frequency set by the internal UP/DOWN of the VFD to make the reference frequency restore to the frequency given by the main reference frequency channel.

<table>
<tr><th>Set value</th><th>Function</th><th>Instructions</th></tr>
<tr><td>13</td><td>Switch between A setting and B setting</td><td rowspan="3">This function can realize the shifting between the frequency setting channels.
The 13th function can realize the shifting between A frequency reference channel and B frequency reference channel.
The 14th function can realize the shifting between A frequency reference channel and the combination setting channel set by P00.09
The 15th function can realize the shifting between B frequency reference channel and the combination setting channel set by P00.09</td></tr>
<tr><td>14</td><td>Switch between A setting and combination setting</td></tr>
<tr><td>15</td><td>Switch between B setting and combination setting</td></tr>
<tr><td>16</td><td>Multi-step speed terminal 1</td><td rowspan="4">The 16 stage speeds can be set by the combination of digital state of four terminals.
Note: multi-step speed 1 is the low bit, multi-step speed 4 is the high bit.
<table><tr><td>Multi-step speed 4</td><td>Multi-step speed 3</td><td>Multi-step speed 2</td><td>Multi-step speed 1</td></tr><tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr></table></td></tr>
<tr><td>17</td><td>Multi-step speed terminal 2</td></tr>
<tr><td>18</td><td>Multi-step speed terminal 3</td></tr>
<tr><td>19</td><td>Multi-step speed terminal 4</td></tr>
<tr><td>20</td><td>Multi-step speed pause</td><td>Shield the multi-step speed selection terminal function to keep the setting value at the current state.</td></tr>
<tr><td>21</td><td>ACC/DEC time selection 1</td><td rowspan="2">Select 4 ACC/DEC time by the combination of the 2 terminals.
<table><tr><td>Terminal 1</td><td>Terminal 2</td><td>ACC/DEC time selection</td><td>Corresponding parameter</td></tr><tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 1</td><td>P00.11/P00.12</td></tr><tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2</td><td>P08.00/P08.01</td></tr><tr><td>OFF</td><td>ON</td><td>ACC/DEC time 3</td><td>P08.02/P08.03</td></tr><tr><td>ON</td><td>ON</td><td>ACC/DEC time 4</td><td>P08.04/P08.05</td></tr></table></td></tr>
<tr><td>22</td><td>ACC/DEC time selection 2</td></tr>
<tr><td>23</td><td>Simple PLC stop reset</td><td>Restart simple PLC and clear the memory state of PLC.</td></tr>
<tr><td>24</td><td>Simple PLC pause</td><td>Program pause during PLC implement. Run at the current speed stage. After cancel the function, simple PLC continues to run.</td></tr>
<tr><td>25</td><td>PID control pause</td><td>Temporal PID invalid and the VFD will output at the current frequency.</td></tr>
<tr><td>26</td><td>Traverse pause (stop at the current frequency)</td><td>The VFD will stop at the current output and after canceling the function, the VFD will continue to traverse run at the current frequency.</td></tr>
</table>

Set value	Function	Instructions
27	Traverse reset (return to the middle frequency)	The setting frequency of the VFD will come back to the middle frequency.
28	Counter reset	Counter clear
29	Torque control disabling	The VFD shifts from torque control mode to speed control mode.
30	ACC/DEC disabling	Ensure the VFD will not be affected by the external signals (except for the stopping command) and keep the current output frequency.
31	Counter trigging	Enable the pulse counter.
32	Length reset	Length counter clear
33	Frequency increasing/decreasing setting temporal clear	When the terminal closes, the frequency set by UP/DOWN can be cleared. All set frequency will be restored into the reference frequency by the frequency command channel and the frequency will come back to the value after the frequency increasing or decreasing.
34	DC braking	The VFD will begin DC braking after the valid command.
35	Switch between motor1 and motor2	Motor-shifting can be controlled after the terminal is valid.
36	Switch commands to keypad	After the function terminal become valid, the running command channel will be shifted into keypad running command channel and the running command channel will come back to the original state if the function terminal is invalid.
37	Switch commands to terminals	After the function terminal become valid, the running command channel will be shifted into terminal running command channel and the running command channel will come back to the original state if the function terminal is invalid.
38	Switch commands to communication	After the function terminal become valid, the running command channel will be shifted into communication running command channel and the running command channel will come back to the original state if the function terminal is invalid.
39	Pre-excitation commands	Perform pre-exciting if the terminal is valid until the terminal is invalid.

Set value	Function	Instructions
40	Power consumption clear	The power consumption will be cleared after the command is valid.
41	Power consumption retention	If the command is valid, the current running of the VFD will not affect its power consumption.
42–60	Reserved	
61	PID pole switching	Switch the output pole of PID and be used with P09.03
62–63	Reserved	

Relative parameters list:

Function code	Name	Detailed description	Default value
P05.00	HDI input selection	0: High pulse input 1: Digital input	0
P05.01	S1 terminals function selection	0: No function 1: Forward rotation operation 2: Reverse rotation operation 3: 3-wire control operation 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Operation pause 9: External fault input 10:Increasing frequency setting(UP) 11:Decreasing frequency setting(DOWN) 12:Frequency setting clear 13:Shift between A setting and B setting 14:Shift between combination setting and A setting 15:Shift between combination setting and B setting 16:Multi-step speed terminal 1 17:Multi-step speed terminal 2 18:Multi-step speed terminal 3 19:Multi- step speed terminal 4	1
P05.02	S2 terminals function selection		4
P05.03	S3 terminals function selection		7
P05.04	S4 terminals function selection		0
P05.05	S5 terminals function selection		0
P05.06	S6 terminals function selection		0
P05.07	S7 terminals function selection		0
P05.08	S8 terminals function selection		0
P05.09	HDI terminal function selection		0

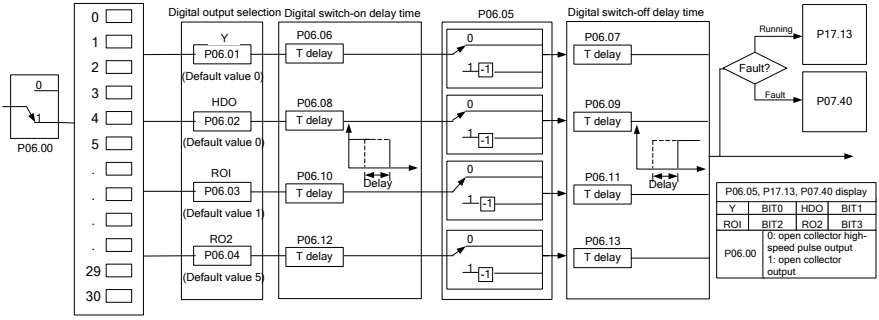
Function code	Name	Detailed description	Default value
		20:Multi- step speed pause 21:ACC/DEC time 1 22:ACC/DEC time 2 23:Simple PLC stop reset 24:Simple PLC pause 25:PID control pause 26:Traverse pause(stop at the current frequency) 27:Traverse reset(return to the center frequency) 28:Counter reset 29:Torque control disabling 30:ACC/DEC disabling 31:Counter trigging 32:Length reset 33:Cancel the frequency change setting temporarily 34:DC brake 35:Shift the motor 1 into motor 2 36:Shift the command to the keypad 37:Shift the command to the terminals 38:Shift the command to the communication 39:Pre-magnetized command 40:Consumption power clear 41: Consumption power holding 42–60:Reserved 61:PID pole switching 62–63: Reserved	
P05.10	Polarity selection of the input terminals	0x000–0x1FF	0x000
P05.11	ON-OFF filter time	0.000–1.000s	0.010s
P05.12	Virtual terminals setting	0x000–0x1FF(0: Disabled, 1:Enabled) BIT0:S1 virtual terminal BIT1:S2 virtual terminal BIT2:S3 virtual terminal BIT3:S4 virtual terminal	0

Function code	Name	Detailed description	Default value
		BIT4:S5 virtual terminal BIT5:S6 virtual terminal BIT6:S7 virtual terminal BIT7:S8 virtual terminal BIT8:HDI virtual terminal	
P05.13	Terminals control running mode	0:2-wire control 1 1:2-wire control 2 2:3-wire control 1 3:3-wire control 2	0
P05.14	Switch-on delay of S1 terminal	0.000–50.000s	0.000s
P05.15	Switch-off delay of S1 terminal	0.000–50.000s	0.000s
P05.16	Switch-on delay of S2 terminal	0.000–50.000s	0.000s
P05.17	Switch-off delay of S2 terminal	0.000–50.000s	0.000s
P05.18	Switch-on delay of S3 terminal	0.000–50.000s	0.000s
P05.19	Switch-off delay of S3 terminal	0.000–50.000s	0.000s
P05.20	Switch-on delay of S4 terminal	0.000–50.000s	0.000s
P05.21	Switch-off delay of S4 terminal	0.000–50.000s	0.000s
P05.22	Switch-on delay of S5 terminal	0.000–50.000s	0.000s
P05.23	Switch-off delay of S5 terminal	0.000–50.000s	0.000s
P05.24	Switch-on delay of S6 terminal	0.000–50.000s	0.000s
P05.25	Switch-off delay of S6 terminal	0.000–50.000s	0.000s
P05.26	Switch-on delay of S7 terminal	0.000–50.000s	0.000s
P05.27	Switch-off delay of S7 terminal	0.000–50.000s	0.000s

Function code	Name	Detailed description	Default value
P05.28	Switch-on delay of S8 terminal	0.000–50.000s	0.000s
P05.29	Switch-off delay of S8 terminal	0.000–50.000s	0.000s
P05.30	Switch-on delay of HDI terminal	0.000–50.000s	0.000s
P05.31	Switch-off delay of HDI terminal	0.000–50.000s	0.000s
P07.39	Input terminals state at current fault		0
P17.12	Digital input terminals state		0

7.12 Digital output

Goodrive300-02 series VFDs have 2 relay output terminals, 1 open collector Y output terminal and 1 high-speed pulse output terminal in the standard configuration. All functions of the digital input terminals are programmable by the function codes. The high-speed pulse output terminal HDO can be selected into high-speed pulse output terminal or switch output terminal by function code.



0	Invalid	1	Running	2	Forward running
3	Reverse running	4	Jogging	5	Inverter fault
6	FDT1	7	FDT2	8	Frequency arrival
9	Zero- speed running	10	Upper-limit frequency arrival	11	Lower-limit frequency arrival
12	Ready	13	Pre-exciting	14	Overload pre-alarm
15	Underload pre-alarm	16	Simple PLC stage completion	17	Simple PLC cycle completion
18	Set counting arrival	19	Fixed counting arrival	20	External fault valid
21	Length arrival	22	Running time arrival	23	MODBUS communication virtual terminal output
24	PROFIBUS/CANopen communication virtual terminal output	25	Ethernet communication virtual terminal output	26	Voltage establishment finished
27~30	Reserved				

The below table is the option of the four function parameters and selecting the repeated output terminal function is allowed.

Set value	Function	Instructions
0	Invalid	The output terminal has no function.
1	Running	Output ON signal when the VFD is running and there is frequency output.
2	Forward running	Output ON signal when the VFD is running forward and there is frequency output.
3	Reverse running	Output ON signal when the VFD is running reverse and there is frequency output.
4	Jogging	Output ON signal when the VFD is jogging and there is frequency output.
5	VFD fault	Output ON signal when the VFD is in fault
6	FDT1	Please refer to P08.32 and P08.33 for detailed information.
7	FDT2	Please refer to P08.34 and P08.35 for detailed information.
8	Frequency arrival	Please refer to P08.36 for detailed information.
9	Zero-speed running	Output ON signal when the output frequency and reference frequency of the VFD is 0 at the same time.
10	Upper-limit frequency arrival	Output ON signal when the running frequency of the VFD is the upper limit frequency.
11	Upper-limit frequency arrival	Output ON signal when the running frequency of the VFD is the lower limit frequency.
12	Ready	When the main circuit and the control circuit is established and the protection function of the VFD is not active. The VFD is in the running state and it will output ON signal.
13	Pre-exciting	Output ON signal when the VFD is in the pre-exciting state.
14	Overload pre-alarm	Output ON signal if the VFD is beyond the pre-alarm point. Refer to P11.08–P11.10 for the detailed instruction.
15	Underload pre-alarm	Output ON signal if the VFD is beyond the pre-alarm point. Refer to P11.11–P11.12 for the detailed instruction.
16	Simple PLC stage completion	Output signal if the simple PLC stage is completed.

Set value	Function	Instructions
17	Simple PLC cycle completion	Output signal if the simple PLC cycle is completed.
18	Set counting arrival	Output ON signal if the detected counting exceeds the set value of P08.25.
19	Fixed counting arrival	Output ON signal if the detected counting exceeds the set value of P08.26.
20	External fault valid	Output ON signal if external fault occurs.
21	Length arrival	Output ON signal if the actual detected length exceeds the set length by P08.19.
22	Running time arrival	Output ON signal if the accumulative running time of the VFD exceeds the setting time by P08.27.
23	Modbus communication virtual terminal output	Output corresponding signal according to the setting value of Modbus. Output ON signal if the setting value is 1 and output OFF signal if the setting value is 0.
24	POROFIBUS/CANopen communication virtual terminal output	Output corresponding signal according to the setting value of PROFIBUS/CANopen. Output ON signal if the setting value is 1 and output OFF signal if the setting value is 0.
25	Ethernet communication virtual terminal output	Output corresponding signal according to the setting value of Ethernet. Output ON signal if the setting value is 1 and output OFF signal if the setting value is 0.
26	Voltage establishment finished	The output is valid when the bus voltage reaches the undervoltage point.
27–30	Reserved	

Relative parameters list:

Function code	Name	Detailed description	Default value
P06.00	HDO output	0:Open collector high-speed pulse output 1: Open collector output	0
P06.01	Y output	0:Invalid 1:In operation 2:Forward rotation operation 3:Reverse rotation operation 4: Jogging operation 5:VFD fault	0
P06.02	HDO output		0
P06.03	Relay RO1 output		1
P06.04	Relay RO2 output		5

Function code	Name	Detailed description	Default value
		6:Frequency degree test FDT1 7:Frequency degree test FDT2 8:Frequency arrival 9:Zero speed running 10:Upper limit frequency arrival 11:Lower limit frequency arrival 12:Ready for operation 13:Pre-magnetizing 14:Overload pre-alarm 15: Underload pre-alarm 16:Completion of simple PLC stage 17:Completion of simple PLC cycle 18:Setting count value arrival 19:Reference count value arrival 20:External fault valid 21:Length arrival 22:Running time arrival 23:Modbus communication virtual terminals output 24:PROFIBUS/CANopen communication virtual terminals output 25: Ethernet communication virtual terminals output 26: Completion of DC bus voltage setting 27–30: Reserved	
P06.05	Polarity of output terminals	0x00–0x0F	0x00
P06.06	Y switch-on delay time	0.000–50.000s	0.000s
P06.07	Y switch-off delay time	0.000–50.000s	0.000s
P06.08	HDO switch-on delay time	0.000–50.000s (valid only when P06.00=1)	0.000s
P06.09	HDO switch-off delay time	0.000–50.000s (valid only when P06.00=1)	0.000s
P06.10	RO1 switch-on delay time	0.000–50.000s	0.000s
P06.11	RO1 switch-off delay time	0.000–50.000s	0.000s
P06.12	RO2 switch-on delay time	0.000–50.000s	0.000s
P06.13	RO2 switch-off delay time	0.000–50.000s	0.000s

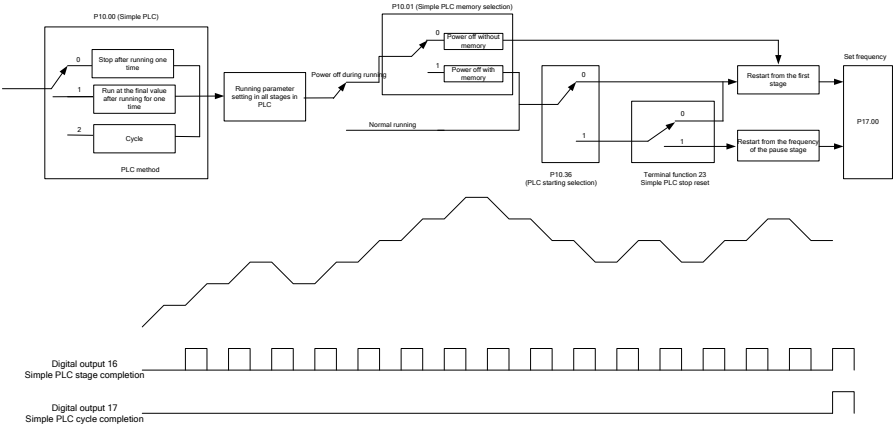
Function code	Name	Detailed description	Default value
P07.40	Output terminals state at current fault		0
P17.13	Digital output terminals state		0

7.13 Simple PLC

Simple PLC function is also a multi-step speed generator. The VFD can change the running frequency, direction to meet the need of processing according to the running time automatically. In the past, this function needs to be assisted by external PLC, but now the VFD can realize this function by itself.

The series VFDs can control 16-stage speed with 4 groups of ACC/DEC time.

The multi-function digital output terminals or multi-function relay output an ON signal when the set PLC finishes a circle (or a stage).



Relative parameters list:

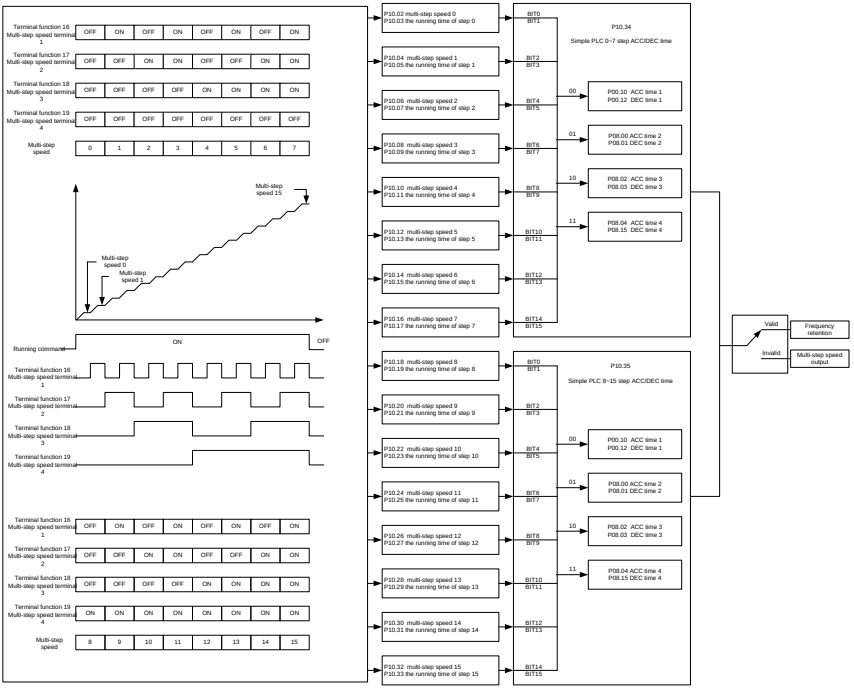
Function code	Name	Detailed description	Default value
P10.00	Simple PLC	0:Stop after running once 1:Run at the final value after running once 2:Cycle running	0
P10.01	Simple PLC memory	0:Power loss without memory 1:Power loss memory	0

Function code	Name	Detailed description	Default value
P10.02	Multi-step speed 0	-100.0–100.0%	0.0%
P10.03	The running time of step 0	0.0–6553.5s(min)	0.0s
P10.04	Multi-step speed 1	-100.0–100.0%	0.0%
P10.05	The running time of step 1	0.0–6553.5s(min)	0.0s
P10.06	Multi-step speed 2	-100.0–100.0%	0.0%
P10.07	The running time of step 2	0.0–6553.5s(min)	0.0s
P10.08	Multi-step speed 3	-100.0–100.0%	0.0%
P10.09	The running time of step 3	0.0–6553.5s(min)	0.0s
P10.10	Multi-step speed 4	-100.0–100.0%	0.0%
P10.11	The running time of step 4	0.0–6553.5s(min)	0.0s
P10.12	Multi-step speed 5	-100.0–100.0%	0.0%
P10.13	The running time of step 5	0.0–6553.5s(min)	0.0s
P10.14	Multi-step speed 6	-100.0–100.0%	0.0%
P10.15	The running time of step 6	0.0–6553.5s(min)	0.0s
P10.16	Multi-step speed 7	-100.0–100.0%	0.0%
P10.17	The running time of step 7	0.0–6553.5s(min)	0.0s
P10.18	Multi-step speed 8	-100.0–100.0%	0.0%
P10.19	The running time of step 8	0.0–6553.5s(min)	0.0s
P10.20	Multi-step speed 9	-100.0–100.0%	0.0%
P10.21	The running time of step 9	0.0–6553.5s(min)	0.0s
P10.22	Multi-step speed 10	-100.0–100.0%	0.0%
P10.23	The running time of step 10	0.0–6553.5s(min)	0.0s
P10.24	Multi-step speed 11	-100.0–100.0%	0.0%
P10.25	The running time of step 11	0.0–6553.5s(min)	0.0s
P10.26	Multi-step speed 12	-100.0–100.0%	0.0%
P10.27	The running time of step 12	0.0–6553.5s(min)	0.0s
P10.28	Multi-step speed 13	-100.0–100.0%	0.0%
P10.29	The running time of step 13	0.0–6553.5s(min)	0.0s
P10.30	Multi-step speed 14	-100.0–100.0%	0.0%
P10.31	The running time of step 14	0.0–6553.5s(min)	0.0s
P10.32	Multi-step speed 15	-100.0–100.0%	0.0%
P10.33	The running time of step 15	0.0–6553.5s(min)	0.0s
P10.36	PLC restart	0:Restart from the first stage 1:Continue to run from the stop frequency	0
P10.34	Simple PLC 0–7 step ACC/DEC time	0x0000–0XFFFF	0000

Function code	Name	Detailed description	Default value
P10.35	Simple PLC 8–15 step ACC/DEC time	0x0000–0XFFFF	0000
P05.01–P05.09	Digital input function selection	23:Simple PLC stop reset 24:Simple PLC pause 25:PID control pause	
P06.01–P06.04	Digital output function selection	16:Completion of simple PLC stage 17:Completion of simple PLC cycle	
P17.00	Setting frequency	0.00Hz – P00.03 (Max. output frequency)	0.00Hz
P17.27	Simple PLC and current step of the multi-step speed	0–15	0

7.14 Multi-step speed running

Set the parameters when the VFD carries out multi-step speed running. Goodrive300-02 series VFDs can set 16 stages speed which can be selected by the combination code of multi-step speed terminals 1–4. They correspond to multi-step speed 0 to 15.



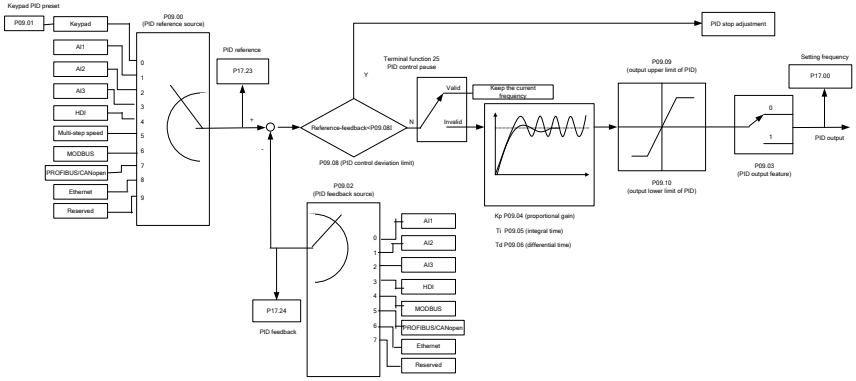
Relative parameters list:

Function code	Name	Detailed description	Default value
P10.02	Multi-step speed 0	-100.0–100.0%	0.0%
P10.03	The running time of step 0	0.0–6553.5s(min)	0.0s
P10.04	Multi-step speed 1	-100.0–100.0%	0.0%
P10.05	The running time of step 1	0.0–6553.5s(min)	0.0s
P10.06	Multi-step speed 2	-100.0–100.0%	0.0%
P10.07	The running time of step 2	0.0–6553.5s(min)	0.0s
P10.08	Multi-step speed 3	-100.0–100.0%	0.0%
P10.09	The running time of step 3	0.0–6553.5s(min)	0.0s
P10.10	Multi-step speed 4	-100.0–100.0%	0.0%
P10.11	The running time of step 4	0.0–6553.5s(min)	0.0s
P10.12	Multi-step speed 5	-100.0–100.0%	0.0%
P10.13	The running time of step 5	0.0–6553.5s(min)	0.0s
P10.14	Multi-step speed 6	-100.0–100.0%	0.0%
P10.15	The running time of step 6	0.0–6553.5s(min)	0.0s
P10.16	Multi-step speed 7	-100.0–100.0%	0.0%
P10.17	The running time of step 7	0.0–6553.5s(min)	0.0s
P10.18	Multi-step speed 8	-100.0–100.0%	0.0%
P10.19	The running time of step 8	0.0–6553.5s(min)	0.0s
P10.20	Multi-step speed 9	-100.0–100.0%	0.0%
P10.21	The running time of step 9	0.0–6553.5s(min)	0.0s
P10.22	Multi-step speed 10	-100.0–100.0%	0.0%
P10.23	The running time of step 10	0.0–6553.5s(min)	0.0s
P10.24	Multi-step speed 11	-100.0–100.0%	0.0%
P10.25	The running time of step 11	0.0–6553.5s(min)	0.0s
P10.26	Multi-step speed 12	-100.0–100.0%	0.0%
P10.27	The running time of step 12	0.0–6553.5s(min)	0.0s
P10.28	Multi-step speed 13	-100.0–100.0%	0.0%
P10.29	The running time of step 13	0.0–6553.5s(min)	0.0s
P10.30	Multi-step speed 14	-100.0–100.0%	0.0%
P10.31	The running time of step 14	0.0–6553.5s(min)	0.0s
P10.32	Multi-step speed 15	-100.0–100.0%	0.0%
P10.33	The running time of step 15	0.0–6553.5s(min)	0.0s
P10.34	Simple PLC 0–7 step ACC/DEC time	0x0000–0XFFFF	0000
P10.35	Simple PLC 8–15 step ACC/DEC time	0x0000–0XFFFF	0000

Function code	Name	Detailed description	Default value
P05.01–P05.09	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:Multi-step speed pause	
P17.27	Simple PLC and current step of the multi-step speed	0–15	0

7.15 PID control

PID control is commonly used to control the procedure through the controlled procedure. Adjust the output frequency by proportional, integral, differential operation with the dispersion of the target signals to stabilize the value on the target. It is possible to apply to the flow, pressure and temperature control. Figure of basic control is as below:



Simple illustration of the PID control operation and adjustment:

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

difference becomes small. Integral time (Ti): the output adjustment will accumulate if there is an error between the feedback and the reference. The adjustment will keep on increasing until the error disappears. If the error is existent all the time, the integration adjustor can cancel the static error effectively. Vibration may occur as a result of unstable system caused by repeated over-adjustment if the integration adjustor is too strong. The features of this kind of vibration are: the fluctuating feedback signal (around the reference) and increasing traverse range will cause vibration. Adjust the integral time parameter from a big value to a little one to change the integral time and monitor the result until a stable system speed is available.

Derivative time (Td): when the error between the feedback and the reference, a proportional adjustment will be output. The adjustment only depends on the direction and value of the error change other than the error itself. The derivation adjustment controls the change of feedback signals according to the changing trend when it fluctuates. Because the derivation may enlarge the interference to the system, especially the frequent-changing interference, please use it carefully.

When P00.06, P00. 07=7 or P04.27=6, the running mode of the VFD is procedure PID control.

7.15.1 General steps of PID parameters setting:

a. Ensure the gain P

When ensure the gain P, firstly cancel the PID integration and derivation (set Ti=0 and Td=0, see the PID parameter setting for detailed information) to make proportional adjustment is the only method to PID. Set the input as 60%–70% of the permitted Max. Value and increase gain P from 0 until the system vibration occurs, vice versa, and record the PID value and set it to 60%–70% of the current value. Then the gain P commission is finished.

b. Ensure the integral time Ti

After ensuring the gain P, set an original value of a bigger integral time and decrease it until the system vibration occurs, vice versa, until the system vibration disappear. Record the Ti and set the integral time to 150%–180% of the current value. Then integral time commission is finished.

c. Ensure the derivative time Td

Generally, it is not necessary to set Td which is 0.

If it needs to be set, set it to 30% of the value without vibration via the same method with P and Ti.

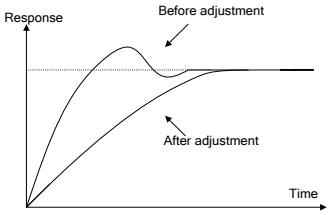
d. Commission the system with and without load and then adjust the PID parameter until it is available.

7.15.2 PID inching

After setting the PID control parameters, inching is possible by following means:

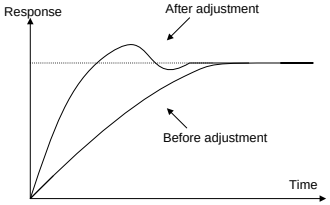
Control the overshoot

Shorten the derivative time and prolong the integral time when overshoot occurs.



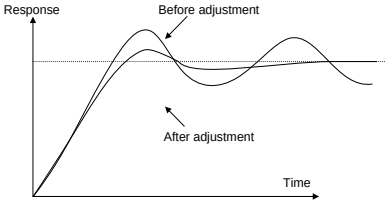
Achieve the stable state as soon as possible

Shorten the integral time (Ti) and prolong the derivative time (Td) even the overshoot occurs, but the control should be stable as soon as possible.



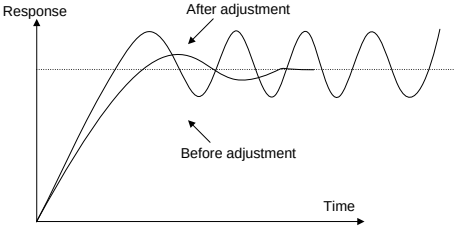
Control long vibration

If the vibration periods are longer than the set value of integral time (Ti), it is necessary to prolong the integral time (Ti) to control the vibration for the strong integration.



Control short vibration

Short vibration period and the same set value with the derivative time (Td) mean that the derivative time is strong. Shortening the derivative time (Td) can control the vibration. When setting the derivative time as 0.00 (ire no derivation control) is useless to control the vibration, decrease the gain.



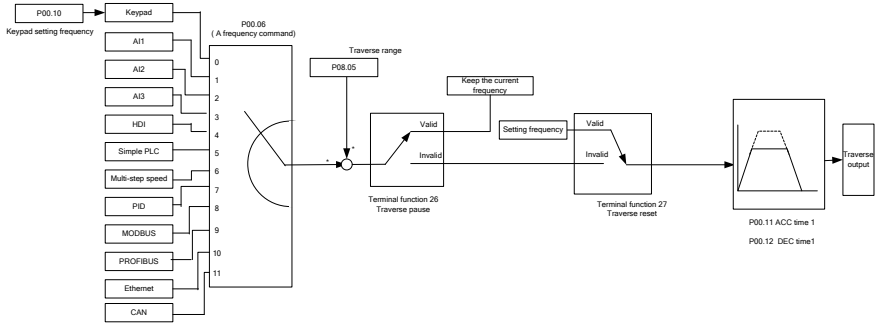
Relative parameters list:

Function code	Name	Detailed description	Default value
P09.00	PID reference source	0:Keypad (P09.01) 1: AI1 2: AI2 3: AI3 4: HDI 5:Multi-step speed set 6:Modbus communication set 7:PROFIBUS/CANopen communication set 8:Ethernet communication set 9:Reserved	0
P09.01	Keypad PID preset	-100.0%–100.0%	0.0%
P09.02	PID feedback source	0: AI1 1: AI2 2: AI3 3: HDI 4:Modbus communication feedback 5:PROFIBUS/CANopen communication feedback 6:Ethernet communication feedback 7:Reserved	0
P09.03	PID output feature	0:PID output is positive 1:PID output is negative	0
P09.04	Proportional gain (Kp)	0.00–100.00	1.00
P09.05	Integral time(Ti)	0.00–10.00s	0.10s
P09.06	Differential time(Td)	0.00–10.00s	0.00s
P09.07	Sampling cycle(T)	0.000–10.000s	0.100s
P09.08	PID control deviation limit	0.0–100.0%	0.0%
P09.09	Output upper limit of PID	P09.10–100.0% (Max. frequency or the Max. voltage)	100.0%
P09.10	Output lower limit of PID	-100.0%–P09.09 (Max. frequency or the Max. voltage)	0.0%
P09.11	Detection value of feedback offline	0.0–100.0%	0.0%
P09.12	Detection time of feedback offline	0.0–3600.0s	1.0s

Function code	Name	Detailed description	Default value
P09.13	PID adjustment	0x0000–0x1111 LED ones: 0: Keep on integral adjustment when the frequency achieves the upper and low limit; the integration shows the change between the reference and the feedback unless it reaches the internal integral limit. When the trend between the reference and the feedback changes, it needs more time to offset the impact of continuous working and the integration will change with the trend. 1: Stop integral adjustment when the frequency achieves the upper and low limit. If the integration keeps stable, and the trend between the reference and the feedback changes, the integration will change with the trend quickly. LED tens: P00.08 is 0 0: The same with the setting direction; if the output of PID adjustment is different from the current running direction, the internal will output 0 forcedly. 1:Opposite to the setting direction LED hundreds: P00.08 is 0 0: Limit to the maximum frequency 1: Limit to frequency A LED thousands: 0:A+B frequency, the buffer of A frequency is invalid 1:A+B frequency, the buffer of A frequency is valid ACC/DEC is determined by ACC time 4 of P08.04	0x0001
P17.00	Setting frequency	0.00Hz–P00.03 (Max. output frequency)	0.00Hz
P17.23	PID reference	-100.0–100.0%	0.0%
P17.24	PID feedback	-100.0–100.0%	0.0%

7.16 Traverse running

Traverse is applied in some industries such as textile, chemical fiber and cases where traverse and convolution is required. The working flowchart is as below:

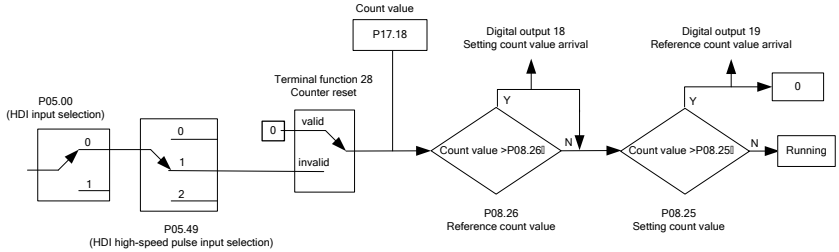


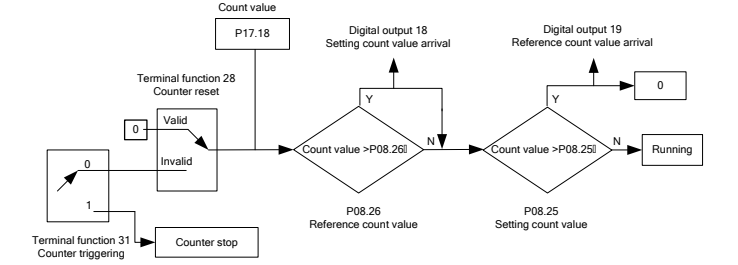
Function code	Name	Detailed description	Default value
P00.03	Max. output frequency	P00.03–400.00Hz	50.00Hz
P00.06	A frequency command	0:Keypad 1: AI1 2: AI2 3: AI3 4:High-speed pulse HDI setting 5:Simple PLC program setting 6: Multi-step speed running setting 7: PID control setting 8:Modbus communication setting 9:PROFIBUS/CANopen communication setting 10:Ethernet communication setting 11:Reserved	0
P00.11	ACC time 1	0.0–3600.0s	Depend on model
P00.12	DEC time 1	0.0–3600.0s	Depend on model
P05.01–P05.09	Digital input function selection	26:Traverse pause (stop at the current frequency) 27:Traverse reset (return to the center frequency)	

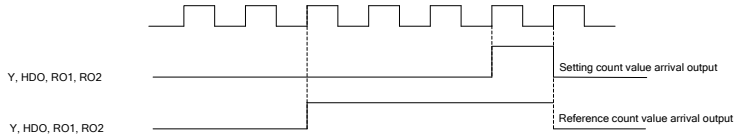
Function code	Name	Detailed description	Default value
P08.15	Traverse range	0.0–100.0%(relative to the set frequency)	0.0%
P08.16	Sudden jumping frequency range	0.0–50.0%(relative to the traverse range)	0.0%
P08.17	Traverse boost time	0.1–3600.0s	5.0s
P08.18	Traverse declining time	0.1–3600.0s	5.0s

7.17 Pulse counter

Goodrive300-02 series VFDs support pulse counter which can input counting pulse through HDI terminal. When the actual length is longer than or equal to the set length, the digital output terminal can output length arrival pulse signal and the corresponding length will clear automatically.



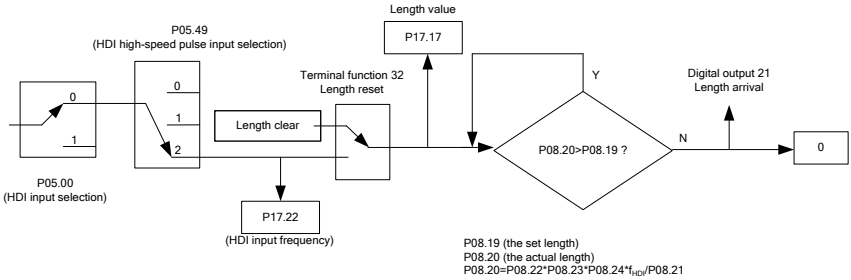




Function code	Name	Detailed description	Default value
P05.00	HDI input selection	0: High-speed pulse input 1: Digital input	0
P05.49	HDI high-speed pulse input selection	0: Frequency setting input 1: Counter input 2: Length counting input	0
P05.01–P05.09	Digital input function selection	28:Counter reset 31:Counter trigger	
P06.01–P06.04	Digital output function selection	18:Setting count value arrival 19:Reference count value arrival	
P08.25	Setting count value	P08.26–65535	0
P08.26	Reference count value	0–P08.25	0
P17.18	Count value	0–65535	0

7.18 Fixed-length control

The VFDs support fixed-length control function which can input length counting pulse through HDI, and then count the actual length according to the internal counting formula. If the actual length is longer than or equal to the set length, the digital output terminal can output the length arrival pulse signal and the corresponding length will clear automatically.



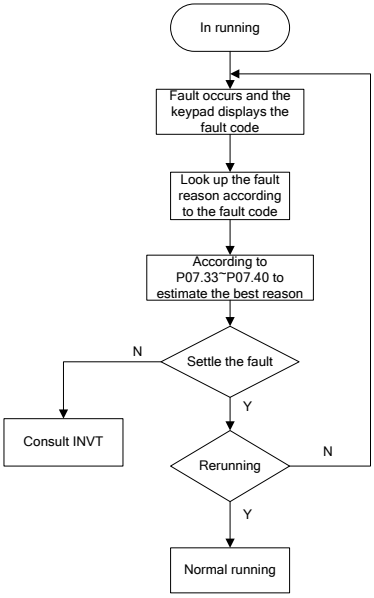
Note: The length arrival belongs to pulse output and the lasting time is 200ms.

Function code	Name	Detailed description	Default value
P05.00	HDI input selection	0: High-speed pulse input 1: Digital input	0
P05.49	HDI high-speed pulse input function selection	0:Frequency setting input 1:Counter input 2:Length counting input	0

Function code	Name	Detailed description	Default value
P05.01–P05.09	Digital input function selection	32: Length reset	
P06.01–P06.04	Digital output function selection	21: Length arrival	
P08.19	Setting length	0–65535m	0
P08.20	Actual length	0–65535m	0
P08.21	Pulse per rotation	1–10000	1
P08.22	Axle perimeter	0.01–100.00cm	10.00
P08.23	Length ratio	0.001–10.000	1.000
P08.24	Length correcting coefficient	0.001–1.000	1.000
P17.17	Length value	0–65535	0
P17.22	HDI input frequency	Display HDI input frequency Range: 0.000–50.000kHz	0.000kHz

7.19 Fault handling

Goodrive300-02 series VFDs provide sufficient fault handling information for the convenience of user's application.



Relative parameters list:

Function code	Name	Detailed description	Default value
P07.27	Current fault type	0: No fault 1: IGBT U phase protection (OUt1) 2: IGBT V phase protection (OUt2) 3: IGBT W phase protection (OUt3) 4: ACC overcurrent (OC1) 5: DEC overcurrent (OC2) 6: Constant speed overcurrent (OC3) 7: ACC overvoltage (OV1) 8: DEC overvoltage (OV2) 9: Constant speed overvoltage (OV3) 10: Bus undervoltage UV 11: Motor overload (OL1) 12: VFD overload (OL2) 13: Input side phase loss (SPI) 14: Output side phase loss (SPO) 15: Overheat of the rectifier module (OH1) 16: Overheat fault of the converter module (OH2) 17: External fault (EF) 18: 485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor antotuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID response offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time arrival (END) 25: Electrical overload (OL3) 26: Panel communication fault (PCE) 27: Parameter uploading fault (UPE) 28: Parameter downloading fault (DNE) 29: PROFIBUS communication fault (E-DP) 30: Ethernet communication fault (E-NET) 31: CANopen communication fault (E-CAN) 32: Grounding short circuit fault 1 (ETH1) 33: Grounding short circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Maladjustment (STo) 36: Underload fault (LL)	0
P07.28	Previous fault type		
P07.29	Previous 2 fault type		
P07.30	Previous 3 fault type		
P07.31	Previous 4 fault type		
P07.32	Previous 5 fault type		

Function code	Name	Detailed description	Default value
P07.33	Running frequency at current fault		0.00Hz
P07.34	Ramp reference frequency at current fault		0.00Hz
P07.35	Output voltage at the current fault		0V
P07.36	Output current at current fault		0.0A
P07.37	Bus voltage at current fault		0.0V
P07.38	Max. temperature at current fault		0.0°C
P07.39	Input terminals state at current fault		0
P07.40	Output terminals state at current fault		0
P07.41	Running frequency at previous fault		0.00Hz
P07.42	Ramp reference frequency at previous fault		0.00Hz
P07.43	Output voltage at previous fault		0V
P07.44	Output current at previous fault		0.0A
P07.45	Bus voltage at previous fault		0.0V
P07.46	Max. temperature at previous fault		0.0°C
P07.47	Input terminals state at previous fault		0
P07.48	Output terminals state at previous fault		0
P07.49	Running frequency at previous 2 fault		0.00Hz
P07.50	Ramp reference frequency at previous 2 fault		0.00Hz

Function code	Name	Detailed description	Default value
P07.51	Output voltage at previous 2 fault		0V
P07.52	Output current at previous 2 fault		0.0A
P07.53	Bus voltage at previous 2 fault		0.0V
P07.54	Max. temperature at previous 2 fault		0.0°C
P07.55	Input terminals state at previous 2 fault		0
P07.56	Output terminals state at previous 2 fault		0

8 Fault tracking

8.1 What this chapter contains

This chapter tells how to reset faults and view fault history. It also lists all alarms and fault messages as well as the possible causes and measures.

Only qualified electricians are allowed to maintain the VFD. Read the safety instructions in chapter 1 "Safety precautions" before working on the VFD.

8.2 Alarm and fault indications

Fault is indicated by LEDs. See 5.4 "Keypad operation". When TRIP light is on, an alarm or fault message on the keypad display indicates abnormal VFD state. Using the information given in this chapter, most alarm and fault cause can be identified and corrected. If not, contact with the INVT office.

8.3 Fault reset

The VFD can be reset by pressing the keypad key STOP/RST, through digital input, or by switching the power light. When the fault has been removed, the motor can be restarted.

8.4 Fault history

Function codes P07.27–P07.32 store 6 recent faults. Function codes P07.33–P07.40, P07.41–P7.48, P07.49–P07.56 show drive operation data at the time the latest 3 faults occurred.

8.5 Fault instruction and solution

Do as the following after the VFD fault:

1. Check to ensure there is nothing wrong with the keypad. If not, please contact with the local INVT office.

2. If there is nothing wrong, please check P07 and ensure the corresponding recorded fault parameters to confirm the real state when the current fault occurs by all parameters.

3. See the following table for detailed solution and check the corresponding abnormal state.

4. Eliminate the fault and ask for relative help.

5. Check to eliminate the fault and carry out fault reset to run the VFD.

8.5.1 Fault instruction and solution

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

Code	Fault	Cause	Solution
OUt1	[1] IGBT U phase protection	The acceleration is too fast; There is damage to the	Increase ACC time; Change the power unit;

Code	Fault	Cause	Solution
OUt2	[2] IGBT V phase protection	internal to IGBT of the phase; Interference causes faulty action; The connection of the driving wires is not good; The grounding is not good	Check the driving wires; Check if there is strong interference to the external equipment
OUt3	[3] IGBT W phase protection		
OV1	[7] Accelerating overvoltage	1. The input voltage is abnormal. 2. There is large energy feedback. 3. No braking components. 4. Braking energy is not open	1. Check the input power 2. Check if the DEC time of the load is too short or the VFD starts during the rotation of the motor or it needs to increase the energy consumption components. 3. Install the braking components. 4. Check the setting of relative function codes.
OV2	[8] Decelerating overvoltage		
OV3	[9] Constant overvoltage		
OC1	[4] Accelerating overcurrent	1. The acceleration or deceleration is too fast. 2. The voltage of the grid is too low. 3. The power of the VFD is too low. 4. The load transients or is abnormal. 5. The grounding is short circuited or the output is phase loss. 6. There is strong external interference. 7. The overvoltage stall protection is not open.	1. Increase the ACC time 2. Check the input power 3. Select the VFD with a larger power 4. Check if the load is short circuited (the grounding short circuited or the wire short circuited) or the rotation is not smooth. 5. Check the output configuration. 6. Check if there is strong interference. 7. Check the setting of relative function codes.
OC2	[5] Decelerating overcurrent		
OC3	[6] Constant overcurrent		
UV	[10] Bus undervoltage fault	1. The voltage of the power supply is too low. 2. The overvoltage stall protection is not open.	1. Check the input power of the supply line. 2. Check the setting of relative function codes.

Code	Fault	Cause	Solution
OL1	[11] Motor overload	The voltage of the power supply is too low; The setting of motor rated current is incorrect; The motor stall or load transients is too strong	Check the power of the supply line; Reset the rated current of the motor Check the load and adjust the torque lift
OL2	[12] VFD overload	The acceleration is too fast; Reset the rotating motor; The voltage of the power supply is too low; The load is too heavy; The motor power is too small.	Increase the ACC time; Avoid the restarting after stopping; Check the power of the supply line; Select an VFD with bigger power; Select a proper motor
SPI	[13] Input phase loss	Phase loss or fluctuation of input R,S,T	Check input power; Check installation distribution
SPO	[14] Output phase loss	U, V, W phase loss output (or three phases of the load are seriously asymmetrical)	Check the output distribution; Check the motor and cable
OH1	[15] Rectifying module overheat	Air duct jam or fan damage; Ambient temperature is too high; The time of overload running is too long	Dredge the air duct or change the fan; Low the ambient temperature
OH2	[16] Converter module overheat		
EF	[17] External fault	SI external fault input terminals action	Check the external device input
CE	[18] 485 communication fault	The baud rate setting is incorrect; Fault occurs to the communication wiring; The communication address is wrong; There is strong interference to the communication	Set proper baud rate; Check the communication connection distribution; Set proper communication address; Change or replace the connection distribution or improve the anti-interference capability
ItE	[19] Current detection fault	The connection of the control board is not good;	Check the connector and repatch;

Code	Fault	Cause	Solution
		Hoare component is broken; The modifying circuit is abnormal	Change the Hoare; Change the main control board
tE	[20] Motor autotuning fault	The motor capacity does not comply with the VFD capacity; The rated parameter of the motor does not set correctly; The offset between the parameters from autotune and the standard parameter is huge; Autotune overtime	Change the VFD model; Set the rated parameter according to the motor name plate; Empty the motor load and reindentify; Check the motor connection and set the parameter; Check if the upper limit frequency is above 2/3 of the rated frequency
EEP	[21] EEPROM operation fault	Error of controlling the write and read of the parameters; Damage to EEPROM	Press STOP/RST to reset; Change the main control board
bCE	[22] PID feedback offline fault	Braking circuit fault or damage to the braking pipes; The external braking resistor is not sufficient	Check the braking unit and change new braking pipes; Increase the braking resistor
END	[23] Braking unit fault	The actual running time of the VFD is above the internal setting running time	Ask for the supplier and adjust the setting running time
OL3	[24] Running time arrival	The VFD will report overload pre-alarm according to the set value	Check the load and the overload pre-alarm point
PCE	[25] Electrical overload	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; There is circuit fault on the communication of the keypad and main board	Check the keypad wires and ensure whether there is mistake; Check the environment and avoid the interference source; Change the hardware and ask for service

Code	Fault	Cause	Solution
UPE	[26] Keypad communication fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; Communication fault	Check the environment and eliminate interference source; Change the hardware and ask for service; Change the hardware and ask for service;
DNE	[27] Parameters uploading fault	The connection of the keypad wires is not good or broken; The keypad wire is too long and affected by strong interference; There is mistake on the data storage of the keypad	Check the environment and eliminate interference source; Change the hardware and ask for service; Repack up the data in the keypad
E-DP	[28] Parameters downloading fault	Communication address is not correct; Corresponding resistor is not dialed; The files of main stop GSD does not set right; The ambient interference is too strong	Check the related setting; Check the environment and avoid the interference
E-NET	[29] PROFIBUS communication fault	Ethernet address is not set right; Ethernet communication is not selected to right; The ambient interference is too strong	Check the related setting; Check the communication method selection; Check the environment and avoid the interference
E-CAN	[30] Ethernet communication fault	The connection is not good; Corresponding resistor is not dialed; The communication baud rate is uneven; The ambient interference is too strong	Check the connection; Draw out the corresponding resistor; Set the same baud rate; Check the environment and avoid the interference
ETH1	[31] CANopen communication fault	The output of the VFD is short circuited with the ground;	Check if the connection of the motor is normal or not; Change the Hoare;

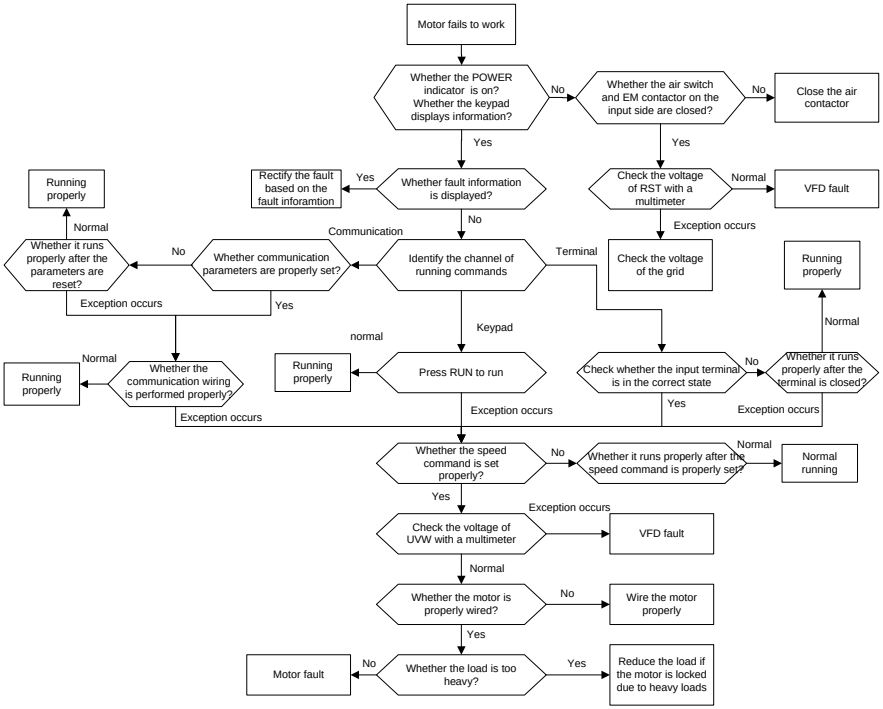
Code	Fault	Cause	Solution
		There is fault in the current detection circuit; The actual motor power sharply differs from the VFD power.	Change the main control board; Set motor parameters correctly.
ETH2	[32] Grounding shortcircuit fault 1	The output of the VFD is short circuited with the ground; There is fault in the current detection circuit; The actual motor power sharply differs from the VFD power.	Check if the connection of the motor is normal or not; Change the Hoare; Change the main control board; Set motor parameters correctly.
dEu	[33] Grounding shortcircuit fault 2	The load is too heavy or stalled	Check the load and ensure it is normal; Increase the detection time; Check whether the control parameters are normal
STo	[34] Speed deviation fault	The control parameter of the synchronous motor is not set right; The autotuning parameter is not correct; The VFD is not connected to the motor	Check the load and ensure it is normal; Check whether the control parameter is set properly or not; Increase the maladjustment detection time
LL	[35] Maladjustment fault	The VFD will report the underload pre-alarm according to the set value	Check the load and the underload pre-alarm point
	[36] Electronic underload fault		

8.5.2 Other faults

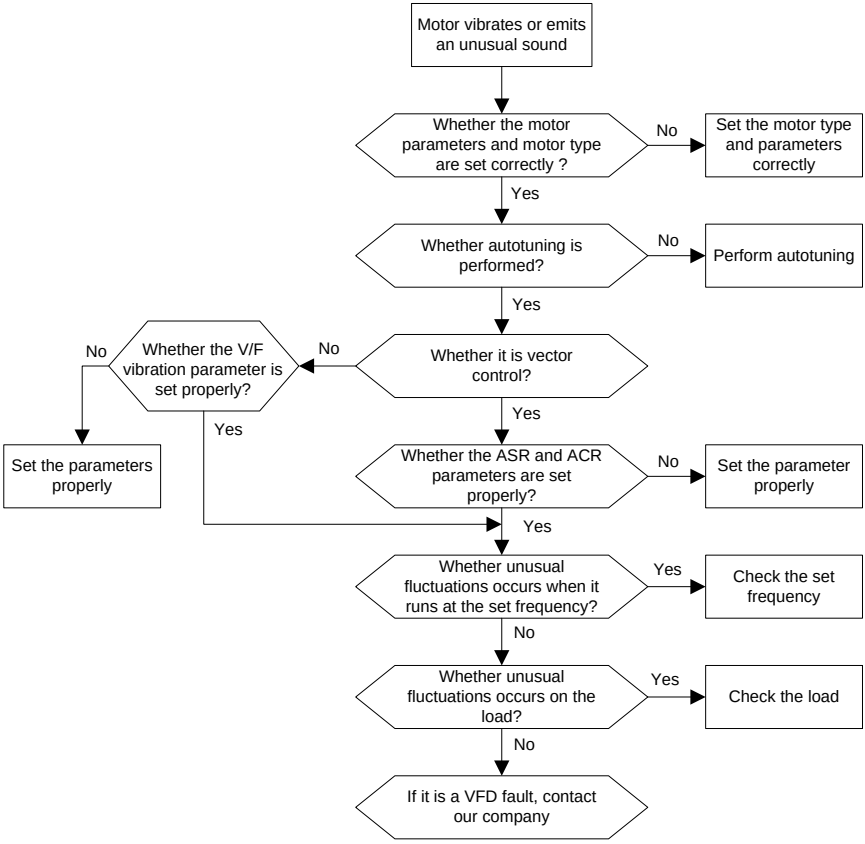
Code	Fault	Cause	Solution
PoFF	System power failure	The system is power-off or the bus voltage is too low	Check the environment of the power supply
	Communication failure between keypad and main control board	The keypad is not connected properly	Check the installation environment of the keypad

8.6 Common fault analysis

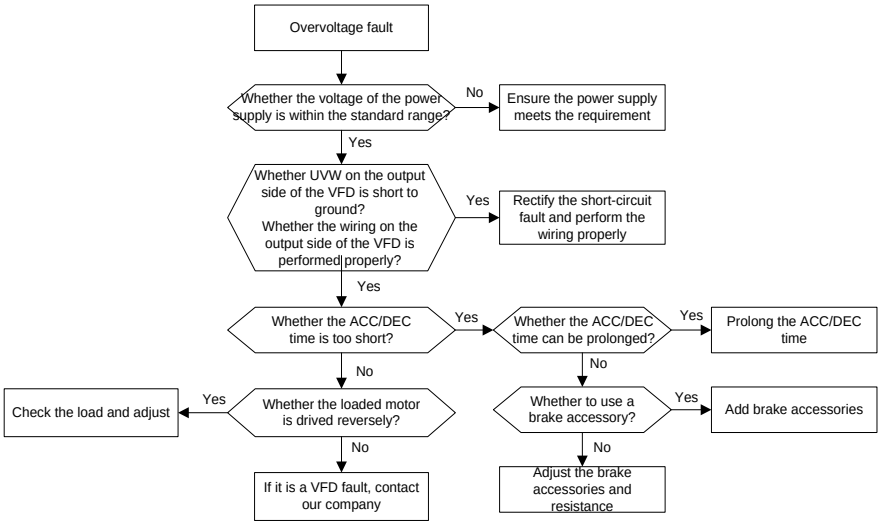
8.6.1 Motor fails to work



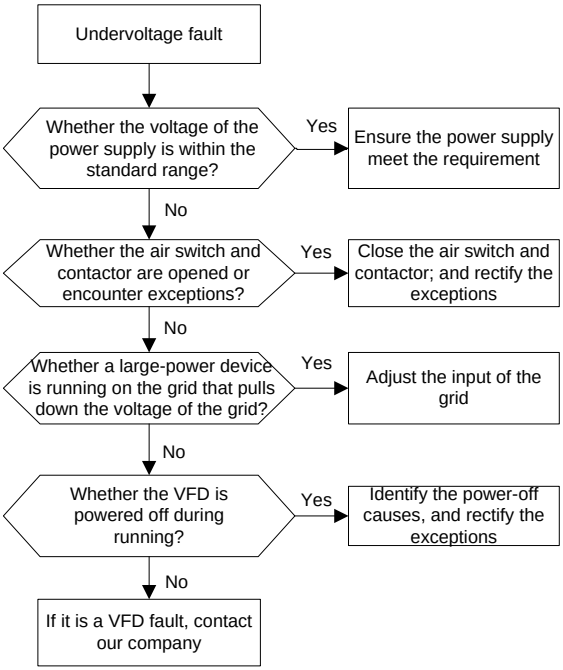
8.6.2 Motor vibrates



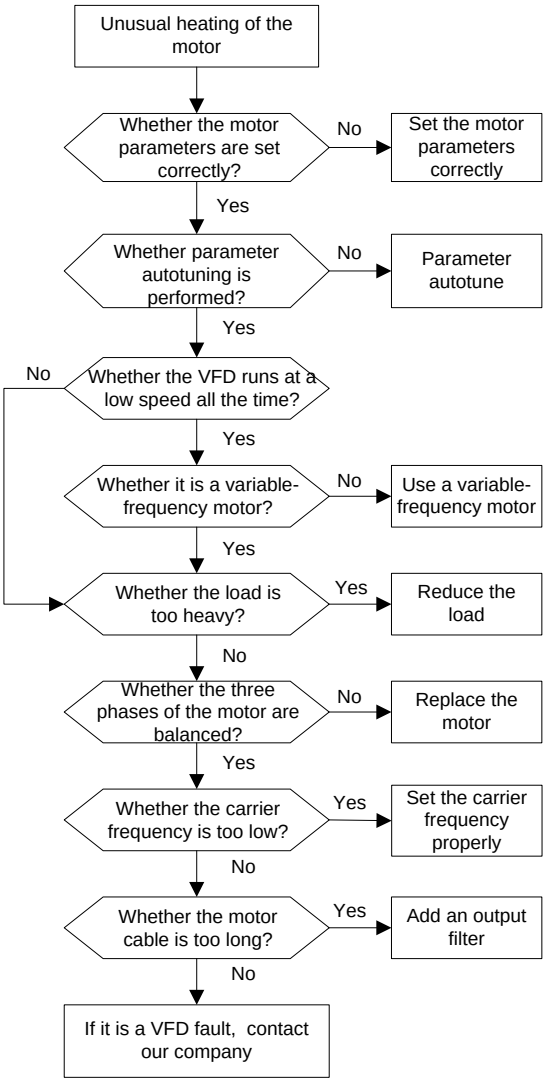
8.6.3 Overvoltage



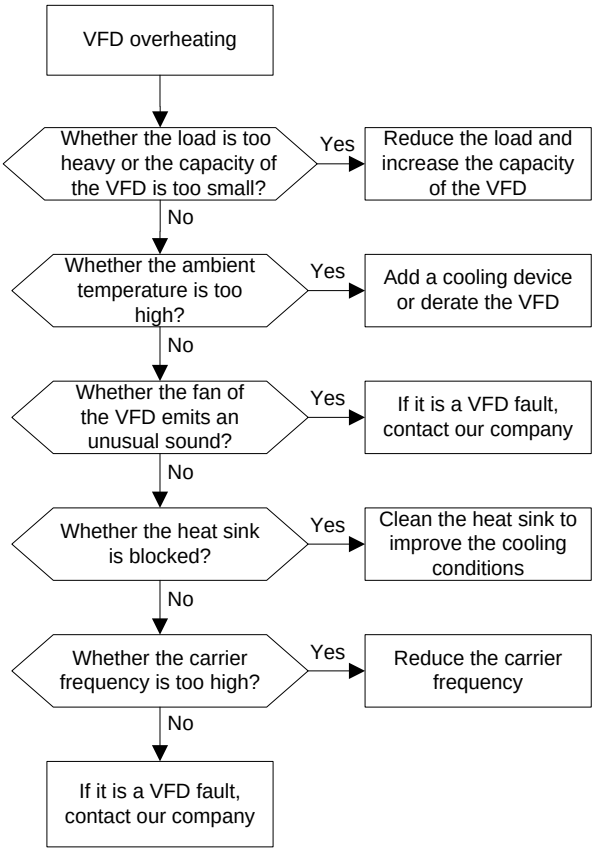
8.6.4 Undervoltage fault



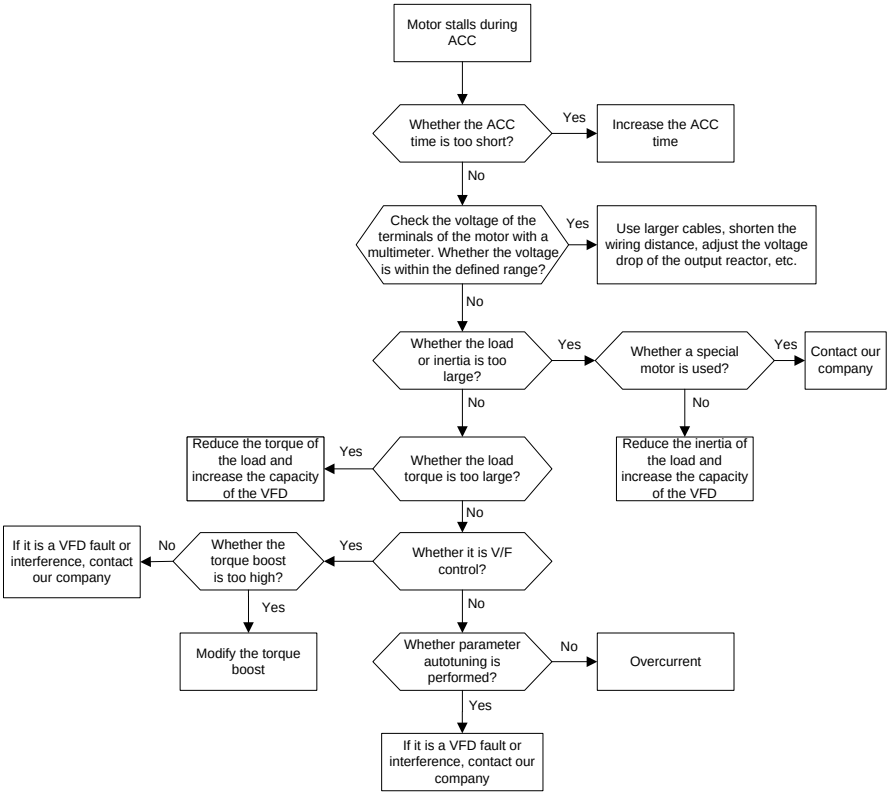
8.6.5 Unusual heating of motor



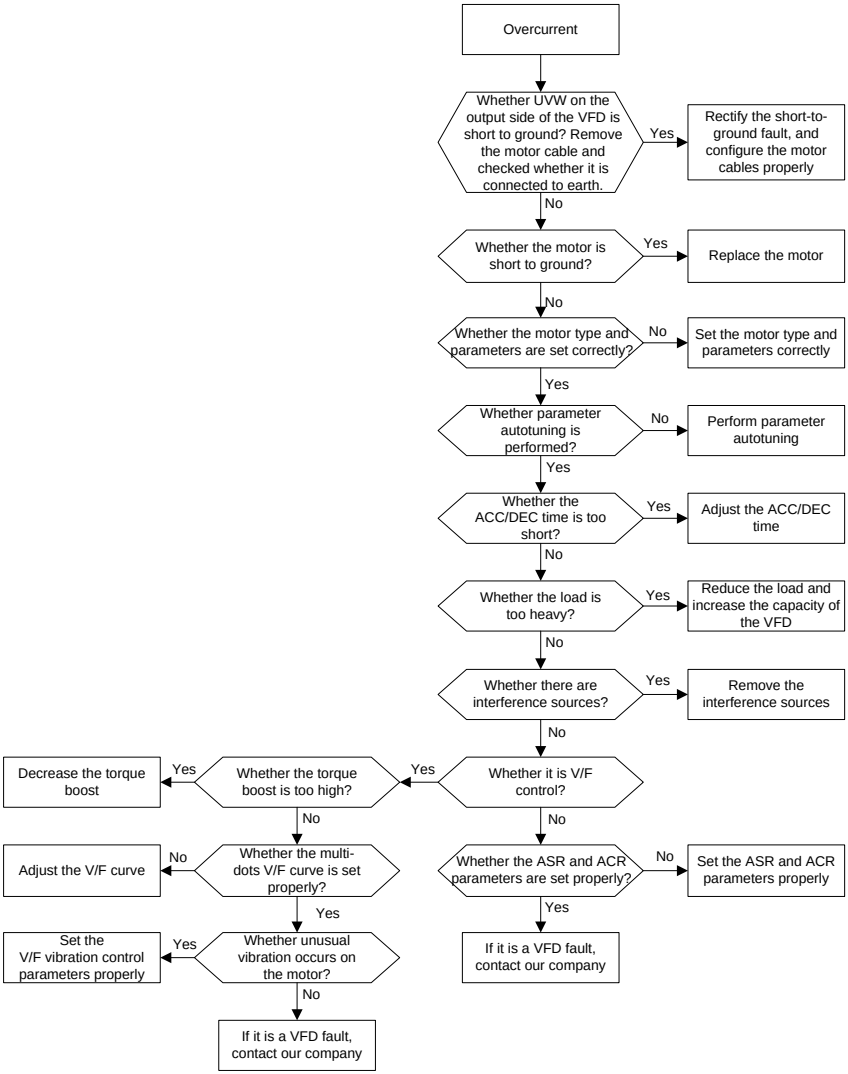
8.6.6 VFD overheating



8.6.7 Motor stalls during ACC



8.6.8 Overcurrent



9 Maintenance and hardware diagnosis

9.1 What this chapter contains

The chapter contains preventive maintenance instructions of the VFD.

9.2 Maintenance intervals

If installed in an appropriate environment, the VFD requires very little maintenance. The table lists the routine maintenance intervals recommended by INVT.

Checking		Item	Method	Criterion
Ambient environment		Check the ambient temperature, humidity and vibration and ensure there is no dust, gas, oil fog or water drop.	Visual examination and instrument test	Conforming to the manual
		Ensure there are no tools or other foreign or dangerous objects.	Visual examination	There are no tools or dangerous objects.
Voltage		Ensure the main circuit and control circuit are normal.	Measure with multimeter	Conforming to the manual
Keypad		Ensure the display is clear enough.	Visual examination	The characters are displayed normally.
		Ensure the characters are displayed totally.	Visual examination	Conforming to the manual
Main circuit	For public use	Ensure the screws are tightened securely.	Tighten up	NA
		Ensure there is no distortion, crackles, damage or color-changing caused by overheat and aging to the machine.	Visual examination	NA
		Ensure there is no dust or dirtiness	Visual examination	NA **Note:** If the color of copper blocks changes, it does not mean there is something wrong with the features.
	Lead of conductors	Ensure that there is no distortion or color-changing caused by overheat to the conductors.	Visual examination	NA

Checking		Item	Method	Criterion
		Ensure that there are no crackles or color-changing to the protective layers.	Visual examination	NA
	Terminals seat	Ensure that there is no damage.	Visual examination	NA
	Filter capacitors	Ensure that there is no leakage, color-changing, crackles or casing expansion.	Visual examination	NA
		Ensure the safety valve is in the right place.	Estimate the life time according to the maintenance or measure the electrostatic capacity	NA
		If necessary, measure the electrostatic capacity.	Measure the capacity by instrument	The capacity is above or equal to the original value *0.85.
	Resistors	Ensure whether there is replacement and splitting caused by overheats.	Smelling and visual examination	NA
		Ensure that there is no offline.	Visual examination or remove one end to coagulate or measure with multimeter	The resistance is in ±10% of the standard value
	Transformer and reactor	Ensure there is no abnormal vibration, noise or smelling	Hearing, smelling and visual examination	NA
	Electro-magnetic contactor and relay	Ensure whether there is vibration noise in the workrooms.	Hearing	NA
		Ensure the contact is in good connection.	Visual examination	NA
Control circuit	PCB and plug	Ensure there are no loose screws or contactors.	Tighten up	NA
		Ensure there is no smelling or color-changing.	Smelling and visual examination	NA
		Ensure there are no crackles, damage, distortion or rust.	Visual examination	NA

Checking		Item	Method	Criterion
		Ensure there is no leakage or distortion to the capacitors.	Visual examination or estimate the life time according to the maintenance information	NA
Cooling system	Cooling fan	Estimate whether there is abnormal noise and vibration.	Hearing and Visual examination or rotate with hand	Stable rotation
		Estimate there is no loose screws.	Tighten up	NA
		Ensure there is no color-changing caused by overheat.	Visual examination or estimate the life time according to the maintenance information	NA
	Ventilating duct	Ensure whether there is no stuff or foreign objects in cooling fan, air inlet and air vent.	Visual examination	NA

Consult the local service representative for more details on the maintenance, or visit the official website: http://www.invt.com.cn.

9.3 Cooling fan

The VFD's cooling fan has a minimum life span of 25,000 operating hours. The actual life span depends on the VFD usage and ambient temperature.

The operating hours can be found through P07.14.

Fan failure can be predicted by the increasing noise from the fan bearings. If the VFD is operated in a critical part of a process, fan replacement is recommended once these symptoms appear. Spare fans are also available.

9.3.1 Replacing the cooling fan

Read and follow the instructions in chapter 1 "Safety precautions". Ignoring the instructions would cause physical injury or death, or damage to the equipment.

1. Stop the VFD and disconnect it from the AC power source and wait for at least the time designated on the VFD.

2. Loosen the fan cable from the clip (remove the middle casing for the VFD of 380V 7.5–30kW).

3. Disconnect the fan cable.

4. Remove the fan with screwdriver.

5. Install the new fan in the VFD, put the fan cables in the clip and then fix the VFD well. Keep the wind direction of the fan consistent with that of the VFD, as shown below:

6. Connect the power supply.

9.4 Capacitors

9.4.1 Capacitors reforming

The DC bus capacitors must be reformed according to the operation instruction if the VFD has been stored for a long time. The storing time is counted from the delivery date.

Time	Operational principle
Storing time less than 1 year	Operation without charging
Storing time 1-2 years	Connect with the power for 1 hour before first ON command
Storing time 2-3 years	Use voltage-adjusting power supply to charge the VFD • charging 25% rated voltage for 30 minutes • charging 50% rated voltage for 30 minutes • charging 75% rated voltage for 30 minutes • charging 100% rated voltage for 30 minutes
Storing time more than 3 years	Use voltage-adjusting power supply to charge the VFD • charging 25% rated voltage for 2 hours • charging 50% rated voltage for 2 hours • charging 75% rated voltage for 2 hours • charging 100% rated voltage for 2 hours

Use voltage-adjusting power supply to charge the VFD:

The right selection of the voltage-adjusting power supply depends on the supply power of the VFD. The single-phase 220V AC/2A voltage regulator is applied to single/three-phase 220V AC VFD. The single/three-phase VFD can apply single-phase voltage-adjusting power supply for charging (L+ to R, N to S or T). All DC bus capacitors can charge at the same time because there is one rectifier.

High-voltage VFD needs enough voltage (for example, 380V) during charging. The small capacitor power (2A is enough) can be used because the capacitor nearly does not need current when charging.

The operation method of VFD charging through resistors (LEDs):

The charging time is at least 60 minutes if charge the DC bus capacitor directly through power supply. This operation is available on normal temperature and no-load condition and the resistor should be serially connected in the 3-phase circuits of the power supply.

380V drive device: 1K/100W resistor. LED of 100W can be used when the power voltage is no more than 380V. But if used, the light may be off or weak during charging.

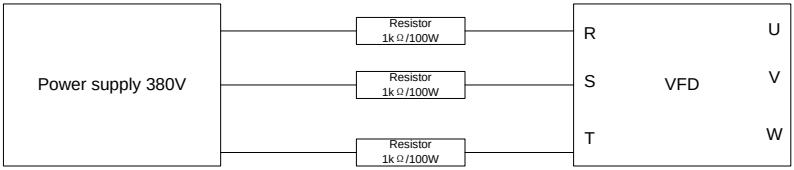


Figure 9-1 380V charging illustration of the drive device

9.4.2 Change electrolytic capacitors

	✧ Read and follow the instructions in chapter 1 "Safety precautions". Ignoring the instructions may cause physical injury or death, or damage to the equipment.

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

9.5 Power cable

	✧ Read and follow the instructions in chapter 1 "Safety precautions". Ignoring the instructions may cause physical injury or death, or damage to the equipment.

1. Stop the drive and disconnect it from the power line. Wait for at least the time designated on the VFD.

2. Check the tightness of the power cable connections.

3. Connect the power supply.

10 Communication protocol

10.1 What this chapter contains

This chapter describes the communication protocol of Goodrive300-02 series VFDs.

The VFDs provide RS485 communication interface and adopt international standard Modbus communication protocol to perform master-slave communication. The user can realize centralized control through PC/PLC, upper computer control, etc. (set the control command, running frequency of the VFD, modify relevant function codes, monitor and control the operating state and fault information of the VFD and so on) to adapt specific application requirements.

10.2 Brief introduction to Modbus protocol

Modbus protocol is a software protocol and common language which is applied in the electrical controller. With this protocol, the controller can communicate with other devices via the channel of signal transmission. And with this industrial standard, the controlling devices of different manufacturers can be connected to an industrial network for the convenience of being monitored.

There are two transmission modes for Modbus protocol: ASCII mode and RTU (Remote Terminal Units) mode. On one Modbus network, all devices should select the same transmission mode and their basic parameters, such as baud rate, digital bit, check bit and stop bit should have no difference.

Modbus network is a controlling network with single master and multiple slaves, which means that only one device is the master and the others are the slaves on one Modbus network. The master can either communicate with any slave independently or send broadcasting messages to all slaves. For the independent access command, the slave will send a response message; for the broadcasting message from the master, the slave will not need to make any response message.

10.3 Application of the VFD

The Modbus protocol of the VFD is RTU mode and the physical layer is RS485.

10.3.1 RS485

The interface of RS485 works on semiduplex and its data signal applies differential transmission which is called balance transmission, too. It uses twisted pairs, one of which is defined as A (+) and the other is defined as B (-). Generally, if the positive electrical level between sending drive A and B is among +2–+6V, it is logic “1”; if the electrical level is among -2V–-6V, it is logic “0”.

485+ on the terminal board corresponds to A and 485- to B.

Communication baud rate means the binary bit number in one second. The unit is bit/s (bps). The higher the baud rate is, the quicker the transmission speed is and the weaker the anti-interference is. If the twisted pairs of 0.56mm (24AWG) is applied as the communication cables, the Max. transmission distance is as below:

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

It is recommended to use shield cables and make the shield layer as the grounding wires during RS485 remote communication.

In the cases with less devices and shorter distance, it is recommended to use 120Ω terminal resistor as the performance will be weakened if the distance increase even though the network can perform well without load resistor.

10.3.1.1 Single application

Figure 1 is the site Modbus connection figure of single VFD and PC. Generally, the computer does not have RS485 interface, the RS232 or USB interface of the computer should be converted into RS485 by converter. Connect the A terminal of RS485 to the 485+ terminal of the VFD and B to the 485- terminal. It is recommended to use the shield twisted pairs. When applying RS232-RS485 converter, if the RS232 interface of the computer is connected to the RS232 interface of the converter, the wire length should be as short as possible within the length of 15m. It is recommended to connect the RS232-RS485 converter to the computer directly. If using USB-RS485 converter, the wire should be as short as possible, too.

Select a right interface to the upper computer (select the interface of RS232-RS485 converter, such as COM1) after the wiring and set the basic parameters such as communication baud rate and digital check bit to the same as the VFD.

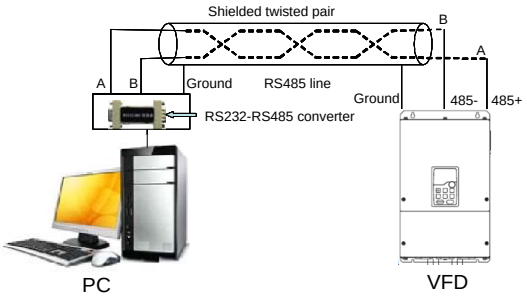


Figure 10-1 RS485 physical connection in single application

10.3.1.2 Multi-application

In the real multi-application, the chrysanthemum connection and star connection are commonly used.

Chrysanthemum chain connection is required in the RS485 industrial fieldbus standards. The two ends are connected to terminal resistors of 120Ω which is shown as Figure 10-2. Figure 10-3 is the simplified connection figure and Figure 10-4 is the real application figure.

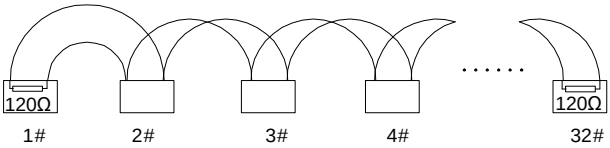


Figure 10-2 Chrysanthemum connection

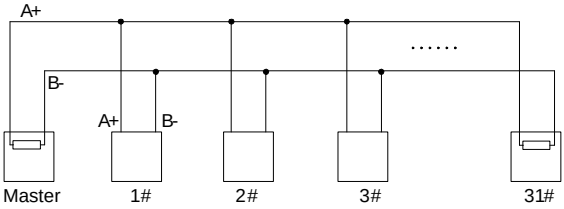


Figure 10-3 Simplified chrysanthemum connection

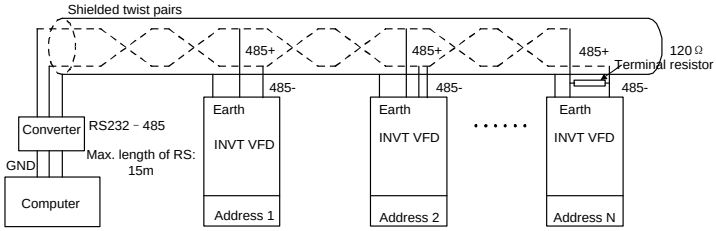


Figure 10-4 Chrysanthemum connection applications

Figure 10-5 is the star connection. Terminal resistor should be connected to the two devices which have the longest distance. (1# and 15# device)

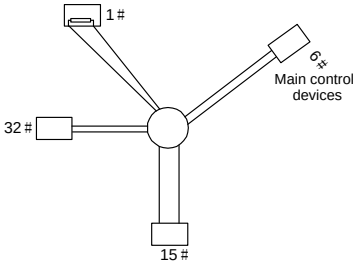


Figure 10-5 Star connection

It is recommended to use shield cables in multiple connection. The basic parameter of the devices, such as baud rate and digital check bit in RS485 should be the same and there should be no repeated address.

10.3.2 RTU mode

10.3.2.1 RTU communication frame format

If the controller is set to communicate by RTU mode in Modbus network every 8bit byte in the message includes two 4Bit hex characters. Compared with ACSII mode, this mode can send more data at the same baud rate.

Code system

- 1 start bit
- 7 or 8 digital bit, the minimum valid bit can be sent firstly. Every 8 bit frame includes two hex characters (0...9, A...F)
- 1 even/odd check bit . If there is no checkout, the even/odd check bit is inexistent.
- 1 end bit (with checkout), 2 Bit (no checkout)

Error detection field

- CRC

The data format is illustrated as below:

11-bit character frame (BIT1–BIT8 are the data bits)

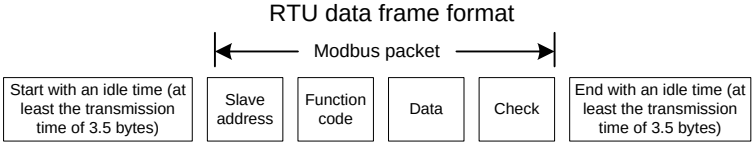
Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	BIT8	Check bit	End bit

10-bit character frame (BIT1–BIT7 are the data bits)

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

In one character frame, the digital bit takes effect. The start bit, check bit and end bit is used to send the digital bit right to the other device. The digital bit, even/odd checkout and end bit should be set as the same in real application.

In the RTU mode, the minimum idle time between new frames should be no less than 3.5 bytes. In the network whose transmission speed is calculated by baud rate, transmission time of 3.5 bytes can be controlled easily. The data fields are as follows: slave address, operation code, data and CRC checkout, the byte of each field is hex (0...9, A...F). The network device is always monitoring the action of communication bus. When the first field (the address message) is received, each device will confirm the byte. After the final byte is transmitted, there will be another interval time similar to 3.5 bytes to indicate the end of the frame. Later, a new frame will start.



The whole message frame in RTU mode is a continuous transmitting flow. If there is an interval time (more than 1.5 bytes) before the completion of the frame, the receiving device will renew the uncompleted message and suppose the next byte as the address field of the new message. As such, if the new message follows the previous one within the interval time of 3.5 bytes, the receiving device will deal with it as the same with the previous message. If these two phenomena all happen during the transmission, the CRC will generate a fault message to respond to the sending devices.

The standard structure of RTU frame:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	Communication address: 0–247 (decimal system) (0 is the broadcast address)
CMD	03H: read slave parameters 06H: write slave parameters
DATA (N-1) … DATA (0)	The data of 2*N bytes are the main content of the communication as well as the core of data exchanging
CRC CHK low bit	Detection value: CRC (16BIT)
CRC CHK high bit	
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

10.3.2.2 RTU communication frame error checkout

Various factors may cause errors in the data transmission. If there is no error checkout, the receiving devices will not find the message is wrong and they may give an incorrect response which may cause serious impact. So the checkout is essential to the message.

The theme of checkout is that: the sender calculates the sending data according to a fixed formula, and then sends the result with the message. When the receiver gets this message, it will calculate anther result according to the same method and compare it with the sending one. If two results are the same, the message is correct. If not, the message is incorrect.

The error checkout of the frame can be divided into two parts: the bit checkout of the byte and the whole data checkout of the frame (CRC check).

Bit checkout of the byte

The user can select different bit checkouts or non-checkout, which impacts the check bit setting of each byte.

The definition of even checkout: add an even check bit before the data transmission to illustrate the number of “1” in the data transmission is odd number or even number. When it is even, the check byte is “0”, otherwise, the check byte is”1”. This method is used to stabilize the parity of the data.

The definition of odd checkout: add an odd check bit before the data transmission to illustrate the number of “1” in the data transmission is odd number or even number. When it is odd, the check byte is “0”, otherwise, the check byte is”1”. This method is used to stabilize the parity of the data.

For example, when transmitting “11001110”, there are five “1” in the data. If the even checkout is applied, the even check bit is “1”; if the odd checkout is applied; the odd check bit is “0”. The even and odd check bit is calculated on the check bit position of the frame. And the receiving devices also carry out even and odd checkout. If the parity of the receiving data is different from the setting value, there is an error in the communication.

CRC check (Cyclical Redundancy Check)

The checkout uses RTU frame format. The frame includes the frame error detection field which is based on the CRC calculation method. The CRC field is two bytes, including 16 figure binary values. It is added into the frame after calculated by transmitting device. The receiving device recalculates the CRC of the received frame and compares them with the value in the received CRC field. If the two CRC values are different, there is an error in the communication.

During CRC, 0xFFFF will be stored. And then, deal with the continuous 6-above bytes in the frame and the value in the register. Only the 8Bit data in every character is effective to CRC, while the start bit, the end and the odd and even check bit is ineffective.

Each 8 bit character xors with the register, the result moves to the lowest effective bit and the highest bit is filled by 0. If LSB is detected to be 1, the register will xor with the preset value. If LSB is 0, the action will not carry on. Repeat 8 times during the whole process. After the last bit is completed, the next 8 bit character will xor with the current value of the register. The final value in the register is the CRC after the completion of operating all bytes.

The calculation of CRC applies the international standard CRC checkout principles. When the user is editing CRC calculation, he can refer to the relative standard CRC calculation to write the required CRC calculation program.

Here provided a simple function of CRC calculation for the reference (programmed with C 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 ladder logic, CKSM calculated the CRC value according to the frame with the table inquiry. The method is advanced with easy program and quick calculation speed. But the ROM space the program occupied is huge. So use it with caution according to the program required space.

10.4 RTU command code and communication data illustration

10.4.1 Command code: 03H, read N words (Max. continuous reading is 16 words)

Command code 03H means that if the master read data for the VFD, the reading number depends on the “data number” in the command code. The max. continuous reading number is 16 and the parameter address should be continuous. The byte length of every data is 2 (one word). The following command format is illustrated by hex (a number with “H” means hex) and one hex occupies one byte.

The command code is used to read the working stage of the VFD.

For example, read continuous 2 data content from 0004H from the VFD with the address of 01H (read the content of data address of 0004H and 0005H), the frame structure is as below:

RTU master command message (from the master to the VFD)

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR (address)	01H
CMD (command code)	03H
Most significant byte (MSB) of the start address	00H
Least significant byte (LSB) of the start address	04H
MSB of data quantity	00H
LSB of data quantity	02H
LSB of CRC	85H
MSB of CRC	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

T1-T2-T3-T4 between START and END is to provide at least the time of 3.5 bytes as the leisure time and distinguish two messages for the avoidance of taking two messages as one message.

ADDR=01H means the command message is sent to the VFD with the address of 01H and ADDR occupies one byte;

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

“Start address” means reading data from the address and it occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind.

“Data number” means the reading data number with the unit of word. If the “start address” is 0004H and the “data number” is 0002H, the data of 0004H and 0005H will be read.

CRC occupies 2 bytes with the fact that the low bit is in the front and the high bit is in the behind.

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

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	03H
Number of bytes	04H
MSB of data in 0004H	13H
LSB of data in 0004H	88H
MSB of data in 0005H	00H
LSB of data in 0005H	00H
LSB of CRC	7EH
MSB of CRC	9DH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The meaning of the response is that:

ADDR=01H means the command message is sent to the VFD with the address of 01H and ADDR occupies one byte;

CMD=03H means the message is received from the VFD to the master for the response of reading command and CMD occupies one byte;

“Byte number” means all byte number from the byte (excluding the byte) to CRC byte (excluding the byte). 04 means there are 4 byte of data from the “byte number” to “CRC low bit”, which are “digital address 0004H high bit”, “data low bit of address 0004H”, “data high bit of address 0005H” and “data low bit of address 0005H”.

There are 2 bytes stored in one data with the fact that the high bit is in the front and the low bit is in the behind of the message, the data of address 0004H is 1388H,and the data of address 0005H is 0000H.

CRC occupies 2 bytes with the fact that the low bit is in the front and the high bit is in the behind.

10.4.2 Command code: 06H, write one word

The command means that the master write data to the VFD and one command can write one data

other than multiple data. The effect is to change the working mode of the VFD.

For example, write 5000 (1388H) to 0004H from the VFD with the address of 02H, the frame structure is as below:

RTU master command message (from the master to the VFD)

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

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

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

Note: 10.4.1 and 10.4.2 mainly describe the command format, and the detailed application will be mentioned in 10.4.8 with examples.

10.4.3 Command code: 08H, diagnosis function

Meaning of sub-function codes:

Sub-function code	Description
0000	Return to inquire information data

For example: The inquiry information string is same as the response information string when the loop detection to address 01H of driver is carried out.

The RTU request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
MSB of the sub-function code	00H
LSB of the sub-function code	00H
MSB of data	12H
LSB of data	ABH
LSB of CRC CHK	ADH
MSB of CRC CHK	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The RTU response command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	01H
CMD	08H
MSB of the sub-function code	00H
LSB of the sub-function code	00H
MSB of data	12H
LSB of data	ABH
LSB of CRC CHK	ADH
MSB of CRC CHK	14H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

10.4.4 Command code: 10H, continuous writing

Command code 10H means that if the master writes data to the VFD, the data number depends on the “data number” in the command code. The Max. continuous reading number is 16.

For example, write 5000(1388H) to 0004H of the VFD whose slave address is 02H and 50(0032H) to 0005H, the frame structure is as below:

The RTU request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	10H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of data quantity	00H
LSB of data quantity	02H

Number of bytes	04H
MSB of data to be written to 0004H	13H
LSB of data to be written to 0004H	88H
MSB of data to be written to 0005H	00H
LSB of data to be written to 0005H	32H
LSB of CRC	C5H
MSB of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The RTU response command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
ADDR	02H
CMD	10H
MSB of data writing address	00H
LSB of data writing address	04H
MSB of data quantity	00H
LSB of data quantity	02H
LSB of CRC	C5H
MSB of CRC	6EH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

10.4.5 The definition of data address

The address definition of the communication data in this part is to control the running of the VFD and get the state information and relative function parameters of the VFD.

10.4.5.1 The rules of parameter address of the function codes

The parameter address occupies 2 bytes with the fact that the high bit is in the front and the low bit is in the behind. The range of high and low byte are: high byte-00–ffH; low byte-00–ffH. The high byte is the group number before the radix point of the function code and the low byte is the number after the radix point. But both the high byte and the low byte should be changed into hex. For example P05.06, the group number before the radix point of the function code is 05, then the high bit of the parameter is 05, the number after the radix point 06, then the low bit of the parameter is 06, then the function code address is 0506H and the parameter address of P10.01 is 0A01H.

Function code	Name	Description	Setting range	Default value	Modify
P10.00	Simple PLC mode	0: Stop after running once 1: Keep running in the final value after running once 2: Cyclic running	0–2	0	○

Function code	Name	Description	Setting range	Default value	Modify
P10.01	Simple PLC memory selection	0: No memory after power down 1: Memory after power down	0–1	0	○

Note: P29 group is the factory parameter which cannot be read or changed. Some parameters cannot be changed when the VFD is in the running state and some parameters cannot be changed in any state. The setting range, unit and relative instructions should be paid attention to when modifying the function code parameters.

Besides, EEPROM is stocked frequently, which may shorten the usage time of EEPROM. For users, some functions are not necessary to be stocked on the communication mode. The needs can be met on by changing the value in RAM. Changing the high bit of the function code from 0 to 1 can also realize the function. For example, the function code P00.07 is not stocked into EEPROM. Only by changing the value in RAM can set the address to 8007H. This address can only be used in writing RAM other than reading. If it is used to read, it is an invalid address.

10.4.5.2 The address instruction of other function in Modbus

The master can operate the parameters of the VFD as well as control the VFD, such as running or stopping and monitoring the working state of the VFD.

Below is the parameter list of other functions:

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Communication control command	2000H	0001H:forward running	R/W
		0002H:reverse running	
		0003H:forward jogging	
		0004H:reverse jogging	
		0005H:stop	
		0006H:coast to stop	
		0007H:fault reset	
		0008H:jogging stop	
The address of communication setting	2001H	Communication setting frequency (0–Fmax(unit: 0.01Hz))	R/W
	2002H	PID reference, range (0 – 1000, 1000 corresponds to 100.0%)	
	2003H	PID feedback, range (0 – 1000, 1000 corresponds to 100.0%)	R/W
	2004H	Torque setting value (-3000–3000, 1000 corresponds to the 100.0% of the rated current of the motor)	R/W

Function instruction	Address definition	Data meaning instruction	R/W characteristics
	2005H	The upper limit frequency setting during forward rotation (0–Fmax(unit: 0.01Hz))	R/W
	2006H	The upper limit frequency setting during reverse rotation (0–Fmax(unit: 0.01Hz))	R/W
	2007H	The upper limit torque of electromotion torque (0–3000, 1000 corresponds to the 100.0% of the rated current of the motor)	R/W
	2008H	The upper limit torque of braking torque (0–3000, 1000 corresponds to the 100.0% of the rated current of the motor)	R/W
	2009H	Special control command word Bit0–1:=00: motor 1 =01: motor 2 =10: motor 3 =11: motor 4 Bit2:=1 torque control prohibit =0: torque control Bit3:=1 power consumption clear =0: no power consumption clear Bit4:=1 pre-exciting enabling =0: pre-exciting disabling Bit5:=1 DC braking enabling =0: DC braking disabling	R/W
	200AH	Virtual input terminal command , range: 0x000–0x1FF	R/W
	200BH	Virtual output terminal command , range: 0x00–0x0F	R/W
	200CH	Voltage setting value (special for V/F separation) (0–1000, 1000 corresponds to the 100.0%)	R/W
	200DH	AO output setting 1 (-1000–1000, 1000 corresponds to 100.0%)	R/W
	200EH	AO output setting 2 (-1000–1000, 1000 corresponds to 100.0%)	R/W
SW 1 of the VFD	2100H	0001H:forward running	R
		0002H:forward running	
		0003H:stop	
		0004H:fault	
		0005H: POFF state	
		0006H: pre-exciting state	

Function instruction	Address definition	Data meaning instruction		R/W characteristics
SW 2 of the VFD	2101H	Bit0: =0: ready for operation =1: not ready for operation Bit1–2: =00:motor 1 =01:motor 2 =10:motor 3 =11:motor 4 Bit3: =0:asynchronous motor =1:synchronous motor Bit4: =0:pre-alarm without overload =1:overload pre-alarm Bit5– Bit6: =00: keypad control =01: terminal control =10: communication control		R
Fault code of the VFD	2102H	See the fault type instruction		R
Identifying code of the VFD	2103H	GD300-----0x010a		R
Operation frequency	3000H	0–Fmax (unit: 0.01Hz)	Compatible with CHF100A and CHV100 communication addresses	R
Setting frequency	3001H	0–Fmax (unit: 0.01Hz)		R
Bus voltage	3002H	0.0–2000.0V (unit: 0.1V)		R
Output voltage	3003H	0–1200V (unit: 1V)		R
Output current	3004H	0.0–3000.0A (unit: 0.1A)		R
Rotation speed	3005H	0–65535 (unit: 1RPM)		R
Output power	3006H	-300.0–300.0% (unit: 0.1%)		R
Output torque	3007H	-250.0–250.0% (unit: 0.1%)		R
Close loop setting	3008H	-100.0–100.0% (unit: 0.1%)		R
Close loop feedback	3009H	-100.0–100.0% (unit: 0.1%)		R
Input IO state	300AH	000–1FF		R
Output IO state	300BH	000–1FF		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	0.00–10.00V (unit: 0.01V)		R
Analog input 4	300FH			R
Read input of high-speed pulse 1	3010H	0.00–50.00kHz (unit: 0.01Hz)		R
Read input of high-speed pulse 2	3011H			R

Function instruction	Address definition	Data meaning instruction		R/W characteristics
Read the current step of multi-step speed	3012H	0–15		R
External length	3013H	0–65535		R
External counting	3014H	0–65535		R
Torque setting	3015H	-300.0–300.0% (unit: 0.1%)		R
Identifying code of the VFD	3016H			R
Fault code	5000H			R

R/W characteristics means the function is with read and write characteristics. For example, “communication control command” is writing chrematistics and control the VFD with writing command (06H). R characteristic can only read other than write and W characteristic can only write other than read.

Note: When operate the VFD with the table above, it is necessary to enable some parameters. For example, the operation of running and stopping, it is necessary to set P00.01 to communication running command channel and set P00.02 to Modbus communication channel. And when operate “PID reference”, it is necessary to set P09.00 to “Modbus communication setting”.

The encoding rules for device codes (corresponds to identifying code 2103H of the VFD)

High 8 bit	Meaning	Low 8 bit	Meaning
0x01	GD	0x08	GD35 vector VFD
		0x0a	GD300 vector VFD

10.4.6 Fieldbus ratio values

The communication data is expressed by hex in actual application and there is no radix point in hex. For example, 50.12Hz cannot be expressed by hex so 50.12 can be magnified by 100 times into 5012, so hex 1394H can be used to express 50.12.

A non-integer can be timed by a multiple to get an integer and the integer can be called fieldbus ratio values.

The fieldbus ratio values are referred to the radix point of the setting range or default value in the function parameter list. If there are figures behind the radix point (n=1), then the fieldbus ratio value m is 10^n. Take the table as the example:

Function code	Name	Description	Setting range	Default value	Modify
P01.20	Hibernation restore delay time	0.0–3600.0s (valid when P01.19 is 2)	0.0~3600.0	0.0s	○
P01.21	Restart after power off	0: Disable 1: Enable	0~1	0	○

If there is one figure behind the radix point in the setting range or the default value, then the fieldbus ratio value is 10. If the data received by the upper computer is 50, then the “hibernation restore delay time” is 5.0 (5.0=50÷10).

If Modbus communication is used to control the hibernation restore delay time as 5.0s. Firstly, 5.0 can be magnified by 10 times to integer 50 (32H) and then this data can be sent.

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

After the VFD receives the command, it will change 50 into 5.0 according to the fieldbus ratio value and then set the hibernation restore delay time as 5.0s.

Another example, after the upper computer sends the command of reading the parameter of hibernation restore delay time, the response message of the VFD is as follows:

01	03	02	00 32	39 91
VFD address	Read command	2-byte data	Parameter data	CRC check

Because the parameter data is 0032H (50) and 50 divided by 10 is 5.0, then the hibernation restore delay time is 5.0s.

10.4.7 Fault message response

There may be fault in the communication control. For example, some parameter can only be read. If a writing message is sent, the VFD will return a fault response message.

The fault message is from the VFD to the master, its code and meaning is as below:

Code	Name	Meaning
01H	Illegal command	The command from master cannot be executed. The reason may be: 1. This command is only for new device; 2. Slave is in fault state and cannot execute it.

Code	Name	Meaning
02H	Illegal data address	Some of the operation addresses are invalid or not allowed to access. Especially the combination of the register and the transmitting bytes are invalid.
03H	Illegal value	When there are invalid data in the message framed received by slave. **Note:** This error code does not indicate the data value to write exceed the range, but indicate the message frame is an illegal frame.
04H	Operation failed	The parameter setting in parameter writing is invalid. For example, the function input terminal cannot be set repeatedly.
05H	Password error	The password written to the password check address is not same as the password set by P7.00.
06H	Data frame error	In the frame message sent by the upper computer, the length of the digital frame is incorrect or the counting of CRC check bit in RTU is different from the lower computer.
07H	Parameters only for read	It only happens in write command
08H	Parameters cannot be changed during running	The modified parameter in the writing of the upper computer cannot be modified during running.
09H	Password protection	When the upper computer is writing or reading and the user password is set without password unlocking, it will report that the system is locked.

The slave uses functional code fields and fault addresses to indicate it is a normal response or some error occurs (named as objection response). For normal responses, the slave shows corresponding function codes, digital address or sub-function codes as the response. For objection responses, the slave returns a code which equals the normal code, but the first byte is logic 1.

For example: when the master sends a message to the slave, requiring it to read a group of address data of the VFD function codes, there will be following function codes:

0 0 0 0 0 0 1 1 (Hex 03H)

For normal responses, the slave responds the same codes, while for objection responses, it will return:

1 0 0 0 0 0 1 1 (Hex 83H)

Besides the function codes modification for the objection fault, the slave will respond a byte of abnormal code which defines the error reason. When the master receives the response for the objection, in a typical processing, it will send the message again or modify the corresponding order.

For example, set the “running command channel” of the VFD (P00.01, parameter address is 0001H) with the address of 01H to 03, the command is as following:

01	06	00 01	00 03	98 0B
VFD address	Write command	Parameters address	Parameters data	CRC check

But the setting range of “running command channel” is 0–2, if it is set to 3, because the number is beyond the range, the VFD will return fault response message as below:

01	86	04	43 A3
VFD address	Abnormal response code	Fault code	CRC check

Abnormal response code 86H means the abnormal response to writing command 06H; the fault code is 04H. In the table above, its name is operation failed and its meaning is that the parameter setting in parameter writing is invalid.

10.4.8 Example of writing and reading

Refer to 10.4.1 and 10.4.2 for the command format.

10.4.8.1 Example of reading command 03H

Example 1: Read the state word 1 of the VFD with the address of 01H (refer to table 1). From the table 1, the parameter address of the state word 1 of the VFD is 2100H.

The command sent to the VFD:

01	03	21 00	00 01	8E 36
VFD address	Read command	Parameters address	Data number	CRC check

If the response message is as below:

01	03	02	00 03	F8 45
VFD address	Read command	Data number	Data content	CRC check

The data content is 0003H. From the table 1, the VFD stops.

Example 2: Watch “the current fault type” to “the previous 5 times fault type” of the VFD through commands, the corresponding function code is P07.27–P07.32 and corresponding parameter address is 071BH–0720H (there are 6 from 071BH).

The command sent to the VFD:

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

If the response message is as below:

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

See from the returned data, all fault types are 0023H (decimal 35) with the meaning of maladjustment (STo).

10.4.8.2 Example of writing command 06H

Example 1: Make the VFD with the address of 03H to run forward. See table 1, the address of "communication control command" is 2000H and forward running is 0001. See the table below.

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	
		0007H: Fault reset	
		0008H: Jogging to stop	

The command sent by the master:

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

If the operation is successful, the response may be as below (the same with the command sent by the master):

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

Example 2: Set the Max. output frequency of the VFD with the address of 03H as100Hz.

Function code	Name	Description	Setting range	Default value	Modify	Serial No.
P00.03	Max. output frequency	P00.04~600.00H (400.00Hz)	100.00~600.00	50.00Hz	◎	3

See the figures behind the radix point, the fieldbus ratio value of the Max. output frequency (P00.03) is 100. 100Hz timed by 100 is 10000 and the corresponding hex is 2710H.

The command sent by the master:

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

If the operation is success, the response may be as below (the same with the command sent by the master):

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

Note: The blank in the above command is for illustration and it cannot be added in the actual application.

10.4.8.3 Example of continuous writing command 10H

Example 1: make the VFD whose address is 01H run forward at 10Hz. Refer to the instruction of 2000H and 0001. Set the address of "communication setting frequency" is 2001H and 10Hz corresponds to 03E8H. See the table below.

Function instruction	Address definition	Data meaning instruction	R/W characteristics
Communication control command	2000H	0001H:forward running	R/W
		0002H:reverse running	
		0003H:forward jogging	
		0004H:reverse jogging	
		0005H:stop	
		0006H:coast to stop	
		0007H:fault reset	
		0008H:jogging stop	
The address of communication setting	2001H	Communication setting frequency (0–Fmax(unit: 0.01Hz))	R/W
	2002H	PID reference, range (0–1000, 1000 corresponds to 100.0%)	

Set P00.01 to 2 and P00.06 to 8.

The command sent to the VFD:

01	10	20 00	00 02	04	00 01	03 E8	3B 10
VFD address	Continuous writing command	Parameters address	Data number	Byte number	Forward running	10Hz	CRC check

If the response message is as below:

01	10	20 00	00 02	4A 08
VFD address	Continuous writing command	Parameters address	Data number	CRC check

Example 2: set the ACC time of 01H VFD as 10s and the DEC time as 20s

Function code	Name	Detailed description	Default value	Modify
P00.11	ACC time 1	Setting range of P00.11 and P00.12: 0.0–3600.0s	Depends on model	○
P00.12	DEC time 1		Depends on model	○

The corresponding address of P00.11 is 000B, the ACC time of 10s corresponds to 0064H, and the DEC time of 20s corresponds to 00C8H.

The command sent to the VFD:

01	10	00 0B	00 02	04	00 64	00 C8	F2 55
VFD address	Continuous writing command	Parameters address	Data number	Byte number	10s	20s	CRC check

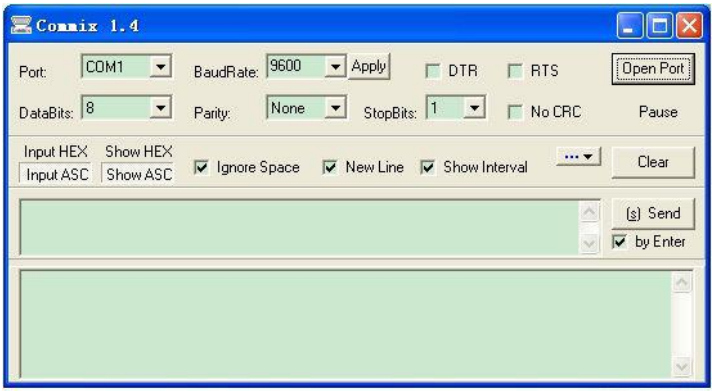
If the response message is as below:

01	10	00 0B	00 02	30 0A
VFD address	Continuous writing command	Parameters address	Data number	CRC check

Note: The space between above commands is for instruction and there is no space between the commands during actual applications.

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

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

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

Note:

1. Set the address (P14.00) of the VFD to 03.
2. Set "Channel of running commands" (P00.01) to "Communication", and set "Communication channel of running commands" (P00.02) to the Modbus/Modbus TCP communication channel.
3. Click **Send**. If the line configuration and settings are correct, a response transmitted by the VFD is received as follows:

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

10.5 Common communication fault

Common communication faults: no response to the communication or the VFD returns abnormal fault.

The possible reasons for no response to the communication:

Select wrong serial interface: for example, if the converter is COM1, select COM2 during the communication;

The baud rate, digital bit, end bit and check bit are not the same with the VFD;

+ and - of RS485 are connected in reverse;

The 485 wire cap on the terminal board of the VFD is not plugged in. The wire cap is behind the terminal block.

Appendix A Extension card

A.1 What this chapter contains

This chapter describes the extension cards used in Goodrive300-02 series VFDs.

A.2 PROFIBUS extension card

(1) PROFIBUS is an open international fieldbus standard that allows data exchange among various types of automation components. It is widely used in manufacturing automation, process automation and in other automation areas such as buildings, transportation, power, providing an effective solution for the realization of comprehensive automation and site-equipment intellectualization.

(2) PROFIBUS is composed of three compatible components, PROFIBUS-DP (Decentralized Periphery, distributed peripherals), PROFIBUS-PA (Process Automation), PROFIBUS-FMS (Fieldbus Message Specification). It is periodically exchange data with the VFD when using master-slave way. PRNV PROFIBUS-DP adapter module only supports PROFIBUS-DP protocol.

(3) The physical transmission medium of bus is twisted-pair (in line with RS-485 standard), two-wire cable or fiber optic cable. Baud rate is from 9.6Kbit/s to 12Mbit/s. The maximum bus cable length is between 100m and 1200m, specific length depending on the selected transmission rate (see Appendix B Technical data). Up to 31 nodes can be connected to the same PROFIBUS network when repeaters aren't used. But, if use repeaters, up to 127 nodes can be connected to the same PROFIBUS network segment (including repeaters and master stations).

(4) In the process of PROFIBUS communication, tokens are assigned among main stations and master-slave transmission among master-slave stations. Supporting single-master or multi-master system, stations-programmable logic controller (PLC)-choose nodes to respond to the host instruction. Cycle master-from user data transmission and non-cyclic master-master station can also send commands to multiple nodes in the form of broadcast. In this case, the nodes do not need to send feedback signals to the host. In the PROFIBUS network, communication between nodes cannot be allowed.

(5) PROFIBUS protocol is described in detail in EN 50170 standard. To obtain more information about PROFIBUS, please refer to the above-mentioned EN 50170 standards.

A.2.1 Product naming rules

Fieldbus adapter naming rules, the product model:

EC-TX 1 03

① ② ③ ④

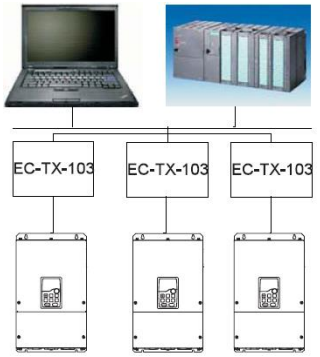
No.	Instruction	Meaning
①	Product type	EC: extension card
②	Card type	TX: communication card
③	Technical version	Odds such as 1,3,5,7 means the 1st, 2nd, 3rd, 4th technical version
④	Card difference	03: PROFIBUS+Ethernet communication card 04: Ethernet+CAN communication card

A.2.2 EC-TX-103 communication card

EC-TX-103 communication card is an optional device to VFD which makes VFD connected to PROFIBUS network. In PROFIBUS network, VFD is a subsidiary device. The following functions can be completed using EC-TX-103 communication card:

- Send control commands to VFD (start, stop, fault reset, etc.).
- Send speed or torque reference signal to VFD.
- Read state and actual values from VFD.
- Modify VFD parameter.

Please refer to the description of function codes in Group P15 for the commands supported by the VFD. Below is the structure diagram of the connection between the VFD and PROFIBUS:



A.2.3 The appearance of EC-TX-103 communication card

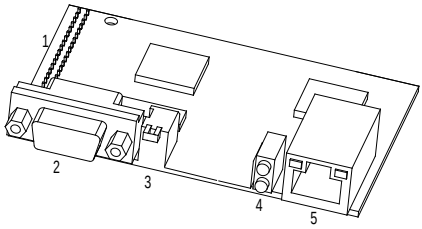


Figure A-1 Outline diagram of EC-TX-103 communication card

1. Interface to control panel
2. Bus communication interface
3. Bus terminal
4. State display LEDs
5. Ethernet interface

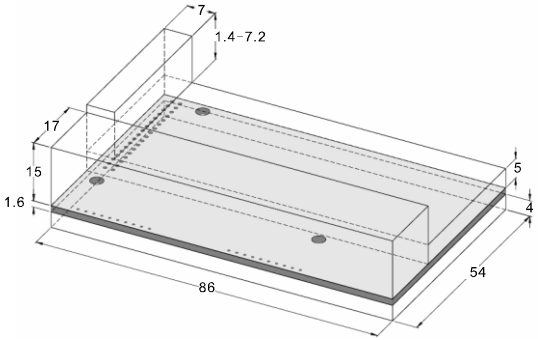


Figure A-2 External dimensions of EC-TX-103 communication card (Unit: mm)

A.2.4 Compatible motor of EC-TX-103 communication card

EC-TX-103 communication card is compatible with the following products:

- Goodrive300-02 series devices and all VFDs supporting PROFIBUS extension
- Host station supporting PROFIBUS-DP protocol

A.2.5 Delivery list

The package of EC-TX-103 communication card contains:

- EC-TX-103 communication card
- Three screws (M3x10)
- User manual

Please contact with the company or suppliers if there is something missing. Information may be subject to change without notice during product improving.

A.2.6 Installation of EC-TX-103 communication card

A.2.6.1 Mechanical installation of EC-TX-103 communication card

1. Installation ambient

- Ambient temperature: 0°C–+40°C
- Relative humidity: 5%–95%

- Other climate conditions: no condensation, ice, rain, snow or hail, solar radiation below 700W/m^2, air pressure 70–106kPa
- Content of salt spray and corrosive gases: pollution degree 2
- Content of dust and solid particles: pollution degree 2
- Vibration and shock: 5.9m/s^2 (0.6g) on 9–200Hz sinusoidal vibration

2. Installation steps:

- Fix the screws on the location holes with screws.
- Insert the module into the defined location carefully and fix it on the copper column with screws.
- Set the bus terminal switch of the module to the needed location.

3. Notes:

Disconnect the device from the power line before installation. Wait for at least three minutes to let the capacitors discharge. Cut off dangerous voltage from external control circuit to the unit output and input terminals.

Some electric components are sensitive to static charge. Do not touch the circuit board. If you have to operate it, please wear the grounding wrist belt.

A.2.6.2 Electrical installation of EC-TX-103 communication card

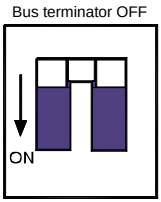
1. Node selection

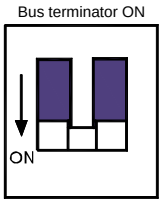
Node address is the only address of PROFIBUS on the bus. The address which is among 00–99 is shown with two figures and is selected by the spinning switch on the module. The left switch shows the first number and the right one show the second number.

Node address=10 x the first digital value + the second digital value x 1

2. Bus terminals

There is a bus terminal in each heading and ending to avoid error during operation. The DIP switch on RPBA-01PCB is used to connect the bus terminals which can avoid the signal feedback from the bus cables. If the module is the first or last one in the internet, the bus terminal should be set as ON. Please disconnect EC-TX-103 communication card terminals when the PROFIBUS D-sub connector with internal terminals is in use.





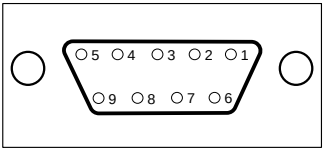
A.2.6.3 Bus net connection of EC-TX-103 communication card

1. Bus communication interface

Transformation by double-shielded twisted pair copper cable is the most common way in PROFIBUS (conform to RS-485 standard).

The basic characteristics of transmission technology:

- Net topology: Linear bus, there are bus resistor in two ends.
- Transmission speed: 9.6k bit/s–12M bit/s
- Medium: Double-shielded twisted pair cables, the shield can be removed according to the environment (EMC).
- Station number: There are 32 stations in each segment (without relays) up to 127 stations (with relays)
- Contact pin: 9 frames D pin, the connector contact pins are as below:,



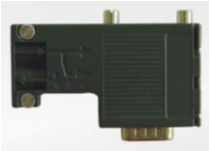
Contact pin of the connector		Instruction
1	-	Unused
2	-	Unused
3	B-Line	Positive data (twisted pair cables 1)
4	RTS	Sending requirement
5	GND_BUS	Isolation ground
6	+5V BUS	Isolated 5V DC power supply
7	-	Unused
8	A-Line	Negative data (twisted pair cables 2)
9	-	Unused
Housing	SHLD	PROFIBUS shielded cable

+5V and GND_BUS are used in the fieldbus terminals. Some devices, such as light transceiver (RS485) may get external power supply form these pins.

RTS is used in some devices to determine the sending direction. Only A-Line wires, B-Line wires and shield are used in the normal application.

It is recommended to apply the standard DB9 connector of SIEMENS. If the communication baud rate is above 187.5kbps, please follow the connection rules of SIEMENS seriously.

Available

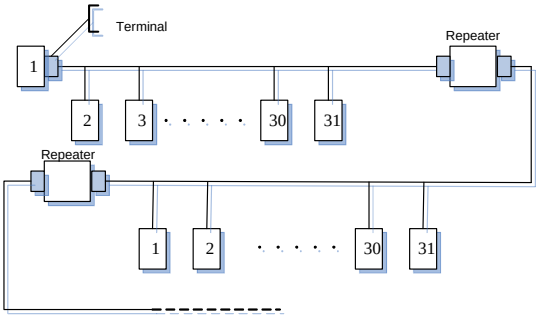


Not available (with interference to the keypad wiring)

2. Repeater

Up to 32 stations can be connected to each segment (master station or subsidiary stations), the repeater have to be used when stations is more than 32. The repeaters in series are generally no more than 3.

Note: There is no repeater station address.



A.2.6.4 Transmission rate and maximum distance

Maximum length of cable depends on the transmission rate. The Table below shows the relationship between transmission rate and distance.

Transmission rate (kbps)	A-wire (m)	B-wire (m)
9.6	1200	1200
19.2	1200	1200
93.75	1200	1200
187.5	1000	600
500	400	200
1500	200	-----
12000	100	-----

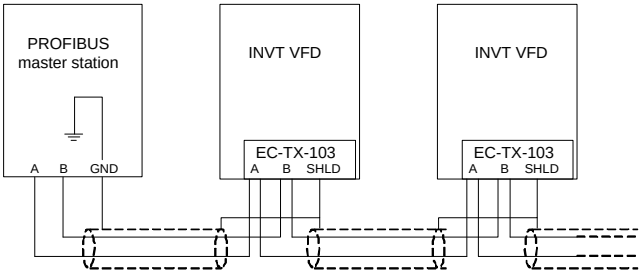
Transmission line parameters:

Transmission rate (kbps)	A-wire (m)	B-wire (m)
Impedance (Ω)	135–165	100–130
Capacitance per unit length(pF/m)	< 30	< 60

Transmission rate (kbps)	A-wire (m)	B-wire (m)
Loop resistance (Ω/km)	110	--------
Core wire diameter (mm)	0.64	> 0.53
Line-core cross-section (mm^2)	> 0.34	> 0.22

Besides shielding twisted-pair copper wires, PROFIBUS can also use optical fiber for transmission in an electromagnetic interference environment to increase the high-speed transmission distance there are two kinds of fiber optical conductors, one is low-cost plastic fiber conductor, used distance is less than 50 meters, the other is glass fiber conductor, and used distance is less than 1km.

A.2.6.5 PROFIBUS bus connection diagram



Above is "terminal" wiring diagram. Cable is a standard PROFIBUS cable consisting of a twisted pair and shielding layer. The shielded layer of PROFIBUS cable on all nodes is directly grounded. Users can choose the best grounding method according to the situation.

Note:

- Make sure that signal lines do not twist when connecting all stations. Shielded cable should be used when system runs under high electromagnetic interface environment, which can improve electromagnetic compatibility (EMC).
- If using shielded braided wire and shielding foil, both ends should be connected to ground. Using shielding area should be large enough to maintain a good conductivity. And data lines must be separated from high-voltage.
- Stub line segment should not be used when transmission rate more than 500K bit/s, The plug is available on the market which connects directly to data input and output cable. Bus plug connection can be on or off at any time without interruption of data communications of other station.

A.2.7 System configuration

1. Master station and VFD should be configured so that the master station can communicate with the module after correctly installing EC-TX-103 communication card.

Each PROFIBUS subsidiary station on the PROFIBUS bus need to have "device description document" named GSD file which used to describe the characteristics of PROFIBUS-DP devices.

The software we provided for the user includes VFD related GSD files (device data files) information, users can obtain type definition file (GSD) of master machines from local INVT agent.

Configuration parameters of EC-TX-103 communication card:

Parameter number	Parameter name	Optional setting		Factory setting
0	Module type	Read only		PROFIBUS-DP
1	Node address	0–99		2
2	Baud rate setting	Kbit/s	0:9.6	6
			1:19.2	
			2:45.45	
			3:93.75	
			4:187.5	
			5:500	
		Mbit/s	6:1.5	
			7:3	
			8:6	
			9:9	
			10:12	
3	PZD3	0–65535		0
4	PZD4	The same as the above		0
…	……	The same as the above		0
10	PZD12	The same as the above		0

2. Module type

This parameter shows communication module type detected by VFD; users can not adjust this parameter. If this parameter is not defined, communication between the modules and VFD cannot be established.

3. Node address

In PROFIBUS network, each device corresponds to a unique node address, you can use the node address selection switch to define node address (switch isn't at 0) and the parameter is only used to display the node address.

If node address selection switch is 0, this parameter can define node address. The user can not adjust the parameter by themselves and the parameter is only used to display the node address.

4. GSD file

In PROFIBUS network, each PROFIBUS subsidiary station needs GSD file "device description document" which used to describe the characteristics of PROFIBUS-DP devices. GSD file contains all defined parameters, including baud rate, information length, amount of input/output data, meaning of diagnostic data.

A CD-ROM will be offered in which contains GSD file (extension name is .gsd) for fieldbus adapter. Users can copy GSD file to relevant subdirectory of configuration tools, please refer to relevant system configuration software instructions to know specific operations and PROFIBUS system configuration.

A.2.8 PROFIBUS-DP communication

1. PROFIBUS-DP

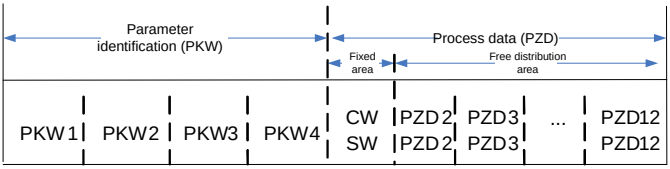
PROFIBUS-DP is a distributed I/O system, which enables master machine to use a large number of peripheral modules and field devices. Data transmission shows cycle: master machine read input information from subsidiary machine then give feedback signal. EC-TX-103 communication card supports PROFIBUS-DP protocol.

2. Service access point

PROFIBUS-DP has access to PROFIBUS data link layer (Layer 2) services through service access point SAP. Every independent SAP has clearly defined function. Please refer to relevant PROFIBUS user manual to know more about service access point information. PROFIDRIVE-Variable speed drive adopts PROFIBUS model or EN50170 standards (PROFIBUS protocol).

3. PROFIBUS-DP information frame data structures

PROFIBUS-DP bus mode allows rapid data exchange between master station and VFD. Adopting master-slave mode dealing with VFD access, VFD is always subsidiary station, and each has definite address. PROFIBUS periodic transmission messages use 16 words (16 bit) transmission, the structure shown in figure1.



Parameters area:

PKW1-parameter identification

PKW2-array index number

PKW3-parameter value 1

PKW4-parameter value 2

Process data:

CW-control word (from master to slave)

SW-state word (from slave to master)

PZD-process data (decided by users) (From master to slave output [reference value], from slave to master input [actual value]).

PZD area (process data area)

PZD area of communication message is designed for control and monitor VFD. PZD from master and slave station is addressed in high priority; the priority of dealing with PZD is superior to that of PKW, and always sends current valid date from interface.

Control word (CW) and state word (SW)

Control word (CW) is a basic method of fieldbus system controlling VFD. It is sent by the fieldbus master station to VFD and the EC-TX-103 communication cards act as gateway. VFD responds according to the control word and gives feedbacks to master machine through state word (SW).

Reference value

VFD can receive control information by several ways, these channels include: analog and digital input terminals, VFD control board and module communication (such as RS485, EC-TX-103 communication cards). In order to use PROFIBUS control VFD, the communication module must be set to be VFD controller.

Actual value

Actual value is a 16-bit word, which contains converter operation information. Monitoring capabilities are defined by VFD parameter. The integer scaling of actual value is sent to master machine depending on selected function, please refer to VFD manual.

Note: VFD always check the control word (CW) and bytes of reference value.

Mission message (From master station to VFD)

Control word (CW)

The first word of PZD is control word (CW) of VFD; due to different control word (CW) of PWM rectifier regenerative part and VFD part Illustration is depart in next two tables.

Control word (CW) of Goodrive300-02

Bit	Name	Value	State/Description
0–7	COMMAND BYTE	1	Forward running
		2	Reverse running
		3	Forward jogging
		4	Reverse jogging
		5	Decelerate to stop
		6	Coast to stop
		7	Fault reset
		8	Jogging stop
8	WIRTE ENABLE	1	Write enable (mainly is PKW1-PKW4)
9–10	MOTOR GROUP SELECTION	00	MOTOR GROUP 1 SELECTION
		01	MOTOR GROUP 2 SELECTION
		02	MOTOR GROUP 3 SELECTION
		03	MOTOR GROUP 4 SELECTION

Bit	Name	Value	State/Description
11	TORQUE CONTROL SELECTION	1	Torque control enable
		0	Torque control disable
12	ELECTRIC CONSUMPTION CLEAR	1	Electric consumption clear enable
		0	Electric consumption clear disable
13	PRE-EXCIATION	1	Pre-excitation enable
		0	Pre-excitation disable
14	DC BRAKE	1	DC braking enable
		0	DC braking disable
15	HEARTBEAT REF	1	Heartbeat enable
		0	Heartbeat disable

Reference value (REF):

From 2nd word to 12th of PZD task message is the main set value REF, main frequency set value is offered by main setting signal source. As PWM rectifier feedback part doesn't have main frequency setting part, corresponding settings belong to reserved part, the following table shows VFD part settings for Goodrive300-02.

Bit	Name	Function selection
PZD2 receiving	0:Invalid 1:Set frequency(0–Fmax(unit:0.01Hz)) 2:PID reference, range(0–1000,1000 corresponds to 100.0%) 3:PID feedback, range(0–1000,1000 corresponds to 100.0%) 4:Torque set value(-3000–3000,1000 corresponds to 100.0% the rated current of the motor) 5:Set value of the forward rotation upper-limit frequency(0–Fmax unit:0.01Hz)) 6:Set value of the reversed rotation upper-limit frequency(0–Fmax(unit:0.01Hz)) 7:Electromotion torque upper limit (0–3000,1000 corresponds to 100.0%of the rated current of the motor) 8:Braking torque upper limit (0–2000,1000 corresponds to 100.0% of the rated current of the motor) 9:Virtual input terminals command Range:0x000–0x1FF 10:Virtual output terminals command Range:0x00–0x0F 11:Voltage setting value(special for V/F separation) (0–1000,1000 corresponds to 100.0% the rated voltage of the motor) 12:AO output set value 1 (-1000–1000, 1000 corresponds to 100.0%) 13:AO output set value 2 (-1000–1000, 1000 corresponds to 100.0%)	0
PZD3 receiving		0
PZD4 receiving		0
PZD5 receiving		0
PZD6 receiving		0
PZD7 receiving		0
PZD8 receiving		0
PZD9 receiving		0
PZD10 receiving		0
PZD11 receiving		0
PZD12 receiving		0

State word (SW):

The first word of PZD response message is state word (SW) of VFD, the definition of state word is as follows:

State Word (SW) of Goodrive300-02 (SW)

Bit	Name	Value	State/Description
0–7	RUN STATE BYTE	1	Forward running
		2	Reverse running
		3	The VFD stops
		4	The VFD is in fault
		5	The VFD is in POFF state
		6	Pre-exciting state
8	DC VOLTAGE ESTABLISH	1	Running ready
		0	The running preparation is not ready
9–10	MOTOR GROUP FEEDBACK	0	Motor 1 feedback
		1	Motor 2 feedback
		2	Motor 3 feedback
		3	Motor 4 no feedback
11	MOTOR TYPE FEEDBACK	1	Synchronous motor
		0	Asynchronous motor
12	OVERLOAD ALARM	1	Overload pre-alarm
		0	Non-overload pre-alarm
13	RUN/STOP MODE	0	Keypad control
		1	Terminal control
14		2	Communication control
		3	Reserved
15	HEARTBEAT FEEDBACK	1	Heartbeat feedback
		0	No heartbeat feedback

Actual value (ACT):

From 2nd word to 12th of PZD task message is main set value ACT, main frequency set value is offered by main setting signal source.

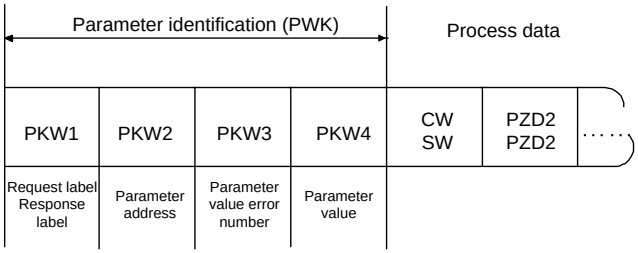
Actual value of Goodrive300-02

Bit	Name	Function selection
PZD2 sending	0: Invalid	0
PZD3 sending	1:Running frequency(*100, Hz)	0
PZD4 sending	2: Set frequency(*100, Hz)	0
PZD5 sending	3: Bus voltage(*10, V)	0

Bit	Name	Function selection
PZD6 sending	4: Output voltage(*1, V)	0
PZD7 sending	5:Output current (*10, A)	0
PZD8 sending	6:Output torque actual value(*10, %)	0
PZD9 sending	7:Output power actual value (*10, %)	0
PZD10 sending	8:Running rotating speed(*1, RPM)	0
PZD11 sending	9:Running linear speed (*1, m/s)	0
PZD12 sending	10:Ramp reference frequency 11:Fault code 12:AI1 value (*100, V) 13:AI2 value (*100, V) 14:AI3 value (*100, V) 15:PULSE frequency value (*100, kHz) 16:Terminals input state 17:Terminals output state 18:PID reference (*100, %) 19:PID feedback (*100, %) 20:Motor rated torque	0

PKW area (parameter identification marks PKW1-value area). PKW area describes treatment of parameter identification interface, PKW interface is a mechanism which determine parameters transmission between two communication partners, such as reading and writing parameter values.

Structure of PKW area:



Parameter identification zone

In the process of periodic PROFIBUS-DP communication, PKW area is composed of four words (16 bit), each word is defined as follows:

The first word PKW1 (16 bit)		
Bit 15–00	Task or response identification marks	0–7
The second word PKW2 (16 bit)		
Bit 15–00	Basic parameters address	0–247

The third word PKW3 (16 bit)		
Bit 15–00	Parameter value (high word) or return error code value	00
The fourth word PKW4 (16 bit)		
Bit 15–00	Parameter value (low word)	0–65535

Note: If the master requests one parameter value, the value of PKW3 and PKW4 will not be valid.

Task requests and responses

When passing data to slave machine, master machine use request label while slave machine use response label to positive or negative confirmation. The following tables list the request/response function.

The definition of task logo PKW1 is as follows:

Definition of task logo PKW1

Request label (From master to slave)		Response label	
Request	Function	Positive confirmation	Negative confirmation
0	No task	0	—
1	Request parameter value	1,2	3
2	Modification parameter value (one word) [only change RAM]	1	3 or 4
3	Modification parameter value (double word) [only change RAM]	2	3 or 4
4	Modification parameter value (one word) [RAM and EEPROM are modified]	1	3 or 4
5	Modification parameter value (double word) [RAM and EEPROM are modified]	2	3 or 4

Request label

"2"-modification parameter value (one word) [only change RAM],

"3"-modification parameter value (double word) [only change RAM]

"5"-modification parameter value (double word) [RAM and EEPROM are modified] not support currently.

Reponses logo PKW1 defines as below:

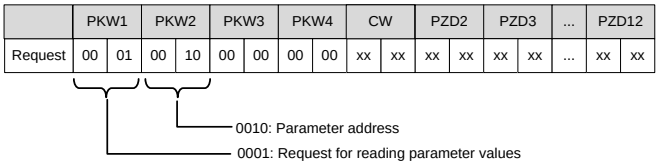
Response label (From slave to master)	
Confirmation	**Function**
0	No response
1	Transmission parameter value (one word)
2	Transmission parameter value (two word)

Response label (From slave to master)	
Confirmation	**Function**
3	Task cannot be executed and returns the following error number: 0: Illegal parameter number 1: Parameter values cannot be changed (read-only parameter) 2: Out of set value range 3: The sub-index number is not correct 4: Setting is not allowed (only reset) 5: Data type is invalid 6: The task could not be implemented due to operational state 7: Request isn't supported. 8: Request can't be completed due to communication error 9: Fault occurs when write operation to stationary store 10: Request fails due to timeout 11: Parameter cannot be assigned to PZD 12: Control word bit can't be allocated 13: Other errors
4	No parameter change rights

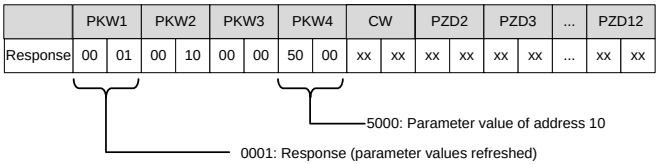
Example 1: Read parameter value

Read keypad set frequency value (the address of keypad set frequency is 10) which can be achieved by setting PKW1 as 1, PKW2 as 10, return value is in PKW4.

Request (From master to VFD):



Response (From VFD to master)



Example 2: Modify the parameter values (RAM and EEPROM are modified)

Modify keypad settings frequency value (the address of keypad set frequency is 4) which can be achieved by setting PKW1 as 4; PKW2 as 10, modification value (50.00) is in PKW4.

Request (From master to VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Request	00	04	00	10	00	00	50	00	xx	xx	xx	xx	xx	xx	...	xx	xx

5000: Parameter value of address 10

0004: Parameter changes

Response (From VFD to master)

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		...	PZD12	
Response	00	01	00	10	00	00	50	00	xx	xx	xx	xx	xx	xx	...	xx	xx

0001: Response (parameter values refreshed)

Example for PZD:

Transmission of PZD area is achieved through VFD function code; please refer to relevant INVT VFD user manual to know relevant function code.

Example 1: Read process data of VFD

VFD parameter selects "8: Run frequency" as PZD3 to transmit which can be achieved by setting Pd.14 as 8. This operation is mandatory until the parameter is instead of others.

Response (From VFD to master):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		…	PZD12	
Response	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	0A	…	xx	xx

Example 2: Write process data into VFD

VFD parameter selects "2": Traction given from PZD3 which can be achieved by setting Pd.03 as 2. In each request frame, parameters will use PZD3 to update until re-select a parameter.

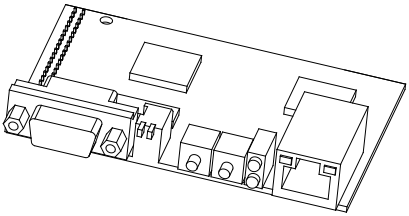
Request (From master to VFD):

	PKW1		PKW2		PKW3		PKW4		CW		PZD2		PZD3		…	PZD12	
Response	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	00	00	…	xx	xx

In each request frame contents of PZD3 are given by traction until re-select a parameter.

A.2.9 Fault information

EC-TX-103 communication card is equipped with 2 fault display LEDs as shown is figure below. The roles of these LEDs are as follows:



Fault display LEDs

LED No.	Name	Color	Function
1	Online	Green	ON: module online and data can be exchanged. OFF: module is not in "online" state.
2	Offline/Fault	Red	ON: module offline and data can't be exchanged. Blinking: module is not in "offline" state. 1. Blinking frequency 1Hz--configuration error: The length of user parameter data sets is different from that of network configuration process during module initialization process. 2. Blinking frequency 2Hz--user parameter data error: The length or content of user parameter data sets is different from that of network configuration process during module initialization process. 3. Blinking frequency 4Hz--PROFIBUS communication ASIC initialization error. OFF: Diagnostic closed.

A.3 CANopen optional cards

Refer to the operation manual of EC-TX105 CANopen communication card.

Appendix B Technical data

B.1 What this chapter contains

This chapter contains the technical specifications of the VFD, as well as provisions for fulfilling the requirements for CE and other marks.

B.2 Ratings

B.2.1 Capacity

VFD sizing is based on the rated motor current and power. To achieve the rated motor power given in the table, the rated current of the VFD must be higher than or equal to the rated motor current. Also the rated power of the VFD must be higher than or equal to the rated motor power.

Note:

1. The maximum allowed motor shaft power is limited to 1.5·PN. If the limit is exceeded, motor torque and current are automatically restricted. The function protects the input bridge of the drive against overload.

2. The ratings apply at ambient temperature of 40°C

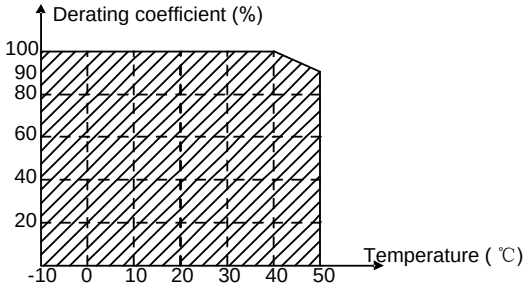
3. It is important to check that in common DC systems the power flowing through the common DC connection does not exceed PN.

B.2.2 Derating

The load capacity decreases if the installation site ambient temperature exceeds 40°C, the altitude exceeds 1000m or the switching frequency is changed from 4kHz to 8, 12 or 15kHz.

B.2.2.1 Temperature derating

In the temperature range +40°C–+50°C, the rated output current decreases by 1% for every additional 1°C. Refer to the below list for the actual derating.



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

B.2.2.2 Altitude derating

The device can output rated power if the installation site below 1000m. The output power decreases if the altitude exceeds 1000 meters.

When the installation site altitude exceeds 1000m, derate 1% for every increase of 100m; when the installation site altitude exceeds 3000m, consult the local INVT dealer or office.

B.2.2.3 Carrier frequency derating

For the VFDs, different power level corresponds to different carrier frequency range. The rated power of the VFD is based on the factory carrier frequency, so if it is above the factory value, the VFD needs to derate 10% for every additional 1 kHz carrier frequency.

B.3 Grid specifications

Grid voltage	AC 3PH 380V (-15%)–440V (+10%)
Short-circuit capacity	Maximum allowed prospective short-circuit current at the input power connection as defined in IEC 60439-1 is 100kA. The drive is suitable for use in a circuit capable of delivering not more than 100kA at the drive maximum rated voltage.
Frequency	50/60Hz ± 5%, maximum rate of change 20%/s

B.4 Motor connection data

Motor type	Asynchronous induction motor or PMS motor
Voltage	0 to U1 (motor rated voltage), 3-phase symmetrical, Umax (VFD rated voltage) at the field weakening point
Short-circuit protection	The motor output is short-circuit proof by IEC 61800-5-1
Frequency	0–400Hz
Frequency resolution	0.01Hz
Current	Refer to Ratings
Power limit	1.5·times of PN
Field weakening point	10–400Hz
Carrier frequency	4, 8, 12 or 15kHz

B.4.1 EMC compatibility and motor cable length

To comply with the European EMC Directive (2014/30/EU), use the following maximum motor cable lengths for 4kHz switching frequency.

All models (with external EMC filter)	Maximum motor cable length (m)
Second environment (category C3)	30

The maximum motor cable length is determined by the drive's operational factors. Contact the local representative for the exact maximum lengths when using external EMC filters.

For the instruction of the second environment (category C3) and first environment (category C2), please refer to B.6 "EMC regulations".

B.5 Applicable standards

The VFD complies with the following standards:

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–Functional safety of safety-Related electrical, electronic and programmable electronic control systems
IEC/EN 61800-3	Adjustable speed electrical power drive systems. Part 3: EMC requirements and specific test methods
IEC/EN 61800-5-1	Adjustable speed electrical power drive systems–Part 5-1: Safety requirements–Electrical, thermal and energy
IEC/EN 61800-5-2	Adjustable speed electrical power drive systems–Part 5-2: Safety requirements–Functional
GB/T 30844.1	General-purpose variable-frequency adjustable-speed equipment of 1 kV and lower—Part 1: Technical conditions
GB/T 30844.2	General-purpose variable-frequency adjustable-speed equipment of 1 kV and lower—Part 2: Test methods
GB/T 30844.3	General-purpose variable-frequency adjustable-speed equipment of 1 kV and lower—Part 3: Safety regulations

B.5.1 CE marking

The CE marking on the name plate of a 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).

B.5.2 Compliable with EMC regulations

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

B.6 EMC regulations

EMC product standard (EN 61800-3) describes the EMC requirementson VFDs.

First environment: Any residential area where the VFD is directly connected to a public low-voltage supply without an intermediate transformer.

Second environment: All locations outside residential areas.

VFD categories:

C1: Rated voltage lower than 1000 V, applied to the first environment.

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 the first environment

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 the second environment. They cannot be applied to the first environment. but not the first environment.

C4: Rated voltage higher than 1000 V, or rated current higher or equal to 400 A, applied to complex systems in the second environment.

B.6.1 VFD category C2

The induction disturbance limit meets the following stipulations:

1. Select an optional EMC filter according to Appendix D Optional peripheral accessories and install it following the description in the EMC filter manual.

2. Select the motor and control cables according to the description in the manual.

3. Install the VFD according to the description in the manual.

4. For the maximum length of the motor cable, see section B.4.1 EMC compatibility and motor cable length.

	The VFD may generate radio interference, and therefore you need to take measures to reduce the interference.

B.6.2 VFD category C3

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

The induction disturbance limit meets the following stipulations:

1. Select an optional EMC filter according to Appendix D Optional peripheral accessories and install it following the description in the EMC filter manual.

2. Select the motor and control cables according to the description in the manual.

3. Install the VFD according to the description in the manual.

4. For the maximum length of the motor cable, see section B.4.1 EMC compatibility and motor cable length.

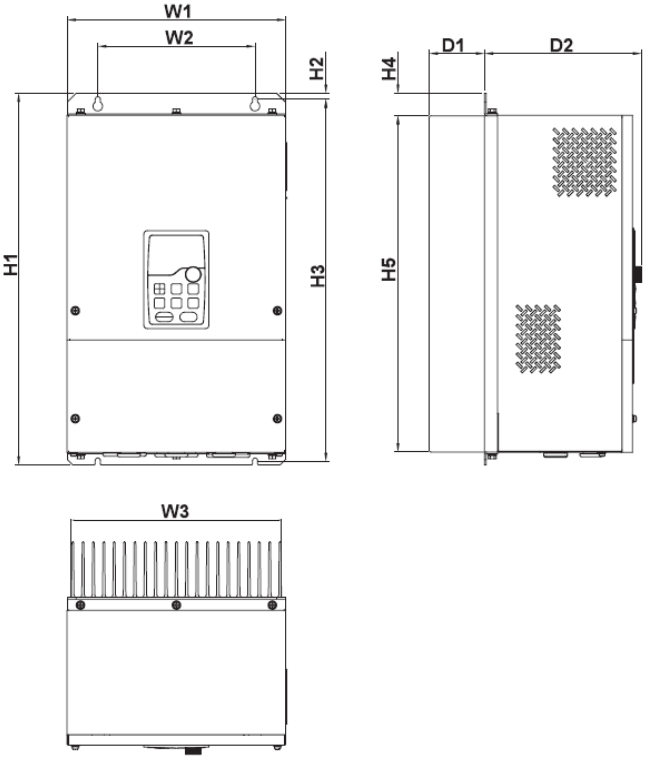
	VFDs of C3 category cannot be applied to civilian low-voltage common grids. When applied to such grids, the VFDs may generate radio frequency electromagnetic interference.

Appendix C Dimension drawings

C.1 What this chapter contains

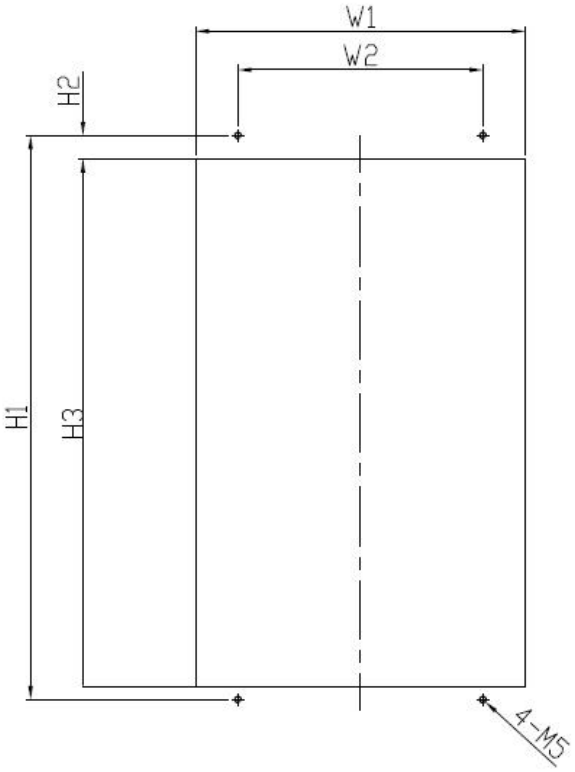
This chapter describes the VFD dimension drawings. The dimension unit used in the drawings is millimeter (mm).

C.2 Overall dimension



Model	W1	W2	W3	H1	H2	H3	H4	H5	D1	D2
7.5kW–18.5kW	230	160	194	419	7	408	26	379	65	154.5
22kW–30kW	253	182	219	430.2	7	419	26	389.2	64	181.7
37kW–55kW	320	220	290.5	515.3	7	504	26	474	79	282.2

C.3 Installation dimension



Model	W1	W2	H1	H2	H3	Hole size
7.5kW–18.5kW	198	160	408	17	383	Ø 7
22kW–30kW	245	182	419	17.5	392.5	Ø 7
37kW–55kW	295	220	504	16.5	478	Ø 7

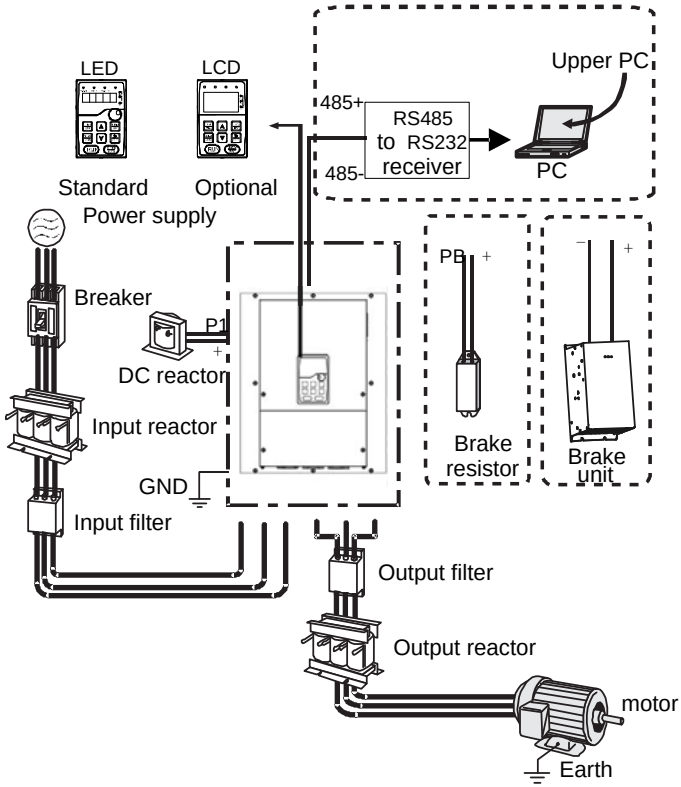
Appendix D Optional peripheral accessories

D.1 What this chapter contains

This chapter describes how to select the options and parts of the VFD.

D.2 Peripheral wiring

The following figure shows the external wiring of the VFD.

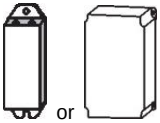


Note:

1. The VFDs of 380V (≤18.5kW) are embedded with braking unit.

2. The VFDs of 380V (≥37kW) have P1 terminal and can be connected with external DC reactors.

3. The braking units apply standard braking units. Refer to the instruction of DBU for detailed information.

Pictures	Name	Descriptions
	Cables	Device to transfer the electronic signals
	Breaker	Prevent from electric shock and protect the power supply and the cables system from overcurrent when short circuits occur. (Please select the breaker with the function of reducing high order harmonic and the rated sensitive current to 1 VFD should be above 30mA).
	Input reactor	This device is used to improve the power factor of the input side of the VFD and control the higher harmonic current. The VFDs of 380V (≥37kW) have external DC reactors.
	DC reactor	
	Input filter	Control the electromagnetic interference generated from the VFD, please install close to the input terminal side of the VFD.
 or	Braking unit or resistors	Shorten the DEC time The VFDs of 380V (≤18.5kW) only need braking resistors while the VFDs of 380V (≥22kW) need braking units besides braking resistors.
	Output filter	Control the interference from the output side of the VFD and please install close to the output terminals of the VFD.
	Output reactor	Prolong the effective transmitting distance of the VFD to control the sudden high voltage when switching on/off the IGBT of the VFD.

D.3 Power supply

Please refer to Installation guidelines.

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

D.4 Cables

D.4.1 Power cables

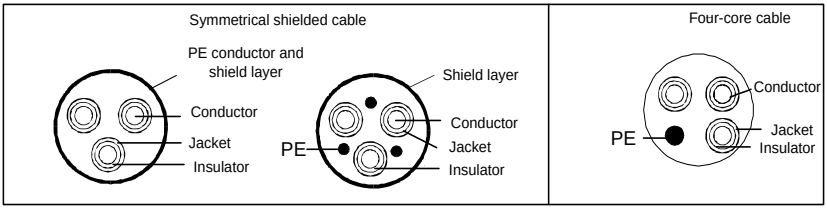
The dimensions of input power cables and motor cables should comply with local regulations.

- The input power and motor cables must be able to carry the corresponding load current.

- The cable must be rated for at least 70°C maximum permissible temperature of the conductor in continuous use.
- The conductivity of the PE conductor must be equal to that of the phase conductor (same cross-sectional area).
- Refer to chapter Technical data for the EMC requirements.

A symmetrical shielded motor cable (see the figure below) must be used to meet the EMC requirements of the CE.

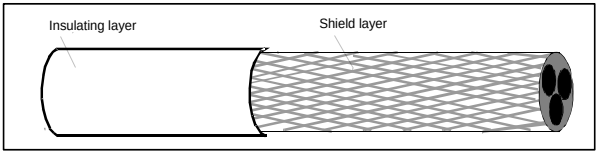
A 4-core conductor system is allowed for input cables, but a shielded symmetrical cable is recommended. Compared to a 4-core conductor system, the use of a symmetrical shielded cable reduces electromagnetic emission of the whole drive system as well as motor bearing current and wear.



Note: A separate PE conductor is required if the conductivity of the cable shield is not sufficient for the purpose.

To function as a protective conductor, the shield must have the same cross-sectional area as the phase conductors when they are made of the same metal.

To effectively suppress radiated and conducted radio-frequency emissions, the shield conductivity must be at least 1/10 of the phase conductor conductivity. The requirements are easily met with a copper or aluminum shield. The minimum requirement of the motor cable shield of the drive is shown below. It consists of a concentric layer of copper wires. The better and tighter the shield, the lower the emission level and bearing currents.



Cross-section of the cable

D.4.2 Control cables

All analog control cables and the cable used for the frequency input must be shielded. Use a double-shielded twisted pair cable (Figure a) for analog signals. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

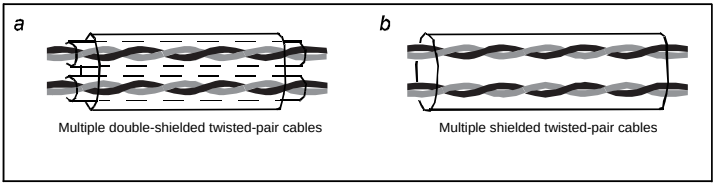


Figure D-1 Power cables routing

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. The relay cable needs the cable type with braided metallic screen.

The keypad needs to connect with cables. It is recommended to use the screen cable on complex electrical magnetic condition.

Note: Run analog and digital signals in separate cables.

Do not make any voltage tolerance or insulation resistance tests (for example hi-pot or megger) on any part of the drive as testing can damage the drive. Every drive has been tested for insulation between the main circuit and the chassis at the factory. Also, there are voltage-limiting circuits inside the drive which cut down the testing voltage automatically.

Note: Check the insulation of the input power cable according to local regulations before connecting to the drive.

D.4.2.1 AC 3PH 380V (-15%)－440V(+10%)

Model	Recommended cable size (mm^2)		Connecting cable size (mm^2)				Terminal screw	Tightening torque (Nm)
	RST UVW	PE	RST UVW	P1, (+)	PB (+), (-)	PE		
GD300-02-7R5G-4	4	4	4–16	4–16	4–16	4–16	M5	2-–2.5
GD300-02-011G-4	6	6	6–16	6–16	6–16	6–16	M5	2-–2.5
GD300-02-015G-4	10	10	10–25	10–25	10–25	6–25	M5	2-–2.5
GD300-02-018G-4	16	16	16–25	16–25	16–25	10–25	M5	2-–2.5
GD300-02-022G-4	16	16	16–25	16–25	16–25	10–25	M6	4–6
GD300-02-030G-4	25	16	16–25	16–25	16–25	16–25	M6	4–6
GD300-02-037G-4	25	16	25–50	25–50	25–50	16–50	M8	9–11
GD300-02-045G-4	35	16	25–50	25–50	25–50	16–50	M8	9–11
GD300-02-055G-4	50	25	50–95	50–95	50–95	25–50	M8	9–11

Note:

1. It is appropriate to use the recommended cable size under 40°C and rated current. The wiring distance should be no more than 100m.

2. Terminals P1, (+), PB and (-)are used to connect the DC reactor and braking parts.

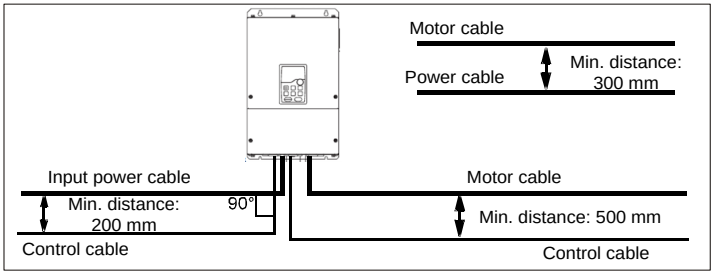
D.4.3 Routing the cables

Route the motor cable away from other cable routes. Motor cables of several drives can be run in parallel installed next to each other. It is recommended that the motor cable, input power cable and control cables are installed on separate trays. Avoid long parallel runs of motor cables with other cables to decrease electromagnetic interference caused by the rapid changes in the drive output voltage.

Where control cables must cross power cables make sure that they are arranged at an angle as near to 90 degrees as possible.

The cable trays must have good electrical bonding to each other and to the grounding electrodes. Aluminum tray systems can be used to improve local equalizing of potential.

A figure of the cable routing is shown below.



Cable arrangement distances

Figure D-2 Routing distances

D.4.4 Insulation checking

Check the insulation of the motor and motor cable as follows:

1. Check that the motor cable is connected to the motor and disconnected from the drive output terminals U, V and W.

2. Measure the insulation resistance between each phase conductor and the PE conductor using a measuring voltage of 500V DC. For the insulation resistance of other motors, please consult the manufacturer's instructions.

Note: Moisture inside the motor casing will reduce the insulation resistance. If moisture is suspected, dry the motor and repeat the measurement.

D.5 Breaker and electromagnetic contactor

It is necessary to add fuse for the avoidance of overload.

It is appropriate to use a breaker (MCCB) which complies with the VFD power in the 3-phase AC power and input power and terminals (R, S, T). The capacity of the VFD should be 1.5-2 times of the rated current.

	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.

It is necessary to install the electromagnetic contactor in the input side to control the switching on and off safety of the main circuit. It can switch off the input power supply when system faults.

AC 3PH 380V(-15%)–440V(+10%)

VFD model	Fuse (A)	Breaker (A)	Rated working current of the contactor (A)
GD300-02-7R5G-4	60	40	25
GD300-02-011G-4	78	63	32
GD300-02-015G-4	105	63	50
GD300-02-018G-4	114	100	63
GD300-02-022G-4	138	100	80
GD300-02-030G-4	186	125	95
GD300-02-037G-4	228	160	120
GD300-02-045G-4	270	200	135
GD300-02-055G-4	315	200	170

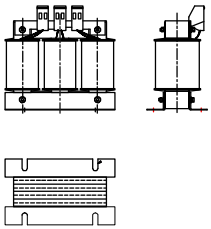
Note: The accessory specifications described in the preceding table are ideal values. You can select accessories based on the actual market conditions, but try not to use those with lower values.

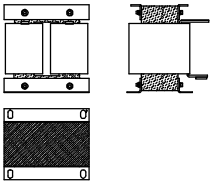
D.6 Reactors

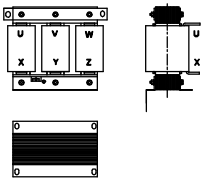
Transient high current in the input power circuit may cause damage to the rectifying components. It is appropriate to use AC reactor in the input side for the avoidance of high-voltage input of the power supply and improvement of the power factors.

If the distance between the VFD and the motor is longer than 50m, frequent overcurrent protection may occur to the VFD because of high leakage current caused by parasitic capacitance effects from the long cables to the ground. In order to avoid the damage of the motor insulation, it is necessary to add reactor compensation. If the distance between the VFD and motor is 50–100m, see the table below for model selection. If it exceeds 100m, consult with INVT technical support.

The VFDs of 380V (≥37kW) can be equipped with external DC reactors for the improvement of power factors and the avoidance of damage from high input current to the rectifying components because of the high-capacity transformer. The device can also cease the damage to the rectifying components which are caused by supply net voltage transients and harmonic waves of the loads.


Input reactor


DC reactor



Output reactor

AC 3PH 380V(-15%)–440V(+10%)

VFD model	Input reactor	DC reactor	Output reactor
GD300-02-7R5G-4	ACL2-7R5-4	/	OCL2-7R5-4
GD300-02-011G-4	ACL2-011-4	/	OCL2-011-4
GD300-02-015G-4	ACL2-015-4	/	OCL2-015-4
GD300-02-018G-4	ACL2-018-4	/	OCL2-018-4
GD300-02-022G-4	ACL2-022-4	/	OCL2-022-4
GD300-02-030G-4	ACL2-030-4	/	OCL2-030-4
GD300-02-037G-4	ACL2-037-4	DCL2-037-4	OCL2-037-4
GD300-02-045G-4	ACL2-045-4	DCL2-045-4	OCL2-045-4
GD300-02-055G-4	ACL2-055-4	DCL2-055-4	OCL2-055-4

Note:

1. The rated derate voltage of the input reactor is 2%±15%.

2. The power factor of the input side is above 90% after installing DC reactor.

3. The rated derate voltage of the output reactor is 1%±15%.

4. Above options are external, the customer should indicate when purchasing.

D.7 Filters

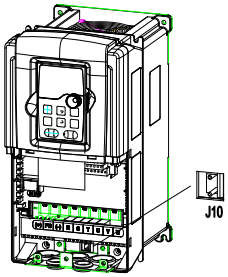
J10 is not connected in factory for VFDs of 380V (≤ 110kW). Connect the J10 packaged with the manual if the requirements of level C3 need to be met;

Note:

Disconnect J10 in the following situations:

1. The EMC filter is applicable to neutral-grounded grid system. If it is used for IT grid system (that is, non- neutral grounded grid system), disconnect the J10.

2. If leakage protection occurs when configuring the residual-current circuit breaker, disconnect J10.



Note: Do not connect C3 filter in IT power supply system.

The input interference filter can decrease the interference of the VFD to the surrounding equipments.

Output interference filter can decrease the radio noise cause by the cables between the VFD and the motor and the leakage current of the conducting wires.

Our company configured some filters for the convenience of the users.

D.7.1 Filter type instruction

FLT – P 04 045 L – B
A B C D E F

Character designation	Detailed instruction
A	FLT: VFD filter series
B	Filter type P: power supply filter L: output filter
C	Voltage degree 04: AC 3PH 380V(-15%)–440V(+10%)
D	3 bit rated current code, “015” means 15A
E	Filter performance L: Common type H: High performance type
F	Utilization environment of the filters A: the first environment (IEC61800-3) category C1 (EN 61800-3) B: the first environment (IEC61800-3) category C2 (EN 61800-3) C: the second environment (IEC61800-3) category C3 (EN 61800-3)

AC 3PH 380V(-15%)–440V(+10%)

VFD model	Input filter	Output filter
GD300-02-7R5G-4	FLT-P04032L-B	FLT-L04032L-B
GD300-02-011G-4		
GD300-02-015G-4	FLT-P04045L-B	FLT-L04045L-B
GD300-02-018G-4		
GD300-02-022G-4	FLT-P04065L-B	FLT-L04065L-B
GD300-02-030G-4		
GD300-02-037G-4	FLT-P04100L-B	FLT-L04100L-B
GD300-02-045G-4		
GD300-02-055G-4	FLT-P04150L-B	FLT-L04150L-B

D.8 Braking system

D.8.1 Select the braking components

It is appropriate to use braking resistor or braking unit when the motor brakes sharply or the motor is driven by a high inertia load. The motor will become a generator if its actual rotating speed is higher than the corresponding speed of the reference frequency. As a result, the inertial energy of the motor and load return to the VFD to charge the capacitors in the main DC circuit. When the voltage increases to the limit, damage may occur to the VFD. It is necessary to apply braking unit/resistor to avoid this accident happens.

	✧ Only qualified electricians are allowed to design, install, commission and operate the VFD. ✧ Follow the instructions in “warning” during working; otherwise, physical injury or death or serious property may occur. ✧ Only qualified electricians are allowed to wire; otherwise, damage to the VFD or braking options and parts may occur. ✧ Read the instructions of braking resistors or units carefully before connecting them with the VFD. ✧ Do not connect the braking resistor with other terminals except for PB and (+). Otherwise, damage to the VFD or braking circuit or fire may occur. ✧ Do not connect the braking unit with other terminals except for (+) and (-).
	Connect the braking resistor or braking unit with the VFD according to the diagram. Incorrect wiring may cause damage to the VFD or other devices.

AC 3PH 380V(-15%)–440V(+10%)

Goodrive300-02 VFDs of 380V (≤18.5kW) have embedded braking units but the VFDs of 380V (≥22kW) have optional braking units. Please select the resistance and power of the braking resistor according to actual operation (the requirements of braking torque and usage ratio).

VFD model	Model of braking unit	Braking resistance at 100% of the braking torque (Ω)	The consumed power of the braking resistor			Min. allowable braking resistance (Ω)
			10% braking	50% braking	80% braking	
GD300-02-7R5G-4	Embedded braking units	65	1.1	5.6	9	47
GD300-02-011G-4		44	1.7	8.3	13.2	31
GD300-02-015G-4		32	2	11	18	23
GD300-02-018G-4		27	3	14	22	19
GD300-02-022G-4	DBU100H-060-4	22	3	17	26	17
GD300-02-030G-4		17	5	23	36	17
GD300-02-037G-4		13	6	28	44	11.7
GD300-02-045G-4	DBU100H-110-4	10	7	34	54	6.4
GD300-02-055G-4		8	8	41	66	

Note:

- Select the resistance and power of the braking resistor according to the data our company provided.
- The braking resistor may increase the braking torque of the VFD. The resistor power in the above table is designed on 100% braking torque, 10%, 50% and 80% braking usage ratio. Users can select braking system according to the actual operation.
- When using the external braking units, please see the instructions of the energy braking units to set the voltage degree of the braking unit. Incorrect voltage degree may affect the normal running of the VFD.

	Never use a brake resistor with a resistance below the minimum value specified for the particular VFD. The internal VFD is not able to handle the overcurrent caused by the low resistance.
	Increase the power of the braking resistor properly in the frequent braking situation (the frequency usage ratio is more than 10%).

D.8.2 Select the braking resistor cables

Use a shielded cable to the resistor cable.

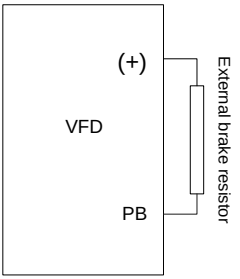
D.8.3 Install the braking resistors

Install all resistors in a place with good ventilation.

	✧ The materials near the braking resistors must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. Protect the resistor against contact.

Installation of the braking resistor:

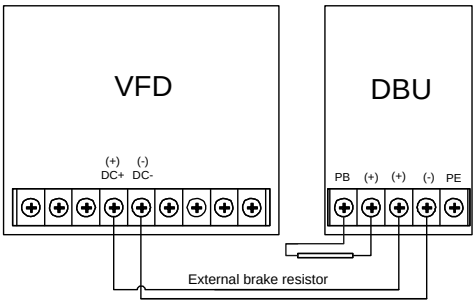
	✧ The VFDs of 380V (≤18.5) only need external braking resistors. ✧ PB and (+) are the wiring terminals of the braking resistors.



Installation of the braking unit:

	✧ The VFDs of 380V (≥22kW) need external braking units. ✧ (+), (-) are the wiring terminals of the braking units. ✧ The wiring length between the (+), (-) terminals of the VFD and the (+), (-) terminals of the braking units should be no more than 5m, and the distributing length among BR1 and BR2 and the braking resistor terminals should be no more than 10m.

Single installation is as follows:



Appendix E Further information

E.1 Product and service inquire

Address any inquiries about the product to your local INVT offices, quoting the type designation and serial number of the unit in question. A listing of INVT sales, support and service contacts can be found on www.invt.com.

E.2 Feedback on INVT VFD manuals

Your comments on our manuals are welcome. Go to www.invt.com, directly contact online service personnel or choose **Contact Us** to obtain contact information.

E.3 Documents on the Internet

You can find manuals and other product documents in PDF format on the Internet. Go to www.invt.com and choose **Support** > **Download**.

Service line:86-755-86312859 E-mail:overseas@invt.com.cn Website:www.invt.com

The products are owned by **Shenzhen INVT Electric Co.,Ltd.**
Two companies are commissioned to manufacture: (For product code, refer to the 2nd/3rd place of S/N on the name plate.)

Shenzhen INVT Electric Co., Ltd. (origin code: 01)
Address: INVT Guangming Technology Building, Songbai Road, Matian, Guangming District, Shenzhen, China

INVT Power Electronics (Suzhou) Co., Ltd. (origin code: 06)
Address: 1# Kunlun Mountain Road, Science&Technology Town, Gaoxin District, Suzhou, Jiangsu, China

Industrial Automation: ■HMI ■PLC ■VFD ■Servo System ■Elevator Intelligent Control System ■Rail Transit Traction System

Energy & Power: ■UPS ■DCIM ■Solar Inverter ■SVG ■New Energy Vehicle Powertrain System ■New Energy Vehicle Charging System ■New Energy Vehicle Motor

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