Operation Manual

Goodrive30 Series VFD

SHENZHEN INVT ELECTRIC CO., LTD.

No.	Change description	Version	Release date
1	First release	V1.0	December 2020
2	…	…	…

Contents

1 Safety precautions

Please read this manual carefully and follow all safety precautions before moving, installing, operating and servicing the variable-frequency drive (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.

1.1 Safety definition

Danger:	Serious physical injury or even death may occur if not follow related requirements
Warning:	Physical injury or damage to the devices may occur if not follow related requirements
Note:	Physical hurt may occur if not follow related 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 installation, commissioning, operating and maintaining the device to avoid any emergency.

1.2 Warning symbols

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

Symbols	Name	Instruction	Abbreviation
 Danger	Danger	Serious physical injury or even death may occur if related requirements are not followed	
 Warning	Warning	Physical injury or damage to the devices may occur if related requirements are not followed	
 Do not	Electrostatic discharge	Damage to the PCBA board may occur if not related requirements are not followed	
 Hot sides	Hot sides	Sides of the device may become hot. Do not touch.	
Note	Note	Physical hurt may occur if related requirements are not followed	**Note**

1.3 Safety guidelines

- ✧ Only qualified electricians are allowed to operate on 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. The waiting time list is as follows.

VFD module		Minimum waiting time
1PH 220V	0.4kW-2.2kW	5 minutes
3PH 220V	0.4kW-7.5kW	5 minutes
3PH 380V	0.75kW-110kW	5 minutes

- ✧ Do not refit the VFD unauthorized; 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 related operation.

1.3.1 Delivery and installation

- ✧ Please install the VFD on fire-retardant material and keep the VFD away from combustible materials.
- ✧ Connect the braking optional parts according to the wiring diagram.
- ✧ Do not operate on 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 exposure 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.
- ✧ 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. For models higher

than 30kW, the cross sectional area of the PE grounding conductor can be slightly less than the recommended area.

✧ R, S and T are the input terminals of the power supply, while U, V and W are the motor terminals. Please connect the input power cables and motor cables with proper techniques; otherwise, the damage to the VFD may occur.

1.3.2 Commissioning and operation

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

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.

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

1.3.3 Maintenance and component replacement

	✧ 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 and other conductive matters to fall into the VFD during maintenance and component replacement.

Note:

✧ Please select proper torque to tighten screws.

✧ Keep the VFD, parts 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.

1.3.4 What to do after scrapping

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

2 Product overview

2.1 Quick startup

2.1.1 Unpacking inspection

Check as follows after receiving products:

1. Check whether the packing box is damaged or dampened. If yes, contact local dealers or INVT offices.
2. Check the model identifier on the exterior surface of the packing box is consistent with the purchased model. If no, contact local dealers or INVT offices.
3. Check whether the interior surface of packing box is abnormal, for example, in wet condition, or whether the enclosure of the VFD is damaged or cracked. If yes, contact local dealers or INVT offices.
4. Check whether the name plate of the VFD is consistent with the model identifier on the exterior surface of the packing box. If no, contact local dealers or INVT offices.
5. Check whether the accessories (including user's manual and control keypad) inside the packing box are complete. If not, please contact with local dealers or INVT offices.

2.1.2 Checking before applying

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 whether the power class of the VFD needs to be increased.
2. Check whether the actual running current of the motor is less than the rated current of the VFD.
3. Check whether the control accuracy required by the load is the same with that of the VFD.
4. Check whether the grid voltage is consistent with the rated voltage of the VFD.

2.1.3 Environment confirmation

Check as follows before the actual installation and usage:

1. Check whether the ambient temperature of the VFD exceeds 40°C. If it exceeds 40°C, derate 1% for every increase of 1°C. It is not recommended to use the VFD if the ambient temperature exceeds 50°C. **Note:** For the cabinet VFD, the ambient temperature means the air temperature inside the cabinet.
2. Check whether the ambient temperature of the VFD in actual use is lower than -10°C. If yes, use heating facilities. **Note:** For the cabinet VFD, the ambient temperature means the air temperature inside the cabinet.
3. Check whether the altitude of the VFD in actual use exceeds 1000m. If it exceeds 1000m, derate 1% for every increase of 100m. When the altitude exceeds 3000m,

consult the local INVT dealer or office for details.
4. Check whether the humidity of the actual usage site exceeds 90% and condensation occurs. If yes, take additional protective measures.
5. Check whether the actual use site may be exposed to direct sunlight or may have the chance of ingress of foreign objects. If yes, take additional protective measures.
6. Check whether there is dust, explosive gas, or flammable gas in the actual use site. If yes, take additional protective measures.

2.1.4 Installation confirmation

Check the following after the VFD installation:

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

2.1.5 Basic commissioning

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

1. Autotuning. If possible, de-coupled from the motor load to start dynamic autotuning. Or if not, static autotuning is available.
2. Adjust the ACC/DEC time according to the actual running of the load.
3. Commissioning 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.
4. Set all control parameters and then operate.

2.2 Product specification

Function		Specification
Power input	Rated input voltage (V)	1PH 220V (-15%)–240V(+10%) 3PH 220V (-15%)–240V(+10%) 3PH 380V (-15%)–440V(+10%)
	Rated input current (A)	Refer to "Rated specifications".
	Rated frequency	50Hz or 60Hz; allowed range: 47–63Hz
Power output	Output voltage (V)	0–input voltage
	Output current (A)	Refer to "Rated specifications".
	Output power (kW)	Refer to "Rated specifications".
	Output frequency (Hz)	0–400Hz
Technical control performance	Control mode	SVPWM, SVC
	Motor type	Asynchronous motor and permanent magnet synchronous motor
	Speed regulation ratio	Asynchronous motor 1:100 (SVC), synchronous motor 1:20 (SVC)
	Speed control precision	± 0.2% (SVC)
	Speed fluctuation	± 0.3% (SVC)
	Torque response	< 20ms ((SVC)
	Torque control precision	10%
	Starting torque	Asynchronous motor: 0.5Hz/150% (SVC) Synchronous motor: 2.5 Hz/150% (SVC)
	Overload capacity	150% for 1 minute, 180% for 10 seconds, and 200% for 1 second.
Running control performance	Frequency setting method	Settings can be implemented through keypad digits, analog, pulse frequency, multi-step speed running, simple PLC, PID, Modbus communication, and so on. Settings can be combined and the setting channels can be switched.
	Automatic voltage regulation	The output voltage can be kept constant although the grid voltage changes.

Function		Specification
	Fault protection	Provide comprehensive fault protection functions, such as protection against overcurrent, overvoltage, undervoltage, overtemperature, phase loss, and overload.
	Speed tracking restart	Used to implement impact-free smooth startup for rotating motors.
Peripheral interface	Analog input	One input (AI2) 0–10V/0–20mA and 1 input (AI3) -10–10V.
	Analog output	Two inputs (AO1 and AO2) 0–10V/0–20mA.
	Digital input	Four regular inputs; max. frequency: 1kHz; One high-speed input; max. frequency: 50kHz
	Digital output	One Y1 terminal output
	Relay output	Two programmable relay outputs: RO1A: NO; RO1B: NC; RO1C: common terminal; RO2A: NO; RO2B: NC; RO2C: common terminal. Contact capacity: 3A/AC250V
Others	DC reactor	DC reactors have been built in the 18.5kW and higher VFD models as standard configuration.
	Installation mode	Wall and rail installation for the 1PH 220V/3PH 380V (≤2.2KW) and 3PH 220V (≤0.75KW) VFD models. Wall and flange installation for the 3PH 380V (≥4kW) and 3PH 220V (≥1.5kW) VFD models.
	Braking unit	Braking units have been built in the 37kW and lower VFD models as standard configuration. Braking units have been built in the 45–110kW VFD models as optional configuration.
	EMI filter	3PH 380V (≥4kW) and 3PH 220V (≥1.5kW) VFD models can satisfy the requirements of IEC 61800-3 C3, other models can satisfy the requirements of IEC 61800-3 C3 by installing optional external filter. The whole series can satisfy the requirements of IEC 61800-3 C2 by installing optional external filter.
	Temperature of running environment	-10–+50°C; derating is required if the ambient temperature exceeds 40°C.

Function		Specification
	Altitude	Below 1000m. When the altitude exceeds 1000m, derate by 1% for every increase of 100m. When the altitude exceeds 3000m, consult the local INVT dealer or office for details.
	Ingress protection rating	IP20 **Note:** The VFD with plastic casing should be installed in metal distribution cabinet, which conforms to IP20 and of which the top conforms to IP3X.
	Safety	Meet the requirement of CE.
	Cooling mode	Forced air cooling.

2.3 Product nameplate

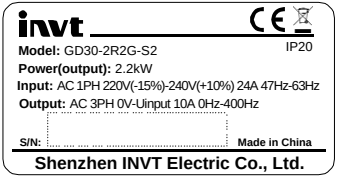


Figure 2-1 Product nameplate

Note: This is a nameplate example of a standard VFD product. The CE/TUV/IP20 marking on the top right will be marked according to actual certification conditions.

2.4 Mode code

The model code contains product information. You can find the model code on the VFD nameplate or simplified nameplate.

GD30 – 2R2G – S2
① ② ③

Figure 2-2 Product model

Field	No.	Description	Content
Abbreviation of product series	①	Abbreviation of product series	GD30: Goodrive30 series VFD
Rated power	②	Power range + Load type	2R2–2.2kW G: Constant torque load

Field	No.	Description	Content
Voltage class	③	Voltage class	S2: AC 1PH 220V(-15%)–240V(+10%) 2: AC 3PH 220V(-15%)–240V(+10%) 4: AC 3PH 380V(-15%)–440V(+10%)

Note:

Braking units have been built in the 37kW and lower VFD models as standard configuration. Braking units are not standard configuration for the 45–110kW VFD models. (If you want to use braking units for these models, add suffix "-B" at the end of the model codes in your purchase orders, for example, GD30-045G-4-B.)

2.5 Rated specifications

Model	Voltage class	Output power (kW)	Input current (A)	Output current (A)
GD30-0R4G-S2	1PH 220V	0.4	6.5	2.5
GD30-0R7G-S2		0.75	9.3	4.2
GD30-1R5G-S2		1.5	15.7	7.5
GD30-2R2G-S2		2.2	24	10
GD30-0R4G-2	3PH 220V	0.4	3.7	2.5
GD30-0R7G-2		0.75	5	4.2
GD30-1R5G-2		1.5	7.7	7.5
GD30-2R2G-2		2.2	11	10
GD30-004G-2		4	17	16
GD30-5R5G-2		5.5	21	20
GD30-7R5G-2		7.5	31	30
GD30-0R7G-4	3PH 380V	0.75	3.4	2.5
GD30-1R5G-4		1.5	5.0	4.2
GD30-2R2G-4		2.2	5.8	5.5
GD30-004G-4		4	13.5	9.5
GD30-5R5G-4		5.5	19.5	14
GD30-7R5G-4		7.5	25	18.5
GD30-011G-4		11	32	25
GD30-015G-4		15	40	32
GD30-018G-4		18.5	47	38
GD30-022G-4		22	51	45
GD30-030G-4		30	70	60
GD30-037G-4		37	80	75
GD30-045G-4		45	98	92
GD30-055G-4		55	128	115
GD30-075G-4		75	139	150

Model	Voltage class	Output power (kW)	Input current (A)	Output current (A)
GD30-090G-4		90	168	180
GD30-110G-4		110	201	215

2.6 Structure diagram

The following figure shows the structure of the VFD (3PH 380V, ≤2.2kW) (using the 0.75kW VFD model as the example).

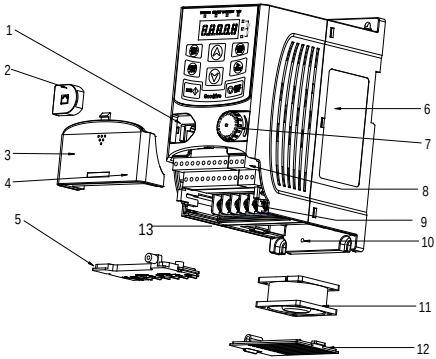


Figure 2-3 Product structure (3PH 380V, ≤2.2kW)

No.	Item	Description
1	External keypad port	Connect the external keypad.
2	Port cover	Protect the external keypad port.
3	Sliding cover	Protect the internal parts and components.
4	Hole for the sliding cover	Fix the sliding cover.
5	Trunking board	Protect the inner components and fix the cables of the main circuit.
6	Product nameplate	See section 2.3 "Product nameplate" for detailed information.
7	Potentiometer knob	Refer to Chapter 4 "Keypad operation procedure".
8	Control terminals	See Chapter 3 "Installation guidelines" for detailed information.
9	Main circuit terminals	See Chapter 3 "Installation guidelines" for detailed information.
10	Screw hole	Fix the fan cover and fan.

No.	Item	Description
11	Cooling fan	See Chapter 6 "Fault tracking" for detailed information.
12	Fan cover	Protect the fan.
13	Bar code	The same as the bar code on the name plate. **Note:** The bar code is on the middle shell which is under the cover.
Note: In above figure, the screws at 4 and 10 are provided with packaging, and specific installation depends on the requirements of customers.		

The following figure shows the structure of the VFD (3PH 380V, ≥4kW) (using the 4kW VFD model as the example).

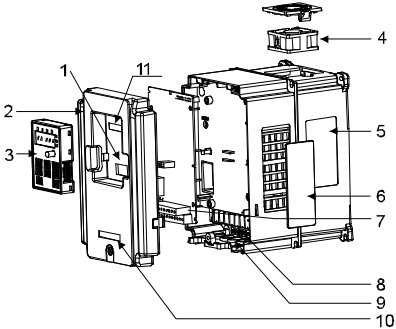


Figure 2-4 Product structure (3PH 380V, ≥4kW)

No.	Item	Description
1	Keypad port	Connect the keypad.
2	Cover	Protect the internal parts and components.
3	Keypad	Refer to Chapter 4 "Keypad operation procedure".
4	Cooling fan	See Chapter 6 "Fault tracking" for detailed information.
5	Product nameplate	See section 2.3 "Product nameplate" for detailed information.
6	Ventilation hole cover	Optional. Using the ventilation hole cover can enhance the protection rating but also increase the internal temperature, which requires derating.
7	Control terminals	See Chapter 3 "Installation guidelines" for detailed information.

No.	Item	Description
8	Main circuit terminals	See Chapter 3 "Installation guidelines" for detailed information.
9	The cable entry of the main circuit	Fix the main circuit cables.
10	Simple nameplate	Refer to section 2.4 "Mode code".
11	Bar code	The same as the bar code on the name plate. **Note:** The bar code is on the keypad, which is under the keypad.

3 Installation guidelines

The chapter describes the mechanical installation and electric installation of the VFD.

- ✧ Only trained and qualified professionals are allowed to carry out the operations mentioned in this chapter. Please carry out operations according to instructions presented in chapter 1 "Safety precautions". Ignoring these safety precautions may lead to physical injury or death, or equipment damage.
- ✧ Ensure the VFD power is disconnected before installation. If the VFD has been powered on, disconnect the VFD and wait for at least the time designated on the VFD.
- ✧ Installation must be designed and done according to applicable local laws and regulations. INVT does not assume any liability whatsoever for any installation which breaches local laws and regulations. If recommendations given by INVT are not followed, the VFD may experience problems that the warranty does not cover.

3.1 Mechanical installation

3.1.1 Installation environment

Installation environment is essential for the VFD to operate at its best in the long run.

Environment	Condition
Installation site	Indoors
Ambient temperature	✧ -10°C–+50°C, and the temperature changing rate is less than 0.5°C/minute. ✧ When the ambient temperature exceeds 40°C, derate 1% for every additional 1°C. ✧ It is not recommended to use the VFD when the ambient temperature is above 50°C. ✧ In order to improve the reliability of the device, do not use the VFD if the ambient temperature changes frequently. ✧ Please provide cooling fan or air conditioner to control the internal ambient temperature below the required one if the VFD is used in an enclosed space such as in the control cabinet. ✧ When the temperature is too low, if the VFD needs to restart to run after a long stop, it is necessary to provide an external heating device to increase the internal temperature; otherwise, damage to the devices may occur.
Humidity	✧ The relative humidity (RH) of the air is less than 90%. ✧ Condensation is not allowed.

Environment	Condition
Storage temperature	-40°C–+70°C, and the temperature changing rate is less than 1°C/minute.
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	✧ Below 1000m. ✧ When the altitude exceeds 1000m, derate by 1% for every increase of 100m. ✧ When the altitude exceeds 3000m, consult the local INVT dealer or office for details.
Vibration	The max. amplitude of vibration should not exceed 5.8m/s^2 (0.6g).
Installation direction	Install the VFD vertically to ensure good heat dissipation effect.

Note:

✧ The VFD must be installed in a clean and well-ventilated environment based on the IP level.

✧ The cooling air must be clean enough and free from corrosive gases and conductive dust.

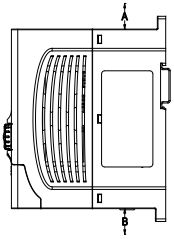
3.1.2 Installation direction

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

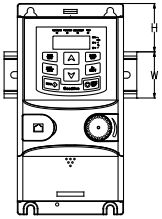
The VFD must be installed vertically. Check the installation position according to following requirements. Refer to Appendix B "Dimension drawings" for dimension details.

3.1.3 Installation mode

1. Wall and rail mounting for the VFDs (1PH 220V/3PH 380V, ≤2.2KW and 3PH 220V, ≤0.75KW)



a) Wall mounting

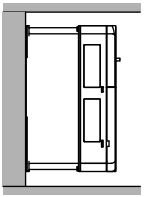


b) Rail mounting

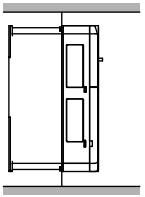
Figure 3-1 Installation mode

Note: The minimum space of A and B is 100mm if H is 36.6mm and W is 35.0mm.

2. Wall and flange mounting for the VFDs (3PH 380V, ≥4KW and 3PH 220V, ≥1.5KW)



a) Wall mounting



b) Flange mounting

Figure 3-2 Installation mode

(1) Mark the position of the installation hole. Refer to Appendix B "Dimension drawings" for the position of installation hole.

(2) Mount the screws or bolts onto the designated position.

(3) Put the VFD on the wall.

(4) Tighten the fixing screws on the wall.

3.2 Standard wiring

3.2.1 Wiring of main circuit

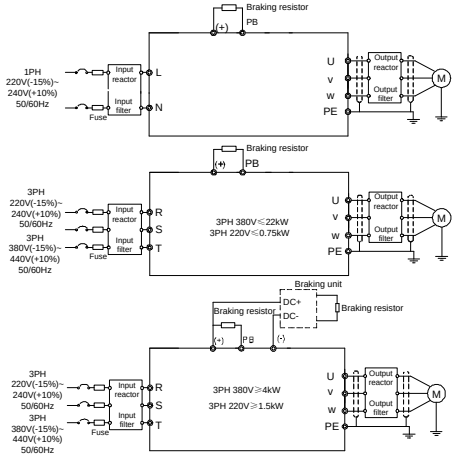


Figure 3-3 Wiring of main circuit

Note:

- ✧ The fuse, braking resistor, input reactor, input filter, output reactor, output filter are optional parts. Please refer to Appendix C "Optional peripheral accessories" for detailed information.
- ✧ Remove the yellow warning labels of PB, (+) and (-) on the terminals before connecting the braking resistor; otherwise, poor connection may be occur.

3.2.2 Main circuit terminals

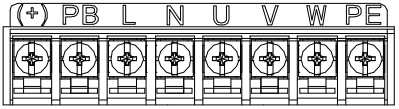


Figure 3-4 Main circuit terminal diagram for 1PH VFD models

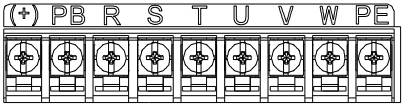


Figure 3-5 Main circuit terminal diagram for VFD models of 3PH 220V, ≤0.75kW and 3PH 380V, ≤2.2kW)

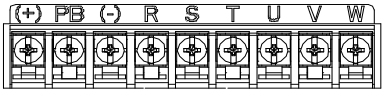


Figure 3-6 Main circuit terminal diagram for VFD models of 3PH 220V, ≥1.5kW and 3PH 380V, 4-22kW)

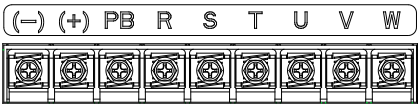


Figure 3-7 Main circuit terminal diagram for VFD models of 3PH 380V, 30-37kW

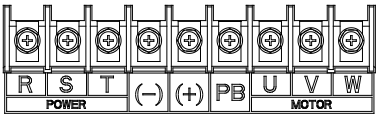


Figure 3-8 Main circuit terminal diagram for VFD models of 3PH 380V, 45-110kW)

Terminal	Description
L, N	1PH AC input terminal, connected to the grid.
R, S, T	3PH AC input terminal, connected to the grid.
PB, (+)	Connected to external dynamic braking resistor terminal
(+), (-)	Input terminal of the braking unit or DC bus
U, V, W	3PH AC output terminal, connected to the motor in most cases.
PE	Grounding terminal for safe protection, and proper grounding is required for each machine.

Note:

✧ Do not use asymmetrical motor cables. If there is a symmetrical grounding conductor in the motor cable besides the conductive shielded layer, ground the grounding conductor on the VFD and motor ends.

- ✧ Route the motor cables, input power cables and control cables separately.
- ✧ DC bus circuits of GD series VFDs cannot be connected in parallel with those of CH series VFDs.
- ✧ When DC bus circuits of GD series VFDs are connected in parallel with those of CH series VFDs, the power of these VFDs must be the same, and power-on and power-off shall be conducted simultaneously.
- ✧ For parallel connection of DC bus circuits, current sharing on the input side of the VFD shall be considered during wiring. It is recommended to configure an equalizing reactor.

3.2.3 Wiring procedure of the main circuit terminals

1. Connect the ground wire of the input power cable to the ground terminal (PE) of the VFD, connect the 3PH input cable to the terminals R, S, and T, and fasten them up.
2. Connect the grounding wire of the motor cable to the ground terminal of the VFD, and connect the 3PH motor cable to the terminals U, V, and W, and fasten them up.
3. Connect the braking resistor and other accessories that are equipped with cables to the specified positions.
4. Fasten all the cables outside of the VFD mechanically, if possible.

3.2.4 Wiring of control circuit

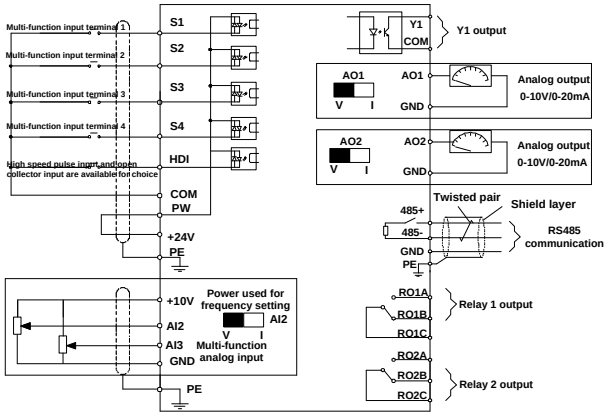


Figure 3-9 Control circuit wiring

3.2.5 Control circuit terminals

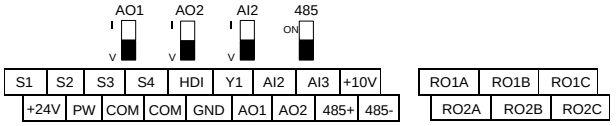


Figure 3-10 Control circuit terminal diagram for less than 4kW VFDs

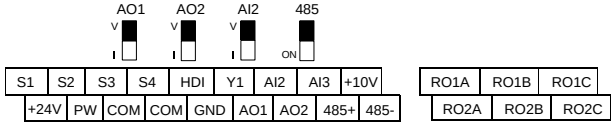


Figure 3-11 Control circuit terminal diagram for 4kW and higher VFDs

Note: The rectangular black mark indicates the shorting cap or DIP switch ex-factory selection position.

Type	Terminal	Function description	Technical specifications
Communication	485+	RS485 communication	RS485 communication terminal, using the Modbus protocol.
	485-		
Digital input/output	S1	Digital input	✧ Internal impedance: 3.3kΩ ✧ Accept 12–30V voltage input ✧ The terminal is the bi-directional input terminal ✧ Max. input frequency: 1KHz
	S2		
	S3		
	S4		
	HDI	High frequency pulse input channel	✧ In addition to S1–S4 functions, the terminals can also act as high frequency pulse input channels. ✧ Max. input frequency: 50kHz ✧ Duty ratio: 30%–70%
	PW	Digital power supply	Used to provide input digital working power from the external to the internal. Voltage range: 12–30V.
	Y1	Digital output	✧ Switch capacity: 50mA/30V ✧ Range of output frequency: 0–1kHz
	COM		Common terminal of open collector output
24V power	+24V	24V power supply	✧ Used to externally provide

Type	Terminal	Function description	Technical specifications
supply	COM		24V±10% power supply. Max. output current: 200mA. ✧ Generally used as the the working power supply of digital input/output or the external sensor power supply.
Analog input/output	+10V	External 10V reference power supply	✧ 10V reference power supply. Max. output current: 50mA. ✧ Generally used as the regulation power supply of the external potentiometer whose impedance is greater than 5kΩ.
	AI2	Analog input	✧ Input range: AI2 voltage/current can choose 0–10V / 0–20mA; AI3: -10V – +10V. ✧ Input impedance: 20kΩ during voltage input; 500Ω during current input. ✧ Whether voltage or current is used for input is set through the DIP switch. ✧ Resolution ratio: When 10V corresponds to 50Hz, the min. resolution ratio of AI2/AI3 is 10mV/20mV.
	AI3		
	GND	Analog reference ground	Analog reference ground.
	AO1	Analog output	✧ Output range: 0–10V or 0–20mA ✧ Whether voltage or current is used for output is set through the DIP switch. ✧ Deviation±1%, 25°C when full range.
	AO2		
Relay output	RO1A	NO contact of relay 1	✧ RO1 output; RO1A: NO; RO1B: NC; RO1C: common ✧ RO2 output; RO2A: NO; RO2B: NC; RO2C: common ✧ Contact capacity: 3A/AC250V
	RO1B	NC contact of relay 1	
	RO1C	Common contact of relay 1	

Type	Terminal	Function description	Technical specifications
	RO2A	NO contact of relay 2	
	RO2B	NC contact of relay 2	
	RO2C	Common contact of relay 2	

3.2.6 Input/output signal connection diagram

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

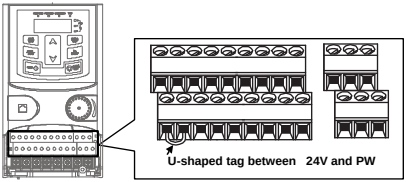


Figure 3-12 Position of U-type short connector

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

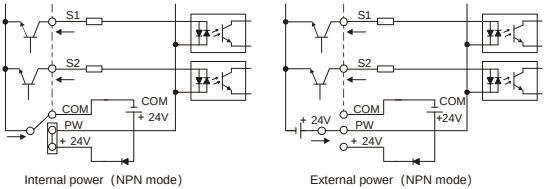


Figure 3-13 NPN mode

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

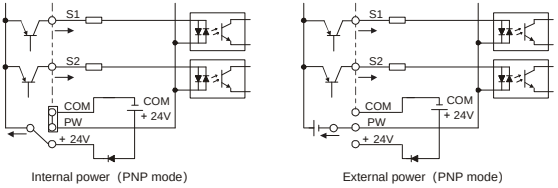


Figure 3-14 PNP mode

3.3 Wiring protection

3.3.1 Protecting the VFD and input power cable in short circuit

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

Carry out protective measures according to the following requirements.

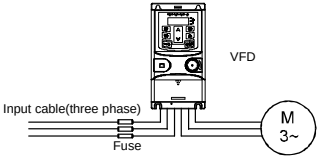


Figure 3-15 Fuse configuration

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

3.3.2 Protecting the motor and motor cable

If the motor cable is selected according to the rated current of the VFD, the VFD can perform short-circuit protection for the motor and motor cable. The VFD provides the motor thermal overload protection function, which can protect the motor, and lock the output and cut off the current when necessary.

	✧ If the VFD is connected to multiple motors, an additional thermal overload switch or breaker must be used to protect the motor and motor cable. Such a device may use the fuse to cut off the short-circuit current.

3.3.3 Bypass connection

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

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

If frequent switchover is needed, you can use the switch/contactor which carries mechanical interlock to ensure motor terminals are not connected to input power cables and VFD output ends simultaneously.

4 Keypad operation procedure

4.1 Keypad introduction

You can use the keypad to control the start and stop, read status data, and set parameters of the VFD. The keypad can be externally connected to the VFD, which requires a network cable with a standard RJ45 crystal head as the connection cable.

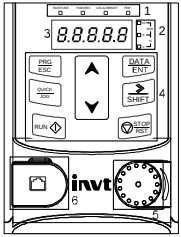


Figure 4-1 Film-type keypad

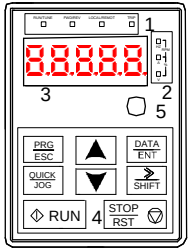
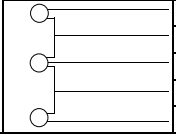


Figure 4-2 External keypad

Note:

- ✧ A film-type keypad is a standard configuration for the VFD models of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW). An external keypad is a standard configuration for the VFD models of 3PH 380V (≥4kW) and 3PH 220V (≥1.5kW).
- ✧ In addition, if you need, an external keypad (an optional part) can be provided (including the external keypads with and without the function of parameter copying).

<table>
<tr><th>Serial No.</th><th>Name</th><th colspan="3">Description</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Status indicator</td><td>RUN/TUNE</td><td colspan="2">VFD running status indicator.
LED off: The VFD is stopped.
LED blinking: The VFD is autotuning parameters.
LED on: The VFD is running.</td></tr>
<tr><td>FWD/REV</td><td colspan="2">Forward or reverse running indicator.
LED off: The VFD is running forward.
LED on: The VFD is running reversely.</td></tr>
<tr><td>LOCAL/REMOT</td><td colspan="2">Indicates whether the VFD is controlled through the keypad, terminals, or remote communication.
LED off: The VFD is controlled through the keypad.
LED blinking: The VFD is controlled through terminals.
LED on: The VFD is controlled through remote communication.</td></tr>
<tr><td>TRIP</td><td colspan="2">Fault indicator
LED on: in fault state
LED off: in normal state
LED blinking: in pre-alarm state</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Unit indicator</td><td colspan="3">Unit displayed currently.</td></tr>
<tr><td rowspan="5">  </td><td>Hz</td><td>Frequency unit</td></tr>
<tr><td>RPM</td><td>Rotating speed unit</td></tr>
<tr><td>A</td><td>Current unit</td></tr>
<tr><td>%</td><td>Percentage</td></tr>
<tr><td>V</td><td>Voltage unit</td></tr>
</table>

<table>
<tr><td>3</td><td>Digital display zone</td><td colspan="3">Five-digit LED displays various monitoring data and alarm codes such as the frequency setting and output frequency.
<table>
<tr><th>Displayed word</th><th>Corresponding word</th><th>Displayed word</th><th>Corresponding word</th><th>Displayed word</th><th>Corresponding word</th><th>Displayed word</th><th>Corresponding word</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>2</td><td>2</td><td>3</td><td>3</td></tr>
<tr><td>4</td><td>4</td><td>5</td><td>5</td><td>6</td><td>6</td><td>7</td><td>7</td></tr>
<tr><td>8</td><td>8</td><td>9</td><td>9</td><td>A.</td><td>A</td><td>b.</td><td>B</td></tr>
<tr><td>C.</td><td>C</td><td>d.</td><td>D</td><td>E.</td><td>E</td><td>F.</td><td>F</td></tr>
<tr><td>H.</td><td>H</td><td>I.</td><td>I</td><td>L.</td><td>L</td><td>n.</td><td>N</td></tr>
<tr><td>n</td><td>n</td><td>O</td><td>o</td><td>P.</td><td>P</td><td>r</td><td>r</td></tr>
<tr><td>S.</td><td>S</td><td>t</td><td>t</td><td>U.</td><td>U</td><td>u</td><td>v</td></tr>
<tr><td>.</td><td>.</td><td>-</td><td>-</td><td></td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td rowspan="8">4</td><td rowspan="8">Key area</td><td>PRG ESC</td><td>Programming key</td><td>Press it to enter or exit level-1 menus or delete a parameter.</td></tr>
<tr><td>DATA ENT</td><td>Confirmation key</td><td>Press it to enter menus in cascading mode or confirm the setting of a parameter.</td></tr>
<tr><td>▲</td><td>UP key</td><td>Press it to increase data or move upward.</td></tr>
<tr><td>▼</td><td>Down key</td><td>Press it to decrease data or move downward.</td></tr>
<tr><td>SHIFT</td><td>Right-shifting key</td><td>Press it to select display parameters rightward in the interface for the VFD in stopped or running state or to select digits to change during parameter setting.</td></tr>
<tr><td>RUN</td><td>Run key</td><td>Press it to run the VFD when using the keypad for control.</td></tr>
<tr><td>STOP RST</td><td>Stop/Reset key</td><td>Press it to stop the VFD that is running. The function of this key is restricted by P07.04. In fault alarm state, this key can be used for reset in any control modes.</td></tr>
<tr><td>QUICK JOG</td><td>Multifunction shortcut key</td><td>The function is determined by P07.02.</td></tr>
</table>

5	Analog potentiometer	AI1. When the external common keypad (without the function of parameter copy) is valid, the difference between the local keypad AI1 and the external keypad AI1 is: When the external keypad AI1 is set to the Min. value, the local keypad AI1 will be valid and P17.19 will be the voltage of the local keypad AI1; otherwise, the external keypad AI1 will be valid and P17.19 will be the voltage of the external keypad AI1. **Note:** If the external keypad AI1 is frequency reference source, adjust the local potentiometer AI1 to 0V/0mA before starting the VFD.
6	Keypad port	External keypad port. When the external keypad with the function of parameter copying is valid, the local keypad LED is off. When the external keypad without the function of parameter copying is valid, the local and external keypad LEDs are on. **Note:** Only the external keypad which has the function of parameters copy owns the function of parameters copy, other keypads do not have. (only for the VFDs ≤ 2.2kW)

4.2 Keypad display

The keypad of Goodrive30 series VFD displays the stopped-state parameters, running-state parameters, function parameter editing status, and fault alarm status.

4.2.1 Displaying stopped-state parameters

When the VFD is in stopped state, the keypad displays stopped-state parameters, as shown in Figure 4-3.

In the stopped state, parameters in various states can be displayed. You can determine which parameters are displayed by setting the binary bits of P07.07. For definitions of the bits, see the description of P07.07.

In stopping state, there are 14 parameters that can be selected for display, including set frequency, bus voltage, input terminal status, output terminal status, PID reference value, PID feedback value, torque setting, AI1, AI2, AI3, high-speed pulse HDI frequency, PLC and the current step of multi-step speed, pulse counting value, length value. P07.07 can select the parameter to be displayed or not by bit, and you can press 》/SHIFT to shift selected parameters from left to right or press QUICK/JOG to shift selected parameters from right to left.

4.2.2 Displaying running-state parameters

After receiving a valid running command, the VFD enters the running state, and the keypad displays running-state parameters, with the RUN/TUNE indicator on. The on/off state of the FWD/REV indicator is determined by the current running direction. It is shown in Figure 4-3.

In running state, there are 24 parameters that can be selected for display, including running frequency, set frequency, bus voltage, output voltage, output current, running speed, output

power, output torque, PID reference value, PID feedback value, input terminal status, output terminal status, torque setting, length value, PLC and the current step of multi-step speed, AI1, AI2, AI3, high-speed pulse HDI frequency, motor overload percentage, VFD overload percentage, ramp reference value, linear speed, and AC input current. P07.05 and P07.06 can select the parameter to be displayed or not by bit, and you can press 》/SHIFT to shift selected parameters from left to right or press QUICK/JOG to shift selected parameters from right to left.

4.2.3 Displaying fault information

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

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

4.2.4 Editing function codes

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

Figure 4-3 Status display

4.3 Operatons on the keypad

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

4.3.1 Modifying VFD function codes

The VFD provides three levels of menus, including:

1. Function code group number (level-1 menu)

2. Function code number (level-2 menu)

3. Function code setting (level-3 menu)

Note: When performing operations on the level-3 menu, you can press the PRG/ESC or DATA/ENT key to return to the level-2 menu. If you press the DATA/ENT key, the set value of

the parameter is saved to the control board first, and then the level-2 menu is returned, displaying the next function code. If you press the PRG/ESC key, the level-2 menu is returned directly, without saving the set value of the parameter, and the current function code is displayed.

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

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

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

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

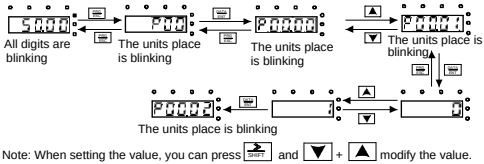


Figure 4-4 Modifying a parameter

4.3.2 Setting a password for the VFD

Goodrive30 series VFDs provide password protection function to users. Set P07.00 to gain the password and the password protection becomes effective 1 minute later 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, you cannot enter it.

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

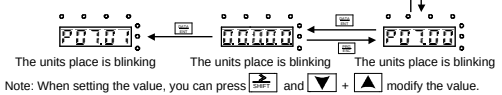


Figure 4-5 Setting a password

4.3.3 Viewing VFD status

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

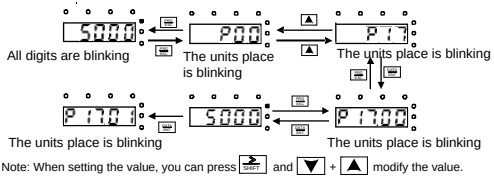


Figure 4-6 Viewing a parameter

5 Function parameter list

The function parameters of Goodrive30 series VFD 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. A three-level menu style is applied to function codes. For example, "P08.08" indicates the 8th function code in the P8 group. The P29 group consist of factory function parameters, which are user inaccessible.

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

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

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

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

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

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

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

"○" indicates that the value of the parameter can be modified when the VFD is in stopped or running state.

"◎" indicates that the value of the parameter cannot be modified when the VFD is in running state.

"●" indicates that the value of the parameter is detected and recorded, and cannot be modified.

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

2. The parameters adopt the decimal system (DEC). If the hexadecimal system is adopted, the data in each digit is independent from each other during parameter editing. The values of some of the digits can be hexadecimal (0–F).

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

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

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

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

P00 group Basic functions

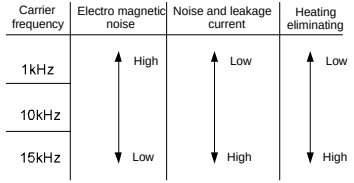
Function code	Name	Description	Default	Modify
P00.00	Speed control mode	0: SVC mode 0 (applicable to AM and SM) There is no need to install encoders. It is suitable in applications with low frequency, big torque and high speed control accuracy for accurate speed and torque control. Compared to mode 1, this mode is more suitable for the applications which need medium and small power. 1: SVC mode 1 (applicable to AM) There is no need to install encoders. It is suitable in applications with high speed control accuracy for accurate speed and torque control at all power ratings. 2: SVPWM control mode There is no need to install encoders. It can improve the control accuracy with the advantages of stable operation, valid low-frequency torque boost and current vibration suppression and the functions of slip compensation and voltage adjustment. **Note:** AM: Asynchronous motor (AM) SM: Synchronous motor (SM)	1	◎
P00.01	Channel of running commands	The function code is used to select the channel of VFD control commands. Control commands of the VFD include: start, stop, forward/reverse rotating, jogging, and fault reset. 0: Keypad (the "LOCAL/REMOT" indicator is off) The running commands are controlled through	0	○

Function code	Name	Description	Default	Modify
		keypad keys, such as the RUN and STOP/RST keys. 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 simultaneously in running state to make the VFD coast to stop. 1: Terminal (the "LOCAL/REMOT" indicator blinks) 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 (the "LOCAL/REMOT" indicator is on) The running commands are controlled by the upper computer in communication mode.		
P00.03	Max. output frequency	Used to set the max. output frequency of the VFD. Pay attention to the function code because it is the foundation of the frequency setting and the speed of acceleration (ACC) and deceleration (DEC). Setting range: P00.04–400.00Hz	50.00Hz	◎
P00.04	Upper limit of running frequency	The upper limit of the running frequency is the upper limit of the output frequency of the VFD, which is lower than or equal to the max. output frequency. When the set frequency is higher than the upper limit of the running frequency, the upper limit of the running frequency is used for running. Setting range: P00.05–P00.03 (Max. output frequency)	50.00Hz	◎
P00.05	Lower limit of running frequency	The lower limit of the running frequency is the lower limit of the output frequency of the VFD, When the set frequency is lower than the lower limit of the running frequency, the lower limit of the running frequency is used for running. **Note:** Max. output frequency ≥ Upper limit of frequency ≥ Lower limit of frequency	0.00Hz	◎

Function code	Name	Description	Default	Modify
		Setting range: 0.00Hz–P00.04 (Upper limit of running frequency)		
P00.06	Setting channel of A frequency command	**Note:** A frequency and B frequency cannot set as the same frequency given method. The frequency source can be set by P00.09. 0: Keypad	0	○
P00.07	Setting channel of B frequency command	Modify the value of P00.10 (frequency set through keypad) to set the frequency by the keypad. 1: AI1 2: AI2 3: AI3 Set the frequency by analog input terminals. The VFD provides 3 channels of analog input terminals as the standard configuration, of which AI1/AI2 is the voltage/current option (0–10V/0–20mA) which can be shifted by jumpers; while AI3 is voltage input (-10V–+10V). **Note:** When AI1/AI2 selects the 0–20mA input, the corresponding voltage of 20mA is 10V input. 100.0% of the analog input setting corresponds to the max. output frequency (P00.03) in forward direction while -100.0% corresponds to the max. output frequency in reverse direction (P00.03). 4: High-speed pulse HDI The frequency is set by high-speed pulse terminals. The VFD provides 1 high speed pulse input as the standard configuration. Range of pulse frequency: 0.00–50.00kHz. 100.0% of the high speed pulse input setting corresponds to the max. output frequency (P00.03) in forward direction while -100.0% corresponds to the max. output 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 P05.49 (HDI high-speed pulse input function	2	○

Function code	Name	Description	Default	Modify
		selection) to "Frequency setting input". 5: Simple PLC program 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 step. See the function description of P10 group for detailed information. 6: Multi-step speed running The VFD runs at multi-step speed mode when P00.06=6 or P00.07=6. Set P05 to select the current running step, and set P10 to select the running frequency of the current step. The multi-step speed has the priority when P00.06 or P00.07 are not equal to 6, but the setting step can only be the 1–15 step. The setting step is 1–15 if P00.06 or P00.07 equals to 6. 7: PID control 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 preset source, preset value and feedback source of PID. 8: Modbus communication The frequency is set by Modbus communication. See P14 for detailed information. 9-11: Reserved		
P00.08	Reference object of B frequency command	0: Maximum output frequency, 100% of B frequency setting corresponds to the max. output frequency 1: A frequency command, 100% of B frequency setting corresponds to the max. output frequency. Select this setting if it needs to adjust on the base of A frequency command.	0	○

Function code	Name	Description	Default	Modify
P00.09	Combination mode 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 and B frequency commands is the set frequency. 5: Min (A, B): The lower one between A frequency and B frequency commands is the set frequency. **Note:** The combination mode can be switched by P05 (terminal function).	0	○
P00.10	Frequency set through keypad	When A and B frequency commands select the keypad for setting, the value of the function code is the original setting one of the frequency data of the VFD. Setting range: 0.00 Hz–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. output frequency (P00.03). DEC time means the time needed if the VFD speeds down from the max. output frequency (P00.03) to 0Hz. The VFD has four groups of ACC/DEC time, which can be selected by P05. The factory default ACC/DEC time of the VFD is the first group. Setting range of P00.11 and P00.12: 0.0–3600.0s	Model depended	○
P00.12	DEC time 1		Model depended	○
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 opposite direction, the VFD runs in the reverse direction. FWD/REV indicator is on.	0	○

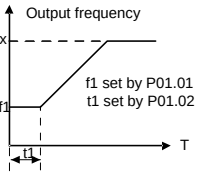
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>Modify P00.13 to shift the rotation direction of the motor. This effect equals to the shifting the rotation direction by adjusting either two of the motor lines (U, V and W). The motor rotation direction can be changed by QUICK/JOG on the keypad. Refer to parameter P07.02 for details.
Note: When the function parameter comes back to the default value, the motor's running direction will come back to the factory default state. 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</td><td> 

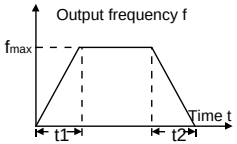
The relationship between models and carrier frequencies is as follows:
<table>
<tr><th>Model</th><th>Default carrier frequency</th></tr>
<tr><td>0.4–11kW</td><td>8kHz</td></tr>
<tr><td>15–55kW</td><td>4kHz</td></tr>
<tr><td>75–110kW</td><td>2kHz</td></tr>
</table>
Advantage of high carrier frequency: ideal current waveform, little current harmonic wave and motor noise.
Disadvantage of high carrier frequency: increasing the switch loss, increasing VFD temperature and the impact to the output capacity. The VFD needs to derate on high carrier frequency. At the same time, the leakage</td><td>Model depended</td><td>○</td></tr>
</table>

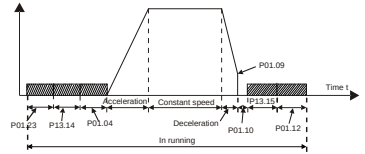
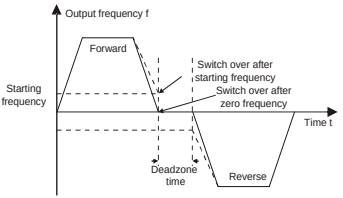
Function code	Name	Description	Default	Modify
		and electrical magnetic interference will increase. On the contrary, an extremely-low a carrier frequency may cause unstable operation at low frequency, decrease the torque, or even lead to oscillation. The carrier frequency has been properly set in the factory before the VFD is delivered. In general, you do not need to modify it. When the frequency used exceeds the default carrier frequency, the VFD needs to derate by 10% for each increase of 1k carrier frequency. Setting range: 1.0–15.0kHz		
P00.15	Motor parameter autotuning	0: No operation 1: Rotary autotuning. Comprehensive motor parameter autotuning. It is recommended to use rotating autotuning when high control accuracy is needed. 2: Static autotuning 1 (comprehensive autotuning); static autotuning 1 is used in cases where the motor cannot be disconnected from load. 3: Static autotuning 2 (partial autotuning); when the present motor is motor 1, only P02.06, P02.07 and P02.08 are autotuned.	0	◎
P00.16	AVR function selection	0: Invalid 1: Valid during the whole procedure The auto-adjusting function of the VFD can eliminate the impact on the output voltage of the VFD because of the bus voltage fluctuation.	1	○
P00.17	Reserved			
P00.18	Function parameter restore	0: No operation 1: Restore default values 2: Clear fault records **Note:** ✧ After the selected operation is performed, the function code is automatically restored to 0.	0	◎

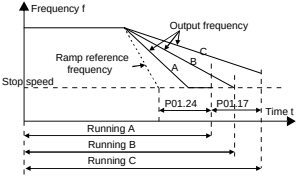
Function code	Name	Description	Default	Modify
		✧ Restoring the default values may delete the user password. Exercise caution when using this function.		

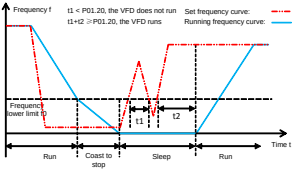
P01 group Start and stop control

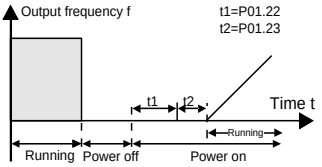
Function code	Name	Description	Default	Modify
P01.00	Start mode	0: Direct start: start from the starting frequency P01.01. 1: Start after DC braking: start the motor from the starting frequency after DC braking (set the parameter P01.03 and P01.04). It is suitable in the cases where reverse rotation may occur to the low inertia load during starting. 2: Speed tracking restart: The direction and speed will be tracked automatically for the smoothing starting of rotating motors. It is suitable in the cases where reverse rotation may occur to the high inertia load during starting. **Note:** The function is available only for 4kW and higher models.	0	◎
P01.01	Starting frequency of direct start	The function code indicates the initial frequency during VFD start. See P01.02 (Starting frequency hold time) for detailed information. Setting range: 0.00–50.00Hz	0.50Hz	◎
P01.02	Starting frequency hold time	 Setting a proper starting frequency can increase the torque during VFD start. During the hold time of the starting frequency, the output frequency of the VFD is the starting frequency. And then, the VFD runs from the starting frequency to the set frequency. If the set frequency is lower than the	0.0s	◎

Function code	Name	Description	Default	Modify
		starting frequency, the VFD stops running and keeps in the standby state. The starting frequency is not limited in the lower limit frequency. Setting range: 0.0–50.0s		
P01.03	DC braking current before start	The VFD performs DC braking with the braking current before start and it speeds up after the DC braking time. If the DC braking time is set to 0, the DC braking is invalid. Stronger braking current indicates larger braking power. The DC braking current before start is a percentage of the VFD rated current. Setting range of P01.03: 0.0–100.0% Setting range of P01.04: 0.00–50.00s	0.0%	◎
P01.04	DC braking time before start		0.00s	◎
P01.05	ACC and DEC mode	The function code indicates the changing mode of the frequency during start 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 a stop command takes effect, the VFD lowers output frequency based on the DEC mode and the defined DEC time; after the frequency drops to the stop speed (P01.15), the VFD stops. 1: Coast to stop. After a stop command takes effect, the VFD stops output immediately; and the load coasts to stop according to mechanical inertia.	0	○
P01.09	Starting frequency	Starting frequency of DC braking for stop: During the deceleration to stop, the VFD starts DC	0.00Hz	○

Function code	Name	Description	Default	Modify
	of DC braking for stop	braking for stop when running frequency reaches the starting frequency determined by P01.09.		
P01.10	Wait time before DC braking for stop	Wait time before DC braking for stop: The VFD blocks the output before starting DC braking. After this wait time, DC braking is started so as to prevent overcurrent caused by DC braking at high speed.	0.00s	○
P01.11	DC braking current for stop	DC braking current for stop: The value of P01.11 is the percentage of rated current of VFD. Stronger current indicates greater DC braking effect.	0.0%	○
P01.12	DC braking time for stop	DC braking time for stop: It indicates the hold time of DC braking. If the time is 0, DC braking is invalid, and the VFD decelerates to stop within the specified time.  Setting range of P01.09: 0.00Hz–P00.03 (Max. output frequency) Setting range of P01.10: 0.00–50.00s Setting range of P01.11: 0.0–100.0% Setting range of P01.12: 0.00–50.00s	0.00s	○
P01.13	FWD/REV running deadzone time	This function code indicates the transition time specified in P01.14 during FWD/REV rotation switching. See the figure.  Setting range: 0.0–3600.0s	0.0s	○

Function code	Name	Description	Default	Modify
P01.14	FWD/REV running switching mode	The function code is used to set the switching threshold of the VFD. 0: Switch at zero frequency 1: Switch at the starting frequency 2: Switch after the speed reaches the stop speed with a delay	0	◎
P01.15	Stop speed	0.00–100.00Hz	0.50 Hz	◎
P01.16	Stop speed detection mode	0: Detect by the set speed (without stop delay) 1: Detect by the feedback speed (only valid for vector control)	1	◎
P01.17	Feedback speed detection time	When P01.16=1, the feedback frequency of the VFD is less than or equal to P01.15 and is detected during the time set by P01.17, the VFD will stop; otherwise, the VFD stops in the time set by P01.17.  Setting range: 0.00–100.00s (only valid when P01.16=1)	0.50s	◎
P01.18	Terminal-based running command protection at power-on	When the channel of running commands is terminal control, the system detects the state of the running terminal during power-on. 0: The terminal running command is invalid at power-on. Even the running command is considered as valid during power-on, the VFD does not run and it keeps the protection state until the running command is canceled and enabled again. 1: The terminal running command is valid at power-on. If the running command is considered as valid during power-on, the VFD is started automatically after the initialization. **Note:** Exercise caution before using this	0	○

Function code	Name	Description	Default	Modify
		function. Otherwise, serious result may follow.		
P01.19	Action selected when running frequency less than frequency lower limit (valid when frequency lower limit greater than 0)	The function code determines the running state of the VFD when the set frequency is lower than the lower-limit one. 0: Run at the frequency lower limit 1: Stop 2: Sleep The VFD coasts to stop when the set frequency is lower than the lower-limit one. If the set frequency exceeds the lower limit one again and it lasts for the time set by P01.20, the VFD resumes the running state automatically.	0	◎
P01.20	Wake-up-from-sleep delay	The function code determines the wake-up-from-sleep delay time. When the running frequency of the VFD is lower than the lower limit, the VFD becomes standby. When the set frequency exceeds the lower limit one again and it lasts for the time set by P01.20, the VFD runs automatically.  Setting range: 0.0–3600.0s (valid when P01.19=2)	0.0s	○
P01.21	Restart after power-off	The function code indicates whether the VFD automatically runs after re-power on. 0: Disable 1: Enable. If the restart condition is met, the VFD will run automatically after waiting the time defined by P01.22.	0	○

Function code	Name	Description	Default	Modify
P01.22	Wait time for restart after power-off	The function code indicates the wait time before the automatic running of the VFD that is re-powered on.  Setting range: 0.0–3600.0s (valid when P01.21=1)	1.0s	○
P01.23	Start delay	After a VFD running command is given, the VFD is in standby state and restarts with the delay defined by P01.23 to implement brake release. Setting range: 0.0–60.0s	0.0s	○
P01.24	Stop speed delay	Setting range: 0.0–100.0s	0.0s	○
P01.25	0Hz output selection	The function code is used to select the 0Hz output of the VFD. 0: Output without voltage 1: Output with voltage 2: Output with the DC braking current for stop	0	○

P02 group Motor 1 parameters

Function code	Name	Description		Default	Modify
P02.00	Type of motor 1	0: Asynchronous motor (AM) 1: Synchronous motor (SM)		0	◎
P02.01	Rated power of AM 1	0.1–3000.0kW	The function code is used to set parameters of the controlled asynchronous motor. To ensure the control performance, set P02.01–P02.05 correctly according to the information on the nameplate of the	Model depended	◎
P02.02	Rated frequency of AM 1	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P02.03	Rated speed of AM 1	1–36000rpm		Model depended	◎

Function code	Name	Description	Default	Modify
P02.04	Rated voltage of AM 1	0–1200V	Model depended	◎
P02.05	Rated current of AM 1	0.8–6000.0A	Model depended	◎
P02.06	Stator resistor of AM 1	0.001–65.535Ω	Model depended	○
P02.07	Rotor resistor of AM 1	0.001–65.535Ω	Model depended	○
P02.08	Leakage inductance of AM 1	0.1–6553.5mH	Model depended	○
P02.09	Mutual inductance of AM 1	0.1–6553.5mH	Model depended	○
P02.10	Non-load current of AM 1	0.1–6553.5A	Model depended	○

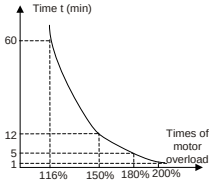
asynchronous motor.
The Goodrive30 series VFD provides the parameter autotuning function. Whether parameter autotuning can be performed properly depends on the settings of the motor nameplate parameters.
In addition, you need to configure a motor based on the standard motor configuration of the VFD. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the VFD degrades significantly.
Note: Resetting the rated power of the motor (P02.01) can initialize the parameters of P02.02 to P02.10.

After motor parameter autotuning is properly performed, the values of P02.06 to P02.10 are automatically updated.
These parameters are the reference parameters for high-performance vector control, directly affecting the control performance.
Note: Do not modify these parameters unless it is necessary.

Function code	Name	Description		Default	Modify
P02.11	Magnetic saturation coefficient 1 of iron core of AM 1	0.0–100.0%		80.0%	○
P02.12	Magnetic saturation coefficient 2 of iron core of AM 1	0.0 – 100.0%		68.0%	○
P02.13	Magnetic saturation coefficient 3 of iron core of AM 1	0.0 – 100.0%		57.0%	○
P02.14	Magnetic saturation coefficient 4 of iron core of AM 1	0.0 – 100.0%		40.0%	○
P02.15	Rated power of SM 1	0.1–3000.0kW	The function code is used to set parameters of the controlled synchronous motor. To ensure the control performance, set P02.15–P02.19 correctly according to the information on the nameplate of the synchronous motor. The Goodrive30 series VFD provides the parameter autotuning function. Whether parameter autotuning can be performed properly depends on the settings of the motor nameplate parameters. In addition, you need to	Model depended	◎
P02.16	Rated frequency of SM 1	0.01Hz–P00.03 (Max. output frequency)		50.00Hz	◎
P02.17	Number of pole pairs of SM 1	1–50		2	◎
P02.18	Rated voltage of SM 1	0–1200V		Model depended	◎
P02.19	Rated current of SM 1	0.8–6000.0A		Model depended	◎

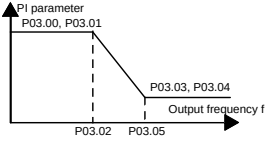
Function code	Name	Description		Default	Modify
			configure a motor based on the standard motor configuration of the VFD. If the power of the motor is greatly different from that of the standard motor configuration, the control performance of the VFD degrades significantly. **Note:** Resetting the rated power of the motor (P02.15) can initialize the parameters of P02.16 to P02.19.		
P02.20	Stator resistance of SM 1	0.001–65.535Ω	After motor parameter autotuning is properly performed, the values of P02.20 to P02.22 are automatically updated. These parameters are the reference parameters for high-performance vector control, directly affecting the control performance. When P00.15=1 (rotary autotuning), the set value of P02.23 may be automatically updated by autotuning, In this case, there is no need to change the value of P02.23. When P00.15=2 (static autotuning), the set value of P02.23 cannot be updated by autotuning. In this case, you need to calculate and manually change the value of P02.23.	Model depended	○
P02.21	Direct-axis inductance of SM 1	0.01–655.35mH		Model depended	○
P02.22	Quadrature-axis inductance of SM 1	0.01–655.35mH		Model depended	○
P02.23	Counter-emf constant of SM 1	When P00.15=2, the set value of P02.23 cannot be updated by autotuning, please count according to the following method. The counter-emf constant can be counted according to the parameters on the nameplate of the motor. There are three ways to		300	○

Function code	Name	Description	Default	Modify
		count: 1. If the nameplate designates the counter-emf constant Ke, then: $E=(Ke\times n_N\times 2^{\pi})/60$ 2. If the nameplate designates the counter-emf constant E'(V/1000r/min), then: $E=E'\times n_N/1000$ 3. If the nameplate does not designate the above parameters, then: $E=P/(\sqrt{3}\times I)$ 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		
P02.24	Initial pole position of SM 1 (reserved)	0x0000 – 0xFFFF	0	●
P02.25	Identification current of SM 1 (reserved)	0%–50.0% (of the motor rated current)	10%	●

Function code	Name	Description	Default	Modify
P02.26	Overload protection selection of motor 1	0: No protection 1: Common motor protection (with low-speed compensation). As the cooling effect of a common motor is degraded at low speed running, the corresponding electronic thermal protection value needs to be adjusted properly, the low compensation indicates lowering the overload protection threshold of the motor whose running frequency is lower than 30Hz. 2: Variable-frequency motor protection (without low speed compensation). Because the heat dissipation function for a variable-frequency motor is not impacted by the rotation speed, it is not necessary to adjust the protection value at low speed running.	2	◎
P02.27	Overload protection coefficient of motor 1	Motor overload multiples M=Iout/(In*K) In is rated motor current, Iout is VFD output current, K is motor overload protection coefficient. A smaller value of K indicates a bigger value of M. When M=116%, protection is performed after motor overload lasts for 1 hour; when M=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	Description	Default	Modify
		Setting range: 20.0%–120.0%		
P02.28	Power display calibration coefficient of motor 1	The function code can be used to adjust the power display value of motor 1. However, it does not affect the control performance of the VFD. Setting range: 0.00–3.00	1.00	○
P02.29	Parameter display selection of motor 1	0: Display by motor type. In this mode, only parameters related to the present motor type are displayed. 1: Display all. In this mode, all the motor parameters are displayed.	0	○

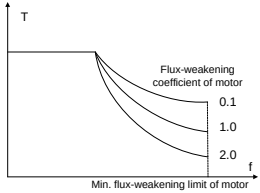
P03 group Vector control

Function code	Name	Description	Default	Modify
P03.00	Speed loop proportional gain 1	The parameters P03.00–P03.05 are applicable only to vector control mode. Below the switching frequency 1 (P03.02), the speed-loop PI parameters are: P03.00 and P03.01. Above the switching frequency 2 (P03.05), the speed-loop PI parameters are: P03.03 and P03.04. PI parameters are obtained according to the linear change of two groups of parameters. See the following figure:  The speed loop dynamic response characteristics of vector control can be adjusted by setting the proportional coefficient and integral time of speed regulator. Increasing proportional gain or reducing integral time can accelerate dynamic response of speed loop; however, if the proportional gain is too large or integral time is too small, system oscillation and overshoot may occur; if proportional gain is too	20.0	○
P03.01	Speed loop integral time 1		0.200s	○
P03.02	Low-point frequency for switching		5.00Hz	○
P03.03	Speed loop proportional gain 2		20.0	○
P03.04	Speed loop integral time 2		0.200s	○
P03.05	High-point frequency for switching		10.00Hz	○

Function code	Name	Description	Default	Modify
		small, stable oscillation or speed offset may occur. PI parameters have a close relationship with the inertia of the system. Adjust PI parameters depending on different loads to meet various demands. Setting range of P03.00: 0–200.0 Setting range of P03.01: 0.000–10.000s Setting range of P03.02: 0.00Hz –P03.05 Setting range of P03.03: 0–200.0 Setting range of P03.04: 0.000–10.000s 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	Electromotive slip compensation coefficient of vector control	Slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy of the system. Adjusting the parameter properly can control the speed steady-state error. Setting range: 50–200%	100%	○
P03.08	Braking slip compensation coefficient of vector control		100%	○
P03.09	Current-loop proportional coefficient P	**Note:** ✧ The two function codes impact the dynamic response speed and control accuracy of the system. Generally, you do not need to modify the two function codes. ✧ The parameters P03.09 and P23.05 are applicable only to SVC 0 (P00.00=0). Setting range: 0–65535	1000	○
P03.10	Current-loop integral coefficient I		1000	○

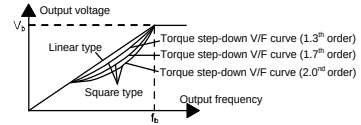
Function code	Name	Description	Default	Modify
P03.11	Torque setting method	The function code is used to enable the torque control mode, and set the torque setting method. 0: Invalid 1: Keypad (P03.12) 2: AI1 3: AI2 4: AI3 5: Pulse frequency HDI 6: Multi-step torque 7: Modbus communication 8–10: Reserved **Note:** For setting methods 2–7, 100% corresponds to three times the motor rated current.	0	○
P03.12	Torque set through keypad	Setting range: -300.0%–300.0% (of the rated motor current)	50.0%	○
P03.13	Torque reference filter time	0.000–10.000s	0.010s	○
P03.14	Setting source of forward rotation upper-limit frequency in torque control	0: Keypad (P03.16 sets the value when P03.14=1; P03.17 sets the value when P03.15=1) 1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI 5: Multi-step setting 6: Modbus communication 7–9: Reserved **Note:** For setting methods 1–6, 100% corresponds to the maximum frequency.	0	○
P03.15	Setting source of reverse rotation upper-limit frequency in torque control		0	○
P03.16	Forward rotation	The function codes are used to set the frequency upper limits. 100% corresponds to the max.	50.00 Hz	○

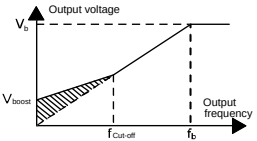
Function code	Name	Description	Default	Modify
	upper-limit frequency set through keypad in torque control	frequency. P03.16 sets the value when P03.14=1; P03.17 sets the value when P03.15=1. Setting range: 0.00 Hz–P00.03 (Max. output frequency)		
P03.17	Reverse rotation upper-limit frequency set through keypad in torque control		50.00 Hz	○
P03.18	Setting source of electromotive torque upper limit	This function codes are used to select the setting sources of electromotive and braking torque upper limits. 0: Keypad (P03.20 sets P03.18 and P03.21 sets P03.19)	0	○
P03.19	Setting source of braking torque upper limit	1: AI1 2: AI2 3: AI3 4: Pulse frequency HDI 5: Modbus communication 6–8: Reserved **Note:** For setting methods 1–5, 100% corresponds to three times the motor rated current.	0	○
P03.20	Electromotive torque upper limit set through keypad	The function codes are used to set torque limits. Setting range: 0.0–300.0% (of the motor rated current)	180.0%	○
P03.21	Braking torque upper limit set through keypad		180.0%	○

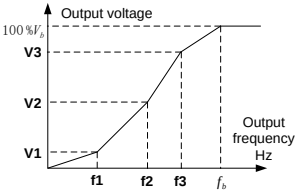
Function code	Name	Description	Default	Modify
P03.22	Weakening coefficient in constant power zone	Used when the motor is in flux-weakening control. 	0.3	○
P03.23	Lowest weakening point in constant power zone	The function codes P03.22 and P03.23 are valid at constant power. The motor enters the flux-weakening state when the motor runs above the rated speed. Change the flux-weakening curvature by modifying the flux-weakening control coefficient. The larger the coefficient, the steeper the curve, the smaller the coefficient, the smoother the curve. P03.22 is valid only for vector mode 1. Setting range of P03.22: 0.1–2.0 Setting range of P03.23: 10% –100.0%	20%	○
P03.24	Max. voltage limit	P03.24 set the max. output voltage of the VFD. Set the value according to onsite conditions. Setting range: 0.0–120%	100.0%	◎
P03.25	Pre-exciting time	Pre-exciting is performed for the motor when the VFD starts up. A magnetic field is built up inside the motor to improve the torque performance during the start process. Setting range: 0.000–10.000s	0.300s	○
P03.26	Flux-weakening proportional gain	0–8000 **Note:** P03.24–P03.26 are invalid only for vector mode 1.	1000	○
P03.27	Speed display selection in vector control	0: Display the actual value 1: Display the set value	0	○

Function code	Name	Description	Default	Modify
P03.28	Static friction compensation coefficient	0.0–100.0% Adjust P03.28 to compensate the low frequency torque. P03.28 is valid only when the running frequency is less than 1Hz.	0.0%	○
P03.29	Dynamic friction compensation coefficient	0.0–100.0% Adjust P03.29 to compensate the torque during running. P03.29 is valid only when the running frequency is greater than 1Hz.	0.0%	○

P04 group SVPWM control

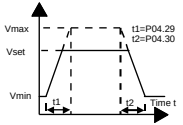
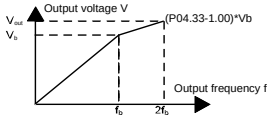
Function code	Name	Description	Default	Modify
P04.00	V/F curve setting of motor 1	This group of function code defines the V/F curve of motor 1 to meet the needs of different loads. 0: Straight-line V/F curve, applicable to constant torque loads 1: Multi-point V/F curve 2: Torque-down V/F curve (power of 1.3) 3: Torque-down V/F curve (power of 1.7) 4: Torque-down V/F curve (power of 2.0) Curves 2–4 are applicable to the torque loads such as fans and water pumps. You can adjust according to the characteristics of the loads to achieve best performance. 5: Customized V/F (V/F separation); in this mode, V can be separated from f and f can be adjusted through the frequency setting channel set by P00.06 or the voltage setting channel set by P04.27 to change the characteristics of the curve. **Note:** In the following figure, V_b is the motor rated voltage and f_b is the motor rated frequency. 	0	◎

Function code	Name	Description	Default	Modify
P04.01	Torque boost of motor 1	In order to compensate for low-frequency torque characteristics, you can make some boost compensation for the output voltage. P04.01 is relative to the maximum output voltage V_b.	0.0%	○
P04.02	Torque boost cut-off of motor 1	P04.02 defines the percentage of cut-off frequency of manual torque boost to the rated motor frequency f_b. Torque boost can improve the low-frequency torque characteristics of V/F. You need to select torque boost based on the load. For example, larger load requires larger torque boost, however, if the torque boost is too large, the motor will run at over-excitation, which may cause increased output current and motor overheating, thus decreasing the efficiency. When torque boost is set to 0.0%, the VFD uses automatic torque boost. Torque boost cut-off threshold: Below this frequency threshold, torque boost is valid; exceeding this threshold will invalidate torque boost.  Setting range of P04.01: 0.0%: (automatic) 0.1%–10.0% Setting range of P04.02: 0.0%–50.0%	20.0%	○
P04.03	V/F frequency point 1 of motor 1	When P04.00=1 (multi-dot V/F curve), you can set the V/F curve through P04.03–P04.08. The V/F curve is generally set according to the load characteristics of the motor. **Note:** V1 < V2 < V3, f1 < f2 < f3. Too high voltage for low frequency will cause motor overheat or damage and cause VFD overcurrent stall or overcurrent protection.	0.00Hz	○
P04.04	V/F voltage point 1 of motor 1		00.0%	○
P04.05	V/F frequency		00.00Hz	○

Function code	Name	Description	Default	Modify
	point 2 of motor 1			
P04.06	V/F voltage point 2 of motor 1		00.0%	○
P04.07	V/F frequency point 3 of motor 1		00.00Hz	○
P04.08	V/F voltage point 3 of motor 1	Setting range of P04.03: 0.00Hz –P04.05 Setting range of P04.04: 0.0%–110.0% (of rated voltage of motor 1) Setting range of P04.05: P04.03 –P04.07 Setting range of P04.06: 0.0%–110.0% (of rated voltage of motor 1) Setting range of P04.07: P04.05–P02.02 (rated frequency of motor 1) or P04.05– P02.16 (rated frequency of motor 1) Setting range of P04.08: 0.0%–110.0% (of rated voltage of motor 1)	00.0%	○
P04.09	V/F slip compensation gain of motor 1	The function code is used to compensate for the motor rotating speed change caused by load change in the space voltage vector mode, and thus improve the rigidity of the mechanical characteristics of the motor. You need to calculate the rated slip frequency of the motor as follows: $\triangle f=f_b-n*p/60$ Of which, f_b is the rated frequency of the motor, corresponding to function code P02.02. n is the rated rotating speed of the motor, corresponding to function code P02.03. p is the number of pole pairs of the motor. 100.0% corresponds to the rated slip frequency △f of motor. Setting range: 0.0–200.0%	100.0%	○
P04.10	Low frequency vibration control	In space voltage vector control mode, the motor, especially the large-power motor, may experience current oscillation at certain frequencies, which may cause unstable motor	10	○

Function code	Name	Description	Default	Modify
	factor of motor 1	running, or even VFD overcurrent. You can adjust the two function codes properly to eliminate such phenomenon. Setting range of P04.10: 0–100 Setting range of P04.11: 0–100 Setting range of P04.12: 0.00Hz–P00.03 (Max. output frequency)		
P04.11	High frequency vibration control factor of motor 1		10	○
P04.12	Vibration control threshold of motor 1		30.00 Hz	○
P04.13	V/F curve setting of motor 2	This group of function code defines the V/F curve of motor 2 to meet the needs of different loads. For details, see P04.00 and P04.12. **Note:** P04 group includes two sets of motor V/F parameters which can be displayed simultaneously, but only valid for the selected motor. The motor selection can be determined by the terminal function 35 "Switch motor 1 to motor 2".	0	◎
P04.14	Torque boost of motor 2		0.0%	○
P04.15	Torque boost cut-off of motor 2		20.0%	○
P04.16	V/F frequency point 1 of motor 2		0.00Hz	○
P04.17	V/F voltage point 1 of motor 2		00.0%	○
P04.18	V/F frequency point 2 of motor 2		00.00Hz	○
P04.19	V/F voltage point 2 of motor 2		00.0%	○
P04.20	V/F frequency		00.00Hz	○

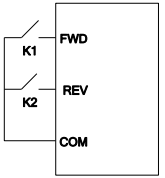
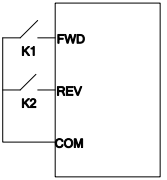
Function code	Name	Description	Default	Modify
	point 3 of motor 2			
P04.21	V/F voltage point 3 of motor 2		00.0%	○
P04.22	V/F slip compensation gain of motor 2		100.0%	○
P04.23	Low frequency vibration control factor of motor 2	In space voltage vector control mode, the motor, especially the large-power motor, may experience current oscillation at certain frequencies, which may cause unstable motor running, or even VFD overcurrent. You can adjust the two function codes properly to eliminate such phenomenon. Setting range of P04.23: 0–100 Setting range of P04.24: 0–100 Setting range of P04.25: 0.00Hz–P00.03 (Max. output frequency)	10	○
P04.24	High frequency vibration control factor of motor 2		10	○
P04.25	Vibration control threshold of motor 2		30.00 Hz	○
P04.26	Energy-saving run	0: Disable 1: Automatic energy-saving run In light-load state, the motor can adjust the output voltage automatically to achieve energy saving.	0	◎
P04.27	Voltage setting channel	Select the output voltage setting channel at V/F curve separation. 0: Keypad (Output voltage is determined by P04.28.) 1: AI1 2: AI2 3: AI3 4: HDI	0	○

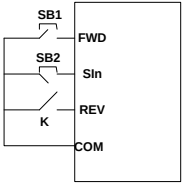
Function code	Name	Description	Default	Modify
		5: Multi-step running 6: PID 7: Modbus communication 8–10: Reserved **Note:** For setting methods 1–7, 100% corresponds to the rated motor voltage.		
P04.28	Voltage set through keypad	The function code is the voltage digital setting when "keypad" is selected as the voltage setting channel. Setting range: 0.0% –100.0%	100.0%	○
P04.29	Voltage increase time	Voltage increase time means the time needed for the VFD to accelerate from min. output voltage to the max. output frequency.	5.0s	○
P04.30	Voltage decrease time	Voltage decrease time means the time needed for the VFD to decelerate from the max. output frequency to min. output voltage. Setting range: 0.0–3600.0s	5.0s	○
P04.31	Max. output voltage	The function codes are used to set the upper and lower limits of output voltage.	100.0%	◎
P04.32	Min. output voltage	 Setting range of P04.31: P04.32 –100.0% (of the motor rated voltage) Setting range of P04.32: 0.0%–P04.31	0.0%	◎
P04.33	Weakening coefficient in constant power zone	The function code is used to adjust the output voltage of the VFD in SVPWM mode during flux-weakening. **Note:** This parameter is invalid in the constant torque mode.  Setting range of P04.33: 1.00–1.30	1.00	○

P05 group Input terminals

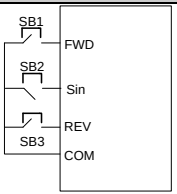
Function code	Name	Description	Default	Modify
P05.00	HDI input type	0: HDI is high-speed pulse input. See P05.49–P05.54. 1: HDI is digital input. See P05.09.	0	◎
P05.01	S1 terminal function selection	0: No function 1: Forward running (FWD) 2: Reverse running (REV) 3: 3-wire running control (SIn) 4: Forward jogging 5: Reverse jogging 6: Coast to stop 7: Fault reset 8: Running pause 9: External fault input 10: Frequency increase (UP) 11: Frequency decrease (DOWN) 12: Clear frequency increase/decrease setting 13: Switch between A setting and B setting 14: Switch between combination setting and A setting 15: Switch between combination setting and B setting 16: Multi-step speed terminal 1 17: Multi-step speed terminal 2 18: Multi-step speed terminal 3 19: Multi-step speed terminal 4 20: Pause multi-step speed running 21: ACC/DEC time selection 1 22: ACC/DEC time selection 2 23: Simple PLC stop reset 24: Pause simple PLC 25: Pause PID control 26: Pause wobbling frequency (stop at the current frequency) 27: Reset wobbling frequency (return to the center frequency) 28: Counter reset 29: Disable torque control	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>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>30: Disable ACC/DEC
31: Trigger the counter
32: Reserved
33: Clear the frequency increase/decrease setting temporarily
34: DC braking for stop
35: Reserved
36: Switch the running command channel to keypad
37: Switch the running command channel to terminal
38: Switch the running command channel to communication
39: Pre-exciting command
40: Clear electricity consumption
41: Keep electricity consumption
42–60: Reserved
61: Switch PID polarities
62–63: Reserved</td><td></td><td></td></tr>
<tr><td>P05.10</td><td>Input terminal polarity</td><td>The function code is used to set the polarity of input terminals.
When a bit is 0, the input terminal is positive; when a bit is 1, the input terminal is negative.
<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>
Setting range: 0x000 –0x1FF</td><td>0x000</td><td>○</td></tr>
<tr><td>P05.11</td><td>Digital filter time</td><td>The function code is used to set the filter time for S1–S8 and HDI. In strong interference cases, increase the value to avoid mal-operation.
Setting range: 0.000–1.000s</td><td>0.010s</td><td>○</td></tr>
<tr><td>P05.12</td><td>Virtual terminal setting</td><td>0x000–0x1FF (0: Disable, 1: Enable)
BIT0: S1 virtual terminal
BIT1: S2 virtual terminal
BIT2: S3 virtual terminal
BIT3: S4 virtual terminal</td><td>0x000</td><td>◎</td></tr>
</table>

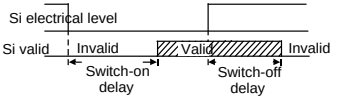
Function code	Name	Description	Default	Modify
		BIT4: S5 virtual terminal BIT5: S6 virtual terminal BIT6: S7 virtual terminal BIT7: S8 virtual terminal BIT8: HDI virtual terminal		
P05.13	Terminal control mode	The function code is used to set the mode of terminal control. 0: Two-wire control 1, the enabling consistent with the direction. This mode is widely used. The defined FWD/REV terminal command determines the motor rotation direction.  FWD REV Running command OFF OFF Stopping ON OFF Forward running OFF ON Reverse running ON ON Hold on 1: Two-wire control 2, the enabling separated from the direction. In this mode, FWD is the enabling terminal. The direction depends on the defined REV state.  FWD REV Running command OFF OFF Stopping ON OFF Forward running OFF ON Stopping ON ON Reverse running 2: 3-wire control 1; This mode defines Sin as the enabling terminal, and the running command is generated by FWD, while the direction is controlled by REV. During running, the Sin terminal needs to be closed, and terminal FWD generates a rising edge signal, then the VFD starts to run in the direction set by the state of terminal REV; the VFD needs to be stopped by disconnecting terminal Sin.	0	◎

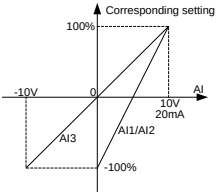
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>


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

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


<table>
<tr><th>SIn</th><th>FWD</th><th>REV</th><th>Running direction</th></tr>
<tr><td rowspan="2">ON</td><td rowspan="2">OFF→ ON</td><td>ON</td><td>Forward</td></tr>
<tr><td>OFF</td><td>Forward</td></tr>
<tr><td rowspan="2">ON</td><td>ON</td><td rowspan="2">OFF→ON</td><td>Reverse</td></tr>
<tr><td>OFF</td><td>Reverse</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: Three-wire control; FWD: Forward running; REV: Reverse running
Note: For 2-wire controlled running mode, when the FWD/REV terminal is valid, if the VFD stops due to a stop command given by another source, the VFD does not run again after the stop command disappears even if the control terminal FWD/REV is still valid. To make the VFD run, you need to trigger FWD/REV again, for example, PLC single-cycle stop, fixed-length stop, and valid STOP/RST stop during terminal control. (See P07.04).
</td><td></td><td></td></tr>
<tr><td>P05.14</td><td>S1 switch-on delay</td><td rowspan="2">The function codes specify the delay time corresponding to the electrical level changes when the programmable input terminals switch on or switch off.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P05.15</td><td>S1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P05.16	S2 switch-on delay	 Setting range: 0.000–50.000s	0.000s	○
P05.17	S2 switch-off delay		0.000s	○
P05.18	S3 switch-on delay		0.000s	○
P05.19	S3 switch-off delay		0.000s	○
P05.20	S4 switch-on delay		0.000s	○
P05.21	S4 switch-off delay		0.000s	○
P05.22	S5 switch-on delay		0.000s	○
P05.23	S5 switch-off delay		0.000s	○
P05.24	S6 switch-on delay		0.000s	○
P05.25	S6 switch-off delay		0.000s	○
P05.26	S7 switch-on delay		0.000s	○
P05.27	S7 switch-off delay		0.000s	○

Function code	Name	Description	Default	Modify
P05.28	S8 switch-on delay		0.000s	○
P05.29	S8 switch-off delay		0.000s	○
P05.30	HDI switch-on delay		0.000s	○
P05.31	HDI switch-off delay		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 0–20 mA is 0–10V. In different cases, the corresponding rated value of 100.0% is different. See the application for detailed information. The following figure illustrates different applications:  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.	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 lower limit of AI2		0.0%	○
P05.39	Upper limit of AI2		10.00V	○
P05.40	Corresponding setting of		100.0%	○

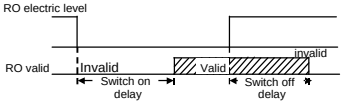
Function code	Name	Description	Default	Modify
	the upper limit of AI2	**Note:** AI1 and AI2 support 0–10V or 0–20mA input. When AI1 and AI2 select 0–20mA input, the corresponding voltage of 20mA is 10V. AI3 supports -10V–+10V input.		
P05.41	AI2 input filter time		0.100s	○
P05.42	Lower limit of AI3	Setting range of P05.32: 0.00V–P05.34	-10.00V	○
P05.43	Corresponding setting of the lower limit of AI3	Setting range of P05.33: -100.0%–100.0% Setting range of P05.34: P05.32–10.00V Setting range of P05.35: -100.0%–100.0% Setting range of P05.36: 0.000s–10.000s Setting range of P05.37: 0.00V–P05.39	-100.0%	○
P05.44	Middle value of AI3	Setting range of P05.38: -100.0%–100.0% Setting range of P05.39: P05.37–10.00V	0.00V	○
P05.45	Corresponding middle setting of AI3	Setting range of P05.40: -100.0%–100.0% Setting range of P05.41: 0.000s–10.000s Setting range of P05.42: -10.00V–P05.44 Setting range of P05.43: -100.0%–100.0%	0.0%	○
P05.46	Upper limit of AI3	Setting range of P05.44: P05.42–P05.46 Setting range of P05.45: -100.0%–100.0%	10.00V	○
P05.47	Corresponding setting of the upper limit of AI3	Setting range of P05.46: P05.44–10.00V Setting range of P05.47: -100.0%–100.0% Setting range of P05.48: 0.000s–10.000s	100.0%	○
P05.48	AI3 input filter time		0.100s	○
P05.49	HDI high-speed pulse input function selection	The function is selected when HDI terminal is high-speed pulse input. 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	-100.0%–100.0%	0.0%	○

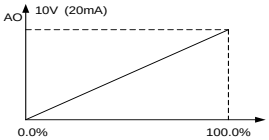
Function code	Name	Description	Default	Modify
	of HDI low frequency setting			
P05.52	Upper limit frequency of HDI	P05.50–50.000kHz	50.000kHz	○
P05.53	Corresponding setting of upper limit frequency of HDI	-100.0%–100.0%	100.0%	○
P05.54	HDI frequency input filter time	0.000s–10.000s	0.010s	○

P06 group Output terminals

Function code	Name	Description	Default	Modify
P06.00	HDO output type	P06.00 is the function selection of the high-speed pulse output terminals. output terminals. 0: Open collector high-speed pulse output. The max. frequency of pulse is 50.00kHz. For details about the related functions, see P06.27–P06.31. 1: Open collector output. For details about the related functions, see P06.02.	0	◎
P06.01	Y1 output	0: Invalid 1: Running 2: Running forward 3: Running reversely 4: Jogging 5: VFD in fault 6: Frequency level detection FDT1 7: Frequency level detection FDT2 8: Frequency reached 9: Running in zero speed 10: Upper limit frequency reached	0	○
P06.03	RO1 output		1	○
P06.04	RO2 output		5	○

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>11: Lower limit frequency reached
12: Ready for running
13: Pre-exciting
14: Overload pre-alarm
15: Underload pre-alarm
16: Simple PLC stage completed
17: Simple PLC cycle completed
18: Set counting value reached
19: Designated counting value reached
20: External fault is valid
21: Length reached
22: Running time reached
23: Modbus communication virtual terminal output
24–25: Reserved
26: DC bus voltage established
27–30: Reserved</td><td></td><td></td></tr>
<tr><td>P06.05</td><td>Output terminal polarity selection</td><td>The function code is used to set the polarity of output terminals.
When a bit is 0, the input terminal is positive;
When a bit is 1, the 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>Reserved</td><td>Y1</td></tr></table>Setting range: 00–0F</td><td>00</td><td>○</td></tr>
<tr><td>P06.06</td><td>Y1 switch-on delay</td><td>Setting range: 0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.07</td><td>Y1 switch-off delay</td><td>Setting range: 0.000–50.000s</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.10</td><td>RO1 switch-on delay</td><td rowspan="2">The function code defines the delay time corresponding to the electrical level changes when the programmable output terminals switch on or switch off.</td><td>0.000s</td><td>○</td></tr>
<tr><td>P06.11</td><td>RO1 switch-off delay</td><td>0.000s</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
P06.12	RO2 switch-on delay		0.000s	○
P06.13	RO2 switch-off delay	Setting range : 0.000–50.000s	0.000s	○
P06.14	AO1 output	0: Running frequency	0	○
P06.15	AO2 output	1: Set frequency 2: Ramp reference frequency 3: Running rotation speed (relative to twice the rotation speed of the motor) 4: Output current (relative to twice the rated current of the VFD) 5: Output current (relative to twice the rated current of the motor) 6: Output voltage (relative to 1.5 times the rated voltage of the VFD) 7: Output power (relative to twice the rated power of the motor) 8: Set torque (relative to twice the rated torque of the motor) 9: Output torque (relative to twice the rated torque of the motor) 10: AI1 input 11: AI2 input 12: AI3 input 13: High-speed pulse HDI input 14: Value 1 set through Modbus communication 15: Value 2 set through Modbus communication 16–21: Reserved 22: Torque current (relative to triple the rated current of the motor) 23: Ramp reference frequency (with sign) 24–30: Reserved	0	○
P06.17	Lower limit of AO1 output	The function codes define the relationship between the output value and analog output. When the output value exceeds the allowed	0.0%	○

Function code	Name	Description	Default	Modify
P06.18	AO1 output corresponding to lower limit	range, the output uses the lower limit or upper limit. When the analog output is current output, 1mA equals 0.5V. In different cases, the corresponding analog output of 100% of the output value is different. See each application for detailed information.  Setting range of P06.17: -100.0%–P06.19 Setting range of P06.18: 0.00–10.00V 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: 0.00–10.00V Setting range of P06.26: 0.000–10.000s	0.00V	○
P06.19	Upper limit of AO1 output		100.0%	○
P06.20	AO1 output corresponding to upper limit		10.00V	○
P06.21	AO1 output filter time		0.000s	○
P06.22	Lower limit of AO2 output		0.0%	○
P06.23	AO2 output corrspondin g to lower limit		0.00V	○
P06.24	Upper limit of AO2 output		100.0%	○
P06.25	AO2 output corresponding to upper limit		10.00V	○
P06.26	AO2 output filter time		0.000s	○

P07 group HMI

Function code	Name	Description	Default	Modify
P07.00	User password	0–65535 When you set the function code to a non-zero number, password protection is enabled. If you set the function code to 00000, the previous user password is cleared and password	0	○

Function code	Name	Description	Default	Modify
		protection is disabled. After the user password is set and takes effect, you cannot enter the parameter menu if you enter an incorrect password. Please remember your password and save it in a secure place. After you exit the function code editing interface, the password protection function is enabled within 1 minute. If password protection is enabled, "0.0.0.0.0" is displayed when you press the PRG/ESC key again to enter the function code editing interface. You need to enter the correct user password to enter the interface. **Note:** Restoring the default values may delete the user password. Exercise caution when using this function.		
P07.01	Function 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 group) 4: Download the keypad function parameters to local address (only for the motor parameter of P02 group) **Note:** After the parameter is set to 1, 2, 3 or 4, and the operation is executed, the parameter is automatically restored to 0. The parameters uploaded or downloaded do not include those of the P29 group (factory function parameters).	0	◎
P07.02	QUICK/JOG key function selection	0: No function 1: Jog. Press QUICK/JOG to begin the jogging running. 2: Switch the display state by the shifting key. Press QUICK/JOG to shift the displayed function	1	◎

Function code	Name	Description	Default	Modify
		code from right to left. 3: Switch between FWD and REV rotating. Press QUICK/JOG to shift the direction of the frequency commands. This function is only valid in the keypad command channels. 4: Clear the UP/DOWN setting. Press QUICK/JOG to clear the set value of UP/DOWN. 5: Coast to stop. Press QUICK/JOG to coast to stop. 6: Switch command channels in sequence. Press QUICK/JOG to shift the reference manner of running commands in sequence. 7: Quick commissioning mode (based on non-default 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 in P00.13 during next powering on.		
P07.03	Sequence of switching running-command channels by pressing QUICK/JOG	When P07.02=6, set the sequence of switching running-command channels by pressing this key. 0: Keypad→Terminal→Communication 1: Keypad←→Terminal 2: Keypad←→Communication 3: Terminal←→Communication	0	○
P07.04	Stop function validity of STOP/RST	The function code specifies the stop function validity of STOP/RST. For fault reset, STOP/RST is valid in any conditions. 0: Valid only for keypad control 1: Valid both for keypad and terminal control 2: Valid both for keypad and communication control 3: Valid for all control modes	0	○

Function code	Name	Description	Default	Modify
P07.05	Selection 1 of parameters displayed in running state	0x0000–0xFFFF BIT0: Running frequency (Hz on) BIT1: Set frequency (Hz blinks) BIT2: Bus voltage (V on) BIT3: Output voltage (V on) BIT4: Output current (A on) BIT5: Running rotating speed (rpm on) BIT6: Output power (% on) BIT7: Output torque (% on) BIT8: PID reference value (% blinks) BIT9: PID feedback value (% on) BIT10: Input terminal state BIT11: Output terminal state BIT12: Torque setting value (% on) BIT13: Pulse counting value BIT14: Length value BIT15: PLC and current step of multi-step speed	0x03FF	○
P07.06	Selection 2 of parameters displayed in running state	0x0000–0xFFFF BIT0: AI1 (V on) BIT1: AI2 (V on) BIT2: AI3 (V on) BIT3: High-speed pulse HDI frequency BIT4: Motor overload percentage (% on) BIT5: VFD overload percentage (% on) BIT6: Ramp frequency reference value (Hz on) BIT7: Linear speed BIT8: AC incoming current (A on) BIT9: Upper limit of frequency (Hz on) BIT10–15: Reserved	0x0000	○
P07.07	Selection of parameters displayed in stopping state	0x0000–0xFFFF BIT0: Set frequency (Hz on, frequency blinks slowly) BIT1: Bus voltage (V on) BIT2: Input terminal state BIT3: Output terminal state BIT4: PID reference value (% blinks) BIT5: PID feedback value (% on) BIT6: Torque setting value (% on) BIT7: AI1 (V on)	0x00FF	○

Function code	Name	Description	Default	Modify
		BIT8: AI2 (V on) BIT9: AI3 (V on) BIT10: High-speed pulse HDI frequency BIT11: PLC and current step of multi-step speed BIT12: Pulse counting value BIT13: Length value BIT14: Upper limit of frequency (Hz on) BIT15: Reserved		
P07.08	Frequency display coefficient	0.01–10.00 Displayed frequency = Running frequency * P07.08	1.00	○
P07.09	Rotational speed display coefficient	0.1–999.9% Mechanical rotation speed =120 * (Displayed running frequency) × P07.09/(Number of motor pole pairs)	100.0%	○
P07.10	Linear speed display coefficient	0.1–999.9% Linear speed = (Mechanical rotation speed) × P07.10	1.0%	○
P07.11	Temperature of rectifier bridge module	-20.0–120.0℃		●
P07.12	Temperature of inverter module	-20.0–120.0℃		●
P07.13	Software version of control board	1.00–655.35		●
P07.14	Accumulated running time	0–65535h		●
P07.15	High bit of power consumption of the VFD	The function codes are used to display the power consumption of the VFD. VFD power consumption =P07.15*1000+P07.16 Setting range of P07.15: 0–65535kWh (*1000) Setting range of P07.16: 0.0–999.9kWh		●

Function code	Name	Description	Default	Modify
P07.16	Low bit of power consumption of the VFD			●
P07.17	Reserved	Reserved		●
P07.18	Rated VFD power	0.4–3000.0kW		●
P07.19	Rated VFD voltage	50–1200V		●
P07.20	Rated VFD current	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	Present fault type	0: No fault 1: Inverter unit U phase protection (OUt1) 2: Inverter unit V phase protection (OUt2) 3: Inverter unit W phase protection (OUt3) 4: Overcurrent during acceleration (OC1) 5: Overcurrent during deceleration (OC2) 6: Overcurrent during constant speed running (OC3) 7: Overvoltage during acceleration (OV1) 8: Overvoltage during deceleration (OV2) 9: Overvoltage during constant speed running (OV3) 10: Bus undervoltage (UV) 11: Motor overload (OL1)		●
P07.28	Last fault type			●
P07.29	2nd-last fault type			●
P07.30	3rd-last fault type			●
P07.31	4th-last fault type			●
P07.32	5th-last fault type			●

Function code	Name	Description	Default	Modify
		12: VFD overload (OL2) 13: Phase loss on input side(SPI) 14: Phase loss on output side (SPO) 15: Rectifier module overheat(OH1) 16: Inverter module overheat (OH2) 17: External fault (EF) 18: 485 communication fault (CE) 19: Current detection fault (ItE) 20: Motor autotuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID feedback offline fault (PIDE) 23: Braking unit fault (bCE) 24: Running time reached (END) 25: Electronic overload (OL3) 26: Keypad communication error (PCE) 27: Parameter upload error (UPE) 28: Parameter download error (DNE) 29–31: Reserved 32: To-ground short-circuit fault 1 (ETH1) 33: To-ground short-circuit fault 2 (ETH2) 34: Speed deviation fault (dEu) 35: Mal-adjustment fault (STo) 36: Underload fault (LL)		
P07.33	Running frequency at present fault		0.00Hz	●
P07.34	Ramp reference frequency at present fault		0.00Hz	●
P07.35	Output voltage at present fault		0V	●

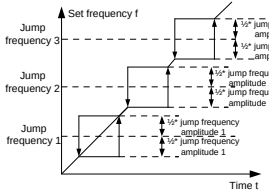
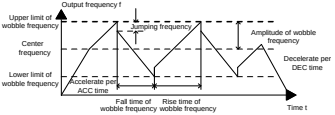
Function code	Name	Description	Default	Modify
P07.36	Output current at present fault		0.0A	●
P07.37	Bus voltage at present fault		0.0V	●
P07.38	Max. temperature at present fault		0.0℃	●
P07.39	Input terminal status at present fault		0	●
P07.40	Output current status at present fault		0	●
P07.41	Running frequency at last fault		0.00Hz	●
P07.42	Ramp reference frequency at last fault		0.00Hz	●
P07.43	Output voltage at last fault		0V	●
P07.44	Output current at last fault		0.0A	●
P07.45	Bus voltage at last fault		0.0V	●

Function code	Name	Description	Default	Modify
P07.46	Max. temperature at last fault		0.0℃	●
P07.47	Input terminal status at last fault		0	●
P07.48	Output terminal status at last fault		0	●
P07.49	Running frequency at 2nd-last fault		0.00Hz	●
P07.50	Ramp reference frequency at 2nd-last fault		0.00Hz	●
P07.51	Output voltage at 2nd-last fault		0V	●
P07.52	Output current at 2nd-last fault		0.0A	●
P07.53	Bus voltage at 2nd-last fault		0.0V	●
P07.54	Max. temperature at 2nd-last fault		0.0℃	●

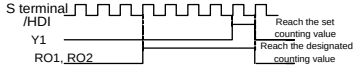
Function code	Name	Description	Default	Modify
P07.55	Input terminal status at 2nd-last fault		0	●
P07.56	Output terminal status at 2nd-last fault		0	●

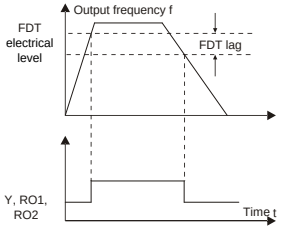
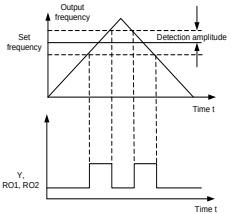
P08 group Enhanced functions

Function code	Name	Description	Default	Modify
P08.00	ACC time 2	Refer to P00.11 and P00.12 for detailed definition. The VFD has four groups of ACC/DEC time which can be selected by P5 group. The first group of ACC/DEC time is the factory default one. Setting range: 0.0–3600.0s	Model depended	○
P08.01	DEC time 2		Model depended	○
P08.02	ACC time 3		Model depended	○
P08.03	DEC time 3		Model depended	○
P08.04	ACC time 4		Model depended	○
P08.05	DEC time 4		Model depended	○
P08.06	Running frequency of jog	The function code is used to define the reference frequency during jogging. Setting range: 0.00Hz–P00.03 (max. output frequency)	5.00Hz	○
P08.07	ACC time for jog	ACC time for jogging means the time needed for the VFD to accelerate from 0Hz to the max. output frequency (P00.03). DEC time for jogging means the time needed for the VFD to decelerate from the max. output frequency (P00.03) to 0Hz. Setting range: 0.0–3600.0s	Model depended	○
P08.08	DEC time for jog		Model depended	○

Function code	Name	Description	Default	Modify
P08.09	Jump frequency 1	When the set frequency is within the range of jumping frequency, the VFD runs at the boundary of jumping frequency. The VFD can avoid the mechanical resonance point by setting jumping frequencies. The VFD supports the setting of three jump frequencies. If the jump frequency points are set to 0, this function is invalid.  Setting range: 0.00Hz–P00.03 (max. output frequency)	0.00Hz	○
P08.10	Jump frequency amplitude 1		0.00Hz	○
P08.11	Jump frequency 2		0.00Hz	○
P08.12	Jump frequency amplitude 2		0.00Hz	○
P08.13	Jump frequency 3		0.00Hz	○
P08.14	Jump frequency amplitude 3		0.00Hz	○
P08.15	Amplitude of wobbling frequency	This function applies to the industries where traverse and convolution function are required such as textile and chemical fiber.	0.0%	○
P08.16	Amplitude of sudden jump frequency	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 follows, of which the traverse is set by P08.15 and when P08.15 is set as 0, the traverse is 0 with no function.	0.0%	○
P08.17	Rise time of wobbling frequency		5.0s	○
P08.18	Fall time of wobbling frequency	 Amplitude of wobbling frequency: The wobbling frequency running is limited by upper and low limits of the frequency. Amplitude of wobbling frequency relative to the center frequency (set frequency): amplitude of wobbling frequency AW = center frequency ×	5.0s	○

Function code	Name	Description	Default	Modify
		amplitude of wobbling frequency P08.15. Sudden jump frequency＝Amplitude of wobbling frequency AW ×Amplitude of sudden jump frequency (P08.16), that is, the value that the sudden jump frequency corresponds to the wobbling frequency when the VFD runs at the wobbling frequency. Rise time of wobbling frequency: Time needed for the VFD to run from the lowest point to the highest one. Fall time of wobbling frequency: The time needed for the VFD to from the highest point to the lowest one. Setting range of P08.15: 0.0–100.0% (relative to the set frequency) Setting range of P08.16: 0.0–50.0% (relative to the amplitude of wobbling frequency) Setting range of P08.17: 0.1–3600.0s Setting range of P08.18: 0.1–3600.0s		
P08.19–P08.24	Reserved			
P08.25	Set counting value	The counter works by the input pulse signals of S terminal (set as "Counter trigger") or HDI (set P05.00 to 1).	0	○
P08.26	Designated counting value	When the designated counting value is reached, the multi-function output terminals will output the signal of "Designated counting value reached " and the counter go on working; when the set counting value is reached, the multi-function output terminals will output the signal of "The set counting value reached", the counter will clear all counting values and stop to recount until the next pulse comes. The setting counting value P08.26 shall be no more than the setting counting value P08.25. The function is illustrated as follows.	0	○

Function code	Name	Description	Default	Modify
		 Setting range of P08.25: P08.26–65535 Setting range of P08.26: 0–P08.25		
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 reached". Setting range: 0–65535 min	0min	○
P08.28	Auto fault reset count	Auto fault reset count: When the VFD uses automatic fault reset, it is used to set the number of automatic fault reset times. When the number of continuous reset times exceeds the value, the VFD reports a fault and stops.	0	○
P08.29	Auto fault reset interval	Auto fault reset interval: Time interval from when a fault occurred to when automatic fault reset takes effect. If no fault occurred within 60s after the VFD starts, the number of automatic fault reset times is cleared. Setting range of P08.28: 0–10 Setting range of P08.29: 0.1–3600.0s	1.0s	○
P08.30	Frequency decrease ratio in drop control	The output frequency of the VFD changes as the load changes. The function code is mainly used to balance the power when several motors drive a same load. Setting range: 0.00–50.00Hz	0.00Hz	○
P08.31	Reserved			
P08.32	FDT1 electrical level detection value	When the output frequency exceeds the corresponding frequency of FDT electrical level, the multifunction digital output terminal continuously outputs the signal of "Frequency level detection FDT". The signal is invalid only when the output frequency decreases to a value lower than the frequency corresponding to (FDT electrical level—FDT lagging detection value). The waveform diagram is as follows:	50.00Hz	○
P08.33	FDT1 lagging detection value		5.0%	○

Function code	Name	Description	Default	Modify
P08.34	FDT2 electrical level detection value		50.00Hz	○
P08.35	FDT2 lagging detection value	Setting range of P08.32: 0.00Hz–P00.03 (Max. output frequency) Setting range of P08.33: 0.0–100.0% (FDT1 electrical level) Setting range of P08.34: 0.00Hz–P00.03 (Max. output frequency) Setting range of P08.35: 0.0–100.0% (FDT2 electrical level)	5.0%	○
P08.36	Detection value for frequency being reached	When the output frequency is within the detection range, the multi-function digital output terminal outputs the signal of "Frequency reached".  Setting range: 0.00Hz–P00.03 (max output frequency)	0.00Hz	○
P08.37	Enabling energy consumption braking	The function code is used to control enabling of the brake tube action inside the VFD. 0: Disable 1: Enable **Note:** It is onlyapplicable to VFD models that are built in braking tubes.	0	○

Function code	Name	Description	Default	Modify
P08.38	Energy consumption braking threshold voltage	The function code is used to set the starting bus voltage of energy consumption braking. Adjust this value properly to achieve effective braking for the load. The default value varies depending on the voltage class.	220V voltage: 380.0V 380V voltage: 700.0V	○
P08.39	Running mode of cooling fan	0: Common running mode 1: The fan keeps running after power-on	0	○
P08.40	PWM selection	0x00–0x21 Ones place: PWM mode selection 0: PWM mode 1, 3PH modulation and 2PH modulation 1: PWM mode 2, 3PH modulation Tens place: 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	01	◎
P08.41	Overmodulation	Ones place: 0: Disable overmodulation 1: Enable overmodulation Tens place 0: Mild overmodulation; in zone 1 1: Deepened overmodulation, in zone 2	01	◎
P08.42	Data control set through keypad	0x000–0x1223 Ones place: Frequency enabling selection 0: Both ∧/∨ keys and analog potentiometer adjustments are valid 1: Only ∧/∨ keys adjustment is valid 2: Only analog potentiometer adjustments is valid 3: Neither ∧/∨ keys nor digital potentiometer	0x0000	○

Function code	Name	Description	Default	Modify
		adjustments are valid Tens place: Frequency control selection 0: Only valid when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority Hundreds place: Action selection during stopping 0: Setting is valid 1: Valid during running, cleared after stopping 2: Valid during running, cleared after a stop command is received Thousands place: ∧/∨ keys and analog potentiometer integral function 0: The integral function is enabled 1: The integral function is disabled		
P08.43	Integral time of digital potentiometer	0.01–10.00s	0.10s	○
P08.44	UP/DOWN terminal control setting	0x000–0x221 Ones place: Frequency enabling selection 0: UP/DOWN terminal setup is valid 1: UP/DOWN terminal setup is invalid Tens place: Frequency control selection 0: Valid only when P00.06=0 or P00.07=0 1: Valid for all frequency setting methods 2: Invalid for multi-step speed running when multi-step speed running has the priority Hundreds place: Action selection during stopping 0: Setting is valid 1: Valid during running, cleared after stopping 2: Valid during running, cleared after a stop command is received	0x000	○
P08.45	UP terminal frequency incremental change rate	0.01–50.00Hz/s	0.50 Hz/s	○

Function code	Name	Description	Default	Modify
P08.46	DOWN terminal frequency decremental change rate	0.01–50.00Hz/s	0.50 Hz/s	○
P08.47	Action selection at power-off during frequency setting	0x000–0x111 Ones place: Action selection at power-off during frequency adjusting through digitals. 0: Save the setting at power-off 1: Clear the setting at power-off Tens place: Action selection at power-off during frequency setting through Modbus communication 0: Save the setting at power-off 1: Clear the setting at power-off Hundreds place: Action selection at power-off during frequency setting through other communication methods 0: Save the setting at power-off 1: Clear the setting at power-off	0x000	○
P08.48	MSB of initial power consumption	This parameter is used to set the initial power consumption. Initial power consumption =P08.48*1000+P08.49 Setting range of P08.48: 0–59999 kWh (k) Setting range of P08.49: 0.0–999.9 kWh	0 kWh	○
P08.49	LSB of initial power consumption		0.0 kWh	○
P08.50	Magnetic flux braking	This function code is used to enable magnetic flux braking. 0: Invalid. 100–150: A greater coefficient indicates greater braking strength. The VFD can quickly slow down the motor by increasing the magnetic flux. The energy generated by the motor during braking can be transformed into heat energy by increasing the	0	○

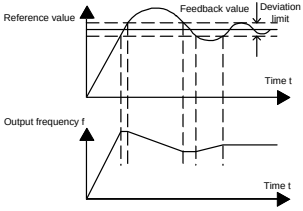
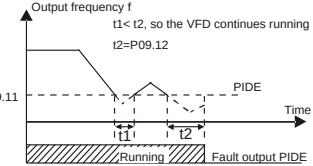
Function code	Name	Description	Default	Modify
		magnetic flux. The VFD monitors the state of the motor continuously even during the magnetic flux period. So the magnetic flux can be used for motor stop, as well as for motor rotation speed change. Its other advantages include: Braking is performed immediately after the stop command is given. The braking can be started without waiting for magnetic flux weakening. The cooling is better. The current of the stator other than the rotor increases during magnetic flux braking, while the cooling of the stator is more effective than the rotor.		
P08.51	VFD input power factor	This function code is used to adjust the displayed current on the AC input side. Setting range: 0.00–1.00	0.56	○

P09 group PID control

Function code	Name	Description	Default	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 VFD is process PID controlled. The function code determines the target given channel during the PID process. 0: Keypad (P09.01) 1: AI1 2: AI2 3: AI3 4: High speed pulse HDI 5: Multi-step running 6: Modbus communication 7–9: Reserved The set target of process PID is a relative value, for which 100% equals to 100% of the feedback signal of the controlled system. The system always calculates a related value (0–100.0%).	0	○

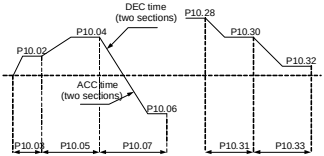
Function code	Name	Description	Default	Modify
		Note: 1. Set multi-step speed, which can be compeleted by setting P10 group parameters. 2. For PROFIBUS, Ethernet, and CANopen communication setting, corresponding extension cards are needed.		
P09.01	PID reference preset through keypad	The function code is mandatory when P09.00=0. The base value of the function code is the feedback of the system. Setting range: -100.0%–100.0%	0.0%	○
P09.02	PID feedback source	The function code is used to select PID feedback channel. 0: AI1 1: AI2 2: AI3 3: High speed HDI 4: Modbus communication 5–7: Reserved **Note:** The reference channel and feedback channel cannot be duplicate. Otherwise, effective PID control cannot be achieved.	0	○
P09.03	PID output characteristics	0: PID output is positive. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will decrease to balance the PID. Example: PID control on strain during unwinding. 1: PID output is negative. When the feedback signal is greater than the PID reference value, the output frequency of the VFD will increase to balance the PID. Example: PID control on strain during unwinding.	0	○
P09.04	High frequency proportional gain (Kp)	The function is applied to the proportional gain P of PID input. P determines the strength of the whole PID adjuster. The value 100 indicates that when the difference between the PID feedback value and given value is 100%, the range within which the	1.00	○

Function code	Name	Description	Default	Modify
		PID regulator can regulate the output frequency command is the max. frequency (ignoring integral function and differential function). Setting range: 0.00–100.00		
P09.05	High frequency integral time (Ti)	It determines the speed of integral regulation made on the deviation between PID feedback and reference by PID regulator. When the deviation between PID feedback and reference is 100%, the regulation of integral regulator (ignoring integral and differential actions), after undergoing continuous regulation during this time period, can reach max. output frequency (P00.03) or max. output voltage (P04.31). The shorter the integral time, the stronger the regulation intensity. Setting range: 0.00–10.00s	0.10s	○
P09.06	High frequency differential time (Td)	It determines the intensity of the regulation made on the change rate of deviation between PID feedback and reference by PID regulator. If feedback changes by 100% during this period, the regulation of differential regulator (ignoring integral and differential actions) is max. output frequency (P00.03) or max. output voltage (P04.31). The longer the differential time, the stronger the regulation intensity. Setting range: 0.00–10.00s	0.00s	○
P09.07	Sampling cycle (T)	It means the sampling cycle of feedback. The regulator operates once during each sampling cycle. The larger the sampling cycle, the slower the response. Setting range: 0.000–10.000s	0.100s	○
P09.08	Limit of PID control deviation	It is the max. allowable deviation of PID system output value relative to closed-loop reference value. Within this limit, PID regulator stops regulation. Set this function code properly to regulate the precision and stability of PID system.	0.0%	○

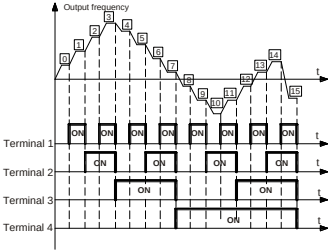
Function code	Name	Description	Default	Modify
		 Setting range: 0.0–100.0%		
P09.09	Upper limit value of PID output	The two function codes are used to set the upper/lower limit value of PID regulator. 100.0% corresponds to max. output frequency (P00.03) or max. output voltage (P04.31). Setting range of P09.09: P09.10–100.0% Setting range of P09.10: -100.0%–P09.09	100.0%	○
P09.10	Lower limit value of PID output		0.0%	○
P09.11	Feedback offline detection value	Set the PID feedback offline detection value, when the detection value is no more than the feedback offline detection value, and the duration exceeds the value set in P09.12, the VFD will report "PID feedback offline fault", and keypad displays PIDE.	0.0%	○
P09.12	Feedback offline detection time	 Setting range of P09.11: 0.0–100.0% Setting range of P09.12: 0.0–3600.0s	1.0s	○
P09.13	PID control selection	0x0000–0x1111 Ones place: 0: Continue integral control after the frequency reaches upper/lower 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	0x0001	○

Function code	Name	Description	Default	Modify
		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 control after the frequency reaches upper/lower limit. If the integration keeps stable, and the trend between the reference and the feedback changes, the integration will change with the trend quickly. Tens place: 0: The same with the set direction. If the output of PID control is different from the current running direction, 0 will be output forcedly. 1: Contrary to the set direction. If the output of PID control is different from the current running direction, the closed-loop regulation output opposite to the current running direction is executed. Hundreds place: 0: Limit based on the max. frequency 1: Limit based on A frequency Thousands place: 0: A+B frequency, ACC/DEC of main reference A frequency source buffering is invalid 1: A+B frequency, ACC/DEC of main reference A frequency source buffering is valid, ACC and DEC are determined by P08.04 (ACC time 4)		
P09.14	Low frequency proportional gain (Kp)	0.00–100.00	1.00	○
P09.15	ACC/DEC time of PID command	0.0–1000.0s	0.0s	○
P09.16	PID output filter time	0.000–10.000s	0.000s	○

P10 group Simple PLC and multi-step speed control

Function code	Name	Description	Default	Modify
P10.00	Simple PLC mode	0: Stop after running once; the VFD stops automatically after running for one cycle, and it can be started only after receiving running command. 1: Keep running in the final value after running once. The VFD keeps the running frequency and direction of the last section after a single cycle. 2: Cyclic running; the VFD enters the next cycle after completing one cycle until receiving stop command and stops.	0	○
P10.01	Simple PLC memory selection	0: No memory after power-off 1: Memory after power-off; PLC memories its running step and frequency before power-off.	0	○
P10.02	Multi-step speed 0	Setting range of the frequency in 0^{th}–15^{th} sections are -100.0–100.0%, 100% corresponds to Max. output frequency P00.03. Setting range of the running time in 0^{th}–15^{th} sections are 0.0–6553.5s (min), the time unit is determined by P10.37. When simple PLC operation is selected, it is required to set P10.02–P10.33 to determine the running frequency and running time of each section. **Note:** The symbol of multi-step speed determines the running direction of simple PLC, and the negative value means reverse running.  When selecting multi-step speed running, the multi-step speed is within the range of $-f_{max}$–f_{max},	0.0%	○
P10.03	Running time of step 0		0.0s	○
P10.04	Multi-step speed 1		0.0%	○
P10.05	Running time of step 1		0.0s	○
P10.06	Multi-step speed 2		0.0%	○
P10.07	Running time of step 2		0.0s	○
P10.08	Multi-step speed 3		0.0%	○
P10.09	Running time of step 3		0.0s	○
P10.10	Multi-step speed 4		0.0%	○

Function code	Name	Description	Default	Modify
P10.11	Running time of step 4	and it can be set continuously. The start/stop of multi-step running is also determined by P00.01. Goodrive30 series VFD can set 16-step speed, which are set by combined codes of multi-step terminals 1–4 (set by S terminal, correspond to function codes P05.01–P05.09) and correspond to multi-step speed 0 to multi-step speed 15.	0.0s	○
P10.12	Multi-step speed 5		0.0%	○
P10.13	Running time of step 5		0.0s	○
P10.14	Multi-step speed 6		0.0%	○
P10.15	Running time of step 6		0.0s	○
P10.16	Multi-step speed 7		0.0%	○
P10.17	Running time of step 7		0.0s	○
P10.18	Multi-step speed 8	When terminal 1, terminal 2, terminal 3 and terminal 4 are OFF, the frequency input mode is set by P00.06 or P00.07. When terminal 1, terminal 2, terminal 3 and terminal 4 are not all OFF, the frequency set by multi-step speed will prevail, and the priority of multi-step setting is higher than that of the keypad, analog, high-speed pulse, PID, and communication frequency setting. The relation between terminal 1, terminal 2, terminal 3, terminal 4, and step of multi-step speed are shown in the table below.	0.0%	○
P10.19	Running time of step 8		0.0s	○
P10.20	Multi-step speed 9		0.0%	○
P10.21	Running time of step 9		0.0s	○
P10.22	Multi-step speed 10		0.0%	○
P10.23	Running time of step 10		0.0s	○
P10.24	Multi-step speed 11		0.0%	○
P10.25	Running time of step 11		0.0s	○



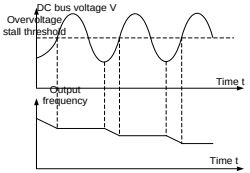
Terminal 1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
Terminal 2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
Terminal 3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
Terminal 4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

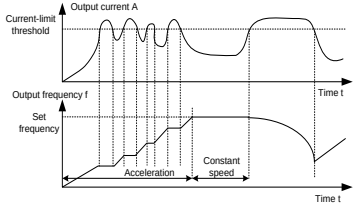
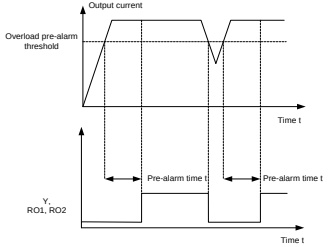
<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P10.26</td><td>Multi-step speed 12</td><td rowspan="9">
<table>
<tr><td>Step</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>Terminal 1</td><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>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>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>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>Running time of step 15</td><td>0.0s</td><td>○</td></tr>
<tr><td>P10.34</td><td>ACC/DEC time of 0^{th}–7^{th} step of simple PLC</td><td rowspan="2">Detailed illustration is shown in the table below.
<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>
<tr><td>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>
</table>
</td><td>0x0000</td><td>○</td></tr>
<tr><td>P10.35</td><td>ACC/DEC time of 8^{th}–15^{th} step of simple PLC</td><td>0x0000</td><td>○</td></tr>
</table>

Function code	Name	Description	Default	Modify
		BIT3 BIT2 9 00 01 10 11 BIT5 BIT4 10 00 01 10 11 BIT7 BIT6 11 00 01 10 11 BIT9 BIT8 12 00 01 10 11 BIT11 BIT10 13 00 01 10 11 BIT13 BIT12 14 00 01 10 11 BIT15 BIT14 15 00 01 10 11 Select corresponding ACC/DEC time, and then convert 16-bit binary number into hexadecimal number, and then set corresponding function codes. ACC/DEC time 1 is set by P00.11 and P00.12; ACC/DEC time 2 is set by P08.00 and P08.01; ACC/DEC time 3 is set by P08.02 and P08.03; ACC/DEC time 4 is set by P08.04 and P08.05. Setting range: 0x0000–0xFFFF		
P10.36	PLC restart mode	0: Restart from the first step, namely if the VFD stops during running (caused by stop command, fault or power down), it will run from the first step after restart. 1: Continue running from the step frequency when interruption occurred, namely if the VFD stops during running (caused by stop command or fault), it will record the running time of current step, and enters this step automatically after restart, then continue running at the frequency defined by this step in the remaining time.	0	◎
P10.37	Multi-step time unit selection	0: Second; the running time of each step is counted in seconds; 1: Minute; the running time of each step is counted in minutes.	0	◎

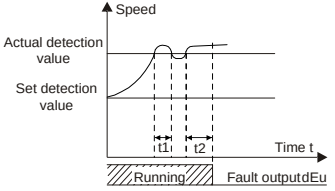
P11 group Protection parameters

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td>P11.00</td><td>Phase loss protection</td><td>0x00–0x11
Ones place:
0: Disable input phase loss protection
1: Enable input phase loss protection
Tens place:
0: Disable output phase loss protection
1: Enable output phase loss protection</td><td>11</td><td>○</td></tr>
<tr><td>P11.01</td><td>Frequency drop at transient power-off</td><td>0: Enable
1: Disable</td><td>0</td><td>○</td></tr>
<tr><td>P11.02</td><td>Frequency drop ratio at transient power-off</td><td>Setting range: 0.00Hz/s–P00.03 (max. output frequency)
After the grid powers off, the bus voltage drops to the frequency drop point at transient power-off, the VFD begins to decrease the running frequency based on P11.02, to make the motor generate power again. The returning power can maintain the bus voltage to ensure a rated running of the VFD until the VFD is powered on again.
<table><tr><th>Voltage degree</th><td>220V</td><td>380V</td><td>660V</td></tr><tr><th>Frequency drop point at transient power-off</th><td>260V</td><td>460V</td><td>800V</td></tr></table>Note:
✧ Adjust the parameter properly to avoid the stopping caused by VFD protection during the switching of the grid.
✧ Disable the input phase loss protection before enabling this function.</td><td>10.00Hz/s</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>
</table>

Function code	Name	Description	Default	Modify
				
P11.04	Overvoltage stall protection voltage	110–150% (standard bus voltage) (380V)	130%	○
		110–150% (standard bus voltage) (220V)	120%	
P11.05	Current limit action	During accelerated running, as the load is too large, the actual acceleration rate of motor is lower than that of output frequency, if no measures are taken, the VFD may trip due to overcurrent during acceleration. Ones place: Current limit action selection 0: Invalid 1: Always valid Tens place: Hardware current limit overload alarm selection 0: Valid 1: Invalid	01	◎
P11.06	Automatic current limit level	Current limit protection function detects output current during running, and compares it with the current-limit level defined by P11.06, if it exceeds	160.0%	◎
P11.07	Frequency drop rate during current limit	the current-limit level, the VFD will run at stable frequency during accelerated running, or run in decreased frequency during constant-speed running; if it exceeds the current-limit level continuously, the VFD output frequency will drop continuously until reaching lower limit frequency. When the output current is detected to be lower than the current-limit level again, it will continue accelerated running.	10.00Hz/s	◎

Function code	Name	Description	Default	Modify
		 Setting range of P11.06: 50.0–200.0% Setting range of P11.07: 0.00–50.00Hz/s		
P11.08	Pre-alarm selection for VFD/motor OL/UL	Overload pre-alarm signal will be outputted if the output current of the VFD or motor is higher than overload pre-alarm detection level (P11.09), and the duration exceeds overload pre-alarm detection time (P11.10).	0x000	○
P11.09	Overload pre-alarm detection level		150%	○
P11.10	Overload pre-alarm detection time	Setting range of P11.08: The function code is used to enable and define the overload pre-alarm of the VFD/motor. Setting range: 0x000–0x131 Ones place: 0: Motor overload/underload pre-alarm, relative to rated motor current; 1: VFD overload/underload pre-alarm, relative to rated VFD current. Tens place: 0: The VFD continues running after overload/underload alarm;	1.0s	○

Function code	Name	Description	Default	Modify
		1: The VFD continues running after underload alarm, and stops running after overload fault; 2: The VFD continues running after overload alarm, and stops running after underload fault; 3: The VFD stops running after overload/underload fault. Hundreds place: 0: Always detect 1: Detect during constant-speed running Setting range of P11.09: P11.11–200% Setting range of P11.10: 0.1–3600.0s		
P11.11	Underload pre-alarm detection level	Underload pre-alarm signal will be outputted if the output current of the VFD or motor is lower than underload pre-alarm detection level (P11.11), and the duration exceeds underload pre-alarm detection time (P11.12). Setting range of P11.11: 0–P11.09 Setting range of P11.12: 0.1–3600.0s	50%	○
P11.12	Underload pre-alarm detection time		1.0s	○
P11.13	Fault output terminal action upon fault occurring	The function code is used to set the action of fault output terminals at undervoltage and fault reset. 0x00–0x11 Ones place: 0: Act at undervoltage 1: Do not act at undervoltage Tens place: 0: Act at fault reset 1: Do not act at fault reset	0x00	○
P11.14	Speed deviation detection value	0.0–50.0% The function code is used to set the speed deviation detection value.	10.0%	○
P11.15	Speed deviation detection time	The function code is used to set the speed deviation detection time.	0.5s	○

Function code	Name	Description	Default	Modify
		 t1<t2, so the VFD continues running t2=P11.15 Setting range of P11.15: 0.0–10.0s		
P11.16	Automatic frequency reduction during voltage drop	0: Disable 1: Enable. When the grid voltage drops to the rated voltage, the VFD ensures the rated output torque by automatic frequency reduction.	0	○

P13 group SM control

Function code	Name	Description	Default	Modify
P13.00	Pull-in current reduction coefficient	0.0–100.0%	80.0%	○
P13.01	Initial pole detection method	0: Do not detect 1: High-frequency superposition (reserved) 2: Pulse superposition	0	◎
P13.02	Pull-in current 1	Pull-in current is the pole positioning current. Pull-in current 1 is valid within the lower limit of pull-in current switchover frequency threshold. If you need to increase the starting torque, increase the value of the function code properly. Setting range: 0.0%–100.0% (of the motor rated current)	20.0%	○
P13.03	Pull-in current 2	Pull-in current is the pole positioning current. Pull-in current 2 is valid within the upper limit of pull-in current switchover frequency threshold. Generally, you do not need to modify the function	10.0%	○

Function code	Name	Description	Default	Modify
		code. Setting range: 0.0%–100.0% (of the motor rated current)		
P13.04	Pull-in current switchover frequency	The function code indicates the valid frequency threshold for switching between pull-in current 1 and pull-in current 2. Setting range: 0.00Hz–P00.03 (max. output frequency)	10.00 Hz	○
P13.05	High-frequency superposing frequency (reserved)	200–1000Hz	500Hz	◎
P13.06	Pulse superposing voltage	0.0–300.0% (of the motor rated voltage)	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	0–65535	0	○
P13.11	Maladjustment detection time	The function code is used to adjust the responsiveness of anti-maladjustment function. If the load inertia is large, increase the value of the function code properly, however, the responsiveness may slow down accordingly. Setting range: 0.0–10.0s	0.5s	○
P13.12	High-frequency compensation coefficient	The function code is valid when the motor speed exceeds the rated speed. If motor oscillation occurred, adjust the function code properly. Setting range: 0.0–100.0%	0.0%	○
P13.13	Short-circuit braking current	When the VFD starts in direct start mode (P01.00=0), set P13.14 to a non-zero value to enter short-circuit braking.	0.0%	○

Function code	Name	Description	Default	Modify
P13.14	Hold time of short-circuit braking before start	During stop, if the running frequency of VFD is lower than the starting frequency of brake for stop, set P13.15 to a non-zero value to enter short-circuit braking for stop, and then carry out	0.00s	○
P13.15	Hold time of short-circuit braking for stop	DC braking in the time set by P01.12. (Refer to the descriptions for P01.09–P01.12.) Setting range of P13.13: 0.0–150.0% (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	Description	Default	Modify
P14.00	Local communication address	Setting range: 1–247 When the master writes the slave communication address to 0 indicating a broadcast address in a frame, all the salves on the Modbus bus receive the frame but do not respond to it. Local communication address is unique in the communication network, which is the basis for point-to-point communication between the upper computer and the VFD. **Note:** The communication address of a slave cannot be set to 0.	1	○
P14.01	Communication baud rate	The function code is used to set the data transmission speed between the upper computer and the VFD. 0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS 6: 57600BPS **Note:** The baud rate set on the VFD must be consistent with that on the upper computer. Otherwise, the communication fails. A greater baud rate indicates faster communication.	4	○

Function code	Name	Description	Default	Modify
P14.02	Data bit check	The data format set on the VFD must be consistent with that on the upper computer. Otherwise, the communication fails. 0: No check (N, 8, 1) for RTU 1: Even check (E, 8, 1) for RTU 2: Odd check (O, 8, 1) for RTU 3: No check (N, 8, 2) for RTU 4: Even check (E, 8, 2) for RTU 5: Odd check (O, 8, 2) for RTU	1	○
P14.03	Communication response delay	0–200ms The function code indicates the communication response delay, that is, the interval from when the VFD completes receiving data to when it sends response data to the upper computer. If the response delay is shorter than the VFD processing time, the VFD sends response data to the upper computer after processing data. If the delay is longer than the VFD processing time, the VFD does not send response data to the upper computer until the delay is reached although data has been processed.	5	○
P14.04	Communication overtime fault time	0.0 (invalid), 0.1–60.0s When the function code is set to 0.0, the communication timeout time is invalid. When the function code is set a non-zero value, the rectifier reports the "485 communication fault" (CE) if the communication interval exceeds the value. In general, the function code is set to 0.0. When continuous communication is required, you can set the function code to monitor communication status.	0.0s	○
P14.05	Transmission error processing	0: Report an alarm and coast to stop 1: Keep running without reporting an alarm 2: Stop in enabled stop mode without reporting an alarm (applicable only to communication mode) 3: Stop in enabled stop mode without reporting	0	○

Function code	Name	Description	Default	Modify
		an alarm (applicable to any mode)		
P14.06	Communication processing action	0x00–0x11 Ones place: 0: Respond to write operations. The VFD responds to read and write commands of the upper computer. 1: Not respond to write operations. The VFD responds only to the read commands of the upper computer. This mode can improve the communication efficiency. Tens place: 0: Communication encryption is invalid. 1: Communication encryption is valid.	0x00	○

P17 group Status viewing

Function code	Name	Description	Default	Modify
P17.00	Set frequency	Displays current set frequency of the VFD. Range:0.00Hz–P00.03	0.00Hz	●
P17.01	Output frequency	Displays current output frequency of the VFD. Range: 0.00Hz–P00.03	0.00Hz	●
P17.02	Ramp reference frequency	Displays current ramp reference frequency of the VFD. Range: 0.00Hz–P00.03	0.00Hz	●
P17.03	Output voltage	Displays current output voltage of the VFD. Range: 0–1200V	0V	●
P17.04	Output current	Displays the valid value of current output current of the VFD. Range: 0.0–3000.0A	0.0A	●
P17.05	Motor speed	Displays current motor speed. Range: 0–65535RPM	0 RPM	●
P17.06	Torque current	Displays current torque current of the VFD. Range: -3000.0–3000.0A	0.0A	●
P17.07	Exciting current	Displays current exciting current of the VFD. Range: -3000.0–3000.0A	0.0A	●
P17.08	Motor power	Displays current motor power; 100% relative to rated motor power, positive value is motoring state, negative value is generating state.	0.0%	●

<table>
<tr><th>Function code</th><th>Name</th><th>Description</th><th>Default</th><th>Modify</th></tr>
<tr><td></td><td></td><td>Range: -300.0–300.0% (relative to rated motor power)</td><td></td><td></td></tr>
<tr><td>P17.09</td><td>Output torque</td><td>Displays current output torque of the VFD; 100% relative to rated motor torque, during forward running, positive value is motoring state, negative value is generating state, during reverse running, positive value is generating state, negative value is motoring state.
Range: -250.0–250.0%</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.10</td><td>Estimated motor frequency</td><td>Displays the estimated motor rotor frequency under open-loop vector condition.
Range: 0.00– P00.03</td><td>0.00Hz</td><td>●</td></tr>
<tr><td>P17.11</td><td>DC bus voltage</td><td>Displays 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 terminal state</td><td>Displays current digital input terminal 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 terminal state</td><td>Displays current digital output terminal 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>Reserved</td><td>Y</td></tr>
</table>
Range: 0000–000F</td><td>0</td><td>●</td></tr>
<tr><td>P17.14</td><td>Digital adjustment value</td><td>Displays the adjustment value of the keypad.
Range: 0.00Hz–P00.03</td><td>0.00Hz</td><td>●</td></tr>
<tr><td>P17.15</td><td>Torque reference value</td><td>Relative to percentage of the rated torque of current motor, display torque reference.
Range: -300.0%–+300.0% (of the motor rated current)</td><td>0.0%</td><td>●</td></tr>
<tr><td>P17.16</td><td>Linear speed</td><td>Displays the current linear speed of the VFD.
Range: 0–65535</td><td>0</td><td>●</td></tr>
</table>

Function code	Name	Description	Default	Modify
P17.17	Reserved			
P17.18	Counting value	Displays the current counting number of the VFD. Range: 0–65535	0	●
P17.19	AI1 input voltage	Displays input signal of AI1. Range: 0.00–10.00V	0.00V	●
P17.20	AI2 input voltage	Displays input signal of AI2. Range: 0.00–10.00V	0.00V	●
P17.21	AI3 input voltage	Displays input signal of AI3. Range: -10.00–10.00V	0.00V	●
P17.22	HDI input frequency	Displays input frequency of HDI. Range: 0.000–50.000kHz	0.000kHz	●
P17.23	PID reference value	Displays PID reference value. Range: -100.0–100.0%	0.0%	●
P17.24	PID feedback value	Displays PID feedback value. Range: -100.0–100.0%	0.0%	●
P17.25	Motor power factor	Displays the power factor of current motor. Range: -1.00–1.00	0.00	●
P17.26	Current running time	Displays current running time of the VFD. Range: 0–65535min	0min	●
P17.27	Simple PLC and current step number of multi-step speed	Displays simple PLC and current step number of multi-step speed Range: 0–15	0	●
P17.28	ASR controller output	Displays the speed loop ASR controller output value under vector control mode, relative to the percentage of rated torque of the motor. Range: -300.0%–+300.0% (of the rated motor current)	0.0%	●
P17.29	Magnetic pole angle of SM	Displays the magnetic pole angle of synchronous motor. Range: 0.0–360.0	0.0	●

Function code	Name	Description	Default	Modify
P17.30	Phase compensation quantity of SM	Displays the phase compensation quantity of synchronous motor. Range: -180.0–180.0	0.0	●
P17.31	High-frequency superposition current of SM	Displays the high-frequency superposition current of synchronous motor. Range: 0.0–200.0% (of the rated motor current)	0.0	●
P17.32	Flux linkage	Displays the flux linkage of the motor. Range: 0.0–200.0%	0.0%	●
P17.33	Exciting current reference	Displays the exciting current reference value under vector control mode. Range: -3000.0–3000.0A	0.0A	●
P17.34	Torque current reference	Displays torque current reference value under vector control mode. Range: -3000.0–3000.0A	0.0A	●
P17.35	AC incoming current	Displays the valid value of incoming current on AC side. Range: 0.0–5000.0A	0.0A	●
P17.36	Output torque	Display output torque value, during forward running, positive value is motoring state, negative value is generating state; during reverse running, positive value is generating state, negative value is motoring state. Range: -3000.0Nm–3000.0Nm	0.0Nm	●
P17.37	Motor overload count value	0–100 (OL1 fault is reported when the count value reaches 100)	0	●
P17.38	PID output value	Displays the output value of PID control. -100.00–100.00%	0.00%	●
P17.39	Function parameter in parameter download error	0.00–99.99	0.00	●

6 Fault tracking

6.1 Fault prevention

This chapter describes how to carry out preventive maintenance on VFDs.

6.1.1 Periodical maintenance

If the VFD is installed in an environment that meets requirements, little maintenance is needed. The following table describes the routine maintenance periods recommended by INVT. For more detailed information on maintenance, please contact us.

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

Subject		Item	Method	Criterion
		Check whether there are stains and dust attached.	Visual inspection	No exception occurs. **Note:** Discoloration of copper bars does not mean that they cannot work properly.
	Conductor and wire	Check whether the conductors are deformed or their color change due to overheat.	Visual inspection	No exception occurs.
		Check whether the wire sheaths are cracked or their color changes.	Visual inspection	No exception occurs.
	Terminal block	Check whether there is damage.	Visual inspection	No exception occurs.
	Filter capacitor	Check whether there is electrolyte leakage, discoloration, cracks, and chassis expansion.	Visual inspection	No exception occurs.
		Check whether the safety valves are released.	Determine the service life based on the maintenance information, or measure them through electrostatic capacity.	No exception occurs.
		Check whether the electrostatic capacity is measured as required.	Use instruments to measure the capacity.	Electrostatic capacity ≥ initial value × 0.85
	Resistor	Check whether there is displacement caused due to overheat.	Olfactory and visual inspection	No exception occurs.
		Check whether the resistors are disconnected.	Use a multimeter for measurement.	Resistance range: ±10% (of the standard

Subject		Item	Method	Criterion
				resistance)
	Transformer and reactor	Check whether there is unusual vibration sounds or smells.	Auditory, olfactory, and visual inspection	No exception occurs.
	Electromagnetic contactor and relay	Ensure whether there are vibration sounds in the workshop.	Auditory inspection	No exception occurs.
		Check whether the contacts are in good contact.	Visual inspection	No exception occurs.
Control circuit	PCB and plugs	Check whether the screws and connectors loose.	Screw them up.	No exception occurs.
		Check whether there is unusual smell or discoloration.	Olfactory and visual inspection	No exception occurs.
		Check whether there are cracks, damage, deformation, or rust.	Visual inspection	No exception occurs.
		Check whether there is electrolyte leakage or deformation.	Visual inspection, and determine the service life based on the maintenance information.	No exception occurs.
Cooling system	Cooling fan	Check whether there are unusual sounds or vibration.	Auditory and visual inspection, and turn the fan blades with your hand.	The rotation is smooth.
		Check whether the bolts loose.	Screw them up.	No exception occurs.
		Check whether there is discoloration caused due to overheat.	Visual inspection, and determine the service life based on the maintenance	No exception occurs.

Subject		Item	Method	Criterion
			information.	
	Ventilation duct	Check whether there are foreign matters blocking or attached to the cooling fan, air inlets, or air outlets.	Visual inspection	No exception occurs.

6.1.2 Cooling fan

The service life of the cooling fan of the VFD is more than 25,000 hours. The actual service life of the cooling fan is related to the use of the VFD and the temperature in the ambient environment. You can view the running duration of the VFD through P07.14 (Accumulated running time).

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

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

1. Stop the device, disconnect the AC power supply, and wait for a time no shorter than the waiting time designated on the VFD.
2. Pry the fan mounting plate up from the cabinet with a screwdriver, and lift the fan mounting plate up. Loosen the fan cable from the cable clamp.
3. Disconnect the fan cable, and remove the fan mounting plate.
4. Install the mounting plate in the VFD in the reverse steps. Ensure that the air direction of the fan is consistent with that of the VFD, as shown in the following figure.

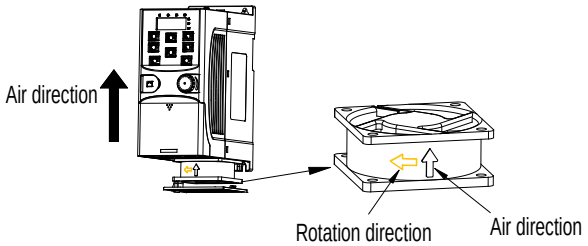


Figure 6-1 Fan maintenance for 1PH 220V, 2.2kW and lower models

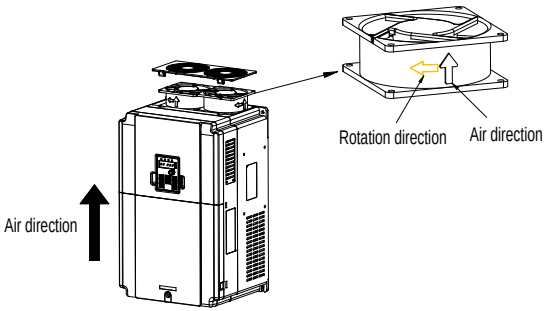


Figure 6-2 Fan maintenance for 3PH 380V, 4kW and higher models

5. Power on the VFD.

6.1.3 Capacitor

6.1.3.1 Capacitor reforming

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

Storage time	Operation instruction
Less than 1 year	No charging operation is required.
1 to 2 years	The VFD needs to be powered on for 1 hour before the first running command.
2 to 3 years	Use a voltage controlled power supply to charge the VFD: Charge the VFD at 25% of the rated voltage for 30 minutes, and then charge it at 50% of the rated voltage for 30 minutes, at 75% for another 30 minutes, and finally charge it at 100% of the rated voltage for 30 minutes.
More than 3 years	Use a voltage controlled power supply to charge the VFD: Charge the VFD at 25% of the rated voltage for 2 hours, and then charge it at 50% of the rated voltage for 2 hours, at 75% for another 2 hours, and finally charge it at 100% of the rated voltage for 2 hours.

The method for using a voltage controlled power supply to charge the VFD is described as follows:

The selection of a voltage controlled power supply depends on the power supply of the VFD.

For VFDs with an incoming voltage of 1PH/3PH 220V AC, you can use a 220VAC/2A voltage regulator. Both 1PH and 3PH VFDs can be charged with a 1PH voltage controlled power supply (connect L+ to R, and N to S or T). All the DC bus capacitors share one rectifier, and therefore they are all charged.

For VFDs of a high voltage class, ensure that the voltage requirement (for example, 380 V) is met during charging. Capacitor charging requires little current, and therefore you can use a small-capacity power supply (2A is sufficient).

6.1.3.2 Electrolytic capacitor replacement

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

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

6.1.4 Power cable

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

1. Stop the VFD, disconnect the power supply, and wait for a time no shorter than the waiting time designated on the VFD.

2. Check the connection of the power cables. Ensure that they are firmly connected.

3. Power on the VFD.

6.2 Fault handling

	✧ Only trained and qualified professionals are allowed to carry out the work described in this chapter. Operations should be carried out according to the instructions presented in "Safety precautions".

6.2.1 Indications of alarms and faults

The fault is indicated by indicators (see "Keypad operation procedure"). When TRIP indicator is on, the alarm or fault code displayed in the keypad indicates the VFD is in exception state. The function codes P07.27 to P07.32 record the types of the last six faults. The function codes P07.33 to P07.40, P07.41 to P07.48, and P07.49 to P07.56 record the running data of the VFD at the last three faults, respectively. This chapter covers most of the alarms and faults, and their possible causes and corrective measures, if users cannot figure out the alarm or fault causes, contact local INVT office.

6.2.2 Fault reset

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

6.2.3 VFD faults and solutions

When a fault occurred, handle the fault as follows.

1. When a VFD fault occurred, confirm whether keypad display is improper? If yes, contact INVT.
2. If keypad works properly, check the function codes in P07 group to confirm the corresponding fault record parameters, and determine the real state when current fault occurred through parameters.
3. Check the table below to see whether corresponding exception states exist based on the corresponding corrective measures.
4. Rule out the faults or ask for help from professionals.
5. After confirming faults are removed, reset the fault and start running.

Fault code	Fault type	Possible cause	Solution
OUt1	Inverter unit U phase protection	✧ Acceleration is too fast. ✧ IGBT module is damaged. ✧ Misacts caused by interference. ✧ Drive wires are poorly connected. ✧ To-ground short circuit occurs.	✧ Increase acceleration time. ✧ Replace the power unit. ✧ Check the drive wires. ✧ Check whether there is strong interference surrounds the peripheral equipment.
OUt2	Inverter unit V phase protection		
OUt3	Inverter unit W phase protection		
OV1	Overvoltage during acceleration	✧ Exception occurred to input voltage; ✧ Large energy feedback. ✧ Lack of braking units. ✧ Dynamic brake is not enabled.	✧ Check the input power. ✧ Check whether load deceleration time is too short; or the motor starts during rotating. ✧ Install dynamic braking units. ✧ Check the setup of related function codes.
OV2	Overvoltage during deceleration		
OV3	Overvoltage during constant speed running		
OC1	Overcurrent during acceleration	✧ Acceleration/deceleration is too fast. ✧ Grid voltage is too low. ✧ VFD power is too small. ✧ Load transient or exception occurred.	✧ Increase acceleration/ deceleration time. ✧ Check the input power. ✧ Select the VFD with larger power. ✧ Check if the load is short
OC2	Overcurrent during deceleration		

Fault code	Fault type	Possible cause	Solution
OC3	Overcurrent during constant speed running	✧ To-ground short circuit or output phase loss occur. ✧ Strong external interference sources. ✧ Overvoltage stall protection is not enabled	circuited (to-ground short circuit or line-to-line short circuit) or the rotation is not smooth. ✧ Check the output wiring. ✧ Check if there is strong interference. ✧ Check the setup of related function codes.
UV	Bus undervoltage	✧ Grid voltage is too low. ✧ Overvoltage stall protection is not enabled.	✧ Check the grid input power. ✧ Check the setup of related function codes.
OL1	Motor overload	✧ Grid voltage is too low. ✧ Rated motor current is set improperly. ✧ Motor stalls or load jumps violently.	✧ Check the grid voltage. ✧ Reset the rated motor current. ✧ Check the load and adjust torque boost.
OL2	VFD overload	✧ Acceleration is too fast. ✧ The motor in rotating is restarted. ✧ Grid voltage is too low. ✧ Load is too large. ✧ Power is too small.	✧ Increase acceleration time. ✧ Avoid restart after stop. ✧ Check the grid voltage. ✧ Select the VFD with larger power. ✧ Select a proper motor.
SPI	Phase loss on input side	Phase loss or violent fluctuation occurred to R, S and T input	✧ Check the input power. ✧ Check the installation wiring.
SPO	Phase loss on output side	Phase loss occurred to U, V, W output (or the three phases of motor is asymmetrical)	✧ Check the output wiring. ✧ Check the motor and cable.
OH1	Rectifier module overheat	✧ Air duct is blocked or fan is damaged. ✧ Ambient temperature is too high. ✧ Long-time overload running.	✧ Ventilate the air duct or replace the fan. ✧ Lower the ambient temperature.
OH2	Inverter module overheat		
EF	External fault	SI external fault input terminal acts.	Check the external device input.
CE	485 communication	✧ Baud rate is set improperly.	✧ Set proper baud rate. ✧ Check the wiring of

Fault code	Fault type	Possible cause	Solution
	fault	✧ Communication line fault. ✧ Communication address error. ✧ Communication suffers from strong interference.	communication interfaces. ✧ Set proper communication address. ✧ Replace or change the wiring to enhance anti-interference capacity.
ItE	Current detection fault	✧ Poor contact of the connector of control board. ✧ Exception occurred to amplification circuit	✧ Check the connector and re-plug wires. ✧ Replace the main control board.
tE	Motor autotuning fault	✧ Motor capacity does not match with the VFD capacity. ✧ Motor parameters are set improperly. ✧ The parameters gained from autotuning deviate sharply from the standard parameters. ✧ Autotuning timeout.	✧ Change the VFD model. ✧ Set proper motor type and nameplate parameters. ✧ Empty the motor load and carry out autotuning again. ✧ Check motor wiring and parameter setup. ✧ Check whether upper limit frequency is larger than 2/3 of the rated frequency.
EEP	EEPROM operation fault	✧ R/W error occurred to the control parameters. ✧ EEPROM is damaged	✧ Press STOP/RST to reset. ✧ Replace the main control board
PIDE	PID feedback offline fault	✧ PID feedback offline. ✧ PID feedback source disappears.	✧ Check PID feedback signal wires. ✧ Check PID feedback source.
bCE	Braking unit fault	✧ Brake circuit fault or brake tube is damaged. ✧ The resistance of external braking resistor is too small.	✧ Check the braking unit, and replace with new brake tubes. ✧ Increase brake resistance.
END	Running time reached	The actual running time of the VFD is larger than the set running time.	Ask help from the supplier, and adjust the set running time.
OL3	Electronic overload	The VFD releases overload pre-alarm based on the set value.	Check the load and overload pre-alarm threshold.

Fault code	Fault type	Possible cause	Solution
PCE	Keypad communication error	✧ The keypad wire is poorly contacted or disconnected. ✧ The keypad wire is too long and suffers strong interference. ✧ Circuit fault occurred to the keypad or communication part of the main board.	✧ Check the keypad wires to confirm whether fault exists. ✧ Check the surroundings to rule out interference source. ✧ Replace the hardware and ask for maintenance service.
UPE	Parameter upload error	✧ The keypad wire is poorly contacted or disconnected. ✧ The keypad wire is too long and suffers strong interference. ✧ Circuit fault occurred to the keypad or communication part of the main board.	✧ Check the surroundings to rule out interference source. ✧ Replace the hardware and ask for maintenance service. ✧ Replace the hardware and ask for maintenance service.
DNE	Parameter download error	✧ The keypad wire is poorly contacted or disconnected. ✧ The keypad wire is too long and suffers strong interference. ✧ Data storage error occurred to the keypad.	✧ Check the surroundings to rule out interference source. ✧ Replace the hardware and ask for maintenance service. ✧ Re-backup keypad data.
ETH1	To-ground short-circuit fault 1	✧ VFD output is short connected to the ground. ✧ Current detection circuit is faulty. ✧ Actual motor power setup deviates sharply from the VFD power.	✧ Check whether motor wiring is proper. ✧ Replace the hall component. ✧ Replace the main control board. ✧ Reset the motor parameters properly.
ETH2	To-ground short-circuit fault 2		
LL	Electronic underload fault	The VFD performs underload pre-alarm based on the set value	Check the load and overload pre-alarm threshold.

6.2.4 Other states

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

7 Communication protocol

7.1 Brief instruction to Modbus protocol

Modbus protocol is a software protocol and common language which is applied in the electronic controller. With this protocol, the controller (device) can communicate with other devices via network (the channel of signal transmission or the physical layer, such as RS485). And with this industrial standard, the controlling devices of different manufacturers can be connected to an industrial network for the convenient 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 same transmission mode and their basic parameters, such as baud rate, digital bit, check bit, and stopping bit should have no difference.

Modbus network is a controlling network with single-master and multiple slaves, which means that there is only one device performs as the master and the others are the slaves on one Modbus network. The master means the device which has active talking right to send message to Modbus network for the controlling and inquiring to other devices (slaves). The slave means the passive device which sends data message to the Modbus network only after receiving the controlling or inquiring message (command) form the master (response). After the master sends message, there is a period of time left for the controlled or inquired slaves to response, which ensure there is only one slave sends message to the master at a time for the avoidance of singles impact.

Generally, the user can set PC, PLC, IPC and HMI as the masters to realize central control. Setting certain device as the master is a promise other than setting by a bottom or a switch or the device has a special message format. For example, when the upper computer is running, if the operator clicks the sending command bottom, the upper computer can send command message actively even it cannot receive the message from other devices. In this case, the upper computer is the master. And if the designer makes the VFD send the data only after receiving the command, then the VFD is the slave.

The master can communicate with any single slave or with all slaves. For the single-visiting command, the slave should feedback a response message; for the broadcasting message from the master, the slave does not need to feedback the response message.

7.2 Application of the VFD

The VFD uses the Modbus RTU mode and the physical layer is 2-wire RS485.

7.2.1 2-wire RS485

2-wire RS485 interfaces works in half-duplex mode and send data signals in the differential transmission way, which is also referred to as balanced transmission. An RS485 interface

uses a twisted pair, in which one wire is defined as A (+), and the other B (-). Generally, if the positive electrical level between the transmission drives A and B ranges from +2 V to +6 V, the logic is "1"; and if it ranges from -2 V to -6 V, the logic is "0".

On the VFD terminal block, the 485+ terminal corresponds to A, and 485- corresponds to B.

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

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

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

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

7.2.1.1 When one VFD is used

Figure 7-1 is the Modbus wiring diagram for the network with one VFD and PC. Generally, PCs do not provide RS485 interfaces, and therefore you need to convert an RS232 or USB interface of a PC to an RS485 interface through a converter. Then, connect end A of the RS485 interface to the 485+ port on the terminal block of the VFD, and connect end B to the 485- port. It is recommended that you use shielded twisted pairs. When an RS232-RS485 converter is used, the cable used to connect the RS232 interface of the PC and the converter cannot be longer than 15 m. Use a short cable when possible. It is recommended that you insert the converter directly into the PC. Similarly, when a USB-RS485 converter is used, use a short cable when possible.

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

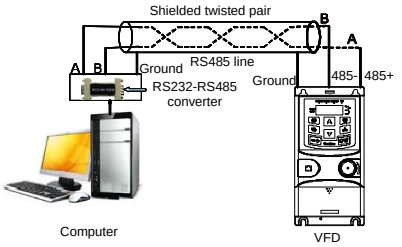


Figure 7-1 RS485 wiring diagram for the network with one VFD

7.2.1.2 When multiple VFDs are used

In the network with multiple VFDs, chrysanthemum connection and star connection are commonly used. According to the requirements of the RS485 industrial bus standards, all the devices need to be connected in chrysanthemum mode with one 120 Ω terminal resistor on each end, as shown in Figure 7-2.

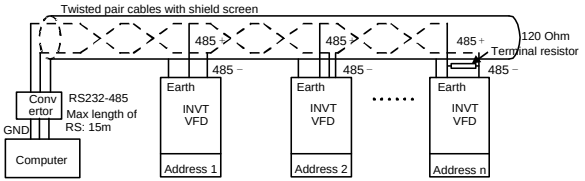


Figure 7-2 Practical application diagram of chrysanthemum connection

Figure 7-3 shows the start connection diagram. When this connection mode is adopted, the two devices that are farthest away from each other on the line must be connected with a terminal resistor (in this figure, the two devices are devices 1# and 15#).

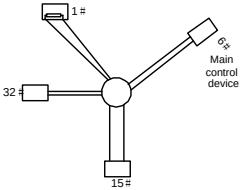


Figure 7-3 Star connection

Use shielded cables, if possible, in multi-VFD connection. The baud rates, data bit check settings, and other basic parameters of all the devices on the RS485 line must be set consistently, and addresses cannot be repeated.

7.2.2 RTU mode

7.2.2.1 RTU communication frame structure

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

Code system

- 1 start bit
- 7 or 8 data bits; the minimum valid bit is sent first. Each frame domain of 8 bits includes 2 hexadecimal characters (0–9, A–F).
- 1 odd/even check bit; this bit is not provided if no check is needed.
- 1 stop bit (with check performed), or 2 bits (without check)

Error detection domain

- Cyclic redundancy check (CRC)

The following table describes the data format.

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

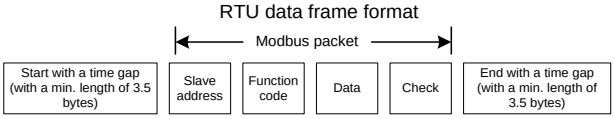
Start bit	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	BIT8	Check bit	Stop bit

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

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

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

In RTU mode, a new frame always must be preceded by a time gap with a mini. length of 3.5 bytes. On a network where the transmission rate is calculated based on the baud rate, time gap of 3.5 bytes can be easily obtained. After the idle time ends, the data domains are sent in the following sequence: slave address, operation command code, data, and CRC check character. Each byte sent in each domain includes hexadecimal characters (0–9, A–F). The network devices always monitor the communication bus. After receiving the first domain (address information), each network device identifies the byte. After the last byte is sent, a similar transmission interval (with a mini. length of 3.5 bytes) is used to indicate that the frame transmission ends. Then, the transmission of a new frame starts.



The information of a frame must be sent in a continuous data flow. If there is an interval greater than the transmission time of 1.5 bytes before the transmission of the entire frame is complete, the receiving device deletes the incomplete information, and mistakes the subsequent byte for the address domain of a new frame. Similarly, if the transmission interval between two frames is shorter than the time gap with a min. length of 3.5 bytes, the receiving device mistakes it for the data of the last frame. The CRC check value is incorrect due to the disorder of the frames, and thus a communication fault occurs.

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

START (frame header)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR (slave address domain)	Communication address: 0–247 (in decimal system) (0 indicates the broadcast address)
CMD (function domain)	03H: read slave parameters 06H: write slave parameters
Data domain DATA (N-1) … DATA (0)	Data of 2*N bytes, main content of the communication as well as the core of data exchanging
CRC CHK low-order bits	Detection value: CRC (16 bits)
CRC CHK high-order bits	
END (frame tail)	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)

7.2.2.2 RTU communication frame error check modes

During the transmission of data, errors may occur due to various factors (such as electromagnetic interference). For example, if the sending message is a logic "1", A-B potential difference on RS485 should be 6V, but in reality, it may be -6V because of electromagnetic interference, and then the other devices take the sent message as logic "0". Without error check, the data receiving device cannot identify data errors and may make a wrong response. The wrong response may cause severe problems. Therefore, the data must be checked.

The check is implemented as follows: The transmitter calculates the to-be-transmitted data based on a specific algorithm to obtain a result, adds the result to the rear of the message, and transmits them together. After receiving the message, the receiver calculates the data based on the same algorithm to obtain a result, and compares the result with that transmitted by the transmitter. If the results are the same, the message is correct. Otherwise, the message is considered wrong.

The error check of a frame includes two parts, namely, bit check on individual bytes (that is, odd/even check using the check bit in the character frame), and whole data check (CRC check).

Bit check on individual bytes (odd/even check)

You can select the bit check mode as required, or you can choose not to perform the check, which will affect the check bit setting of each byte.

Definition of even check: Before the data is transmitted, an even check bit is added to indicate whether the number of "1" in the to-be-transmitted data is odd or even. If it is even, the check bit is set to "0"; and if it is odd, the check bit is set to "1".

Definition of odd check: Before the data is transmitted, an odd check bit is added to indicate whether the number of "1" in the to-be-transmitted data is odd or even. If it is odd, the check bit is set to "0"; and if it is even, the check bit is set to "1".

For example, the data bits to be transmitted are "11001110", including five "1". If the even check is applied, the even check bit is set to "1"; and if the odd check is applied, the odd check bit is set to "0". During the transmission of the data, the odd/even check bit is calculated and placed in the check bit of the frame. The receiving device performs the odd/even check after receiving the data. If it finds that the odd/even parity of the data is inconsistent with the preset information, it determines that a communication error occurs.

Cyclical Redundancy Check (CRC) method

A frame in the RTU format includes an error detection domain based on the CRC calculation. The CRC domain checks all the content of the frame. The CRC domain consists of two bytes, including 16 binary bits. It is calculated by the transmitter and added to the frame. The receiver calculates the CRC of the received frame, and compares the result with the value in the

received CRC domain. If the two CRC values are not equal to each other, errors occur in the transmission.

During CRC, 0xFFFF is stored first, and then a process is invoked to process a minimum of 6 contiguous bytes in the frame based on the content in the current register. CRC is valid only for the 8-bit data in each character. It is invalid for the start, stop, and check bits.

During the generation of the CRC values, the "exclusive or" (XOR) operation is performed on the each 8-bit character and the content in the register. The result is placed in the bits from the low-order bit to the high-order bit, and 0 is placed in the high-order bit. Then, the low-order bit is detected. If the low-order bit is 1, the XOR operation is performed on the current value in the register and the preset value. If low-order bit is 0, no operation is performed. This process is repeated 8 times. After the last bit (8th bit) is detected and processed, the XOR operation is performed on the next 8-bit byte and the current content in the register. The final values in the register are the CRC values obtained after operations are performed on all the bytes in the frame.

The calculation adopts the international standard CRC check rule. You can refer to the related standard CRC algorithm to compile the CRC calculation program as required.

The following example is a simple CRC calculation function for your reference (using the C programming language):

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

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

7.3 RTU command code and communication data

7.3.1 Command code 03H, reading N words (continuously up to 16 words)

The command code 03H is used by the master to read data from the VFD. The count of data to be read depends on the "data number" in the command. A maximum of 16 pieces of data can be read. The addresses of the read parameters must be contiguous. Each piece of data occupies 2 bytes, that is, one word. The command format is presented using the hexadecimal system (a number followed by "H" indicates a hexadecimal value). One hexadecimal value occupies one byte.

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

For example, starting from the data address of 0004H, to read two contiguous pieces of data (that is, to read content from the data addresses 0004H and 0005H) of the VFD whose slave address is 01H, the frame structures are described in the following.

RTU master command (sent from the master to the VFD)		RTU slave response (sent from the VFD to the master)	
START	T1-T2-T3-T4	START	T1-T2-T3-T4
ADDR (address)	01H	ADDR	01H
CMD (command code)	03H	CMD	03H
		Number of bytes	04H
Start address high-order bit	00H	High-order bit of data in 0004H	13H
Start address low-order bit	04H	Low-order bit of data in 0004H	88H
Data number high-order bit	00H	High-order bit of data in 0005H	00H
Data number low-order bit	02H	Low-order bit of data in 0005H	00H
CRC low-order bit	85H	CRC CHK low-order bits	7EH
CRC high-order bit	CAH	CRC CHK low-order bits	9DH
END	T1-T2-T3-T4	END	T1-T2-T3-T4

"START" and "END" are "T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)", indicating that a time gap with a mini. length of 3.5 bytes must be kept before RS485 communication is

executed. The time gap is used to distinguish one message from another so that the two messages are not regarded as one message.

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

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

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

"Data number" indicates number of data to be read (unit: word). "Start address" is "0004H" and "Data number" is 0002H, indicating that data is to be read from the data addresses of 0004H and 0005H.

CRC check occupies two bytes, with the low-order bit on the left and high-order bit on the right.

The definition of the response information is described as follows:

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

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

"Number of bytes" indicates the number of bytes between a byte (not included) and the CRC byte (not included). The value "04" indicates that there are four bytes of data between "Number of bytes" and "CRC CHK low-order bit", that is, "High-order bit of data in 0004H", "Low-order bit of data in 0004H", "High-order bit of data in 0005H", and "Low-order of data in 0005H".

A piece of data is two bytes, with the high-order bits on the left and low-order bit on the right. From the response, the data in 0004H is 1388H, and that in 0005H is 0000H.

CRC check occupies two bytes, with the low-order bit on the left and high-order bit on the right.

7.3.2 Command word 06H, writing a word

This command is used by the master to write data to the VFD. One command can be used to write only one piece of data. It is used to modify the running mode of the VFD.

For example, to write 5000 (1388H) to 0004H of the VFD whose slave address is 02H, the frame structures are described in the following.

RTU master command (sent from the master to the VFD)		RTU slave response (sent from the VFD to the master)	
START	T1-T2-T3-T4	START	T1-T2-T3-T4
ADDR	02H	ADDR	02H
CMD	06H	CMD	06H
High-order bit of data writing address	00H	High-order bit of data writing address	00H
Low-order bit of data writing address	04H	Low-order bit of data writing address	04H
Data content high-order bit	13H	Data content high-order bit	13H
Data content low-order bit	88H	Data content low-order bit	88H
CRC CHK low-order bit	C5H	CRC CHK low-order bit	C5H
CRC CHK high-order bit	6EH	CRC CHK high-order bit	6EH
END	T1-T2-T3-T4	END	T1-T2-T3-T4

Note: Sections 7.2 and 7.3 mainly describe the command formats.

7.3.3 Command code 08H, diagnosis

Sub-function code description:

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

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

RTU master command		RTU slave response	
START	T1-T2-T3-T4	START	T1-T2-T3-T4
ADDR	01H	ADDR	01H
CMD	08H	CMD	08H
Sub-function code high-order bit	00H	Sub-function code high-order bit	00H
Sub-function code low-order bit	00H	Sub-function code low-order bit	00H
Data content high-order bit	12H	Data content high-order bit	12H

RTU master command		RTU slave response	
Data content low-order bit	ABH	Data content low-order bit	ABH
CRC CHK low-order bit	ADH	CRC CHK low-order bit	ADH
CRC CHK high-order bit	14H	CRC CHK high-order bit	14H
END	T1-T2-T3-T4	END	T1-T2-T3-T4

7.3.4 Command code 10H, continuous writing

The command code 10H is used by the master to write data to the VFD. The quantity of data to be written is determined by "Data number", and a maximum of 16 pieces of data can be written.

For example, to write 5000 (1388H) and 50 (0032H) respectively to 0004H and 0005H of the VFD whose slave address is 02H, the frame structures are described in the following.

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

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

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

START	T1-T2-T3-T4 (time gap with a min. length of 3.5 bytes)
ADDR	02H

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

7.4 Data address definition

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

7.4.1 Function code address format rules

The address of a function code consists of two bytes, with the high-order bit on the left and low-order bit on the right. The high-order bit ranges from 00 to ffH, and the low-order bit also ranges from 00 to ffH. The high-order bit is the hexadecimal form of the group number before the dot mark, and low-order bit is that of the number behind the dot mark. Take P05.05 as an example: The group number is 05, that is, the high-order bit of the parameter address is the hexadecimal form of 05; and the number behind the dot mark is 05, that is, the low-order bit is the hexadecimal form of 05. Therefore, the function code address is 0505H in the hexadecimal form. For example, the parameter address of P10.01 is 0A01H.

Function code	Name	Description	Default	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	○
P10.01	Simple PLC memory selection	0: No memory after power-off 1: Memory after power-off	0	○

Note:

✧ The parameters in the P29 group are set by the manufacturer and cannot be read or modified. Some parameters cannot be modified when the VFD is running; some cannot be modified regardless of the VFD status. Pay attention to the setting range, unit, and description of a parameter when modifying it.

✧ The service life of the Electrically Erasable Programmable Read-Only Memory (EEPROM) may be reduced if it is frequently used for storage. Some function codes do not need to be stored during communication. The application requirements can be met by modifying the value of the on-chip RAM, that is, modifying the MSB of the corresponding function code address from 0 to 1. For example, if P00.07 is not to be stored in the EEPROM, you need only to modify the value in the RAM, that is, set the address to 8007H. The address can be used only for writing data to the on-chip RAM, and it is invalid when used for reading data.

7.4.2 Description of other function addresses

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

Function	Address	Data description	R/W characteristics
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	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	
	2003H	PID feedback, range (0–1000, 1000 corresponding to 100.0%)	R/W
	2004H	Torque setting (-3000–+3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2005H	Setting of the upper limit of the forward running frequency (0–Fmax, unit: 0.01 Hz)	R/W
	2006H	Setting of the upper limit of the reverse running frequency (0–Fmax, unit: 0.01 Hz)	R/W
	2007H	Upper limit of the electromotion torque (0–3000, 1000 corresponding to 100.0% of the motor rated current)	R/W

Function	Address	Data description	R/W characteristics
	2008H	Upper limit of the brake torque (0–3000, 1000 corresponding to 100.0% of the motor rated current)	R/W
	2009H	Special control command word: Bit0–1: =00: Motor 1 =01: Motor 2 =10: Motor 3 =11: Motor 4 Bit2: =1 Disable torque control =0: Enable torque control Bit3: =1 Clear electricity consumption =0: Not clear electricity consumption Bit4: =1 Pre-excitation =0: Disable pre-excitation Bit5: =1 DC brake =0: Disable DC brake	R/W
	200AH	Virtual input terminal command, range: 0x000–0x1FF	R/W
	200BH	Virtual output terminal command, range: 0x00–0x0F	R/W
	200CH	Voltage setting (used for V/F separation) (0–1000, 1000 corresponding to 100.0% of the motor rated voltage)	R/W
	200DH	AO output setting 1 (-1000–+1000, 1000 corresponding to 100.0%)	R/W
	200EH	AO output setting 2 (-1000–+1000, 1000 corresponding to 100.0%)	R/W
VFD status word 1	2100H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Stopped	
		0004H: Faulty	
		0005H: POFF	
		0006H: Pre-excited	
VFD status word 2	2101H	Bit0: =0: Not ready to run =1: Ready to run Bi1–2: =00: Motor 1 =01: Motor 2 =10: Reserved =11: Reserved Bit3: =0: Asynchronous motor =1: Synchronous motor Bit4: =0: No overload alarm =1: Overload	R

Function	Address	Data description		R/W characteristics
		alarm Bit5–Bit6: =00: Keypad-based control =01: Terminal-based control =10: Communication-based control		
VFD fault code	2102H	See the description of fault types.		R
VFD identification code	2103H	GD30-----0x0106		R
Running frequency	3000H	0–Fmax (Unit: 0.01Hz)	Compatible with GD series, CHF100A, and CHV100 communication addresses	R
Set frequency	3001H	0–Fmax (Unit: 0.01Hz)		R
Bus voltage	3002H	0.0–2000.0V (Unit: 0.1V)		R
Output voltage	3003H	0–1200V (Unit: 1V)		R
Output current	3004H	0.0–3000.0A (Unit: 0.1A)		R
Rotating 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
PID setting	3008H	-100.0–100.0% (Unit: 0.1%)		R
PID 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	-10.00 – 10.00V (Unit: 0.01V)		R
Analog input 4	300FH	Reserved		R
Read input of	3010H	0.00 – 50.00kHz (Unit:		R

Function	Address	Data description		R/W characteristics
high-speed pulse 1		0.01Hz)		
Read input of high-speed pulse 2	3011H	Reserved		R
PLC and current step of multi-step speed	3012H	0 – 15		R
External length	3013H	0 – 65535		R
External count value	3014H	0 – 65535		R
Torque setting	3015H	-300.0 – 300.0% (Unit: 0.1%)		R
Identification code	3016H			R
Fault code	5000H			R

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

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

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

Eight high-order bits of code	Meaning	Eight low-order bits of code	Meaning
01	Goodrive	06	GD35 vector VFD

Note: A device code consists of 16 bits, with eight high-order bits and eight low-order bits. Eight high-order bits indicates the motor series, and eight low-order bits indicates the derivative model.

7.4.3 Fieldbus scale

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

In the process of multiplying a non-integer by a multiple to obtain an integer, the multiple is referred to as a fieldbus scale.

The fieldbus scale depends on the number of decimals in the value specified in "Description" or "Default" of the function parameter list. If there are n decimals in the value (for example, n=1), the fieldbus scale m is the nth-power of 10. Take the following table as an example, m is 10.

Function code	Name	Description	Default	Modify
P01.20	Wake-up-from-sleep delay	0.0–3600.0s (valid when P01.19 is 2)	0.0s	○
P01.21	Restart after power-off	0: Disable 1: Enable	0	○

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

To set the "Wake-up-from-sleep delay" to 5.0s through Modbus communication, you need first to multiply 5.0 by 10 according to the scale to obtain an integer 50, that is, 32H in the hexadecimal form, and then transmit the following write command:

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

After receiving the command, the VFD converts 50 into 5.0 based on the fieldbus scale, and then sets "Wake-up-from-sleep delay" to 5.0s.

For another example, after the upper computer transmits the "Wake-up-from-sleep delay" parameter read command, the master receives the following response from the VFD:

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

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

7.4.4 Error message response

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

following table describes the codes and definitions of the error message responses.

Code	Name	Description
01H	Invalid command	The command code received by the upper computer is not allowed to be executed. The possible causes are as follows: • The function code is applicable only on new devices and is not implemented on this device. • The slave is in the faulty state when processing this request.
02H	Invalid data address	For the VFD, the data address in the request of the upper computer is not allowed. In particular, the combination of the register address and the number of the to-be-transmitted bytes is invalid.
03H	Invalid data value	The received data domain contains a value that is not allowed. The value indicates the error of the remaining structure in the combined request. **Note:** It does not mean that the data item submitted for storage in the register includes a value unexpected by the program.
04H	Operation failure	The parameter is set to an invalid value in the write operation. For example, a function input terminal cannot be set repeatedly.
05H	Password error	The password entered in the password verification address is different from that set in P07.00.
06H	Data frame error	The length of the data frame transmitted by the upper computer is incorrect, or in the RTU format, the value of the CRC check bit is inconsistent with the CRC value calculated by the lower computer.
07H	Parameter read-only	The parameter to be modified in the write operation of the upper computer is a read-only parameter.
08H	Parameter cannot be modified in running	The parameter to be modified in the write operation of the upper computer cannot be modified during the running of the VFD.
09H	Password protection	A user password is set, and the upper computer does not provide the password to unlock the system when performing a read or write operation. The error of "system locked" is reported.

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

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

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

For an exception response, the following code is returned:

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

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

For example, to set the "Channel of running commands" (P00.01, the parameter address is 0001H) of the VFD whose address is 01H to 03, the command is as follows:

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

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

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

The exception response code 86H (generated based on the highest-order bit "1" of the write command 06H) indicates that it is an exception response to the write command (06H). The error code is 04H. From the preceding table, we can see that it indicates the error "Operation failure", which means "The parameter is set to an invalid value in the write operation".

7.5 Read/Write operation example

For details about the formats of the read and write commands, see section 7.3.

7.5.1 Examples of read command 03H

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

The read command transmitted to the VFD is as follows:

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

Assume that the following response is returned:

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

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

7.5.2 Examples of write command 06H

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

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

The command transmitted by the master is as follows:

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

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

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

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

Function code	Name	Description	Default	Modify
P00.03	Max. output frequency	Used to set the max. output frequency of the VFD. Pay attention to the function code because it is the foundation of the frequency	50.00Hz	◎

Function code	Name	Description	Default	Modify
		setting and the speed of acceleration (ACC) and deceleration (DEC). Setting range: P00.04–400.00Hz		

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

The command transmitted by the master is as follows:

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

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

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

7.5.3 Examples of continuously write command 10H

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

Function	Address	Data description	R/W characteristics
Communication-based control command	2000H	0001H: Forward running	R/W
		0002H: Reverse running	
		0003H: Forward jogging	
		0004H: Reverse jogging	
		0005H: Stop	
		0006H: Coast to stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging to stop	
Communication-based value setting	2001H	Communication-based frequency setting (0–Fmax, unit: 0.01 Hz)	R/W

Function	Address	Data description	R/W characteristics
	2002H	PID setting, range (0–1000, 1000 corresponding to 100.0%)	

The command transmitted by the master is as follows:

01	10	20 00	00 02	04	00 01	03 E8	3B 10
VFD address	Continuous writing command	Parameter address	Data number	Number of bytes	Forward running	10Hz	CRC check

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

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

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

P00.11	ACC time 1	Setting range of P00.11 and P00.12: 0.0–3600.0s	Model depended	○
P00.12	DEC time 1		Model depended	○

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

The command transmitted by the master is as follows:

01	10	00 0B	00 02	04	00 64	00 C8	F2 55
VFD address	Continuous writing command	Parameter address	Data number	Number of bytes	10s	20s	CRC check

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

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

Note: In the preceding command description, spaces are added to a command just for explanatory purposes. In practical applications, no space is required in the commands unless the upper computer can remove the space by themselves.

7.6 Common communication faults

Common communication faults include the following:

- ✧ No response is returned.
- ✧ The VFD returns an exception response.

Possible causes of no response include the following:

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

Appendix A Technical data

A.1 Derated application

A.1.1 Capacity

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

Note:

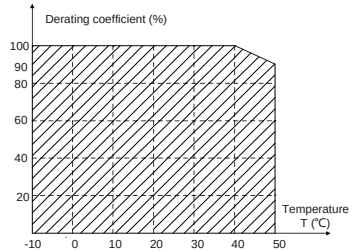
- ✧ The maximum allowable shaft power of the motor is limited to 1.5 times the rated power of the motor. If the limit is exceeded, the VFD automatically restricts the torque and current of the motor. This function effectively protects the input shaft against overload.
- ✧ The rated capacity is the capacity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

A.1.2 A.1.2 Derating

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

A.1.2.1 Derating due to temperature

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



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

A.1.2.2 Derating due to altitude

When the altitude of the site where the VFD is installed is lower than 1000 m, the VFD can run

at the rated power. When the altitude exceeds 1000m, derate by 1% for every increase of 100m. When the altitude exceeds 3000m, consult the local INVT dealer or local INVT office for details.

A.1.2.3 Derating due to carrier frequency

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

A.2 CE

A.2.1 CE marking

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

A.2.2 EMC compliance declaration

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

A.3 EMC regulations

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

Application environment categories

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

Category II: All environments except those in Category I.

VFD categories

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

C2: Rated voltage lower than 1000 V, non-plug, socket, or mobile devices; power drive systems that must be installed and operated by specialized personnel when applied to environments of Category I

Note: The EMC standard IEC/EN 61800-3 no longer restricts the power distribution of VFDs, but it specifies their use, installation, and commissioning. Specialized personnel or organizations must have the necessary skills (including the EMC-related knowledge) for installing and/or performing commissioning on the electrical drive systems.

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

applied to environments of Category I.

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

A.3.1 VFD category of C2

The induction disturbance limit meets the following stipulations:

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

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

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

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

A.3.2 VFD category of C3

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

The induction disturbance limit meets the following stipulations:

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

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

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

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

Appendix B Dimension drawings

This chapter describes the dimension drawings of the VFD. The dimension unit used in the drawings is mm.

B.1 External keypad structure

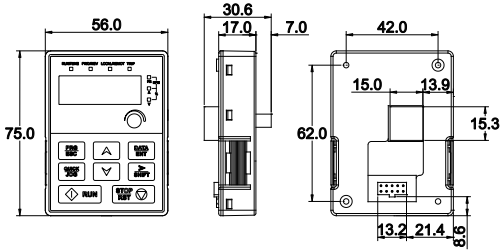


Figure B-1 Keypad outer outline

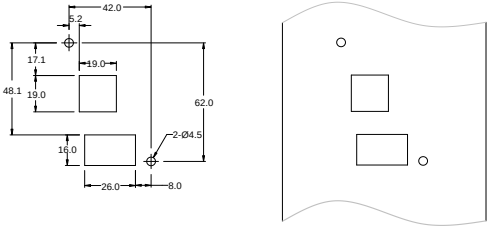


Figure B-2 Hole-cutting diagram for non-bracket keypad

Note: An external keypad is the optional part for the VFD models of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW). For the VFD models of 3PH 380V (≥4kW) and 3PH 220V (≥1.5kW), the keypad can be connected externally.

When installing an external keypad, you can install it on the keypad adapter bracket which is optional part.

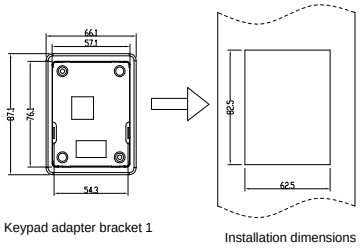


Figure B-3 Outline and installation dimensions

B.2 VFD dimensions

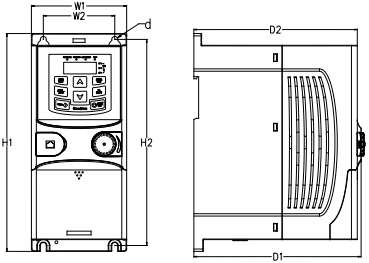


Figure B-4 Wall mounting of VFDs of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW)

Model	W1	W2	H1	H2	D1	D2	Installation hole (d)	Weight (kg)
GD30-0R4G-S2	80.0	60.0	160.0	150.0	123.5	120.3	5	0.9
GD30-0R7G-S2	80.0	60.0	160.0	150.0	123.5	120.3	5	0.9
GD30-1R5G-S2	80.0	60.0	185.0	175.0	140.5	137.3	5	1.2
GD30-2R2G-S2	80.0	60.0	185.0	175.0	140.5	137.3	5	1.2
GD30-0R4G-2	80.0	60.0	185.0	175.0	140.5	137.3	5	1
GD30-0R7G-2	80.0	60.0	185.0	175.0	140.5	137.3	5	1
GD30-0R7G-4	80.0	60.0	185.0	175.0	140.5	137.3	5	1
GD30-1R5G-4	80.0	60.0	185.0	175.0	140.5	137.3	5	1
GD30-2R2G-4	80.0	60.0	185.0	175.0	140.5	137.3	5	1

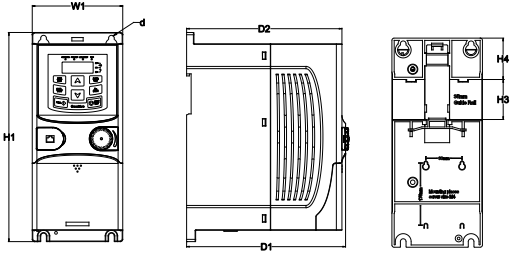


Figure B-5 Rail mounting of VFDs of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW)

Model	W1	H1	H3	H4	D1	D2	Installation hole (d)	Weight (kg)
GD30-0R4G-S2	80.0	160.0	35.4	36.6	123.5	120.3	5	0.9
GD30-0R7G-S2	80.0	160.0	35.4	36.6	123.5	120.3	5	0.9
GD30-1R5G-S2	80.0	185.0	35.4	36.6	140.5	137.3	5	1.2
GD30-2R2G-S2	80.0	185.0	35.4	36.6	140.5	137.3	5	1.2
GD30-0R4G-2	80.0	185.0	35.4	36.6	140.5	137.3	5	1
GD30-0R7G-2	80.0	185.0	35.4	36.6	140.5	137.3	5	1
GD30-0R7G-4	80.0	185.0	35.4	36.6	140.5	137.3	5	1
GD30-1R5G-4	80.0	185.0	35.4	36.6	140.5	137.3	5	1
GD30-2R2G-4	80.0	185.0	35.4	36.6	140.5	137.3	5	1

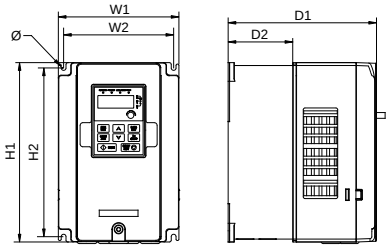


Figure B-6 Wall mounting of VFDs of 3PH 380V (4–37kW) and 3PH 220V (1.5–7.5kW)

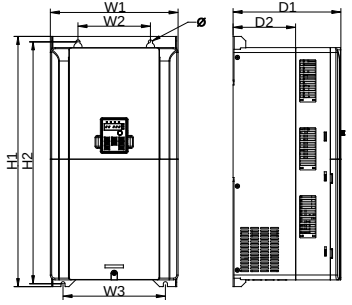


Figure B-7 Wall mounting of VFDs of 3PH 380V (45–75kW)

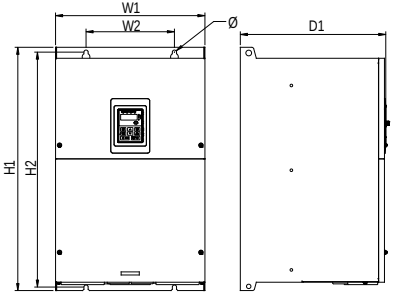


Figure B-8 Wall mounting of VFDs of 3PH 380V (90–110kW)

Model	W1	W2	W3	H1	H2	D1	D2	Installation hole	Weight (kg)
GD30-1R5G-2	146.0	131.0	—	256.0	243.5	167.0	84.5	6	3.1
GD30-2R2G-2	146.0	131.0	—	256.0	243.5	167.0	84.5	6	3.1
GD30-004G-2	146.0	131.0	—	256.0	243.5	167.0	84.5	6	3.1
GD30-5R5G-2	170.0	151.0	—	320.0	303.5	196.3	113.0	6	5.58
GD30-7R5G-2	170.0	151.0	—	320.0	303.5	196.3	113.0	6	5.83
GD30-004G-4	146.0	131.0	—	256.0	243.5	167.0	84.5	6	3.1
GD30-5R5G-4	146.0	131.0	—	256.0	243.5	167.0	84.5	6	3.1
GD30-7R5G-4	170.0	151.0	—	320.0	303.5	196.3	113.0	6	5.58
GD30-011G-4	170.0	151.0	—	320.0	303.5	196.3	113.0	6	5.58
GD30-015G-4	170.0	151.0	—	320.0	303.5	196.3	113.0	6	5.83
GD30-018G-4	200.0	185.0	—	340.6	328.6	184.3	104.5	6	9
GD30-022G-4	200.0	185.0	—	340.6	328.6	184.3	104.5	6	9
GD30-030G-4	250.0	230.0	—	400.0	380.0	202.0	123.5	6	15.5
GD30-037G-4	250.0	230.0	—	400.0	380.0	202.0	123.5	6	15.5
GD30-045G-4	282.0	160.0	226.0	560.0	542.0	238.0	138.0	9	25
GD30-055G-4	282.0	160.0	226.0	560.0	542.0	238.0	138.0	9	25
GD30-075G-4	282.0	160.0	226.0	560.0	542.0	238.0	138.0	9	25
GD30-090G-4	338.0	200.0	—	554.0	535.0	329.2	—	9.5	45
GD30-110G-4	338.0	200.0	—	554.0	535.0	329.2	—	9.5	45

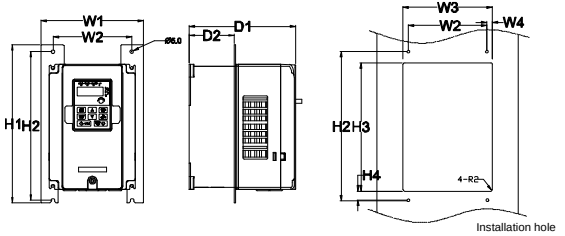


Figure B-9 Flange mounting of VFDs of 3PH 380V (4–75kW) and 3PH 220V (1.5–7.5kW)

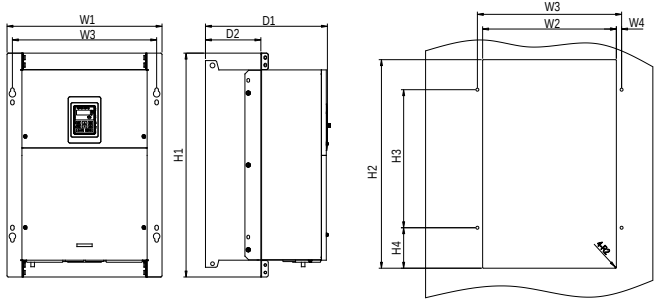


Figure B-10 Flange mounting of VFDs of 3PH 380V (90–110kW)

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation hole	Screw	Weight (kg)
GD30-1R5G-2	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5	3.1
GD30-2R2G-2	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5	3.1
GD30-004G-2	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5	3.1
GD30-5R5G-2	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5	5.58
GD30-7R5G-2	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5	5.83
GD30-004G-4	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5	3.1
GD30-5R5G-4	170.2	131	150	9.5	292	276	260	6	167	84.5	6	M5	3.1
GD30-7R5G-4	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5	5.58
GD30-011G-4	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5	5.58
GD30-015G-4	191.2	151	174	11.5	370	351	324	12	196.3	113	6	M5	5.83
GD30-018G-4	266	250	224	13	371	250	350.6	20.3	184.6	104	6	M5	9
GD30-022G-	266	250	224	13	371	250	350.	20.3	184.6	104	6	M5	9

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Installation hole	Screw	Weight (kg)
4							6						
GD30-030G-4	316	300	274	13	430	300	410	55	202	118.3	6	M5	15.5
GD30-037G-4	316	300	274	13	430	300	410	55	202	118.3	6	M5	15.5
GD30-045G-4	352	332	306	13	580	400	570	80	238	133.8	9	M8	25
GD30-055G-4	352	332	306	13	580	400	570	80	238	133.8	9	M8	25
GD30-075G-4	352	332	306	13	580	400	570	80	238	133.8	9	M8	25
GD30-090G-4	418.5	361	389.5	14.2	600	559	370	108.5	329.5	149.5	9.5	M8	45
GD30-110G-4	418.5	361	389.5	14.2	600	559	370	108.5	329.5	149.5	9.5	M8	45

Note: The flange-mounting plate is a must for flange installation.

Appendix C Optional peripheral accessories

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

C.1 Wiring of peripheral accessories

The following figure shows the external wiring of the VFD.

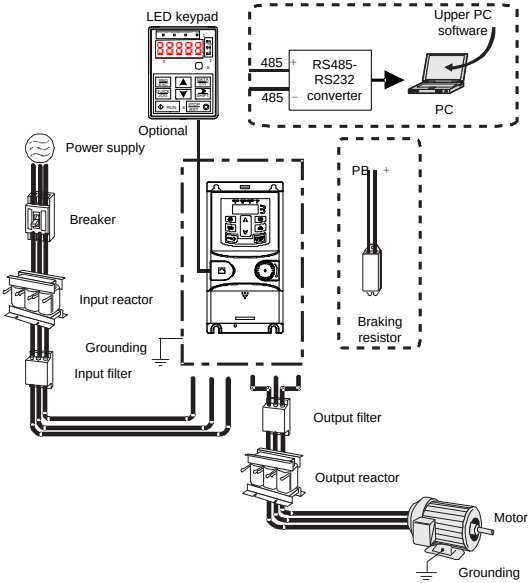


Image	Name	Description
	External keypad	External keypads include the external keypads with and without the function of parameter copying. When the external keypad with parameter copying is valid, the local keypad is off; when the external keypad without parameter copying is valid, the local and external keypads are on simultaneously.

Image	Name	Description
	Cable	Accessory for signal transmission.
	Breaker	Device for electric shock prevention and protection against short-to-ground that may cause current leakage and fire. Select residual-current circuit breakers (RCCBs) that are applicable to VFDs and can restrict high-order harmonics, and of which the rated sensitive current for one VFD is larger than 30 mA.
	Input reactor	Accessories used to improve the current adjustment coefficient on the input side of the VFD, and thus restrict high-order harmonic currents.
	Input filter	Accessory that restricts the electromagnetic interference generated by the VFD and transmitted to the public grid through the power cable. Try to install the input filter near the input terminal side of the VFD.
	Braking resistor	Accessories used to consume the regenerative energy of the motor to reduce the DEC time. The VFD models need only to be configured with braking resistors.
	Output filter	Accessory used to restrict interference generated in the wiring area on the output side of the VFD. Try to install the output filter near the output terminal side of the VFD.
	Output reactor	Accessory used to lengthen the valid transmission distance of the VFD, which effectively restrict the transient high voltage generated during the switch-on and switch-off of the IGBT module of the VFD.
	Membrane of heat releasing holes at the side	Accessory applied in severe environment scenarios for improving protective effect. The VFD can be derated by 10% through using the membrane.

C.2 Power supply

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

C.3 Cables

C.3.1 Power cables

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

Note: If the conductivity of the shielding layer of the motor cables cannot meet the requirements, separate PE conductors must be used.

C.3.2 Control cables

All analog control cables and cables used for frequency input must be shielded cables.

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

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

Note:

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

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

VFD model	Recommended cable size (mm^2)		Connecting cable size (mm^2)			Terminal screw	Tightening torque (Nm)
	RST / UVW	PE	RST / UVW	P1, (+)	PE		
GD30-0R4G-S2	1.5	1.5	1–4	1–4	1–4	M3	0.8
GD30-0R7G-S2	1.5	1.5	1–4	1–4	1–4	M3	0.8
GD30-1R5G-S2	2.5	2.5	1–4	1–4	1–4	M3	0.8
GD30-2R2G-S2	2.5	2.5	1–4	1–4	1–4	M3	0.8
GD30-0R4G-2	1.5	1.5	1–1.5	1–1.5	1–1.5	M3	0.8
GD30-0R7G-2	1.5	1.5	1–1.5	1–1.5	1–1.5	M3	0.8
GD30-1R5G-2	2.5	2.5	1.5–6	2.5–6	2.5–6	M4	1.13
GD30-2R2G-2	2.5	2.5	1.5–6	2.5–6	2.5–6	M4	1.13
GD30-004G-2	2.5	2.5	1.5–6	2.5–6	2.5–6	M4	1.13
GD30-5R5G-2	4	4	4–10	4–10	4–10	M5	2.3
GD30-7R5G-2	6	6	4–10	4–10	4–10	M5	2.3
GD30-0R7G-4	1.5	1.5	1–1.5	1–1.5	1–1.5	M3	0.8
GD30-1R5G-4	1.5	1.5	1–1.5	1–1.5	1–1.5	M3	0.8

VFD model	Recommended cable size (mm²)		Connecting cable size (mm²)			Terminal screw	Tightening torque (Nm)
	RST UVW	PE	RST UVW	P1, (+)	PE		
GD30-2R2G-4	1.5	1.5	1–1.5	1–1.5	1–1.5	M3	0.8
GD30-004G-4	2.5	2.5	2.5–6	2.5–6	2.5–6	M4	1.13
GD30-5R5G-4	2.5	2.5	2.5–6	2.5–6	2.5–6	M4	1.13
GD30-7R5G-4	4	4	4–10	4–10	4–10	M5	2.3
GD30-011G-4	6	6	4–10	4–10	4–10	M5	2.3
GD30-015G-4	6	6	4–10	4–10	4–10	M5	2.3
GD30-018G-4	10	10	10–16	10–16	10–16	M5	2.3
GD30-022G-4	16	16	10–16	10–16	10–16	M5	2.3
GD30-030G-4	25	16	25–50	25–50	16–25	M6	2.5
GD30-037G-4	25	16	25–50	25–50	16–25	M6	2.5
GD30-045G-4	35	16	35–70	35–70	16–35	M8	10
GD30-055G-4	50	25	35–70	35–70	16–35	M8	10
GD30-075G-4	70	35	35–70	35–70	16–35	M8	10
GD30-090G-4	95	50	70–120	70–120	50–70	M12	35
GD30-110G-4	120	70	70–120	70–120	50–70	M12	35

Note:

- ✧ Cables of the sizes recommended for the main circuit can be used in scenarios where the ambient temperature is lower than 40°C, the wiring distance is shorter than 100 m, and the current is the rated current.
- ✧ The terminals (+) and PB are used to connect to braking resistors.
- ✧ If the control cable and power cable need to be crossed, ensure that the angle between the control cable and the power cable is 90 degrees.
- ✧ If the inside of the motor is wet, the insulation resistance will decrease. If you think there is moisture inside the motor, dry the motor and re-measure it.

C.4 Breaker and electromagnetic contactor

You need to add a fuse to prevent overload.

You need to configure a manually manipulated molded case circuit breaker (MCCB) between the AC power supply and VFD. The breaker must be locked in the open state to facilitate installation and inspection. The capacity of the breaker needs to be 1.5 to 2 times the rated current of the VFD.

	✧ According to the working principle and structure of breakers, if the manufacturer's regulation is not followed, hot ionized gases may escape

	from the breaker enclosure when a short-circuit occurs. To ensure safe use, exercise extra caution when installing and placing the breaker. Follow the manufacturer's instructions.

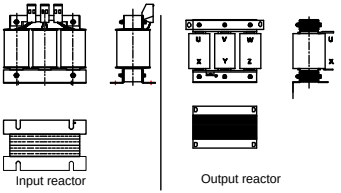
To ensure safety, you can configure an electromagnetic contactor on the input side to control the switch-on and switch-off of the main circuit power, so that the input power supply of the VFD can be effectively cut off when a system fault occurs.

VFD model	Fuse (A)	Breaker (A)	Contactor rated current (A)
GD30-0R4G-S2	10	10	9
GD30-0R7G-S2	16	16	12
GD30-1R5G-S2	25	25	25
GD30-2R2G-S2	50	40	32
GD30-0R4G-2	6	6	9
GD30-0R7G-2	10	10	9
GD30-1R5G-2	16	16	12
GD30-2R2G-2	25	25	18
GD30-004G-2	35	32	25
GD30-5R5G-2	35	32	32
GD30-7R5G-2	50	63	50
GD30-0R7G-4	6	6	9
GD30-1R5G-4	10	10	9
GD30-2R2G-4	10	10	9
GD30-004G-4	25	25	25
GD30-5R5G-4	35	32	25
GD30-7R5G-4	50	40	38
GD30-011G-4	63	63	50
GD30-015G-4	63	63	50
GD30-018G-4	100	100	65
GD30-022G-4	100	100	80
GD30-030G-4	125	125	95
GD30-037G-4	150	160	115
GD30-045G-4	150	200	170
GD30-055G-4	200	200	170
GD30-075G-4	250	250	205
GD30-090G-4	325	315	245
GD30-110G-4	350	350	300

C.5 Reactors

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

When the distance between the VFD and motor is longer than 50 m, the parasitic capacitance between the long cable and ground may cause large leakage current, and overcurrent protection of the VFD may be frequently triggered. To prevent this from happening and avoid damage to the motor insulator, compensation must be made by adding an output reactor. If the distance between the VFD and motor is 50 m to 100 m, select the reactor according to the following table. If the distance is longer than 100 m, contact INVT's technical support technicians.



VFD model	Input reactor	Output reactor
GD30-0R4G-S2	/	/
GD30-0R7G-S2	/	/
GD30-1R5G-S2	/	/
GD30-2R2G-S2	/	/
GD30-0R4G-2	ACL2-1R5-4	OCL2-1R5-4
GD30-0R7G-2	ACL2-1R5-4	OCL2-1R5-4
GD30-1R5G-2	ACL2-004-4	OCL2-004-4
GD30-2R2G-2	ACL2-004-4	OCL2-004-4
GD30-004G-2	ACL2-5R5-4	OCL2-5R5-4
GD30-5R5G-2	ACL2-7R5-4	OCL2-7R5-4
GD30-7R5G-2	ACL2-015-4	OCL2-015-4
GD30-0R7G-4	ACL2-1R5-4	OCL2-1R5-4
GD30-1R5G-4	ACL2-1R5-4	OCL2-1R5-4
GD30-2R2G-4	ACL2-2R2-4	OCL2-2R2-4
GD30-004G-4	ACL2-004-4	OCL2-004-4

VFD model	Input reactor	Output reactor
GD30-5R5G-4	ACL2-5R5-4	OCL2-5R5-4
GD30-7R5G-4	ACL2-7R5-4	OCL2-7R5-4
GD30-011G-4	ACL2-011-4	OCL2-011-4
GD30-015G-4	ACL2-015-4	OCL2-015-4
GD30-018G-4	ACL2-018-4	OCL2-018-4
GD30-022G-4	ACL2-022-4	OCL2-022-4
GD30-030G-4	ACL2-030-4	OCL2-030-4
GD30-037G-4	ACL2-037-4	OCL2-037-4
GD30-045G-4	ACL2-045-4	OCL2-045-4
GD30-055G-4	ACL2-055-4	OCL2-055-4
GD30-075G-4	ACL2-075-4	OCL2-075-4
GD30-090G-4	ACL2-110-4	OCL2-110-4
GD30-110G-4	ACL2-110-4	OCL2-110-4

Note:

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

C.6 Filters

C.6.1 C3 Filter model description

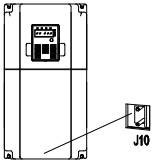
FLT-P04003L-C-G
A B C D E F G

Field identifier	Field description
A	FLT: Name of the VFD filter series
B	Filter type P: Power input filter L: Output filter
C	Voltage class S2: AC 1PH 220V(-15%) – 240V(+10%) 04: AC 3PH 380V(-15%) – 440V(+10%)
D	3-digit development serial number. For example, 003 stands for the serial number of C3 filters in development
E	Filter performance L: General H: High-performance

Field identifier	Field description
F	Filter application environment A: Environment Category I (IEC61800-3) category C1 (EN 61800-3) B: Environment Category I (IEC61800-3) category C2 (EN 61800-3) C: Environment Category II (IEC61800-3) category C3 (EN 61800-3)
G	Lot No. G: Special for external C3 filter

C.6.2 C3 Filter model selection

The VFD models of 1PH 220V/3PH 380V (≤2.2kW) and 3PH 220V (≤0.75kW) are configured with optional external C3 filters, as shown in the following figure. The VFD models of 3PH 380V (≥4kW) and 3PH 220V (≥1.5kW) are configured with built-in C3 filters, and you can select whether to connect C3 filters to the VFD models or not through jumper J10. (**Note:** Jumper J10 is put in the same bag with operation manual)



Interference filters on the input side can reduce the interference of VFDs (when used) on the surrounding devices.

Noise filters on the output side can decrease the radio noise caused by the cables between VFDs and motors and the leakage current of conducting wires.

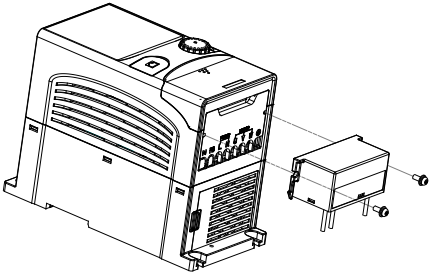
INVT provides some of the filters for you to choose.

VFD model	Input filter
GD30-0R4G-S2	FLT-PS2004L-C-G
GD30-0R7G-S2	
GD30-1R5G-S2	
GD30-2R2G-S2	
GD30-0R4G-2	FLT-P04008L-C-G
GD30-0R7G-2	
GD30-0R7G-4	
GD30-1R5G-4	
GD30-2R2G-4	

Note:

- ✧ The input EMI meets the C3 requirements after an input filter is configured.
- ✧ The preceding table describes external accessories. You need to specify the ones you choose when purchasing accessories.

C.6.3 C3 filter installation instruction



Install the C3 filter according to the following steps.

1. Connect the filter cable to the corresponding input terminal of the VFD according to the label.
2. Fix the filter onto the VFD with M3*10 screws (as shown in above picture).

C.6.4 C2 Filter model description

FLT-P04016L-B

A B C D E F

Field identifier	Field description
A	FLT: Name of the VFD filter series
B	Filter type P: Power input filter L: Output filter
C	Voltage class S2: AC 1PH 220V(-15%) – 240V(+10%) 04: AC 3PH 380V(-15%) – 440V(+10%)
D	3-digit code indicating the rated current. For example, 016 indicates 16A.
E	Filter performance L: General H: High-performance
F	Filter application environment

Field identifier	Field description
	A: Environment Category I (IEC61800-3) category C1 (EN 61800-3) B: Environment Category I (IEC61800-3) category C2 (EN 61800-3)

C.6.5 C2 Filter model selection

VFD model	Input reactor	Output reactor
GD30-0R4G-S2	FLT-PS2010H-B	FLT-L04006L-B
GD30-0R7G-S2		
GD30-1R5G-S2	FLT-PS2025L-B	FLT-L04016L-B
GD30-2R2G-S2		
GD30-0R4G-2	FLT-P04006L-B	FLT-L04006L-B
GD30-0R7G-2		
GD30-1R5G-2	FLT-P04016L-B	FLT-L04016L-B
GD30-2R2G-2		
GD30-004G-2	FLT-P04032L-B	FLT-L04032L-B
GD30-5R5G-2		
GD30-7R5G-2	FLT-P04045L-B	FLT-L04045L-B
GD30-0R7G-4	FLT-P04006L-B	FLT-L04006L-B
GD30-1R5G-4		
GD30-2R2G-4		
GD30-004G-4	FLT-P04016L-B	FLT-L04016L-B
GD30-5R5G-4		
GD30-7R5G-4	FLT-P04032L-B	FLT-L04032L-B
GD30-011G-4		
GD30-015G-4	FLT-P04045L-B	FLT-L04045L-B
GD30-018G-4		
GD30-022G-4	FLT-P04065L-B	FLT-L04065L-B
GD30-030G-4		
GD30-037G-4	FLT-P04100L-B	FLT-L04100L-B
GD30-045G-4		
GD30-055G-4	FLT-P04150L-B	FLT-L04150L-B
GD30-075G-4		
GD30-090G-4	FLT-P04240L-B	FLT-L04240L-B
GD30-110G-4		

Note:

✧ The input EMI meets the C2 requirements after an input filter is configured.

✧ The preceding table describes external accessories. You need to specify the ones you choose when purchasing accessories.

C.7 Braking resistors

C.7.1 Braking resistor selection

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

	✧ The design, installation, commissioning, and operation of the device must be performed by trained and qualified professionals. ✧ Follow all the "Warning" instructions during the operation. Otherwise, major physical injuries or property loss may be caused. ✧ Only qualified electricians are allowed to perform the wiring. Otherwise, damage to the VFD or brake components may be caused. ✧ Read the braking resistor instructions carefully before connecting them to the VFD. ✧ Connect braking resistors only to the terminals PB and (+). Do not connect them to other terminals. Otherwise, damage to the brake circuit and VFD and fire may be caused.
	✧ Connect the brake components to the VFD according to the wiring diagram. If the wiring is not properly performed, damage to the VFD or other devices may be caused.

VFD model	Braking unit model	Resistance applicable for 100% brake torque (Ω)	Dissipated power of braking resistor (kW)			Min. allowable brake resistance (Ω)
			10% brake usage	50% brake usage	80% brake usage	
GD30-0R4G-S2	Built-in braking unit	361	0.06	0.30	0.48	42
GD30-0R7G-S2		192	0.11	0.56	0.90	42
GD30-1R5G-S2		96	0.23	1.10	1.80	30
GD30-2R2G-S2		65	0.33	1.70	2.64	21
GD30-0R4G-2		361	0.06	0.3	0.48	131
GD30-0R7G-2		192	0.11	0.56	0.9	93
GD30-1R5G-2		96	0.23	1.1	1.8	44
GD30-2R2G-2		65	0.33	1.7	2.64	44
GD30-004G-2		36	0.6	3	4.8	33
GD30-5R5G-2		26	0.75	4.13	6.6	25
GD30-7R5G-2		19	1.13	5.63	9	13
GD30-0R7G-4		653	0.11	0.56	0.90	240

VFD model	Braking unit model	Resistance applicable for 100% brake torque (Ω)	Dissipated power of braking resistor (kW)			Min. allowable brake resistance (Ω)
			10% brake usage	50% brake usage	80% brake usage	
GD30-1R5G-4		326	0.23	1.13	1.80	170
GD30-2R2G-4		222	0.33	1.65	2.64	130
GD30-004G-4		122	0.6	3	4.8	80
GD30-5R5G-4		89.1	0.75	4.13	6.6	60
GD30-7R5G-4		65.3	1.13	5.63	9	47
GD30-011G-4		44.5	1.65	8.25	13.2	31
GD30-015G-4		32.0	2.25	11.3	18	23
GD30-018G-4		27	3	14	22	19
GD30-022G-4		22	3	17	26	17
GD30-030G-4		17	5	23	36	17
GD30-037G-4		13	6	28	44	11.7
GD30-045G-4-B		10	7	34	54	8
GD30-055G-4-B		8	8	41	66	8
GD30-075G-4-B		6.5	11	56	90	6.4
GD30-090G-4-B		5.4	14	68	108	4.4
GD30-110G-4-B		4.5	17	83	132	4.4

Note:

- ✧ Select braking resistors according to the resistance and power data provided by our company.
- ✧ The braking resistor may increase the brake torque of the VFD. The preceding table describes the resistance and power for 100% brake torque, 10% brake usage, 50% brake usage, and 80% brake usage. You can select the braking system based on the actual operation conditions.

	✧ Do not use braking resistors whose resistance is lower than the specified minimum resistance. The VFD does not provide protection against overcurrent caused by resistors with low resistance.
	✧ In scenarios where brake is frequently implemented, that is, the brake usage is greater than 10%, you need to select a braking resistor with higher power as required by the operation conditions according to the preceding table.

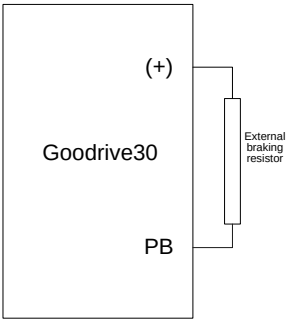
C.7.2 Braking resistor installation

Braking resistor cables need to be shielded cables.

All resistors need to be installed in places with good cooling conditions. Braking resistors are connected externally.

	✧ The materials near the braking resistor must be non-flammable. The surface temperature of the resistor is high. Air flowing from the resistor is of hundreds of degrees Celsius. Prevent any materials from coming into contact with the resistor.

Goodrive30 series VFD need only external braking resistors. PB and (+) are the terminals for connecting braking resistors. Installation of braking resistors is shown in the following figure.



Appendix D Further information

D.1 Product and service queries

Should you have any queries about the product, contact the local INVT office. Provide the model and serial number of the product you query about. You can visit www.invt.com to find a list of INVT offices.

D.2 Feedback on INVT VFD manuals

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

D.3 Documents on the Internet

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